Effect of change of Antenna Model with the Variation of Pause Time for Reactive and Hybrid Routing Protocols in Mobile Ad-Hoc Networks

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Abstract

The collection of the many mobile nodes forming a short lived infrastructure with the help of any centralized administration. Since there's a random and dynamic modification in topology due to the quality of host, so the requirement for a study dynamic routing protocol is needed. Mobile ad-hoc network have the attributes like wireless affiliation, continuously dynamic topology, distributed operation and simple deployment. It establishes a short lived affiliation wherever nodes will be part of or leave the network at any time. Communication takes place by routing protocols in effective and economical manner in wireless network. Economical protocols are accustomed forward information packets while not a lot of packet loss. The target of the present paper is to boost the performance of the reactive and hybrid routing protocols with different directional antenna i.e. Omni and Pattern antenna with variation of pause time. The performance metrics in the research paper is PDR, NRL, Throughput and Routing Overhead.

Keywords: MANET, Reactive routing protocol (AODV), Hybrid Routing Protocol (ZRP), Mobility model (RWP).

1. Introduction

Highlight MANETs are self-configuring multi hop network wherever the structure of the network changes dynamically as a result of the quality of host nodes. MANET may be a wireless network of assortment of freelance mobile nodes which will communicate to every different via radio waves .Ad hoc networking establish communication anytime and anyplace while not the help of a central infrastructure, routing in MANET means that to decide on a right and appropriate path from supply to destination . The routers are liberated to move at random and place themselves at random, that's why the network wireless topology is modification speedily associate degreed means such a network could operate in an unbiased way. If 2 nodes don't seem to be at intervals the diffusion vary of every different, other nodes are required to function middle routers for the message between sources to finish node. What is more, mobile devices wander unconnectedly and converse via with excitement ever-changing network. Thus, many modification of constellation may be an exhausting challenge for plenty

of vital problems, like routing protocol heft, and performance ruin resiliency.

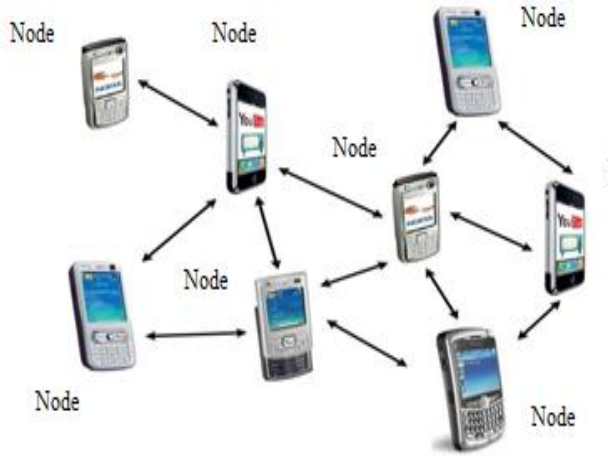

Figure 1: A Mobile Ad hoc network

2. Routing protocols

Ad-hoc routing protocols can be categorized in three parts, Proactive (Table driven) routing protocol, Reactive (On demand) routing protocol and Hybrid routing protocol. The present paper has been focus only reactive (AODV) and hybrid (ZRP) routing protocol.

A. Reactive (On-demand) Routing Protocol

In reactive or On-demand protocols, the data is maintained only for active routes. That is, the routes are determined and maintained by a node only if it desires to forward information to a destination. On demand protocols use two completely different operations to Route discovery and Route maintenance operation. During this routing data is acquiring on-demand. This is the path innovation process. Path continuance is that the method of6responding to alter in topology that happen when a route has initially been created.

AODV

Pure on-demand routing protocol. A node does not perform route discovery or maintenance until it needs a route to another node or it offers its services as an intermediate node. Nodes that are not on active paths do not maintain routing information and do not participate in routing table exchanges.

Uses a broadcast route discovery mechanism, Uses hop-by-hop routing. Routes are based on dynamic table entries maintained at intermediate nodes. The Ad hoc On-Demand Distance Vector protocol is both an on-demand and a table-driven protocol. AODV supports multicasting and unicasting within a uniform framework.

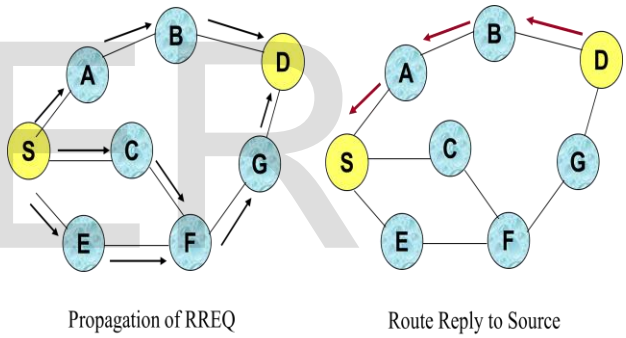

Figure 2: AODV Route Discovery

B. Hybrid Routing Protocol

Hybrid routing protocol is the combination of reactive and proactive routing protocol. This routing protocol based on zonal radius in which the zones are divided such as communication inside the zone is proactive and when the communication process is outside the zone the data is forwarded in reactive manner. Both proactive and reactive routing protocols establish to be ineffective in this position. Hybrid routing protocol combines the advantages of the proactive and reactive

approaches. Hybrid protocols include: ZRP, ZHLS routing protocol.

Zone Routing Protocol (ZRP)

Hybrid protocol incorporates the merits of proactive (table-driven) and reactive (on-demand) routing protocols. Each node has a routing zone by specifying a zone radius in terms of hops. Size of a zone can affect the communication performance. Within the routing zone, a table driven routing protocol is used; therefore, each node has a route to all the other nodes within the zone. If destination falls out of the routing zone of source node, an on-demand routing protocol is used. All nodes within hop distance at most *d* from a node X are said to be in the routing zone of node X. All nodes at hop distance exactly *d* are said to be peripheral nodes of node X's routing zone. Intra-zone routing: Proactively maintain routes to all nodes within the source node's own zone.. Inter-zone routing: Use an on-demand protocol (similar to DSR or AODV) to determine routes to outside zone.

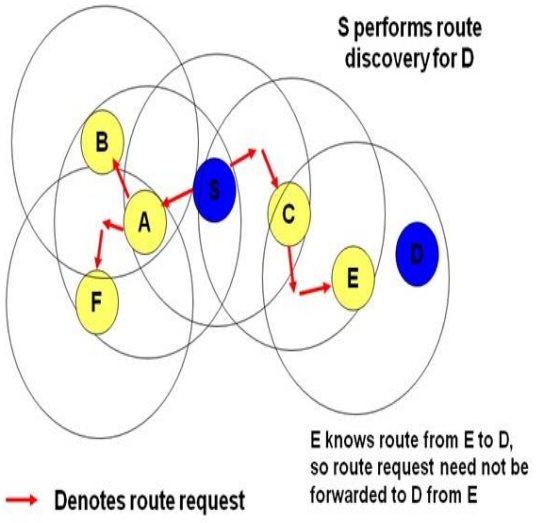

Figure 3: Zone Routing Protocol process

3. Simulation Setup

This simulation is performed using Qualnet 6.1 simulator. It provide mobility element; Pause time, Start time movement, area of movement, the pause time of mobile node and their corresponding probability type (e.g. uniform, exponential, etc.). The design of the scenario is random in which constant bit rate (CBR) is applied between source and destination. The random waypoint model of the mobility is used in the scenario. The simulation parameter used in the scenario is shown in the Table 1.

Table 1 Simulation parameters

Parameters	Value
Simulator	QualNet 6.1
Terrain Area (m*m)	1500*1500
Simulation time	150 sec
Routing Protocols	AODV, ZRP
No. of nodes	50
Pause time	10, 20, 30, 40, 50,60
Antenna	Omni directional and Pattern
Traffic type	CBR
Mobility model	Random Way Point
MAC layer	802.11b

4. Metrics Performance:

There are special metrics that can be useful to evaluate the ad hoc routing protocols routine. The subsequent metrics are use for the concert evaluation of AODV and ZRP routing protocols for Mobile ad hoc networks.

Routing Overhead: The number of control packets transmitted for every data packet sent.

$$Overhead = \frac{\sum_{i=1}^{n} \text{number of control packets sent by source}}{\sum_{i=1}^{n} \text{number of received data packets by destination}}$$

Where 'n' is number of nodes in the network. This metric can be employed to estimate how many transmitted control packets are used for one successful data packet delivery, to determine the efficiency and scalability of the protocol.

Packet Delivery Ratio (PDR): The ratio of data packets received by the destinations to those generated by the sources. This performance metric gives us plan of how fit the protocol is the stage in conditions of packet delivery at different pause time with different traffic model.

$$Packet\ delivery\ Ratio = \frac{\sum \text{number of data packets delivered}}{\sum \text{number of data packets sent}}$$

Normalized Routing load (NRL): NRL is the number of routing packets transmitted per data packet delivered at the destination. Equation for NRL is:

$$Normalized\ Routing\ Load = \frac{\sum_{1}^{k} Routing\_Packet}{\sum_{1}^{n} CBR\_Received}$$

Throughput: This metric represents the total number of bits forwarded to higher layers per second. It is measured in bps. It can also be defined as the total amount of data a receiver actually receives from sender divided by the time taken by the receiver to obtain the last packet [19].

$$\text{Throughput} = P_r / P_f$$

Where

P_r *is the total number of received packets and* P_f *is the total number of forwarded packets.*

5. SIMULATION RESULTS

This section presents analysis of the performance metrics for two different antennas with different pause time. The simulation result has been shown in terms of Routing Over head, Packet delivery Ratio, Normalized Routing Load, Throughput.

Routing Overhead: ZRP routing protocols gives best result in comparison to AODV for Pattern antenna then Omni directional antenna. Routing overhead increases as pause time increases for Pattern antenna or Omni directional antenna. AODV has higher value of overhead in case of Omni antenna because when ZRP routing protocol are used, network is divided into zones. A proactive, routing technique is used inside every zone whereas a reactive routing technique is used to communicate with nodes that are outside the zone both of these techniques are as follows in ZRP routing protocol.

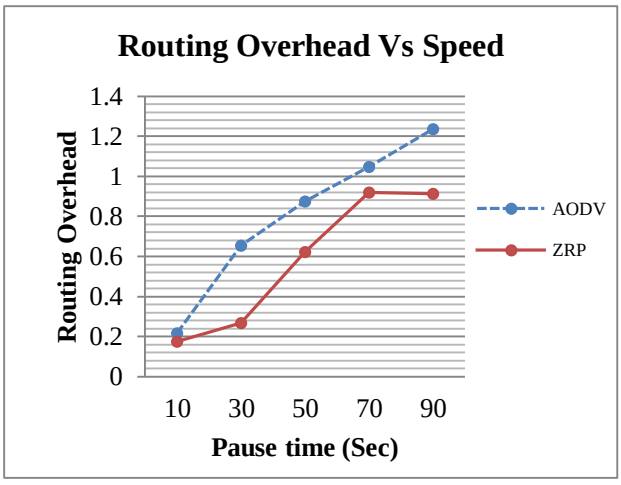

Figure 4.1 (a): Routing Overhead with Omni directional Antenna

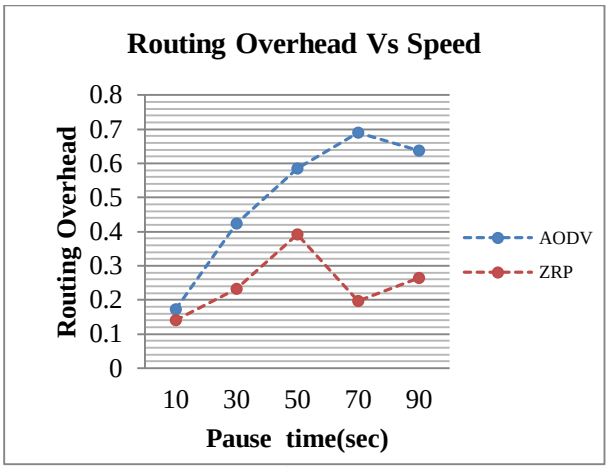

Figure 4.1 (b): Routing Overhead with Pattern Antenna

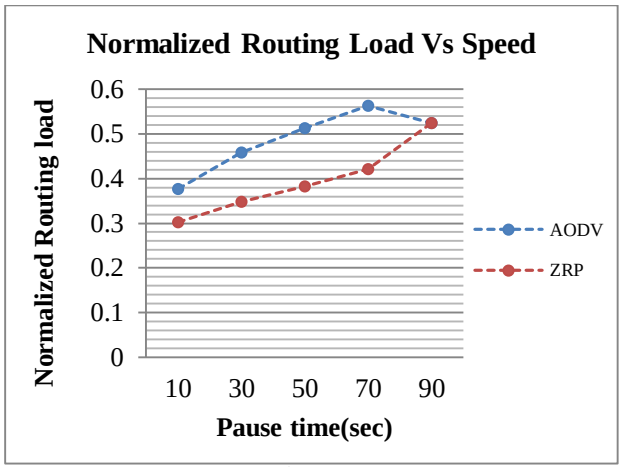

Figure 4.2 (b): Normalized Routing Load with Pattern Antenna

Normalized Routing Load: Normalized routing load increases when pause time increases for both routing protocols protocol in case of Omni directional antenna and in case of Pattern antenna routing load increase but when it crosses a limit of pause time then it suddenly decrease for AODV routing protocol in case of Patterned antenna and there is no change in ZRP when pause time increase the NRL is continuously increasing.

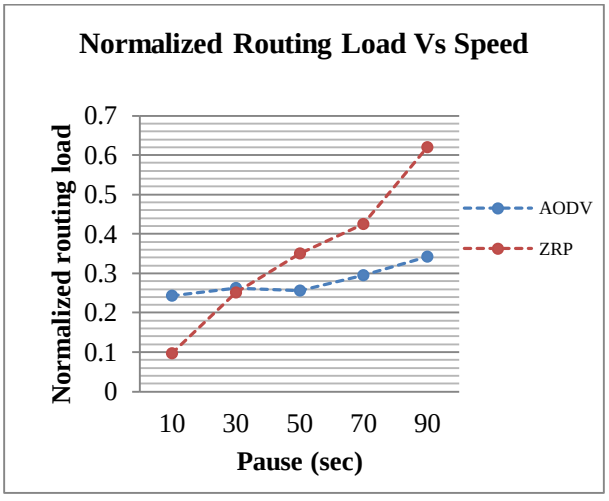

Figure 4.2 (a): Normalized Routing Load with Omni directional Antenna

Packet delivery Ratio: In case of Omni directional antenna packet delivery ratio for AODV routing protocol is increases when pause time increases. ZRP has high PDR then AODV in minimum pause time. In the case of Patterned antenna the Packet delivery ratio is Maximum for the AODV routing protocol in comparison to ZRP.

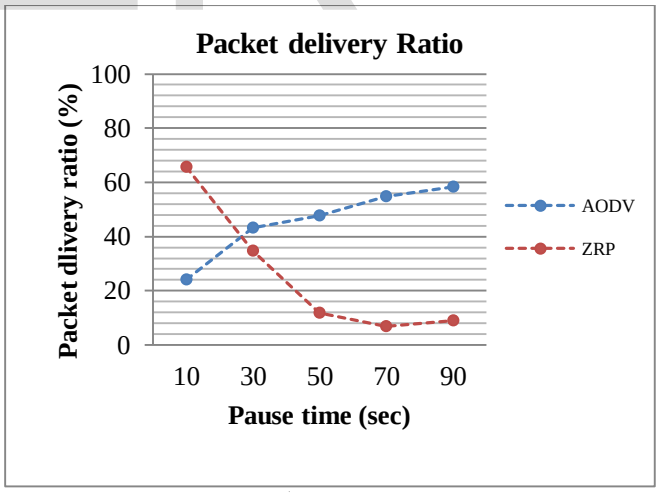

Figure 4.3 (a): Packet delivery Ratio with Omni directional Antenna

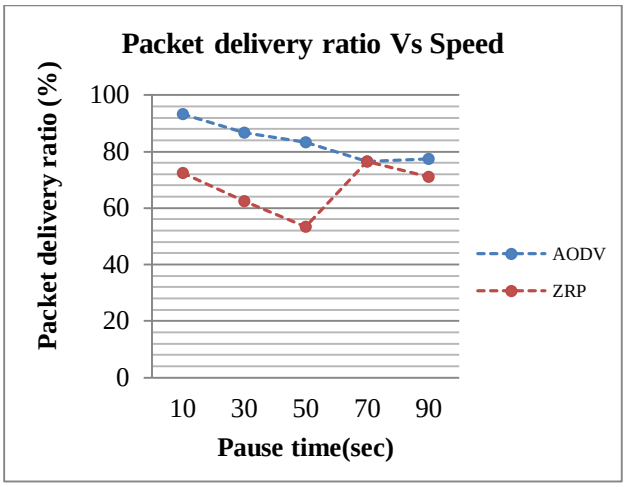

Figure 4.3 (b): Packet delivery Ratio with Pattern Antenna

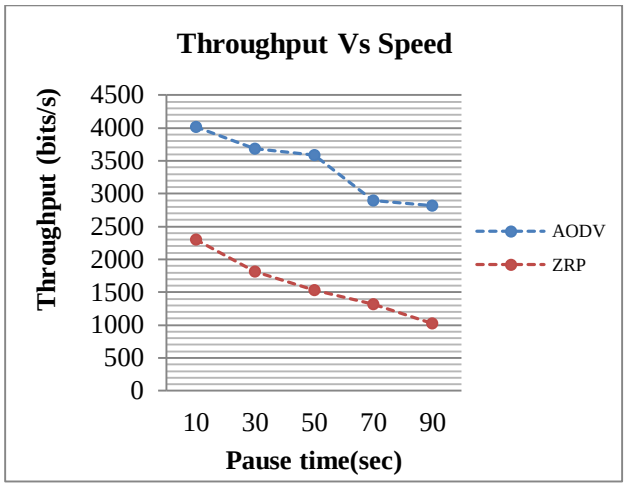

Figure 4.4 (b): Throughput with Patterned Antenna

Throughput: It is evident from the result graph of Pattern antenna has high throughput then Omni directional antenna for AODV routing protocol then ZRP. But in both antenna cases the throughput of ZRP is same. From the simulation it has been analyzed that in ZRP routing protocol has no change when change the directional antenna due to its work is depends in zone.

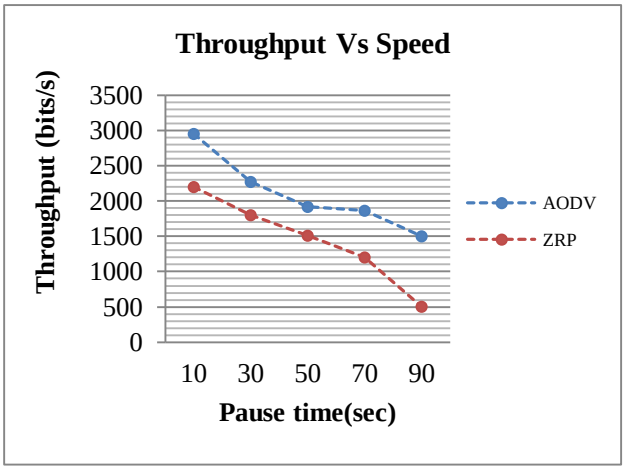

Figure 4.4 (a): Throughput with Omni directional Antenna

6. Conclusion

The present research paper has been shown that the comparison of two routing protocols i.e. AODV and ZRP and two different antennas i.e. Omni directional and patterned antenna with the different Pause time is done. The networks performance is carried for certain performance metrics which conclude that the performance of AODV for variations in pause time is best in Patterned antenna then performances of Omni directional antenna. In ZRP routing protocol whole area is divided into zone and it's mainly work in zone then from the present research work it has been analyzed that uses of different directional antenna is no affected in ZRP. Directional antenna is mainly affected in AODV i.e. reactive routing protocol because it works on demand then ZRP. Change of antenna is mainly affected in reactive routing protocols then hybrid routing proctors. A change of directional antenna is not affected in ZRP in case of throughput but in other matrices cases changes has been analyzed.

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