



# Different QOS Based Comparative Simulation Evaluation of Infra-Red and Extended Rate PHY (802.11g) Based on GRP Routing Protocol

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**Abstract**— *In this paper analysis of Comparative performance of Infra Red WLAN and Extended Rate PHY (802.11g) 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 and Extended Rate PHY (802.11g) WLAN is compared in terms of 1 Mbps for different QOS's using GRP protocol. According to the resulted performance we can say that Infra Red performed better in our QOS. The simulation result of the research has practical reference value for further study.*

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

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## I. INTRODUCTION

Gathering based routing protocol 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. Mobile Ad hoc network (MANET) is a dynamic network formed without the use of any existing infrastructure or centralized administration. Each device in a MANET is free to move independently in any direction due to its dynamic nature. The mobility of nodes in MANETs results in frequent changes of network topology making routing in MANETs a challenging task. The result of this approach is achieving fast transfer with less overhead of control messages [1].

This approach is widely known as hybrid routing protocol, because it can simultaneously use the strengths of reactive routing and proactive routing protocols. In this method communication in MANET is possible when nodes are near to each other and the supposition that changes in topology are only important if they happen in the vicinity of a node. 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 is a standard that determines how nodes find the way to forward packets between devices in the network. In this paper Comparative performance of Infra Red Wireless LAN and Extended Rate PHY (802.11g) WLAN 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. WIRELESS LAN

A wireless local area network (WLAN) is a wireless computer network that links two or more devices using a wireless distribution method (often spread-spectrum or OFDM radio) within a limited area such as a home, school, computer laboratory, office building or campus. 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. Most modern WLANs 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.

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. 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

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 II  
SIMULATION PARAMETERS

Simulation Parameter	Value
Simulator	OPNET Modular 14.5
Area	1500*1500
Network Size	20 Nodes
Data Rate	1 Mbps
Mobility Model	Random waypoint
Traffic Type	FTP, Email
Simulation Time	1500 sec
Address Mode	IPV4
Standard	IEEE 802.11 Infra Red, (802.11g)
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, Extended Rate (802.11g)
Data Rate	1 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 data rate. Figure 2 Shows Process Model.

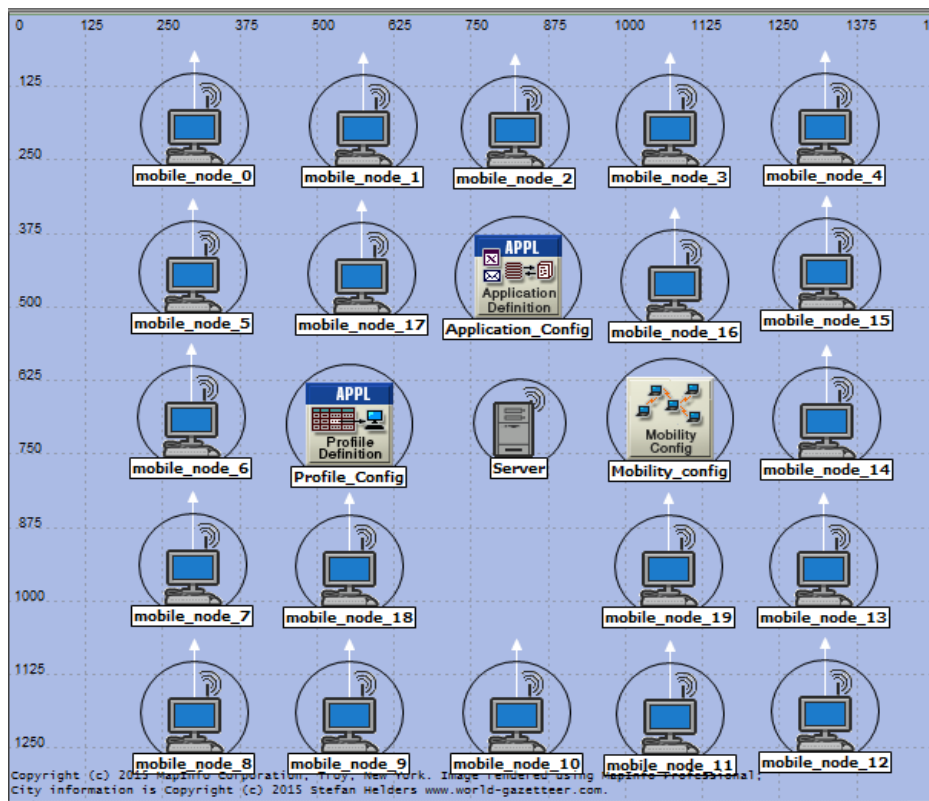


Fig. 1 Network Model for 20 Nodes scenario

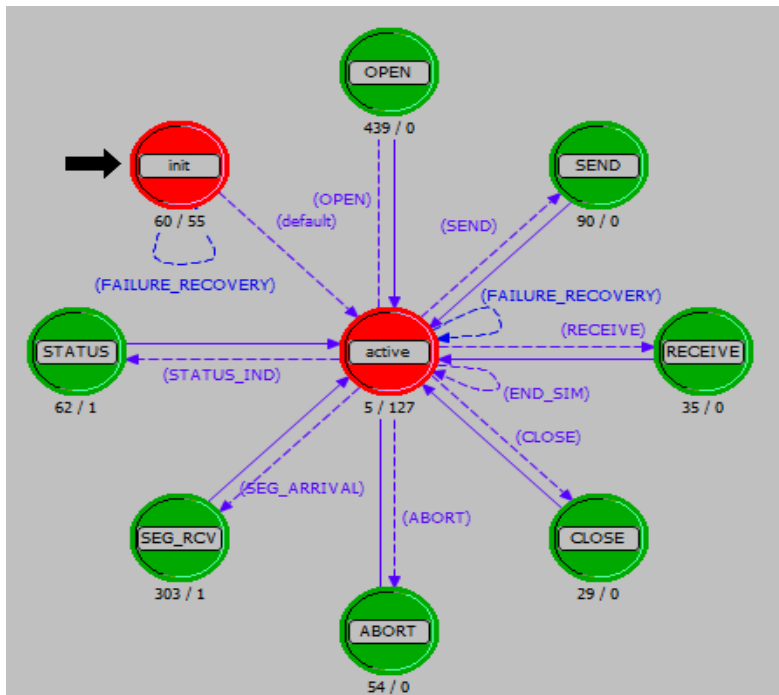


Fig. 2 Process Model of TCP Manager

## 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. Email 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 Email 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. GRP 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

### F. 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 LAN's.

## VI. SIMULATION RESULTS AND ANALYSIS

Figure (3 - 8) below shows Email Download Response Time (sec), Email Upload Response Time (sec), FTP Traffic Sent, FTP Traffic Received, GRP packets Dropped Total and GRP Total No. of Backtracks in 20 mobile nodes scenario for IEEE 802.11 Infra Red standard and Extended Rate IEEE 802.11g standard at 1 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 and Extended Rate IEEE 802.11g.

### A. Email Download Response Time (sec)

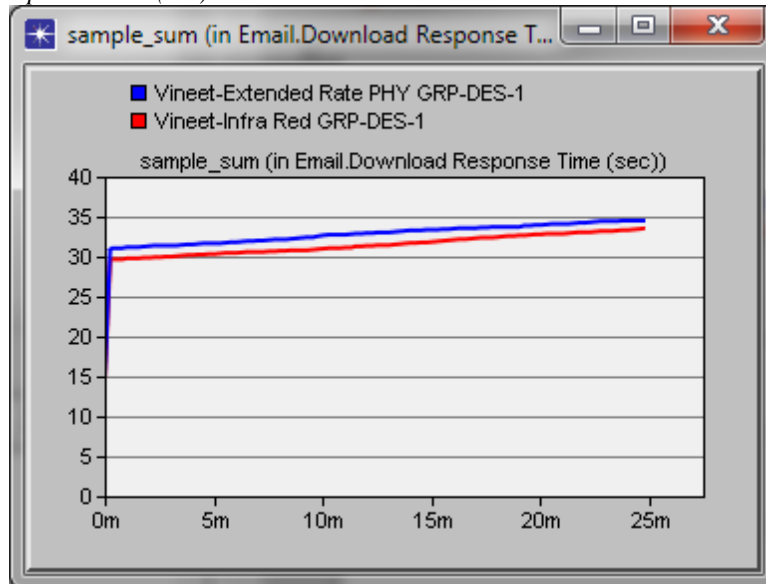


Fig. 3 Sample Sum for *Email Download Response Time (sec)* in 1 Mbps for IRWLAN and Extended Rate 802.11g

According to simulation, as we can see in Fig. 3, Email Download response time in Infra Red WLAN is less than Extended Rate 802.11g. This shows Infra Red WLAN works well than Extended Rate 802.11g in terms of Email Download Response time.

### B. Email Upload Response Time (sec)

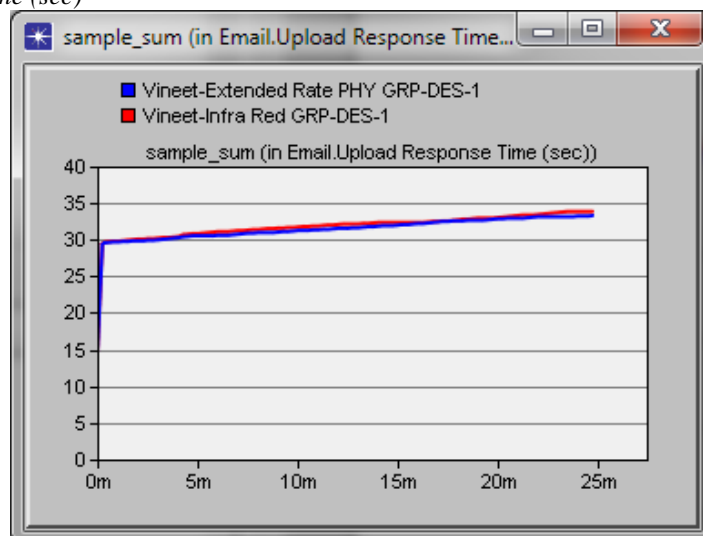


Fig. 4 Sample Sum for *Email Upload Response Time (sec)* in 1 Mbps for IRWLAN and Extended Rate 802.11g

According to simulation, as we can see in Fig. 4, Email Upload Response time in Infra Red WLAN is slightly higher than Extended Rate 802.11g. This shows Extended Rate 802.11g works well than Infra Red WLAN in terms of Email Upload Response time.

*C. FTP Traffic Sent (bytes/sec)*

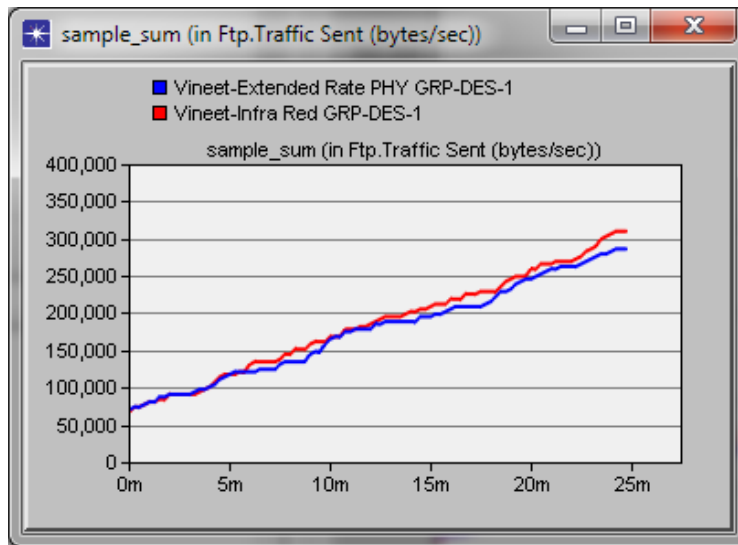


Fig. 5 Sample Sum for FTP Traffic Sent (bytes/sec) in 1 Mbps for IRWLAN and Extended Rate 802.11g

According to simulation, as we can see in Fig. 5, 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)*

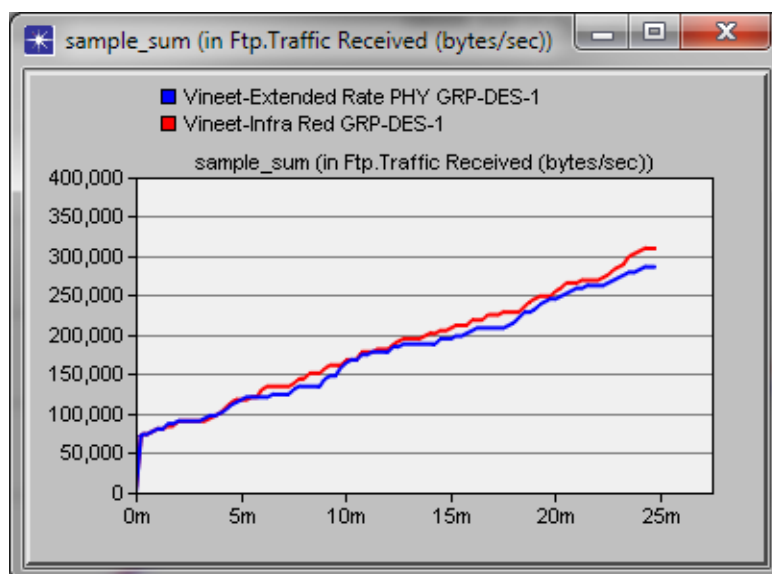


Fig. 6 Sample Sum for FTP Traffic Received (bytes/sec) in packets in 1 Mbps for IRWLAN and Extended Rate 802.11g

According to simulation, as we can see in Fig. 6, FTP Traffic Received 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 Received.

*E. GRP Packets Dropped Total (bits/sec)*

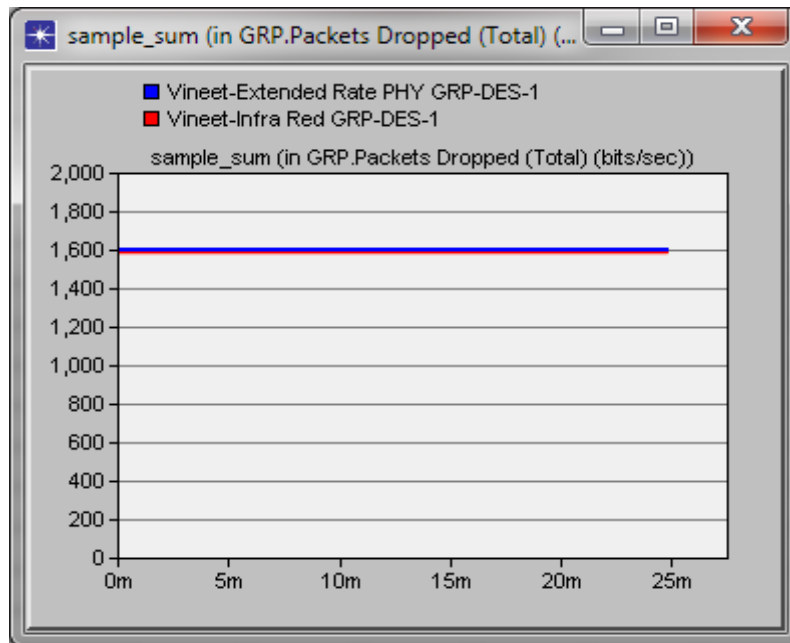


Fig. 7 Sample Sum for GRP Packets Dropped Total (bits/sec) in 1 Mbps for IRWLAN and Extended Rate 802.11g

According to simulation, as we can see in Fig. 7, GRP Packets Dropped Total in Extended Rate 802.11g is slightly higher than Infra Red WLAN. This shows Infra Red WLAN works well than Extended Rate 802.11g in terms of GRP Packets Dropped Total.

*F. GRP Total No. of Backtracks*

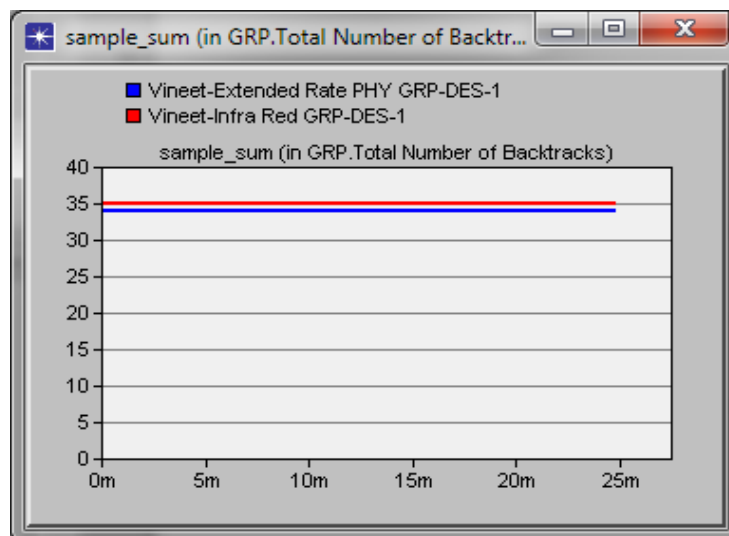


Fig. 8 Sample Sum for GRP Total No. of Backtracks in 1 Mbps for IRWLAN and Extended Rate 802.11g



According to simulation, as we can see in Fig. 8, GRP Total No. of Backtracks in Infra Red WLAN is slightly higher than Extended Rate 802.11g. This shows Extended Rate 802.11g works well than Infra Red WLAN in terms of GRP Total no. of Backtracks.

## VII. CONCLUSION

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

TABLE 5  
RESULTING VALUES

S. No.	PERFORMANCE METRICS	INFRA RED WLAN	EXTENDED RATE 802.11G
1	EMAIL DOWNLOAD RESPONSE TIME	BETTER	
2	EMAIL UPLOAD RESPONSE TIME		BETTER
3	FTP TRAFFIC SENT	BETTER	
4	FTP TRAFFIC RECEIVED	BETTER	
5	GRP PACKETS DROPPED TOTAL	BETTER	
6	GRP TOTAL NO. OF BACKTRACKS		BETTER

Infra Red WLAN have large no 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 mobile applications. The simulation result of the research has practical reference value for further study.

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