A Review on Multipath Routing strategy to handle link failure in AODV protocol for MANET

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Abstract— **A mobile ad hoc network (MANET) is a continuously self-configuring, infrastructure-less network of mobile devices connected wirelessly. The biggest challenge among them is routing. Routing is the process of path in a network along which to send data packets. Routing in the MANETs is different from conventional infrastructure network since the nodes not only act as end devices but also act as routers. The absence of any infrastructure for security and ever changing topology of the network makes the routing protocols vulnerable to variety of attacks. Due to this, an improved algorithm is proposed to reduce current recovery time by improving reliability of system. In this paper, modified optimal path will be provided in the existing AODV routing protocol to deal with congestion and ensure secure routing in mobile Adhoc network. All simulations will be done in MATLAB.**

Keywords— **MANET, Proactive Protocol, Reactive Protocol**

I. INTRODUCTION

A mobile ad hoc network (often referred to as MANET)is the one consisting of a collection of mobile nodes (MNs)sharing a wireless channel without any centralized controller established communication backbone. Ad hoc networks have no fixed routers; all nodes are capable of movement and can be connected dynamically in an arbitrary manner. Usually, these nodes act as both end systems and routers at the same time [1].

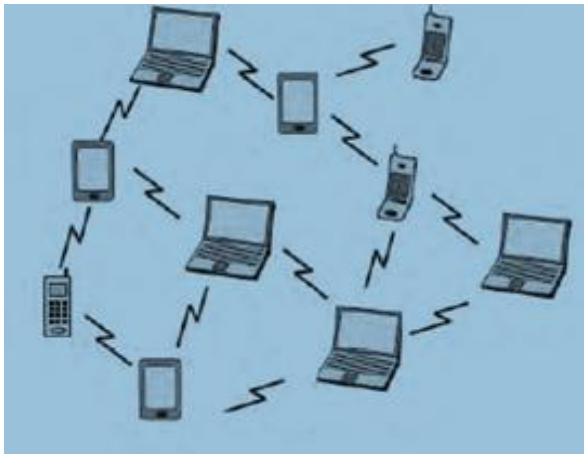

Fig 1 Mobile ad hoc network

We can divide the life cycle of mobile ad hoc network into first, second and third generation. Present ad hoc network are considered the third generation. The first generation of ad hoc network can be traced back to 1970's. In 1970's, these are called Packet Radio Network (PRNET). PRNET uses the combination of Areal Location of Hazardous Atmospheres and Carrier Sense Multiple Access for multiple access and distance vector routing. MANET is born in Internet Engineering Task Force (IETF) who worked to standardized routing protocols for MANET and gives rise to the development of various mobile devices like PDA's , palmtops, notebooks, etc. Ad hoc network benefited by The Development of Standard IEEE 802.11 (i.e. WLAN's).Some other standards like Bluetooth and HIPERLAN are also developed that provide benefits to the MANET.
The rapid development in ad hoc technology is widely used in portable computing such as laptop, mobile phone used to access the web services, telephone calls when the user are in travelling. The advantages of an ad hoc network include:

- Routing protocols use metrics to evaluate what path Separation from central network administration.
- Self-configuring nodes are also routers.
- Self-healing through continuous re-configuration.
- Scalability incorporates the addition of more nodes.
- Mobility allows ad hoc networks created on the fly in any situation where there are multiple wireless devices.
- Flexible ad hoc can be temporarily setup at anytime, in any place.
- Lower getting-started costs due to decentralized administration.
- The nodes in ad hoc network need not rely on any hardware and software. So, it can be connected and communicated quickly.

II. CLASSIFICATION OF MANET PROTOCOL

A metric is a standard of measurement; such as path bandwidth, reliability, delay, current load on that path etc; that is used by routing algorithms to determine the optimal path to a destination. There are many types of ad-hoc routing protocols are available such as proactive routing protocol, reactive routing protocol, hybrid routing protocol for routing

in MANET. The figure 1shows the classification of ad-hoc routing protocol.

The expected properties of routing protocols are:

- A routing protocol should be aware of Quality of Service (QoS).
- The routing protocol should be power efficient.

A. Proactive Routing Protocol:

These types of protocols are called table driven protocols in which, the route to all the nodes is maintained in routing table. Packets are transferred over the predefined route specified in the routing table. In this scheme, the packet forwarding is done faster but the routing overhead is greater because all the routes have to be defined before transferring the packets. Proactive protocols have lower latency because all the routes are maintained at all the times. Example protocols: DSDV, OLSR (Optimized Link State Routing).

B. Reactive Routing Protocol:

These types of protocols are also called as On Demand Routing Protocols where the routes are not predefined for routing. A Source node calls for the route discovery phase to determine a new route whenever a transmission is needed. This route discovery mechanism is based on a flooding algorithm which employs on the technique that a node just broadcasts the packet to all of its neighbours and intermediate nodes just forward that packet to their neighbors. This is a repetitive technique until it reaches the destination. Reactive techniques have smaller routing overheads but higher latency. Example Protocols: DSR, AODV.

C. Hybrid protocols

Hybrid protocols are the combinations of reactive and proactive protocols and takes advantages of these two protocols and as a result, routes are found quickly in the routing zone. Example Protocol: ZRP (Zone Routing Protocol)

III. AODV PROTOCOL

Ad hoc in demand distance vector (AODV), find the route only when there is data to be transmitted hence, generate low control traffic and routing overhead. .AODV Ad-hoc On demand Distance Vector (AODV) [2] routing protocol is a reactive protocol or on-demand protocol that establishes the route only on demand and always search for the shortest path irrespective of reliability of the path. It does not have information about other nodes until any communication is needed. AODV is a combination of on-demand and distance vector i.e. hop-to-hop routing methodology. When a node needs to know a route to a specific destination it creates a ROUTE REQUEST. Next the route request is forwarded by intermediate nodes which also create a reverse route for itself for destination. When the request reaches a node with route to destination it creates again a REPLY which contains the number of hops that are require to reach the destination. All nodes that participate in forwarding this reply to the source node create a forward route to destination. This route created from each node from source to destination is a hop-by-hop state and not the entire route as in source routing. . In network communications, using pre-computed backup paths provide a solution when failure or loss of connectivity occurs. Pre-computed route give good performances in high-density conditions in some cases. With ad-hoc mobile networks, mobile nodes in the same range can exchange messages with their neighbors. Through these messages, the routing protocol will begin to construct the routing table between source and destination. Neighborhood is represented by a set of nodes that have at least two nominated as neighbors. The Backup Routing protocol computes a backup path after checking that these nodes are on the primary one. The protocol then excludes them to ensure that the alternative path will be disjointed from the primary one and that it has different nodes to be able to maintain this path even if the nodes move. These backup paths are geographically close to the primary path in order to provide efficient recovery from route failure and reduce the number of route discovery procedure.

The remainder of this paper is organized as follows. Section IV surveys the related works and Section III describes the Proposed Work. Finally, Section V concludes the paper.

IV. RELATED WORK

Author [3] modified the existing AODV routing protocol incorporating the trust dynamics and load balancing to deal with congestion and ensure secure routing in cyclic mobile Adhoc network. Fair Initialization and management of trust values is also considered. The simulation study of MANET using trust and load balancing mechanism showed that use of trust model is an effective measure to counter the maliciously behaving nodes especially in cyclic MANETs.

Authors [4] presented a new energy and delay aware routing method which combines Cellular automata (CA) with the Genetic algorithm (GA). Here, two QoS parameters are used for routing; energy and delay. The results showed that the method proposed produces a higher degree of performance than the AODV and another QoS method in terms of network lifetime and end-to-end delay.

Authors [5] introduced a routing model which has the ability to detect the mobile ad-hoc network (MANET) mobility states and self-adapt routing metrics accordingly. They analysed that there are two key contributions: (i) the model allows nodes to detect whether the network state is static (consisting of relatively and absolutely static) or mobile; and (ii) based on the detected mobility state, a node can determine whether to employ the ETX or the MF metric for routing to achieve the best routing performance. Packet delivery ratio increases 10% in both static and mobile conditions whereas the number of drop packets reduces half compared with the original optimised link state routing protocol.

Authors [6] proposed an efficient algorithm for MANETs, which maximises the network lifetime by minimising the power consumption while establishing path with the help of

modified DSR. The proposed work minimises the energy consumption per packet and maximises the network lifetime. The proposed algorithm can find selfish nodes and deal with them by using a modified DSR protocol, which we call as an efficient DSR (EDSR). The simulation results show an increase in the packet delivery ratio in the network. The average node lifetime of proposed EDSR model is 45–60% longer than that of DSR model.

Authors [7] have compared the performance of five ad hoc routing protocols against three different mobility models. , the simulated protocols are: AODV, OLSR, DSR, DSDV and ZRP. Furthermore, they examined the impact of traffic load, mobility and density of nodes on the behaviour of these protocols. Simulations results show that there is no protocol that outperforms all other protocols for all the evaluation criteria. As a result, each protocol has different performance behaviour with respect to the considered metrics, including the routing overhead, packets delivery ratio, end-to-end average delay, and average throughput. AODV, DSR, OLSR and ZRP performed better in terms of average throughput and PDR compared to DSDV. However, DSDV, OLSR, ZRP performed better in terms of average end-to-end delay when compared to AODV and DSR.

Author [8] presented a new scheme called efficient power routing DSR (EPRDSR) is used to improve the existing on-demand routing protocols by introducing a power efficient scheme in the whole MANET. In the route discovery, the EPRDSR selects the bandwidth and the power constraints are built into the DSR route discovery mechanism. Hence, it enhances the network lifetime and delays the repair and reconstruction of the route. The main goal of EPRDSR is not only to extend the lifetime of each node, but also to prolong the lifetime of each connection. Author proposed a scheme that utilises the power status of each mobile node and alternate paths. This scheme can be incorporated into any ad hoc on-demand unicast routing protocol to improve reliable packet delivery, end-to-end delay and packet delivery ratio in the face of node movements and route breaks.

Authors [9] proposed a new mechanism that has probabilistic rebroadcast based on neighbour coverage for the routing overhead reduction. He analysed that proposed mechanism reduced the packet retransmission and thus reduce the routing overhead. This approach combines the advantages of probabilistic mechanism and neighbour area coverage based approach. This new mechanism can improve the performance of broadcasting in various network scenarios.

Author [10] analysed the AODV with and without hello is done to check the suitability of using hello message. He observed that AODV without hello performs better as compared with AODV with hello. He also proposed three different algorithms RLLR, PLLR and CLLR and simulated with Qual net simulator and results are compared with the basic AODV protocol without hello.

Author [11] proposed a unified trust management scheme that enhances the security in MANETs. In the proposed trust management scheme, he analysed that the trust model has two components: trust from direct observation and trust from indirect observation.With direct observation from an observer node, the trust value is derived using Bayesian inference, which is a type of uncertain reasoning when the full probability model can be defined. On the other hand, with indirect observation, also called second hand information that is obtained from neighbour nodes of the observer node, the trust value is derived using the Dempster- Shafer theory, which is another type of uncertain Reasoning Combining these two components in the trust model, they obtained more accurate trust values of the observed nodes in MANETs.

Author [12] proposed a light-weight Proactive Source Routing protocol, PSR. Author analysed that PSR can maintain more network topology information than distance vector routing to facilitate source routing, while, it has a much smaller overhead than traditional distance-vector based protocol(e.g. DSDV), link-state based routing (e.g. OLSR), and reactive source routing (e.g. DSR).

Author [13] considered routing and control overheads, storage requirements, and network setup costs of these protocols to see how well they fit in MANETs with nodes that have scarce resources. He estimated the resources needed to implement several popular wireless ad hoc routing schemes. He selected the best representatives from proactive, reactive, and location-based routing schemes to estimate their overhead for data, routing, control packets, and memory.

Although generally, proactive protocols do not appear as a lucrative choice under a tight-resource budget, some reactive protocols do perform adequately.

Author [14] explored the throughput-delay trade-off in a mobile ad hoc network (MANET) operating under the practical Reference Point Group Mobility (RPGM) model and also a general setting of node moving speed. In this paper author have investigated the fundamental scaling laws of per node throughput and average delay in a mobile ad hoc network with correlated mobility and a general setting of moving speed. Results indicate that the correlated mobility could result in a much efficient delay throughput trade-off than that under independent mobility.

Author [15] improved the routing efficiency as well as minimizing the energy consumption in MANET. Author gave the various routing protocols and various metrics used for selecting the stable link.

Author [16] compared the ad hoc On-demand Distance Vector (AODV), Dynamic Source Routing (DSR), Optimized Link State Routing (OLSR) and Destination Sequenced Distance Vector (DSDV) protocols using NS2 simulator. Author concluded that DSR protocol is the best in terms of average PDR. For high mobility condition of nodes DSR gives better packet delivery ratio than other protocols making it suitable for highly mobile random networks. Similarly for network size analysis it is observed that the DSR protocols outperform other protocols if the network size is less than 600x600sqm.

Author [17] presented two main routing protocols categories .proactive protocols (e.g. Optimized Link State Routing-OLSR) and reactive protocols (e.g. Ad hoc On

Demand Distance Vector - AODV, Dynamic Source Routing - DSR). The have considered qualitative and quantitative criteria. The first one concerns distributed operation, loop-freedom, security, sleep period operation. The second are used to assess performance of different routing protocols. . Author concluded that proactive protocol (OLSR) offers better performances for CBR sources (eg. voice services) given that it guaranties lowest delay. However it consumes much more bandwidth. Periodically, OLSR protocol sends routing packets to discover and to maintain routes to all destinations. That's why the number of delivered packets decreases when the traffic load (number of connections) increases.

Author [18] have overviewed the key challenge with routing on multi-hop wireless networks with OSPF: drastic control signalling reduction while keeping track of a topology that changes much more often compared to "usual" OSPF topology and concluded by recommending a specific configuration for MPR-based OSPF, which outperforms existing OSPF extensions for MANET.

Author [1] compared the performance of different protocols for ad hoc networks – Ad Hoc On-Demand Distance Vector Routing (AODV), Location-Aided Routing (LAR), Ad Hoc On- Demand Multipath Distant Vector (AOMDV) routing and Location-Aided Multipath Routing (LAMR). He observed that AOMDV has the best performance in terms of packet delivery, average end to end delay compared with the three others consistently, and LAMR does better than LAR in almost cases. They also observed that the simulation results shown AOMDV consistently performs better than LAMR in terms of overall packet delivery, but does more frequent flooding of control packets and thus higher bandwidth usage than LAMR.

Author [2] presented a new routing scheme for ad hoc networks that provides fresh routing information along active routes with affordable cost. He proposed a hybrid routing scheme for ad hoc networks. It uses proactive route maintenance (PRM) mechanism to replace the naive route maintenance in existing reactive routing protocols. PRM maintains active backup paths and adapts well to highly dynamic networks. By forwarding data on several optimal paths, PRM achieves several desirable properties, such as load balance, higher reliability, low average delay, and low delay jitter.

V. CONCLUSIONS

MANETs are fast emerging as alternate network architecture to infrastructure networks. It is finding many applications and the constraints of processing power, memory, power and bandwidth will be soon be overcome with the rapid improvement in the technologies. However the major concern which will remain is the security of the network. Due to this, it reviews about optimal routing in MANETs. It will provide the concept of optimal routing in case of fault occurs. It will provide the analysed process of routing, some node failure concepts and their way of handling the attack. It reviewed the possible countermeasure against these attacks. The proposed work will improve the effectiveness of system.

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