Performance Analysis on Packet Delivery Ratio, Collision Detection Ratio, End To End Delay during Mobility in Various Wireless Techniques

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Abstract - **This paper present the effectiveness of the mobility of Bluetooth, Wi-Fi & Wi-Max. Bluetooth is an open wireless protocol for exchanging data over short distances from fixed and mobile devices. It is used to producing personal area networks (PANs). It is also recognizes as 802.15 standard of IEEE and wireless PAN. Wi-Max network can be built around an whole city, instead of providing partial coverage area while as Wi-Fi provides the services in broadband LAN. Anyway it doesn't meet QoS prerequisites for ongoing data traffic applications, for example, voice and video transmissions. Broadband Wireless advancements are progressively picking up popularity by the effective worldwide sending of the Wireless Personal Area Networks. The outcomes indicated how various factors, for example, load and mobility may influence the performance of Wi-Fi. The simulation input boundary is versatility and yield boundary are start to finish delay, packet delay proportion, defer jitter and throughput were considered as the performance measures in this paper.**

keywords - **IEEE 802.15, Bluetooth, IEEE 802.16, IEEE 802.11, WEP.**

I. INTRODUCTION

Wi-Fi: - According to its speed and the presented time, Wi-Fi technology can be separated into IEEE 802.11b, IEEE 802.11a, IEEE 802.11g and IEEE802.11n. IEEE802.11b and IEEE802.11g are commonly used [2]. IEEE802.11b is the oldest wireless network standard and the most widely used Wi-Fi standard. Its highest bandwidth is 11Mbps. When the signal is weak or there are interferences, the bandwidth can be adjusted to 5.5Mbps, 2Mbps and 1Mbps. The auto conditioning of bandwidth effectively ensure the stability and reliability of network. IEEE 802.11a has a larger throughput than IEEE 802.11b. It works in the 5.8GHz frequency band and has good anti-interference ability. But it cannot be compatible with IEEE 802.11b and IEEE 802.11g. Furthermore, its coverage is relatively tiny (only about 30m indoor). So IEEE 802.11a is still rarely used among all the Wi-Fi standards currently. In order to explain the incompatible problems between IEEE 802.11a and IEEE 802.11b, IEEE 802.11 working group formally approved the IEEE 802.11g standard in July 2003[2]. It can be obedient with IEEE 802.11b. So the applications of IEEE 802.11g are more than IEEE 802.11a.

Bluetooth:- Bluetooth is a networking equipment aimed at low-powered, short range appliances. It was initially developed by Ericsson, but is governed as an open requirement by the Bluetooth Special Interest Group. Bluetooth is a newly proposed standard for short variety, low power wireless communication. Originally, it is being envisioned simply as a wire substitution technology. Its most frequently described application is that of a "cordless computer "consisting of several devices including a personal computer, possibly a laptop, keyboard, mouse, joystick, printer, scanner etc., each equipped with a Bluetooth card. There are no cable associations between these devices, and Bluetooth is to enable seamless communication among all them, essentially replacing what is today achieved through a grouping of serial and parallel cables, and infrared links. Though, Bluetooth has the potential for being much more than a wire substitute technology, and the Bluetooth standard was indeed drafted with such a more ambitious goal in mind. Bluetooth holds the promise of becoming the technology of choice for adhoc networks of the future. This is in part because its low power utilization and potential low cost make it an attractive result for the typical mobile devices used in adhoc networks. Bluetooth is a requirement for Wireless Personal Area. It is a way to attach and swap information and data among mobile phones, laptops, digital cameras and video games. The communication is wireless and has the range of up to 10 meters. Visualize the situation; you go to your office. You connect your notebook to the LAN port. You switch it on. It goes through the whole procedure of booting up and then you transmit the data to your desktop computer this about process takes around 10-15 minutes, depending upon speed of your computer. Bluetooth will also enable to transmit files, photos, and songs from the mobile to other device. The Bluetooth comes in with a wireless headsets and it comes in free with the mobile phone or computer, the wireless headset also useful for people who like to be on the go or while driving the car, as they are hands free.

Wi-MAX: - Wi-MAX is an IP based, wireless broadband access equipment that provides performance similar to 802.11/Wi-Fi networks with the coverage and QOS (quality of service) of cellular networks. WiMAX is also a contraction meaning "Worldwide Interoperability for Microwave Access (WiMAX). WiMAX is a wireless digital communication structure, also known as IEEE 802.16 that is proposed for wireless" metropolitan area networks". WiMAX can introduce broadband wireless

access (BWA) up to 30 miles (50 km) for fixed stations, and 3 - 10 miles (5 - 15 km) for mobile stations. Interestingly, the WiFi/802.11 wireless local area network is restricted as a rule to just 100 - 300 feet (30 - 100m). WiMAX works on both authorized and non-authorized frequencies, giving a directed situation and feasible financial model for remote transporters. The normal cell ranges for most WiMAX organizations will probably flaunt 4-5 mile run (in NLOS able frequencies) even through tree spread and building dividers. Service ranges up to 10 miles (16 Kilometers) are likely in line of sight (LOS) applications (by and by relying on recurrence). Mobile WiMAX abilities on a for every client premise are obviously superior to contending 3G advances. WiMAX is regularly refered to have a spectral efficiency of 5 bps/Hz, which is excellent in contrast with other broadband wireless technologies, particularly 3G.

II. SIMULATION TOOL

In this research performance evaluation of Bluetooth, Wi-Fi and Wi-Max is based on NS2 simulator tool. Network Simulator (Version 2), broadly known as NS2, is just an event driven recreation instrument that has demonstrated helpful in examining the dynamic idea of communication networks. Simulation of wired just as remote organization capacities and conventions (e.g., routing algorithms, TCP, UDP) should be possible utilizing NS2. In general, NS2 furnishes clients with a method of indicating such network protocols and simulating their comparing practices. Because of its adaptability and particular nature, NS2 has increased consistent ubiquity in the networking research community since its introduction to the world in 1989. From that point onward, a few transformations and amendments have denoted the developing maturity of the tool, on account of significant commitments from the major parts in the field. Among these are the University of California and Cornell University who built up the REAL organization test system, the establishment on which NS is imagined. Since 1995 the Defense Advanced Research Projects Agency (DARPA) upheld the improvement of NS through the Virtual Inter Network Testbed (VINT) venture .Currently the National Science Foundation (NSF) has joined the ride being developed. Last however not the least, the gathering of specialists and engineers in the network are continually attempting to keep NS2 solid and adaptable.

The device is utilized for both wired and remote communication network. Anyway a simulation can't give proof in true situations. NS2 utilizes an equal discrete-occasion reproduction ability gave by Parsec. It is utilized for successive and equal execution of discrete-occasion recreation models. We have broke down the 802.15, 802.11and 802.16 principles for IEEE. NS2 contains the application, canister, doc, incorporate, java, macintosh, fundamental, organization, radio situation, tcplib and transport registries. We change the parameters in MyTCL.tcl records. The progressions are simulated and compose the last insights results in nam mean animator record [14].

III. SIMULATION SCENARIOS AND RESULTS

In this, we have built up a few simulation scenarios using GloMoSim, to discover the performance of Wi-Fi under explicit conditions, for example, load, traffic type, versatility and inclusion. The packet delay jitters for all situations where CBR traffic was utilized. The output parameters are end to end delay, throughput, collision and packet delivery ratio. [12] The simulation time was ten minutes for each situation. These are characterizes and examined underneath. The table present all the organization input parameter which is utilized for simulation tests. These are characterizes its details.

Table 1: Simulation Parameters

Parameter	Wi-Fi	Wi-MAX	Bluetooth	Description
Simulation time	5s			Maximum execution time
Terrain Dimensions	1200, 1200			Phy. area the nodes are placed
Number of Nodes	Varies			Nodes particip. in the network
Traffic Model	CBR			Constant Bit Rate link used
Node Placement	Uniform			Node placement policy
Mobility	5-30 (m/s)			Speed of node they are moving
MAC-Protocol	802.11	802.15	802.16	MAC layer protocol used
Routing Protocol	AODV			Routing protocol used
Bandwidth	2000000	12000000	12000000	Bandwidth used
Radio Frequency	2.4 eq	2.5 eq	1.5 eq	Frequency used

Scenario 1: Packet Delivery Ratio (PDR)

PDR is most important metric that we should consider in packet forwarding. It is the ratio between the number of packets that are received and the number of packets sent. This metric only considers backward path traffic. It may affects by different criteria such as packet size, group size, action range and mobility of nodes.

PDR= (Total Number of Packet received/ Total Number of Packet Send)*100

Table 2: Packet Delivery Ratio (PDR)

P D R	10-15	15- 20	20-25	25-30
Received by Wi-MAX	3890	3890	3890	3890
Received by Wi-Fi	1770	1429	1356	1123
Received by Bluetooth	1604	1119	906	516

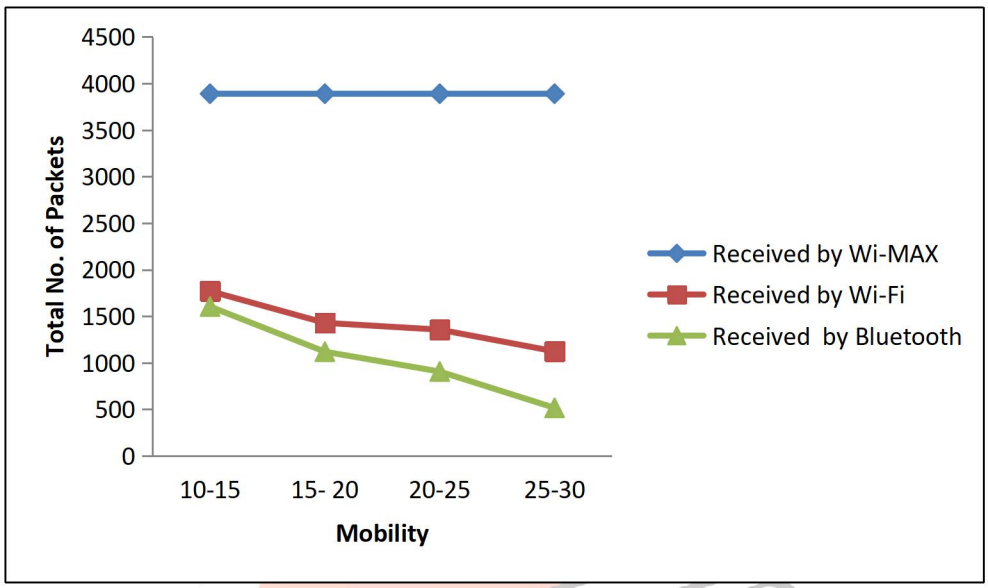

Figure 1: Result analysis of PDR

Scenario 2: Average End To End Delay

The delay is the total latency experienced by a packet to traverse the network from the source to the destination. At the network layer the end-to-end packet latency is the sum of processing delay, packetization, transmission delay, queuing delay, and propagation delay. The end-to-end delay of a path is the summation of the node delay at each node plus the link delay at each link on the path. The queuing delay and MAC delay are considered as two main factors that accumulated the node's delay. The Fig. below shows measure of end-to-end delay for the Wi-Fi and the Wi-MAX technology at different node mobility. The end-to-end delay increases as the node speed increases. Higher mobility causes more links broken and frequent re-routing and thus causes larger end-to-end delay. The end-to-end delay in Wi-Fi is more the end-to-end delay in Wi-MAX.

Table 3: Average End to End delay

Mobility	10-15	15-20	20-25	25-30
Wi-MAX	0.00535	0.00535	0.00535	0.00535
Wi-Fi	0.01956	0.0184	0.01817	0.01795
Bluetooth	0.02003	0.01979	0.0183	0.17014

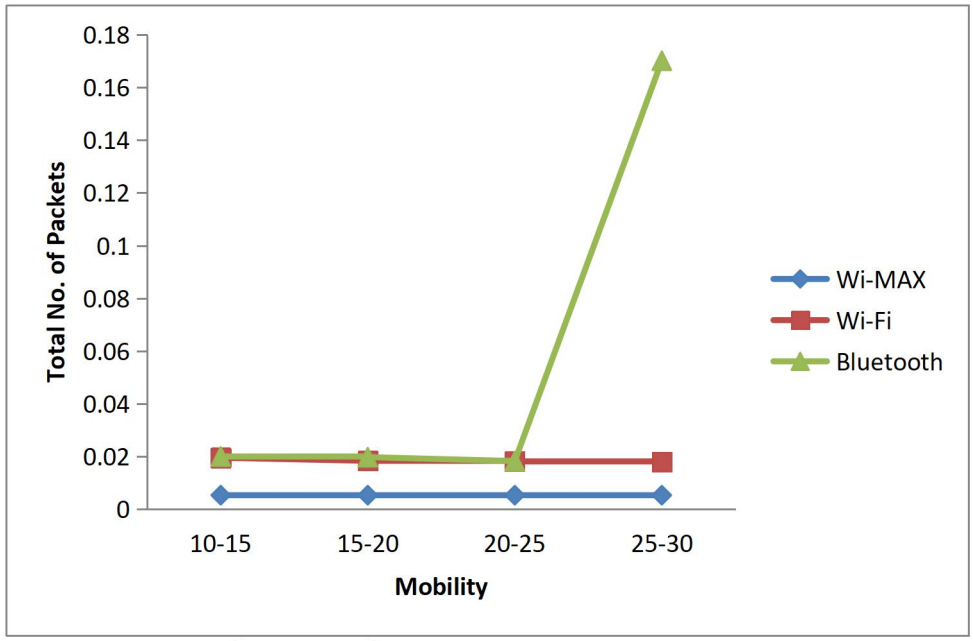

Figure: 2: Result analysis of End to End delay

Scenario 3: Packet Collision Ratio

In networks, packet collision occurs when two or more packets from different source nodes arrive at the same destination node simultaneously. The simulation measures the number of total packets (total_pkt) arriving at a specific node and calculates how many packets encounter collision (collided_pkt); the packet collision ratio is the ratio of collided_pkt to total_pkt. The metric packet loss rate measures the percentage of packets discarded at an end-node, due to either collision or corruption. It is defined as the ratio of (collided_pkt +corrupted_pkt) to total_pkt. Fig. Shows the packet loss rates under various Mobility schemes. It is clear from the graph that the more collisions occur in case of Wi-Fi as compare to the Wi-MAX. The table shows both side collision ratio sender and receiver.

Table 4: Packet Collision ratio

Collision Ratio	10-15	15-20	20-25	25-30
Wi-Fi	42	33	27	26
Wi-MAX	5	5	4	4
Bluetooth	39	28	21	15

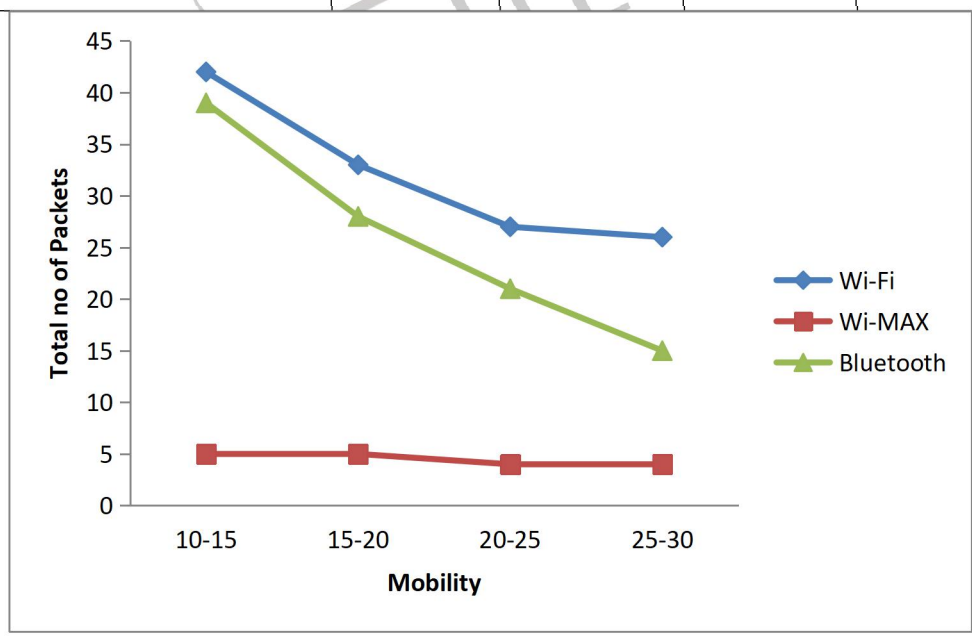

Figure 3: Result analysis of collision ratio

IV. CONCLUSIONS

This paper has introduced an exact portrayal of three of the most prominent developing wireless access network and even examined concerning how these technologies may collaborate together to shape an alternatives for executing last-mile. Detailed technical comparative analysis between the 802.16, 802.11 and 802.16 wireless networks that give elective answer for the issue of data access in remote inaccessible areas where wired organizations are not financially effective has been investigated. This work has demonstrated that the Wi-MAX standard is ideal yet, it isn't to supplant Wi-Fi and Bluetooth.

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