

Network traffic based assessment of reactive, proactive and hybrid MANET protocols

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Abstract: MANETS are the networks that do not need backbone infrastructure support and are easy to deploy. They are Useful in the conditions when infrastructure is absent, destroyed or impractical. It is a dense collection of different nodes such as laptops, handheld computers, PDA and portable computers and mobile devices. Since many of these small computers operate for hours with battery power, users are free to move without being constrained by wires. To sustain such type of circumstances MANET has been designed. MANET has several characteristics such as, dynamic topologies, bandwidth-constrained, variable capacity links, energy constrained operation and limited physical security. The paper reveals the performance comparison of proactive, reactive and hybrid protocols.

Keywords: AODV, DSDV, MANET, ZRP.

I. Introduction

Mobile Ad hoc Network (MANET) is a collection of wireless mobile nodes that dynamically form a network provisionally without any support of central management. Moreover, Every node in MANET moves randomly making the multi-hop network topology to change arbitrarily at capricious times.[1]. The most popular routing protocols [2] in MANET are AODV (reactive), AODV (reactive), DSDV (proactive)and ZRP (hybrid). Reactive protocols find the routes when they are needed. Proactive protocols are table driven protocols and find routes before they need it. And finally hybrid routing protocols offer an proficient framework that can concurrently draw on the strengths of proactive and reactive routing protocols.[3].In this paper, we concentrate on three MANET routing protocols, AODV, DSDV and ZRP. We consider four parameters to appraise the performance of these routing protocols: number of packets sent, number of packets received, number of packets dropped and throughput. [3].

II. Characteristics Of Manets

1. **Dynamic topology:** Nodes are free to move randomly in any direction thus the topology of the network change impulsively.
2. **Energy constrained operation:** The nodes are moveable devices and are dependent on batteries. This is the most important design consideration of the MANET
3. **Security:** Wireless networks are more prone to threats than wired networks. The increased option of various security attacks like eavesdropping, denial of service should be handled cautiously.
4. **Limited Bandwidth:** The bandwidth offered for wireless networks is commonly low than that of wired networks. The throughput of these networks is normally low due various noises, fading effects[4].

III. Routing Protocols

Two types of routing protocols have been defined for ad hoc networks: Table-driven protocol and On-demand routing protocol. Table driven protocols are proactive in nature and consume extreme network bandwidth. On the other hand, on demand routing protocol exchange routing information only when required[14].The new type of protocol that is introduced is the combination of both the above written types of protocols and due to its mixed characteristics, it is called hybrid routing protocol. They can be summarized as:

1. **Reactive Routing protocol:** Reactive routing protocols try to use additional acknowledgements or a small number of retransmission and, thus, introduce more overhead. Proactive routing protocols occasionally broadcast control messages and remove confined routing entries if they time out. Hence, they do not have this problem. But certainly, the periodically broadcast control messages contribute to overhead. [5]
2. **Proactive Protocols:** Proactive, or table-driven routing protocols. In proactive routing, each node has to retain one or more tables to store routing information, and any alteration in network topology must to be reflected by propagating updates all the way through the network in order to preserve a steady network view. Example of such schemes are the conventional routing schemes: Destination sequenced distance

vector (DSDV). They attempt to maintain consistent, up-to-date routing information of the whole network. It minimizes the delay in communication and allow nodes to swiftly determine which nodes are present or accessible in the network.[6]

3. **Hybrid Protocols:** Combinations of proactive and reactive protocols, where nearby routes (for example, maximum two hops) are kept up-to-date proactively, while far-away routes are set up reactively, are also possible and fall in the category of *hybrid* routing protocols [7]. Hybrid routing protocols are generally more complex in behavior, and hence more complex to implement, than purely reactive or proactive protocols. [15].

IV. Concise Explanation OF AODV, DSDV And Zrp

This paper narrates about the comparative study of three different type of routing protocols i.e. AODV from reactive routing protocol, DSDV from proactive routing protocol and ZRP from hybrid protocol.

1. Adhoc On Demand Distance Vector(AODV):

The Ad hoc On-Demand Distance Vector (AODV) [16, 17] is a reactive routing protocol which allows dynamic, self-starting, multihop routing among participating mobile nodes that desire to set up and preserve an ad hoc network. It allows the communication between two nodes through intermediated nodes, if those two nodes are not within the range of each other. To launch a route, there is route discovery segment in AODV, along which messages can be passed[8].

2. Destination Sequenced Distance vector

DSDV is a table-driven (or proactive) routing protocol and is essentially based on the basic distributed Bellman-Ford routing algorithm [13]. Each node in the network maintains a routing table consisting of the next hop address, routing metric and sequence number for each destination address. To guarantee loop free operation, routing updates from a given node are tagged with a monotonically increasing sequence number to distinguish between stale and new route update messages[9,18].

3. Zone Routing protocol

In addition to proactive and reactive protocols, another class of unicast routing protocols that is introduced is hybrid protocols. The Zone- Based Hierarchical Link State Routing Protocol (ZRP) is an example of hybrid protocol that unites both proactive and reactive approaches thus trying to bring together the advantages of the two approaches. ZRP defines around each node a zone that contains the neighbors within a given number of hops from the node. Proactive and reactive algorithms are used by the node to route packets within and outside the zone, respectively.[10]

V. Simulation Setup

A conclusion section must be included and should indicate clearly the advantages, limitations, and possible applications of the paper. Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extentions.

The whole simulation is carried out using NS-2 simulator. Because it supports large number of routing protocols and offers easy graphical interface. The simulation is performed by varying the simulation areas and by using constant number of nodes. The different simulation areas taken are listed in the table1 below:

Parameter	Value
Protocols	AODV, DSDV and ZRP
Nodes	150
Simulation Time	1000sec.
Traffic Type	High quality GSM voice
Packet Size	1kbps
Simulation Area	5000m*5000m,6000m*6000m,7000m*7000m and 8000m*8000m
Simulator	NS-2.34

Table1: Parameters used in simulation and their corresponding values

VI. Performance Metrics

- 1. Number of packets sent:** During transmission of data in simulated ad hoc network routing traffic is sent by all wireless nodes. In other words it shows that how much traffic is sent by source node to destination node with the help of intermediate node in particular simulation area using MANET routing protocols. [11].
- 2. Number of packets received :**It is basically number of packets received by the destination node from the source node via intermediate nodes for specified simulation area. The number of packets received can be calculated by subtracting number of packets lost and number of packets dropped from the number of packets sent.
- 3. Number of packets dropped:** When one or more packets sent from source to the destination fail to reach their destination and are dropped by the routers in between the transmission due to any error condition in the network, they are considered as dropped packets.
- 4. Throughput:** Throughput is the average rate of successful data packets received at destination. It is usually measured in bits per second (bit/s or bps), and sometimes in data packets per second[12].

VII. Results And Observations

In this paper, an attempt was made to compare three different types of protocols under the same simulation environment. For all the simulations, the same movement models were used, the number of nodes was fixed at 150 but the simulation area is varied and different areas are represented by different scenarios i.e. S1,S2, S3 and S4 for 5000m*5000m, 6000m*6000m, 7000m*7000m and 8000m*8000m respectively.

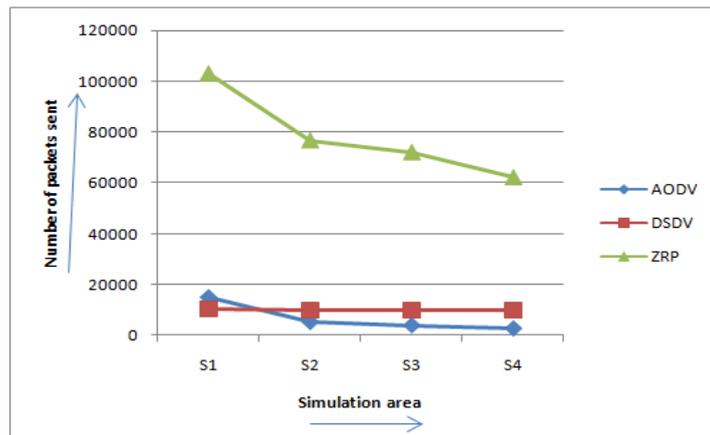


Figure1: Number of packets sent for AODV, DSDV and ZRP for different scenarios

Figure1 explains that number of packets sent for ZRP is much more in comparison to AODV and DSDV. So, it can be used in the areas where maximum number of packets is required to be sent.

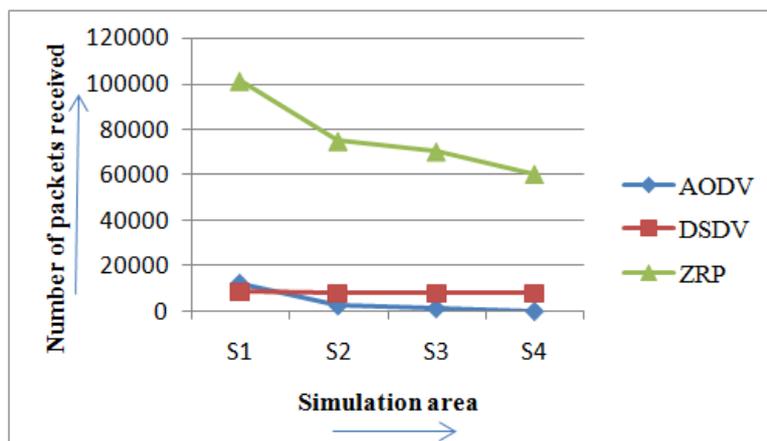


Figure2: Number of packets received for AODV,DSDV and ZRP for different scenarios

Figure2 explains that number of packets sent for ZRP is much more in comparison to AODV and DSDV. So, it can be used in the areas where maximum number of packets are required to be received.

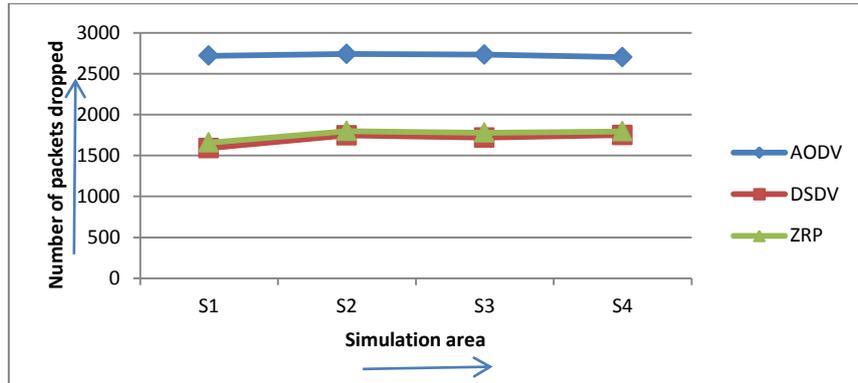


Figure3: Number of packets dropped for AODV, DSDV and ZRP for different scenarios

Figure3 explains that number of packets dropped for AODV is much more in comparison to ZRP and DSDV. So, the case where the number of packets dropped are minimum is DSDV and is counted better in comparison to the other two protocols.

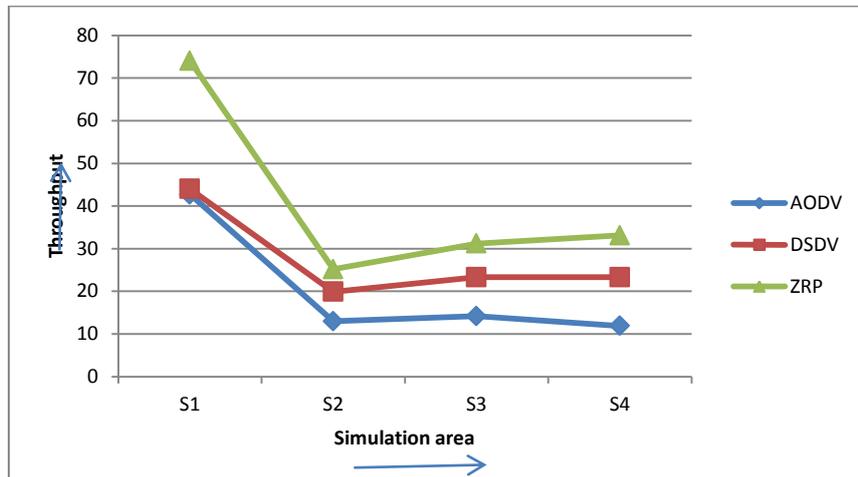


Figure4: Throughput for AODV,DSDV and ZRP for different scenarios

Figure4 explains that throughput is maximum for ZRP in comparison to AODV and DSDV. So, ZRP favors the conditions for throughput.

VIII. Conclusion

This paper concludes that on the basis of parameters used i.e. number of packets sent, number of packets received, number of packets dropped and throughput, ZRP performs very well than AODV and DSDV. So, on the basis of performance metrics used hybrid protocols are considered better than proactive and reactive routing protocols. For future work, the other parameters which are not covered in this paper can be used and also number of nodes which are kept constant can be varied.

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