A Review on Difficulties and Challenges in Multi Path Routing of MANET

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ABSTRACT

A Mobile Ad-hoc Network (MANET) refers to a dynamic and wireless network which can be designed without an existing infrastructure as every node serves as a router. This survey investigates multipath routing protocols for mobile ad hoc networks (MANETs). The main objectives of multipath routing protocols are to provide reliable communication and to ensure load balancing as well as to improve quality of service (QoS) of MANETs.. MANET is a self-configuring system of mobile nodes that are connected wirelessly. Every node serves as a sink, as well as a router to send packets. The movement of the nodes is not restricted as they can move in any direction, and they have the ability to get organized into a network. Due to their free and independent movement, they do not have a fixed position. For effective load balancing, congestion control and to improve energy routing matrices, authentic capture of the load at various location of the network is required. This paper discussed the application of multipath routing protocol such as (AOMDV) to support application constraints such as load balancing, energy conservation, reliability and QoS. We also compare performance of existing single path routing protocol such as AODV and DSR with that of multipath routing protocol (AOMDV) for MANET. Multipath routing protocols address issues such as multiple paths discovery and maintaining these paths. Issues, objectives, performances, advantages and disadvantages of these protocols are investigated and summarized.

***Keywords**: AOMDV, Reliability, Load balancing, Energy conservation and QoS.*

1. INTRODUCTION

A Mobile Ad-Hoc Network (MANET) is defined as a group of digital data terminals that has wireless receivers that communicate with each other with needing a fixed network infrastructure [1]. It does not contain any base station. In MANET nodes communicate with each other without the control of any centralized administrator. The designing of the ad-hoc network comes with some challenges. The first challenge is that all MANET nodes such as the source nodes, corresponding destination nodes, and the routing nodes responsible for forwarding traffic between nodes may be mobile. Due to the fact that wireless transmission has a limited range, breakage occurs in the wireless link. MANETs are typically distinguished by their limited power processing and memory resources as well as high degree of mobility. MANETs are described as active, multihop and continuously modifying topology [1]. There are a lot of aspects that reduce the Quality of Service of a MANET. The links within the mobile nodes may exist, or non-exist, in view of the position of the mobile nodes, broadcasting power, and the ambiance. To accomplish packet delivery, one of the popular methods is specifying the multipath routing with the purpose of continuing an amount of dissimilar paths between source and destination Some example of possible uses of MANET includes landslide detection, industrial monitoring, military application, education and commercial use etc.

1.1 Characteristics of MANET are-

1.1.1 Dynamic Topologies: In MANET nodes are free to move randomly with different speeds; thus, the network topology may change arbitrary and at uncertain time. The nodes in the MANET dynamically establish routing among themselves as they travel around, creating their own network.

1.1.2 Multihop routing: When a node tries to send information to other nodes which is out of its communication range, the packet should be forwarded via one or more intermediate nodes.

1.1.3 Energy-constrained Operation: The devices in the modern electronic world totally depend on batteries. The design of the network is to be optimized to conserve the energy consumed by the mobile nodes.

1.1.4 Limited Bandwidth: The bandwidth of the wireless network is limited and the networks are to be optimized to execute with the maximum efficiency with in the limited bandwidth.

1.2 Issues and challenges in designing multipath routing protocols

While designing a multipath routing protocol, the following three major fundamental issues have been addressed in the literature.

1.2.1 How to discover multiple paths: To discover multiple paths from a source to ,the basic route discovery mechanisms used in DSR and AODV protocols need to be modified. In fact, one of the major reasons for using multipath routing is to discover multiple paths that should be node-disjointed or link-disjointed.

How to select a path: Once multiple paths are discovered, a multipath routing protocol should decide how to select a path for sending data packets. If a number of paths are discovered, there is a question to ask how many of these paths should be used, If only a few paths are used, the performance of a multipath routing protocol should be similar to that of the shortest path routing protocol. On the other hand, if all paths are used, there is a chance of selecting an excessively long path, which may adversely affect the performance of a multipath routing protocol [2].

Bandwidth constraint: Variable low capacity links exists as compared to wireless network which are more manageable, to interference, external noise and signal attenuation effects. Scalability: Due to mobility of nodes, scale of ad-hoc

network changing all the time. So scalability is a major issue concerning security. Security mechanism should be capable of handling a large network as well as small ones.

1.2.2 Routing Overhead: In mobile adhoc networks, nodes often change their position within network. So, some stale routes are generated in the routing table which leads to unnecessary routing overhead due to limited battery power, multihop topology is used.

1.2.3 Load balancing: In MANET routing is performed with limited resources, load should be properly distributed in the network. Otherwise, heavily-loaded nodes may make up a bottleneck that lowers the network performances by larger delays and congestion apart from lowering network life time. Load-balancing is a critical challenge in MANET.

1.2.4 Energy conservation: Energy efficient routing protocols play a key role in MANET. Ad hoc On Demand Multipath Distance Vector (AOMDV) routing protocol give an advantage for achieving faster and efficient recovery from node failures.

1.2.5 QoS.:The main objectives of QoS based routing are[2]:Dynamic determination of feasible paths for accommodating the QoS of the given flow under policy constraints such as path cost, provider selection, optimal utilization of resources for improving total networking throughput and graceful performance degradation during overload conditions giving better throughput. [3]

Now a days mobile Ad Hoc Networks are becoming a major immerging technology in mobile computing.In this paper we focus on the evolution of MANET routing techniques emphasis on load balancing.

The remainder of the paper is organized as follows.

Section 2 provides a overview of routing in MANET. Section 3 represents the brief description of single path and multipath routing. Section 4 and 5 gives the working of AODV and AOMDV. Comparison between AODV and AOMDV is defined under the section 6.Section 7 provides a review of related works on multipath routing in MANET. Section 8 concludes the paper.

2. ROUTING:

Routing in the MANETs is a challenging task and has received a tremendous amount of attention from re-searches Routing is the process of information exchange from one node to the other node in a network. Routing is the mechanism of transmit packet towards its destination using most effective route. Efficiency of the path is measured in various metrics like, traffic, number of hops, security, etc. Classification of routing protocol in MANET in Fig 1 can be defined in many ways. Routing protocol can be categorized as Proactive (table driven), Reactive (on demand) and Hybrid depending on the network structure. Classification of routing protocol is shown in figure 1

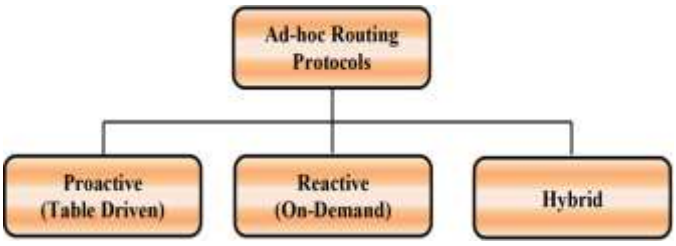

Fig 1 Classification of routing protocol in MANET

2.1 Proactive Routing Protocols

2.1.1 Proactive routing protocol or table driven approach:

This routing protocol maintains a regular and up to date routing information about each and every path by spreading route updating scheme at fixed time intervals. Example of proactive routing protocols are Destination

Sequenced Distance Vector Routing (DSDV), Optimized Link State Routing (OLSR) and Wireless Routing Protocol (WRP).In proactive routing protocols, each node maintains the network topology information in form of routing table by periodically exchanging routing information. These protocol attempts to find shortest paths by using periodic updated information of network topology. Proactive protocol has the advantages of providing lower latency in data delivery. The main disadvantage of this protocol suffers from excessive control overhead that is proportional to the number of nodes in the networks and therefore it is no scalable in MANET [3].

2.1.1.1 DSDV:

Distance vector routing protocol is a hop-by-hop routing protocol. DSDV is the one of the first protocol proposed for MANET. By using hop count as the metric Distance vector protocols determine the route to remote networks. A hop count is defined as the number of times a packet needs to pass through a router to reach a remote destination. Each network node updates a routing table and each routing table consist the next-hop, and number of hops to, all reachable destinations. To maintain the reliability of routing tables in a dynamically varying topology every mobile node periodically transmits updates and Routing Tables are updated. To insure loop-freedom the concept of sequence numbers is used in DSDV to specify the freshness of route. DSDV needs regular update of its routing entries. The main drawback of DSDV is that this protocol is not suitable for highly dynamic networks.

Advantages and drawbacks of DSDV: DSDV protocol guarantees loop free paths. Count to infinity problem is minimized in DSDV [4]. DSDV maintains only the best path instead of maintaining multiple paths to every destination. With this, the amount of space in routing table is reduced.

Drawback of DSDV as-

- Wastage of bandwidth due to inessential advertising of routing information even if there is no change in the network topology.
- DSDV doesn't maintain Multi path Routing.
- It is inconvenient to determine a time delay for the advertisement of paths.
- For larger network DSDV is difficult to maintain the routing table's advertisement. Each and every host in the network should maintain a routing table for advertising. But for larger network this would lead to overhead, which consumes more bandwidth.

2.1.1.2 OLSR:

Optimized link state routing is another routing technique of proactive routing protocol for mobile ad hoc network. The protocol obtains the stability of the link state algorithm and has the benefit of having paths immediately available when required due to its proactive behavior. [5] OLSR reduces the overhead produce by flooding of control traffic by using only selected nodes, called Multi-Point Relays (MPR), to retransmit control messages. MPR is the main idea for the OLSR protocol to minimize the information exchange overhead. OLSR uses MPR to reduce the number of the host which transmits the information throughout the network. The MPR is a host's one hop neighbor which may forward its messages. The MPR set of host is kept small in order for the protocol to be efficient. In OLSR only the MPRs can forward the data throughout the network. [5]

Advantages and drawback of OLSR-

Another Table driven routing protocol is OLSR. To manage its routing process, OLSR does not require central administrative system. The proactive Features of the protocol produce that the protocol has all the routing instruction to all shared hosts in the network. However, as a limitation of OLSR protocol needs that each host periodic sends the updated topology information throughout the entire network, this improve the protocols bandwidth usage. However the flooding is minimized by the multipoint relays, which are only, enable to forward the topological messages.

2.2 Reactive Routing Protocols

This routing protocol establishes the route for transmission only when there is a demand. Example of reactive routing protocols are Ad Hoc On-Demand Distance Vector (AODV), Dynamic Source Routing (DSR) and Associativity Based Routing (ABR). These protocols perform a route discovery operation between the source and desire destination when the source needs to send a packet and route to the destination is not known. In Reactive (on-demand) approach, a route is established only when it is required and hence the need to find routes to all other nodes in the network as required by table driven approach is eliminated. So that the advantage of On-demand operation is that it usually has a much lower average routing over head in comparison to the proactive protocol. The disadvantage of this protocol is that the route maintenance mechanism does not locally repair a broken link. The different types of on-demand protocol are Dynamic source routing (DSR), ad-hoc on-demand distance vector (AODV), and ad-hoc on-demand multipath distance vector (AOMDV). [6]

2.2.1 Dynamic Source Routing (DSR)

Dynamic Source Routing is a reactive protocol designed to restrict the bandwidth consumed by control packets in MANET by eliminating the periodic table update messages required in the table driven approach. In DSR each node maintains a route cache with entries that are continuously updated as a node learns new route. In DSR no periodic control messages like AODV. The DSR routing protocol uses two major mechanisms to discover routes and maintain the route information from one node to another used. [6, 7]

DSR is a reactive or on-demand routing protocol. This protocol has been designed to reduce the bandwidth wasted via the control packets in wireless networks and that via deleting the periodic table-update messages required in the table-driven approach [7]. In DSR protocol, there is no need for network infrastructure or administration, due to these networks fully self-configured and organized. The source routing is a method which the source packet defines the complete sequence of nodes through which to forward the data packets. The source routing does not need to keep the routing information via the intermediate hops. Figure 3 shows the advantages and disadvantages of DSR protocol [8].

2.2.2 Destination Sequenced Distance Vector (DSDV)

DSDV is one of the most widely known proactive or table-driven routing protocols for MANETs [9]. The routing algorithm of DSDV is depended on the numeral of hops to arrive at the destination node. To transmit the data packets among the nodes in the network, DSDV protocol utilizing routing tables which are stored in every node. DSDV protocol has three major characteristics which are: decreasing the high routing overhead, solve the "count to infinity" problem and avert the loops. Each mobile node contains a table of routing information which includes all the routes to the destinations and another information [9]. Figure 3 shows the advantages and disadvantages of DSDV protocol. Fig. 3. The Advantages and Disadvantages of AODV, DSR and DSDV Routing Protocols.

2.2.3 Ad-hoc on demand distance vector routing (AODV)

AODV is an on demand distance vector routing protocol. AODV is used for mobile ad hoc network for single path routing, in AODV routes are decided only when required. In AODV route are established and maintain by using dynamic, self starting, multihop behavior of AODV. We will discuss about AODV further in section 4.

2.3 Hybrid Protocol

This protocol combines the benefits of proactive and reactive routing. Hybrid Routing, commonly referred to as balanced-hybrid routing, protocol which works by sharing its knowledge of the entire network with its neighbors and link-state routing which works by having the routers tell every router on the network about its closest neighbors. An example of such a protocol is the Zone Routing Protocol (ZRP).

Protocols	Advantages	Disadvantages
AODV	In AODV, route discovery process is in on demand, which is more efficient in dynamic nature of mobile ad-hoc network.	Due to on demand manner, it won't check route in periodic interval so transmission of data after discover the rote is taking some more delay.
DSR	The route is created only when it is required and the nodes utilize the route cache information efficiently to reduce the overhead and collision.	The route maintenance mechanism does not locally repair a broken link. The delay is higher than in table-driven protocols.
DSDV	DSDV was one of the early algorithms available. It is quite suitable for creating ad hoc networks with small number of nodes.	DSDV requires a regular update of its routing tables, which uses up battery power and a small amount of bandwidth.

Fig. 3. The Advantages and Disadvantages of AODV, DSR and DSDV Routing Protocols.

3. SINGLE PATH AND MULTIPATH ROUTING

Single path routing of ad hoc routing protocol is classified into two classes Table based and On demand protocols. In Table based known as proactive routing each node keeps a routing table containing routes to all nodes in the network. Nodes must periodically interchange messages with routing information to maintain routing table up to date.[5] Thus, paths between nodes are stored and computed even when they are not required. MANET has a dynamic nature, because of dynamic behavior; a considerable number of routing messages may have to be exchanged in order to maintain routing information correct. [10] In on demand or reactive routing protocol nodes compute routes only when they are required. Thus reactive protocols are more scalable to dynamic, large networks. Whenever a node required a route to another node, it originates a route discovery process to find a route. Reactive routing consists of two main phases:

3.1 Route discovery: Route discovery process is used for discover a path between two nodes.

3.2 Route maintenance: Route maintenance is process used for maintaining a broken route or discovering the new route, whenever a route failure is occurs. In a uni-path routing infrastructure, only a single path lies between any two networks in the internetwork. While this may simplify the packet flow paths and the routing tables, single-path internetworks are not fault tolerant. A fault can be recognized with a dynamic router, but the networks across the failure are unavailable for the duration of the fault. A downed router or a downed link must be brought back up before packets can be delivered successfully across the downed link or router. In MANET two of the most widely used protocol are Ad-hoc On-demand Distance Vector (AODV) and Dynamic Source Routing (DSR).Both are reactive routing protocol and the unipath or single path routing algorithm.[10]

In a multipath routing frame work, multiple routes exist between networks in the internetwork. When dynamic routing is used, multipath internetworks are fault tolerant and some routing protocols, such as OSPF, can balance the load of network traffic across multiple paths with the same metric value. Multipath internetworks, however, can be more complex to configure and can have a higher probability of routing loops during convergence when using distance vector–based routing protocols. Multipath routing consists of discovering multiple paths between a source and destination node. These multiple paths between source and destination node pairs can be used to reimburse for the dynamic and unpredictable nature of ad hoc networks.

Advantages of multipath routing- Multiple path routing provides fault-tolerance, load balancing and higher aggregate bandwidth. Load balancing can be achieved by spreading the traffic along multiple paths. This can reduce bottlenecks and congestion. Multipath routing algorithm also consists of two main components:

4. AODV (Ad-hoc on demand distance vector routing)

AODV is a kind of reactive protocols. Its methodology is hop-to-hop routing. node establishes the Route Request (RREQ) if it wants to know the route to a particular destination. Then the intermediate nodes forward the route request and at the same time, these intermediate nodes create a reverse route to the destination [11]. When the node receives the request that has the route to the destination, it establishes a Route Reply (RREP) which includes numeral of hops which are required to arrive the destination. Each node that cooperates in sending this reply to the source node, it creates a forward route to the destination [11]. Figure 2 shows the routing of RREQ and RREP in AODV protocol. This route that has been established from source to destination is a hop-by-hop case. Figure 3 shows the advantages and disadvantages of AODV routing protocol.

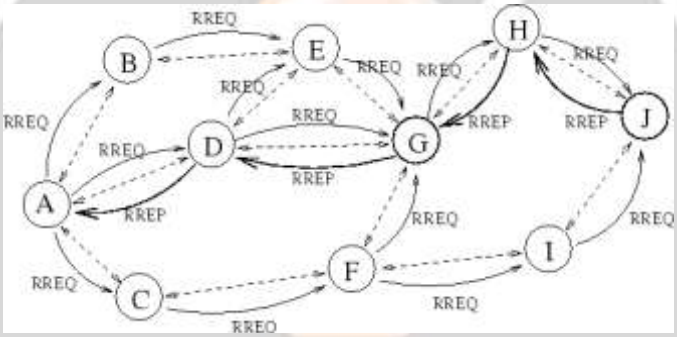

Fig .2 Route discovery

In AODV route discovery process is done initial state, source node does not have path for required destination. Whenever a source has data to send to an unknown destination, it broadcast a Route request (RREQ) packet for that destination. After receiving RREQ packet if a node is the destination node

It will reply back to the source node by Route reply (RREP) otherwise, it will rebroadcast the RREQ packet to its immediate neighbor and update its routing table and create a reverse route or path entry in its routing table for both sender and receiver. This process is repeat until a route to the destination node is found, when a node is found source can send data using the newly formed route [10,11]. When available route is not found for destination, a route request packet is broadcast to entire network. The RREQ has the following fields:

Source Address	Request ID	Source Sequence number	Destination address	Destination sequence number	Hop count

To initiate route discovery the source node creates RREQ in which the node places the

- Source address
- IP address of the destination
- Last unknown sequence number
- Its own IP address
- Current sequence no
- Hop count

In **Route discovery** process there are multiple copies of RREQ and RREP packets. If multiple RREP are received by the source node, then the path is selected which have shortest hop count. Duplicate copies of RREQ are immediately discarded

In **Route maintenance** is done with the help of route error (RERR) packets. When a neighboring node detects a

link failure, it originates a RERR packet. The RERR packets broadcast towards all traffic sources having a route via the broken link and remove all broken routes on the way. A source node on receiving the RERR packets, it originates a new route discovery if it still needs the route. [9] As data shows from the source to destination, each node along the route updates the timers associated with the routes to the source and destination, and maintains the routes in the routing table. If a route is not used for some period of time, a node cannot be sure whether the route is still valid, the nodes removes the routes from its routing table. [12]

5. AOMDV (Ad-hoc on demand multiple distance vector routing protocol)

Ad-hoc on demand multiple distance vector routing protocol (AOMDV) is an extension to the AODV. AOMDV is a reactive protocol, based on multiple path. AOMDV is used for computing multiple loop free and disjoint paths. This protocol uses hop by hop routing approach to carry out transmission [12]. In AOMDV every node has an unique IP address (UID) and all links are bi-directional, that is link exist between a node k to j if and only if there is link from j to k. In AOMDV when RREQ packets broadcast from source node to destination it creates multiple paths both at intermediate nodes as well as the destination nodes.

The multiple paths created by RREQ packet is further used by RREPs as traverse these reverse path back to source at the destination and intermediate nodes. Note that AOMDV also provided intermediate node with alternative path as they are found to be useful in reducing route discovery frequency [13]. AOMDV route update rules, applied locally at every node, play a key role in maintaining loop-freedom and disjointness properties. AOMDV can be used to find node disjoint or link disjoint routes.

5.1 Loop-freedom- The routing information for each destination contain a list of the next-hops along with the corresponding hop Counts where next hops have the same sequence number and in keeping track of a route. For each destination a node maintains the advertised hop count, which is defined as the maximum hop count for all the paths, which is used for sending route advertisements of the destination. Each duplicate route advertisement received by a node may define an alternate path to the destination. Loop freedom is assertive for a node by accepting all alternating paths to destination if it has a less hop count as compare to advertised hop count for that destination[13]. Based on the above theory, we calculate below a set of sufficient condition for loop freedom. These conditions allow multiple paths to be maintained at a node for a destination.

Sequence number rule:- Sequence numbers, indicating the freshness of routing information, have been widely used to guarantee loop freedom. AODV uses sequence number to avoid routing loops .Previous to broadcasting RREQ, RREP and RERR message, AODV must increment its sequence number. Each route maintains a sequence number, with higher sequence numbers indicating "fresher" route. When more than one routes are available to a destination node, the route with the highest sequence number will be used. Those packets which have lower sequence number will be dropped. [12,13] The AOMDV protocol accepting alternate route with lower hop counts these guarantees loop freedom. Figure 2 illustrate this problem using simple. In figure, node D is the destination and F has two paths to D a five hop path via J (F-J-K-L-M-D) and direct one hop path (F-D).Suppose that I advertise the path (F-J-K-L-M-D) to node G and then path (F-D) to node H. Then both G and H have a path to D through F, but each of them has different hop count. Later, if F obtains a four hop path to D from I (I-H-F-D), F cannot determine whether I is upstream or downstream to itself as only the hop count information is included in the route advertisement. So F forms a path via I resulting in a loop. This situation occurs because a node F here advertises a shorter path (F-D) when it also has an alternate longer path (F-J-K-L-M-D). [13]

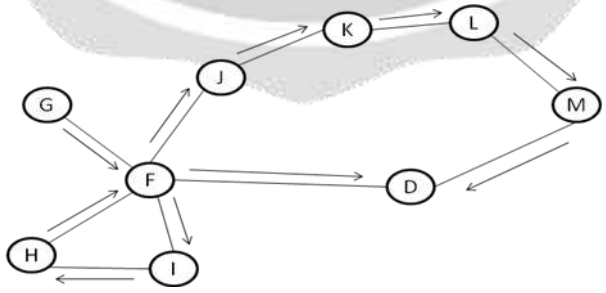

Fig 3 Example of AOMDV protocol alternate route guarantees loop freedom

5.2 Disjoint path

Apart from maintaining multiple loop- free paths, AOMDV try to find disjoint alternate path for improving fault tolerance using multiple paths. Multipath routing protocols can attempt to find node disjoint, link disjoint, or non-disjoint routes. Node disjoint routes, also known as totally disjoint routes,

have no nodes or links in common. Link disjoint routes have no links in common, but may have nodes in common. Non-disjoint routes can have nodes and links in common. AOMDV works on finding link-disjoint or

node-disjoint routes. For finding node-disjoint routes, each node does not immediately reject duplicate RREQs and each RREQs arriving via a different neighbor of the source defines a node-disjoint path. This is mainly due to lake of broadcast of duplicate RREQs by node, and any two RREQs arriving at an intermediate node through a different neighbor of the source could not have traversed the same node. The main advantage of AOMDV is that it permits intermediate nodes to reply to RREQs, while still selecting disjoint paths. However, it has more overheads during route discovery due to increased flooding and since it is a multipath routing protocol, the replies are also in longer overhead.

5.3 Load Balancing and Congestion: - The main objective of load balancing is to redirect traffic from route which is currently congested. To enhanced the performance of MANET, load balancing technique is used which is significant tool. With the help of load balancing technique the network can minimize the traffic congestion and imbalance of the load. In MANET load balancing is necessary for insure Quality of service (QoS).Load balancing and congestion control are difficult task in MANET. Both these are very necessary to guaranteed QoS for time sensitive application. Multipath routing protocol can enhance load balancing by scattering the traffic along multiple paths. [14]

6. Comparison between AODV and AOMDV

In this section, we compare the performance of two types of On demand routing protocols- Ad-hoc On-demand Distance Vector (AODV) routing protocol, On-demand Multipath Distance Vector (AOMDV) routing protocol. AODV is single path routing protocol whereas AOMDV is multipath routing protocol.

6.1 No. of Packets Dropped-

In AODV, the number of packet dropped is more than the no of packet dropped in AOMDV. Because the reason behind that is, AODV is unipath routing protocol, where the packet will not be delivered to the final destination, if a link is broken and the packet will get dropped. AOMDV is multipath routing protocol even on the failure of the current link the network will discover an alternate path for source to destination node and have greater chance of packet delivery. Hence ratio of dropped packet is minimized.

6.2 Packet delivery fraction

AOMDV has grater pdf value when compared to AODV for each set of connection. It is because mean while the time waited at anode, AOMDV can find an alternate route, if the current link has broken whereas AODV become purposeless at that point.[15].

6.3 Routing Overhead

Because of AODV is a single path routing protocol, once a link breaks the packet delivery along that route stops. Whereas AOMDV is a multipath routing protocol and it discover for an alternate route, if the current path breaks by flooding the network with RREQ packets. Hence AOMDV suffer more routing overhead than AODV.

7. RELATED WORK

Load balancing congestion control in MANET [3] has significant research awareness. In [1] authors develop a new on demand multipath routing protocol named as ad hoc on demand multipath distance vector routing protocol (AOMDV). AOMDV has three major features compared other on demand multipath protocol. First it does not have high inter-nodal coordination overheads like some other protocol. Second, it guaranteed disjointness of alternate routes through distributed computation without the use of source routing. Ultimately AOMDV computes alternate path with minimal overheads over AODV. AOMDV assure that the set of multiple paths are loop-free and disjoint.

In [6] paper author analyzed AODV routing protocol, in which AODV transmits network information only on demand. The route maintenance is precise proactive part. The AODV is loop free and avoid the counting to infinity problem by using sequence number. AODV offers transformation to mobile networks with low processing and low bandwidth utilization. Limitation of AODV comprises its latency and scalability.

Seyed et al. [18] have presented a multi-rate multicast congestion control scheme for MANETs in order to achieve high fairness with TCP, robustness against misbehaving receivers, and traffic stability, without changing the queuing, scheduling, or forwarding policies of existing networks. This scheme only introduces very limited control traffic overhead by the on-the-spot information collection and rate control**.**

Mohammad et al. [3] basically aimed at assessing the quality of routing protocols in MANET by implementing several parameters. In a study by Mueen et al. [8], the AODV and AOMDV were compared through the use of evaluation criteria of simulation time and some nodes.

In another study, the authors **Y. Harold et al.** [7] investigated how the performances of DSR and AODV are affected by the variation in speed and pause time. Similarly, in a study by **Fahad Taha et al.** [2], the effect of the number of nodes on the performance of AOMDV and DSR was studied. Consequently, this paper, an attempt is made to evaluate the performance of the AOMDV and DSR routing protocols in MANET environment. The methodology used in this paper is the same as the one used in [11], [12]. The methodology is used in describing the behavior of the routing protocols in different scenarios. The major contribution of this paper is considering the factors of some nodes and network size for implementing and assessing the AOMDV and DRS in a MANET environment.

8. CONCLUISION

In this paper we studied the performances of AODV, AOMDV, DSDV and DSR routing protocol on various parameters for example load balancing, Load-balanced congestion adaptive routing. In such routing [7], two metrics (traffic load density and life time associated with a routing path) are used to determine the congestion status and weakest node of the route. The route with low traffic load density and maximum life time is selected for packet transmission. energy conservation and QoS for improving time delay, network throughput and performance of network. We also studied a Congestion control in multipath routing protocol can ensure load balancing and improve QoS by addressing multiple paths discovery and maintaining these paths. The congestion control mechanism in [8] detects the congestion in candidate node by using the arrival rate and the outgoing rate. The load balancing technique [8] also distributes the traffic over multiple paths by using gateway nodes, which are selected by using path cost and link cost. congestion adaptive multipath routing protocol to increase throughput and avoid congestions in MANET. DSDV routing takes more bandwidth , because of the continuous transmitting of routing updates while compared with AODV, doesn't maintain any routing table at nodes. AODV is best for general mobile ad hoc networks as it takes less bandwidth and minimum overhead. We concluded that AOMDV gives better performance as compared to AODV. AOMDV is able to efficiently cope with mobility-induced route failure.

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