PERFORMANCE ANALYSIS OF MANET PROTOCOLS UNDER THE COMBINATION OF CBR AND FTP TRAFFIC

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Abstract: Mobile ad hoc networks use virtual nodes to transmit data over the network and is very dynamic by nature as it constantly changes its configuration and not controlled by any centralization. Studies on the performance of MANET protocols like AODV, DSDV, DSR to analyse their performances over various scenarios have been conducted. In real situations all types of traffics can also exist together in networks. Hence the objective of this paper is to study the performances of various protocols under the combination of FTP and CBR traffic generators using various scenarios like varying time, varying number of source-destination nodes over grid topology using Network Simulator NS-2.The Metrics taken into account for the Performance Evaluation of the mentioned protocols are Throughput, Average End to End Delay (AEED), Packet Delivery Ratio (PDR) and Packets Dropped.

Index terms - AODV, DSDV, DSR, Performance, CBR, FTP

I. INTRODUCTION

Mobile Ad hoc networks works on the basis of nodal transmission of data without any predefined infrastructure in a wireless scenario. The nodes act as routers for the data to be sent between the devices connected wirelessly. Such networks may also use Internet Connection for this purpose. The nodes here are not limited to any restrictions as they can move through and leave the network as they please. This makes it a tough job to handle the transmission of data. The routing protocols are developed to control and maintain the proper data transmission from source to destination. These protocols are distinctly divided into 2 basic categories namely proactive and reactive. Ad hoc on Demand Distance Vector (AODV), Dynamic Source Routing (DSR) and Temporally Ordered Routing Algorithm (TORA) are some of the most popular Reactive Protocols whereas Destination Sequenced Distance Vector (DSDV) and Optimized Link State Routing (OLSR) are some of the Proactive Protocols. Several studies have been conducted to evaluate and compare the performance of various routing protocols over diverse simulation environment and to explore the length and breadth of the possibilities of effective networking to make it easier and flexible to the real world. A varying Most of the research studies in MANET have been carried out taking into account, CBR as the traffic generator .But in real sense, the network may not have a specific application and a specific type of traffic, but may have a combination of different traffic generators. In this study we use CBR and FTP traffic generators. Both have a very diverse way of transmitting the data. There have been various studies on both .Hence in this, we probe the performance of various protocols like AODV, DSDV and DSR under the combination of Constant Bit Rate (CBR) and File Transfer Protocol (FTP) traffic considering two different scenarios, Varying Simulation Time and Varying Number of Source Destination Nodes (CBR-FTP traffics combined).

II. LITERATURE REVIEW

In this paper the combination of FTP and CBR has been considered. Few research papers which have inspired and motivated us to consider the combination of traffic generators are as follows:

In [1], they investigated the performance of three MANET protocols and have used a scenario of non-specific application traffic and FTP traffic and have concluded that the type of traffic in the network affects the performance of the routing protocols with and without FTP from the results shown by the different performance metrics.

In [2], they have implemented the simulation of wireless sensor network with varying number of nodes using AODV protocol with both FTP and CBR as the traffic sources and observed that the delay increased with increase in number of nodes for small network as nodes get limited number of paths to destination having constant throughput.

In [3], they have simulated the AODV, DSR and WRP protocols and evaluated the performance under CBR and FTP traffic considering PDR as performance metric with pause time as scenario, concluding that in CBR traffic, AODV performs better in terms of PDR, throughput and routing message overhead whereas in FTP traffic, DSR performed better in terms of packet delivery ratio and throughput.

In [4], they have concluded that the AODV and DSR both perform significantly well in case of CBR traffic while DSR did not perform well for FTP traffic. On the whole, AODV relatively gives higher performance in both the cases when compared with DSR and Dymo protocols.

III. ROUTING PROTOCOLS

Routing is an act of moving data from source to destination. The protocols select the appropriate path for the transmission of data in a given Wireless network and keeps track of the activities of the path in an orderly manner.

A. AODV Approach:

Ad Hoc on Demand Distance Vector Routing Protocol also known as AODV belongs to Reactive or On Demand Routing protocol scheme. In this a node doesn't have to initiate the route discovery and maintenance until needed or it is requested to be an intermediate for the transmission. Node doesn't need to update routing protocols unless it is demanded by the network. The nodes are only active when there is a need to transmit data and after that they are discarded. The routes are provided to the source only on demand. The source nod initiates a Route Request (RREQ) when needed to transmit data and broadcasts it to the neighbours. Every neighbour which receives the route request either returns a reply (RREP) of transmitting the data or forwards the RREQ to its neighbours. In case of link failure and error message is generated and sent to the source (RERR) so that source again sends a RREQ. In AODV its bandwidth is mainly utilized during the initial state of transmission, but not throughout the entire transmission. In AODV the sender selects the shortest path offered to transmit data.

B. DSR Approach:

Dynamic Source Routing Protocols is also known as DSR also belongs to Reactive Protocol Scheme. It is similar to AODV in terms of on demand routing but source routing is used instead of routing table every time. It includes route discovery and maintenance on demand. The RREQ contains source and destination addresses and request ID and a record is maintained by the node which caches all the routes known to it in the route form from source to destination. In times of fatal transmissions Route Maintenance is initiated where RERR's are generated. It eliminates the periodic table updates thereby restricting the consumption of bandwidth by control packets in an Ad hoc Network.

C. DSDV Approach:

Destination Sequenced Distance Vector Routing Protocol also known as DSDV belongs to Proactive or Table Driven Routing Protocol Scheme. Its main contribution is to solve the Loop Problems. In DSDV each and every node maintains a routing table. The table contains all the routes and their requirements through that node. It periodically updates the routing table and sends it to all the neighbours to maintain topology. Each node sends to and responds to Route control messages in the same format. Since all the paths from source to destination nodes are predefined, it results in more utilization of more memory.

IV. PERFORMANCE METRICS

Various performance metrics are to be scrutinized in MANET to conclude the performance of different protocols under varying scenarios. In this study we consider the major performance metrics like Throughput, Average End to End Delay, Packet Delivery Ratio and Packet Loss to analyse and compare the routing protocols and conclude which one works best in the given scenario.

i) Throughput: Throughput is a measure of the maximum rate at which data packets can be sent over

a network. It measures the number of packets which can be sent over a network in a unit time. A network with high throughput is advantageous.

ii) Packet Delivery Ratio: The ratio of the number of received packets to the number of generated packets. A network is said to be better performed if it attains a high PDR.

iii) Average End to End Delay: The average time taken by data packets to transmit from source to destination including the total time. It is desirable to have a network with least AEED.

iv) Packet Loss: It is the difference between the number of packets sent by the source and number of packets received at the destination.

V. SIMULATION ENVIRONMENT

In this paper, the operating system used as a support for simulation is Linux (Ubuntu 17.04) as the network simulator (NS2.35) requires an operating system that offers both Graphical User Interface (GUI) and Command Line Interface (CLI).

NS2.35 [8] which is a network simulator is used for the networking research and provides good support for simulation of both wired and wireless networks with TCP, routing and multicast protocols.

NSG which is NS2 Scenarios Generator is also used in this paper as a tool which generates TCL scripts for both wired and wireless networks. It connects the nodes in the network using agents like TCP and UDP and creates applications such as CBR and FTP.

Jtrana is a software tool used in this paper to analyse the trace files generated by the NS2 [8] and gives information related to packet delivery ratio, average end to end delay, throughput, packet drop etc.,

Simulation scenario: In this paper, grid topology is used as the network model with 16 nodes as shown in Fig 1. The nodes in the network are connected by using TCP and both CBR and FTP are used as a combination of traffic generators. The three routing protocols AODV, DSDV, DSR have been considered for performance analysis with varying simulation time and varying source – destination pairs are shown in Table 01

TABLE 01

Time (in ms)	CBR (no. of nodes)	FTP (no. of nodes)
30	1	1
35	2	1
40	2	3
45	3	2

The parameters used in our simulation are shown in the Table 02

TABLE 02

Network Simulator	NS2.35
Protocols	AODV, DSDV, DSR
Network Model	Grid topology
No. of nodes	16
Traffic type	CBR, FTP
Propagation Model	Two ray ground
Max. packet in queue	30
MAC protocol type	IEEE 802.11
Packet size	1000 bytes
Time Interval	0.005 seconds

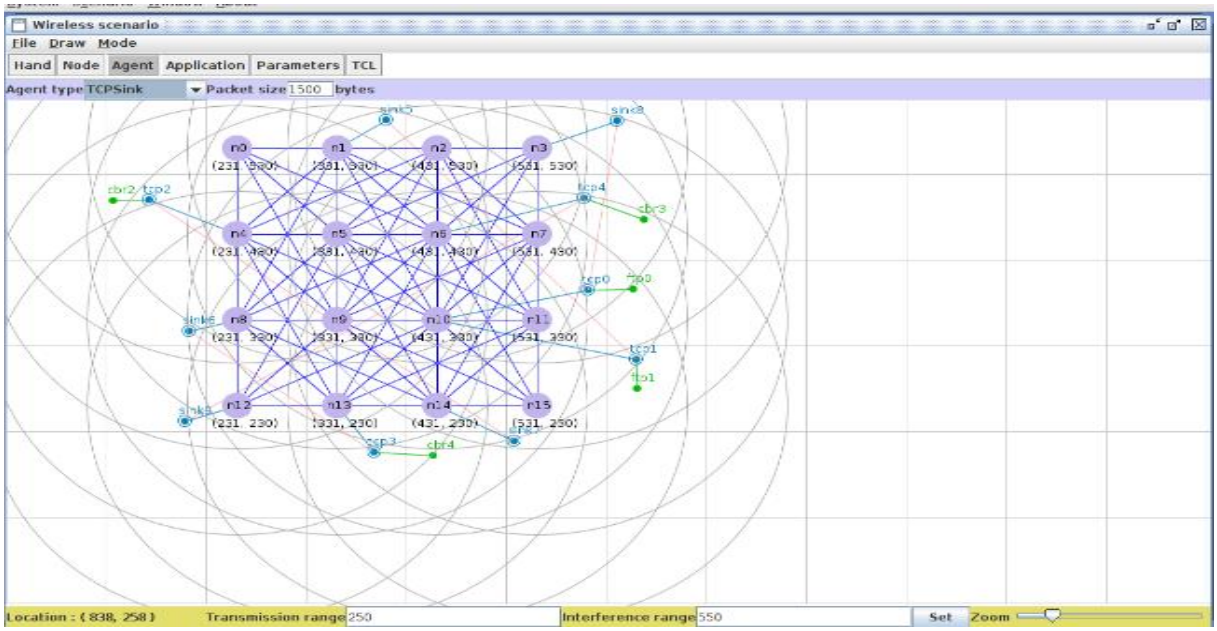

Fig 01 Grid Topology

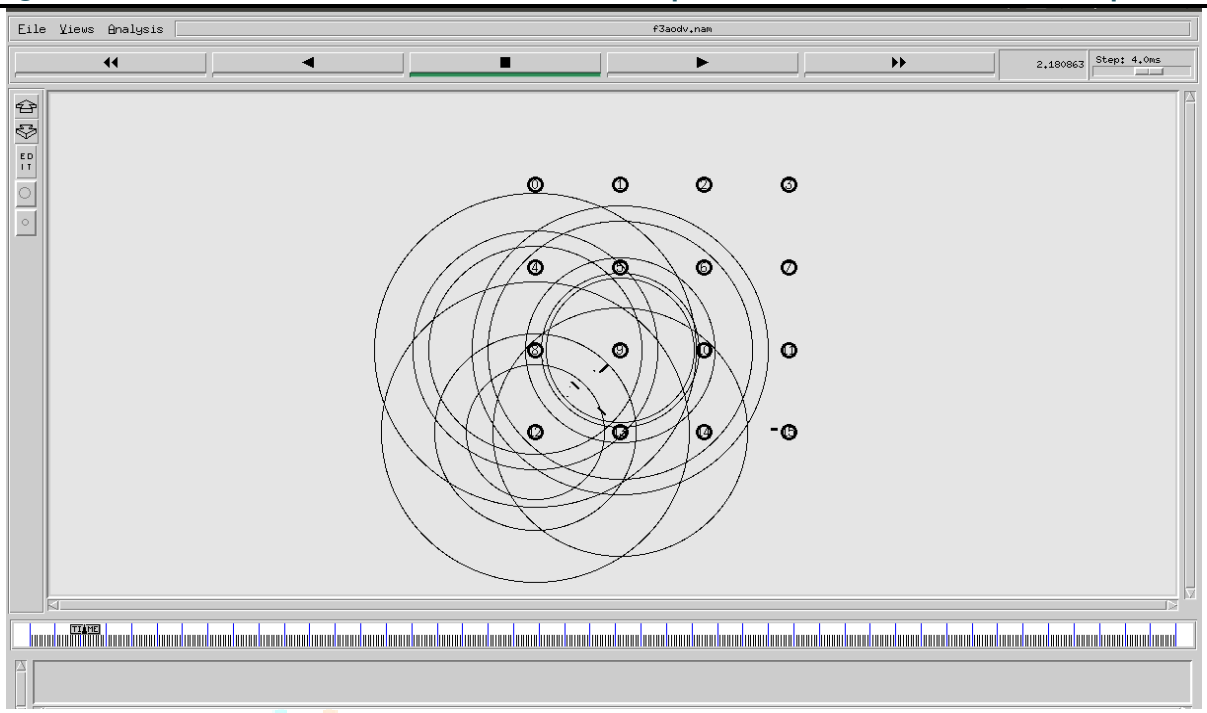

Fig. 02 Simulation using NS2

VI. SIMULATION RESULTS:

The Simulation results are the output of the different performance metrics applied to routing protocols. The results shown below are the performance evaluation of the protocols under the two scenarios Varying Simulation Time and Varying Number of Source Destination Pairs.

1. The Fig-03 represents the Throughput of the routing protocols we have analysed. It shows that AODV protocol attained the highest Throughput.
2. The average end to end delay of the routing protocols are analysed and shows that AODV has the least value.
3. The Fig-05 represents the Packet Delivery Ratio of the Routing protocols. It shows that DSR has higher PDR. The other protocols following with less difference.
4. The Fig-06 represents the Packet Loss of the routing protocols we analysed. It shows that DSDV has least number of packets lost.
5. The Fig-07 represent the overall performance of the routing protocols over different metrics. It shows that AODV performs better in the given environment.

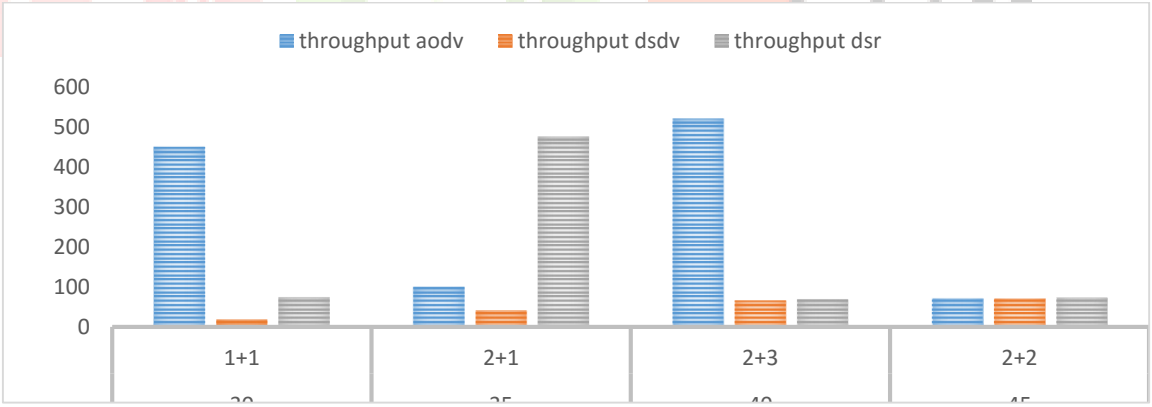

Fig. 03 Throughput Vs Varying CBR-FTP pairs over Varying Time

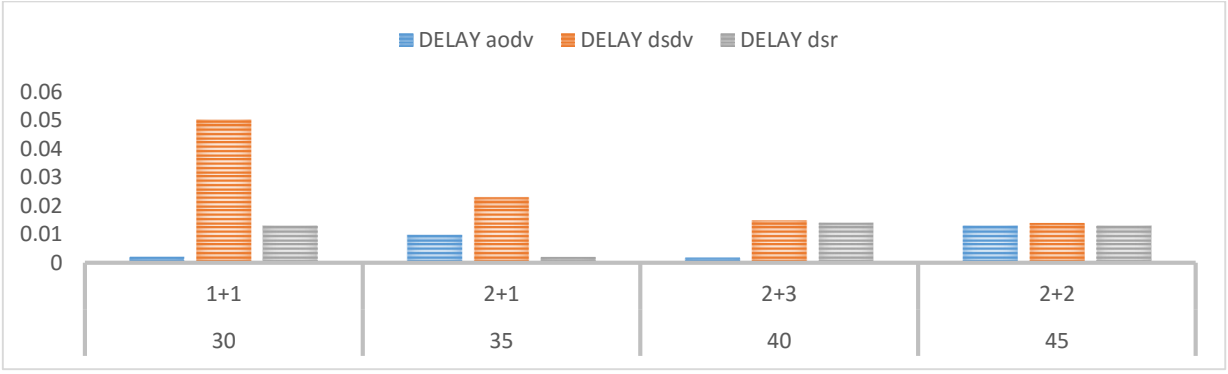

Fig. 04 Delay Vs Varying CBR-FTP pairs over Varying Time

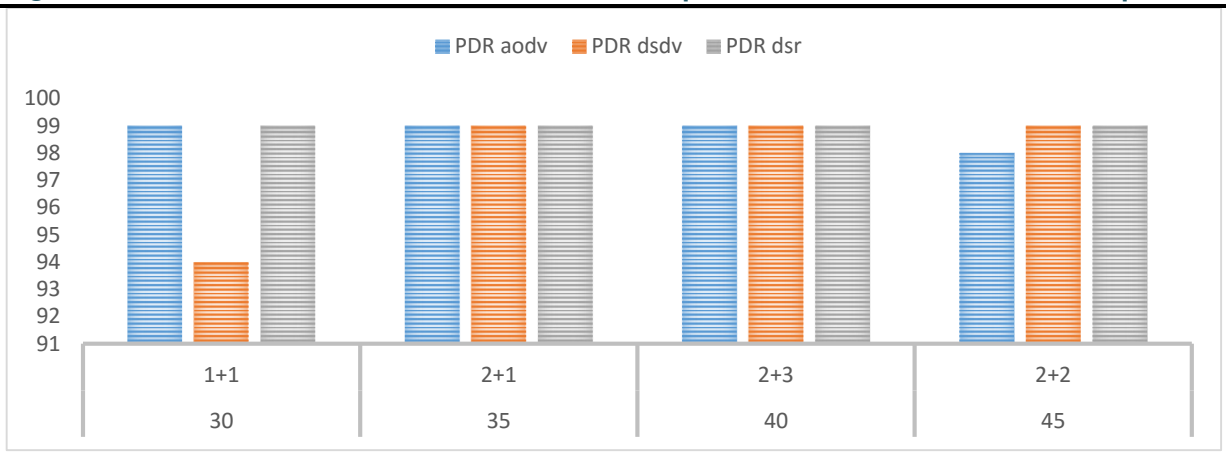

Fig. 05 PDR Vs Varying CBR-FTP pairs over Varying Time

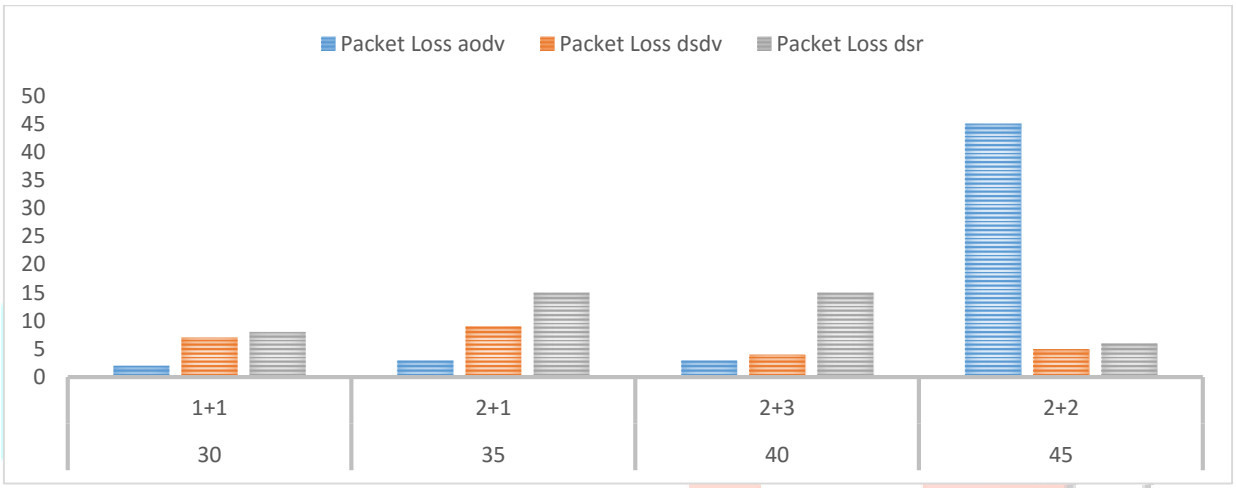

Fig. 06 Packet Loss Vs Varying CBR-FTP over Varying Time

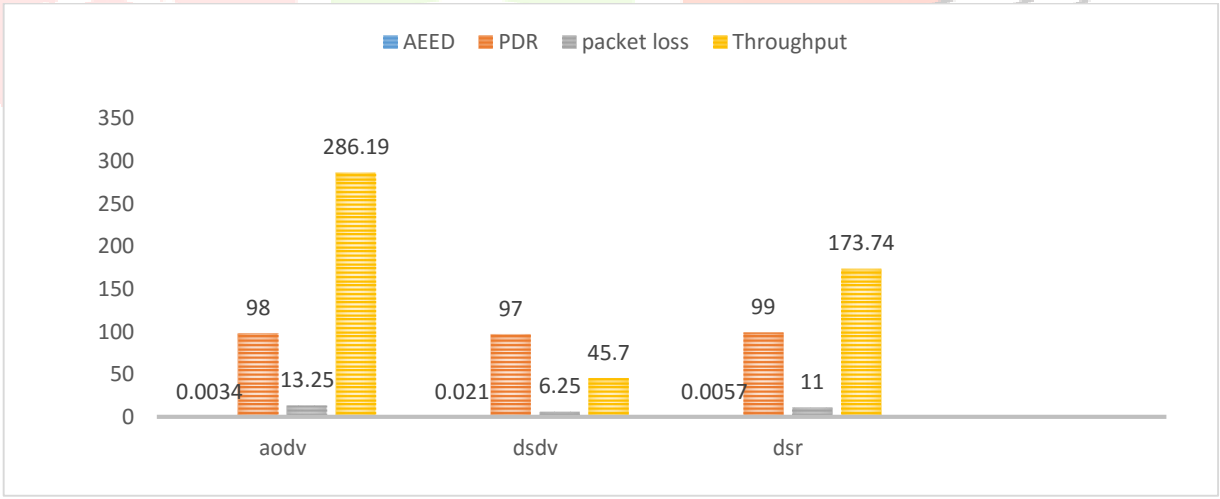

Fig. 07 Performance Analysis of Protocols

VII. CONCLUSION

Grid topology with fixed nodes are taken and the behaviour of standard protocols over the varying Time and No. of source Destination pairs with a combination of CBR and FTP is studied. The simulation results indicate that none of the protocols gave best in all the metrics. DSR works best when it comes to PDR. DSDV performs best in the case of packet loss. AODV performs best when it comes to Average End to End Delay and Throughput. Here we observed that when the number of FTP sources are more, AODV performed best in case of throughput, packet loss and Delay comparatively making it more reliable. In future, advancement can be made in the research by also varying the number of nodes and using mobility of nodes over various other topologies and study the performance of the protocols.

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