Available Online at www.ijcsmc.com

International Journal of Computer Science and Mobile Computing

A Monthly Journal of Computer Science and Information Technology

ISSN 2320–088X

IJCSMC, Vol. 4, Issue. 1, January 2015, pg.140 – 148

RESEARCH ARTICLE

Infra-Red WLAN Performance Evaluation in 1 Mbps and 2 Mbps Using OPNET for GRP

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Abstract— In this paper analysis and performance of Infra-Red WLAN is done for 1 and 2 mbps data rate for GRP. We used OPNET Simulation tool we created a network containing 20 mobile nodes with data rate 1 Mbps and 2 Mbps with transmission power 0.005 watts and buffer size 1024000 bits each node moves randomly in the network and simulation time was 1500 sec. Infra-Red WLAN is compared in terms of 1 Mbps and 2 Mbps for different QOS's using GRP protocol. According to the resulted performance we can say that infrared wireless LAN might do a better job of satisfying requirements for mobile applications. The simulation result of the research has practical reference value for further study.

Keywords— GRP, IRLAN, INFRA RED, MANET, QOS, OPNET

I. INTRODUCTION

Mobile ad hoc Network is a dynamic distributed network. Due to the dynamic nature the network topology keep changes randomly. The mobility of nodes in MANETs results in frequent changes of network topology making routing in MANETs a challenging task. GRP collects network information at a source node with a small amount of control overheads. According to the information collected, source node can find routes and continuously transmit data even if the current route is disconnected. The result of this approach is achieving fast transfer with less overhead of control massages [1].

This approach is widely known as hybrid routing protocol, because it can simultaneously use the strengths of reactive routing and proactive routing protocols. The source node computes the best route according to collected information and then immediately starts to transmit data packets. Wireless LAN is the major issue in data communication's performance of MANET. 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

is a standard that determines how nodes find the way to forward packets between devices in the network. In this paper performance of Infra Red Wireless LAN is evaluated by using FTP and Email application type and GRP as 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)	6,9,12,18,24,36,48,54	5.5,11	6,9,12,18,24,36,48,54
Modulation	OFDM	DSSS	OFDM,DSSS

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. **IR WIRELESS LAN**

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. 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 reason that 802.11 IR is unheard of is that there are no known vendors that sell products compliant with 802.11 IR. Some offer infrared-based wireless LANs that come close to the standard. For example Spectrix, once the chair of the 802.11 IR group, offers wireless LAN products that implement diffused optical technologies very similar to 802.11 IR. The primary difference between infrared and radio wireless LANs is the frequency of the transmitted signal. Don't become complacent with radio frequency (RF) technologies,

such as 802.11a and 802.11b, as the only option for wireless LANs. An infrared wireless LAN might do a better job of satisfying requirements for mobile applications.

IV. **SIMULATION SETUP**

This research used software known as OPNET Modeler, Which is a tool provided by the OPNET Technologies in order to undertake the experimental evaluation; the version named OPNET Modeler 14.5 has been adopted for study [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. OPNET is one of the most extensively used commercial simulators based on Microsoft Windows platform, which incorporates most of the MANET routing parameters compared to other commercial simulators. It simulates the network graphically and gives the graphical structure of actual networks and network components.

TABLE II
SIMULATION PARAMETERS

Simulation Parameter	**Value**
Simulator	OPNET Modular 14.5
Area	1500*1500
Network Size	20 Nodes
Data Rate	1, 2 Mbps
Mobility Model	Random waypoint
Traffic Type	FTP, Email
Simulation Time	1500 sec
Address Mode	IPV4
Standard	IEEE 802.11 INFRA RED
Routing Protocol	GRP

TABLE III
GRP PARAMETERS

Attribute	**Value**
Hello Interval(Sec)	Uniform(4.9,5.0)
Neighbor Expiry Time(Sec)	Constant(10)
Distance Moved(Meters)	1000
Position Request Timer(Sec)	5.0
Backtrack Option	Enabled
Routes Export	Disabled
Number Of Initial Floods	1

TABLE IV
WIRELESS LAN PARAMETERS

Attribute	**Value**
Physical Characteristics	INFRA RED
Data Rate	1,2 Mbps
Short Retry Limit	9
Long Retry Limit	7
Max Receive Lifetime (sec)	0.5
Buffer Size(bits)	1024000
Roaming Capability	Enabled

Fig. 1 shows the simulation environment of scenario containing 20 WLAN mobile nodes, one fixed WLAN Server, Application definition, Profile definition and Mobility config. We configure the nodes in the scenario to work with 1 Mbps and 2 Mbps data rate.

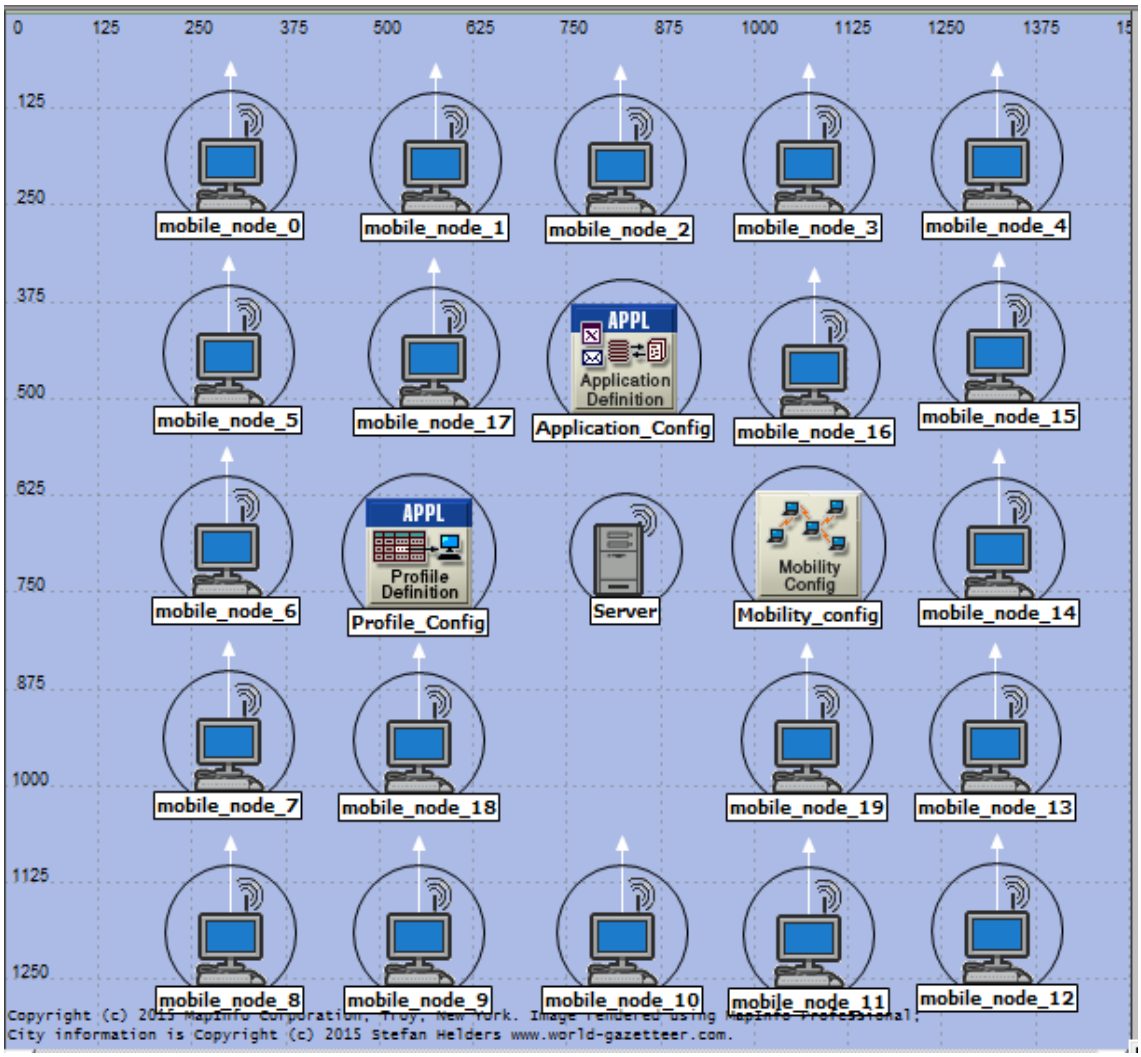

Fig. 1 Network Model for 20 Nodes scenario

V. **PERFORMANCE METRICS**

A. Email Download 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 Email application is included in this statistic.

B. FTP 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 FTP application is included in this statistic.

C. GRP Total No. of Backtracks

It is the total no of Backtracks taken during the simulation till the full process completes for different data transmission rates

D. WLAN Retransmission Attempts (packets)

It is the total number of retransmission attempts by all WLAN MACs in the network until either packet is successfully transmitted or it is discarded as a result of reaching short or long retry limit.

E. WLAN Media Access Delay (sec)

It represents the global statistic for the total of queuing and contention delays of the data, management, delayed Block-ACK and Block-ACK Request frames transmitted by all WLAN MACs in the network.

VI. SIMULATION RESULTS AND ANALYSIS

Figure (2 - 6) below shows Email Download Response Time(sec), FTP Upload Response Time (sec), GRP Total No. of Backtracks, WLAN Retransmission Attempts (packets) and WLAN Media Access Delay (sec) in 20 mobile nodes scenario for IEEE 802.11 Infra Red standard at 1 Mbps and 2 Mbps data rate with GRP. 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.

A. Email Download Response Time (sec)

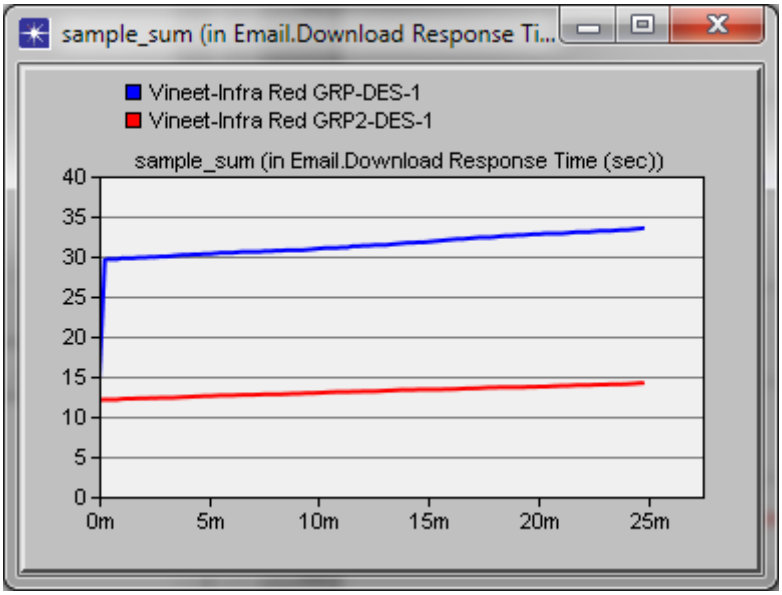

Fig. 2 Sample Sum for *Email Download Response Time (sec)* in 1 and 2 Mbps for IRWLAN GRP

According to simulation, as we can see in Fig. 2, Email Download response time in Infra Red WLAN GRP 1 Mbps is more than 2 Mbps. This shows 2 Mbps works well than 1 Mbps in Infra Red WLAN GRP in terms of Email Download Response time.

B. FTP Upload Response Time (sec)

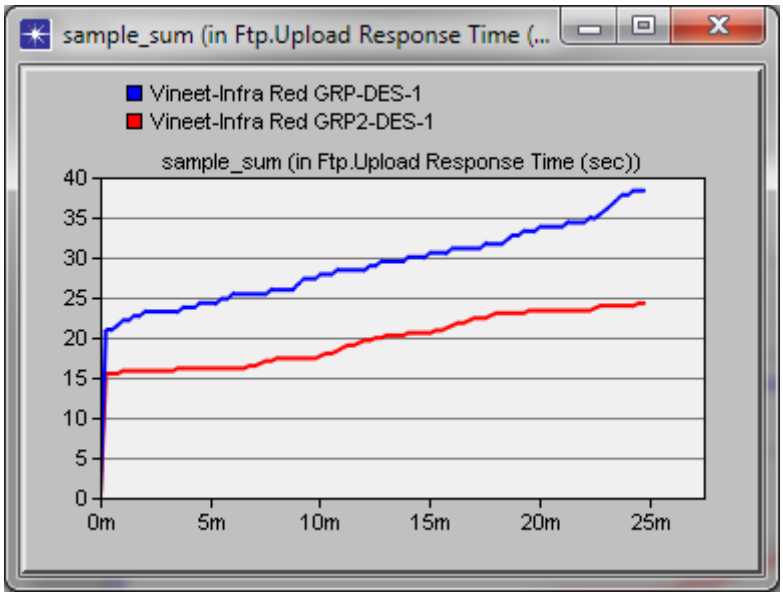

Fig. 3 Sample Sum for *FTP Upload Response Time (sec)* for 1 and 2 Mbps for IRWLAN GRP

According to simulation, as we can see in Fig. 3, FTP Upload Response time in Infra Red WLAN GRP 1 Mbps is higher than in 2 Mbps. This shows 2 Mbps works well than 1 Mbps in Infra Red WLAN GRP in terms of FTP Upload Response time.

C. GRP Total No. of Backtracks

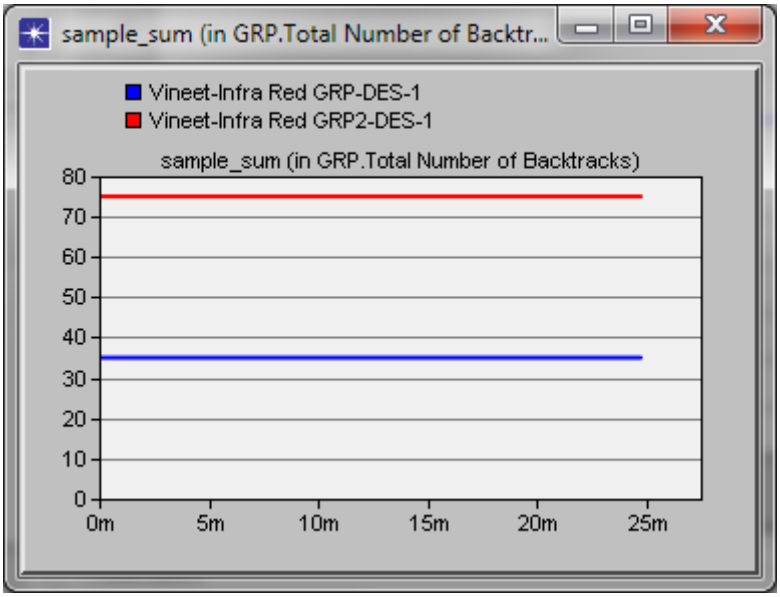

Fig. 4 Sample Sum for GRP Total No. of Backtracks for 1 and 2 Mbps for IRWLAN GRP

According to simulation, as we can see in Fig. 4, GRP Total No. of Backtracks in Infra Red WLAN GRP 2 Mbps is higher than in 1 Mbps. This shows 1 Mbps works well than 2 Mbps in Infra Red WLAN GRP in terms of Total no. of Backtracks.

D. WLAN Retransmission Attempts (packets)

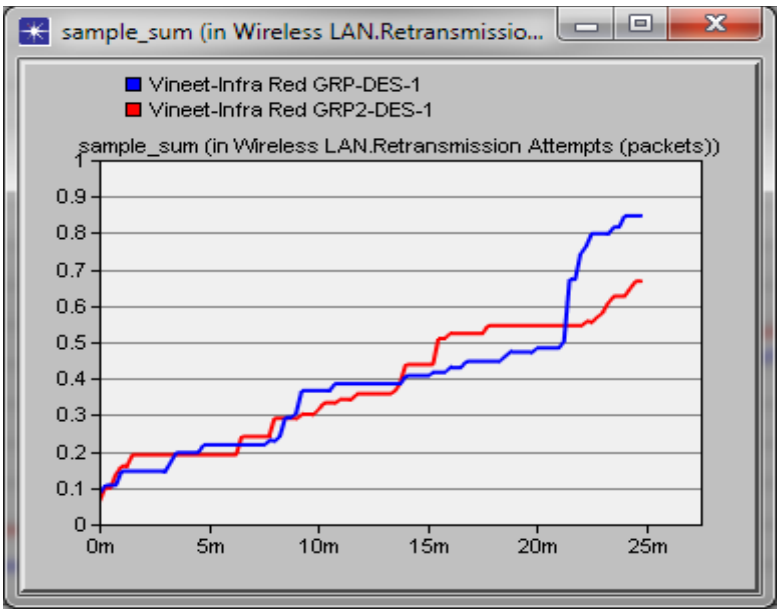

Fig. 5 Sample Sum for Retransmission Attempts in packets for 1 and 2 Mbps for IRWLAN GRP

According to simulation, as we can see in Fig. 5, Wireless LAN Retransmission Attempts in Infra Red WLAN GRP 1 Mbps is higher than in 2 Mbps. This shows 1 Mbps works well than 2 Mbps in Infra Red WLAN GRP in terms of FTP Retransmission Attempts.

E. WLAN Media Access Delay (sec)

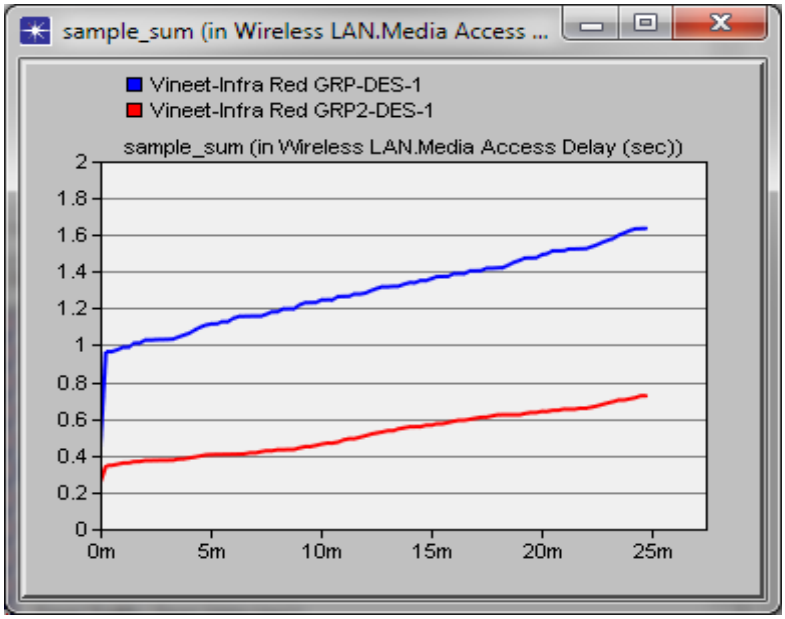

Fig. 6 Sample Sum for Media Access Delay for 1 and 2 Mbps for IRWLAN GRP

According to simulation, as we can see in Fig. 6, Mac Delay in Infra Red WLAN GRP 1 Mbps is higher than in 2 Mbps. This shows 2 Mbps works well than 1 Mbps in Infra Red WLAN GRP in terms of Media Access Delay.

VII. CONCLUSION

In this paper performance of Infra Red WLAN is evaluated with the use of GRP Protocol for metrics like Email Download Response Time (sec), FTP Upload Response Time (sec), GRP Total No. of Backtracks, WLAN Retransmission Attempts (packets) and WLAN Media Access Delay (sec) by using 20 nodes scenario with IEEE 802.11 Infra Red WLAN Standard in 1 Mbps and 2 Mbps. From the above discussion we find out that Infra Red 1 Mbps performs better in terms of GRP Total No. of Backtracks and WLAN Retransmission Attempts (packets) and Infra Red 2 Mbps performs better in terms of Email Download Response Time (sec), FTP Upload Response Time (sec) and WLAN Media Access Delay (sec).

TABLE IV
RESULTING VALUES

S. No.	Performance Metrics	IR WLAN GRP (1 Mbps)	IR WLAN GRP (2 Mbps)
1	Email Download Response Time	More	Less
2	FTP Upload Response Time	More	Less
3	GRP Total No. of Backtracks	Less	More
4	Retransmission Attempts	More	Less
5	WLAN Media Access Delay	More	Less

Infra Red WLAN have large no of possibilities to be worked on. An infrared wireless LAN might do a better job of satisfying requirements for mobile applications. The simulation result of the research has practical reference value for further study.

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