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# Simulation based analysis of Reactive Protocols Metrics in MANET Using OPNET

H. NAWAZ[++], H. M. ALI*, G. NABI**

Department of Computer Science, SZABIST, 90 Clifton, Karachi

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**Abstract:** The modern era of communication technology plays vital in the field of mobile Adhoc networking. This research paper work is about the simulation based analysis of reactive protocols metrics in MANET using opnet. The reactive protocols metrics are important subject matter in the mobile Adhoc network environment. The network environment connecting devices or nodes with each other efficiently and establish communication that is mobile Adhoc network . It offers mobility to network devices to freely move in any direction and establish connection to any device when it comes in coverage. The aim of this research paper is to analyze the reactive protocol metrics as, transmission range, media access delay, load, end to end delay and throughput by evaluating the AODV, DSR and TORA protocols using video conferencing application. The simulation results have been carried out through OPNET 14.5 modeler tool, however scenario created, having different WLAN physical characteristics and having different transmission power configured, and reactive protocols metrics results analyzed.

**Keywords:** MANET, Reactive, Protocols, Metrics, OPNET

## 1. INTRODUCTION

The MANET (Mobile Adhoc Network) is the flavor of wireless mobile network. Wireless mobile networks played an important role in the field of communication and technology. The MANET is described as it is auto configured network layout in that condition where fixed network could not be deployed. In MANET all devices develops auto configuration links and establishes the network. In Mobile Adhoc network each device is free to move independently. The MANET have features of self organizing, automatic dynamic configuration and as well self administration (Kaur, 2013). The MANET network have AODV, DSR, TORA, OLSR and ZRP routing protocols. But in this research paper AODV, DSR and TORA routing protocol have been considered for analysis. There are many issues, problems in the Mobile Adhoc Network; likewise there is Mobility issue when devices are moved independently. There is also scalability issue in MANET as well there is security issue, we know that in wireless technology there are many flaws, in security the security protocols are vulnerable hence it affects mobility scalability and performance of overall MANET network. Obviously there is also routing protocol issues which affecting the services of MANET. Nodes connectivity issues which degrades the services of MANET. This problem occurs due to routing protocols which providing the link between nodes which are AODV, DSR, TORA, OLSR and ZRP. Hence in this study routing protocol AODV, DSR and TORA metrics, media access delay, network load, end to end delay, throughput, transmission range and transmit power analyzed through simulation. Pl. define the abbreviation at the air first appearance.

## 2. RELATED WORK

Mobile Adhoc network is wireless network technology which is more feasible for that Location where it is difficult to deploy the fixed network. Hence it provides the dynamic infrastructure by which self configured network can be deployed dynamically (Dadral *et al*, 2012), has worked on proactive AODV and reactive DSR routing protocols evaluated using FTP traffic by using separate scenarios and observed the results which were varied according to traffic and the simulation results that the reactive DSR routing protocol performs better as compared to the proactive AODV routing protocol in terms of different traffic parameters. On other hand proactive routing protocols have good performance in the sense of end to end delay and in the sense of routing message overhead (Sharma *et al*, 2013) . Other author Jahangir khan et al have evaluated QoS framework and observed the packet delivery issues between intermediate nodes. Also Mashri *et al* evaluated in their research the time of packet delivery is varied and OLSR was weak routing protocol (Khan *et al*, 2011). (Singla *et al.*, 2012) compared the AODV, TORA and DSDV routing protocols both TCP and CBR traffic pattern. In terms of packet delivery ratio and average end to end delay AODV is better than DSDV (Singla *et al*, 2010). In MANET there are two categorize of routing protocols. One is on- demand routing protocols category and another is table driven routing protocols category

[++]Corresponding Author: Haque Nawaz Lashari, E-mail: hnlashari@smiu.edu.pk, Cell# +92-333-7588408
,*Department of Computer Science, SZABIST, 90 Clifton, Karachi
**Institute of Mathematics & Computer Sindh University, Jamshoro

(Pragya *et al*, 2013). Here on- demand routing protocol discussed. AODV (Ad hoc On demand Distance Vector) it is known as on demand routing protocol which mean routes are established when required (Puneet *et al*, 2012, Sari *et al*, 2013).

DSR (Dynamic Source Routing) It is known as reactive protocol having two mechanisms one is route discovery and an others is maintenance of source routes. In Route discovery, source node obtain a route towards destination node. In route maintenance, the mechanism by which source node detect route when network topology changed. It is not used longer that route to a destination node (Dadral *et al*, 2012, Sari *et al*, 2013). TORA (Temporally Ordered Routing Algorithm). It is known as reactive protocol. It is loop free and uses distributed routing algorithm. This protocol has three functions 1) Creating routes: Source node to destination node has required to establish direct links from source to destination which accomplished by using query and reply process through which DAG directed acyclic graph established. 2) Maintaining routes: Routes are maintained by response of topological change by reestablishing the route. 3) Erasing routes: CLR clear packets used for to erase the routes (Dadral *et al*, 2012, Sari *et al*, 2013).

## 3. RESEARCH METHODOLOGY

The methodology or proposed approach which has been carried out by using OPNET 14.5 modeler for this research paper simulation based analysis of reactive protocols metrics in MANET using opnet. In this paper, it has been studied out by evaluating the MANET routing protocols using event driven protocols which are AODV, DSR, and TORA by using video conferencing application traffic. To accomplish this task, media access delay, network load, end to end delay, throughput, transmission range and transmit power metrics analyzed and observed the results, how these metrics affecting the behavior of routing protocols in MANET.

## 4. SIMULATION EXPERIMENTAL WORK

The research is carried out by developing the a scenarios having 16 nodes. The routing protocol AODV, DSR and TORA has been configured in this scenario with default setting. Then Wireless LAN standard 802.11a, physical characteristics are used first, by using default setting attributes. The simulation has been carried out and observed the results. Then the Wireless LAN standard 802.11a physical characteristics configuration changed in this scenario to Wireless LAN Standard 802.11g physical characteristics and same way, the scenario has been configured by using default setting attributes, and the simulation has been carried out and the results has been observed. On the other hand wireless LAN default attribute transmit power (w) 0.005 w first configured for both WLAN physical characteristics and then same attribute transmission power (w) has been changed to 0.004 (w) for both WLAN physical characteristics and the simulation has been carried out and results have been observed. It is observed how results have been affected by changing the transmit power. Indeed it has been seen how performance of MANET degraded. The developed scenario is having 16 nodes.

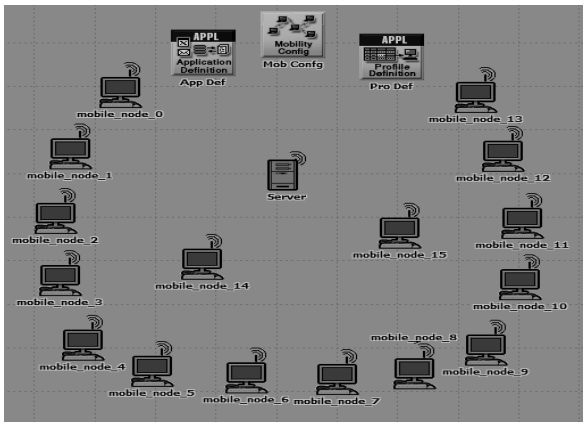


**Fig. 1 Scenario with WLAN 802.11a/ 802.11ghaving 16 Nodes**

In the **(Fig.1)** scenario 1500x1500 meters MANET campus network has been developed. By using object palette of MANET model of opnet the application definition, profile definition, mobility configuration, Fixed server and mobile nodes dragged and dropped to workplace. After that the application definition configured, firstly name has been changed then in the application attribute video conferencing application configured with high resolution description. Profile Definition configured firstly the name has been changed; secondly, profile services like: FTP and HTTP and video conferencing application configured. The mobility configuration also configured, first name changed then the random waypoint mobility configured. The server also configured then the MANET protocols AODV, DSR and TORA configured with default setting. Then server application support profile configured and supported services configured then Wireless LAN parameters configured. The physical characteristics WLAN 802.11a configured first and run the simulation. After that again the physical characteristic of WLAN 802.11g configured with same parameters having, data rate configured 48 mbps, channel setting auto assigned, transmitter power 0.005 watt, fragmentation threshold 1024 and buffer size 256000 bits configured. The simulation time of the above scenario has been fixed 30 m. Then run the simulation and results collected and oberved. Again after collecting of simulation results the transmit power attribute reconfigured from 0.005 watt to 0.004 watt for analysis how it affecting the protocols metrics in MANET. All above steps and configuration repeated in the Fig. 1 Scenario for both WLAN Physical Characteristics.

In the **(Fig. 2)** it has been observed that in WLAN (802.11a) environment media access delay of AODV is 0.11 sec, DSR has 0.12 sec and TORA has 0.042 sec. The result shows that the DSR protocol has greater media access delay as compared to AODV and TORA. On other hand AODV has greater media access delay than TORA. It means TORA has less media access delay.

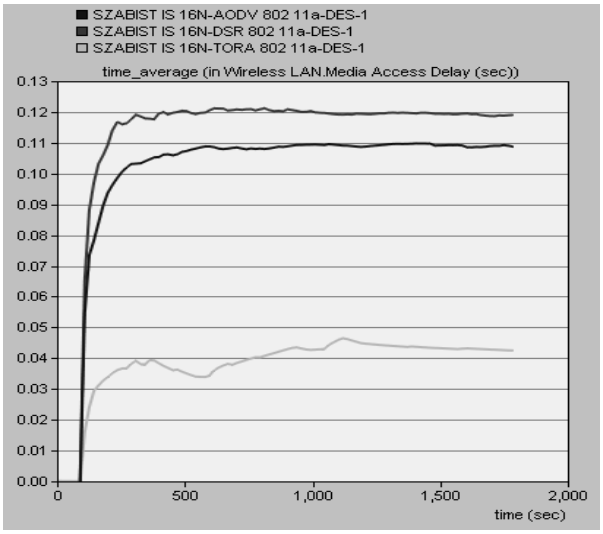


**Fig. 2 Wireless LAN (802.11a) Media Access Delay**

In the **(Fig. 3)** it has been observed that in WLAN (802.11g) environment media access delay of AODV is 0.35 sec, DSR has 0.59 sec and TORA has 0.30 sec. The figure result shows that the DSR protocol has greater media access delay as compared to AODV and TORA. On other hand AODV has greater media access delay than TORA. It means TORA has less media access delay.

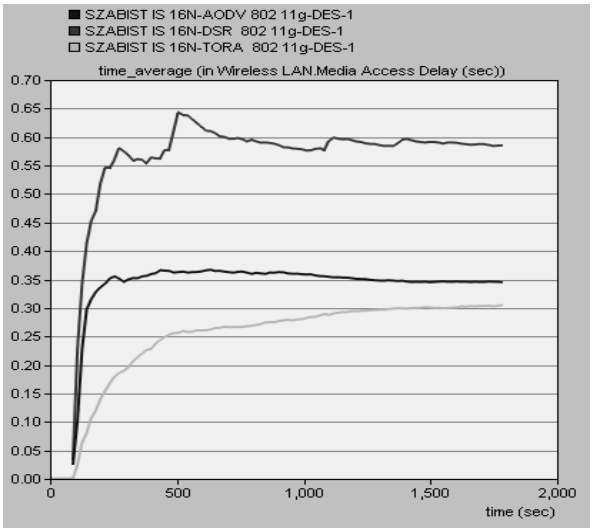


**Fig. 3 Wireless LAN (802.11g) Media Access Delay**

In the **(Fig. 4)** it has been observed that in WLAN (802.11a) environment network load of AODV is 15.2 mbps, DSR has 25 mbps and TORA has 12 mbps. The result shows that the DSR protocol has greater network load as compared to AODV and TORA. On other hand AODV has greater network load than TORA. It means TORA has less network load.

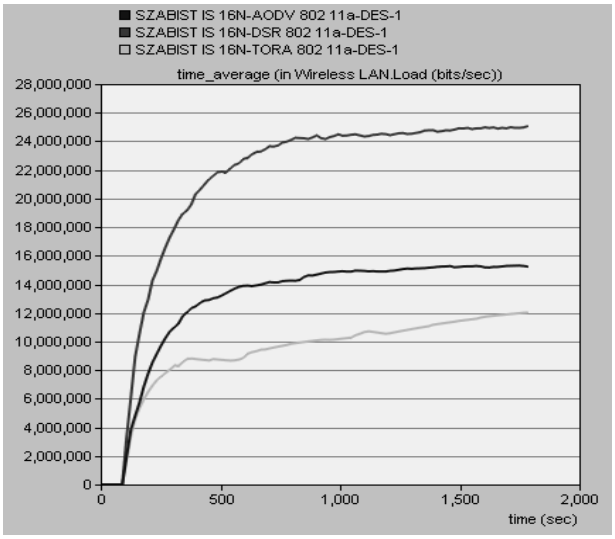


**Fig. 4 Wireless LAN (802.11a) Network Load**

In the **(Fig. 5)** it has been observed that in WLAN (802.11g) environment network load of AODV is 88 mbps, DSR has 209 mbps and TORA has 121 mbps. The result shows that the DSR protocol has greater network load as compared to AODV and TORA. On other hand TORA has greater network load than AODV. It means AODV has less network load.

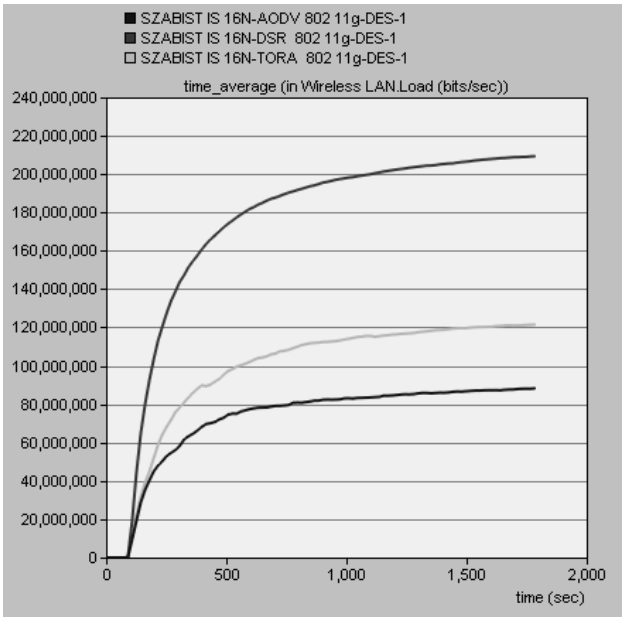


**Fig. 5 Wireless LAN (802.11g) Network Load**

In the **(Fig. 6)** it has been observed that in WLAN (802.11a) environment end to end delay of

AODV is 0.048 sec, DSR has 0.064 sec and TORA has 0.043 sec. The result shows that the DSR protocol has greater end to end delay as compared to AODV and TORA. On other hand AODV has greater end to end delay than TORA. It means TORA has less end to end delay.

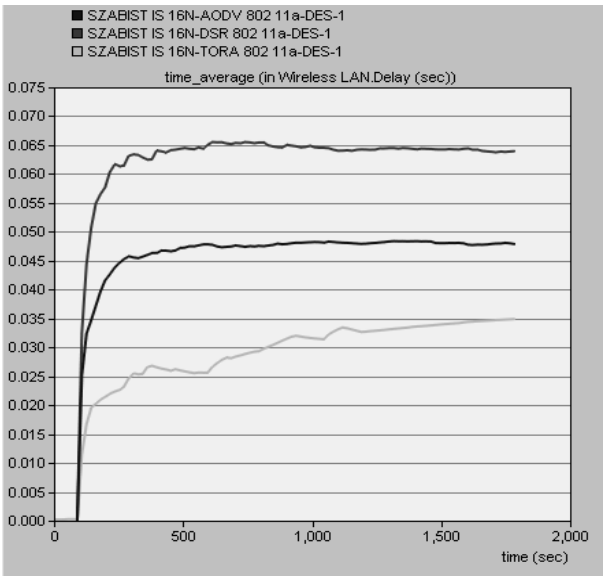


**Fig. 6 Wireless LAN (802.11a) End to End Delay**

In the **(Fig. 7)** it has been observed that in WLAN (802.11g) environment end to end delay of AODV is 0.60 sec, DSR has 0.066 sec and TORA has 0.34 sec. The above result shows that the DSR protocol has greater end to end delay as compared to AODV and TORA. AODV has greater end to end delay than TORA. And TORA has less end to end delay.

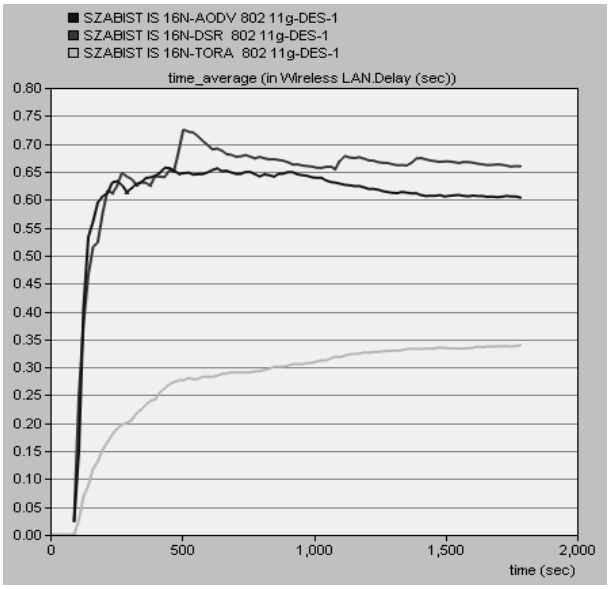


**Fig. 7 Wireless LAN (802.11g) End to End Delay**

In the **(Fig. 8)** it has been observed that in WLAN (802.11a) environment throughput of AODV is 3.5 mbps, DSR has 1.7 mbps and TORA has 7.3 mbps. The result shows that the TORA protocol has greater throughput as compared to AODV and DSR. On other hand AODV has greater throughput than DSR. It means DSR has less throughput.

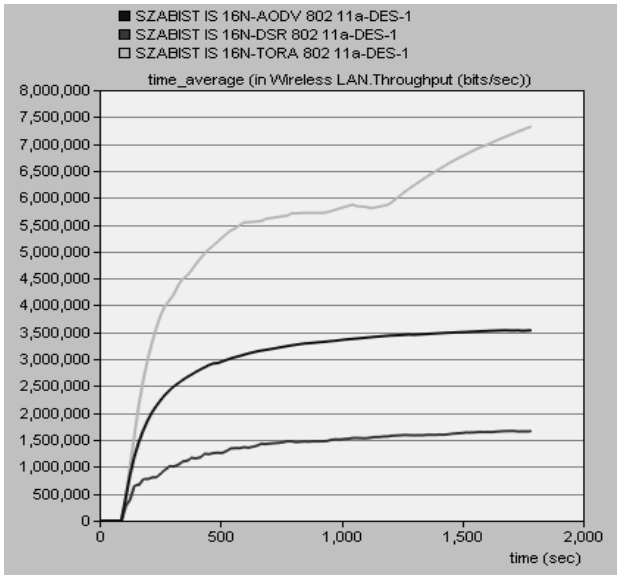


**Fig. 8 Wireless LAN (802.11a) Throughput**

In the **(Fig. 9)** it has been observed that in WLAN (802.11g) environment throughput of AODV is 16.6 mbps, DSR has 13.6 mbps and TORA has 17.23 mbps. The result shows that the TORA protocol has greater throughput as compared to AODV and DSR. On other hand AODV has greater throughput than DSR. It means DSR has less throughput.

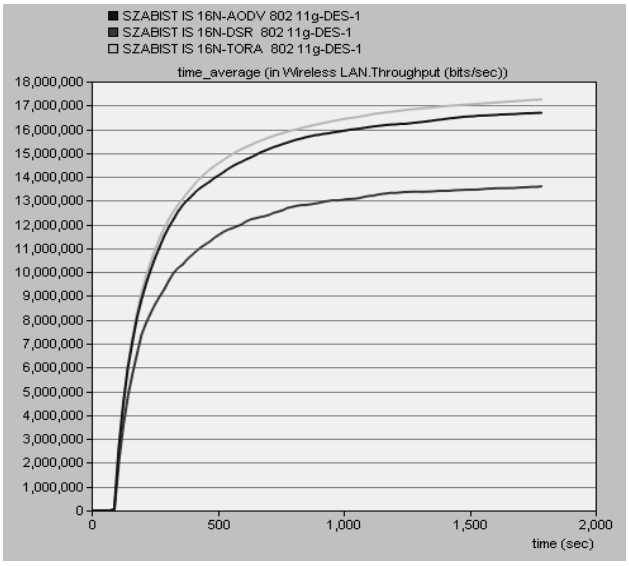


**Fig. 9 Wireless LAN (802.11g) Throughput**

In the Fig. 10, Scenario , the transmit power value changed from 0.005 w to 0.004 w for analysis of protocols metrics and it affects the performance.

In the **(Fig. 10)** it has been observed that in WLAN (802.11a) environment media access delay of AODV is 0.17 sec, DSR has 0.193 sec and TORA has 0.000 sec. The above result shows that the DSR protocol has greater media access delay as compared to AODV and TORA. On other hand AODV has greater media access delay than TORA. It means TORA has less media access delay.

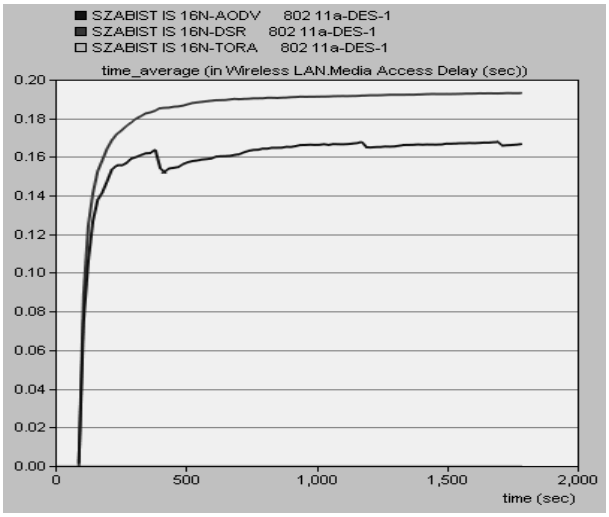


**Fig. 10 Wireless LAN (802.11a) Media Access Delay**

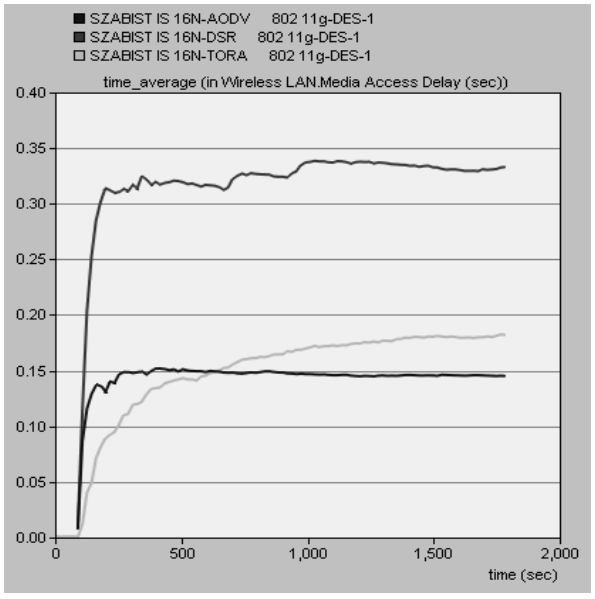


**Fig. 11 Wireless LAN (802.11g) Media Access Delay**

In the **(Fig. 11)** it has been observed that in WLAN (802.11g) environment media access delay of AODV is 0.15 sec, DSR has 0.33 sec and TORA has 0.18 sec. The above result shows that the DSR protocol has greater media access delay as compared to AODV and TORA. On other hand TORA has greater media access delay than AODV. It means AODV has less media access delay.

In the **(Fig. 12)** it has been observed that in WLAN (802.11a) environment network load of AODV is 5.2 mbps, DSR has 20 mbps and TORA has 0.0002 mbps. The above result shows that the DSR protocol has greater network load as compared to AODV and TORA. On other hand AODV has greater network load than TORA. It means TORA has less network load.

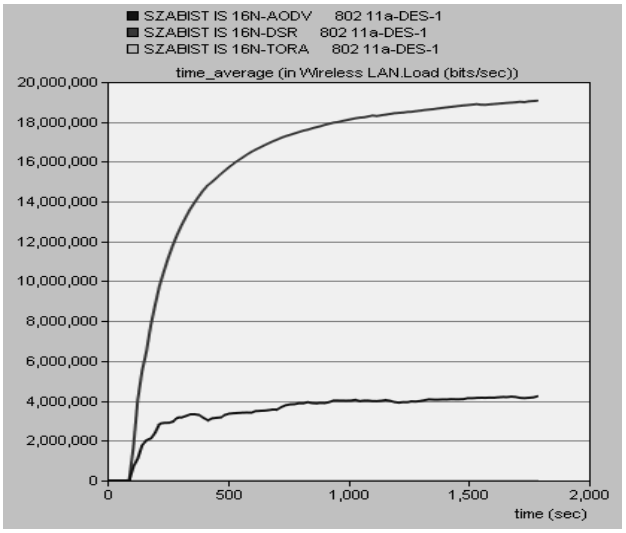


**Fig. 12 Wireless LAN (802.11a) Network Load**

In the **(Fig. 13)** it has been observed that in WLAN (802.11g) environment network load of AODV is 64 mbps, DSR has 123 mbps and TORA has 57.8 mbps. The above result shows that the DSR protocol has greater network load as compared to AODV and TORA. On other hand AODV has greater network load than TORA. It means TORA has less network load.

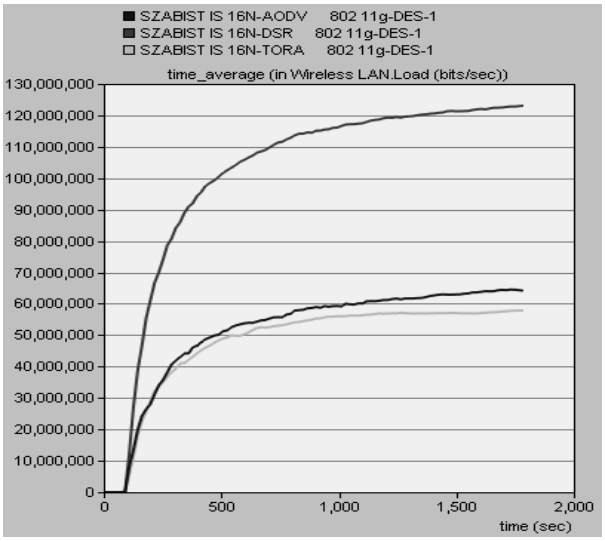


**Fig. 13 Wireless LAN (802.11g) Network Load**

In the **(Fig. 14)** it has been observed that in WLAN (802.11a) environment end to end delay of AODV is 0.18 sec, DSR has 0.21 sec and TORA has 0.0003 sec. The above result shows that the DSR protocol has greater end to end delay as compare to AODV and TORA. On other hand AODV has greater end to end delay than TORA. It means TORA has less end to end delay.

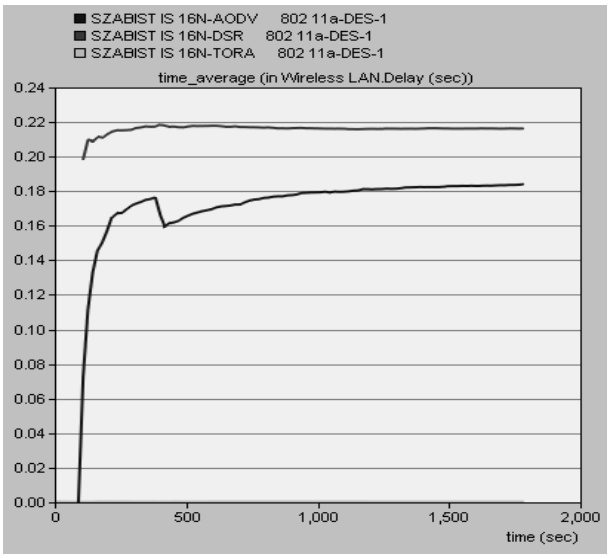


**Fig. 14 Wireless LAN (802.11a) End to End Delay**

In the **(Fig. 15)** it has been observed that in WLAN (802.11g) environment end to end delay of AODV is 0.18 sec, DSR has 0.35 sec and TORA has 0.19 sec. The above result shows that the DSR protocol has greater end to end delay as compared to AODV and TORA. On other hand TORA has greater end to end delay than AODV. It means AODV has less end to end delay

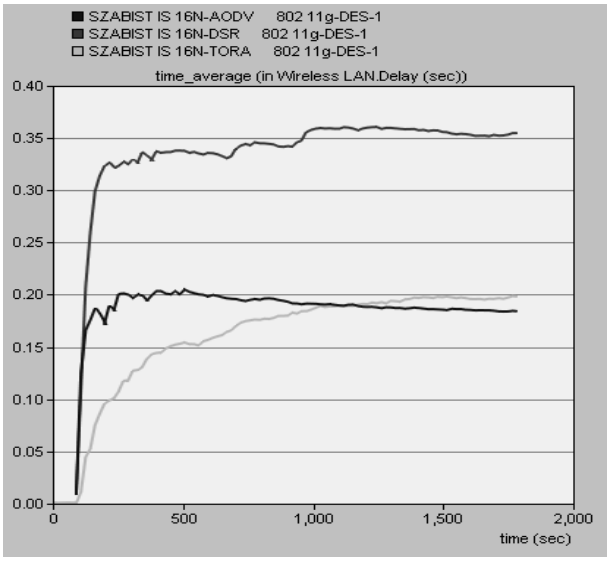


**Fig. 15 Wireless LAN (802.11g) End to End Delay**

In the **(Fig. 16)** it has been observed that in WLAN (802.11a) environment throughput of AODV is 0.13 mbps, DSR has 0.21 mbps and TORA has 0.0001 mbps. The above result shows that the DSR protocol has greater throughput as compared to AODV and TORA. On other hand AODV has greater throughput than TORA. It means TORA has less throughput.

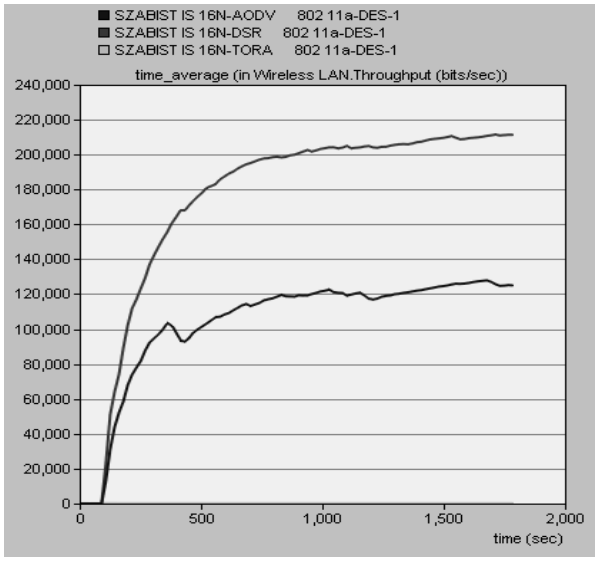


**Fig. 16 Wireless LAN(802.11a) Throughput**

In the **(Fig. 17)** it has been observed that in WLAN (802.11g) environment throughput of AODV is 17.7 mbps, DSR has 15.5 mbps and TORA has 18.7 mbps. The above result shows that the TORA protocol has greater throughput as compared to AODV and DSR. On other hand AODV has greater throughput than DSR. It means DSR has less throughput.

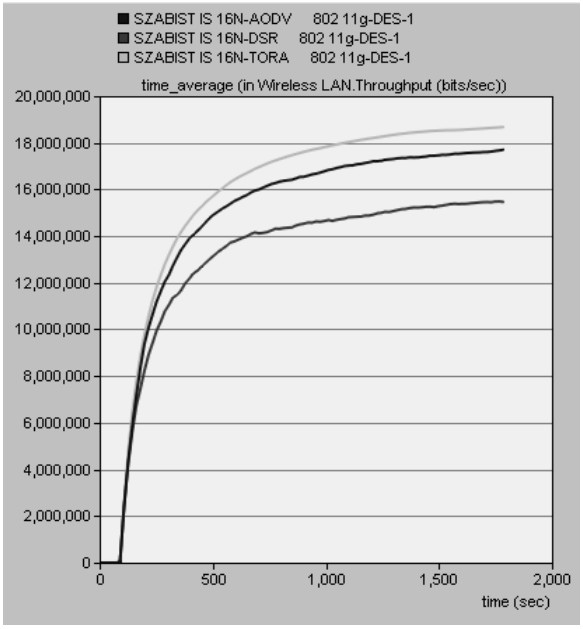


**Fig. 17 Wireless LAN (802.11g) Throughput**

## 5. EXPERIMENTAL WORK RESULTS

| | Scenario 2 (16 -Node) | | | W LAN 802.11a | | | WLAN 802.11g | | |
|---|---|---|---|---|---|---|---|---|---|
| **Metrics** | **Node Density** | **Transmit Power (w)** | **Transmission Range** | **AODV** | **DSR** | **TORA** | **AODV** | **DSR** | **TORA** |
| WLAN Media Access Delay | 16 | 0.005 (W) | 1250 (m) | 0.11 Sec | 0.12 Sec | 0.042 Sc | 0.35 Sec | 0.59 Sec | 0.30 Sec |
| WLAN Load | | | | 15.2 Mbps | 25 Mbps | 12 Mbps | 88 Mbps | 209 Mbps | 121 Mbps |
| WLAN Delay | | | | 0.048 Sec | 0.064 Sec | 0.043 Sec | 0.60 Sec | 0.66 Sec | 0.34 Sec |
| WLAN Throughput | | | | 3.5 Mbps | 1.7 Mbps | 7.3 Mbps | 16.6 Mbps | 13.6 Mbps | 17.23 Mbps |
| WLAN Media Access Delay | 16 | 0.004 (W) | 1117 (m) | 0.17 Sec | 0.193 Sec | 0.0000 Sec | 0.15 Sec | 0.33 Sec | 0.18 Sec |
| WLAN Load | | | | 4.2 Mbps | 20 Mbps | 0.0002 Mbps | 64 Mbps | 123 Mbps | 57.8 Mbps |
| WLAN Delay | | | | 0.18 Sec | 0.21 Sec | 0.0003 Sec | 0.18 Sec | 0.355 Sec | 0.19 Sec |
| WLAN Throughput | | | | 0.13 Mbps | 0.21 Mbps | 0.0001 Mbps | 17.7 Mbps | 15.5 Mbps | 18.7 Mbps |

## 6. CONCLUSION

This research paper is providing analytical study of Mobile Adhoc Network about the protocols metrics behavior when the power attribute value changed, the behavior of protocols performance are increased or decreased means changed. It has been observed from results that transmit power has direct impact on the performance of MANET protocols metrics. Same way transmission range also is affecting the protocols performance and metrics became affected. In this research paper it has been observed that the transmit power is affecting overall MANET protocols functionality, it has been analyzed. The physical characteristics 802.11a or 802.11g are analyzed separately by using different metrics of protocols, it has been observed AODV, DSR and TORA is not working properly in 802.11a environment when transmit power value decreased from 0.005 to 0.004. it means by decreasing power also metrics performance of protocols in 802.11g environment has been affected.

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