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Comparative Simulation Evaluation of Infra Red and Extended Rate PHY (802.11g) Based on Different QOS of AODV Routing Protocol for 2 Mbps Data Rate

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ABSTRACT

In this paper analysis of Comparative performance of Infra Red WLAN and Extended Rate PHY (802.11g) WLAN standard is done for 2 mbps data rate for AODV Routing Protocol based on different routing protocols. OPNET Simulation tool is used by us and we created a network containing 25 mobile nodes with data rate 2 Mbps with transmission power 0.005 watts and buffer size 1024000 bits each node moves randomly in the network and simulation time was 2000 sec. Infra Red WLAN and Extended Rate PHY (802.11g) WLAN is compared in terms of 2 Mbps data rate for different QOS's using AODV protocol. The simulation result of the research has practical reference value for further study.

Keywords : GRP, IRLAN, INFRA RED, MANET, QOS, OPNET, IEEE

I. INTRODUCTION

Dynamic distributed network i.e. MANET, Due to the dynamic nature the network topology keeps on changing randomly. Every node maintains a table in Ad hoc On-Demand Distance Vector, containing information about neighbors to send the packets and to in order to reach the destination. The AODV algorithm enables routing between participating mobile nodes those intend to establish and maintain an ad hoc network. Bellman-Ford distant vector algorithm is a relative of it, but it is adapted to work in a mobile environment. AODV allows mobile nodes to respond to link breakages and changes in network topology in order to the requirement. The cooperation of nodes results in success of communication. [1]

Routing protocol is the major issue in data communication's performance of Mobile Ad Hoc Network. Hence, routing protocol required is to be effective and accurate so as to handle mobility of nodes and to give best utilization to technology. In this paper performance of AODV protocol is evaluated by using FTP and HTTP application type of IEEE 802.11a/b/g WLAN Standard. [2]Wireless LAN is the major issue in data communication's performance of MANET other than Routing Protocols. Hence, Wireless LAN required is to be effective and accurate so as to handle mobility of nodes and to give best utilization to technology. Routing protocol are like eyes that determines how nodes find the way to forward packets between devices of the network. In this paper performance comparison of Infra Red Wireless LAN and Extended Rate PHY (802.11g) WLAN is done by using FTP and HTTP application type and AODV as Mobile Ad hoc Routing Protocol of IEEE 802.11a/b/g WLAN Standard. [2]

TABLE I. IEEE 802.11 CLASSIFICATIONS

Standard	IEEE 802.11a	IEEE 802. 11b	IEEE802.11g
Release	Sept 1999	Sept 1999	Jun 2003
Bandwidth (MHz)	20	20	20
Frequency(GHz)	0.5	2.4	2.4
Data Rate(Mbit/ s)	6,9,12,18,24,3 6,48,54	5.5,1 1	6,9,12,18,24,3 6,48,54
Modulatio n	OFDM	DSS S	OFDM,DSSS

TABLE II. WLAN CLASSIFICATIONS

WLAN Physical Characteristics	Data Rates
Frequency Hopping	1 , 2 Mbps
Direct Sequence	1 , 2 , 5.5 , 11 Mbps
Infra Red	1 , 2 Mbps
OFDM(802.11a)	6 , 9 , 12 , 18 , 24 , 36 , 48 , 54 Mbps
Extended Rate PHY(802.11g)	1 , 2 , 5.5 , 11 , 6 , 9 , 12 , 18 , 24 , 36 , 48 , 54 Mbps

II. RELATED WORK

Jonish [1] analyzed the performance of TORA and GRP routing protocol with the use of OPNET simulation tool, they created a 50 mobile nodes network on data rate 1 and 2 Mbps and transmission power 0.005 watts with buffer size 256000 bits the time of simulation was 1500 sec. TORA and GRP routing protocols were compared in terms of Download Response Time, Upload Response Time, Delay, Load and Media Access Delay in scenario for the simulation analysis and performances.

Anjali [2] analyzed the performance of AODV, OLSR and GRP routing protocols is evaluated for FTP based application traffic on IEEE 802.11 WLAN Standard and 48 Mbps data rate. The network performance is evaluated by using OPNET simulator based on various quantitative metrics- Network Load, Throughput, Retransmission Attempts and Media Access Delay by varying physical characteristics and number of nodes. A comparative performance analysis of these protocols have been carried out in this paper and in the last conclusion will be presented which demonstrate that performance of routing protocols differs by varying the network and selection of accurate routing protocol according to the network ultimately influences the efficiency of the network in a magnificent way.

Kuldeep vats [5] analyzed the performance of DSR, OLSR and GRP routing protocols. They used OPNET simulation tool. They created a network containing 150 mobile nodes with the data rate of 18 mbps and transmit power of 0.11 watts. Each node moves randomly within the network range 10,000 sq m and Simulation time was 1000 sec. According to their simulation result OLSR presented the best performance and GRP presented low to OLSR and high to DSR or finally DSR presented the low performance (DSR<GRP<OLSR) is analyzed.

III. WIRELESS LAN

A WLAN is a wireless computer network that links two or more devices using a wireless distribution method within a limited area such as a home, school, computer laboratory, office or campus of college. This gives users the ability to move around within a local coverage area and still be connected to the network, and can provide a connection to the wider Internet options. Most Wireless LANs are based on IEEE 802.11 standards, marketed under the Wi-Fi brand

name. The primary IEEE 802.11 standards in use today are 802.11a and 802.11b, which both use radio waves for transferring information wirelessly over a network. An infrared wireless LAN might do a better job of satisfying requirements for mobile applications. The difference between infrared and radio wireless LANs is the frequency of the transmitted signal. Few people realize, however, that the 802.11 standard also includes the 802.11 Infrared (IR) Physical Layer 802.11 IR defines 1Mbps and 2Mbps operation by bouncing light off ceilings and walls to provide connectivity within a room or small office. The 802.11 IR is unheard because there are no known vendors that sell products compliant with 802.11 IR. Don't become complacent with radio frequency (RF) technologies, such as 802.11a and 802.11b, as the only option for wireless LANs.

IV. SIMLATION SETUP

OPNET Modeler is commercial network simulation environment for network modeling and simulation the version named OPNET Modeler 14.5 has been adopted in our study. It allows the users to design and study communication networks, devices, protocols, and applications with flexibility and scalability [12]. It is easy to work with GUI interface and the OPNET provides us the GUI interface to work. And it is easy to built model of working in GUI Virtual environment. It simulates the network graphically and gives the graphical structure of actual networks and network components.

TABLE III. SIMULATION PARAMETERS

Simulation Parameter	Value
Simulator	OPNET Modular 14.5
Area	2000*2000
Network Size	25 Nodes
Data Rate	2 Mbps
Mobility Model	Random waypoint
Traffic Type	FTP, HTTP
Simulation Time	2000 sec
Address Mode	IPV4
Standard	IEEE 802.11 INFRA RED
Routing Protocol	AODV

TABLE IV. AODV PARAMETERS

Attribute	Value
Active Route Timeout	3.0
Hello Interval(sec)	Uniform(1,1.1)
Allowed Hello Loss	2
Net Diameter	35
Node Traversal Time(sec)	0.04
Route Error Rate Limit (pkts/sec)	10
Timeout Buffer	2
TTL Start	1
TTL Increment	2
TTL Threshold	7
Local Add TTL	2
Packet Queue Size (Packets)	Infinity
Local Repair	Enabled
Addressing Mode	IPV4

TABLE V. WIRELESS LAN PARAMETERS

Attribute	Value
Physical Characteristics	INFRA RED
Data Rate	2 Mbps
Short Retry Limit	7
Long Retry Limit	4
Max Receive Lifetime (sec)	0.5
Buffer Size(bits)	1024000
Roaming Capability	Enabled
Large Packet Processing	Fragment

Fig. 1 shows the Process Model of simulation environment of scenario containing 25 WLAN mobile nodes, one fixed WLAN Server, Application definition, Profile definition and Mobility config. We configure the nodes in the scenario to work with 2 Mbps data rate. Figure 2 Shows.

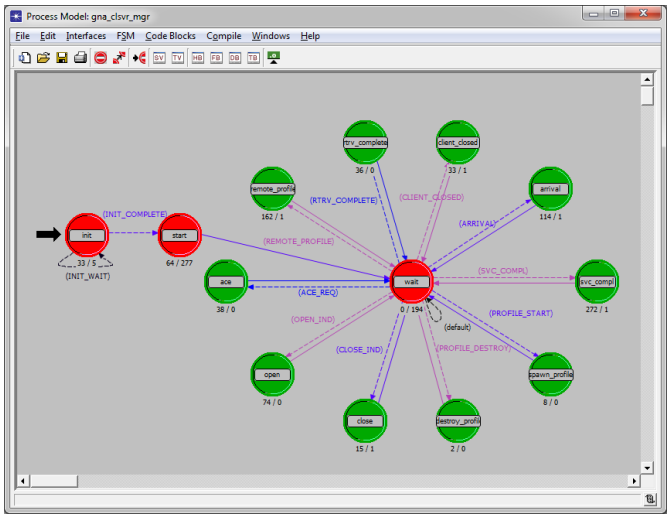

Fig. 1 Process Model of Application Manager

V. PERFORMANCE MERICS

A. HTTP Object Response Time (sec)

Time elapsed between sending a request and receiving the response packet. Measured from the time a client application sends a request to the server to the time it receives a response packet. Every response packet sent from a server to an HTTP application is included in this statistic.

B. HTTP Upload Response Time (sec)

Time elapsed between sending a file and receiving the response. The response time for responses sent from any server to an HTTP application is included in this statistic.

C. FTP Traffic Sent (bytes/sec)

Average bytes per second submitted to the transport layers by all FTP applications in the network.

D. FTP Traffic Received (bytes/sec)

Average bytes per second forwarded to all FTP applications by the transport layers in the network.

E. AODV Packets Dropped Total (bits/sec)

It is the total no of Packets Dropped during the simulation till the full process completes for different data transmission LAN's

VI. SIMULATION RESULTS AND ANALYSIS

Figure (3 - 8) below shows HTTP Download Response Time (sec), HTTP Upload Response Time (sec), FTP Traffic Sent, FTP Traffic Received & AODV packets Dropped Total in 25 mobile nodes scenario for IEEE 802.11 Infra Red standard and Extended Rate IEEE 802.11g standard at 2 Mbps data rate with AODV. The color scheme is showing the protocols behavior in different graphs which gives the average values. From these average values we will conclude the behavior of the IRWLAN and Extended Rate IEEE 802.11g.

A. HTTP Object Response Time (sec)

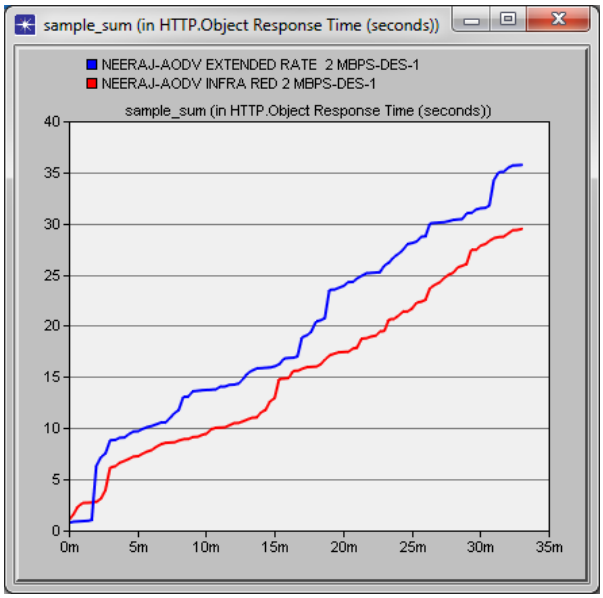

Fig. 2 Sample Sum for *HTTP Object Response Time (sec)* in 2 Mbps for IRWLAN and Extended Rate 802.11g

According to simulation, as we can see in Fig. 2, object response time in Infra Red WLAN is less than Extended Rate 802.11g. This shows Infra Red WLAN in 2 Mbps works best in terms of HTTP Object Response time.

B. HTTP Page Response Time (sec)

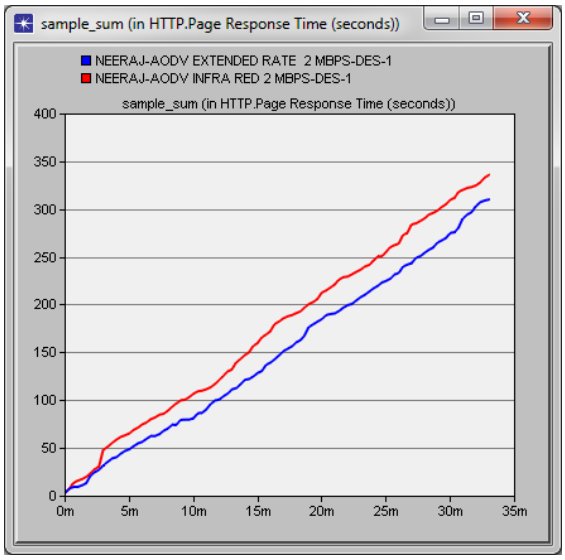

Fig. 3 Sample Sum for *HTTP Page Response Time (sec)* in 2 Mbps for IRWLAN and Extended Rate 802.11g

According to simulation, as we can see in Fig. 3, HTTP Page Response time in Infra Red WLAN is higher than Extended Rate 802.11g while seeing the 2 Mbps. This shows Extended Rate 802.11g is better in terms of HTTP Page Response time.

C. FTP Traffic Sent (packets/sec)

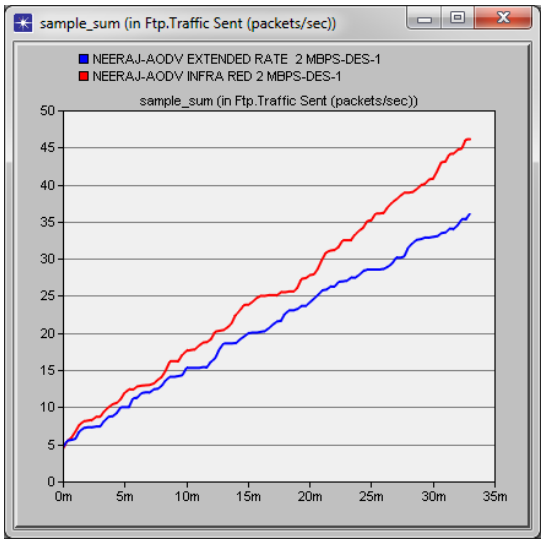

Fig. 4 Sample Sum for FTP Traffic Sent (packets/sec) in 2 Mbps for IRWLAN and Extended Rate 802.11g

According to simulation, as we can see in Fig. 4, FTP Traffic Sent in Infra Red WLAN is more than Extended Rate 802.11g. This shows Infra Red WLAN works well than Extended Rate 802.11g in terms of FTP Traffic Sent.

D. FTP Traffic Received (bytes/sec)

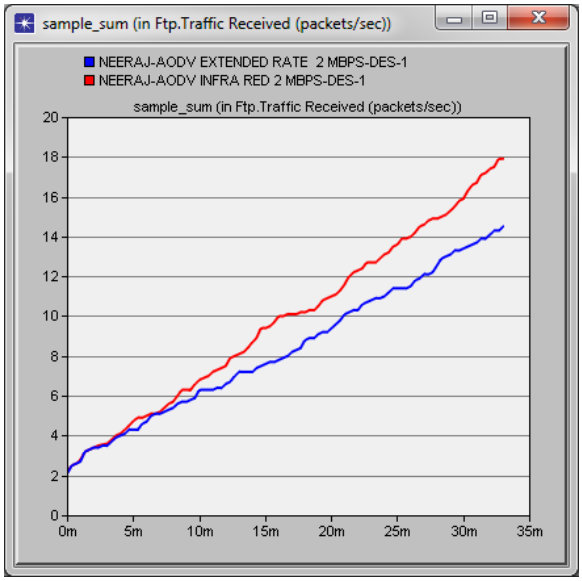

Fig. 5 Sample Sum for FTP Traffic Received (bytes/sec) in packets in 1&2 Mbps for IRWLAN and Extended Rate 802.11g

According to simulation, as we can see in Fig. 5, FTP Traffic Received in Infra Red WLAN is more than Extended Rate 802.11g. This shows Infra Red WLAN works better than Extended Rate 802.11g in terms of FTP Traffic Received.

E. AODV Packets Dropped Total (bits/sec)

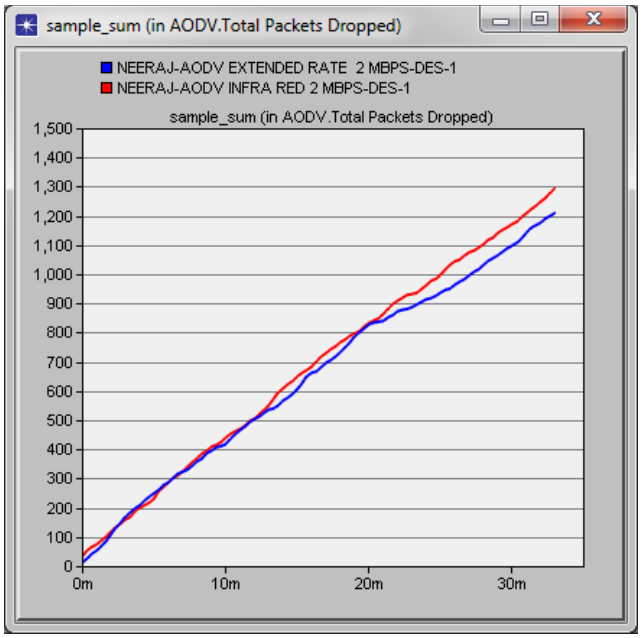

Fig. 6 Sample Sum for AODV Packets Dropped Total in 2 Mbps for IRWLAN and Extended Rate 802.11g

According to simulation, as we can see in Fig. 6, AODV Packets Dropped Total in Extended Rate 802.11g is slightly lower in WLAN. This shows Extended Rate 802.11g works well than Infra Red WLAN in terms of AODV Packets Dropped Total.

VII. CONCLUSION

In this paper performance of Infra Red WLAN and Extended Rate 802.11g is evaluated with the use of AODV Protocol for metrics like HTTP Object Response Time (sec), HTTP Upload Response Time (sec), FTP Traffic Sent (bytes/sec), FTP Traffic Received (bytes/sec), AODV Packets Dropped Total (bits/sec) by using 25 nodes scenario with IEEE 802.11 Infra Red WLAN Standard and IEEE 802.11g Extended Rate in 2 Mbps. From the above discussion we find out that Infra Red performs better in some cases and Extended Rate performs better in some cases as per the table below.

TABLE 5. RESULTING VALUES

S. No.	Performance Metrics	Infra Red WLAN	Extended Rate 802.11g
1	HTTP Object Response Time (sec)	Better	
2	HTTP Upload Response Time (sec)		Better
3	FTP Traffic Sent (Packets/sec)	Better	
4	FTP Traffic Received (bytes/sec)	Better	
5	AODV Packets Dropped Total (bits/sec)		Better

Infra Red WLAN has large number of possibilities to be worked on. After seeing these results I wonder why these are not widely used. An infrared wireless LAN might do a better job of satisfying requirements for campus networks. The simulation result of the research has practical reference value for further study.

VIII. REFERENCES

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