

Energy Based Analysis of Routing Protocols In Mobile Ad-Hoc Networks

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Abstract: Mobile ad-hoc networks use wireless connections to connect various networks. This can be standard Wi-Fi connection, or any other medium such as a satellite transmission or cellular network. Routing protocols is the term which refers to a formula or protocol used by a router to determine the appropriate path over which data is transmitted [1]. The routing protocol specifies how routers in a network share information with each other and work each other. Most internet protocol network use Ad-hoc On-demand Distance Vector (AODV), Destination Sequence Distance Vector (DSDV), Dynamic Source Routing (DSR). Some of these respective protocols have been studied and their performances have been analyzed focusing on aspects like consumption of energy, packet delivery ratio, life time of Network etc. In this paper, a performance analysis of the DSR (Dynamic Source Routing), AODV (Ad-Hoc on Demand Distance Vector) and DSDV (Destination Sequenced Distance Vector) routing protocols is evaluated on the basis of energy efficiency metrics by varying nodes, connections and pause time. We done the simulations by using NS-2(version NS-2. 34). At last we analyze the best energy saving protocol.

Keywords: Ad-hoc On-demand Distance Vector (AODV), Destination Sequence Distance Vector (DSDV), Dynamic Source Routing (DSR).

1. INTRODUCTION

Mobile Ad Hoc Network (MANET) consists of a collection of mobile nodes. MANET is an infrastructure less network. MANET nodes can communicate with each other directly or indirectly through intermediate nodes. MANETs make them very popular and highly suitable for applications like emergencies, natural disasters and military operations. Mobile phones, laptops and PDAs are the services used as nodes in MANETs. Researchers and industry both are working on the mechanism to prolong the lifetime of these devices. The mechanisms are classified based on whether the routing protocols minimize the active communication energy required to transmit and receive data packets or minimize the energy during inactive periods. Here we use routing protocols. Consumption of energy or power is one of the main while designing routing protocol. There are 3 types of protocols called proactive, reactive, hybrid protocols.

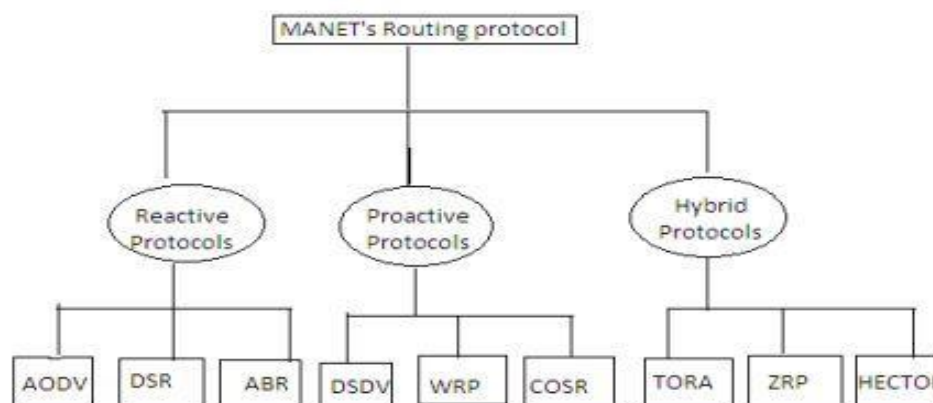


Figure: 1 Routing Protocols in MANET'S

Proactive protocols: It is Table Driven Routing Protocol, and also Called Proactive routing Protocols. Work out routes in the background independent of traffic demands. In this all nodes uses routing information to store the location information of other nodes in the network ^[2] and this information is used to move data among other nodes in the network. These protocols maintain new lists of destinations and their routes by periodically distributing routing tables throughout the network. These protocols having a persistent overview of the network and this can be a drawback as they react to change in the network topology even if no traffic is affected by the topology modification which could create unnecessary overhead. These protocols will use limited resources i.e. power and link bandwidth therefore these are not to be considered an effective routing for Ad hoc Networks. Example of the proactive protocol is DSDV i.e. Destination Source Distance Vector.

Reactive protocols: On Demand Routing Protocol, it is also known as Reactive Protocols, it will create the routes between nodes only when they are required to route data packets. In the network there is no updating of every possible route instead it focuses on routes that are being used or being set up. Whenever a route is required by a particular source node to a destination node for which it does not contain route information, it starts with a route discovery process which goes from one node to the other node until it enter at the destination or a node in between has a route to the destination. These protocols are generally considered systematic, when the route discovery is less frequent than the data transfer because the network traffic caused by the route discovery step is low compared to the total communication bandwidth. This creates On Demand Protocols more suited to large networks with less traffic and low mobility. Route discovery process is used in on Demand routing by flooding the route request (RREQ) packets throughout the network ^[3]. Examples of these protocols are: AODV and DSR.

Hybrid Routing Protocols: Hybrid routing protocol combines Table Driven Routing Protocols with On Demand Routing Protocols. This protocol uses distance vectors for more accurate metrics to establish the best paths to destination networks and when there is a change in the topology of the network we have to describe routing information. Each and every node in the network has its own routing zone, the size of the number of hops which is defined by a zone radius, which is defined by a metric. Each node keeps a data of routing information for its own zone.

2. ROUTING PROTOCOLS

DSDV (Destination Sequence Distance Vector):

Destination Sequence distance Vector routing is one of the example of Proactive Protocol and it is taken from the Routing Information Protocol (RIP). It adds new Attribute & Sequence Number to each route table entry of the RIP. The Selection of Route in DSDV is if a router accepts new information, then it uses the new sequence number ^[4]. If the sequence number is the similar as the one already exist in the table, the route with the preferable metric is used. Old entries are those entries that have not been updated for a while ^[5]. Such type of entries as well as the routes using those nodes as next hops is deleted.

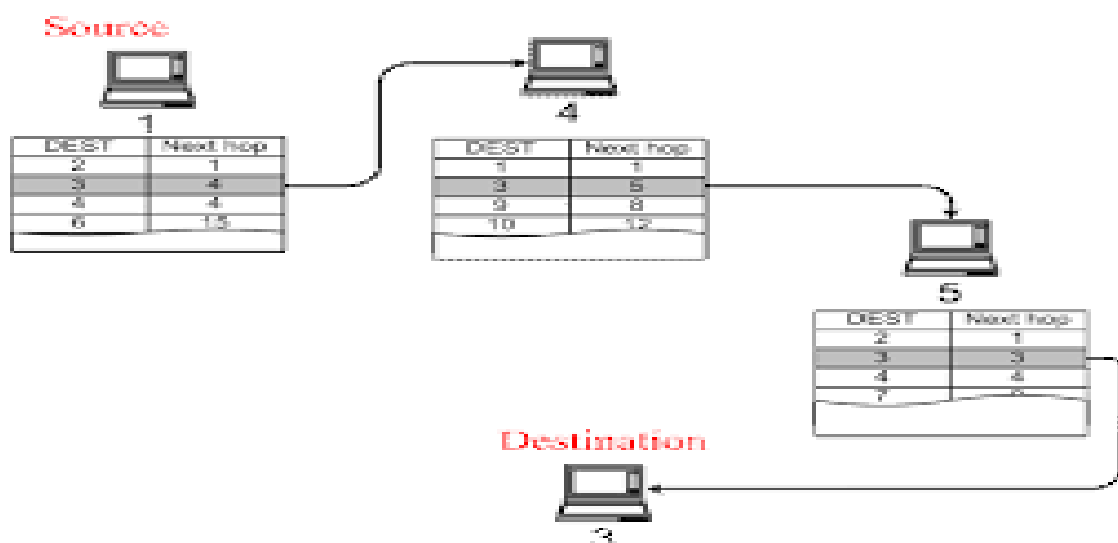


Figure: 2 Routing in DSDV

AODV (Ad-hoc On Demand Distance Vector):

It is a Reactive or on Demand routing protocol and it is Descendant of DSDV. It will Uses bi-directional links. In this protocol Route discovery cycle is used for route finding, and maintenance of active routes. In this Sequence numbers are used for loop prevention and as route freshness criteria and it will also Provides unicast and multicast communication^[6] Whenever routes are not used it will discard i.e. reduces stale routes, Reduces need for route maintenance. It Minimizes number of active routes between an active source and destination, and it Can determine multiple routes between a source and a destination, but implements only a one route, because Difficult to manage multiple routes between same source/destination pair, If one route breaks, it's difficult to know whether other route is available

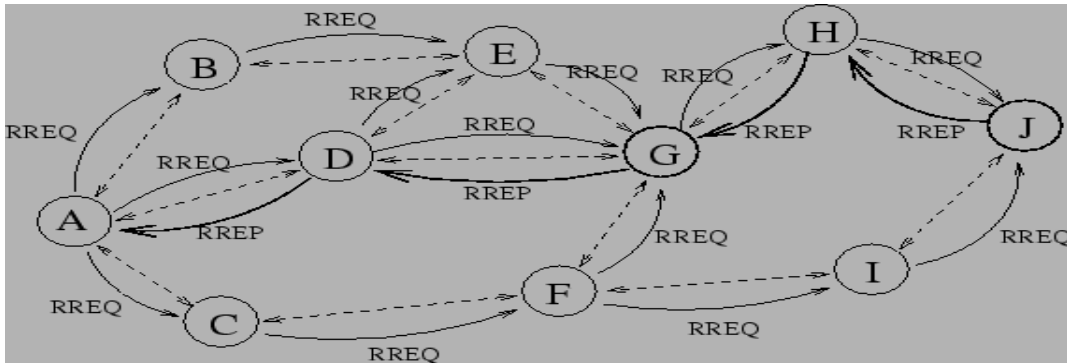
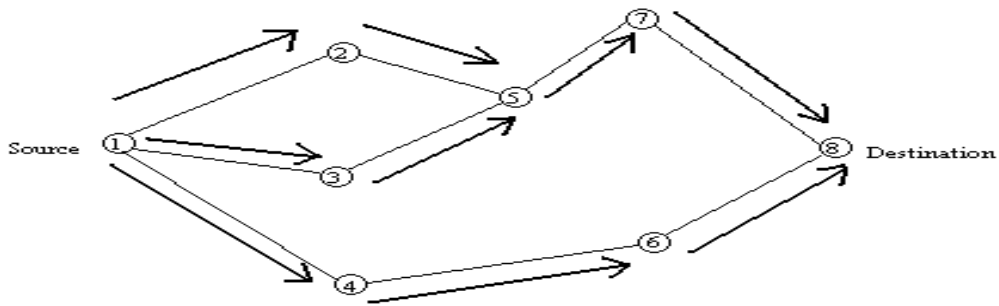


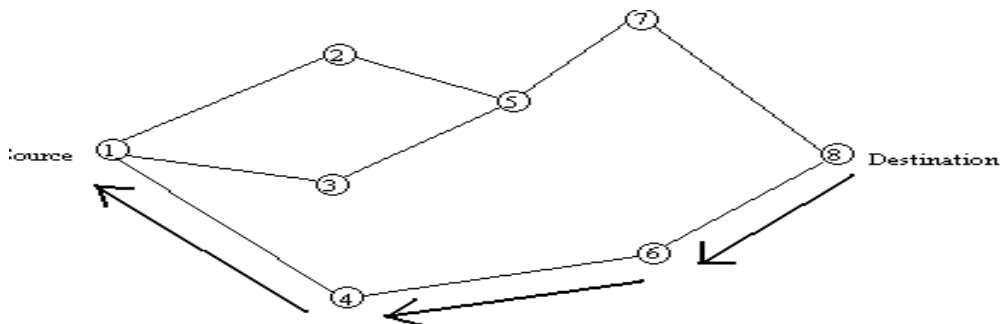
Figure: 3 Routing in AODV

DSR (Dynamic source routing):

DSR is Reactive or On Demand protocol. In this protocol Route discovery cycle is used for route finding. It can Maintenance of active routes only. No regular activity of any form. Utilizes source routing i.e. entire route is part of the header. It will Use of -- Caches to store routes^[7]. This protocol Supports unidirectional links i.e. Asymmetric routes are supported Dynamic Source Routing (DSR).Route discovery is like When node S wants to send a packet to node D, but it doesn't know a route to node D, node S establish a route discovery, Source node S floods Route Request (RREQ), Each RREQ, has sender's address, destination's address, and a individual Request ID decided by the sender, Each node attach own identifier when forwarding RREQ.



(a) Propagation of Route Request (RREQ) Packet



(b) Path taken by the Route Reply (RREP) Packet

Importance of Energy: In this paper Energy placed important role, because in mobile ad-hoc networks the nodes are traversing from source to destination, the energy of particular node will be reduced, in this we are using three protocols for energy consumption. At last we analyze that which protocol is best for reducing energy of a node.

Performance Metrics:

For MANET simulation, there are many performance metrics which are used to analysis the various proposals. In this we have used 3 performance metrics that evaluate routing protocols in all important aspects.

Energy Model: In this we are calculating consume energy and total energy and average energy of particular nodes. These are calculate by using formula is given below

1. $\text{Consume energy} = \text{Initial energy} - \text{Final energy}$

2. $\text{Total energy} += \text{Consume energy}$

3. PERFORMANCE ANALYSIS BASED UPON SIMULATION RESULTS

1. Energy Model:

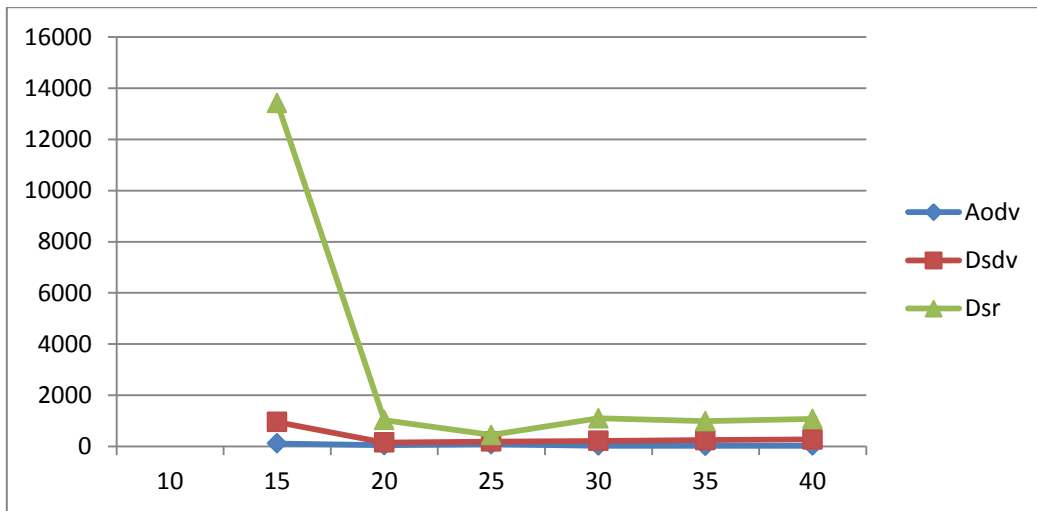


Figure: 5 Average Energy with varying number of nodes.

The above figure shows the clear result of average Energy with varying number of nodes. The performance of AODV is better than DSDV and DSR for less number of nodes and more number of nodes in terms of average energy. DSR performance is poor when compared to DSDV & AODV.

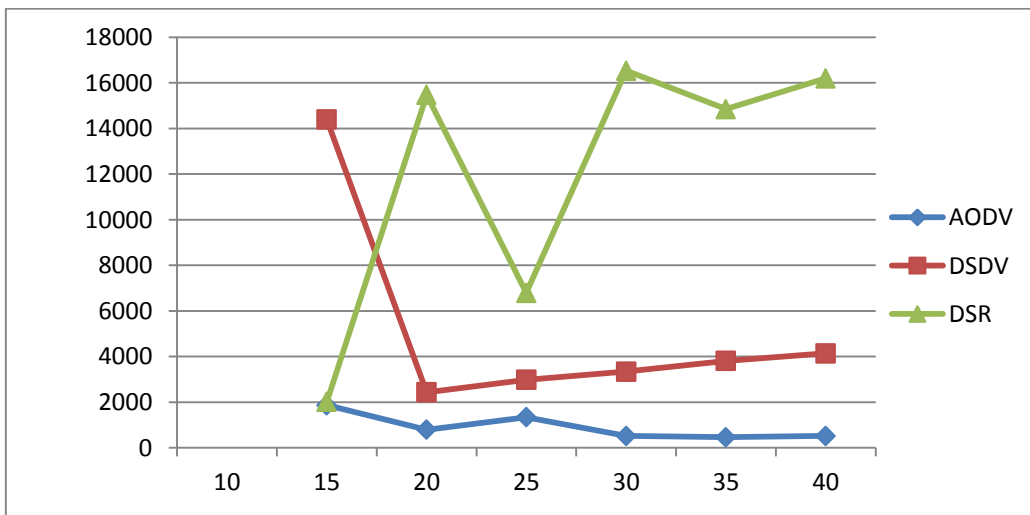


Figure: 6 Total Energy with varying number of nodes.

The above figure shows the clear result of total Energy with varying number of nodes. In this the performance of AODV is better than DSDV and DSR for less number of nodes and more number of nodes in terms of total energy. Here the DSR performance is poor when compared to DSDV & AODV.

4. CONCLUSION OF FUTURE WORK

The main goal of this paper was energy evaluation of MANET routing protocols such as reactive routing protocol, proactive routing protocol. The protocols are DSR, DSDV, and AODV. In this paper, the Energy of MANET routing protocols have been analyzed under the one quantitative performance metrics (Energy evolution). The simulation result shown in the above graph. The Energy based analysis of AODV is better than DSDV & DSR for small number of nodes and large number of nodes. In this paper we choose only quantitative performance metrics.

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REFERENCES

- [1] Tutorial for Simulation-based energy Performance Analysis of MANET Routing Protocols in ns-2 By Joseph.
- [2] D. B. Johnson and D. A. Maltz, "Dynamic Source Routing in Ad hoc Networks, "Mobile Computing".
- [3] Boukerche A, 2004. Performance Evaluation of routing Protocols for Ad Hoc Wireless Networks. Journal on Mobile Networks and Applications: 333–342.
- [4] Abolhasan M, Winsock T, Dutkiewicz E, 2004. A review of routing protocols for mobile ad hoc networks. Ad Hoc Networks 2: 1-22.
- [5] C.E. Perkins and P. Bhagwat, Highly dynamic destination sequenced distance vector routing (DSDV) for mobile computers, in: Proc. of ACM SIGCOMM'94, London, UK (August–September 1994) pp. 234–244.
- [6] C.E. Perkins, E.M. Royer and S.R. Das, Ad hoc on-demand distance vector (AODV) routing, IETF MANET Working Group, Internet-Draft (March 2000).
- [7] D. B. Johnson, D. A. Maltz, and J. Brooch, "DSR: the dynamic source routing protocol for multi-hop wireless ad hoc networks," in Ad Hoc Networking, Addison-Wesley, 2001, pp. 139-172.