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Intensive Analysis of Routing Algorithm Detection over Mobile Ad hoc Network Using Machine Learning

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ABSTRACT- As we are in the Digital Era, in our daily life activities we use different types of communication devices like Mobile Phone, Laptops, Smart watches, etc. and In Common these Mobile Devices allows users to access Information and Services through wireless mode. Basically, there are two types of wireless Networks they are Infrastructure and Infrastructure less Networks. This Infrastructure Network is known as Cellular Networks, they are stationary components, and they used to connect the Mobile Nodes within the Network. But this Infrastructure less Network is also known as Mobile Ad hoc Network (MANET). MANET consist of no fixed Routers and unlimited Nodes. They are Dynamic in Nature. They can move at any direction and at any Movement. It forms a temporary Network for Data Transmission Purpose from Source and Destination. There can be any number of Nodes in Between Source to Destination. Here this Transmission of data is taken place with an Optimal Path in the MANET. This MANET is preferred to be used during Natural Calamities and for Military Operations. Here the node will be created first for communication in this proposed research work. Then the Machine Learning Algorithm will be applied after the node creation. There will be n numbers of nodes, one is master and the *n-1* are treated as slaves. The Master node will be concluded by using Highest Network range. The charge will be checked and maintained by Machine Learning Algorithm. Again, Master will update the information. Here ML Algorithm will be act as data centers. The Master node will be changed as per their Capacities based on ML algorithm. In this research work we will discuss about the process of Routing, which will be carried by DSR Algorithm which is more responsive when compared with AODV and DSDV.

Keywords: MANET, Nodes, Master Node, Routing, Highest Network Range.

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1. INTRODUCTION

Now days these Wireless Networks plays a vital role in the Communication field. This wireless Network is exactly suitable in the field of Defense, Manufacturing Sectors as well as in Personal Gadgets. The most common Difference between the wired and wireless communications are wired devices come up with a cord always. Whereas the wireless devices are Portable and accessible from anywhere. As per the advancements of technology wireless device like Cordless telephone, Wi-Fi, Communications through Microwave were discovered. Hence all networks have the infrastructure in fixed way (*figure-1*).

Some common capabilities to design these wireless Protocols are it should be fully distributed which should not be centralized. Therefore, the nodes to be transported frequently in all areas, it should be adoptive for different topology. Because of the mobility of nodes Route computation and Maintenance must be involved in very minimum numbers. It should be responsive to the error routes.

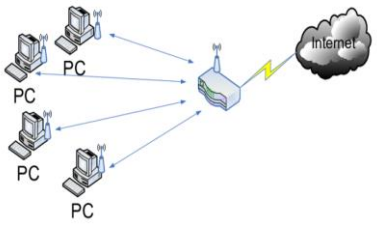

Figure 1: Infrastructure of Wireless Networks

In common Ad hoc network the main purpose is to consume energies (Bandwidth, Computing Power, Memory, and Battery Power) in optimistic by Hardware devices [1]. IETF has defined a Mobile Ad hoc Network (MANET) as "An autonomous system of mobile routers (and related hosts) connected by wireless connections the union of which forms an open graph [2]. A network's wireless architecture can alter swiftly and unpredictably since routers may move and rearrange themselves at will. If it is connected to the more excellent Internet, it can function independently. As per in Advancements in Wireless Ad-hoc Network, this technique plays a prominent role which supports an uninterrupted service for Mobile Users. No topological restrictions for communicating Larger Areas. Here the proposed topology can be changed dynamically. Existing wireless networking protocols cannot be replaced to these ad-hoc wireless networks. The Dynamical changes would suit for

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all mobile nodes. The Strength of the Bandwidth is the most important thing in ad-hoc network communication. Therefore, the design of routing protocols for networks like this, where each node participates in routing by dynamically forwarding data based on the network connection, is made more complicated. Due to its decentralized design, it enhances wireless network scalability over infrastructure-based systems. Ad-hoc networks are ideally suited for urgent events, such as natural catastrophes, military conflicts, or other emergencies.

An Access Point (AP) acts as the gateway between the mobile device and the Internet in a frequently used network type based on a centralized approach. There are several advantages to infrastructure-based networks for mobile devices, but they need a significant amount of time and money to build up the requisite infrastructure. Radio must be near an AP to connect to the network. In the event of a natural disaster, conflict, or geographic isolation, communication infrastructure may not function properly. In other words, network connectivity may be difficult to come by regularly. There are times when delivering connectivity and network services are difficult because of the lack of available network connections in a specific geographic location. A workaround for this issue has arisen in ad hoc technology. This research work is to allow people to communicate with one another no matter where they are in the world. Mobile phone use has increased dramatically, making it easier for people to communicate without a central base station, making it a valuable tool in emergencies. Since the gadgets themselves function as nodes, the initiative primarily focuses on facilitating communication without any traditional infrastructure.

In this research work the first thing is node creation, then the Machine Learning algorithm will be applied to the node. Master node will be declared by the proposed algorithm. Hence the routing will be carried further. This proposed DSR algorithm will be compared with two different algorithms like ADOV and DSDV to show the comparative accuracy for the nodes

2. RELATED WORKS

A Pentinnen performed research on ad-hoc networking [3]. Before the technology can be widely used, it must first be classified, and the significant problems that must be overcome are outlined. We learn about ad-hoc networks, the challenges they confront, and the fact that scalability is a given and quality of service for ad-hoc networks is still mostly untapped territory. Because of the interferences and other factors, the quality of service cannot be guaranteed for a lengthy period. Energy efficiency takes precedence over security when determining power control settings. Numerous structures for mobile Ad hoc protocols might also be implemented in VANET protocols provided by N. Saeed, M. Abbod, and H. Al-article [4]. Raweshidy's To discover the best route from one location to another, several routing protocols (MANET) are available in the literature. As a result, these protocols should be categorized and grouped. Routing protocols may be better understood, analyzed, compared, and evaluated with the assistance of this categorization. Using classification, researchers and designers may distinguish between the features of routing protocols and discover the connections among them. There is no way to classify MANET routing protocols into a single category or classification; hence a list of the known properties must be compiled. Varieties of routing protocols based on design philosophy and network structure are provided. Mobile Ad Hoc Networks, according to Ankur.O.Bang and Prabhakar L.Ramteke [5] is rapidly emerging as a critical component of mobile computing. MANET's development, problems, and wide range of applications were examined in this research. In the first portion, we learned about the history and development of MANET, followed by a discussion of the primary issues faced by Mobile Ad Hoc Networks. Finally, we learned about some of the applications for MANET that are now in use. As a result, we learn about the significance of MANET in the current environment.

Meenakshi Yadav and Nisha Uparosiya [6] discuss the three forms of routing protocols: proactive, reactive, and hybrid, and describe the algorithm and workings of each type. Router security and assaults are also covered in this course. They discovered that the trust mechanism might overcome the security problem in MANETs. Active and passive assaults, for example, have the potential to devastate a network and cause a significant issue. MANET routing protocols are designed to provide efficient and secure routing algorithms that are conscious of the network's energy consumption. MANET's characteristics, features, benefits and drawbacks are discussed in this study. Afterwards, we learned about MANET security's most challenging aspects: its aims and attacks. MANET is a continually evolving and changing discipline that has a wide range of research projects in this area. Patel Rajankumar and Patel Nimisha [7] explain the networking of the reactive protocol AODV by running it on two different platforms, NS2 and NS3. Using various simulators produces varied results, which is understandable. It explains why network simulators are so heavily relied upon by the networking world to assess network behaviour and performance. There was a comparison of the two most popular network simulators, NS2 (NS2) and NS3. The PING programme simulates and compares various aspects of the AODV routing protocol in a MANET environment. To make the NS2 models available in NS3, they must first be imported from NS2. However, for all its size and performance, it is feasible to use the same code for both models in real-world implementations, but it is not possible to use the same code for both models in real-world applications for the NSIS2 AODV model. In [8], [9], [10] the authors performed a study of the Effect of Mobility Model on Various Parameters by Varying Node Density in VANETs. 11. L. Abusalah [11] performed detailed analysis of MANET protocols. V. Sharma [12] et.al applied machine learning algorithms for routing approach using ML methodologies. In [13], authors proposed a model for Secure Optimization Routing Algorithm for Mobile Ad Hoc Networks. In [14], authors discussed AI, ML and Genetic Algorithms based methods for routing process.

3. MATERIALS AND METHODS

The proposed method architecture is shown in *figure-2*. In the proposed method, three different protocols namely AODV, DSDV and DSR are compared using machine learning.

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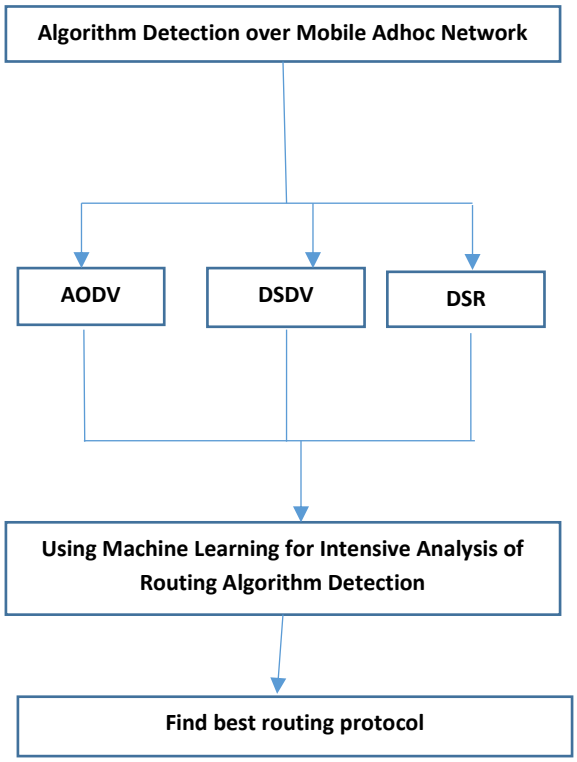

Figure 2: Proposed Architecture

3.1 Routing Protocols

Routers interact with one another using routing protocols. Routers must communicate with one another to keep up with changes in the network topology. Distance-vector and link-state protocols are two types of routing protocols. Router-to-router communication can be handled in a variety of ways.

3.1.1 Distance Vector Protocol

When using distance-vector routing protocols, each router transmits to all other routers it is directly connected to all the routes it is aware of (that is, its neighbours). It's impossible to complete a journey when all a router knows about other routers are the ones it's connected to, so the next hop is all it can do. Distance-vector routing methods calculate the shortest path to a destination by using hops. If a router is four hops distant from another router, there are three routers, or hops, between it and the goal. This is because each router comprises one hop.

3.2 Route Selection

This means that whenever a router gets new data, it will utilise the most recent sequence number. The route with the superior metric is utilised if the sequence number is the same as the one already in the database. To put it another way, "stale entries" are those entries that have not been changed for some time.

Routing Information Protocol (RIP) has been converted for ad hoc networks to the destination sequenced distance vector routing (DSDV).
For example, the mobile nodes may discriminate between old and new route information using the newly inserted sequence number. This helps to eliminate routing loops.

3.2.1 Master Node

Among the network's nodes, you'll discover the master. The controller node is one of the N nodes that make up the network. One of the agent nodes in the master node in this scenario. The remaining nodes, referred to as slave nodes, are under the control of the master node. Additionally, the master node is in charge of establishing a path from the source to the destination. The different parameters will be used to select the master. Periodically, the charge will be checked and maintained. The master will eventually have to update the data. Data will be housed in an algorithmic data centre in this case. When a new master is found, it will be determined by the greatest charge.

3.2.2 Machine Learning in Master Selection

Machine learning is the process through which computers figure out how to accomplish things independently, without having to be explicitly programmed. In the network master node is responsible for many tasks and decision so the charge consumption is more for the master node. If there is no charge of the node how the device can handle other device. For that purpose, master will be selected for every particular unit time period that will avoid the unique constant master node. Master node will be selected based on the machine learning. To select the master, its uses the different parameters. In machine learning we used the classification concept to select the master node. In the project we used the trained data to select the master node. Master node selection we test the test data against the trained data. For both trained data and test data contain different parameters. Master node will be selected by the following parameters.

Parameter of master selection depends on:

- The node which having the highest charging will be considered as master node.
- The node which active in a greater number of transmissions is also considered as master node.
- The node which active movement in the network is also considered as master node
- The node which acts as hop in many times between the source and destination is also considered as master node.
- The node which has a greater number of connections in the network is also considered as master node.
- The best performance of node which having the highest transmitting speed is also considered as master node.
- The node should be existed for long period of time which long lasting in a network is also considered as master node.

3.2.3 DSDV Based Packet Routing and Routing Table Management

Each mobile node in the network keeps an ad-hoc routing table. This routing database includes a list of all potential destination nodes, their metric and the next hop to each destination, and a sequence number created by the destination node. When network topology changes are detected, each mobile node immediately broadcasts or multicasts a routing table update packet. To instruct linked nodes, the update packet uses a metric of one. This shows that each receiving neighbour is one metric (hop) away from the node on the network path. Unlike other routing methods, this one is unique. After getting the update

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packet, the device began to function normally again. Neighbours retransmit the update packet to the relevant neighbours of each of them after updating their routing table by one and incrementing the metric in the process by one. Ad hoc network nodes will continue to receive updates until they have gotten a copy of the update packet. Equivalent unit of measurement.

It is possible to dampen the oscillations of the routing table and minimize the number of rebroadcasts of possible route entries that come with the same sequence number by delaying the advertisement of the route. A dynamic topology in an ad hoc network necessitates dynamic changes to the items in each node's routing table. The dynamic ad hoc network's mobile nodes will nearly always identify each other if the routing information advertising is frequent or rapid enough to achieve this consistency. Each node in the dynamically generated ad hoc network must relay data packets to other nodes upon request based on the updated routing information.

3.2.4 DSDV Algorithm

- STEP 1: A routing table is kept by each node.
- STEP 2: An IP address is associated with a routing table entry if assigned a unique sequence number.
- STEP 3: Destination-generated sequence number.
- STEP 4: The packets in a network are sent from one node to the next using a routing table.
- STEP 5: Routing tables are maintained by each node and updated regularly.
- STEP 6: At regular intervals, neighbour nodes exchange their routing tables.
- STEP 7: Repeat this procedure until you have constructed a route from one node to another.

4. RESULTS

AODV, DSR, and DSDV are just a few of the MANET networking protocols used in this study. And also compared the methods in this study.

- The implementation of each protocol follows a specific process.
- Creating a TCL script.
- TCL is linked to different folders, such as NAM 1.15 and ns-allinone-2.35.
- TCL file execution and NAM file generation.
- Execution of the NAM file.
- Awk script execution and monitoring packet transfer.

4.1 AODV Based Simulation Result

To determine the total number of packets sent and received, GEDIT is used to create an awk script. To determine the delay and sequence number for each packet. TCP and UDP packets of 1000 bytes each are sent in this example. The results are shown in *figure-3*.

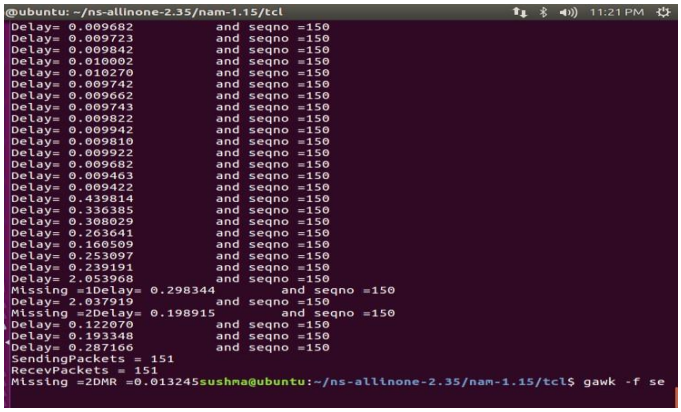

Figure 3: Simulation result of AODV

GEDIT is used to write an awk script that calculates the protocol's end-to-end delay. Gawk –f "filename.awk tracefilename.tr" is used to run the file in NS2. The e2e delay for AODV is shown in *figure-4*.

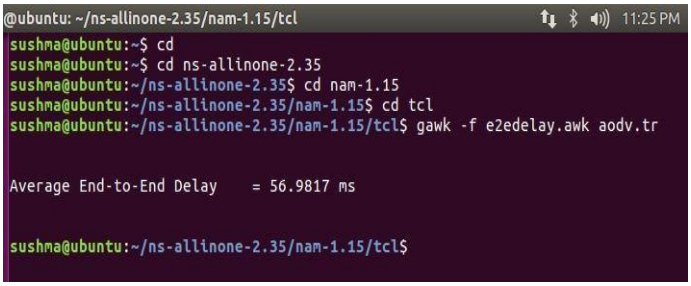

Figure 4: e2e delay for AODV

4.2 Simulation Result of DSR

To determine the total number of packets sent and received, GEDIT is used to create an awk script. To determine the delay and sequence number for each packet. TCP and UDP packets of 1000 bytes each are sent in this example. The results are shown in *figure-5*. The e2e delay for DSR is shown in *figure 5*.

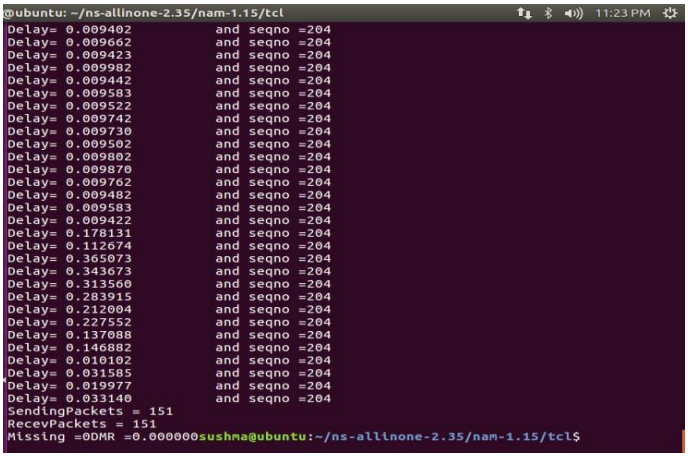

Figure 5: Simulation result of DSR

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GEDIT is used to write an awk script that calculates the protocol's end-to-end delay. Enter "gawk –f filename.awk tracefilename.tr" into the ns2 command line window to run the file.

4.3 Applying DSDV Protocol

```
sushma@ubuntu:~$ cd
sushma@ubuntu:~$ cd ns-allinone-2.35
sushma@ubuntu:~/ns-allinone-2.35$ cd nam-1.15
sushma@ubuntu:~/ns-allinone-2.35/nam-1.15$ cd tcl
sushma@ubuntu:~/ns-allinone-2.35/nam-1.15/tcl$ gawk -f e2edelay.awk dsr.tr


Average End-to-End Delay    = 25.1134 ms


sushma@ubuntu:~/ns-allinone-2.35/nam-1.15/tcl$
```

Figure 6: e2e delay for DSR

The TCL script for the DSDV protocol created in GEDIT is now ready for use. The command "ns filename.tcl" is used to run this programme on the NS2 simulator. *Figure-7* shown execution of DSDV protocol.

```
sushma@ubuntu:~$ cd
sushma@ubuntu:~$ cd ns-allinone-2.35
sushma@ubuntu:~/ns-allinone-2.35$ cd nam-1.15
sushma@ubuntu:~/ns-allinone-2.35/nam-1.15$ cd tcl
sushma@ubuntu:~/ns-allinone-2.35/nam-1.15/tcl$ ns Wireless_DSDV.tcl
num_nodes is set 22
INITIALIZE THE LIST xListHead
Starting Simulation.......
channel.cc:sendUp - Calc highestAntennaZ_ and distCST_
highestAntennaZ_ = 1.5,  distCST_ = 1856.3
SORTING LISTS ...DONE!
MAC_802_11: accessing MAC cache_ array out of range (src 22, dst 0, size 22)!
MAC_802_11: accessing MAC cache_ array out of range (src 22, dst 0, size 22)!
MAC_802_11: accessing MAC cache_ array out of range (src 22, dst 0, size 22)!
MAC_802_11: accessing MAC cache_ array out of range (src 22, dst 0, size 22)!
Going to run dsdv.nam
sushma@ubuntu:~/ns-allinone-2.35/nam-1.15/tcl$
```

Figure 7: Execution of DSDV protocol

4.4 DSDV Protocol Execution from a NAM File

A NAM file is created when the DSDV protocol is executed in a TCL script. The transportation of packets from one node to another node is monitored in a network of 22 nodes. The simulation detects the radiation. *Figure-8* shows NAM file execution of DSDV protocol.

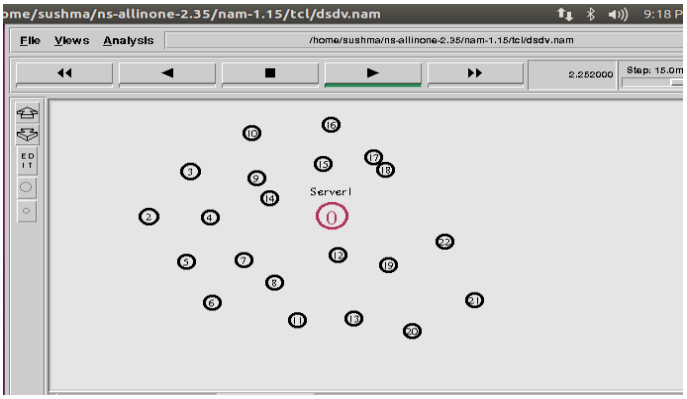

Figure 8: NAM file execution of DSDV protocol

4.5 DSDV Experience Simulation Relations

To determine the total number of packets sent and received, GEDIT is used to create an awk script. To determine the delay and sequence number for each packet. TCP and UDP packets of 1000 bytes each are sent in this example. The simulation of result of DSDV is shown in *figure-9*.

```
sushma@ubuntu: ~/ns-allinone-2.35/nam-1.15/tcl
Delay= 0.009642          and seqno =173
Delay= 0.009602          and seqno =173
Delay= 0.009643          and seqno =173
Delay= 0.009842          and seqno =173
Delay= 0.009802          and seqno =173
Delay= 0.009690          and seqno =173
Delay= 0.009742          and seqno =173
Delay= 0.074890          and seqno =173
Delay= 0.063414          and seqno =173
Delay= 0.086324          and seqno =173
Delay= 0.051896          and seqno =173
Delay= 0.019298          and seqno =173
Delay= 0.096109          and seqno =173
Delay= 0.148727          and seqno =173
Delay= 0.160544          and seqno =173
Delay= 0.041242          and seqno =173
Delay= 0.129052          and seqno =173
Delay= 0.019026          and seqno =173
Delay= 0.097395          and seqno =173
Delay= 0.025817          and seqno =173
Delay= 0.048860          and seqno =173
SendingPackets = 151
RecevPackets = 128
Missing =0DMR =0.000000sushma@ubuntu:~/ns-allinone-2.35/nam-1.15/tcl$
```

Figure 9: Simulation result of DSDV

4.6 Delay is DSDV Performance Due To E2E

GEDIT is used to write an awk script that calculates the protocol's end-to-end delay.
Gawk –f "filename.awk tracefilename.tr" is used to run the file in ns2. *Figure-10* shows e2e delay for DSDV.

```
@ubuntu: ~/ns-allinone-2.35/nam-1.15/tcl
sushma@ubuntu:~$ cd
sushma@ubuntu:~$ cd ns-allinone-2.35
sushma@ubuntu:~/ns-allinone-2.35$ cd nam-1.15
sushma@ubuntu:~/ns-allinone-2.35/nam-1.15$ cd tcl
sushma@ubuntu:~/ns-allinone-2.35/nam-1.15/tcl$ gawk -f e2edelay.awk dsdv.tr


Average End-to-End Delay    = 17.6442 ms


sushma@ubuntu:~/ns-allinone-2.35/nam-1.15/tcl$
```

Figure 10: e2e delay for DSDV

4.7 Comparison of the Implemented Protocols

Table-1 shows comparison of implemented Protocols. The e2e delay for Dynamic source routing protocol and Destination sequenced distance vector is same (25.1134ms). The e2e delay for Ad-hoc on-demand distance vector is 38.84ms.

Table-1: Comparison of the Implemented Protocols

S. No	Name of the protocol	Packets sent	Packets received	Packet transfer rate	Packet Drop rate	E2E delay
1.	Ad-hoc on demand distance vector	151	151	1.0000	0	38.8455 ms
2.	Dynamic source routing protocol	151	128	1.0000	0.152	25.1134 ms
3.	Destination sequenced distance vector	151	151	0.8477	0	25.1134 ms

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From *table-1* it is observed that packets sent for all the three methods Ad-hoc on-demand distance vector, Dynamic source routing protocol and Destination sequenced distance vector are same used in experiment, whereas packets received are 152, 128 and 151 respectively. The packet transfer rate for Destination sequenced distance vector is less than remaining two methods. Packet drop rate is 0 for both Ad-hoc on demand distance vector and Destination sequenced distance vector.

5. CONCLUSION

MANETS are utilized for data transmission in the absence of a base station. It's most beneficial when the network's connection is in jeopardy during a crisis. MANET networking is implemented in this project using three different routing protocols: AODV, DSDV, and DSR, with the associated outcomes. We conducted the study to understand that MANETS are likely to be a crucial infrastructure for the future omnipresent society. Based on the results of this comparison, we conclude that the AODV, DSDV, and DSR protocols are superior because of their capacity to look for alternate route discovery mechanisms, and it is much more efficient when it comes to packet delivery because of this exact reason. As a result, we may conclude that DSR is a superior routing protocol when network load tolerance is not an issue. It gives better statistics for packet delivery, packet loss, and e2e latency.

Conflicts of Interest: The authors declare no conflict of interest.

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