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Comparison and Analysing the Performance of AODV and DSR Protocol in MANET in TCP and UDP Environment

Neelpawan Kalita[1], Utpal Barman[2]

M.Tech Scholar, Girijananda Chowdhury Institute of Management and Technology, Guwahati, India[1]

Asst. Professor, Girijananda Chowdhury Institute of Management and Technology, Guwahati, India[2]

Abstract: Mobile Ad-hoc system framework (MANET) is a self decision plan of flexible centers related by remote associations. Each center point acts as an end system and in addition a change to forward packs. The centers are permitted to move about and create themselves into a framework. These center points change position a significant part of the time. The essential classes of routing protocol are Proactive, Reactive and Hybrid. A Reactive (on-interest) routing strategy is a predominant coordinating grouping for remote uncommonly selected directing. It is a decently new directing rationale that gives a versatile response for the most part broad framework topologies [1]. The framework takes after the prospect that each center tries to decrease sending in order to guide overhead coordinating packs at whatever point a correspondence is inquired. In this paper an endeavour has been made to analyze the execution of two conspicuous on demand responsive routing protocol for MANETs: Ad hoc On Demand Distance Vector (AODV) and Dynamic source routing protocol (DSR). Here we are analysing and comparing AODV and DSR protocol in TCP and UDP environment by varying number of nodes. we will analyse the Throughput, End-To-End Delay and Packet delivery ratio. We will analyse the result for both the protocols and compare them which protocol best suit in which environment.

Keywords: MANET, NS-2 Simulation tool, Routing, AODV, DSR, TCP, UDP.

1. INTRODUCTION

Remote cell frameworks have been being used since 1980s. We have seen their developments to first, second and third era's remote frameworks. These frameworks work with the backing of a concentrated supporting structure, for example, an entrance point. The remote clients can be associated with the remote framework by the assistance of these entrance focuses, when they wander from one spot to the next. The versatility of remote frameworks is constrained by the nearness of a settled supporting coordinate. It implies that the innovation can not work effectively in that spots where there is no changeless framework. Simple and quick organization of remote systems will be normal by the future era remote frameworks. This quick system arrangement is impractical with the current structure of present remote frameworks. Late progressions, for example, Bluetooth presented a crisp sort of remote frameworks which is habitually known as portable specially appointed systems. Mobile Ad-hoc systems or "short live" systems control in the nonexistence of changeless foundation. Mobile Ad-hoc system offers fast and flat system arrangement in conditions where it is definitely not conceivable something else. Ad-hoc is a Latin word, which signifies "for this or for this as it were." Portable specially appointed system is a self-ruling arrangement of versatile hubs associated by remote joins; every hub works as an end framework and a switch for every single other hub in the system. A remote system is a developing new innovation that will permit clients to get to administrations also, data electronically, independent of their geographic position. Remote systems can be ordered in two sorts: - infrastructure system and foundation less (specially appointed) systems. Infrastructure system comprises of a system with settled and wired passages. A portable host collaborates with a scaffold in the system (called base station) inside its correspondence range. The portable unit can move topographically while it is imparting. When it leaves scope of one base station, it associates with new base station and begins conveying through it. This is called handoff. In this approach we are implementing in TCP and UDP environment.

2. ROUTING

Routing is the demonstration of moving data from a source to a destination in an internetwork. No less than one middle hub inside the internetwork is experienced amid the exchange of data. Essentially two exercises are included in this idea: deciding ideal directing ways and exchanging the parcels through an internetwork. The exchanging of bundles through an internetwork is called as packet switching which is straight forward, and the way determination could be exceptionally perplexing. Routing protocol utilize a few measurements as a standard estimation to ascertain the best way to rout the packets to its destination that could be number of hop, which are utilized by the routing algorithms to decide the ideal way for the bundle to its destination. The procedure of way determination is that, routing algorithm discover and keep up routing tables, which contain the aggregate course data for the bundle. The data of course fluctuates starting with one routing calculation then onto the next. The routing tables are loaded with sections in the directing table are ip-address prefix and the following bounce. Destination/next bounce relationship of directing table tell the switch that a specific destination can be come to ideally by sending the parcel to a switch speaking to the - address prefix determines an arrangement of destinations for which the directing section is legitimate. Routing is primarily arranged into static steering and element directing. Static steering alludes to the directing technique being expressed physically or statically, in the switch. Static routing keeps up a directing table normally composed by a systems director. The routing table not Dynamic routing alludes to the routing methodology that is being learnt by an inside or outside routing protocol. This steering essentially relies on upon the condition of the system i.e., the routing table is influenced by the liveliness of the destination.

3. LITURATURE REVIEW

In this paper, we have discussed the various approaches present for Routing protocols in MANET. Here we have discussed DSR Routing protocol and AODV in MANET in TCP and UDP environment. Some of the important literatures which are considered more important survey for our project are discussed below.

Amer O. Abu Salem et al says that the DSR routing protocol has acceptable performance in terms of data packet delivery ratio, throughput and they focused on varying the cache size and the speed by simulation using NS-2.[1]

Salman bhimla et al has said that for a high mobile network, when queue size is very less, the packets are dropped and buffer over flows for DSR protocol. Also the network load increases and through will also increases as compared to the high queue size for high mobile network.[2]

Amit N. Thakare et al said that DSR is more stable and has less overhead. DSR can make use of multiple path and does not send a periodic packet. Moreover it stores all usable routing information extracted from overhearing packets. However, these overheard route information could lead to inconsistencies.[3]

Zaiba Ishrat, et al said that DSR perform better PDR, DELAY and THROUGHPUT and the performance of ZRP is good for less number of nodes and its performance decreases when number of nodes increases. When the pause time is less throughput is low for DSR. Simulation results show that better performance is achieved in DSR protocol in terms of packet loss, throughput over a discontinuous network.[4].

Utpal Barman et al said that in AODV routing protocol increasing the number of nodes the throughput also increases but packet delivery ratio decreases [12].

Utpal Barman et al said that in DSDV routing protocol throughput is better with the increase of number of node again a delay is less. But it is not possible in case of node mobility [13].

4. DESCRIPTION OF REACTIVE PROTOCOL

Reactive protocol is distinguished as On-interest protocol since it makes routes as it were at the point when these routes are required. The need is started by the source, as the name recommends. At the point when a source hub requires a route to a destination, it starts a route discovery process inside the system. This procedure is finished once a route is found or all conceivable route changes have been inspected. After that there is a route upkeep method to keep up the substantial routes and to expel the invalid routes [10].

4.1 Ad-hoc On Demand Distance Vector (AODV)

The different Reactive Routing Protocol are examined underneath: Specially appointed On-Demand Distance Vector (AODV) directing is a routing protocol for portable promotion ad-hoc systems and different remote specially appointed systems. It is together created in Nokia Research Center of University of California, Santa Barbara and University of Cincinnati by C. Perkins and S. Das. It is an on-interest and separation vector routing protocol, implying that a route is built up by AODV from a destination just on interest [24]. AODV is fit for both unicast and multicast directing [17]. It keeps these courses as long as they are alluring by the sources. Also, AODV makes trees which associate multicast bunch individuals. The trees are made out of the gathering individuals and the hubs expected to interface the individuals. The arrangement numbers are utilized by AODV to guarantee the freshness of courses. It is without circle, self-beginning, and scales to huge quantities of versatile hub. AODV characterizes three sorts of control messages for course upkeep: RREQ-A route ask for message is transmitted by a hub requiring a route to a hub. As a streamlining AODV utilizes an extending ring system when flooding these messages. Each RREQ conveys a period to live (TTL) esteem that states for what number of bounces this message ought to be sent. This quality is set to a predefined esteem at the first transmission and expanded at retransmissions. Retransmissions happen if no answers are gotten. Information bundles holding up to be transmitted (i.e. the parcels that started the RREQ). Each hub keeps up two separate counters: a hub arrangement number and a broadcast_ id. The RREQ contains the accompanying field [1].

Source address	Broadcast ID	Source sequence no	Destination address	Destination sequence no	Hop count

4.2 Dynamic Source Routing (DSR)

Dynamic Source Routing (DSR) is a routing protocol for remote cross section systems. It is like AODV in that it builds up a route on-interest when a transmitting portable hub demands one. In any case, it utilizes source routing as opposed to depending on the routing table at every transitional gadget [10]. Dynamic source routing protocol (DSR) is an on-interest, source routing protocol, whereby all the routing data is kept up (ceaselessly upgraded) at versatile hubs. DSR permits the system to be totally selfsorting out and self-arranging, without the requirement for any current system foundation or organization. The protocol is made out of the two fundamental instruments of "Route Discovery" and "Route Maintenance", which cooperate to permit hubs to find and keep up routes to self-assertive destinations in the Ad-hoc system. An ideal way for a correspondence between a source hub and target hub is dictated by Route Discovery process [11]. Route Maintenance guarantees that the correspondence way stays ideal and circle free agreeing the adjustment in system conditions, regardless of the possibility that this requires changing the routes amid a transmission. Route Reply would just be created if the message has achieved the anticipated destination hub (route record which is firstly contained in Route Request would be embedded into the Route Answer). To give back the Route Reply, the destination hub must have a route to the source hub. In the event that the route is in the route reserve of target hub, the route would be utilized. Something else, the hub will turn around the route in view of the route record in the Route Reply message header (symmetric connections). In case of deadly transmission, the Route Maintenance Phase is started whereby the Route Error bundles are created at a hub. The inaccurate bounce will be separated from the hub's route reserve; all routes containing the bounce are decreased at that point. Once more, the Route Discovery Phase is started to decide the most reasonable routes.

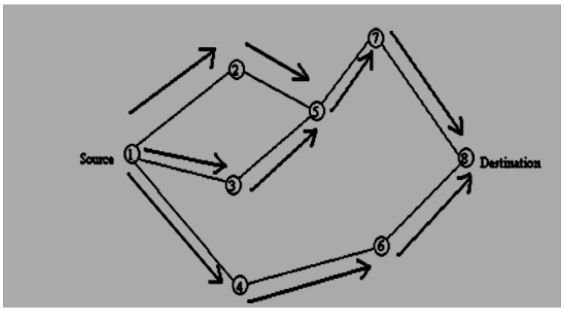
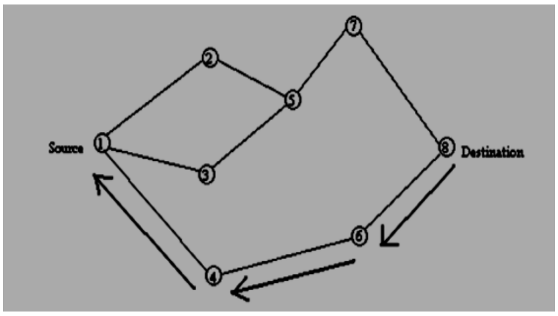


Fig 1 (a) Propagation of RREQ packet [1]



(b) Route creation in DSR [1]

4.3 TRANSMISSION CONTROL PROTOCOL (TCP) AND USER DATAGRAM PROTOCOL (UDP)

The Transmission Control Protocol (TCP) is a core protocol of the Internet protocol suite. It originated in the initial network implementation in which it complemented the Internet Protocol (IP). Therefore, the entire suite is commonly referred to as TCP/IP [10]. TCP provides reliable, ordered, and error-checked delivery of a stream of octets between applications running on hosts communicating over an IP network. Major Internet applications such as the World Wide Web, email, remote administration and file transfer rely on TCP. Applications that do not require reliable data stream service may use the User Datagram Protocol (UDP), which provides a connectionless datagram service that emphasizes reduced latency over reliability [10].

On the other hand UDP uses a simple connectionless transmission model with a minimum of protocol mechanism. It has no handshaking dialogues, and thus exposes the user's program to any unreliability of the underlying network protocol. There is no guarantee of delivery, ordering, or duplicate protection. UDP provides checksums for data integrity, and port numbers for addressing different functions at the source and destination of the datagram [11].

With UDP, computer applications can send messages, in this case referred to as datagram's, to other hosts on an Internet Protocol (IP) network without prior communications to set up special transmission channels or data paths. UDP is suitable for purposes where error checking and correction is either not necessary or is performed in the application, avoiding the overhead of such processing at the network interface level. Time-sensitive applications often use UDP because dropping packets is preferable to waiting for delayed packets, which may not be an option in a real-time system. If error correction facilities are needed at the network interface level, an application may use the Transmission Control Protocol (TCP) or Stream Control Transmission Protocol (SCTP) which are designed for this purpose [11].

5. PERFORMANCE METRICS

In this paper we are trying to analyze the performance and comparing AODV and DSR protocol in two different environments i.e. TCP and UDP by varying number of nodes. in this study we tried to implement both the protocols and justify which protocol best suits in which environment TCP or UDP. Here we analyze End-to-End Delay, Throughput and Packet Delivery Ratio.

5.1 Average End-to-End Delay

This is the average time a data packet takes to access the destination. This metric is calculated as: the time at which first data packet arrived to destination. The time at which first packet was transmitted by source. This includes all possible delays caused by buffering for route discovery, queuing at interface queue, retransmission delays at MAC, propagation and transfer time [1].

5.2 Average Throughput

Average Throughput (messages/second) is the average rate of successful packet delivery data packets divided over a communication channel, this metric is calculated as:
The average total number of delivered packets divided by the total duration of simulation time. We analyze the throughput in TCP and UDP by varying number of nodes[1].

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5.3 Data packet delivery ratio

Total number of delivered data packets divided by total number of data packets transmitted by all nodes [1].

6. RESULT ANALYSIS AND DISCUSSION

As we already mentioned above we have taken DSR and AODV routing protocol in two different environments i.e. TCP and UDP. In this we will justify in which environment DSR and AODV performs best by varying number of nodes as well as we will compare both the protocol by analysis there Throughput, End-to-End Delay and Packet delivery ratio initially we will analyze in minimum nodes then gradually we increased the number of nodes. The mobility model is used is Random waypoint mobility model because it models the random movement of the mobile nodes. Here we have used NS-2 Simulation tool to analyze the result in Linux operating system. In this NAM editor to show the animation of the communication between the nodes and X-graph to show the graphical result of the protocol

6.1 Average End-To-End Delay

In this we analysed AODV and DSR routing protocol in TCP and UDP environment. Here throughout the study we found that AODV is performs better in UDP environment as compare to DSR. From the graph we can see the differences, in TCP environment doesn't give good result both the protocols fluctuates when we increase the number of nodes. We cannot get efficient output when we implanted in TCP environment but on the other hand in UDP environment AODV performs good as compare to DSR. Here from the graph we can see that initially when we place least nodes the delay is maximum but when we increase the nodes gradually we found the delay is minimum and it remains minimum till we reached to the maximum number of nodes. Hence, from this comparison we can justify that End-to-End Delay is very less in AODV in UDP environment as compare to DSR.

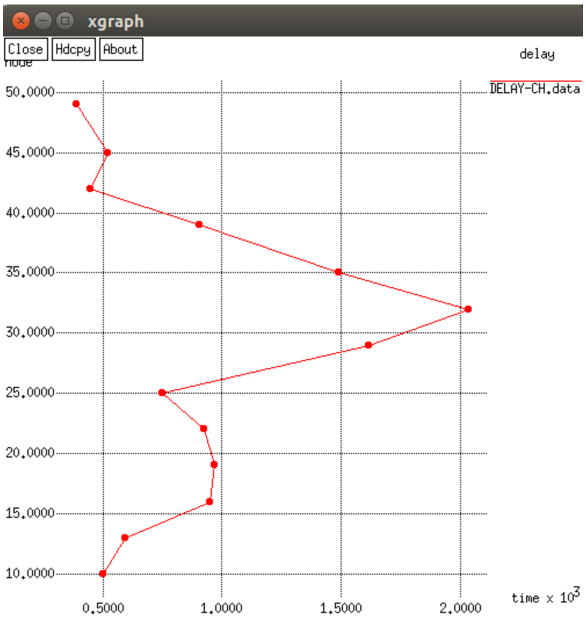

Fig (a) AODV End-to-End Delay (TCP)

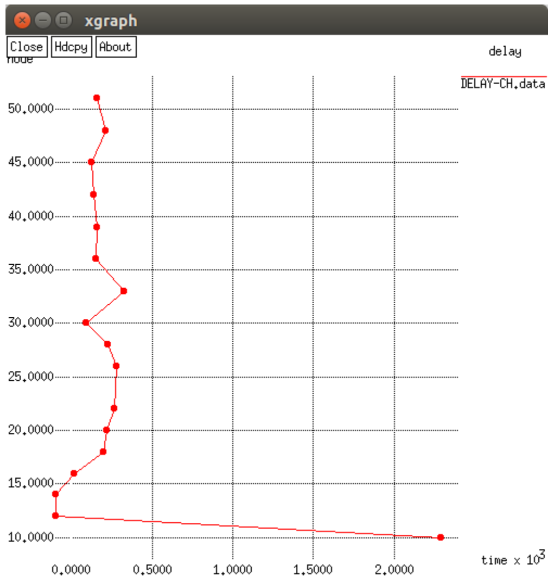

Fig (b) AODV End-to-End Delay (UDP)

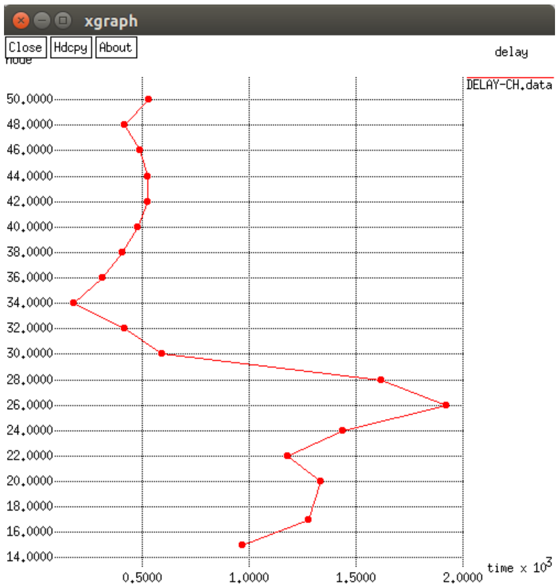

Fig (c) DSR End-to-End Delay (TCP)

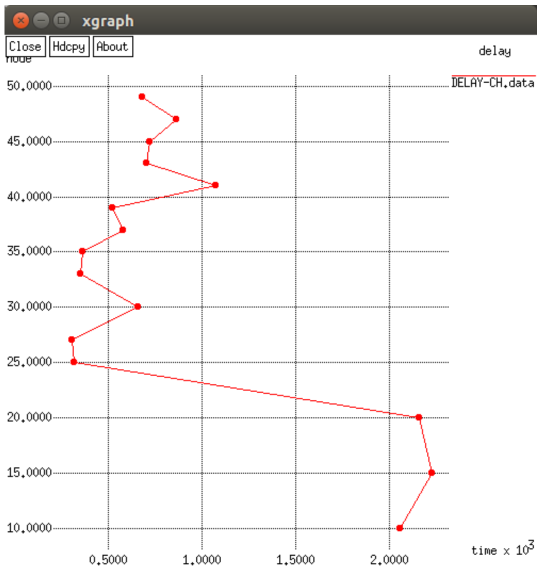

Fig (d) DSR End-to-End Delay (UDP)

6.2 Average Throughput

Here form the below graph we can easily justify that ADOV and DSR better performs in UDP environment but there is little difference between AODV and DSR in UDP environment.

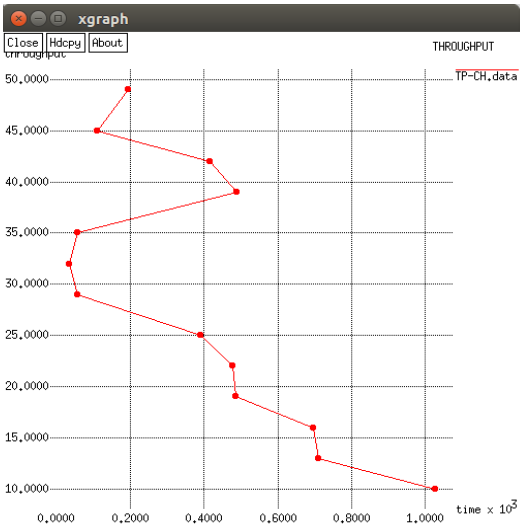

Fig (a) AODV Throughput (TCP)

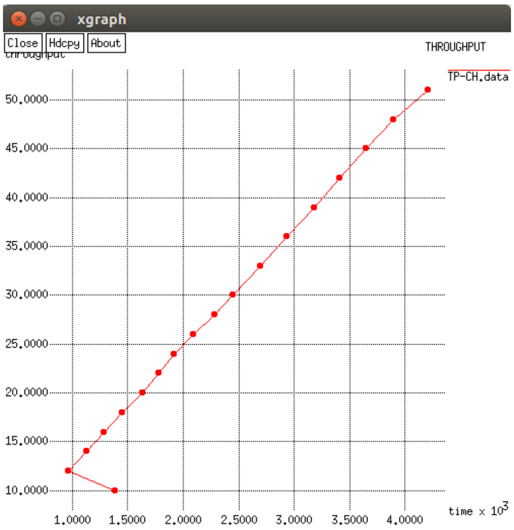

Fig (b) AODV Throughput (UDP)

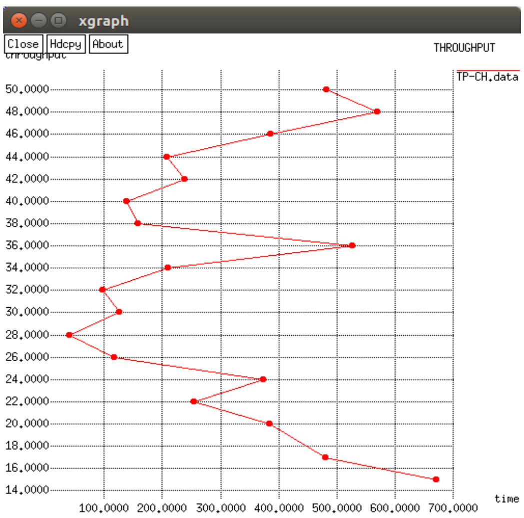

Fig (c) DSR Throughput (TCP)

In DSR (UDP) we see that after the node exceeds 25 the throughput increases but in AODV (UDP) we found that from the minimum initial node itself we got the high throughput. Hence we can say that AODV gives better throughput from the initial stage as compare to DSR (UDP) protocol. The packets transfer of AODV is better that DSR in UDP environment.

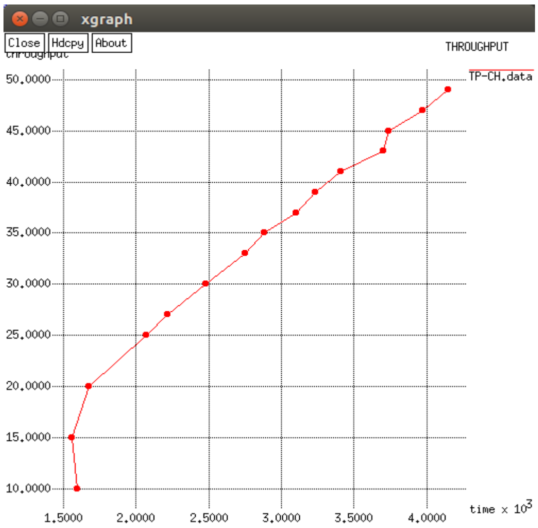

Fig (d) DSR Throughput (UDP)

6.3 Data Packet Delivery Ratio

Here from the graph we analyse that in UDP environment both AODV and DSR protocol if we have least nodes then the rate of PDR is extremely high but in TCP environment both the protocols gives high PDR rate till 25 nodes exceeding 25 gradually the rate of PDR decreases. The rate of PDR decreases due to congestions, collisions, packet loss. If we place maximum nodes the path from source to destination may varies. It get maximum path, link breakage, packets will transfer via multiple nodes. When a protocol has maximum number of nodes then it has multiples routes in between the source and destination nodes. so with this the packets has to transfer via multiple nodes so chances of maximum packet loss is possible. If we have less nodes then packets will transfer to destination via minimum nodes chances of packet loss very minimum.

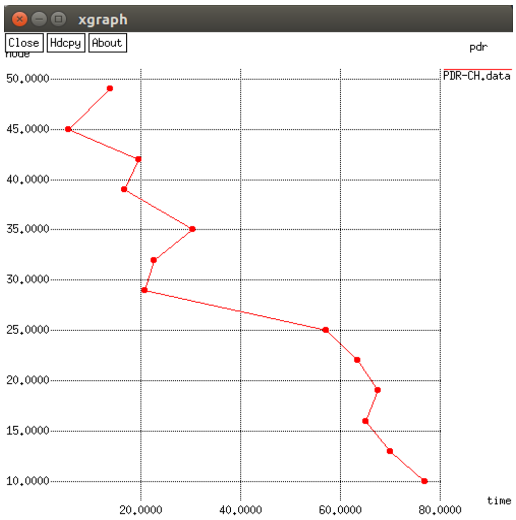

Fig (a) AODV PDR (TCP)

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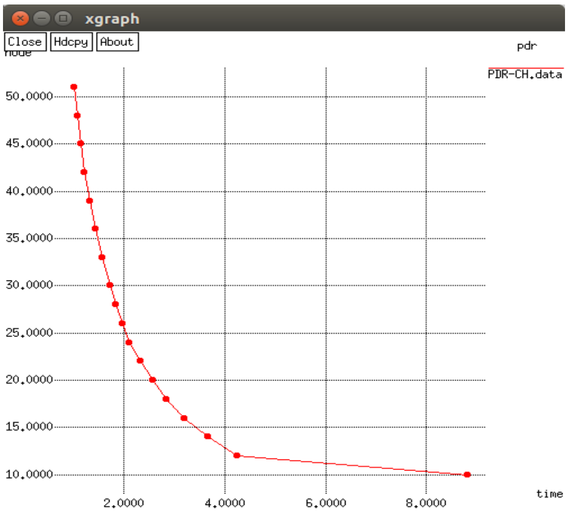

Fig (b) AODV PDR (UDP)

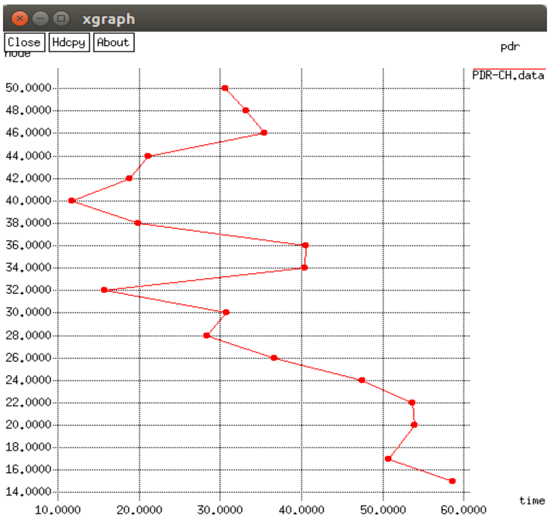

Fig (c) DSR PDR (TCP)

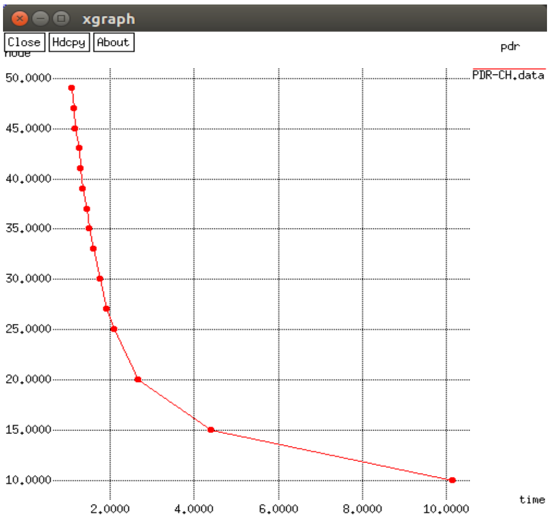

Fig (b) DSR PDR (UDP)

7. CONCLUSION

In this paper we focused on the analysis and performance of Dynamic Source Routing (DSR) protocol with respect to TCP and UDP environment. The simulation is carried out using NS-2/RAM 1GB/500GB HD. We have analyzed in three different scenarios i.e. PDR, End-to-End Delay and Average Throughput with respect to TCP and UDP environment by varying number of nodes. In this we found that in different environments the result of three parameters varies. In TCP environment the results in all the three parameters fluctuates, we could not determine perfect uniform output from all the three parameters in both AODV and DSR routing protocol. Whereas in UDP environment both the protocols performs well as compare to TCP. But if we compare AODV and DSR protocol in UDP environment we found that AODV performs well in all the different parameters. The Throughput of AODV in UDP gradually increases when we increases number of nodes, the End-to-End Delay is very less in AODV (UDP) but in DSR it fluctuates we cannot get uniform output but in PDR we found that for both the protocols and in both environment i.e. TCP and UDP the PDR of AODV in TCP is quite good if we place less number of node as compare to DSR in TCP, UDP and AODV in UDP. In AODV in UDP we found that the in least number the rate of PDR is high but when gradually we increases the number of nodes the rate of PDR decreases. This is because of congestions, collisions, packet loss. If we place maximum nodes the path from source to destination may varies. It get maximum path, link breakage, packets will transfer via multiple nodes. Hence from the above study we found that on an average AODV routing protocol performs well as compare to DSR in UDP environment. Basically this protocol can be implemented practically in an organization or in a small sector to transfer information from one place to another. For example in an institution we can use this protocol to transfer file or dats information from one system to another without having any access point.

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