

Role of wireless in health care sector with the help of emerging technologies

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ABSTRACT

The enhancement in the patients care and monitoring of instruments in hospitals can be done with the help of wired and wireless system deployment. In mass emergency situations wireless technology is the best solution in health care also helpful in human disaster and military conflicts. A number of technologies today are emerging with zeal of customer satisfaction. We can use these technologies in Continuous interactions between patients and doctors, monitoring and logging of medical information. Wireless technologies like Wi-Fi, RFID, and WiMAX are exploring the healthcare sector. In this paper we have focused on care of hospitalized patients and prioritizing the maximum information transfer in accidental case from boarding of patient in ambulance to hospital arrival until the patient is out of danger.[4] We have used Wi-Fi and WiMAX networks with Quality of Service parameters such as jitter, end to end delay and throughput to the technology response.

Keywords: Wi-Fi, WiMAX, RFID, quality of service.

1. INTRODUCTION:

Wireless Technology not a new field in health care or in medical applications, although real time patients monitoring field is basic example of technology. Health Care is one of the social enterprises and businesses that involve a large number of patients, doctors, pharmacies, and other medical and administrative staff. In developing country, a hospital general ward with 20 patients with a single doctor and five nurses can interpret itself the standard of health service to the patient's. The same ward with special monitoring device for each patient with same staff with local area network (LAN) and wireless technologies can give better and enhanced medical facility. Doctor and nurses can check the status of patient condition by their handheld device and can give attention to most urgent required one.[3]

2. NEED WIRELESS IN HEALTHCARE

At time of accident not hours however every moment is countable to save the life of patient, A person who had got accident faces the situation of inhaling the breath for life and death. It is quite difficult for a doctor to reach the spot of accident, at that time availability of ambulance is possible. The facility available within ambulance during the patient boarding would play an important role for its life safety.

With such type of situation gave the idea to think about the latest technologies use in healthcare sector.[2][7] Beyond local area network, the first technologies which come into existence for hospital is Wi-Fi, also known as

WLAN. WLAN is based on short-range RF communications, standardized in the USA by one of the Institute of Electrical and Electronics Engineers (IEEE) working groups.

3. Wi-Fi in healthcare

Wi-Fi is specified by the IEEE in the 802.11 standard. With the deployment 802.11 standards, hospital staff can remain connected to their critical systems regardless of their location. Staff with Wi-Fi enabled Special handheld devices/mobile phones can better serve their patients. Applications of Wi-Fi can be classified as:

The main uses for the Wi-Fi network by the hospital staff are keeping patient information in laptops, which caretakers use by the patients' bedside. By collecting patient information with computers, legibility concerns such as nurses not being able to understand handwritten notes from doctors or other nurses, which accounted for a majority of mistakes are no longer a factor.

Managing the operating rooms, Wi-Fi enables real-time access to patient files in their rooms Wi-Fi enables hospital staff to order patients' meals in real-time.

The Wi-Fi enables and manages operating room information that was previously distributed. Classification of assets and people can be monitored across the organization with Wi-Fi.

Wi-Fi enables the monitoring of inventory of a certain asset type e.g. wheelchairs, pumps and so on, and continually tracking whether it is in use, idle or requires servicing or calibration.

3.1. Advantages of WLAN

Safety -Wi-Fi enabled cameras, RFID tag in such applications serves to eliminate equipment theft, misplacement and hoarding, which in turn allows significant reductions in inventory.

Electronic Prescriptions - Physicians can electronically issue prescriptions while on their rounds, immediately sending the prescription to the patient's pharmacy.[6]

Location-based Content Delivery Location-based content can also be channeled to specific departments on a just-in-time basis, such as in an operating room during a procedure.[6] This not only saves time and money, it also improves the level of patient care and reduces the risk of getting the wrong information for a particular patient.

Lab Reports/Tests Physicians can electronically order detailed tests for their patients and securely view results as soon as they are available. Errors can be prevented by affixing RFID tags with patient information to vials containing blood samples and to any other plastic containers. [2]

Hospital Administration and Management Hospital administrators can see the latest up-to-the-minute information on all of their key assets and programs. Supplies can be scanned and tracked, and patient information can be entered directly into the system once, instead copying information between multiple forms

Location Tracking Using Wi-Fi tags and embedded transmitters to pinpoint the exact location of equipment and people within an organization. In a hospital, this might involve locating the exact whereabouts of expensive, mission-critical medical equipment to eliminate delays in the moment of need.

4. WiMAX

The 802.16 standard for 2-11 GHz is a wireless metropolitan area network (MAN) technology that will provide broadband wireless connectivity to Fixed, Portable and Nomadic devices. [3][2]It can be used to connect 802.11 hot spots to the Internet, provide campus connectivity, and provide a wireless alternative to cable and DSL for last mile broadband access.

4.1. APPLICATIONS of WiMAX

WiMAX can also be used to quickly restore communications in disaster recovery situations. Wireless private networks for industrial complexes, universities, and other campus-type environments represent an additional application for WiMAX. The range and security capabilities of WiMAX provide an advantage over Wi-Fi for these applications. Some key features of WiMAX are as follows[4]

With the availability of 802.16e, public transportation vehicles such as buses, trains, and trolleys can be

connected to a broadband WiMAX network. This connection in conjunction with a Wi-Fi hot spot within the vehicles will enable passengers to take advantage of high-speed access during their commuting time. Personal broadband with WiMAX-enabled handheld devices and broadband services will be available to anyone anywhere within the WiMAX coverage area.[11]

5. SCENARIO

We use of latest technology like Wi-Fi and WiMAX helps in conserving paper and thus saving very important trees. In this paper an environment for application in hospital is used with ns 2.29 to monitor patient as shown in figure 1. Nurses or healthcare observer are supposed with PDA to all rooms in case of emergency. All doctors have individually connected to their patient's situation in real time mode.[8] We have considered three applications CBR, VBR, VOIP in to consideration to provide the related information.[9] we have demonstrated the 802.11 standard with wired connection in all rooms to monitor all information related to a patient and for short range Wi-Fi hotspot is used where as in case of fast movement we have used WiMAX as backbone network.

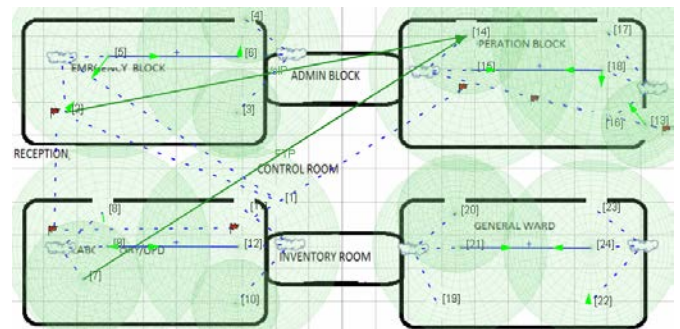


Figure 1 : scenario for hospital environment With Wi-Fi and WiMAX

6. RESULTS AND DISCUSSION

For scenario 1 we have observed that for small speed (m/s) it is good to use Wi-Fi. And for fast speed we should use WiMAX.

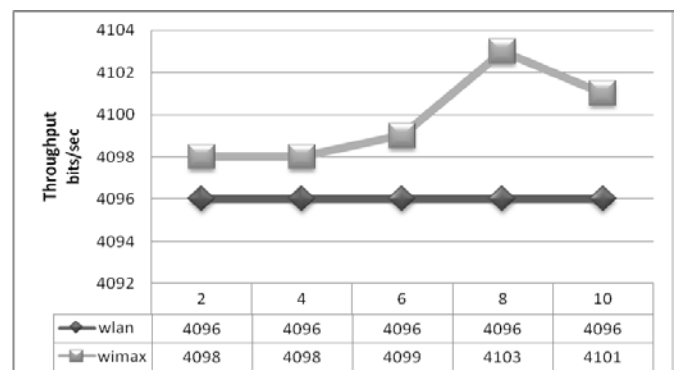


Figure 2 : Throughput comparison of wifi and wimax technology

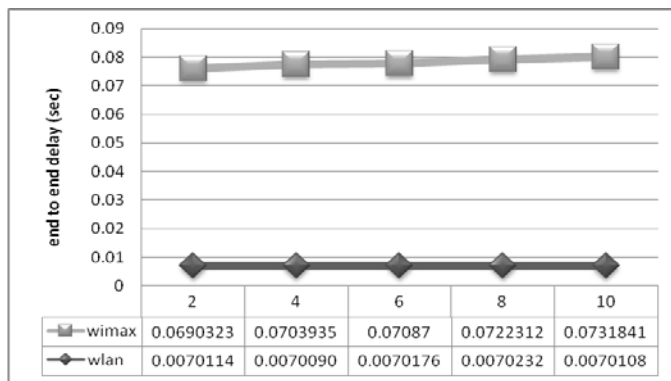


Figure 3: end to end delay response for real time applications.

Figure 2 represents the throughput comparison for Wi-Fi and WiMAX respectively and we found that the for short range wireless coverage the quality of service parameter for Wi-Fi network are better.

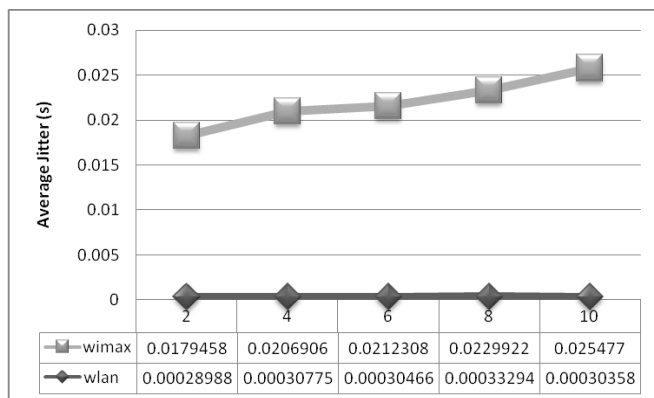


Figure 4: Jitter response comparison in case of wifi and wimax networks

From figure 3 we found that the end to end delay is minimum in case of wifi based network and we should use wifi for local or indoor applications. Although the for outer applications, we should prefer wimax network , when we are using ambulance services.As shown in figure 4, for same application if we use wimax and wifi, jitter (the delay variation) is desirable in case of wifi network.

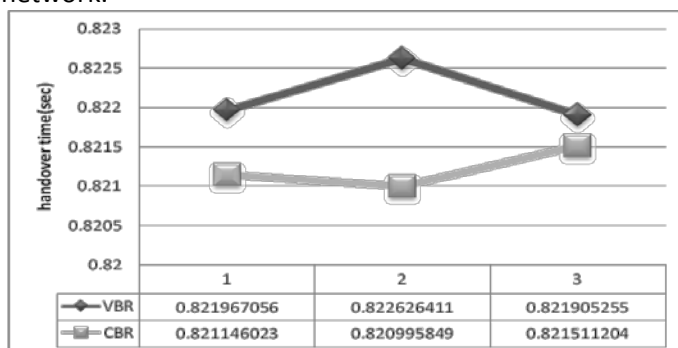


Figure 5 handover time estimation in wimax network.

From figure 5 we found that handover time is less in case of CBR as compared to VBR application with respect to number of handover stages.

7. CONCLUSION

In this paper we studied and compare the quality of service parametrs for WiFi and WiMAX networks. we found that we should use Wi-Fi for indoor applications,for ambulance and fast speed based applications we must use WiMAX .Wi-Fi and WiMAX can bring reliable and secure connectivity to individual mobile health workers, and to remote and mobile clinics India . The countrywide fiber backbone infrastructures in India can be merged with the wireless networks to give nonstop or seamless connectivity to a patient from village to city. . The quality of patients care can be increased with interoperability of two technologies and increasing their deployment.

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