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AN IMPACT OF ROUTING PROTOCOLS IN MANET ENVIRONMENT FOR EFFECTIVE DATA TRANSMISSION

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ABSTRACT

MANETs are defined as a temporary network made up of a number of wireless mobile nodes. Using the multi-hop wireless technique, communication between mobile nodes can be achieved in MANETs, where there is no pre-established infrastructure to facilitate routing activity. Routing protocols in MANETs play a vital role in determining the most efficient path among the source and destination nodes. However, owing to the limited resources and dynamic nature of nodes, routing is an ongoing challenge in MANETs. There have been a sum of routing protocols and techniques proposed in recent years to address these problems in MANETs. There are numerous MANET routing protocol algorithms discussed in this paper. The several classifications, mobility models and sorting criteria, are described. Additionally, a thorough overview of routing protocols is given in the survey paper, and these protocols are also logically categorized for demonstration. In addition to helping researchers access a vast number of protocols and identify trends in the field, classification of protocols is employed in this paper.

Keywords: Mobile Ad Hoc Network, Communication, Mobile Nodes, Routing Protocols, Multi-hop Wireless Technique.

I. INTRODUCTION

Traditional wired network communications have seen a dramatic decrease in demand over wireless communication in modern years. This is mainly because users can access and communicate with wireless network resources with easily. MANET is a self-organizing system that does not have a predetermined topology. Nodes in this network are both routers and hosts at once [1]. As a result, network nodes can join or depart it rather quickly. The mobile nodes within the same radio transmission range can communicate and share data via a direct radio signal. Each node in the network has a built-in wireless interface that allows it to communicate with any other node in the vicinity [2]. If you don't have a fixed substructure like admission points or base stations, this type of network can operate anywhere [3]. A MANET architecture in service is shown in Figure 1 [4].

MANET constructs a wireless ad hoc network in which nodes randomly exit the network. It is challenging to create a MANET for mobile devices due to the rapidly changing of the communication link between the two devices [5]. Density and mobility are still being actively pursued despite active efforts to improve routing. The multi-hop paradigm used by MANET enables mobile nodes to communicate among themselves without the need for fixed infrastructure. Each node in a MANET can be both a host and a router at the same time. The utilization of this network can be advantageous in a variety of emergency situations, including rescue missions, disaster areas, and war operations [6-8]. In MANETs, network nodes can self-organize and configure without the assistance of an administrator. There is no obligation for them to stay or leave the network. Another feature that distinguishes a network with nodes is that nodes can move independently of one another [9-10]. A connection can be made between two mobile nodes if they are close enough to one another for wireless broadcast. To begin a packet transmission operation, a multi-hops mechanism is employed, as well as other nodes are used to perform packet forwarding [11].

The mobile nodes link to one another and send data to the destination using a routing mechanism. Many studies look at the wireless network's networking layer. Because of this, various routing protocols have been projected for MANETs, each with a different set of goals and objectives. Network layer operations include routing and data transmission [12]. While routing is the process of figuring out the route that data packets travel between their source and destination, forwarding is the act of moving packet data from one route to

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another. Quality services can only be provided if there are effective communication protocols in place. Finding a routing method that effectively exchanges data through mobile nodes in MANETs, however, is very challenging. [13]. This is due to a variety of factors, including collisions, packet loss, node mobility, which frequently cause route failures. Due to this, packet delivery ratios fall, overhead increases, and delays increase to a significant degree [14-15]. In recent years, a numerous routing protocols have been contributed and implemented for MANETs. Following a brief description of MANET characteristics, we'll get into more detail about the routing protocols used in these networks in the following sections.

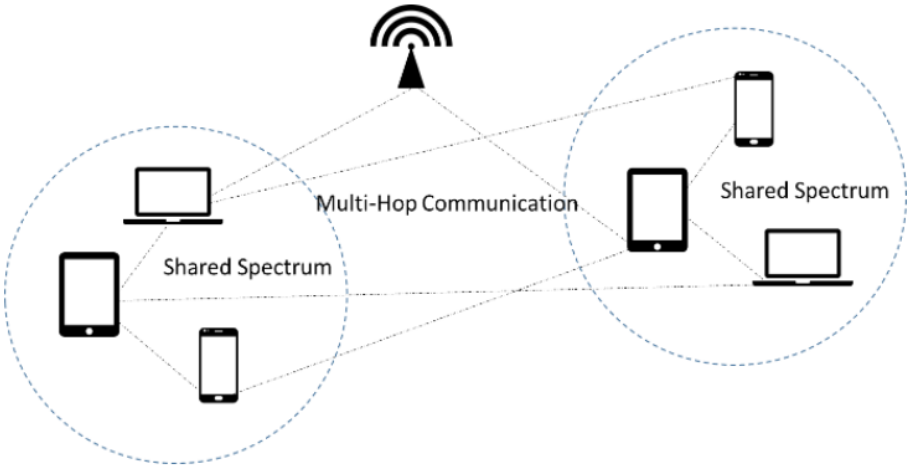

Figure 1: Architecture of MANET

II. CHARACTERISTIC IN MOBILE AD HOC NETWORKS

Dynamic Topologies

Hubs can travel at varying speeds, allowing the organization's geography to shift haphazardly and at random times.

Energy Constrained Operation

Batteries or other disposable energy sources may power some or all of the hubs in a designated organization. Energy conservation can be the most important rule for improving the framework plan.

Limited Bandwidth

The limit on remote connections is much lower than it is for foundation organizations. After secretarial for the effects of various access and impedance conditions, etc., the acknowledged throughput of remote correspondence is frequently lower than the maximum transmission rate of a radio.

Security Threats

Mobile nodes are interconnected with one another in an inclusive environment without a centralized authority, which makes MANETs more susceptible to malicious assaults than centrally managed networks. Lack of network structure makes MANETs vulnerable to assaults and makes it challenging to spot malicious nodes because it is challenging to monitor all data traffic exchanging on a wide scale and quickly changing network topology [16-18].

III. ISSUES IN MANETS NETWORKS

Routing

As impromptu organizations have a right network to various gadgets in their areas, directing is probably the most complicated issue to deal with. Using each hub as a switch, the parcels of other hubs can be sequentially divided among portable hubs.

Security

A remote connection is more vulnerable than a wired connection. False data can be inserted into steering bundles by the client, resulting in erroneous or outdated steering table updates, long breaks in navigation, and ads. To transform the specially designated organization into a decent arrangement, security has a small number of bizarre issues that must be addressed.

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Quality of Service - QoS

Engineers have a difficult time figuring out QoS because the location of a designated organization is constantly shifting. As the organization's circumstances constantly change, it is extremely difficult to maintain assets and support a particular administration style [19].

IV. CHALLENGES IN MANETS

Since there is no centralized controller in MANETs, it is challenging to link and communicate amongst mobile nodes because of their constantly changing nature. To be able to improve MANET performance, these issues must be addressed. The following are some of the most pressing issues [20-24].

Energy-Constrained Operation

In MANETs, mobile nodes have a limited amount of battery power. The power consumption of MANET nodes can be decreased by designing an effective routing algorithm that takes into consideration the most crucial variables.

Security Threats

All passive and aggressive attacks can be used against MANETs. Malicious users, such as those that engage in eavesdropping and impersonation, are interested in learning more information about other nodes in the network without attempting to interfere with network performance. A malicious user's primary goal in an active attack is to disrupt the network's normal operation, such as dropping or delaying packets or altering their routing. Sybil attack, Flooding and Black-Holes are examples of active attacks. As a result, creating a new routing protocol should take MANET intrusion detection into account.

Quality of Service - QoS

Due to the scarce resources and the mobility of wireless nodes, maintaining QoS in MANETs is a challenging task. QoS considerations for routing protocols must include things like available bandwidth, error rates, expense, and latency.

Scalability

Router scalability in MANETs is an additional concern. Small-network-friendly routing schemes should work just as well in large and medium-sized networks as they do on smaller ones. For this, the routing protocol must be scaled up or down according to the size of the network and control overhead must be kept to a minimum. In most existing routing protocols, mobility and scalability cannot be supported at the same time.

Hidden and Obvious Terminal Issue

When nodes simultaneously transmit packets while being outside of a sender's broadcast range but inside of a receiver's transmission range, there is a hidden terminal problem in a MANET.

V. CLASSIFICATION STANDARD FOR ROUTING PROTOCOLS

Based on a set of rules, various groups of routing protocols exist. The procedures can be categorized into a number of different groups; they are not required to be placed in a single category.

Topological Structure

The logical organization of a network may be simple or hierarchical. According on the network topology they employ, routing protocols are categorized.

Algorithm Type

One way to categorize protocols is according to the type of algorithm they use, and this type of algorithm includes things like link state and distance vector.

Route Metric Type

Routing protocols can employ a variety of criteria, including traffic patterns, link quality, battery life, hop count, and more, to choose the optimum path.

Routing Mechanism

Hop-by-hop or source routing are two of the many types of routing available.

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Update Mechanism

Protocols are classified as reactive, proactive, or hybrid based on how they are updated. Routing information is exchanged in two ways: proactively, on a regular basis, and reactively, when a connection is needed. Hybrid protocols combine the two approaches.

Use of Temporal Information

The premise for categorizing protocols is the use of previous, present, or expected wireless channel status to establish viable routes.

Context-awareness

This entails tailoring their operation to a specific situation based on the data. The protocol makes routing decisions and lowers control overhead in a geographical context using geographic information. A network protocol that tolerates interruptions or a lack of connectivity is called a disruption tolerance protocol (DTP).

Transmission Mechanism

A routing protocol grouping norm may be unicast, multichannel, anycast, broadcast, multi-destination, or geo-cast depending on the transmission mechanism. Unicast protocols are used to send the packets from one node to another node. The packets are delivered to a set of nodes using multicast protocols. Anycast protocols transmit a packet to each member of the group they are executing on. Broadcasting is the process of sending data to all destinations at once. In multi-destination routing, the packet includes data about numerous destinations. Using geo-cast routing, a specific group of destinations can receive information based on their location.

Path Availability

Multiple paths between a source as well as a destination address can be found and maintained via routing protocols.

Routing Add-on Considerations

In addition to the fundamentals, a routing protocol may also contain security, quality of service, and other characteristics. A routing protocol can be split into different categories depending on whether it offers extra features like confidentiality and the quality of service, for example.

VI. ROUTING PROTOCOL TAXONOMY

MANETs need to be constructed in a way that is both efficient and secure. Unless the network is still not correctly built, a lot of communication problems could occur. MANET routing is a critical consideration in network design. Routing is a method of identifying the most effective route for data packets to follow. Nodes in MANETs communicate with one another by utilizing a routing protocol [25].

Information routing in a MANET is done by the nodes. The mobile nodes are unaware of the network's topology until they find it. Being a node in a networked environment a node to constantly be on the lookout for broadcasts from other nodes. Every node in the network keeps tabs on the activities of its neighbors and devises new ways to get to them. The routing tables, which keep track of the optimal routes to destinations in the routers' memory, are crucial communication tools that help to increase routing efficiency.

The topology of MANETs, as noted, changes rapidly and dynamically. As a result, several routing protocols that are quick, scalable, fair, and energy-efficient have been created in recent years. One problem with these networks is excessive power consumption, bandwidth waste, and high error rates. Some protocols are well-designed to address these issues. Various MANET routing protocols are categorized according to the data that the network's nodes collect and keep up to date. [26-27]. The following is a list of the various types of routing protocols.

Proactive Routing Protocols

Proactive Routing Protocols are referred to as "distance-vector" and "link-state routing protocols" respectively. Routing tables are often updated in order to keep up with the network's constant change. The word "table-driven" in their name is explained by this. Additionally, routes through nodes that are not currently participating in communication but are still part of the network are included in the updated data set. With these protocols, data transfer can start right away because each node is aware of the best route to follow, and the

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information of routing is already available. Protocols like this have a lot of this benefit. However, because these protocols constantly keep track of the route details about network changes, the overhead in routing increases, which is a drawback. In order to update their routing tables with the updated route information, all nodes within the network must be aware of changes that occur across the whole network. A few nodes' routing tables retain their route details, which could lead to a link failure in certain circumstances.

As a result of the added complexity and time required to implement these routing protocols in large mobile networks, they are rarely used. Large-scale mobile networks demand more memory for routing data, which makes the available network resources less efficient. Proactive routing technologies includes the Wireless Routing Protocol protocols and Destination Sequence Distance Vector.

Reactive Routing Protocols

Routing protocols that respond to a communication request are sometimes referred to as "on-demand" or "source initiated." Instead of constantly updating their routing information as the topology of the network changes, these protocols only become active when data has to be transferred, which reduces routing overhead and the consumption of network resources. Network nodes create routes and send packets to other nodes whenever communication is needed. A request is sent to the node then use a route discovery mechanism to see if it has access to the routing data for the route. Actually, every node is sending the same request again. Once all feasible paths have been located and investigated, the method comes to a finish. This kind of protocol has a significant latency since it requires a lot of time to locate the most practical paths. AODV- Ad hoc On-Demand Distance Vector Routing, DSR - Dynamic Source Routing, and the TORA - Temporarily-Ordered Routing Algorithm are examples of reactive routing methods.

Hybrid Routing Protocols

In this kind of scheme, MANETs routing protocols' reactive and proactive features are merged. As a result, it has issues with the two different kinds of protocol implementations present. The most sophisticated and efficient routing systems decide on routes for sending data packets to the destination node using proactive routing mechanism and only provide updates when the network changes. There are hybrid routing protocols, such as HRPLS and Zone Routing Protocol (ZRP), for large-scale MANETs with mobile backbones (ZRP). Since MANET is a network that is used primarily in the first three protocols shown in Table 1, this comparison is limited to those protocols.

Secure Routing Protocols

Certain working conditions necessitate precise security measures, not just in the strategic sphere. They typically listen in on conversations or disrupt the network's operation by altering routing or redistributing resources.

QoS Routing Protocols

There are a wide variety of services needed for today's diverse applications. Delays, jitters, traffic conditions, and resources, such as processing and bandwidth, battery power, memory, and so on, all have an impact on QoS. For short-distance routes, QoS-aware routing protocols use a metric called hop count instead of the conventional short-distance metric. Quality of Service - QoS protocols evaluate the resource requirements, such as bandwidth routing protocol (BR), to determine what route is best [28].

Location-Aware Routing Protocols

MANETs make use of the same geolocated routing methods as WANs. Users can presume that every other node in the network is aware of each other's whereabouts if you use these techniques. The Global Positioning System (GPS) is the most precise tool for locating these wireless nodes. These coordinates are then used to determine the best routes.

Multipath Routing Protocols

Others employ a single path generating technique, while some use multipath routing to generate many paths from a source to a destination. The effectiveness and dependability of bandwidth use among links is increased by multiple route discovery. The reduction of network congestion brought on by increased network traffic is largely accomplished via multipath protocols. The on-demand multipath can also be generated using proactive

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routing protocols. Due to the rapid mobility of network nodes, these protocols are a significant help in these circumstances.

Any-cast Routing Protocols

Data packets are normally sent to the nearest node in a cast routing. Data packets are routed to any of those nodes via anycast routing, which uses nodes nearby to the one providing the service. MQAR - Mobility & QoS Aware Anycast Routing is an instance of this class [29].

Multicast Routing Protocols

A single sender can simultaneously send data packets to a huge number of recipients when using a multicast routing technique. Most applications require multicasting on a logical level. Distributed database management, audio and video teleconferencing, and real-time video streaming are all examples of multicast protocols. Multicasting should be enforced at the routing algorithm level. Some techniques, such as one-to-all unicast or application-layer multicasting, impose multicasting as a requirement. One example of a multicast ad hoc routing protocol is dynamic core-based multicasting (DCM) [30].

Geo-cast Routing Protocols

Data packets are routed via Geo cast routing from the source location to a certain geographic region. The nodes must rely on localization strategies for the geographical multicast routing protocols to function well.

Hierarchical Routing Protocols

For ad hoc networks made up of multiple flat nodes in the past, the well-known routing technique was hierarchical during the first route estimate. These methods expanded the size of routing tables as networks developed, which decreased data packet overhead. Clustering techniques are used by hierarchical ad hoc routing systems to define the hierarchy of nodes. Nodes found in higher levels of hierarchy provide excellent services and boost the route's effectiveness and adaptability.

Power-Aware Routing Protocols

The long-term durability of MANET networks is significantly influenced by the battery capacity of mobile nodes, with links breaking down as batteries run out. To ensure a long network life, it is necessary to factor in the energy consumption of mobile nodes in the routing protocol. using power-aware routing protocols reduces battery drain on mobile node batteries. This protocol extends the lifetime of the network by routing traffic through nodes with high battery power levels. There have been numerous proposals for power-aware routing protocols, each of which is based on the amount of energy required for transmission, the state of the batteries in mobile nodes, or a mix of the two. Many techniques have been tested in MANETs to enhance the effectiveness of power utilization in the network by exploiting these power-aware information. Each data packet contains details about a particular route, which are kept on mobile nodes in the route cache. These routing methods use intermediary nodes to retain average power consumption costs in the routing cache and extend the lifespan of the route by using periodic updates. In reliable networks, power-based source routing techniques perform better. Routing protocols are used when data packets are transmitted over a network. One of the most crucial considerations is the route's lifetime. The battery life in MANETs is crucial since it influences how long a link, and a route will last. If the network is steady, a route's lifespan can be comfortably increased. Using a mobile node for a long period of time reduces the node's power level because of the constant use of the node. The network's power level eventually goes to zero, dramatically shortening the network's life.

Table 1. Comparison of routing protocols

Parameters	Reactive	Proactive	Hybrid
Storage Requirement	Depending on the number of routes	Higher	Depends on size of each zone or cluster
Routing Schema	Table driven	On demand	Combination of both
Storage Capacity	High, due to the routing tables	Low generally	Depends on the size of zone
Philosophy	Flat	Mostly flat	Hierarchical

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Mobility Support	Periodical updates	Route Maintenance	Combination of both
Routing Overhead	High	Low	Medium
Routing Information	Doesn't store	Keep stored in table	Depends on requirement
Delay	High	Low	Low for local destinations and high for Inter-zone

VII. STUDY OF EXISTING TECHNIQUES

CRCPR (Constructive Relay-based Cooperative Routing) was proposed by Bai et al. (2018) for MANETs in [31] Cooperative Table and Relay Table topological information and a new route selection mechanism that considers energy consumption, energy harvesting, and link break probability are the goals of the research suggested in this study. Simulations show that CRCPR extends network lifetime by 40% and increases network throughput by 60% compared to standard protocols.

Synchronized Fuzzy Ant System is a routing protocol proposed in by Kacem et al. (2018) with the primary goal of finding the least-cost asset in insignificant capacities that ensures that no-traffic is routed [32]. With the help of an ant system and a synchronized fuzzy transition approach, the goal of this proposal is to ensure packet survival in MANET in the case of arc or node malfunctions by resolving the issue of unanticipated cases in ad-hoc networks. To intelligently control the flow of MANETs, this solution has been put forth. For instance, by promptly suggesting new routing tables to make up for the delays brought on by defective nodes, it can reduce packet loss when compared to four more protocols.

Jabbar et al. (2018) proposed Multipath Energy and Quality-of-Service Aware OLSRv2 (MEQSA-OLSRv2) in an effort to improve the OLSRv2 protocol in order to save energy and guarantee data transmission in MANET-WSN convergence scenarios of IoT networks [33]. This study's main objective is to create a mechanism for ranking nodes using the MCNR (Multi-Criteria Node rank Metric), which considers a number of variables such battery life, idle time, speed, and queue. As an added bonus, the researchers in this study devised a mechanism for choosing a multipoint relay (MPR) network's nodes based on energy efficiency and quality of service (QoS). According to simulation studies, MEQSA-OLSRv2 performs better than traditional routing protocols in the areas of QoS, energy savings, and reduced energy cost per packet.

The innovative routing protocol EIMOESOLSR (Enhanced Intellects Masses Optimizer - Energy-efficient and Secure OLSR), created by Kanagasundaram et al. (2019) [34], enhances the security and energy efficiency of the conventional OLSR protocol for MANETs. An Enhanced Intellects-Masses Optimizer (EIMO) and, a Composite Eligibility Index (CEI) that includes multimeric such as available bandwidth, queue occupancy, and lifetime are the focus of the research. The EIMO-ESOLSR protocol surpasses other modern protocols in terms of power consumption, remaining time, and average network lifetime, according to the simulation results.

MANET's MAC layer was used by [35] author D. O. Akande to develop an energy-saving protocol. The MAC layer's multi-target optimizer and power for transmit and residual were gleaned from the developed design's features, which were then used to derive the routing metrics. When compared to traditional routing protocols in a MANET environment, the developed design had a longer network lifetime and improved network parameters. Despite the fact that this model reduced energy efficiency, it did not concentrate on QoS metrics.

U. Khan from [36] created a brand-new, energy-efficient routing protocol based on Heuristics for Flying Temporary Networks (FANET). Using, ACO techniques based on energy parameters to figure out the best FANET route was essential. On FANET screens with varying densities and motions, the improved network performance and power consumption were demonstrated by simulation results. It's all about minimizing energy consumption in this model, which only uses the random way point mobility model.

The Ad hoc On-Demand Multipath Distance Vector (AOMDV) with Fitness Function (FFn) used in the GA protocol was designed by A. Bhardwaj [37]. Based on this new routing algorithm, we can see where our research is headed. The next step is to add specific algorithms to the AOMDV protocol, which is already in use. The experimental results show that some methods outperform AODV, AOMDV, and FF-AOMDV in terms of

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maximum residual power and particular performance levels. Because the GA mutation process takes a while, the search space expands rapidly, requiring time-consuming computations.

Valarmathi K et al. [38] pondered the problem of MANET's high energy consumption and found a way to resolve it by optimizing the energy constraints. Using the K-medoid clustering technique, the mobile nodes prevalent in MANET were grouped in order to reduce the cost of data routing in large and dense networks. For each cluster, the opposition genetic-centered fish swarm optimization - FSO method was used to achieve the constrained EC-centered nodes. The work's energy efficiency and network life expectancy were found to be better than those of the existing work in the simulations. In the event of an attack, the method may only be used to avoid detection. Even if improper behavior is discovered, the technology might not be able to recognize or eliminate hostile nodes from the network across the entire network.

When Veeraiah and his colleagues presented their MANET-based optimization technique, it was clear that it was effective. The cluster-head (CH) of the MANET was able to effectively solve both energy and security problems using techniques like fuzzy clustering and fuzzy Nave-Bayes (NB) [39]. The whale optimization algorithm (WOA) and the birds swarm optimization algorithm (BSA) were put together to develop the BSWOA algorithm, which achieved the most effective routing protocol. In the attack's presence, the BSWOA achieved its throughput, maximum energy, minimal delay, and detection rate. As a result of this restriction, the time needed to discover and secure networks against all malicious nodes is outlined.

In the research of Veeraiah et al. [40]. The hybrid algorithm and the CAT Slap Single-Player (C-SSA) algorithm provide a trust-based approach to ensuring energy-efficient mobility in MANETs. As the indirect, direct, and recent trust values are weighted, CHs (fictional names for group heads) are selected for inclusion in a fuzzy group. The increased node count is determined using confidence bounds for additional nodes. Thus, different routes planned by all call centres select the best route and integrated features like overall route performance, response time, and connectivity to arrive at the final decision.

Genetic algorithms were proposed by Wang [41] to route the sensor network, increasing the fault tolerance and capacity of the network endpoints. There are a variety of distance parameters to consider in order to get the best results from your workout. This list of attributes includes things like a transmitter's separation from its base station and the number of hops needed to get there. A simulation analysis also supported the effectiveness of the strategy.

As part of their research, Ran et al developed an improved version of the standard AODV protocol (AODV-MQS) [42]. Start by creating a network of nodes, starting with intermediate nodes, and storing all the network's nodes in a database. By limiting access to the blockchain to trusted nodes, smart contract tokens are often utilized to safeguard the ledger. The primary communication path in the blockchain network is represented by smart contracts, while the non-mainstream waiting path is discovered. In order to be most effective, it should have a lot of attacks.

NDLR-MP, an ACO deconstructed observational multi-path routing system based on the AODV protocol, has been agreed upon by ACO [43]. In this system, one-way detection identifies all node split pathways between source to destination, therefore routing control overrides are not required. Data packets start moving after finding the first path. During the same time, every secondary pathway is identified. Traffic can be diverted from the damaged link to the destination on the next jump lane by using a lane repair technique. Rooting and maintenance recommendations that are described as performance evaluation metrics may be considered metrics. This strategy should be prioritized in order to avoid security breaches. for the purpose of performance. Optimized bandwidth alternatives are defined by ERS, which improves network performance.

VIII. OPEN ISSUES IN ROUTING

Every sort of network, whether wired or wireless, relies on routing in some way. On the contrary hand, the properties of the routing protocol in these networks are significantly different. Nodes in a wired network don't need to be managed for portability, and routing protocols don't lower the amount of communication overhead. As a result, wired networks require more bandwidths. On the other side, wireless networks depend on routers for routing since they guarantee a more secure connection and lessen the chance of data loss. MANETs are a type of wireless network that differs from others in that they do not utilize routers to carry traffic. The nodes in the network handle routing in MANETs, making these networks incredibly adaptable. These routing protocols

were also developed with a constrained budget in mind. It is critical to be as accurate as possible when creating these protocols. Before creating a routing protocol, it's important to consider some of its properties. The next sections go over some of these characteristics:

Nodes Energy Conservation Techniques

When designing these protocols, minimizing power consumption was a top priority. The nodes in MANETs are mobile devices, such as cell phones, laptops, and similar gadgets, hence power conservation is crucial. The node's sleeping mode is a simple illustration of energy conservation in action.

Loop Free

Another common problem in communication is the loss of data and the waste of network bandwidth caused by loops. Because of this, routing protocols must be free of this issue in order to provide the best possible performance and communication quality. Reactive behavior means that when data packets are needed, the protocol will only activate and react, rather than being proactive all the time.

Distributed Operation

The MANET goes through a number of transformations as it communicates. In order to raise the standard of our service the recommended way to operate routing protocols is through distributed computing. MANETs eliminate the need for centralized control in this scenario.

Network Security Issues

MANETs are vulnerable to attacks because of free space propagation. To establish a secure connectivity between mobile nodes, MANETs can benefit from the usage of encryption and authentication mechanisms.

Multiple Routes

In order to maximize the effectiveness of routing protocols in the face of frequent changes in communication channels, nodes in MANETs must be able to store a number of routes. There's no need to waste time searching for a new route if a route goes down at any point in the transmission.

Quality of Service (QoS) Support

Another crucial aspect of communiqué is to ensure that the end-users receive the best possible service. As a result, when creating these routing protocols, it's important to keep QoS in mind. Regarding audio and video applications, for instance, high-quality communication is necessary.

There are currently no known MANET routing protocols that meet all of these requirements; however, this is an active research area.

IX. CONCLUSION

Classifying the procedures into different categories, this report discusses their important characteristics. The most common routing includes reactive and active, depending on how the route is updated. These two procedures are combined to create hybrids, although other tactics, such as locally proactive and globally reactive approaches, can also be classified as hybrids. Routing tables grow in proportion to the network's growth in terms of scalability. Multipath routing enables the provision of many paths for load balancing, which offers fault tolerance in a dynamic topology. Priority for routing protocols is to keep the network up and running by dynamically selecting the best wireless networks. In addition, a protocol must be established based on the needs, intended uses, and other pertinent limits because it is challenging to incorporate all of these variables into one protocol. Service assurance, bandwidth/energy conservation, and the opportunist method for performance improvement are all suggested as feasible alternatives in Mobile Ad-hoc Networks by experts.

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