Simulation Comparison of AODV and DSDV using TCP and UDP Traffic Patterns

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Abstract
This research paper presents a comprehensive simulation study of Adhoc on Demand Distance Vector Routing Protocol (AODV) and Destination Sequenced Distance Vector Routing Protocol (DSDV) using different mobile traffic patterns (TCP and UDP) for Mobile Ad hoc networks. The performance of above mentioned routing protocols are analysed using various metrics like packet loss, end to end delay and bandwidth using Network Simulator (NS-2).

Keywords
AODV, DSDV, DELAY, TCP, UDP

I. Introduction

An ad hoc network is a collection of wireless mobile nodes dynamically forming temporary network, in which no fixed or centralized backbone infrastructure. There are no dedicated routers, servers, access points, base stations and cables. If two mobile nodes are within each other's transmission range, they can communicate with each other directly. Otherwise, the nodes in between have to forward the packets for them from source node to destination node. Each node in ad hoc network is willing to forward data for other nodes, and the determination of which nodes forward data is made dynamically based on the network connectivity. Mobile ad hoc networking can offer multiple advantages in various environments through its flexibility and its special nature. Furthermore, ad-hoc networks have the potential to serve as a ubiquitous wireless infrastructure capable of interconnecting many thousands of devices with a wide range of capabilities and uses. In order to achieve this status, however, ad-hoc networks must evolve to support large numbers of heterogeneous systems with a wide range of application requirements. Ad-hoc networks are the key factor in the evaluation of wireless communication envisioned as corner stones of future generation wireless networking.

II. Related Work

In this section, we have studied a number of articles that make comparison in terms of performance between the common encryption algorithms like AODV and DSDV.

Adel.S.El ashheb (2012) study reveals that in this paper two protocols AODV and DSDV have been simulated using NS-2 simulator and compared in terms of packet delivery fraction, end to end delay and throughput in different environment; varying period of pause time and the number of expired nodes. Simulation results show that AODV routing protocol has better performance in terms of packet delivery fraction and throughput but, AODV suffers from delay.

Saurabh Mittal et al. (2012) paper presents the performance comparison of four routing protocols namely AODV, DSDV, DSR and TORA in Mobile Ad-hoc Networks using the effect of speed, number of packets transmitted, lost, bytes, bitrate and packet delay. Results show that TORA and DSR perform the better as compared to AODV and DSDV routing protocols.

Neetu et al. (2012) paper discussed the performance of DSDV and AODV routing protocols measured using the different performance metrics such as Packet Delivery Fraction, Average End to End delay and Routing Overhead under two different scenarios, with changing pause time and changing number of nodes. It was observed that the performance of AODV routing protocols is much superior as compare to the DSDV routing protocol.

Sachin Kumar Gupta et al. (2012) paper simulated and analyzed DSDV and AODV routing protocol using different parameter of QoS metrics like Throughput, Jitter and Delay. Simulation results show the performance of TCP and UDP packets with respect to the average end to end delay, throughput, and jitter. Finally, it is concluded that the performance of AODV is better than DSDV routing protocol for real time applications.

Parulpreet Singh et al. (2012) paper carried out performance study AODV, OLSR and DSR ad hoc routing protocols using OPNET simulator. The performance of these routing protocols is evaluated with respect to throughput and end-to-end delay. From this paper, it can be concluded that the delay by using DSR protocol is highest and by OLSR is lowest. In the case of throughput, the throughput of OLSR is least but the AODV has comparative good throughput as shown in the table. In case of HTTP traffic the delay and throughput both are less as compare with FTP traffic.

III. Metrics for Performance Comparison

MANET has number of qualitative and quantitative metrics that can be used to compare ad hoc routing protocols. This paper has been considered the following metrics to evaluate the performance of ad hoc network routing protocols.

A. Bandwidth

The bandwidth metric could be defined as the bandwidth available on a link from a source to a destination. The bandwidth could frequently change with the mobility of the network. Simply it is calculated by adding up size of sent, received and sensed packets over a fix period of time [14].

B. Packet Loss

It occurs when one or more packets traveling across a network fail to reach their destination. Packet loss can be caused by a number of factors, including signal degradation over the network, oversaturated and highly congested network links, corrupted and faulty packets rejected, faulty networking hardware [15].

C. End to End Delay

It is the time taken for an entire message to completely arrive at the destination from the source. Evaluation of end-to-end delay mostly depends on the following components i.e. Propagation Time (PT), Transmission Time (TT), Queuing Time (QT) and Processing Delay (PD) [15].

IV. Simulation Set-up

The performance experiment work was carried out using network simulator NS-2 running on windows-7 operating system Home Premium. The simulation experiment uses a random way point model with CBR and TCP traffic patterns. The table 1 below shows the summary of the traffic and mobility model.

Table 1: Network Parameters

Protocols	AODV & DSDV
Simulator	NS-2
Nodes	150
Simulation Area	1000m * 1000m
Packet Size	1 kb
Traffic Patterns	TCP & UDP
Traffic Rate	25 pkt/sec
Pause Time	100 sec
Simulation Time	200 sec
Transmission Range	250 m
Node Speed	25 m/sec
Send Rate	256 bps

V. Results and Observations

The objective of this research paper is to analyze, simulate and to do a comparative analysis of MANET routing protocols namely AODV and DSDV protocols under TCP traffic and UDP traffic patterns. The comparison has been done by using simulation tool NS2 Simulator for the evaluation of different protocols based on Bandwidth, Packet Loss and End to End Delay.

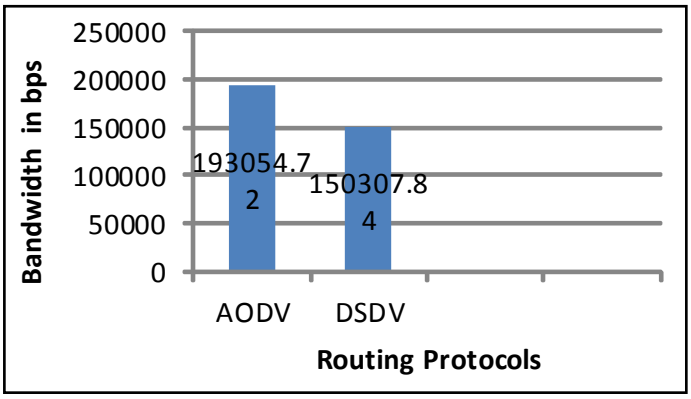

Fig. 1: Bandwidth of AODV & DSDV for UDP Data

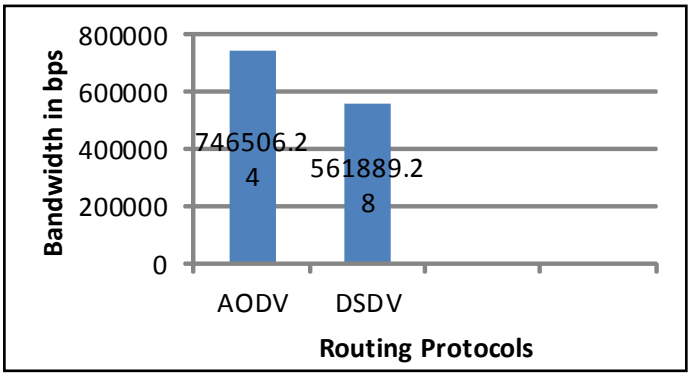

Fig. 2: Bandwidth of AODV & DSDV for TCP Data

In this section, the results of AODV and DSDV routing protocols for Bandwidth (in bps) has been given in the following figure 1 and fig. 2. It shows that AODV has more available Bandwidth as compared to DSDV for TCP as well as UDP traffic patterns.

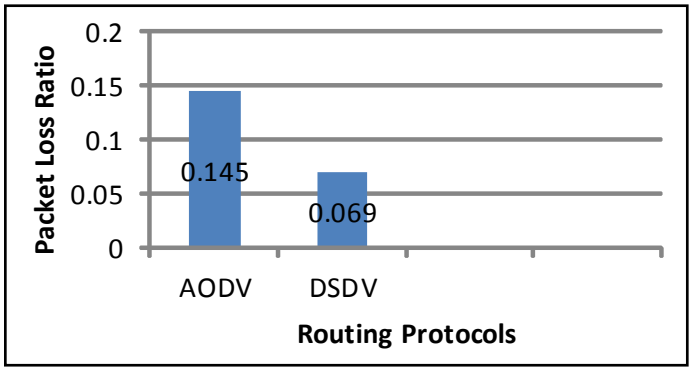

Fig. 3: Packet Loss Ratio of AODV & DSDV for UDP data

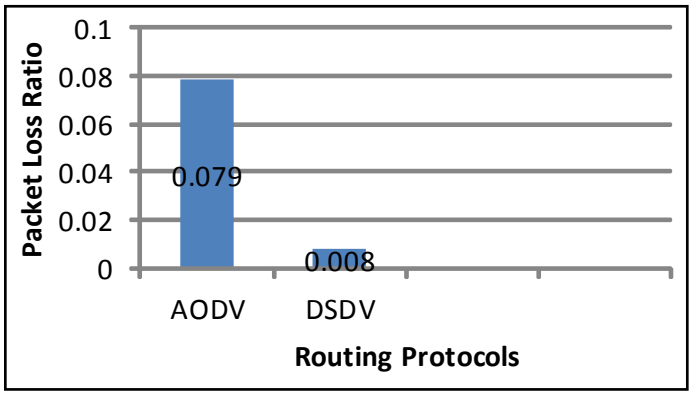

Fig. 4: Packet Loss Ratio of AODV & DSDV for TCP Data

In this section, the results of AODV and DSDV routing protocols for Packet Loss Ratio has been given in the following fig. 3 and fig. 4. It shows that AODV has more value of Packet Loss Ratio as compared to DSDV for TCP as well as UDP traffic patterns.

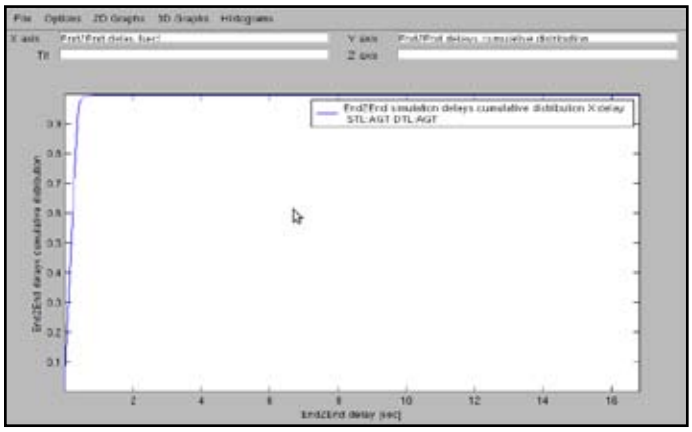

Fig. 5: Cumulative distribution of AODV for TCP data

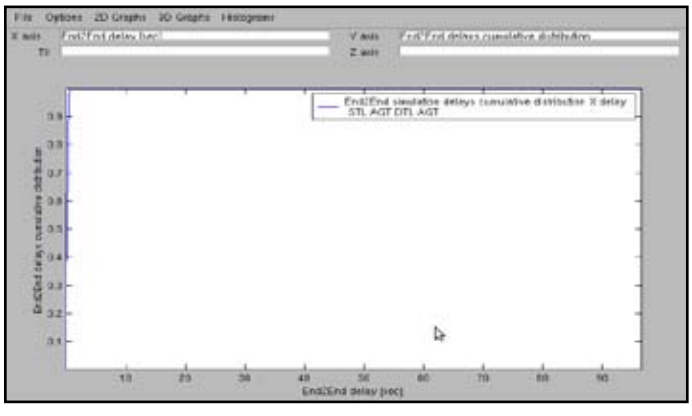

Fig. 6: Cumulative Distribution of DSDV for TCP Data

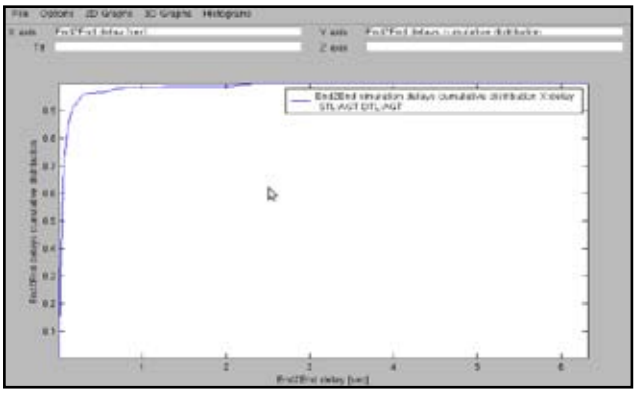

Fig. 7: Cumulative Distribution of AODV for UDP Data

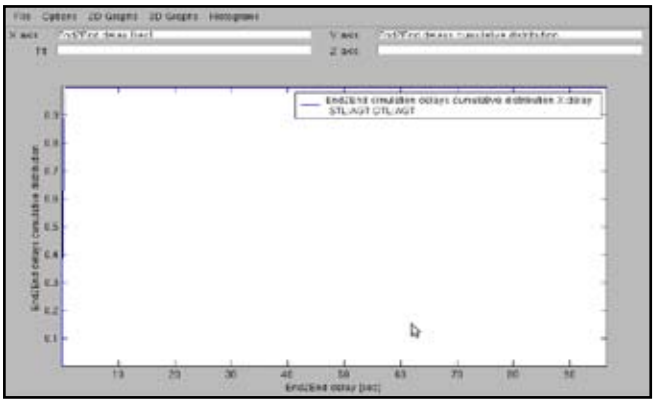

Fig. 8: Cumulative Distribution of DSDV for UDP Data

The above graph shows the End to End delays cumulative distribution of AODV and DSDV for TCP & UDP traffic patterns. Cumulative distribution of AODV and DSDV for TCP & UDP traffic patterns is almost same. With the increase in delay time, the cumulative distribution of AODV and DSDV for TCP as well as UDP traffic patterns increases and after that becomes constant to its maximum value.

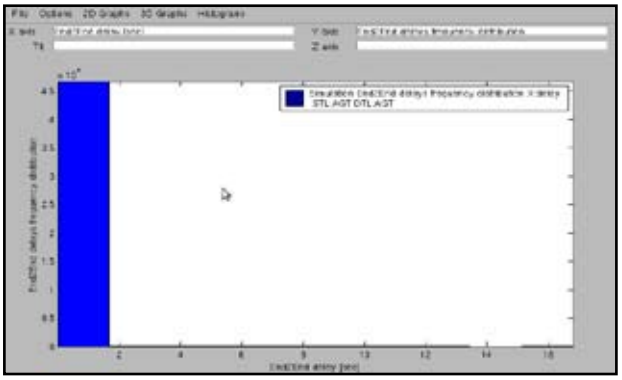

Fig. 9: Frequency Distribution of AODV for TCP Data

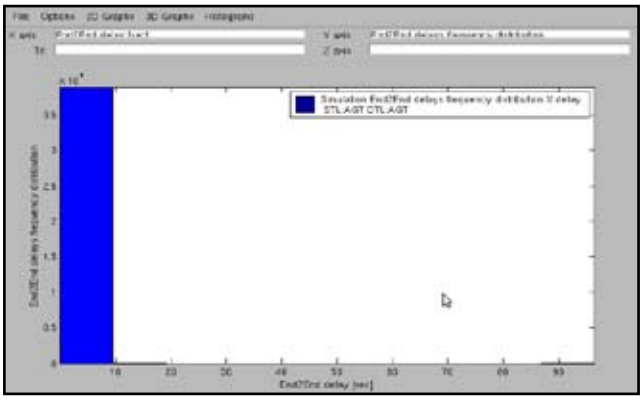

Fig. 10: Frequency Distribution of DSDV for TCP Data

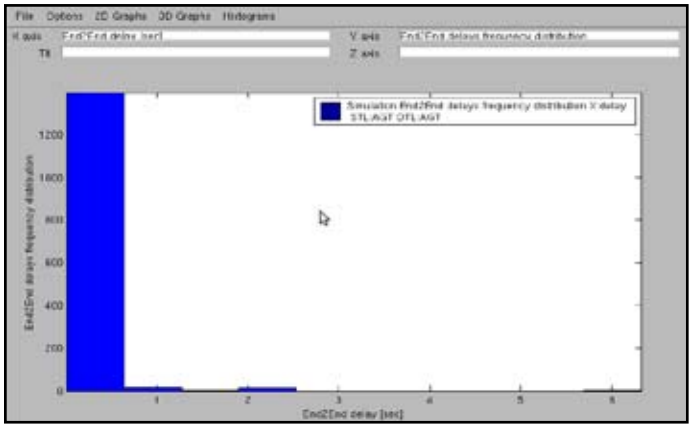

Fig. 11: Frequency Distribution of AODV for UDP Data

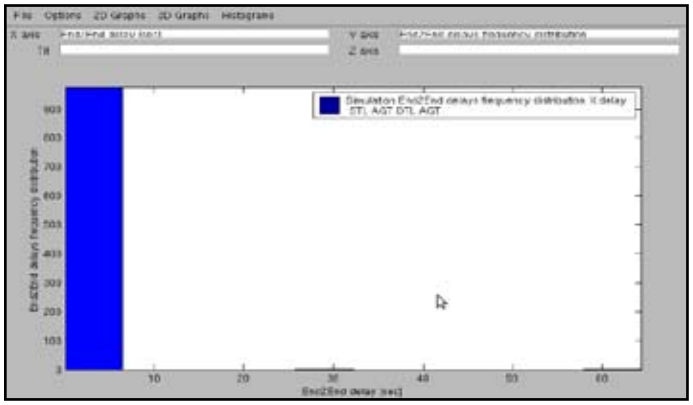

Fig. 12: Frequency Distribution of DSDV for UDP Data

The above graph shows the End to End delays frequency distribution of AODV and DSDV for TCP & UDP traffic patterns. Frequency distribution of AODV and DSDV for TCP & UDP traffic patterns is almost same. End to End delays frequency distribution of AODV and DSDV for TCP has more value than UDP traffic pattern. The frequency distribution is at peak at starting but till goes to minimum value as end to end delay time increases in all above scenario expect the case of AODV for UDP traffic type. In case of AODV for UDP data frequency distribution has more value than other cases after its maximum value.

VI. Conclusion & Future Scope

In this research paper, the performance of AODV and DSDV was analyzed under two different environments i.e. TCP and UDP using NS-2 simulator. We have done comprehensive simulation results of Packet Loss Ratio, End To End delay and Bandwidth over the routing protocols AODV and DSDV for different traffic patterns (TCP AND UDP). The concluded facts are quoted below: Packet Loss Ratio and Bandwidth of AODV is more than DSDV for TCP and UDP traffic patterns. In case of End To End delays frequency distribution of AODV and DSDV for TCP has more value than UDP traffic pattern. For future this work can be extended for more number of nodes and also using other protocols.

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