Performance Evaluation of Proactive and Reactive routing Protocol in MANET at Distinct Hardware Platform using NS2

Krishna Das, Mohammad Irfan Khan, Dr. Rakesh Rathi

Abstract: - With the evolution of modern technology, wireless network has change the style of communication. It has become the most convenient way for common people to communicate. Mobile Ad-hoc Network (MANET) is considered as a subset of wireless network that does not contain the centralized administration. Mobile Ad-hoc Network (MANET) is a collection of randomly distributed node and communicates with each other using radio waves without any defined infrastructure. Many researchers have proposed several efficient routing protocols for MANET with defined software specification. This paper analyses the performance of Proactive (DSDV) routing protocol and Reactive (AODV) routing protocol on different hardware specification. We evaluate the performance of AODV and DSDV routing protocol with different processor, i.e. core 2duo and core i3 by using random way point mobility model on NS-2. We examine the performance of these protocols on different processors in terms of Packet Delivery Ratio (PDR) and end-to-end delay.

Index Terms— AODV, core 2duo, core i3, DSDV, MANET, Random Way Point Mobility Model.

1 INTRODUCTION

Mobile Ad-hoc Network is an independent network that is built with the collection of scattered mobile nodes that can communicate with each other within a limited transmission range. Every node in MANET is owner of its own, so the motions of the mobile nodes in MANET are unpredictable by nature. In MANET nodes do not use the predefined infrastructure to communicate with each other. Due to this reason MANET are appropriate for real time situation like medical situation, natural disaster, military conflicts, industrial networking etc. [1]. A node can directly forward the packet to other node that is in the transmission radius of that node, if the node is not in the transmission radius than the packet is forwarded with the help of intermediate nodes. So, in MANET node can perform the role of both router and destination.

Till now many researcher analyse the performance of routing protocol and simulate these protocols on specific software but hardware also plays a critical role that affects the performance of routing protocols.

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2 RELATED WORKS

Have analyzed and studied the performance of AODV on different Random based mobility model with respect to packet delivery ratio and throughput by changing parameter like number of nodes and speed is inaugurate in [1]. Simulate the effect of routing protocols in MANET by using Random way point mobility model is set up in [2, 3]. Study and analysed the performance of DSDV with respect to end to end delay, packet delivery ratio and the throughputs of the mobile nodes is found in [4]. Comparative review the performance of AODV routing protocol by using Random way point mobility model in terms of packet delivery ratio, end to end delay with fixed number of nodes in [5,10].

3 OVERVIEW OF ROUTING PROTOCOLS

MANET routing protocol is categorize into three types, depending on the behaviour how they are used in the environment. Routing protocol in MANET is used for transmitting the data from source to destination with the help of intermediate hops. Routing protocols are proactive (table-driven), reactive (on-demand) and hybrid routing protocols. But in this paper we will only discuss about two routing protocols.

3.1 Proactive (table-driven) Routing Protocol

The main function of Proactive routing protocol is to give better structure of entire network topology. Proactive routing protocol can also be known as table-driven routing protocol. Nodes in the MANET can move freely anywhere without any restriction. This leads to the

unpredictable behaviour of the nodes. Proactive routing protocol needs to update the table frequently. So that the formation of loop can be avoided and new entries can be updated. This protocol is always best for small topology because life period of these nodes are very short.

3.2 Reactive (On-Demand) Routing Protocol

Reactive routing protocol differs from Proactive routing protocol in a way that, in reactive routing protocol routes are called when it is needed. Here routes are not predefined. Thus in reactive routing protocol, it is not necessary to update the table frequently. In reactive routing protocol, when source want to send packet to the destination then it waits until the route to the destination is discovered, once the route is found it sends the packet. The major issue in reactive routing protocol is that it takes more time in finding the routes towards destination.

3.2.1 Destination Sequence Distance Vector (DSDV)

This protocol relies on Bellman-Ford algorithm. Each node keeps the record of all intermediate hops to reach the destination. A sequence number is associated with each entry. It utilizes full dump and incremental update to mitigate the traffic created by route updates. A routing table created by each node keeps the record of all credible destinations and the number of intermediate nodes to them. All the entries in the routing table may be updated periodically so the advertisements might be made quite often [7, 9].

3.2.2 Ad-hoc On-Demand Distance Vector Routing Protocol (AODV)

AODV enhance the execution of DSDV in the sense of mitigating the broadcast request and generate the route only when required and it does not keep the record of entire routes. The AODV routing protocol empower self-made, multi-hop routing between nodes that take part in maintaining the ad hoc network [8, 11, 12].

4. Overview of Random Way point Mobility Model

The random way point mobility model is the most in-practice mobility model that is construct to device the motion pattern of mobile users and validate the position, location and speed variation over time. A mobile node starts its journey by staying in one location for specific pause time. Once that pause time is over, the mobile node picks a random destination and start travelling with random velocity that is uniformly distributed between [0, speedMax]. When mobile node reaches the selected destination, it waits for some time i.e. pause time and begin the same procedure again [6, 13].

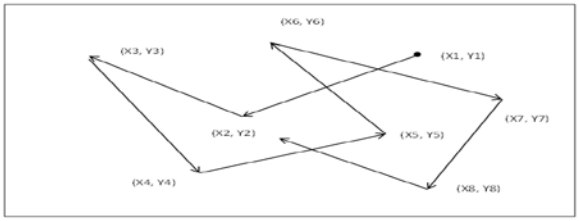

Figure 1: Random Way Point Mobility Model

5 Simulation Environment and Performance Metrics

In this section, we analyse the performance of proactive and reactive routing protocol with random way point mobility model by varying the number of nodes, pause time and number of connection on different processor i.e. core 2duo, core i3. All the simulation has been carried out on the network simulator (NS-2.35) which worked on Ubuntu 12.04 LTS. AWK script is used to examine the generated traces during simulation.

TABLE 1: SIMULATION PARAMETER

Parameter	*Values*
Channel Type	*Channel/Wireless Channel*
Simulator	*NS2.35*
Protocol	*DSDV, AODV*
Simulation	*500m*
Number of Nodes	*50,100,150,200,250,300,350,400*
Transmission Range	*250m*
Mobility Model	*Random way point mobility model*
Processors	*Intel Core2duo and Intel Corei3*
MAC Protocol	*MAC/802.11*
Pause Time(s)	*0,1,2*
Maximum speed	*20 m/s*
Minimum speed	*0.5m/s*
Packet Rate	*4 Packet/s*
Traffic Type	*CBR*
Data Payload	*512 bytes/packet*
Queue length	*100*
Antenna Type	*Omnidirectional*
CBR connection	*5, 10, 15*
Simulation Range	*1500m × 1500m*

5.1 Performance Metrics

The performance of routing protocols is evaluated in terms of following three metrics.

- Packet Delivery Ratio (PDR): PDR can be defined as the number of packets received by the destination divided by the total number of packets generated by source.
- End-to-End Delay: End-to-End delay can be defined as the average amount of time required by a packet to travel from source to destination. This metric is caused by route discovery, propagation and retransmission delays.

6 Result & Discussion

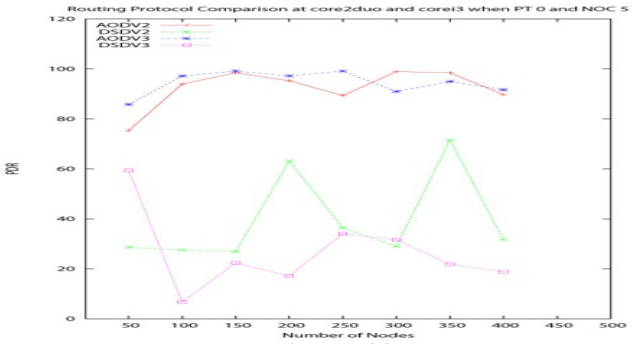

Figure: 2 (a)

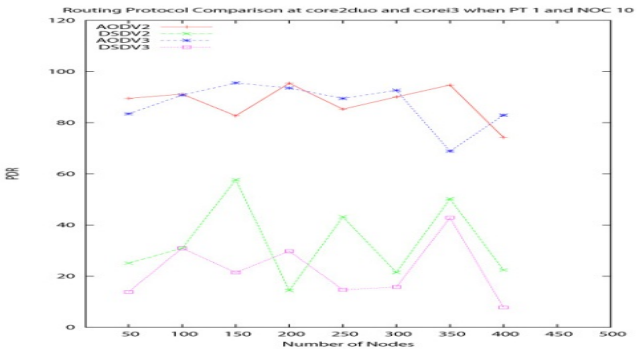

Figure: 2 (b)

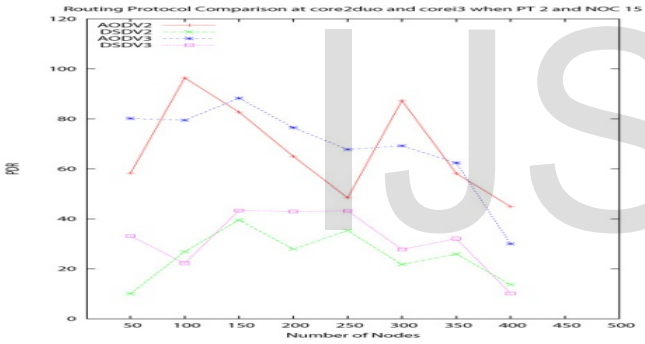

Figure: 2 (c)

Figure 2 shows the performance of AODV and DSDV routing protocol with respect to Packet Delivery Ratio on two distinct hardware platforms i.e. core 2duo and core i3 processors. All the three images (a), (b) and (c) of figure 2 present the graph plot between Packet Delivery ratio and number of nodes by using core 2duo and core i3 processors. In all the three parts of figure 2, red and green line represents the AODV and DSDV protocols on core 2duo processor and named as AODV2 and DSDV2, while blue and pink line represent the AODV and DSDV protocol on core i3 processor and named as AODV3 and DSDV3. In figure 2 (a), the simulation result of AODV protocol shows that the Packet Delivery Ratio is increases with increasing number of nodes on core i3 processor by considering pause time 0 and number of connection is 5. While DSDV performance degrades drastically by considering the same parameter on core i3 processor. But the performance of DSDV is good on core 2duo as compared to core i3 processor. AODV shows the better PDR characteristics than DSDV. Figure 2(b) approximately shows the same results as shown in figure 2 (a) here we consider the same number of nodes but varying the pause time and number of connection as 1 and 10. AODV shows the better PDR result than DSDV. In figure 2 (c), the simulation result indicate that the performance of AODV routing protocol is good for small networks on core i3 processor in terms of PDR by considering pause time 2 and number of connection 15. And for larger network the PDR is good on core 2duo processor. While the performance of DSDV is good for small network on core i3 processor in terms of PDR and for larger network the performance is dropped on core i3 but good on core 2duo. Overall the performance of AODV is found to be excellent in terms of PDR.

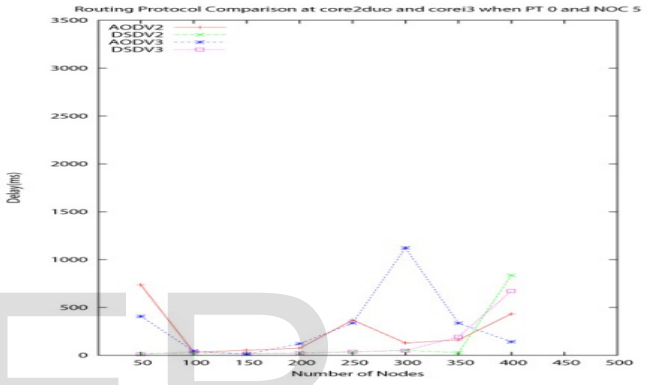

Figure: 3(a)

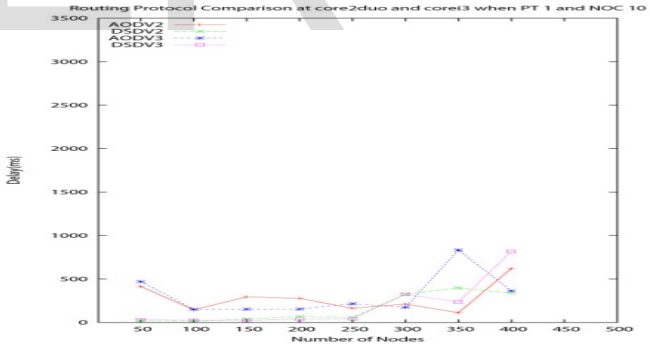

Figure: 3 (b)

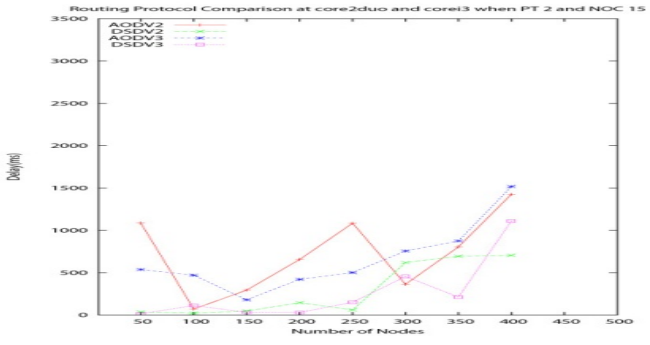

Figure: 3(c)

Figure 3 (a), (b) and (c) shows the graph plot between delay and number of nodes. The red and green line

shows the performance of AODV and DSDV protocol on core 2duo processor. While blue and pink line shows the performance of AODV and DSDV protocol on core i3 processor. All the simulation is done by varying pause time, number of connection and number of nodes. The end-to-end delay in AODV and DSDV is increases with increasing number of nodes, pause time and number of connection on core 2duo processor. While end-to end delay in AODV and DSDV shows the good performance on core i3 processor by considering the above mentioned parameter. In simple words the DSDV has better delay performance for small network as compared to AODV on core 2duo processor. For larger network, the performance of DSDV is satisfactory on core i3 processor. Overall AODV has higher delay as compared to DSDV on both core 2duo and core i3 processors.

7 CONCLUSIONS

In this work, we evaluate the performance of proactive and reactive routing protocols using Random Way Point Mobility Model on two distinct Platform i.e. core 2duo and core i3 processors in terms of packet delivery ratio and end-to-end delay. After simulation, we analyzed that the AODV has better PDR than DSDV on core i3 processor by varying pause time, number of connection and number of nodes. And, average end-to-end delay is less in DSDV for smaller network on core i3 processor, while in larger network DSDV shows less delay as compared to AODV on core 2duo processor. By keeping the view of all the result, we analyzed that the performance of AODV and DSDV routing protocol is also rely on hardware configuration. Our future work incorporates the performance evaluation of proactive and reactive routing protocol on different mobility model on distinct hardware with compatible software.

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