A Careful Study on the Advantages of Wireless-Broadband Solutions for the African Continent By Means Of Research and Discussion of Findings

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Abstract

Africa is a continent where blackouts, undrinkable water and polluted areas are common problems that many Africans face every day. Despite these problems there are many advantages to living and doing business in Africa. Business, as well as the lives of people, can be greatly improved by fast and reliable broadband internet that is available anywhere. Wireless service has provided a solution to national telecommunications monopolies that needed a wider coverage range for the least possible cost. Wireless has a great number of advantages that result in major improvements in many areas in Africa, however certain researchers believe that there are many disadvantages that contradict the advantages of wireless communication in Africa.

New developments have created new wireless networks and communication methods. Data can be transmitted over wide ranges at the most affordable cost. Even speed has been improved as new technologies have been equipped with high speed transmission signals. Services include broadband, satellites, WLAN, Bluetooth, Zigbee, etc. where research scientists are improving to offer good communication services. The objective of this research is to determine whether there are many disadvantages that contradict the advantages of wireless communication in Africa.

With the use of books, journals and internet sites, information has been provided on the different wireless communication services such as; Bluetooth, WLAN, Broadband services, WiMax and Satellite networks. Not only does wireless communication offer mobile communication, it makes communication less of a burden in people's lives.

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1. Introduction

1.1 Background

Wireless networks are emerging as important channels of transferring data between two points or users. They have played a major role for the improvement of communication infrastructures in different continents around the globe. Wireless services have the biggest influence on country/nations growth, even the political section of a community is affected by wireless communications. Another form of wireless networks is broadband. Broadband provides a high bandwidth channel and high-speed channel for communication, voice and video streaming and other multimedia content. Wireless-broadband is the transmission of information signals by means of electromagnetic waves. It is a medium people can use to connect to a network and the internet without wires or physical connections. The three most used Wireless-Broadband technologies include 3G, WIMax, and WI-FI.

1.2 Indication of prior research

Portable communications have become an expectation in many countries around the world. You can see portability and mobility in everything from cordless keyboards and headsets, to satellite phones and global positioning systems (GPS) (Cisco 2009: Networking Academy Exploration).

1.3 Problem statement

As an emerging continent, Africa has many countries that are still considered remote due to the lack of proper network connections. Consequently, conditions for communication channels in Africa have not been the most favorable. The most fundamental factor regarding wireless is that the higher the frequency, the greater the loss, and therefore the shorter the range of a wireless signal. This poses a problem in Africa. (Hearmon, 2007:2). According to Goldsmith (2005:6), the signal processing required to support multimedia applications and networking functions can be power intensive. Problems like this and others cause researchers to think that the disadvantages of wireless override the advantages in Africa.

1.4 Aim

Basic mobile telephony has opened up opportunities for wireless communication to evolve. Third generation wireless technology and networks (3G) and WiMAX have improved the utilisation of wireless networks and communications. With these components, communication infrastructures have efficiently evolved. The objective of this research is to determine whether there are many disadvantages that contradict the advantages of wireless communication in Africa.

1.5 Scope

In this report we look at the advantages of wireless communication in Africa. With a population of 800 million people, with over 600 million surviving mostly as subsistence farmers in wide spread rural communities, the widest range possible from a base station is a pre-requisite in order to provide basic telecommunication services. (Hearmon, 2007:4)

2. Literature Review

According to Mbarika (2007) tens of millions of ordinary Africans carry wireless communicating devices such as cell phones, ”It might come as a surprise that sub-Saharan Africa-with 34 of the poorest countries on earth, according to the United Nations-is now the world’s fastest-growing wireless market.”

Wireless technology has revolutionised multimedia communications between people and devices from any location and it is by any measure, the fastest growing segment of the communication industry (Goldsmith: 2005). With advanced and newly improved wireless systems such as Worldwide Interoperability for Microwave Access (WiMax), Wireless Local Area Networks (WLAN), Wide Area Wireless Data Services, Bluetooth, ZigBee, Broadband wireless, satellite networks…etc, transmission devices have been optimized to the best transmission rates possible.

Broadband wireless access provides high-rate wireless communications between a fixed access point and multiple terminals (Goldsmith 2005). Wireless Local Area Networks (WLAN) support high-speed data transmissions within a small region as users move from place to place (Goldsmith 2005). Bluetooth radios provide short-range connections between wireless devices along with rudimentary networking capabilities (Goldsmith 2005). WiMax is a second generation protocol that allows for more efficient bandwidth use, interface avoidance, and is intended to allow higher data rates over longer distances (Woollard 2006)

All wireless devices are governed by a set rules defined by the IEEE. These rules govern how devices communicate and ensure minimum disruption between signals. Figure 1 below defines global wireless standards.

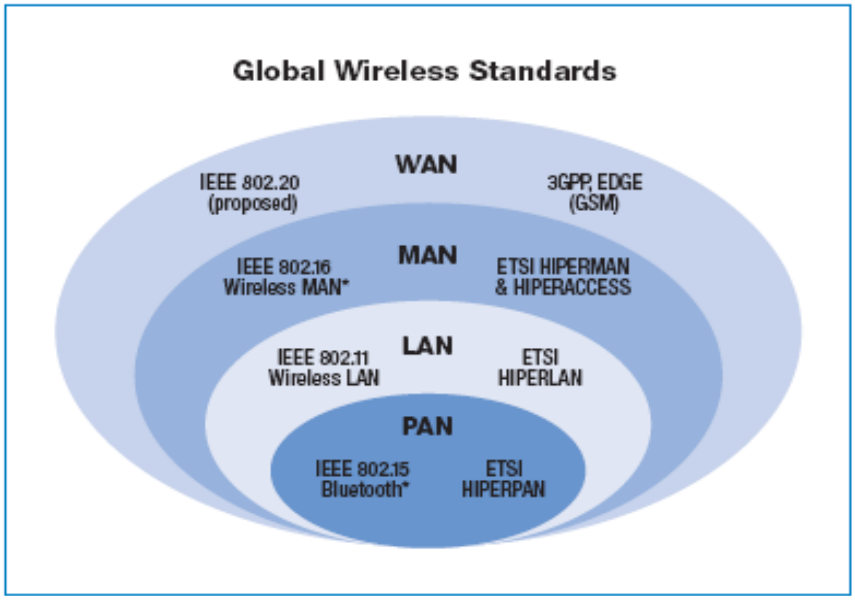


Figure 1 Global wireless standards (M. I. A. S. Neto)

Figure 1 above show the wireless standards of different devices. The hierarchy displays the devices from the least range coverage to the largest.
The table 1 below represent the standards defined by the IEEE and some their characteristics.

Table 1 Different wireless standards and some basic characteristics (Neto M. I. A. S.)

Standard	Application (pt-to-pt; Pt-to-multipt)	Frequency Band	Bandwidth **Throughput (link rate)**	Availability today	Max Range	Modulat.	MAC	Comments
802.11	WLAN	- FHopper (54 hops sec -DS 2.4GHz - Infra Red	1 Mbps (FH and DS), 2 Mbps	No, replaced by newer versions	-	FSK - FH QPSK - DS	CSMA	First standard (1997). Featured both frequency hopping and direct-sequence modulation techniques.
802.11b	WLAN, Pt to multipt & Pt to pt	2.4GHz	5.5 Mbps (11 Mbps)	Since 1999 Widespread, popular, inexpensive	Typ. 75m, 1km possible (Pt-to-multipt) 20Km poss. (pt-to-pt)	QPSK	CSMA	Most common 802.11 equipment. Reduced data rates at long range, relatively inefficient spectrum use
802.11g	WLAN	2.4GHz	22- 54 Mbps	Available	-	OFDM w/ opt. CCK	CSMA	Evolution of 802.11b, same band. Faster standard in the 2.4GHz
802.11a	WLAN	5GHz	6 - 54 Mbps	Available	30m (Pt-to-multipt)	OFDM	CSMA	1999, but products released late 2000. Still more expensive than 11b. Not accepted in Europe (see 802.11h)
802.11h				See 802.11a				Same as 802.11a, but with MAC enhancements. Includes DFS and TPC to operate in Europe
802.16	WIMAN (WiMax)	10-66 GHz (licensed)	70 Mbps	Yes, but still emergent	Typical 7km 30-50Km possible	Depends on data type & error rates	TDMA	Local metropolitan data system. Good range, good speed, but still emerging
802.16a	WIMAN (WiMax)	2-11 GHz (licensed)	70 Mbps	Should be available in the next year	See above	See above	TDMA	Point-to-multpoint Fixed broadband wireless access WLAN backhaul, both for hot spots and home networking
802.16b	WIMAN (WiMax)	5-6 GHz (unlicensed)		Should be available in the next year	See above	See above	TDMA and OFDMA	Includes Mesh mode
HIPERLAN/1		5GHz	11-20 Mbps	Limited availability		GMSK	-	Limited availability, lacks vendor support
HIPERLAN/2		5.15-5.30 GHz	up to 54 Mbps	Very limited availability		OFDM		Has own DFS Better QoS than 802.11a Very rigid, expensive to build
Canopy	Pt-to-pt, pt-to-multipt	2.4 and 5GHz	up to 14Mbps (pt-to-multipt) or 6Mbps (pt-to-pt)	Yes	15km 55km Pt to pt	-	-	Proprietary standard, relatively expensive
corDECT	Point-to-multipoint	1880 - 1935 MHz	32 Kbps ADPCM & Internet at 35/70 Kbps	Yes	10-25km Pt-to-multipt	-	-	Specifically designed for Universal Access

According to table 1 above Wimax has a wide range coverage and the highest frequency band of all the wireless connection types. The data suggests, however, that the use of the 2.4 and

5GHz bands is less restricted in African countries that enjoy a higher degree of competition in the telecommunications market, and potentially a lower degree of regulatory capture. (Neto M. I. A. S.:2002)

According to Melissa (2000) it is possible that electronic communication could have the opposite effect in Africa, where interest aggregation and social organization historically have been severely hindered by the lack of infrastructure and poor methods of communication. Africa has had the most users subscribing to the internet over the past years. (Melissa D, & Melissa R, 2000)

For as much advantages available for wireless communications, there are certain disadvantages that still need to be addressed. In Africa there has also been a problem, providing poor communication and data transmitting signals. For Africa, with its weak teledensity position, a higher use of the bands - in particular in rural areas - may translate into significant differential advantages, by going from no service to 'some' service (Neto M. I. A. S.:2002). Wireless communications are considered slow compared to wired communication and can be difficult to configure securely. Because wireless data is transmitted over wave signals, the data becomes vulnerable to electronic noise and can be easily disrupted.

3. Method

Wireless services have the biggest influence on country's/nations growth, even the political section of a community is affected by wireless communications.
There are many different kinds of wireless equipment, and for certain equipment to be used many factors should be taken into consideration. The factors include affordability, installations processes and the range it can cover. It would be clearly seen if the disadvantages override the advantages after the analysis.

Researches were carried by the utilisation of journals and books with relevant topics. Useful internet site were used to assist in the research on the advantages of wireless communication in Africa. Because of the wide range of materials available, only specific data concerning Africa was extracted and focused on.

4. Results and Discussion of Results

Table 2 Comparison of technologies

	Bluetooth	**WLAN**	**Broadband Service**	**WiMax**	**Satellite Networks**
Range (meters)	200 m **Differs with class*	100 feet (U.S)	30 km	30 feet	4568-6824 km
Cost	Implemented at affordable cost, because it is pair-to-pair device, transmitting small amount of data	Wireless routers are a bit costly and to expand the coverage range more have to bought	For the size and transmission rates of broadband services, the cost can be regarded as value for money	WiMax offers the best transmission rates, but the equipment can be very costly	Satellites are readily available because of the cost of maintenanc e
Advantages for Africa	The implementati on process is easy and simple, and therefore require less knowledge	Can connect a certain community with the least amount of wiring required	Can connect on a wider scale large nations for data exchange	Makes data transmission fast, by offering more bandwidth	Connects very remote areas that have no network coverage
Disadvantages for Africa	The transmission process can be a burden, because data is transferred slowly between hosts	The configuration process can be daunting, thus requires the highly skilled	While faster, broadband connections are often twice as costly as a dial-up connection	Not everyone is permitted to set up a WiMax wireless network	Very expensive and requires trained professional to maintain them

5. Conclusion

The disadvantages of wireless networks in Africa do not contradict the advantages. Advantages such as: less wiring, simple construction, high coverage and fast transmissions to remote areas affect the continents economy and personal lives a great deal; it starts businesses and creates job opportunities for both educated and non-educated people and communication issues are solved. The disadvantages do not affect the continent in a harsh way or cause any dramatic changes to people's lives, common problems such as expenses and highly skilled people that can configure components for wireless communication are required. These disadvantages only come with certain wireless communication devices such as WLAN and satellite networks. It is clear that the issues faced regarding wireless communication are easily solvable or avoided and do not override the many advantages wireless communication has on Africa. It is recommended that personal interviews with wireless communication providers become a form of collecting data to get more insight as they have had hands on personal experience.

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