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Realization of ZRP, AODV and DSR Models Based On Varied Mobility

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ABSTRACT

Mobile hosts use wireless channels to communicate with fixed access points. Under the Ad hoc network configuration, nodes are required to cooperate with each other in establishing transmission paths through the network, using the limited capacity and available resources in the best possible way. The motive of all the networking protocols is to formulate such an algorithm that the nodes are able to communicate with the use of the one-hop transmission services provided by the enabling technologies to construct end-to-end (reliable) delivery services, from a sender to one or more receivers. This paper presents the performance realization of AODV,DSDV and ZRP based on Average end-to-end delay, Packet delivery fraction and Packet loss with respect to variable maximum speeds. On the basis of these models of protocols conclusions are drawn for the most appropriate one.

General Terms: Hybrid protocol Zone routing with respect to Reactive and Proactive protocols

Keywords:*MANET, DSDV, AODV, ZRP, Packet-Loss, Average End-To-End Delay, Packet Delivery Fraction.*

1. INTRODUCTION

Mobile hosts use wireless channels to communicate with fixed access points, they are further classified as Infrastructure and Infrastructure less networks. An Infrastructure Networks consists of wireless mobile nodes and one or more bridges, which connect the wireless networks to the wired networks. Infrastructure less Networks has no fixed routers; all nodes are capable of movement and can be connected dynamically in any arbitrary manner.

2. BACKGROUND

Mehran Abolhasan - In 2004 has presented the upcoming challenge of routing in MANET keeping in view the diverse application of these networks in many different scenarios such as battlefield and disaster recovery.. They have defined that each proposed protocol argues that the strategy proposed provides an improvement over a number of different strategies considered in the literature for a given network scenario. They have also provided a performance comparison of all routing protocols and suggest which protocols may perform best in large networks.

Evaggelos Chatzistavros - In this paper, in July 2010 the variations in performances of various protocols by altering the sizes of packets with constant bit rate through choice of different topologies was examined. They have given a brief discussion as how nodes mobility also does affect the overall performance and efficiency of the network.

3. LITERATURE REVIEW

3.1. MANET

A Mobile Ad-Hoc Network (MANET) is a decentralized network of autonomous mobile nodes that are able to communicate with each other over wireless links Mobile Ad-Hoc Networks (MANET) as described by Charter IETF[32]. MANET is a collection of wireless mobile nodes, which dynamically form a temporary network without using any existing network infrastructure or centralized administration defined by Dhaka A. et.al [10].It represents complex distributed systems which comprises wireless mobile nodes that can freely and dynamically self-organize into arbitrary and temporary, ‘‘ad-hoc’’ network topologies, allowing people and devices to seamlessly internetwork in areas with no pre-existing communication infrastructure, e.g. disaster recovery environments. The growth of mobile computing and communication devices and their nature makes wireless communication the easiest solution for interconnection and this is the reason that the wireless arena has been experiencing exponential growth in the past decade.

3.2. Routing Protocols in MANET

A large number of routing protocols are available which have been designed, either by modifying Internet routing protocols, or proposing new routing approaches. MANET routing protocols are typically subdivided into three main categories as defined by Chatzistavros E. et.al [6] Proactive Routing Protocols (Table driven), Reactive On-Demand Routing protocols (Source Initiated or Demand driven), Hybrid

The characteristics of each of these protocols are quite distinct. Proactive routing protocols are derived from the very old Internet distance-vector and link-state protocols requiring necessary routing related tables and ways for its maintenance Royer E. et.al [45].Reactive on demand routing protocols establish the route to a destination only when there is a demand for it and maintain it until the route is expired Royer E. B. et.al [44]. Hybrid routing protocol is a combination of the characteristics of proactive as well as the reactive protocols. The purpose is to increase scaling, allow neighboring nodes to cooperate in order to create a backbone and to reduce overhead due to route discovery eg Zone Routing Protocol (ZRP)

The Zone-Based Hierarchical Link State Routing Protocol (ZRP) as per Beijar, N. et.al[3] is an example of hybrid protocol that combines both proactive and reactive approaches thus trying to bring together the advantages of the two approaches according to Chlamtac, I. et.al[8]. We used ZRP (Zone Routing Protocol) in our simulations as a representative of hybrid routing protocols Zone Routing Protocol (ZRP) as defined by Chatzistavros E. et.al[6].

The Zone-Based Hierarchical Link State Routing Protocol (ZRP) as per Haas, Z. J. et.al[14] is an example of hybrid protocol that combines both proactive and reactive approaches thus trying to bring together the advantages of the two approaches according to Chlamtac, I. et.al[8].

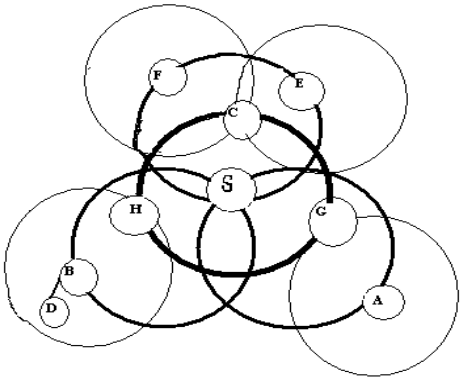

Figure 1 : Zones of each node obeying ZRP

4. METHODOLOGY

4.1. Performance metrics

ZRP, AODV and DSR are evaluated in terms of their performance for Packet delivery fraction, Avg end to end delay and Packet loss.

4.1.1. Scenario Considered

A proactive protocol and a reactive protocol has been chosen to compare with the performance of ZRP as it is a hybrid of the two. For visualizing zones of ZRP we have plotted three zones with zone radius (ρ) =2 i.e. at least 2 hops distance from center node as shown in Figure 6.2: Zone-1 has 0 to10 nodes with source node 0 and 6, 7, 9, 10 as the peripheral nodes (which is at most two hops from source node 0). Zone-2 has 0, 3, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19 nodes with source node 9 and 0, 14, 16, 17, 19 as peripheral nodes. Similarly, Zone-3 has 0, 1, 2, 4, 5, 7, nodes.

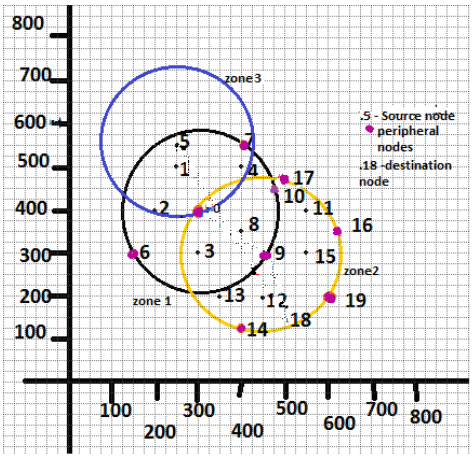

Figure 2 : Scenario for Simulation of ZRP

The simulation parameters are shown in table1

Table 1: Simulation Parameters

PARAMETERS	SCENARIO 1
Terrain Region	800m x 800m
Number of Nodes	20
Pause Time	15 ms
Maximum Speed	15,20,30,40,50 m/s
Simulation time	100 sec
Node Placement	Random
Packet Rate	4.0/sec
Maximum Connection	12
Channel Type	Wireless Channel
Radio Propagation Model	Two Ray Ground Model
Packet Size	**512 bytes**
Routing Protocol	**ZRP, AODV, DSDV**

4.2. Simulation Results from Comparison of ZRP with DSR and AODV

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4.2.1. Packet Delivery Fraction Vs Maximum speed

Table 2 shows Packet Delivery Fraction as a function of Maximum speed of nodes. Here, Maximum speed is varied from 15 to 50. And on the basis of this, PDF is measured for the three different routing protocols.

Table 2: Packet Delivery Fraction Vs Maximum speed

Packet Delivery Fraction			
Max Speed(m/sec)	**AODV(%)**	**ZRP (%)**	**DSDV (%)**
15	98.44	93.57	37.56
20	80.47	82.99	65.74
30	87.98	77.89	18.59
40	77.35	53.05	34.66
50	87.25	74.62	37.75

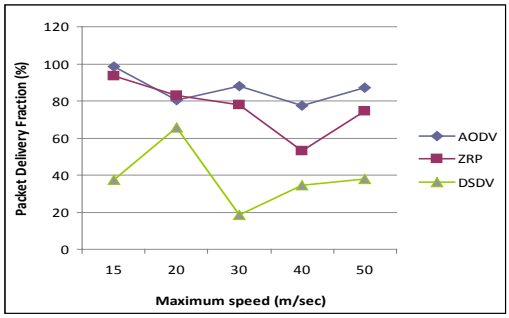

Figure3: Packet Delivery Fraction Vs Maximum speed

Here it is found that when maximum speed is between 15 and 20, AODV provides highest PDF at its initial stage & starts decreasing initially as the speed increases as compared to the other two protocols. So AODV delivers the highest PDF. But performance of ZRP lies between DSDV and AODV. Owing to its hybrid nature ZRP shows average result between the two other protocols. PDF of ZRP could be approximated with that of AODV.

4.2.2. Average End-to-End delay Vs Maximum Speed

Table 3 shows Average End-to-End delay as a function of maximum speed. In this, maximum speed is varied from 15 to 50. And on the basis of this, Average End-to-End delay is measured for the three different routing protocols.

Table 3 :Average End-to-End delay Vs Maximum speed

End-to-End Delay			
Max Speed (m/sec)	**AODV(ms)**	**ZRP (ms)**	**DSDV (ms)**
15	18.24	106.75	16.48
20	706.01	51.31	6.76
30	920.22	144.17	11.91
40	1028	155.15	6.71
50	860.44	33.9	5.81

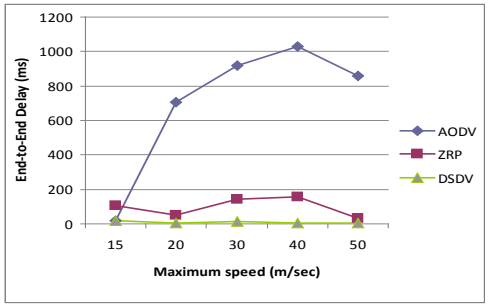

Figure 4: Average End-to-End Delay Vs Max speed

Figure 4 shows the graphical representation of average end to end delay Vs maximum speed, when the maximum speed is varied, the delay immediately increases for AODV amongst all of them but overall DSDV shows the lowest Average End-to-End delay owing to its table-driven nature. ZRP is again near the fairer side i.e., very low end to end delay as compared to AODV. Values of end to end delay for ZRP could be approximated with DSDV.

4.2.3. Packet loss Vs Maximum Speed

Table 4 shows Packet loss Vs maximum speed. In this, maximum speed is varied from 15 to 50. And on the basis of which, Packet loss is measured for the three different routing protocols.

Table 4: Packet loss Vs Maximum Speed

Packet Loss			
Max Speed (m/sec)	**AODV (%)**	**ZRP (%)**	**DSDV (%)**
15	3.39	6.69	58.04
20	19.79	16.54	16.75
30	14.07	23.02	57.98
40	24.94	46.94	62.68
50	12.5	26.23	58.31

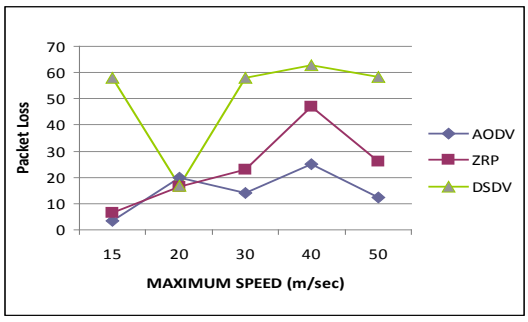

Figure 5: Packet loss Vs Maximum Speed

Figure 5 shows the graphical representation of maximum loss Vs maximum speed. Here, when the speed is varied between 20 and 50, the DSDV gives the maximum packet loss due to congestions in the network as compared to other protocols but overall AODV shows the lowest Packet loss owing to its on

demand route discovery policy. ZRP is providing the intermediate packet loss as compared to AODV and DSDV.

5. CONCLUSION

ZRP is a hybrid protocol which behaves like proactive as well as reactive depending on the type of situation it is implied in. ZRP maintains up-to-date information of the nodes and routes within its zone radius but does not maintain routes for those nodes that lie outside this zone. Since each node maintains its own routing table consisting of one route per destination and destination sequence number to refresh that routing tables hence this nature is very similar to other reactive and proactive protocols. We have observed from the simulation results that ZRP stood average in delivering packet to the destination and its performance is comparative to AODV. Again from the results regarding Avg end-to-end delay it is concluded that ZRP's performance is comparative to DSDV. In general it was observed that in all the cases and from all the scenarios and network sizes ZRP has outperformed. DSDV except in case of calculation of End to End delay as the routes are predefined and their weight is pre calculated in DSDV, but in case of ZRP as the nodes are mobile hence their routes need to be calculated each time when they move beyond the zone radius. Although the ZRP relating the End to end delay is comparable to DSDV but with, the high mobility scenarios and large size networks DSDV is better than ZRP this is due to probability of links breakage. Moreover, nodes carry Semi-sequential search where this accounts for delays in the process of route replay RREP, and RREQ rebroadcasting in case of no route available to the required destination, the second reason is the lack of any mechanism determines routes freshness when multi path choices are available.

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