

## Analysis of Routing Protocols In Mobile Ad-hoc Network Using NS-2

Rahul ,Ravinder Kumar

Department of Computer Science & Engineering  
Shree Siddhivinayak Group Of Institutions,  
Bilaspur, Yamuna Nagar, Haryana, India

### ABSTRACT –

This paper presents the performance comparison of proactive, reactive and hybrid routing protocols. The protocols which we compared are DSR, AODV and ZRP. The metric on which they compared is packet delivery ratio (PDR). The packet delivery ratio is the ratio of received packets to the send packets.

**KEYWORDS-** MANET, Routing Protocols, Throughput and PDR

### INTRODUCTION

Mobile Ad-Hoc Network is a self-configuring wireless system in which mobile nodes can free to move in and out of the network , the nodes can be mobile phone, system etc. MANETs may be used in the areas with little or no communication infrastructure like emergency searches, rescue operations or places, where people wish to quickly share information [1]. There are many research issues in MANET such as routing, power management, bandwidth management, radio interface and security issues [3].

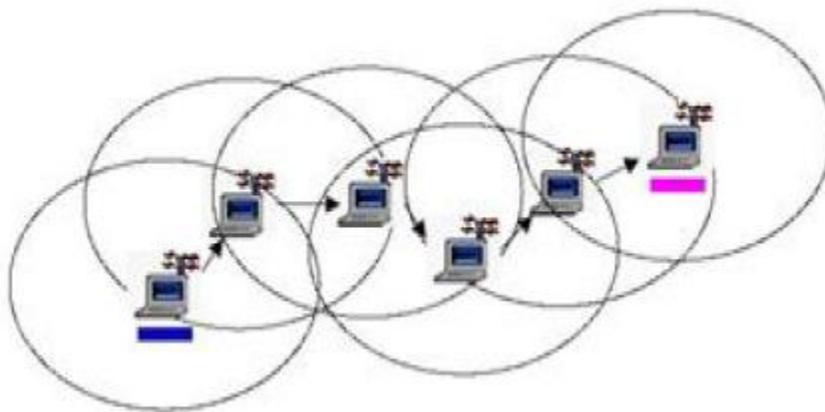


Fig.1 Mobile Ad-hoc Network (adapted from [4])

### CHARACTERISTICS of MANETs

- Correspondence by means of remote means (Nodes can perform the parts of both hosts and switches)
- No concentrated controller and base.

- Inalienable common trust.
- Element system topology.
- Regular routing updates

**FAVORABLE CIRCUMSTANCES AND APPLICATIONS**

The following are the favorable circumstances of Manets:

- They give access to data and administrations
- Regardless of geographic position.
- These systems might be set up at wherever and time.
- Some of the requisitions of Manets are
- Military or police works out.
- Disaster easing operations.
- Mine refer to operations.
- Urgent business meetings

The network simulator ns-2 is commonly used tool for evolution of MANET routing protocols. In this study ns-2.34 is used for all simulation results.

**Ad-hoc Routing Protocols**

Routing protocols are the rules which are used by routers to communicate between nodes (source and destination). In this they don't move the information from source to destination only update the routing tables which contain the information.

There are three types of ad-hoc routing protocols-

- Table-driven routing protocol
- On-demand routing protocol
- Hybrid routing protocol

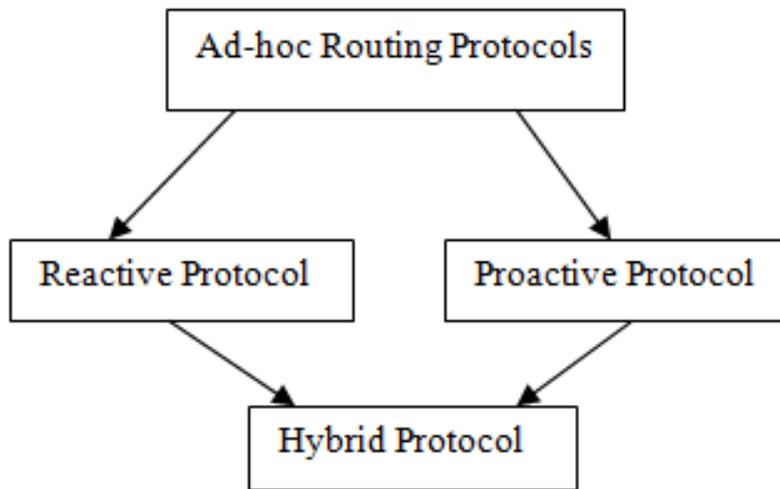


Fig.2 Ad-hoc routing protocols

## CLASSIFICATION OF ROUTING PROTOCOLS

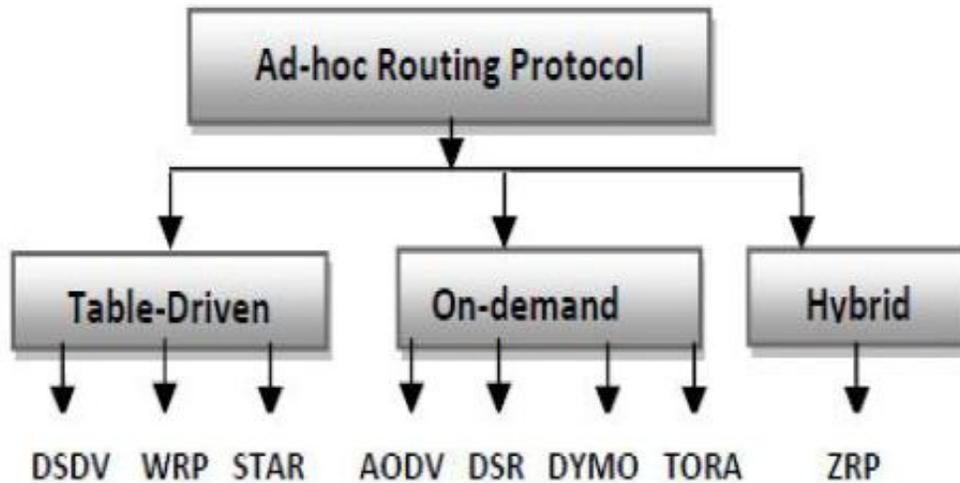


Fig.3 Categorization of ad-hoc routing protocol (adapted from [4])

1. **Table-driven Protocol-** Table-driven routing protocols are also known as proactive routing protocols. In this each node maintain the network topology information in the form of tables. These tables are periodically updates after a regular interval of time. There are different routing protocols under this – for example DSDV, WAR, and OLSR.
2. **On-demand Protocol-** On-demand routing protocols are also known reactive routing protocols. In this route is established on the basis of demand. Under this different routing protocols like- AODV, DSR and TORA.
3. **Hybrid Routing Protocol-** It is the combination of both proactive and reactive routing protocols. It combines the best features of both these protocols. Hybrid protocol is suitable for large networks where large numbers of nodes are present [6]. Example of this protocol is ZRP.

### On-demand Protocol

- i. **DSR (Dynamic Source Routing) Protocol** – DSR is an on-demand routing protocol. It uses the source routing. In this when a source node wants to communicate with the other node and it does not know the route then it starts the route discovery process by flooding the route-request (RREQ) packet [4]. In DSR two main phases- route discovery phase and route maintenance phase. When the destination node receives a route request then it sends back to route reply (RREP) packet to the source node. This route is stored in source node cache for the future communication [4]. The route request contains the sequence number which is generated by the source node to prevent looping. The route error (RERR) packet is used when any link failure/break is occur then this route is remove from the cache.

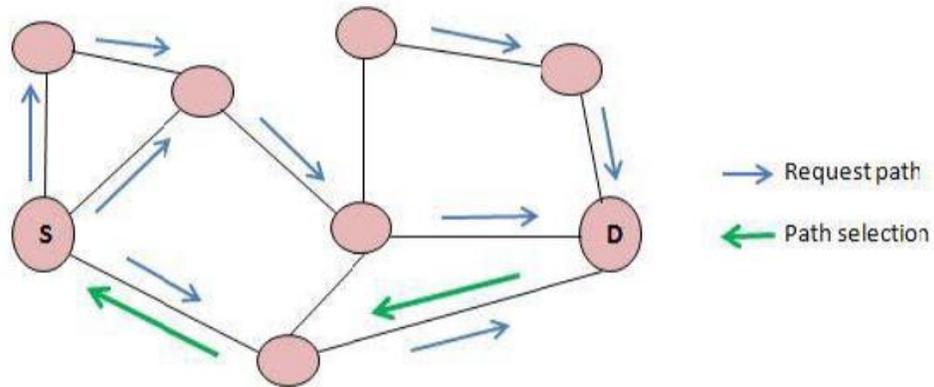


Fig.4 DSR (adapted from [6])

ii. **AODV (Ad-hoc On-demand Distance Vector)** – AODV is a variation of destination sequenced distance vector (DSDV) routing protocol which is collectively based on DSDV and DSR [5]. The ad hoc on demand distance vector (AODV) [7] is based on distance vector routing algorithm. AODV is an on-demand routing protocol. In this route is established when it is required by when it is required by the source node to transmit data packet to the destination. It is beacon-full routing protocol (exchanging of hello packets). The sequence number is also used to prevent routing loops. AODV is capable of both unicast and multicast routing [2]. The route request (RREQ) carries the srcID, destID, source sequence number, destination sequence number, broadcastID and TTL. When the intermediate nodes receive a Route request then it forward or prepare a route-reply (RREP) if it has a valid route to the destination. If any link failure is occur then route-error (RERR) message and it starts a new route discovery process. See in Fig.5

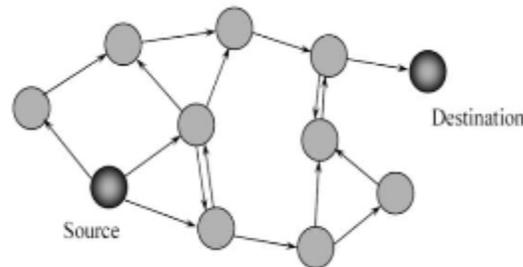


Fig.5 Route Request (RREQ) broadcast flood (adapted from [2])

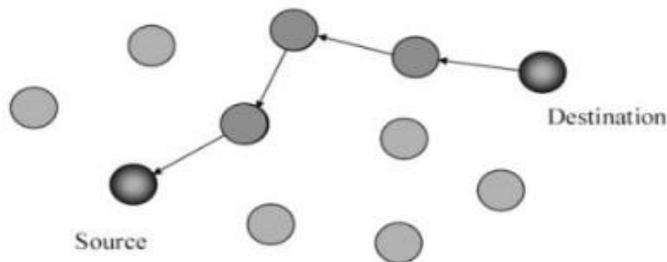


Fig.6 Route Reply (RREP) propagation (adapted from [9])

**HYBRID ROUTING PROTOCOL**

- i. **ZRP (Zone-based Routing Protocol)** – It is hybrid routing protocol, takes the advantages of both (proactive and reactive) routing protocol. In this each node defines its own zone. There are three type of routing protocols used- inter-zone routing protocol (IERP), intra-zone routing protocol (IARP) and border-cast resolution protocol (BRP). The routing process inside the zone is performed by intra-zone routing protocol (IARP) and the process of communication with different zone is done by inter-zone routing protocol (IERP). The border-cast resolution protocol (BRP) is used to send the route-request which is generated by IERP directly to the peripheral nodes.



Fig.7 ZRP - Routing Zone of Node A  $\rho= 2$  (adapted from [2])

**SIMULATION ENVIRONMENT**

The network simulator ns-2 is used to simulate these routing protocols. The performance metrics which are used for simulation –

**Table 1: Simulation Parameters**

Parameters	Value
Routing Protocols	AODV,DSR and ZRP
Nodes	50
Data Traffic	TCP,CBR
Observation Parameters	Packet Received, Packet Lost

**Results and discussion**

Here we calculate number of packets received in our simulation. A high number of packet received means higher performance.

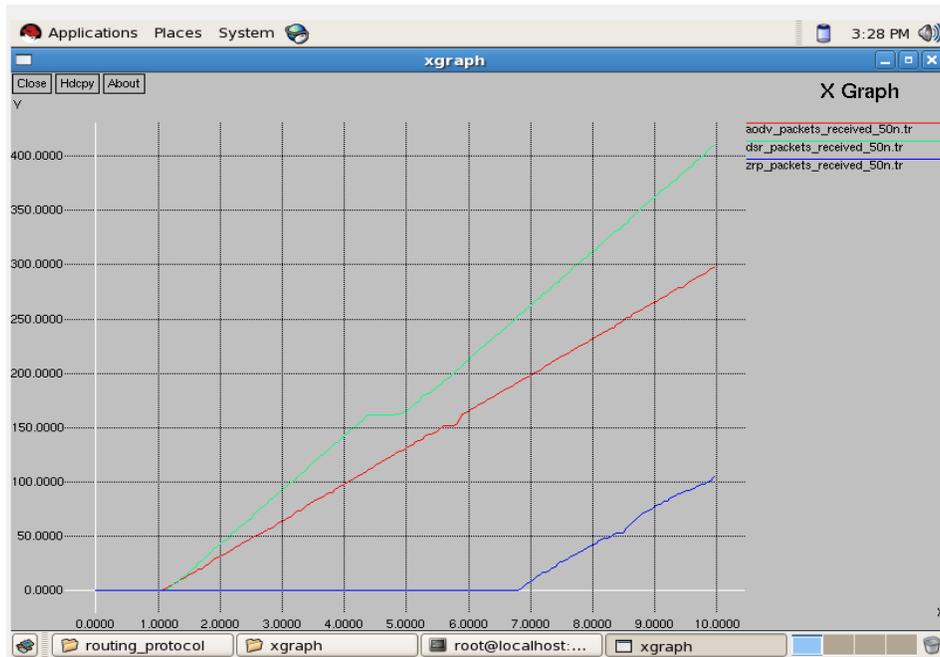


Fig 8: X-graph representing comparison of packet received in simulation for AODV, DSR and ZRP. In fig 8 number of packets recieved in DSR is much higher than other routing protocols. ZRP performs worst in this case.



Fig 9: X-graph representing comparison of packet lost in simulation for AODV, DSR and ZRP. In fig 9, the number of packets lost in ZRP is much higher than other routing protocols. Packets lost is minimum in case of AODV.

## CONCLUSION

In this paper we find out the performance of three topology based routing protocols (both reactive and hybrid ) like DSR, AODV and ZRP for 50 nodes using PDR as metric. The PDR ratio of DSR is high in case of packet received as compared to AODV and ZRP. But packets loss is more in ZRP as compared to DSR and AODV. We have reached to a conclusion that reactive topology based protocols are better than hybrid topology based routing protocols.

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