International Journal of Technical Innovation in Modern Engineering & Science (IJTIMES)
Impact Factor: 3.45 (SJIF-2015), e-ISSN: 2455-2585
Volume 4, Issue 3, March-2018

COMPARISION OF WORKING OF NETWORK TOPOLOGIES IN AODV ROUTING PROTOCOL BASED ON THE PERFORMANCE METRICS.

Akanksha Gupta[1] , Bonthu Vyuhita[2]

[1]Information Technology & Guru Ghasidas University ,akanksha.me2011@gmail.com
[2]Information Technology & Guru Ghasidas University,vyuhitabonthu@gmail.com

Abstract-- Wireless Ad Hoc Network which are more often known as Mobile Ad hoc Network (MANET) .It is a network that has no infrastructure and self-organises the connectivity of mobile devices wirelessly. This paper discusses about comparisons of Horizontal and vertical combination topology and grid topology in AODV protocol on the basis of performance metrics such as Through-put, Packet Delivery Ratio, Avg End to End Delay. AODV is a routing protocol that is loop-free for Ad Hoc networks. Here various metrics for performance of wireless sensor node that is using AODV routing protocol are analysed and implementations on the parameters on the basis of Average end to end delay and Throughput with wait time keeping constant and size of the network i.e. mean of total number of nodes in specific network using traffic scenario in MANET using Network simulator.

Keywords - MANET, AODV, Simulator NS-2, Performance metrics—Throughput, Packet delivery ratio, Avg end to end delay, Packet loss.

I. INTRODUCTION

MANET has no infrastructure .It is IP based network for mobile and machine nodes which are wireless and connected with a radio. While operating, the MANET nodes do not have a centralised mechanism. It is commonly noted for its routable network properties where every node behaves as a "router" for forwarding traffic to other node that is specified in the network. The routers can freely move in any direction and re-organize themselves whimsically ;thus, the wireless topology of the network can possibly change unpredictably. The wireless communication field has become more popular than ever before ,because of the rapid wireless technologies and the wide spread of mobile devices advancement. We have simulated mobile ad hoc network for finite number of nodes in combination of horizontal and vertical topology and grid topology in this research study . The performance of the networks are analysed based on Ad hoc On Demand Distance Vector (AODV)with identical simulation parameters using NS2.

II. PREVIOUS WORK

I. *Arun Jain, Ramesh Bharti* studied the simulation and Performance Analysis of Throughput and Delay on Changing Time and varying number of Nodes and observed that ,as there is limited number of paths to the destination the difference between maximum and minimum delay is increased as the number of nodes in the network are increased.

II. *Santosh Kumar Soni* designed the combination of Vertical and horizontal topology in NS2 and studied the performance simulation of MANET protocols and found that DSDV is better than AODV and DSR for the small scale network in the designed topology.

III.*Laxmi Shrivastava,Sarita S.Bhaduria,G.S.Tomar* studies the evaluation of performance of routing protocols with varying traffic loads in MANET**.**After the comparison of performance with different routing protocols they observed DSR performed well compared to other protocols in heavy traffic load.

IV.*V.K.Taksande,K.D.Kulat* studied the comparison of simulation among AODV,DSDV,DSR protocols for GRID topology and observed that DSR gives the better performance compared to DSDV and AODV for given simulation environment.

III. AODV ROUTING PROTOCOL

Routing policy which is generally called as routing protocol uses software and routing algorithms that determine maximum transfer of network data and communication paths between nodes in the network .They facilitate router communication and understanding of complete network topology. They are of two types, reactive and proactive protocols. An Ad Hoc on Demand Distance Vector (AODV)is one of the reactive protocols. It is designed for MANETs and wireless networks . Routes to destinations (on demand) and support to both uncast and multicast routing is established by this protocol . Routes between nodes are built only if they request the source nodes therefore this is considered as an on-demand algorithm. Extra traffic for 3 communications along links is not created.

Mobile nodes in an ad hoc network are intended to use the Ad hoc On-Demand Distance Vector (AODV) routing protocol . Quick adaptation to dynamic link conditions, low processing and memory overhead, low network utilization are offered by AODV. Destination sequence numbers to ensure loop freedom every time, avoiding problems (such as "counting to infinity") associated with classical distance vector protocols are used by this protocol.

IV. PERFORMANCE METRICS

a) *Throughput*: Throughput is the measure of how much information is transferred for a given amount of time. It generally refers to task performance by a computing service or device over a given period. The amount of completed work against time consumed is measured and that is used to measure the processor performance, memory or network communications.

Throughput= Total Received size / Elapsed time between sent and receive

b) *Packet Delivery Ratio*: Packet delivery ratio (PDR) can be defined as the ratio of packets that are successfully delivered to destination to the packets sent by the sender. Attaining high PDR shows that the network gives better performance. Amount of reliability offered by the network is also determined by PDR.

Packet Delivery Ratio= the Number of packets received successfully /Number of packets that are sent

c) *Average End-to-End Delay*: It refers to average amount of time required for the packet to be transferred between source and destination across the network. Average end -to-end delay must be low for better performance of network.

Average End to End Delay= Number of Routing Control Packets /Total Simulation Time

d) *Packet Drop:* Packet drop which is also known as packet loss is a phenomenon that occurs when the packet transferred across the network does not reach the destination. In wireless network , loss of packets is caused due to the error in the data transmission. Packet Loss is measured as a percentage of packets lost to packets sent.

V. SIMULATION TOOLS

i. NS2 Tool

NS2 is an open-source simulation tool and it runs on Linux platform. It is a discreet event simulator which is targeted at research in networking and substantial support for simulation of routing is provided, multicast protocols are provided and IP protocols, such as UDP, TCP, RTP and SRM over wired and wireless (local and satellite) networks are also provided. It provides many advantages which make it a useful tool, some of them are multiple protocols are supported and the capabilities of graphically detailing network traffic are also supported. In Addition to this, several algorithms in routing and queuing are supported by NS2.

ii. JTrana

You can use it to analyse the NS2 wireless simulation traces. The trace file of the simulated network is given as the input to this tool. Graph or Data-txt is the output. It gives the Network related information like Overall information, Energy remained for the whole network, Packet statistics. It gives node related information like Current selected node info, energy, packets id, throughput, sequence number, delay, RTT, Movement is some of them. Some custom functions like drawing the data from the database using SQL-like scripts and showing the results are also performed.

iii. NSG (Network Scenarios Generator)

NS Generator is a tool that generates tcl scripts automatically. It is JAVA based tool which can run on any platform and generates scripts for both Wired and Wireless scenarios in NS2.

VI. SIMULATION ENVIRONMENT SETUP

Using the above three tools we generated grid topology and Horizontal and vertical combination topology using NSG giving some parameter information**.**

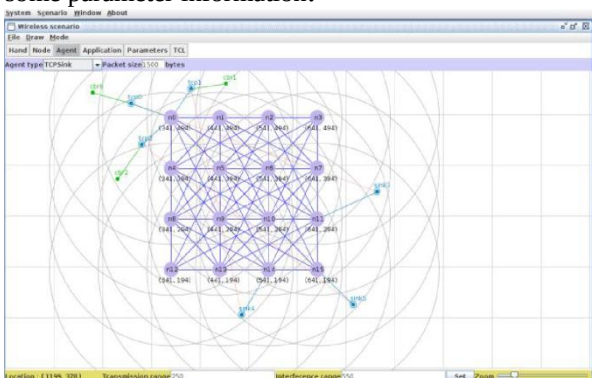

Fig. 1 Creation of Grid Topology in NSG

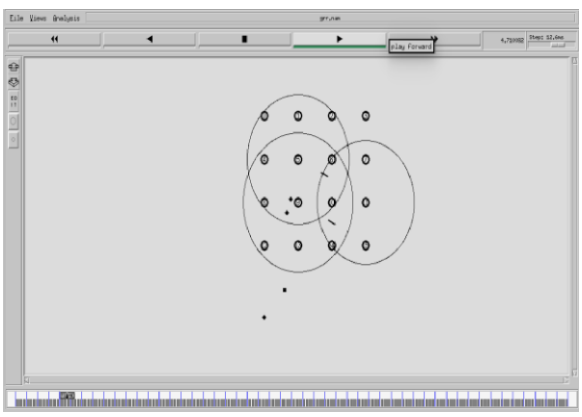

Fig. 3 AODV simulation in Grid using NS2

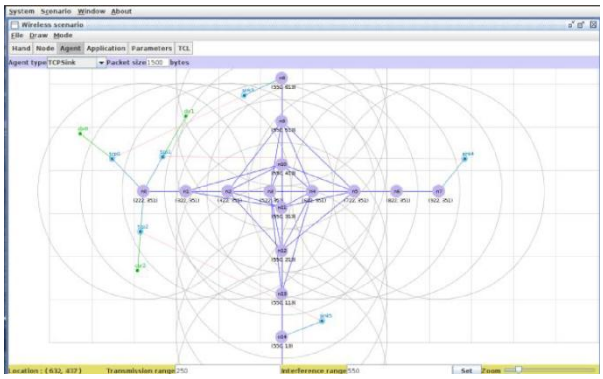

Fig. 2 Creation of Horizontal and Vertical Topology

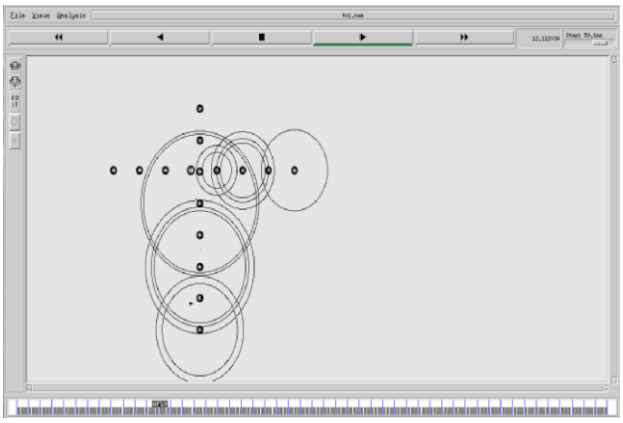

Fig. 4 AODV simulation in Horizontal and vertical topology using NS2

Parameters taken for Simulation

Simulator	NS 2.34
Protocols	AODV
No. Of Nodes	16
Topologies	Grid Topology, Horizontal and Vertical Topology.
Simulation Time	50 seconds
Traffic Type	CBR
Max packet in Queue	20
Packet size	1500 bytes
Time Interval	0.005 seconds
Mac Protocol type	IEEE 802.11
Connection Rate	4 pkts/sec
Channel type	Wireless

(Table 1)

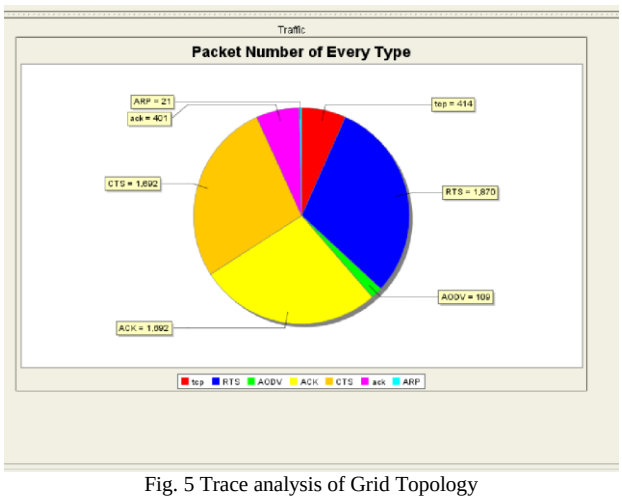

Fig. 5 Trace analysis of Grid Topology

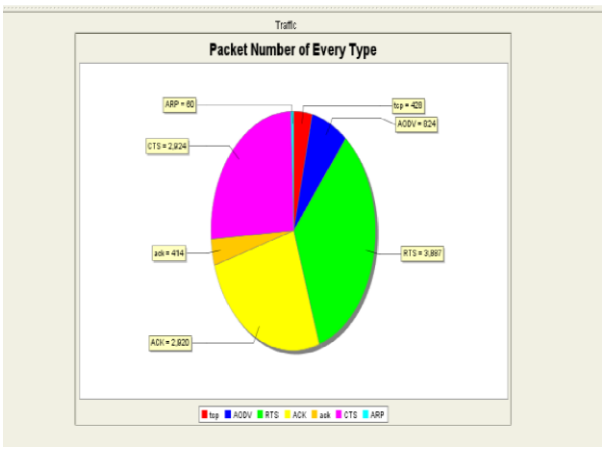

Fig. 6 Trace analysis of Horizontal and Vertical Topology

The NSG tool generates the tell code which is used to simulate AODV protocol in NS2 in fig1&2. The results of the simulated network are analysed using trace file. The trace file is read into JTrana software in fig 3 to obtain the performance results in the form of Graphs and Data-txt.

VII. SIMULATION RESULT

The working of the topologies is compared based on the results obtained. We have taken Performance metrics likes Throughput, Packet-delivery ratio, Average end -to end delay, packet drop. The results are as follows:

THROUGHPUT:
Grid topology gives the better throughput than Horizontal and vertical topology.

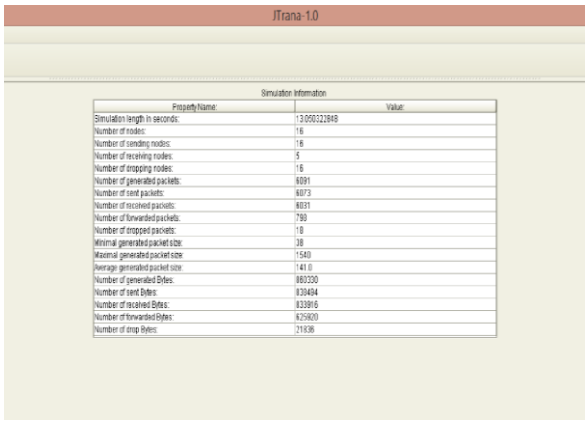

Fig. 7Simulation information of Grid Topology

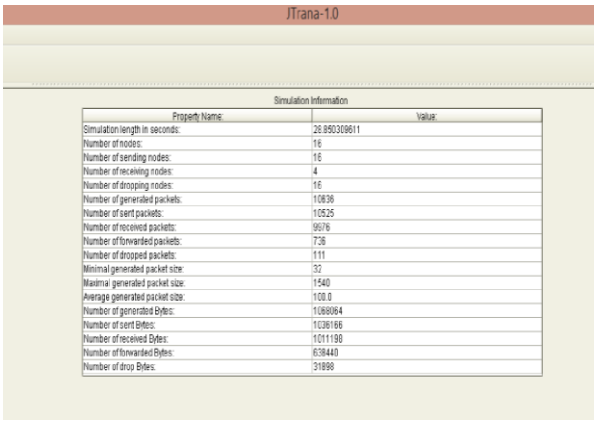

Fig. 8 Simulation information of Horizontal and vertical topology.

Throughput= Total Received size / Elapsed time between sent and receive
From the above values in the calculation
Throughput for grid topology =63,901.6
Throughput for Horizontal and vertical topology =35,050.19

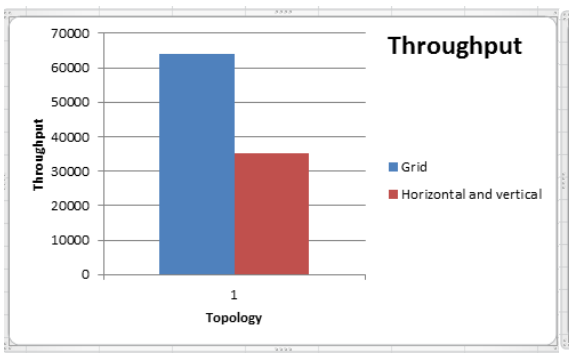

Fig.9 Comparison of Throughput

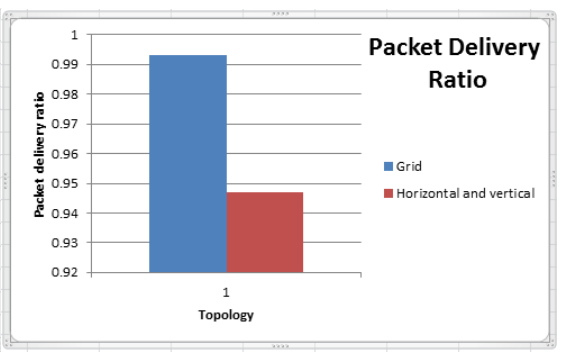

Fig. 10 Comparison of Packet Delivery Ratio

PACKET DELIVERY RATIO:
Grid topology gives better packet delivery ratio when compared to Horizontal and vertical topology.
From [7&8]
PDR for grid topology=0.993
PDR for Horizontal and vertical topology =0.947

AVERAGE END TO END DELAY:

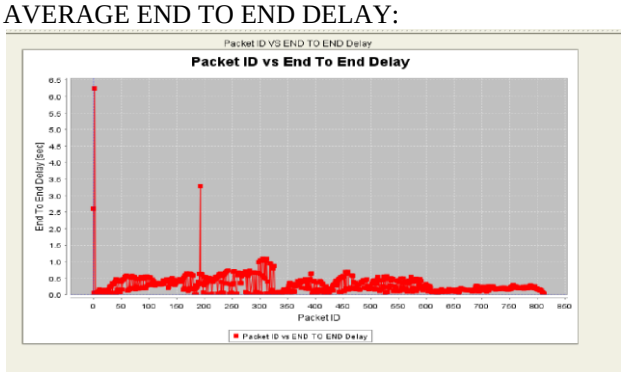

Fig. 11 Avg End-to-end Delay for grid topology

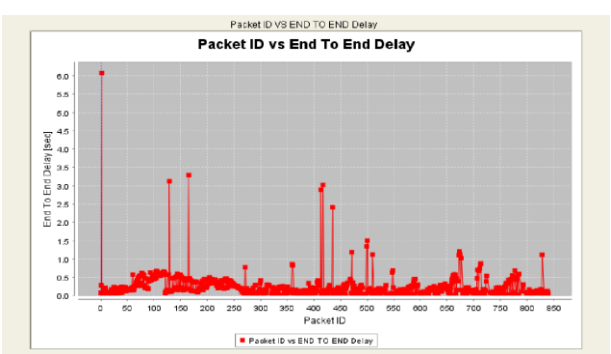

Fig. 12 Avg End-to-end Delay for Horizontal and vertical topology

From the above graphs it is observed that end to end delay for grid topology is less than that of horizontal and vertical topology

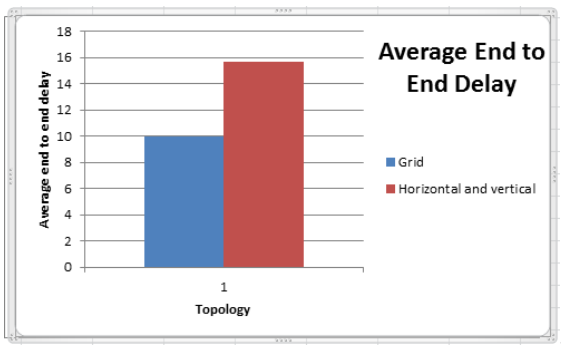

Fig. 13 Comparison of End to End Delay

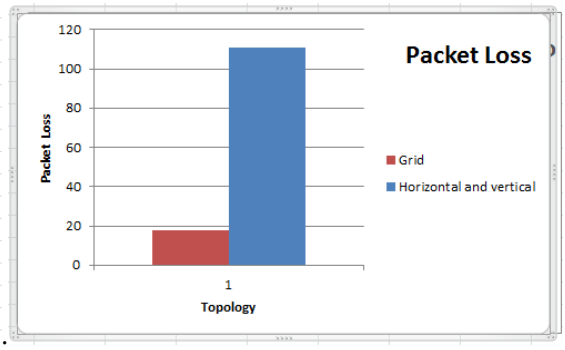

Fig. 14 comparison of packet drop

PACKET DROP:
From 7&8
Packet drop of grid is less than that of horizontal and vertical topology.
Packet drop for grid topology=18
Packet drop for Horizontal and vertical topology =111

VIII. CONCLUSION

From the above simulation results it is clear that AODV protocol works well for Grid topology than Horizontal and vertical topology.
The future scope of our research is comparison of working of topologies for DSDV and DSR routing protocols, keeping the number of nodes in a limit as our requirement is small scale , and in future topologies can also be compared based on the traffic load.
NS2, NSG, JTrana soft ware's made the research easy by giving the approximate results for the analysed codes and files; these can be suggested for future research also.

REFERENCES

[1] *Arun Jain ,Ramesh Bharti*,"Simulation and Performance Analysis of Throughput and Delay on Varying Time and Number of Nodes in MANET ".
[2] *Santosh Kumar, Soni* ,"Performance simulation of MANET protocols with the combination of Horizontal and Vertical topology using NS2".
[3]*Laxmi Shrivastava,Sarita S.Bhaduria and G.S.Tomar*,"Performance Evaluation of Routing Protocols in MANET with different traffic loads".
[4] *V.K.Taksande,K.D.Kulat,"*A Simulation comparison among AODV,DSDV,DSR protocol with IEEE 802.11 MAC for Grid topology in MANET".
[5]*http://www.isi.edu/nsnam/ns/*
[6]*http://ns2analyser.blogspot.in/20 1i/103/jTrana.html*
[7]http://www.ietf.org/rfc/rfc2501.tx t
[8] *Ali Mohamed E. Ejmaa, Shamala Subramaniam, Zuriati Ahmad Zukarnain, Zurina Mohd Hanapi*. "Neighbour-based Dynamic Connectivity Factor Routing Protocol for Mobile Ad Hoc Networks". [9] www.techopedia.com
[10] www.sciencepublication.org
[11] www.sites.google.com
[12]www.docplayer.net