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# Zone Routing Protocol in Manets with Optimized Cache Memorizer

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*Abstract: -* **Mobile Adhoc Networks (MANETS) have no fixed infrastructure and are better than cellular mobile networks which have the fixed infrastructure. In MANETS nodes are mobile and hence can be implemented in military, RADAR, aircraft, air force and in hard real time systems. Bandwidth is limited in the case of wireless networks, so the routing protocols should not occupy a large portion of the network capacity to keep the routing information. To provide optimized QoS in MANETS, Zone Routing Protocol (ZRP) can be used to increase the mobility, throughput, speed and decrease delay, routing overhead, cost and power consumption. It is a hybrid protocol, which uses the advantages of both pro-active and reactive protocols. The cache in the optimized ZRP considers the parameters the priority, the routing information, the lifetime and the latest access time. The tradeoffs between the various parameters are to be considered depending upon the applications.**

*Key words*: **Mobile jammer, Remote control, Radio jamming.**

## I. INTRODUCTION

A Mobile Ad hoc Network is a collection of mobile nodes with no preexisting infrastructure, where all node communications are carried over a wireless medium. Since, the topology of a mobile ad hoc network changes frequently and without prior notice, routing in such networks is a challenging problem. In an emergency scenario, time has an important role; the reactive protocols build the routes on-demand so an initial delay occurs before the start of the communication. This time cannot be tolerated for hard real time systems, which may lead to adverse effects. Hybrid protocols, such as ZRP combines both proactive and reactive approaches where nodes proactively maintain routes to nearby nodes and establish routes to far away nodes only when needed. The ZRP is a hybrid protocol which is both reactive and pro-active. The Network Simulator is used to simulate the design, but practical parameters vary from simulation to real time environment.

MANETS find their applications in many fields.

a) Personal area networking: Used for accessing, sharing, and processing data via the Internet. Examples are cell phone, laptop computer, ear phone and wrist watches.

b) Military environments: To equip soldiers with devices in enemy environments, so they can communicate with each other for tactical operations. Examples are soldiers equipped with Personal Digital Assistants (PDAs), tanks, planes and warships.

c) Civilians environments: Used for accessing and sharing data with other potential users; e.g., distribution of presentations, exchange of information, etc. within a taxi cab network or meeting rooms or sports stadiums and small aircrafts.

d) Emergency operations: To setup communication in life-threatening situations like search and rescue, emergency situations like policing and fire fighting and disaster recovery.

## II. PROTOCOLS SURVEY

### 1. DESTINATION SEQUENCED DISTANCE VECTOR (DSDV):

Efficient proactive protocol using table driven algorithm is destination sequenced distance vector routing protocol. The network topology is known to all nodes in proactive protocol before the incoming of forward request. Routing information of all destinations is maintained by DSDV protocol and updated periodically. A table is maintained by each node which contains destination sequence number of hops etc. The sequence number is assigned for each entry by the destination node.

 

**2. AD HOC ON DEMAND DISTANCE VECTOR ROUTING(AODV):**

The Ad Hoc On-Demand Distance Vector Routing Protocol is a reactive routing protocol based on DSDV. It was introduced in 1997. AODV is designed for networks with tens to thousands of mobile nodes. One feature of AODV is the use of a destination sequence number for each routing table entry. The sequence number is created by the destination node. The sequence number included in a route request or route reply is sent to requesting nodes. Sequence number are very important because they ensures loop freedom and is simple to program. Sequence numbers are used by other nodes to determine the freshness of routing information. If a node has the choice between 2 routes to a destination, a node is required to select the one with the greatest sequence number.

**3. ZONE ROUTING PROTOCOL (ZRP)**

Each node has it is own routing zone and the size of the zone is determine by radius of length where L is the number of hops to the perimeter of the zone. The neighboring nodes should be identified by each node. Obviously a node needs to first know about it is neighbors before it can construct a routing zone and determine it is peripheral nodes. In order to learn about it is direct neighbors, a node may use the media access control (MAC) protocols directly. Alternatively, it may require a Neighbor Discovery Protocol (NDP). Such a NDP typically relies on the transmission of “hello” beacons by each node. Signal strength or frequencies are the various parameters to be considered by NDP. The node periodically broadcast the messages to keep track of up to date information about neighbors.

The ZRP protocol is a framework composed by different components:

1. Intrazone Routing Protocol (IARP)
2. Interzone Routing Protocol (IERP)
3. Broadcasting Routing Protocol (BRP)

a) ZRP Component Architecture:

The IARP protocol is used by a node to communicate with the interior nodes of its zone and as such is limited by the zones radius (the number of hops from the node to it’s peripheral nodes). This protocol is responsible for determining the routes to the peripheral nodes and is commonly a proactive protocol. The ZRP architecture is shown in figure 1.

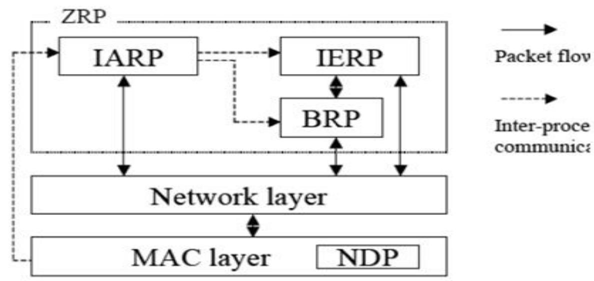


***Figure 1. Architecture of ZRP***

In Interzone Routing Protocol (IERP) route quires are based on route request from the node that is on demand. Broadcasting of routing information minimizes the route discovery of nodes. The broadcast routing protocol removes redundant quires and maximizes efficiency. BRP is only a packet delivery service. The BRP keeps track of which nodes a query has been delivered to, so that it can prune the broadcast tree of nodes that have already received and relayed the query. When a node receives a query packet for a node that does not lie within it is local routing zone, it constructs a broadcast tree, so that it can forward the packet to it is neighbours. Received packet is checked by the node whether it belongs to the tree. The efficiency of the network is maximized by different methods applied by individual nodes.

## III. METHODOLOGY

**OPTIMIZED CACHE MEMORIZER FOR ZRP:**

The cache in the improved Optimized ZRP is divided into four parts as the priority, the routing information, the lifetime and the latest access time, as shown in Table1. The priority is related to the lifetime, the longer the lifetime is and the prior the priority is. The latest access time records the accessing lately. The principle of the optimized ZRP cache mechanism is as follow: when the Ad Hoc network is built, there is no routing information in the ZRP cache memorizer, so set the lifetime initial value of new routing information as t; if one routing information is not accessed for a period of time, its lifetime t is shortened.

***Table 1. The Optimized Cache Information Store Example***

| S. No | Routing Information | Life time | Priority | Latest Access Time |
|---|---|---|---|---|
| 1 | P to Q | t | 1 | 10:18 |
| 2 | P to R | t+ft | 2 | 10:20 |
| 3 | P to S | t+ft+ft | 3 | 10:23 |
| 4 | Q to R | t | 1 | 10:29 |
| 5 | Q to S | t+ft | 2 | 10:43 |

 

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Contrariwise, if the routing information is accessed again and again, the priority is advanced along with the times of the access, namely that add ft to t, also the latest access time is recorded. So, routing information has the dynamic lifetime, this lifetime increases according to the priority and latest activities of different routing information under the equal priority are acquired according to the latest access time. If one routing information isn't accessed, after a period of time, its lifetime changes to 0, and then it is deleted from cache memorizer. When cache is under saturation status and every routing information is on the different priority, the lifetime of new routing information is calculated and then deleted according to its lifetime, namely that the routing information of the shorter lifetime is deleted preferentially; when cache is under saturation status and every routing information is on the same priority, the latest access time of new routing information is acquired and then deleted according to its latest access time, namely that the routing information of the earlier latest access time is deleted preferentially. In virtue of the approach stated above, we have solved the drawback of the traditional cache mechanism, namely that delete routing information prematurely.

## IV. RESULTS AND DISCUSSION

**Simulation Environment:**
To evaluate the performance of our proposed system, we implement a simple simulation using network simulator-2. The simulation scenario is listed in the Table 2.

***Table 2. Simulation Scenario***

| | |
|---|---|
| Simulation Area(Grid Size) | 500m x 500m |
| Maximum Number of Nodes | 100 |
| Node Communication Range | 50 m |
| Node Initial Placement | Random |
| Medium Access Mechanism | IEEE 802.11 |
| Traffic Source Model | CBR |
| Packet Size | 512 Bytes |
| Mobility Model | Random Waypoint |
| Simulation Time | 200s |
| Protocol | DSDV,AODV ,ZRP and AZRP |

NAM OUTPUT FOR OPTIMIZED ZRP (AZRP):

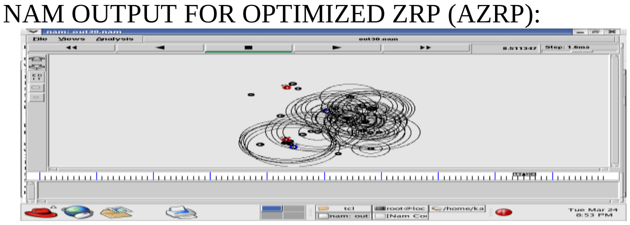

*Figure 2. NAM output for Optimized ZRP*

**Performance Metrics:**
1. End-to-end delay:
It measures as the average delay in sending packets from the source to destination and averaged over the number of source – destination pairs.

2. Delivery Ratio (Transmission Success Ratio)
It is defined as ratio of total number of routed connection requests to the total number of connection requests made.

3. Number of Packets Received
It is the number of Data packets received at destination based on both constraints such as Delay time and Delivery ratio.

4. Routing Overhead:
The routing overhead describes how many routing packets for route discovery and route maintenance need to be sent in order to propagate the data packets.

END TO END DELAY

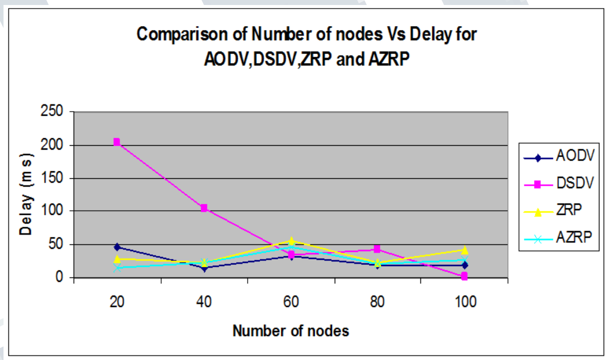


***Figure 3. Comparison of Number of Nodes Vs Delay for AODV, DSDV, ZRP and AZRP***

Comparison of Number of Nodes versus Delay for AODV, DSDV, ZRP and AZRP is shown in Figure 3. The delay varies depending upon the source and destination nodes .The parameters to be considered are the mobility, pause time and distance between the source and destination.

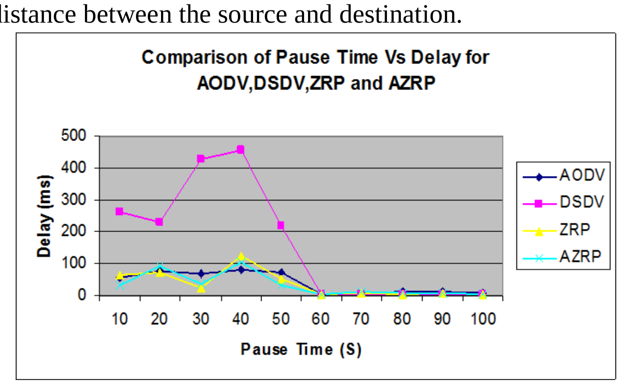


***Figure 4. Comparison of Pause Time Vs Delay for AODV, DSDV, ZRP and AZRP***

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Comparison of Pause Time versus Delay for AODV, DSDV, ZRP and AZRP is shown in Figure 4. The Delay for AODV and DSDV decreases as Pause Time increases. For pause time above 60 the delay for both the protocols remains constant.

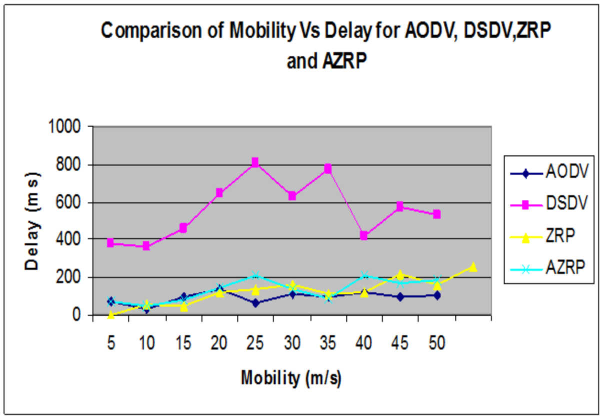


***Figure 5. Comparison of Mobility Vs Delay for AODV, DSDV, ZRP and AZRP***

Comparison of Mobility versus Delay for AODV, DSDV, ZRP and AZRP is shown in Figure 5. The Delay for AODV is almost constant as Mobility increases and the delay for DSDV varies depending upon the up  dating of the routing table.

ROUTING OVERHEAD:

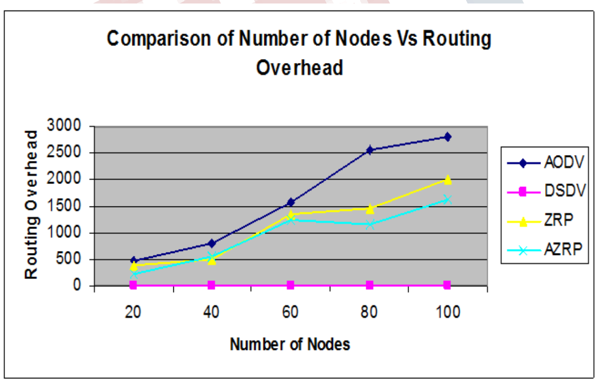


***Figure 6. Comparison of Number of Nodes Vs Routing Overhead***

Comparison of Number of Nodes versus Routing Overhead is shown in Figure 6. The routing overhead for DSDV is 0, because it is a table driven protocol in which the routing information is already maintained. The routing overhead of AODV is high in compared to all the three protocols. The improvement in overhead is seen in AZRP than ZRP.As the number of nodes increase the routing overhead also increases.

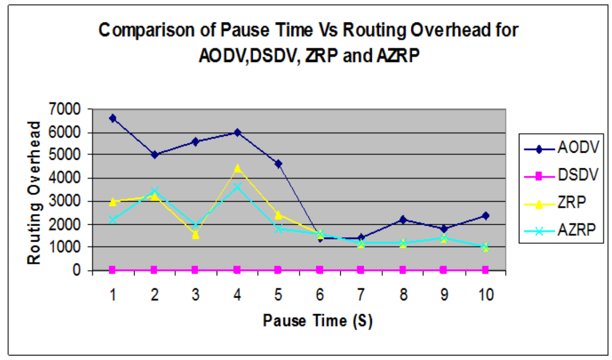


***Figure 7. Comparison of Pause Time Vs Routing Overhead***

Comparison of Pause Time versus Routing Overhead is shown in Figure 7. The routing overhead for DSDV is 0, because it is a table driven protocol in which the routing information is already maintained.  When considering the variation regarding the pause time, there is no constant increase or decrease in the routing overhead. The routing overhead of AODV is high in compared to all the three protocols. ZRP and AZRP have almost same routing overhead with different pause time.

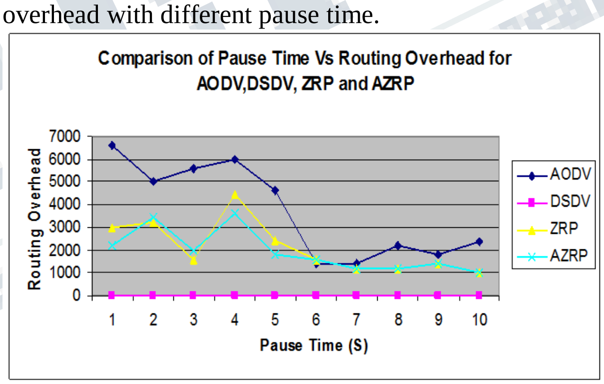


***Figure 8. Comparisons of Mobility Vs Routing Overhead***

Comparisons of Mobility versus Routing Overhead are shown in Figure 8. The routing overhead for DSDV is 0, because it is a table driven protocol in which the routing information is already maintained.  When considering the variation regarding the pause time, there is no constant increase or decrease in the routing overhead. The routing overhead of AODV is high in compared to all the three protocols.

## V. CONCLUSION

DSDV is a table driven pro-active protocol in which the control overhead is more even though the throughput is high. AODV is a on demand reactive protocol in which the routing overhead is high even though the other QoS

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parameters are appreciable. ZRP is a hybrid protocol which is better than both AODV and DSDV with proper query control mechanism. In optimized ZRP the delay, routing overhead has been reduced and the throughput has been increased by varying number of nodes, pause time and mobility.

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