WiMAX: Redes Inalámbricas en Argentina

Anexo Proyecto San Martín Digital

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***Abstract*— This paper focuses on three main developments. First, the advent of WiMAX technology and its differences with the 802.11 standard, commercially known as Wi-Fi. Secondly, a technical view on the main features of WiMAX and 802.16x standards, with some clarifications on 802.20, accompanying the description of its operation. Finally, the implementations and a state of the art on WiMax in Argentina, according to global data and experiences planned for the district of San Martín, Buenos Aires, Argentina.**

Keywords: WiMAX, Networking, VoIP, 802.16, 802.20, IEEE, NLOS, LOS, Modulation, AES, DES, LAN, MAN, WAN.

I. INTRODUCTION

In recent times, introduced Wi-Fi, wireless data networks, which in its different protocols (802.11 a, b, gyn, naming the most popular) operates in bands from 2.4 to 5 GHz. The advantages offered by Wi Fi were manifold: applications and connectivity in different places with absolute mobility as hotels, airports, gas stations, convention centers, bars, etc., As well as transmission speeds of 11-54 Mbps, between others.

WiMAX (Worldwide Interoperability for Microwave Access) is not yet a mass consumer technology, which allows this standard is developed according to a well established cycle, thus ensuring stability of compliance with specifications, ensuring its stability.
WiMAX technology is the basis for the Metropolitan Networks Internet access, will provide support to facilitate connections in rural areas, and used in the corporate world to implement internal communications. Moreover, its popularity will definitely take off other technologies such as VoIP (Voice over IP protocol).
WiMAX technology is designed primarily as a "last mile" and can be used to access links, MAN or WAN. Highlights WiMAX technology in their capacity as carrier, on which can carry IP, TDM, T1/E1, ATM, Frame Relay and voice, making it perfectly suited for large corporate network environments for voice and data, as well as telecommunications operators.

The initial 802.16 standard was in the frequency band of 10-66 GHz and required LOS towers. The new version 802.16a, ratified in March 2003, uses a narrow band spectrum and low, from 2 to 11 GHz, making its regulation. Furthermore, as an added bonus, does not require towers where such links exist LOS but only the deployment of base stations (BS) consisting of antennas stations / receiver capable of serving 200 subscribers stations (SS) that may cover and complete building service. Installation is very simple and fast (the process culminating in two hours) and its competitive price compared to other wireless technologies like Wi-Fi.[1][2]

II. UNDERSTANDING WIMAX

A. *Aims*

- Make a description of the WiMAX standard and its progress in ad hoc applications.
- Define a standard state of affairs in Argentina WIMAX

B. *State of the art*

In the telecommunications industry in recent years of wireless broadband is one of the most important issue. Both broadband technologies such as "Wireless", are having a mass acceptance in the market for technology. A study by the ITU (Telecommunications Indicators update) global cellular services grew from 11 million subscribers (1990) to 4 billion (2008).

In this same range of years the Internet went from being an academic tool to be massively accepted and have thousands of

millions of users. This tremendous growth of the Internet is driven by the demand for services (which will include higher-speed access) on behalf of users. This will bring a growth in the choice of broadband. It is knowing well that the growth of broadband users was no more than 20 million. During the years 2000 onwards were developed many wireless systems. Many of these were due to companies' interest to the possibility of expanding their networks at a low cost. These different methods of connectivity were varied in terms of capabilities, protocols, spectrum use, supporting applications and other parameters. Of the latter managed to be implemented some and the rest were limited to a few markets. Because of the fragmentation that exists in the industry to adopt a common standard is that these wireless systems have failed to transcend. It is assumed that with the emergence of WiMAX, as standard, reverse this paradigm will be achieved.

The following table is a small overview of the evolution of wireless access. Here we see the most important milestones sorted chronologically.

Table I – Evolution of wireless access

Date	Event
February 1997	AT&T announces development of fixed wireless technology code named "Project Angel"
February 1997	FCC auctions 30MHz spectrum in 2.3GHz band for wireless communications services (WCS)
September 1997	American Telecasting (acquired later by Sprint) announces wireless Internet access services in the MMDS band offering 750kbps downstream with telephone dial-up modem upstream
September 1998	FCC relaxes rules for MMDS band to allow two-way communications
April 1999	MCI and Sprint acquire several wireless cable operators to get access to MMDS spectrum
July 1999	First working group meeting of IEEE 802.16 group
March 2000	AT&T launches first commercial high-speed fixed wireless service after years of trial
May 2000	Sprint launches first MMDS deployment in Phoenix, Arizona, using first-generation LOS technology
June 2001	WiMAX Forum established
October 2001	Sprint halts MMDS deployments
December 2001	AT&T discontinues fixed wireless services
December 2001	IEEE 802.16 standards completed for > 11GHz.
February 2002	Korea allocates spectrum in the 2.3GHz band for wireless broadband (WiBro)
January 2003	IEEE 802.16a standard completed
June 2004	IEEE 802.16-2004 standard completed and approved
September 2004	Intel begins shipping the first WiMAX chipset, called Rosedale
December 2005	IEEE 802.16e standard completed and approved
January 2006	First WiMAX Forum-certified product announced for fixed applications
June 2006	WiBro commercial services launched in Korea
August 2006	Sprint Nextel announces plans to deploy mobile WiMAX in the United States

|1]

C. *Brief description of the operation of WiMAX*

In practical terms, WiMAX would operate in a manner similar to WiFi but at higher speed, more distance and a larger number of users. It could cover urban areas and rural areas considered "blind" that currently lack access to broadband internet because the phone or cable companies have not extended the wiring to these remote locations.

A WiMAX system consists of two parts:
• On one side are the towers WiMAX, providing cover of up to 8,000 square kilometers depending on the transmitted signal.
• On the other side are the receivers, ie, cards that connect to your PC, laptop, PDA and others to access.

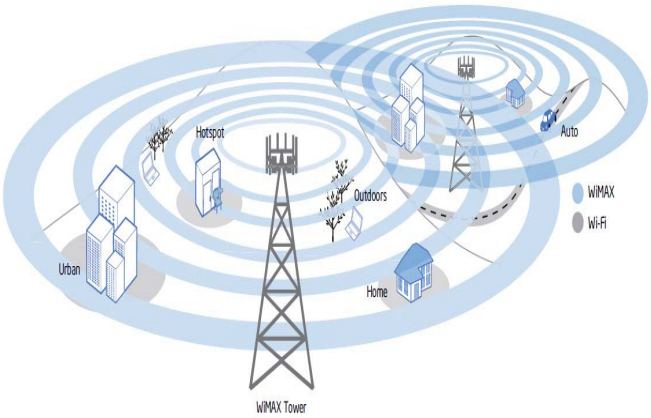

Figure I – WiMAX and WI-FI

We find two types of ways to provide signal:

• NLOS (Non line of sight). When there are objects that stand between the antenna and receiver (ie, they do not need to have a line of sight between the antennas). In this case, operates at low frequencies (between 2 and 11 GHz) so as not to be interfered by the presence of objects. Naturally this makes the available bandwidth is less. The antennas that provide this service will cover 65 square kilometers (more or less like those of mobile phones.

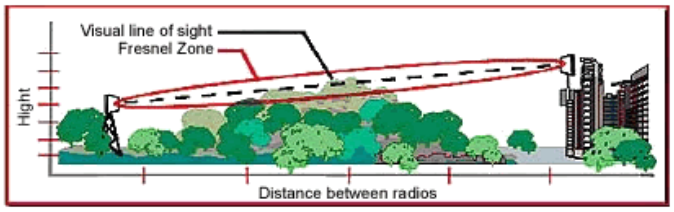

Figure II – NLOS

• LOS (Line of sight). When there is nothing that stands and there is direct eye contact. For transmission over longer distances (in theory can reach 50 km) it is necessary that the antennas have a direct line of sight (LOS). In this case, operates at very high frequencies, the order of 66 GHz, having a large bandwidth.

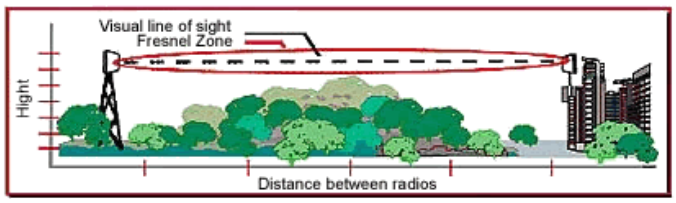

Figure III – LOS

D. *OFDM Modulation*

Multi-carrier modulation techniques are based on the idea of dividing a data stream in a significant number of equally

spaced carriers (called sub-carriers or tones) that transmit at low speed, and thus together provide a high transmission speed.

OFDM is a multi carrier modulation technique known as an excellent method applicable to two-way wireless transmission of high speed. The emergence of this technique is not new, dating from the 60s but at that time was very costly to implement.

We highlight two important advantages of this type of modulation, the first is common to all multi carrier systems and the second is specific to OFDM. When transmitting a signal in an environment with multiple reflections appear a phenomenon called "fading", this is only an attenuation of the signal received in parts of the spectrum since multiple paths are different lengths so that different signals will arrive out of phase to the same receiving antenna.

When there is the sum of the received signals, whether these are in phase, there is an increase of the signal, but if they are at any other stage and fade between them is the phenomenon of fading. To address this phenomenon in systems with a single carrier is needed to equalize the received signal so as to counteract this effect. Since the fading is not constant but varies each time, the systems to equalize the received signal are complex. However, when we use a multi-carrier system can equalize each carrier individually and as bandwidths are smaller, less complex equalizers, ergo, more efficient.

It is important to note that the carriers should be a tone so when we have to modulate to send the information we can not do in terms of frequency.

So each carrier in WiMAX can be modulated in BPSK, QPSK, 16QAM or 64QAM depending on the signal to noise in the channel.

Below is an OFDM transmission scheme:

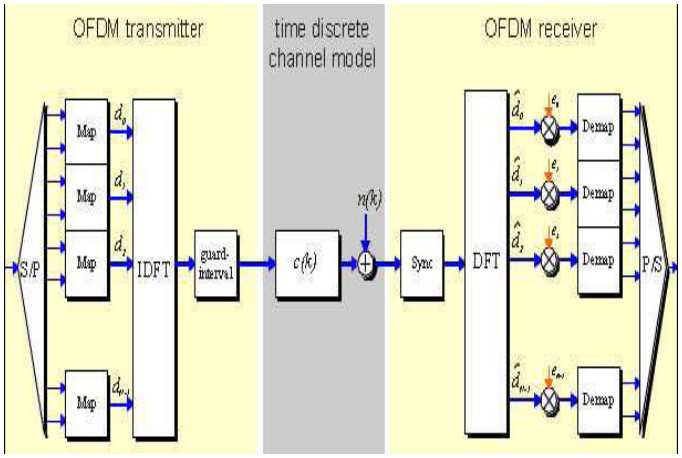

Figure IV – OFDM transmission scheme:

[1][2][3]

E. Adaptive Modulation and Coding in WiMAX

WiMAX supports several types of modulation and coding, which can be changed dynamically for each link, depending on channel conditions. Using an indicator of "quality channel, the mobile can provide the base station information (feedback) on the quality of the channel downstream. In the case of uplink, the base station can estimate the channel quality simply based on the quality of the received signal. The scheduler of the base station may take into account the quality of the channel up or down for each user and assign and the modulation scheme and coding to maximize throughput according to the existing signal to noise ratio. Adaptive modulation and coding can significantly increase overall system capacity, as well as to compensate in real time and for each link, throughput for robustness.
The key to the 802.16 family of standards lies in the adaptive modulation techniques used, mainly QAM (quadrature amplitude modulation). This technique involves digitally modulated in amplitude (ASK), independently, two carriers that have the same frequency but are out of phase with each 90 º (PSK).

QAM modulation can be reduced to simultaneous amplitude modulation and phase ASK PSK, a single carrier. Mathematically this can be expressed as:

QAM (1):

$$S(t) = a_n.\cos(\omega t) + b_n.\mathrm{sen}(\omega t) \qquad (1)$$

The adjustments are automatically adapted according to the distance and channel conditions, techniques being used for short-range QAM and PSK for greater distances. Since 64QAM gives the highest density of information per symbol (which translates as increased throughput) and BPSK gives greater robustness (lower throughput).

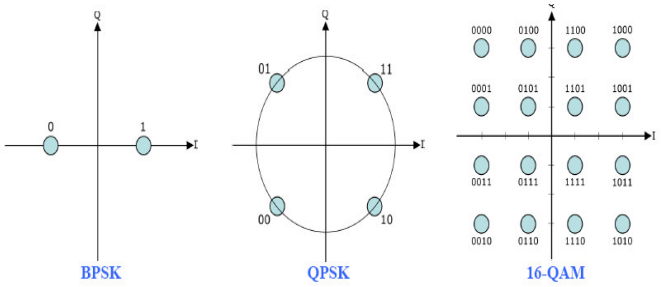

Figure V - Some modulations supported by Wi Max

WiMAX protocols are highly adaptive, allowing the base station to adjust its operating parameters and power levels to provide optimum signal level terminal (CPE - Customer Premises Equipment).[1][4][5]

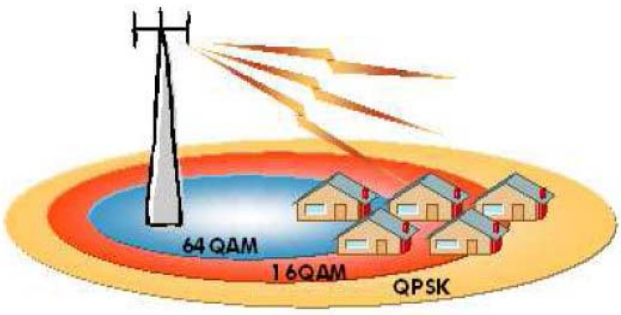

Figure VI - The adaptive modulation transmission rate to compensate for robustness, depending on the distance and channel conditions

F. Layer Medium Access Control (MAC Layer)

Layer Media Access Control or MAC (Media Access Control Layer) is the layer that sits above the physical layer, which is the actual physical medium for data transmission. The MAC layer defines the way that subscribers will access the network, as well as how resources are allocated. Layer Medium Access Control as defined in the 802.16 standard architecture supports point-to-point and point-to-point streak. This standard also had to be optimized for services based on IP protocol (Internet Protocol), as they are today, the best strategy for most operators, but also can support services "connection-oriented ", such as T1/E1 and ATM. Generally, those services inefficiently use the side of wide, which is a very important consideration for any wireless system, since the bandwidth is a valuable resource for this type of technology. The primary function of Layer Media Access Control is to provide an interface between the Transport Layer and Physical Layer.
The MAC layer receives packets from the upper layer, called MAC Service Data Units "or" MSDUs ", and further divided into packages called" MAC Protocol Data Units "or" MPDUs "which are wirelessly transmitted by the Physical Layer. Layer Medium Access Control performs the reverse process for incoming transmissions

The MAC layer has, in its design, a convergence sublayer. This can be interfaced with several higher layer protocols, such as ATM, TDM, and any protocol that is used in the future.

In addition, you can reduce the size of the "headers" of removing data packets MSDU headers. The MPDUs are of variable length, which offers flexibility and allows more efficient transmission. The MPUDs have a generic header, called GMH, which contains the connection identifier, the packet length, bits to indicate the use of CRC, subheadings, bits that indicate whether the payload is encrypted and, if so, what is the key. The payload can be a message for both transport and management. MSDUs addition, the transport payload may contain bandwidth requests or retransmission requests.

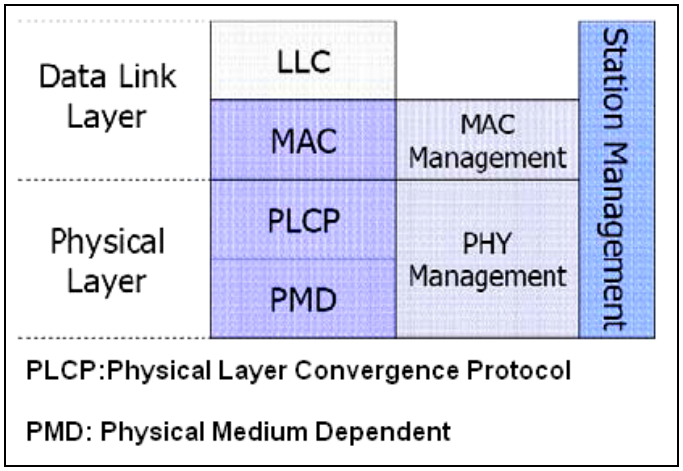

Figure VII - Diagram of the MAC sublayer

G. Interference

Deploying a wireless network compared to installing a wired Ethernet network can be a rather more complex. Within this section attempt to describe the engineering challenges we face to achieve the installation of a wireless network, particularly with regard to the limitations of scope. Multi-path interference (Multipath)

One of the biggest problems affecting radio networks is the fading caused by the phenomenon of multi-path (multipath fading). The waves are combined by superposition. When multiple waves converge at one point, the resulting wave is simply the sum of each of them. When two waves are almost opposite each other, the net result is almost zero.

Unfortunately, wireless networks this result is more common than one might wish. With omnidirectional antennas RF energy is radiated in all directions. The waves spread outward from the transmitting antenna in all directions and are reflected by the surfaces in the area of propagation. The following figure shows a very simplified example of two stations on a rectangular area with no obstruction.

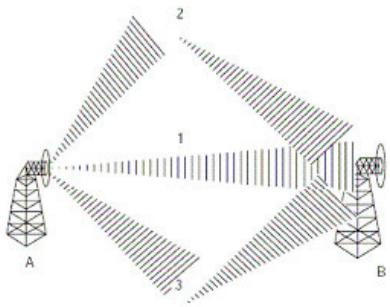

Figure VIII-Multiple paths of waves in a field with no obstructions.

The figure above shows three paths from the transmitter to the receiver. The wave at the receiver is the sum of all the different components. It is certainly possible that the roads shown in the figure are combined with each other to form a resultant wave zero, in which case the receiver does not include transmission

and no signal to receive. Because the transmission is a delayed copy of the same transmission on a different path, the phenomenon is called fading by multi-path (multipath fading) or multi-path interference (multipath Interference). In many cases, multi-path interference can be solved by changing the orientation or position of the receiver.[1][2][3][4][5][6]

III. SECURITY IN WIMAX NETWORKS

WiMAX was created as a robust solution for safety, presenting traditional WLAN technologies. It provides a level of media access control (MAC) that uses a grant-request mechanism to allow the exchange of data. This allows better use of broadcast media, the use of smaller antennas, as well as individual control of each user traffic. This simplifies the support services that require real-time communications and voice communications applications.

Security has been one of the biggest problems encountered by users on the WLAN.

Initial versions of security mechanisms available soon developed, and was relatively easy to get access by unauthorized persons. WiMAX offers a very complete set of features for safety:

• User Authentication based on EAP (Extensible Authentication Protocol).

• Authentication of the terminal by exchanging digital certificates to prevent unauthorized terminals.

• communications using encryption algorithms like DES (Data Encryption Standard) or AES (Advanced Encryption Standard), much more robust than the Wireles Equivalent Privacy (WEP) used initially in the WLAN. Additionally, each service is encrypted with the specific association of public key / private key.

• Advanced Encryption Standard (AES) is a schematic block cipher adopted as an encryption standard by the United States government.

• Extensible Authentication Protocol or EAP (Extensible Authentication Protocol) is a support structure often used in wireless networks and connections point-to-point

Until 2005, it has not found any successful attack against AES. The National Security Agency's (NSA) reviewed all the AES finalists and declared that they were all safe enough for use in non-classified information the U.S. government. In June 2003, the United States government announced that BSE could be used for classified information.

This marks the first time the public has had access to a cipher approved by NSA for super-secret information (TOP SECRET). It is interesting to note that many public products use 128-bit keys by default, it is possible that NSA suspects a fundamental weakness in keys of this size, or simply prefer a safety margin for superconfidential documents (which should preserve the security for decades in the future).

The most common method of attack to a block cipher is to try various attacks on versions of the cipher with a smaller number of rounds. The AES has 10 rounds for 128-bit keys, 12 rounds for 192-bit keys and 14 rounds for 256-bit keys. Until 2005, the best known attacks on versions are reduced to 7 rounds for 128-bit keys, 8 rounds for 192-bit keys, and 9 rounds for 256-bit keys (Ferguson et al, 2000).

Some cryptographers are concerned about the security of AES. They feel that the margin between the number of rounds specified in the cipher and the best known attacks is very small. The risk is that you can find some way to improve attacks and if so, the encryption could be broken. In the cryptographic context is considered "broken" an algorithm if there is any attack faster than exhaustive search (brute force). So an attack on the AES 128-bit key that requires 'only' 2120 operations would be considered an attack that "breaks" the AES, while taking into account that an attack now would be impossible. So far, these concerns can be ignored. The brute force attack over publicized and known a long time has been against a 64-bit RC5 key by distributed.net.

Another concern is the mathematical structure of AES. Unlike most block ciphers, AES has a very orderly mathematical description. This has not yet led to any attacks, but some researchers are worried that future attacks may find a way to exploit this structure.

In 2002, a theoretical attack, called "XSL attack", was announced by Nicolas Courtois and Josef Pieprzyk, showing a potential weakness in the AES algorithm. Several cryptography experts have found problems in mathematics that are below the proposed attack, suggesting that the authors might have made a mistake in their estimates. If this line of attack may be taken against AES, is a question still open. So far, the XSL attack against AES appears speculative, it is unlikely that anyone could carry out this attack in practice.

Doubts about security have been the main obstacle to both traders and for business users to invest more time and Wi-Fi undertake projects or large-scale. This has led the Institute of Electrical and Electronics Engineers (IEEE) and the set of companies in the WiMAX Forum to work together to define a security environment that offers robust and strengthened confidence to users.

According to IEEE and WinMax Forum, MAN 802.16 protocol has the best safety features in its class, achieved through the adoption of the latest technologies available. WiMAX addresses the security based on three (3) main areas:

1. Avoid using underground wireless connection.

This is achieved through encryption, providing strong protection through the implementation of the protocols 128-bit 3DES, AES 192-bit and RSA 1024-bits, providing user authentication and data encryption.

2. Provide services only to specific end users.

Through authentication based on X.509 digital certificates, including the access control layer to the media, giving each user their own certificate WiMAX receiver, plus another for the manufacturer, allowing the base station allow the end user .

3. Complying with secure access management.

Secure access under privacy link is implemented as part of a MAC sub-layer: the layer of privacy. It is based on Privacy Key Management protocol (DOCSIS specification BPI). .[1][2][3][4][5][6]

IV. General characteristics of Argentina

A. *Argentina in Latin America and the world.*

Located at the southern tip of Latin America, Argentina is a country which, by extension, is considered the eighth largest state in the world. It has effective sovereignty over 2.7804 million square kilometers of land, bordered to the north by Paraguay and Bolivia, northeast Brazil, Uruguay and the east by the Atlantic Ocean to the west and south by Chile.

In 1991, Argentina signed an agreement to accelerate integration and promote trade with Brazil, Uruguay and Paraguay, which was called the Southern Common Market (MERCOSUR). While thereafter the development of MERCOSUR has become high on the agenda for Argentina in terms of foreign policy at present is embodied as a customs union or free trade area that has not yet achieved higher progress in integration.

Recent estimates based on official data, the total population by 2004 amounted habitantes4 the 38.212 million, which currently number represents an increase of not less than 1% annually. However, this growth is not a linear correlation in the whole country. The morphology of the country is demographic characteristics highly dissimilar when comparing the population density of different local administrations and demographics change. It features a high concentration of inhabitants in some cities and a continuum of vast areas of virtually uninhabited land.

Unlike other Latin American countries like Brazil, Colombia, Ecuador and Bolivia, where there are several major cities or where capital is relatively small and must compete with other cities, Argentina has almost omnipotent presence of the capital, Buenos Aires, in all aspects of life in this country.

Population agglomerations are representative of a production model and therefore a way of differential access to information in each case.

In this context, the country's major cities are:

• Ciudad Autónoma de Buenos Aires, with 2.776.1385 inhabitants, is the political, economic and cultural development. For the port is done the bulk of Argentina's trade with the rest of the world and concentrated to 2006 more than 25% of GDP nacional6.

• Cordoba, a city in the Midwest and important industrial center. With 1.284.5827 inhabitants is considered the second largest city in the country.

• Rosario, 1.121.4418 people turns out to be an important river port on the River Paraná.

• San Miguel de Tucumán, 527.6079 only inhabitants is the main city in northwestern Argentina.

• Mendoza, in western country, but not an overwhelming number of population (110 993 habitantes10), the fact is that this city serves as core of the great wine region of the country. In line with the inequality that has the country in terms of population distribution, Argentina has a wide geographical range offers a variety of socio-economic landscapes.

B. *Digital cities in Argentina*

Digital cities should be able to offer its inhabitants a set of services that improve the living standards of the community, through the use of existing technology infrastructure. However, the political is the kind of bias that each administration has to generate the economic and cultural incentives involving the collective development of telecommunications. So the digital city is always a reference material that is the city itself, the real city, with its own culture, with a particular technological development and local specificity in the way of governing.

The sharp differences between individuals, groups or geographic areas as regards access, use and capacity in the use of ICTs realize a global phenomenon that does not escape the reality of Argentina and that many authors agree that called digital divide. Already in 2002 Tedy Woodly and Roberto Zubieta explained: "the digital divide is not only a breach or technical investment. It is a breakthrough in human development in a society. "In the country there are different truths and the digital divide is a social divide more. Government initiatives to achieve greater digital inclusion are not uniform and respond to different resources.

At the start of work has shown that the gap separating the municipalities according to population and according to geographical condition that are just a few indicators to guide the analysis. Without being exhaustive or exclusive indicators proposed a cut of the many Argentine realities to account for the distances in the country are large and the encounters are few.

Under the diversity inherent in the morphology of Argentina, has selected a variety of municipalities of different sizes and geographic locations. Methodological purposes, surveys of opinion and technological resources in government more than 5,000 inhabitants (as the local governments of the microcity have features not easily comparable to those of the larger municipalities), the responses from the questionnaires have provided that substantial information on the preparedness of the country's cities for the development and implementation of digital services for the whole of society.

Each selected municipality was approached by a short questionnaire relating to specific aspects of local administration. The form assessed Municipal Bias on one side and Technology Infrastructure for another. The first part of the form understood general features of each municipality and the potential and limitations. This part of the questionnaire was completed by a member of the municipality with the ability to participate in local government policy decisions, as it not only appealed to the information of those who responded, but their views in planning and implementation of public policies . The second part, Infrastructure Technology specifically encompassed technical features with regard to the uses and

technological resources are there in the Municipality. This is information that anyone understood in the area of systems could be at hand.

In conclusion, despite failing to finish a study on the technological infrastructure and political bias with which the municipalities have fewer than 5,000 inhabitants, it proposes a brief reference to them as they contain about 2 million inhabitants (6% of the total population), but in total add up to more than 1,500 local governments.. Many local entities that can not be rejected to account for the digital divide that cuts the country.

C. Broadband wireless networks

The visible growth of broadband access began in mid-2003, particularly a greater demand for speed connections by users.

At present, although the amount of free users that use dial-up system is not as prominent free, in Argentina there are several vendors who offer their service free, and in this case, and Alternative Free Fullzero are leading the market in this field.

The growth in broadband access has led to the involvement of free users, in just one year fell 32% in total residenciales36 access. However, despite this relative loss, according to INDEC, the average connection free monthly users increased by 12%, from 6.59 hours in September 2005 to 200 637 7.48 hours in September.

Without doubt, the way users access to the technological infrastructure available has led to changes in the forms of communication between the different actors of society. In the light of technological developments, the institutional framework containing these forms of interaction needs to be updated, to thereby monitor and encourage the evolution of citizenship in the appropriation of digital resources.[7]

D. San Luis and WiMAX

San Luis Wimax installed the first node (middle-distance wireless Internet) in the province in order to optimize the availability and bandwidth Wi-Fi network provided by the University of La Punta (ULP). In the first phase will benefit the provincial capital. Then reach the cities of Villa Mercedes, Villa Juana Koslay and Merlo.

This facility opens up a comprehensive plan to expand the provincial Wi-Fi offering free wireless internet in 77 towns of San Luis

It is implementing a technology that improves broadband access, to unzip the pockets of higher density of users. The large operators, national and international use these computers to link to areas where access by other means.

"We have established a plan to expand areas where there is greater density, the number of users of the wireless system of the province, and started out of the strip south of the capital. We install in the Lighthouse of Wisdom Cluster Wimax more 60 meters high, and perform the migration of the Wi-Fi antennas in the area to this node, to connect to the AUI network, "said the head of AUI Area Networks, Jose Jerez.

The equipment investment exceeded 700 thousand pesos. "Connection engineering, installation, commissioning and start-up of the system, had no charge since they use the resources of the AUI and the University of La Punta (ULP)," he said.

At present there is a fiber optic network covering almost the entire city, and from there, difficult access to the antennas that are in urban poles. "We were using different links, child benefits as Wimax, which are used when the user density is lower. By increasing the amount we needed to extend the antennas. Now we have four teams each covering a radius of six kilometers away , and allow us to add this new system, the antennas are needed and thus, expand coverage, bandwidth, user technique and the availability of access for the community, "he said.

Jerez also anticipated that the capital city you are adding equipment to the east border and have already begun work on Koslay Juana, Villa de Merlo and Villa Mercedes.

"The implementation of this infrastructure, which aims at optimizing the UIA, has given us the possibility of improving the 'Know How' of our people. This will also allow us a quality inspection on the tasks that execute and provide satisfactory answers to requirement of users, "he said.

Videla Franco, head of AUI Wan said that this type of technology is used by leading companies such as Telmex, Telefónica, Telecom, and all operators that provide links in areas where they can not reach by other means. "This is a great economic effort that makes the province and the ULP to acquire this advanced technology used by major suppliers in the country and abroad, to provide customer service to a subscriber. The provincial government works to improve the free service we are providing, "he said.[8]

E. Conclusions

. Today one of the objectives pursued in telecommunications has been the development of systems that allow users to access information anywhere and at any time quickly and safely. To achieve this we have created systems that provide higher broadband speeds and wireless systems that provide cable connection without limitations.

To unify all these systems, and for technologies that allow the user access to all these properties is that they were created wireless access systems for broadband wireless including include those based on IEEE802.16 and IEEE802.20 . The creation of these standards can fill the technology gap between broadband systems fixed and mobile cellular systems existing today.

Both the IEEE802.16 and IEEE802.20 were created from the same proposal to create a standard wireless access wireless broadband, so that their proposals are similar in area of their application. The two standards are intended to provide its users a system through which they can access all kinds of information (voice, data, video), high data transmission rates, while in motion.

IEEE802.20 proposal has many advantages in the technical aspect regarding the IEEE802.16 standard, by covering a wider

field of application. Working under IEEE802.20 systems have the advantage of working with higher mobility than that offered by IEEE802.16 reach speeds of 250km / h. Likewise, it delivers data rates and higher processing. IEEE802.20 work on lower frequencies than 802.16e, below 3.5GHz frequencies that are more suitable for mobility.

In the commercial field of mobile wireless broadband, IEEE802.16 has an advantage in time over IEEE802.20 to have taken less time to the process of standardization. Although Flash-OFDM and iBurst are already being implemented in some countries must wait at least until 2010 to see an implementation and marketing officer IEEE802.20-based systems, unlike systems-Mobile WiMAX and WiBro already have been launched as a system based on IEEE802.16.

Still can not know what regulations will be in Argentina in terms of mobile wireless access systems based broadband IEEE802.16 and IEEE802.20 as being systems that work in licensed bands, can not be located in the same category as WiFi and WiMAX, which are now classified under the "Standard for the implementation and operation of systems of wideband digital modulation" to work on license-free bands.

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