Literature Survey of AODV and DSR Reactive Routing Protocols

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ABSTRACT
MANET(mobile ad-hoc networks) is a type of network in which mobile nodes communicate to each other via radio waves. MANET is self configuring, infrastructure-less and robust network that's why nowadays its routing protocols become active research area. In this paper , literature survey of on-demand AODV and DSR routing protocols is to be discussed with their comparison.

Keywords
Ad-hoc network, AODV, DSR, MANET.

1. INTRODUCTION
Ad-hoc network provides wireless communication among nodes in a network and the participated nodes acts as routers also when they are used as intermediate nodes between the source node and the destination node for data transmission beyond the network range. Ad hoc network is the vast and an emerging research area which has created its efficient application known as MANET.

MANET provides rapid deployment, flexibility, robustness, energy efficiency, self administration, fully distribution to the ad-hoc networks. MANET provides various routing protocols to make the communication among nodes effective and efficient. MANET categorizes its routing protocols into three categories:

Table-driven or pro-active routing protocol: In this protocol, each node has its own routing table containing routing information of every other node and these routing tables get updated periodically to maintain latest view of routes in the network. So this consumes more battery power. This is used only when a source node requires a path to the destination node for some data transmission. Some pro-active routing protocols are DSDV, DSF. GSR, WRP,ZRP and many more[8].

On- demand driven or reactive protocols: In this, there are no predefined routing tables to each node. The router or paths are discovered on-demand, when one node requires transmitting some data to another node. So this saves the battery power by discovering routes when needed only Each node has route cache instead of routing table for keeping all information of all latest paths from source to destination. DSR, AODV,TORA, ABR etc are some reactive routing protocols.

Hybrid routing protocols[16]: These are the combination of both proactive and reactive protocols and take benefits of both. Due to this combination routes can be found easily and fastly in the network area. Some hybrid routing protocols are ZRP, Hazy Sighted Link State etc.

Section 2 of this paper gives an overview of MANETs background because for discussing anything , we should have a little knowledge of its root concepts.

Section 3 provides description of AODV and DSR protocols.

Section 4 includes the survey to be done on both AODV and DSR protocol. This describes different works to be done on these routing protocols. Some of the papers also provide their performance comparisons with different parameters and different scenarios.

Section 5 acknowledges the contributors.

Section 6 gives the conclusion of this survey paper.

Section 7 shows the future scope of this survey.

Section 8 gives the description of resources which are used for the whole survey.

2. BACKGROUND
Routing is the process of transferring information from source node to destination node in a network. Routing is categorized as static and dynamic routing. Static routing [5] refers to the routing strategy being stated manually or statically in the router. Static routing maintains a routing table usually written by a network administration. The routing table doesn't depend on whether the destination is active or not. Dynamic routing enables routers to select routes according to real time changing network topologies. It allows creation, maintenance and updation of routing tables dynamically. All this can be done when the destination is active.

Several routing algorithms are to be discovered for ad-hoc networks with their advantages and disadvantages. Among MANET's routing protocols reactive routing protocols are more suitable than proactive one[9]. In reactive routing there are two phases: route discovery and route maintenance. The route discovery phase depends on the route request(RREQ) and route reply(RREP) queries on recycle basis which increases the cost and decreases the performance of network. To decrease the cost two techniques are used that are route caching[6] and local flooding.

3. DESCRIPTION OF REACTIVE PROTOCOLS
3.1 AODV
AODV is on-demand extension of the dynamic sequenced distance vector(DSDV) protocol[2].

Route discovery: When a node finds that there is no available route to its destination then the source node start its route discovery process by broadcasting the RREQ query to all the neighboring nodes. This RREQ query includes source ID, destination ID, a sequence number of the source, a last known sequence number of the destination and max. number of hops the RREQ can be forwarded. Nodes receiving this RREQ query check whether they already have seen this RREQ, if so then they drop the RREQ query. If the RREQ query has not

been seen before then they simply increments the hop count and rebroadcasts the RREQ query. If an intermediate node has the route to the destination having sequenced number equal to or greater than the last sequence number of the destination mentioned in RREQ query, then it generates the RREP query. Otherwise it just stores the information regarding the previous hop from which it receives the RREQ query. This information will be during RREP process. The destination node after receiving RREQ query, copy all the information included in RREQ query and generates a RREP query with updated sequenced number. This RREP query unicast back to the source node. This is the route discovery phase of AODV protocol. Route maintenance phase: The source node sends HELLO messages periodically to destination node to check its route activeness. If a HELLO from an active node is not received within specific time interval, the route is considered unreachable, a route error query (RERR) is broadcast to all nodes and another cycle of RREQ query is broadcasted. As only active routes can be used to send data packets, the route table also contains invalids routes for an extended period of time. These invalid routes can provide information for repairing routes and for later RREQ queries. After some time interval, these invalid routes will be deleted.

3.2 DSR

DSR is Dynamic Source Routing Protocol. This also has two mechanisms: route discovery and route maintenance .When a source node needed to send the data to a destined node then its searches the route in its route cache first and initiate route discovery process by issuing RREQ query and RREP queries .When route failure occur, DSR sends RERR query to source for new route. Unlike AODV, DSR do not require sending of any periodic route maintenance messages. Each data packet sent then carries in its header the complete, ordered list of nodes through which the packet must pass, allowing packet routing to be loop free and avoiding the need for up-to-date routing information in the intermediate nodes[5] . In DSR , the new route discovery overhead can be avoided by using caching strategy of multiple routes to a destination occur.

4. RELATED WORK

Asad Amir Pirzada and Chris McDonald[1], proposed an efficient scheme for securing the AODV routing protocol protects the MANET from various attacks carryout by malicious nodes. This proposed protocol worked in three parts: key exchange, secure routing and data protection. This applies a registration with certification authority constraint on the nodes before joining any network. Then session keys are used by key exchange protocols. For route discovery, keys are used in point –to point encryption and for data packets, keys are used in end to end encryption. To protect the network from attacks done by malicious nodes, some key verification and multilayered enciphering schemes are used.

Kulasekaran A. Sivakumar, Mahalingam Ramkumar [2]proposed some modifications in the SAODV routing protocol to make it more secure and generates SAODV-2 protocol .The SAODV-2 protocol uses proactive maintenance of a secure reliable delivery neighborhood by each node and uses the BE based authentication strategy for mutable fields. To do these modifications a two hop secret is used by just maintaining one hop topology and without the knowledge of the two hop topology.

Alekha Kumar Mishra, Bibhu Dutta Sahoo [3] discuses various security threats for the AODV protocol in MANET . Due to lack of resources, MANETs are facing some challenges therefore the analyzation of such challenges or types of attacks on the protocols is must for making it more efficient and better performance. Security threats discussed in this paper are attacks done by modifications and impersonation, using fabrication, atomic and compound misuses.

FAN Ya-qin, FAN Wen-yong, WANG Lin-zhu[4] analyses the performance of DSR routing protocol using OPNET simulation tool with different sizes of MANET models in which no. of nodes varies. The performance metrics used are average route discovery time, average route length, throughput, data network latency and data loss rate. The result concluded is that DSR is suitable for small scale MANET networks and it is necessary to improve DSR protocol for large scale MANETs.

Amer O. Abu Salem, Ghassan Samara,Tareq Alhmiedat[11], evaluates the performance of DSR routing protocol using NS-2 simulation with parameters including delivery ratio, end to end delay and throughput based on different cache sizes and varying speeds. For this evaluation work was done on 50 nodes in simulation setup with CBR traffic model. In this paper two caches primary and secondary are discussed and it is concluded that greater the cache size, greater will be the end to end delay and vice versa. Based on this result the best cache size evaluated for high speed should not more than 10 for primary cache and 20 for secondary cache. Keeping this in mind a new caching strategy can be developed in future research.

Nidhi Sharma ,R.M. Sharma[5] analyze AODV and DSR protocols and compare their performances on NS-2 simulator, in this paper, they have also evaluate the quality of service with some parameters include packet delivery ratio, average time delay , routing load overhead. These parameters were evaluated upon different network sizes and transmission range of the respective nodes. For evaluation authors setup minimum and maximum 10 and 45 nodes. This provides a result that DSR performs better than AODV in less dense scenarios and AODV outperforms DSR in more dense scenarios. This gives an idea to evaluate these two protocols with different other parameters and varying no. of nodes for future work.

Kumar Prateek , Nimish Arvind , Satish Kumar Alaria[8], compares the performance of DSDV, AODV, and DSR routing protocols for MANET using ns-2 simulation. The AODV and DSR are reactive protocols while DSDV is proactive protocol. Both these reactive protocols performed well in high mobility scenarios than DSDV protocol. High mobility results in highly dynamic topology i.e. frequent route failures and changes. The DSDV protocol fail to respond real time changing network topology. Routing overhead in DSDV protocol remains almost constant. The result explains that DSR has performed better than all other protocols for delivery ratio while AODV outperforms for average delay.

Amith Khandakar[7],also compares DSR,AODV and DSDV protocols using NS-2 simulator and metrics taken are packet delivery factor, end –to- end delay and normalized routing load with varying number of nodes, speed and pause time. It also provides step by step scheme based on assumptions on how to carry out comparative study so that it can be used for future work. This implementation shows that DSDV has slighter higher packet delivery factor than AODV and DSR in all scenarios and DSR has slightly more packet delivery factor than AODV.

Table 1. Difference Between AODV And DSR Routing Protocols

AODV	DSR
More routing overhead	Less routing overhead
Less normalized MAC overhead	More normalized MAC overhead
Combination of DSR and DSDV mechanisms	Based on source routing
It performs better in high mobility	It performs better in low mobility
Route discovery process is frequent	It has less frequent route discovery process
Uses one route per destination.	Uses multiple routes per destination.
Consumes more battery power	Save battery power
Rely on timer based activities	Does not rely on timer based activities
Uses route tables to check available routes to the destination.	Uses routing cache aggressively for route discovering.
Gather limited routing information	Gather large amount of routing information by virtual of SR
It is more controlled, the fresher route is always chosen.	It has an implicit mechanism to expire stale routes in the cache or choose fresher routes.

5. ACKNOWLEDGMENT

I would like to thank to Er. Harpreet Kaur, AP & H.O.D of C.S.E Department, Rayat Bahra Group of Institute, Patiala for having faith in me and allowing me to work with all terms and conditions and advising me time to time about my this survey paper.

6. CONCLUSION

From above survey, this is to be concluded that several authors tried to get result about which protocol among AODV and DSR is better but they find difficult and provide each protocol's different features w.r.t different parameters. Both AODV and DSR routing protocols are good in different scenarios and in different parameters. Research must be carried on to compare these protocols and better results will be provided.

7. FUTURE SCOPE

After reviewing this survey, we will go further by comparing these two most popular protocols of MANET with different parameters in different scenarios and with different simulation environments so that we can provide some more better results.

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