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Performance Evaluation of TDRP and EDRP for Voice and Video Services in MANET

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Abstract: The center of attention of this research paper is about the performance evaluation of TDRP (table driven routing protocol) and EDRP (event driven routing protocol) by using voice and video traffic in MANET (mobile Adhoc network). Particularly OLSR (table driven) and DSR (Event driven) routing protocols are focused. The nodes of MANET establish the connections with each other energetically, and move freely in any direction. In mobile Adhoc network environment event driven and table driven protocols have significant subject matter of study. There is a mobility issue which affects the services performance due to breakage and renewal of links of mobile nodes. Protocols performances have significance on overall performance of MANET. The aim of this paper is to present the performance analysis of selected routing protocols by varying the node densities and varying WLAN physical characteristics. The voice and video traffic applications are configured discretely by using OLSR and DSR in scenarios. Moreover, for the performance observation the parameters are, jitter, traffic received, traffic sent, end-to-end delay, traffic load, and throughput. The simulation have been carried out through OPNET 14.5 modeler tool, and results have been analysed.

Keywords: MANET, TDRP, EDRP, METRICS, OPNET

1. INTRODUCTION

An important wireless network environment which is under research is MANET (Mobile Adhoc Network). It is flavor of mobile wireless communication technology. The Wireless mobile Adhoc network has an important position in the field of networking. MANET depicted as self organized and self configured network layout in that situation where fixed network could not be deployed. In the MANET environment all nodes automatically establish connectivity and develop wireless mobile network infrastructure. In this network each node without restraint move independently. In this modern era of advancement of technology the MANET offers best network environment and offers services. But there are many issues, gaps, flaws, problems in the MANET. Obviously when devices are moved independently there is Mobility issue. As well there is security problem also scalability issue in MANET, It has been observed that there are many problems in mobile wireless technology, The security flaws is due to vulnerability of security protocols that degrade the performance of MANET services that also affect the mobility and the scalability. Apparently in MANET there are issues in routing protocols which affects the MANET services. The connectivity flaws of Nodes degrade the MANET services. These issues occur because of the routing protocols of MANET which establish the links between nodes. The goal of this IS; to check the performance with the fidelity of table driven and event driven protocols by using voice and video application in MANET. Throughput and delay parameter will be focused.

This helps to know the trustworthiness by changing the applications. That helps how mobility affected in the scenario of different environment.

2. RELATEDWORK

MANET is wireless self organized network technology which is most efficient for that geographical area where fixed network cannot be deployed. Puneet Dadral *et al*, 2012) MANET provides the vibrant infrastructure where it dynamically deploys in self organized and self configured manner. (Sharma, *et al* 2011) analyzed AODV and DSR protocols and using FTP traffic in different scenarios and found different results according to the nature of traffic. Also the results of simulation of the DSR routing protocol observed better as compared to the AODV routing protocol in terms of special traffic parameters. Obviously proactive protocols have good performance having the parameter of routing message overhead and end to end delay. (Jahangir *et al*, 2011) evaluated framework of QoS and found issues between intermediate nodes during the packet delivery. (Mashri *et al*, 2006) has assessed OLSR

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as weak protocol in terms of time of packet delivery. (Singla *et al*, 2010) the AODV, DSDV and TORA routing protocols compared by CBR traffic pattern and TCP applications. The results compared by parameters average end to end delay and packet delivery ratio. The AODV is found best from DSDV. (Haque *et al*, 2014) have observed that there are many architecture issues in the MANET; there is power draw backs, scalability flaws, mobility flaws, security problems in MANET. (Kavita *et al*, 2011) presented the analysis of DSDV, DSR, AODV and ZRP protocols on the basis of average delay, throughput, routing overhead, and packets dropped by using ns-2 simulator. (Subramanya *et al*, 2011) focused on proactive and reactive and hybrid protocols (OLSR, AODV, DSR,LAR and ZRP) on the basis of average jitter, average end to end delay and packet delivery ratio by using qualnet simulator. OLSR performs better in dense network. (Kuppusamy *et al*, 2014) have given the descriptive comparison of AODV, TORA and OLSR in light of end to end delay, routing overhead and packet delivery ratio metrics and the analysis shows TORA and AODV perform better than OLSR. (Naveen and Harsh 2012) focused on OLSR and AODV on the basis of default and varied metrics evaluated that the performance is varied by node densities, tool OPNET modeler had used. (Palaniammal and Lalli, 2014) has presented an overview of prominent protocols including AODV, DSR and TORA in MANET, pros and cons of these protocols has been described comparatively and it is mentioned that which one is best it is hard to make decision. (Ashish and Firat 2009) have compared selected protocols of MANET by changing network size and analyzed the scalability and mobility during routing process. AODV observed better as compared to OLSR and TORA. (Sharma and Kumar 2014) have proposed modification of OLSR in light of table maintenance that results improved version of OLSR as compared to existing one. It has been proposed to add one additional field message sequence number to the topology table. (Saravanan and Vijayakumar, 2012) examined the trajectories of reactive and proactive protocols with delay and throughput metrics by using OPNET modeler 16.0. and showed analysis that reactive protocols are better for MANET. (Muhammad *et al*, 2010) evaluated different codec of voice like G.729, G.728, G.726, G.723, G.711, GSM-HR and GSM-EFR with similar load of interactive voice has been analyzed. It has been mentioned in this study the G.711 is best solution for small network and GSM-EFR codec is best for large network. (Savita *et al*, 2012) presented the evaluation of DSR, OLSR and ZRP by using ns-2 Simulator, and illustrated DSR performed better as compared to other protocols. (Meenakshi, *et al*, 2014) presented the analysis of AODV, DSDV and ZRP by using ns-2 and illustrated that ZRP is better than AODV and DSDV in terms of metrics which has been used like throughput. (Salman *et al*, 2012) using multimedia application analyzed the TORA, AODV and OLSR by help of opnet. (Gupta *et al*, 2013) evaluated the mobility effect of manet routing protocols in terms of packet delivery ratio and end to end delay by using ns-2 simulator, and observed AODV perform better. (Muhammad *et al* 2012) has reviewed proactive and reactive routing protocols by using FTP traffic, and three parameters end to end delay , load and throughput analyzed with open modeler.

(Manzur *et al.* 2012) evaluated the DSDV and AODV protocols with QoS metrics by using ns-2 simulator and concluded AODV is efficient as compared to DSDV. (Arun *et al*, 2012) have highlighted the issues and simulator tools and metrics which have been used in Manet and presented that scalability and reliability are major issues for manet implementation . (Basu *et al*, 2012) have compared the proactive and reactive protocols, DSDV, AODV and DSR on the basis of protocol parameters properties in descriptive form. (Harmanpareet and Jaswinder 2012) compared the OLSR, TORA and GRP on the basis of load, delay and throughput and observed TORA perform worst as compared to OLSR and GRP by using OPNET modeler .

3. MATERIALS AND METHODS

The research methodology or approach for to accomplish this task OPNET tool has been used. In this manuscript, performance have been analyzed by evaluating the Table driven (OLSR) and event driven (DSR) MANET protocols by using voice and video traffic applications. The following parameters used to evaluate the performance of TDRP and EDRP.

A. *Transmission Range*

The power constraint is limited the transmission range parameter due to reuse of frequency and effects of channel (Arun Kumar B.R et al). Transmission range depends on the transmit power. It has been derived from mathematical formula which is given below.

$$P = \left(\frac{4\pi D}{0.12476}\right)^2 * 10^{-11.1}$$

Equation: 1

The power value which has been used = 0.005 watt, The transmission range is required, the above formula shows that D is the transmission range. Hence the transmission range can be calculated by deriving the above equation.

*=POWER((4*3.14*B1/0.12476),2)*POWER(10,-11.1)*

Equation: 2

The following transmission ranges has been calculated by using above formula:

Table 1: Transmission range

Transmit Power (w)	Transmission Range(m)
0.000805876	100
0.001813221	150
0.003223504	200
0.005036725	250
0.007252885	300
0.009871982	350
0.012894017	400
0.016318991	450
0.020146902	500
0.024377751	550

B. Transmit Power

The transmit power is a feature of Wireless LAN (WLAN) which impact on communication directly and by increasing the Transmit power the transmission range will be increased in MANET. Moreover it is proved through Mathematical formula of transmission range by increasing transmit power which directly impact on transmission range. It indicates that transmission power directly impact on the performance of MANET protocols.

C. Jitter

The packet arrival time variation is known as jitter. The delay or latency variations or the packet arrival time variations are known as jitter. For the better performance the delay or jitter should be minimum (Monzur et al).

C. Packets sent

The data traffic sent by all mobile nodes using routing protocols in MANET during transmission or total number of packets sent by mobile nodes from source to destination (Pragya *et al*, 2013).

D. Packet Received

The data traffic received by the destination nodes during communication from source node. The received packets can be measured by subtracting lost packets dropped packets from sent packets (Pragya *et al*, 2013).

E. Packets Dropped

The data traffic in the form of packets sent to the destination from source nodes but it could not reach towards the destination due to error condition that is known as Packet dropped (Pragya *et al*, 2013).

F. Media Access Delay

The time required to access a media to mobile node or mobile work station for packet transmission is known as media access delay. initially when packet is sent to physical layer the delay has been recorded for each packet (Kuppusamy *et al* 2011).. Media Access Delay may occur because of the network congestion (Minh_ *et al*, 2012).

G. Network Load

The network load corresponds to total number of bps assigned to WLAN layers for higher layers to all nodes of WLAN in the network .

H. End to End Delay

It is a metric or parameter that shows how much time is needed to a packet travel from one end to another end. End to end delay having all probable delay due to buffering in route discovering latency, propagation delay queuing delay all measured in seconds. To calculate the sent time and receive times of packets difference is known as end to end delay (Pragya *et al*, 2013). (Monzur *et al* 2012). The packet end to end delay is an average time that a packet has been acquired in transit from source to destination. *End to end delay* is a gauge he routing protocols reliability using all constraints of the MANET (Mohammad *et al*, 2012).

I. Throughput

The ratio of data amount reaches from source to destination with respect of time taken the destination received last packet that referred to throughput (Kuppusamy *et al* 2011). The throughput can be expressed in bps or packets per second. The phenomenon of topology change frequently affect this metric in MANET (Kuppusamy *et al* 2011). It has been analyzed in different MANET wireless environment with different metrics. The data packets successfully reached at destination, the average rate is known as throughput. Throughput is measured in bps.

4 EXPERIMENTAL WEORK AND DISSCUSSION

For experimental work, 2 (two) scenarios have been developed with 14, 28 nodes. The TDRP (OLSR) and EDRP (DSR) has been configured in both scenarios. The Wireless LAN physical characteristics standard 802.11a has been configured first by using voice traffic. After simulation, collected the results. Then the Wireless LAN physical characteristics standard 802.11 a has been configured with video traffic. Then run the simulation and collected the results. Similarly, 802.11g configured, and carried out the simulation and obtained the results. The Scenarios Main Characteristics has been given below (T**able 2 and 3).**

Table: 2 The Wireless LAN attribute Values has been given below.

Scenarios Parameters	Scenario Values
Simulation tool	PNET 14.5
MANET Protocols	OLSR, DSR
Campus Network Scenario Size	1000x1000 m
Number of Mobile Nodes	14, 28
Data Rate	54 Mbps
Application Name	Voice and Video Traffic
Wireless LAN Phy Characteristics	802.11a and 802.11g
Network Protocol	IP
Mobility model	Random Waypoint
Scenario Simulation Time	30 min

Table-3.

Wireless LAN Parameters	**Wireless LAN Parameters Values**
Channel Setting	Auto assigned
Transmitter Power	0.005 Watt
Transmission Range	250 m
Fragmentation Threshold	1024 bytes
Buffer Size	1024000 bits
Mobile Node Speed	10 m/s

A. Experimental Work Simulation Scenarios 1.

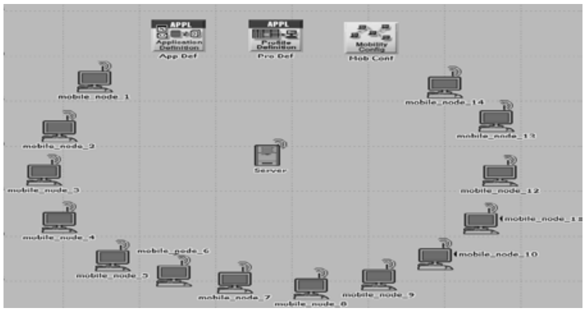

Fig:1 Scenario 1

B. Experimental Work Simulation Scenarios 2.

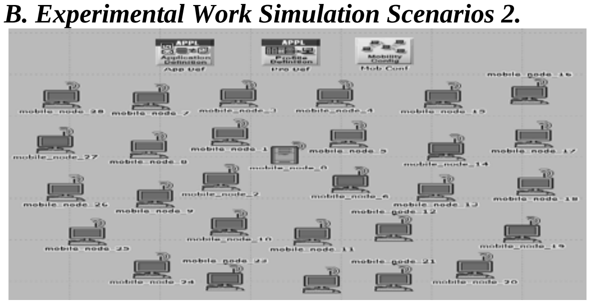

Fig: 2 Scenario 2

Scenario 2 configured by using same process of Scenario 1 configuration, by changing the node density from 14 to 28. Then run the simulation and after completion of the simulation the results has been collected.

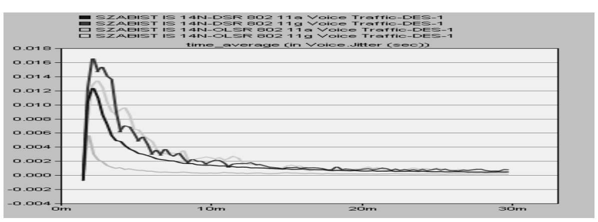

Fig:3 Voice Traffic Jitter (14 Node Density)

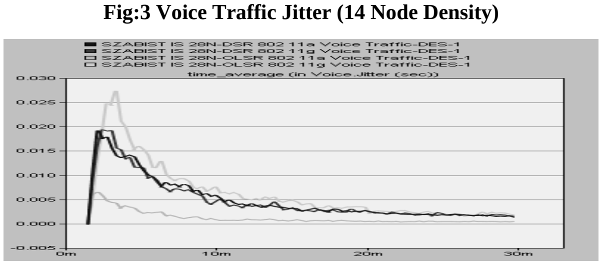

Fig:4 Voice Traffic Jitter (28 Node Density)

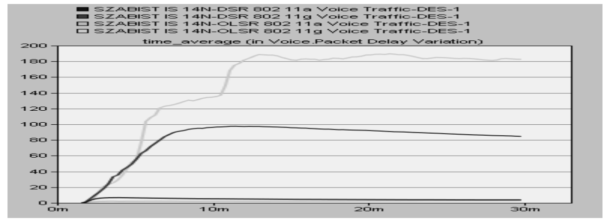

Fig:5 Voice Traffic Packet Delay Variations (14 Node Density)

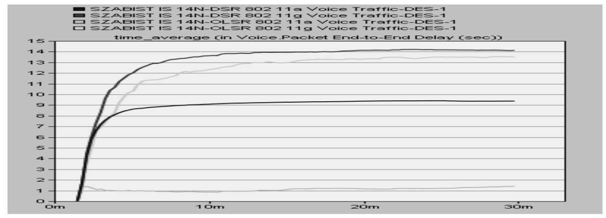

Fig:6 Voice Traffic Packet End to End Delay (14 Nodensity)

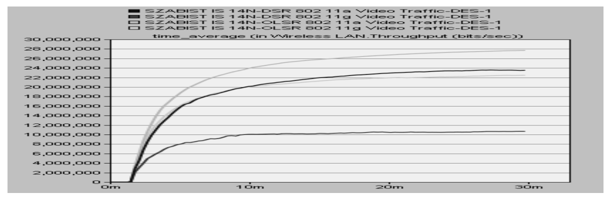

Fig:7 Voice Traffic Throughput (14 Node Density)

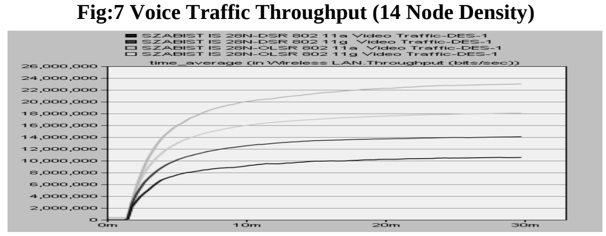

Fig 8 Voice Traffic Throughput (28 Node Density)

6. CONCLUSION

This research paper providing the comprehensive performance analysis of TDRP (OLSR) and EDRP (DSR) of Mobile Adhoc Network using voice and video application services and different node densities with different WLAN physical characteristics such as; WLAN 802.11a and WLAN 802.11g. It has been observed when the voice application used in MANET plate form; the OLSR and DSR performance varied in WLAN 802.11a and 802.11g environment, the analysis shows that the OLSR, voice traffic received and throughput is greater than DSR. Moreover, the traffic load, media access delay and data dropped is grater in DSR as compared to OLSR. From this observation it has been concluded that OLSR has better performance than DSR but it is TDRP. By changing the node density from 14 nodes to 28 nodes the behavior of protocol analyzed, and the behavior of working is observed same and little varied. For the observation of comprehensive analysis the results tables are given having detail. When the video applications has been used with same setting in MANET platform; the OLSR and DSR performance varied as compared to voice application.

5. EXPERIMENTAL WORK RESULTS ANALYSIS OF SCENARIO 1 AND SCENARIO 2

Table: 4

Data Traffic Type	Voice Traffic							
WLAN Physical Characteristics	WLAN 802.11a		WLAN 802.11g		WLAN 802.11a		WLAN 802.11g	
Protocol	DSR	OLSR	DSR	OLSR	DSR	OLSR	DSR	OLSR
Node Density	14				28			
Transmit Power (w)	0.005 (W)				0.005 (W)			
Transmission Range	250 (m)				250 (m)			
Jitter	0.012 sec	0.05 sec	0.017 sec	0.013 sec	0.019 sec	0.007 sec	0.019 sec	0.028 sec
Packet Delay Variations	5 sec	4 sec	85 sec	182 sec	120 sec	100 sec	280 sec	440 sec
Packet End to End Delay	9.5 sec	1.5 sec	14 sec	13.5 sec	22 sec	8 sec	31 sec	34.5 sec
Voice Traffic Sent	560 Kbps	568 kbps	680 kbps	664 kbps	424 kbps	440 kbps	432 kbps	440 kbps
Voice Traffic Received	65 kbps	184 kbps	88 kbps	104 kbps	63.2 kbps	140 kbps	64 kbps	65.6 kbps
WLAN Traffic Load	5 mbps	2 mbps	5.5 mbps	2 mbps	5.2 mbps	2.2 mbps	4.8 mbps	1.9 mbps
WLAN Media Access Delay	5 sec	0.7 sec	12 sec	9 sec	14 sec	4 sec	23.3 sec	20.1 sec
WLAN Data Dropped	2.7 mbps	0 mbps	4.25 mbps	0.75 mbps	3.3 mbps	0.7 mbps	3.7 mbps	0.2 mbps
WLAN Throughput	2.2 mbps	2 mbps	1.2 mbps	1.22 mbps	17 mbps	21 mbps	11.2 mbps	12 mbps

Table: 5

Data Traffic Type	Video Traffic							
WLAN Phy Characteristics	WLAN 802.11a		WLAN 802.11g		WLAN 802.11a		WLAN 802.11g	
Protocol	DSR	OLSR	DSR	OLSR	DSR	OLSR	DSR	OLSR
Node Density	14				28			
Transmit Power (w)	0.005 (W)				0.005 (W)			
Transmission Range	250 (m)				250 (m)			
Packet Delay Variations	0.4 sec	0.1 sec	19 sec	7 sec	88 sec	1 sec	72 sec	3 sec
Packet End to End Delay	0.96 sec	0.2 sec	1.37 sec	0.15 sec	13.2 sec	0.2 sec	7.8 sec	0.9 sec
Video Traffic Sent	12.3 mbps	9.4 mbps	18.2 mbps	12.8 mbps	29 mbps	21 mbps	36 mbps	38 mbps
Video Traffic Received	0.82 mbps	0.3 mbps	0.2 mbps	1.5 mbps	80 kbps	280 kbps	139 kbps	40 kbps
WLAN Traffic Load	96 mbps	65 mps	186 mbps	70 mbps	270 mbps	95 mbps	370 mbps	230mbps
WLAN Media Access Delay	0.3 sec	0.21 sec	1.55 sec	0.5 sec	2.5 sec	0.7 sec	2.43 sec	1.35 sec
WLAN Data Dropped	70 mbps	40 mbps	178 mbps	47 mbps	255 mbps	70 mbps	355 mbps	215 mbps
WLAN Throughput	23.8 mbps	28 mbps	10.8 mbps	22.3 mbps	10.5 mbps	23 mbps	14 mbps	18 mbps

protocols perform better in high load. The throughput is greater in video traffic as compared to voice traffic. Similarly; OLSR perform better in terms of throughput in both WLAN 802.11a and 802.11g environment. WLAN 802.11g providing better platform to TDRP and EDRP to provide better services as compared to 802.11a. The TDRP and EDRP metrics performance varied; it depends on the application type, WLAN physical characteristics and number of nodes. In this way these protocols behavior has been changed. The transmission power and transmission range also have impact on these protocol performance

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