BETTERING OF PARAMETERS LIKE END TO END DELAY, ROUTE OVERHEAD, PACKET DELIVARY RATIO OF PROACTIVE ROUTING PROTOCOL OVER REACTIVE ROUTING PROTOCOL

Dissertation submitted in fulfillment of the requirements for the Degree of

MASTER OF TECHNOLOGY

in

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By

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ABSTRACT

As we are familiar with MANET (Mobile Ad Hoc Network) is infrastructure-less, self organized. We have firstly studied and compare the protocols like reactive routing protocols and proactive routing protocols. We have analyze the protocols: AODV, DSR, DSDV in terms of packet delivery ratio, end-to-end delay, throughput and packet loss. After comparing the protocols we have proposed improvement in protocol which is higher performance for path establishment between source and destination. The proposed improvement will be based on bio inspired techniques like bee colony optimization, cuckoo search algorithm in terms of packet delivery ratio, end-to-end delay and packet loss.

DECLARATION

I hereby declare that the research work reported in the dissertation entitled "**BETTERING OF PARAMETERS LIKE END TO END DELAY, ROUTE OVERHEAD, PACKET DELIVARY RATIO OF PROACTIVE ROUTING PROTOCOL OVER REACTIVE ROUTING PROTOCOL**" in partial fulfillment of the requirement for the award of Degree for Master of Technology in Computer Science and Engineering at Lovely Professional University, Phagwara, Punjab is an authentic work carried out under supervision of my research supervisor Mrs. Balwinder Kaur. I have not submitted this work elsewhere for any degree or diploma. I understand that the work presented here with is in direct compliance with Lovely Professional University's Policy on plagiarism, intellectual property rights, and highest standards of moral and ethical conduct. Therefore, to the best of my knowledge, the content of this dissertation represents authentic and honest research effort conducted, in its entirety, by me. I am fully responsible for the contents of my dissertation work.

Suhani Rajput

11501395

SUPERVISOR'S CERTIFICATE

This is to certify that the work reported in the M.Tech Dissertation entitled "**BETTERING OF PARAMETERS LIKE END TO END DELAY, ROUTE OVERHEAD, PACKET DELIVARY RATIO OF PROACTIVE ROUTING PROTOCOL OVER REACTIVE ROUTING PROTOCOL"**, submitted by **Suhani Rajput** at Lovely Professional University, Phagwara, India is a bonafide record of her original work carried out under my supervision. This work has not been submitted elsewhere for any other degree.

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Internal Examiner

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Name: _____

Date: _____

ACKNOWLEDGMENT

It is with deep sense of reverence that I express my sincere thanks to my supervisor Mrs. Balwinder Kaur for their guidance, encouragement, help and useful suggestions. Their untiring efforts, methodical approach and individual help made it possible for me to complete this work in time. I am also thankful to all my friends for their continuous motivation and help. Although it is not possible to name individual, I cannot forget my well wishers for their persistent support and cooperation.

(Suhani Rajput)

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CHAPTER 1

INTRODUCTION

Manet(Mobile Ad Hoc Network) is infrastructure less because in this all the nodes are moving freely. They work on within radio range by wireless network and the nodes which are very far from network they work as routers. It also creates a very frequent change in topology. This is more use in military while battles for rescue [1]. It works on physical layer of our OSI model. It is a arrangement of wireless nodes where all the nodes exchange the data. Manet increases the performance of nodes on the basis of network. The main goal of mobile adhoc networks are like it uses connection less ip services, ip routing. The manet has some properties like it is distributed in nature like all the nodes are free to move and also it doesn't create any loop. It doesn't have a uniform movement like when where we demand the network that is usable. Also in the case of security, as it is wireless security is easy in this but as we talk about wired, security is hard. As we can see manet have some properties, so it necessary that it also have weakness like it don't have centralized management all the network are distributed on one server it is not there. Resources are not much available in manet. Due to manet of nodes in wireless, scalability is changing all time. It also not too cooperative with networks, as the malicious attacked can attack easily. In manet nodes are dynamically changing as the connection between the nodes get disturbed. Also the power supply is very much limited in the case of manet, when ever nodes move from one place to another they get less power supply. In the case of bandwidth, it has external noise and interference. The main problem with this is this is it doesn't have a predefined boundary, nodes are free to move. No defined area is specified for network. In the case of device discovery, it is different to know the new nodes and inform to existing ones.

1.1 Manet Architecture

The mobile adhoc networks is the network in which no central controller is present and it is the decentralized type of network. In such type of network network mobile

node configure with random topology. In the random topology each node are aware of the nodes which are their adjacent nodes or in their direct range. As illustrated in the 1.2, mobile devices, laptop are configured to form a network. In this type of network, single and mutihop communication is possible. In single hop communication when two nodes are direct range of each and in multihop communication node can communicate each other indirectly through intermediate nodes.

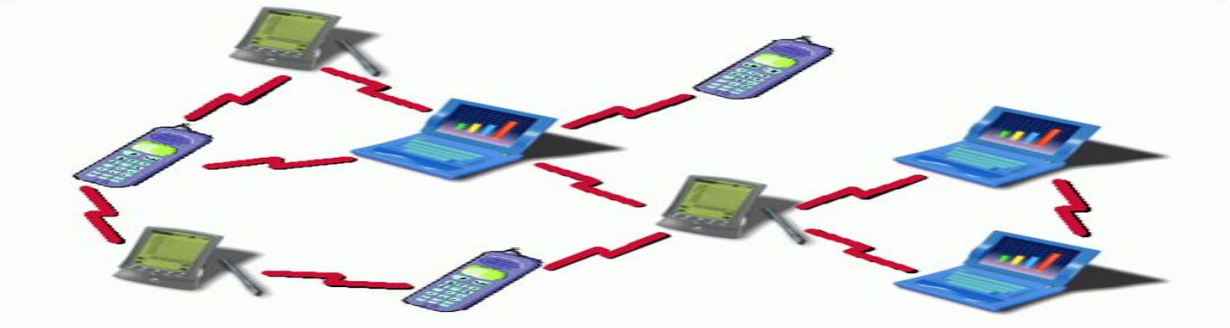


Figure 1.1: A Simple Mobile Ad Hoc Network[2]

1.2 Advantages of Manet

1) **Convenience:** These networks being wireless in nature permits users to utilize network assets from approximately any suitable location inside their main networking environment which can be office or home.

2) **Mobility:** It is observed that with time there is significant evolution of public wireless networks, which now enable users to access the internet while they are outside their working environment like home or office.

3) **Productivity:** It describes that when users are connected to a wireless network, they can seamlessly go through their desired task online without any interruption even when they are on the go.

4) **Deployment:** The deployment of the infrastructure less adhoc network is not much of arrangement, it requires mobile nodes which can work as source as well as a router.

5) **Expandability:** The adhoc networks are scalable in nature, therefore it can handle the addition of new clients to the network. Whereas in case of a wired

network, addition of new clients would be needing some extra wiring which will add to the cost.

6) **Cost:** The hardware required for wireless adhoc network is quiet expensive on the basis of device configurations.

1.3 Applications of Manet

The nodes can join or leave the network at any instant in MANET. As there is no central coordinator present in this network, they self-configured, and self-organized. These network are easy to deploy anywhere within no time, because deployment cost-effective, and no infrastructure is required. The features of MANET are used by military departments in various applications:

- In wired network large infrastructure is required if the base stations or the central controller fails the whole network gets interrupted. Military applications takes advantage MANET and used it in battlefield.

- For commercial usage the sensor networks are used the sensor nodes are locates in sea dessert and forest for sensing the data and send back to location.

- Personal LAN gaming, video conferencing are some examples of local communication usage of MANET.

- Old wired LAN are now replaced by PAN (Personal Area Network).

1.4 Challenges of Manet

The various mobile nodes can form network at any place when required. In MANETs, no central controller is present; it is decentralized type of network. In such type of network following are the various key challenges:

i. Mobile nodes can move without restrictions in the network. When the mobile node changes its position, network topology certainly changes with it. For such type of networks there are several challenges for choosing routing protocol. The multicast routing is the key challenge in MANET.

ii. The security and reliability are the other major challenges of MANET. In this, certain types of internal and external attacks are possible. It have been a tedious task to design the key management and self-authentication mechanism for MANET.

iii. The real time application like video conferencing requires fixed resource reservation to ensure quality of service. It is difficult to design such mechanism that guarantees good quality of service.

iv. The Mobile adhoc networks have been formed when nodes from various handheld devices or sensor nodes communicate. Power consumption is another major shortcoming of MANETs. The wireless sensor networks are deployed for sensing the environment conditions and generally deployed at far places. There have been certain requirements of efficient mechanism for power management.

v. There has been the existence of hidden terminal and exposed terminal problems in case of MANETs. There is an obvious need of a helpful mechanism to solve these problems.

vi. The mobile nodes can change its position at any time. This approach has led to the problem of link failure which degrades the network performance.

1.5 Classification of Routing Protocols

There are mainly 3 types of routing protocol. Proactive routing protocols constantly retain the updated state of the network topology and are typically table-driven[3].

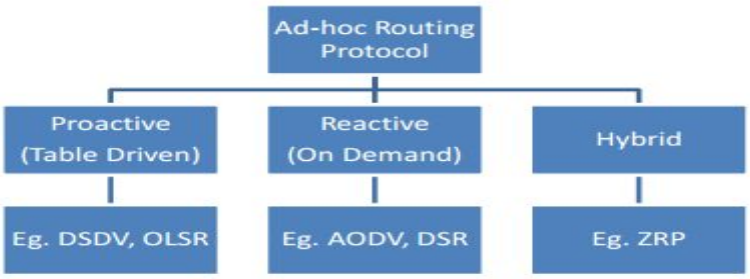


Figure 1.2: Classification of protocols

1.5.1 Reactive Routing Protocol

In this the route is their whenever we demand for that, when the sender wants to send the message to receiver then this protocol creates a path. It creates a multihop routing between the nodes wherever we need [1]. They are not maintained all the time, only whenever we demand then it discovered the route. Whenever the traffic is less and topology is not changing frequently, then it reduces the overhead of routes. All the information are at data packets, they store all the source routing information within it, and the information which is stored in header of data packets is the information of intermediate nodes i.e. For communication and update is not necessary for each intermediate nodes.

1.5.2 Proactive Routing Protocol

This is also called table driven routing protocol. It maintains fresh updating of nodes in the table and when the nodes want to connect with the network it immediately connects with it. It has high latency while we have to find the routes [4]. These routing protocols constantly retain the updated state of the network topology by creating a routing table and this predefined information is used to establish path from source to destination. All the nodes present in the network creates & maintains routing information to every node keep information of their adjacent node which is used at the time of path establishment and maintained information will be updated time to time [5]. The protocols which maintain routing protocols are least using in this type of network due to random topology and has high routing overhead in the network.

1.5.3 Hybrid Routing Protocol

These types of protocols make use of the strengths of both the previously discussed protocols. In this routing is done with some predefined information which is kept on the node and after that source flood route request packets to gather network information. In this it has predefined information of its zone head and nodes which are in the zone.

1.6 Description of Protocols

1.6.1 Adhoc On demand distance vector routing protocol (AODV)

The adhoc on demand vector is the efficient routing protocol which use single source and destination routing. In AODV path establishment protocol starting node will give route request packets and nodes which are adjacent to the destination node then it will give response back with route reply packets. The starting node have various available paths and source select best path on the basis of hop count and sequence number. The hop count defined the number of hopes and sequence number defines the path freshness.

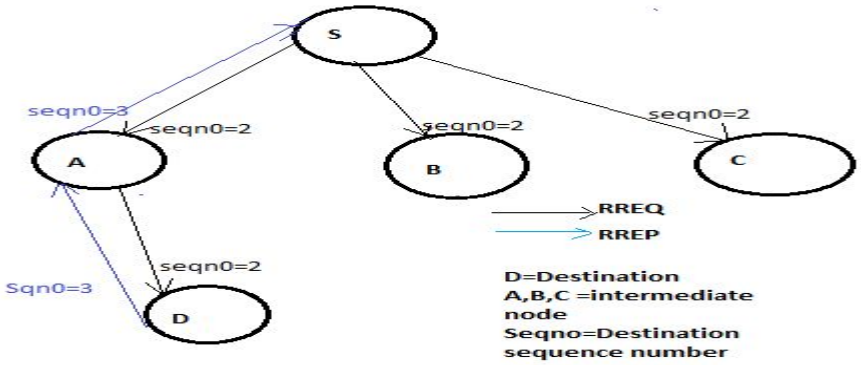


Figure 1.3: AODV protocol

Advantages of AODV:

Main advantages of AODV protocol are:

1. It can be used for wireless mesh networks.
2. It is loop free.
3. It does not require any central system to handle all the nodes.

Disadvantages of AODV:

Main disadvantages of AODV protocol are:

1. During traffic shortest path may be lost.
2. Scalability is not possible in AODV protocol.
3. Load balancing and congestion control problem cannot be handled in AODV.

1.6.2 Dynamic Source Routing Protocol (DSR)

The DSR Protocol is the reactive type of protocol in which the path from the source to destination is selected when required. The Starting node will give the route request packets. The intermediate nodes, which are having route to the destination will respond with the route reply packets. The DSR protocol is similar to the AODV

protocol. When the source node starts broadcasting the route request packets, the header of the route request packet is empty .The header of the route request packet starts populating, when the intermediate node again broadcasts the packets to its adjacent nodes. The node that forwards the route request packets to its adjacent nodes, adds its ID in the header of route request packet. This approach reduces, the congestion in the network. The main disadvantage of this approach is that when the network size grows, overloading of packet header may happens. The DSR protocol has route request, route reply and route error packets. When the route is established between the source and destination, route request and route reply packets are used. There is the possibility that certain mobile nodes can change their location. When mobile nodes change their location, link failure problem may exist between source and destination. To notify the source about the link failure, route error message is used. The working of DSR protocol is given in the fig [6].

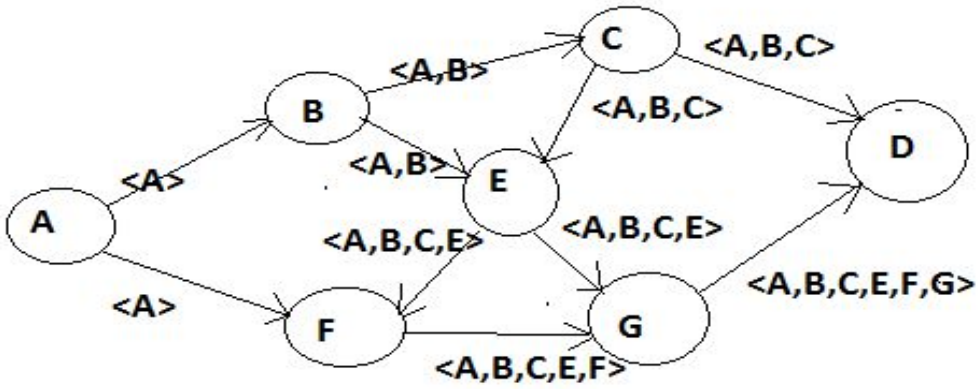


Figure 1.4: Route Request Flooding

As given in Figure 1.4, the starting node A floods the network with route request packets. Every node adds its ID in the packet header until it reaches to the destination.

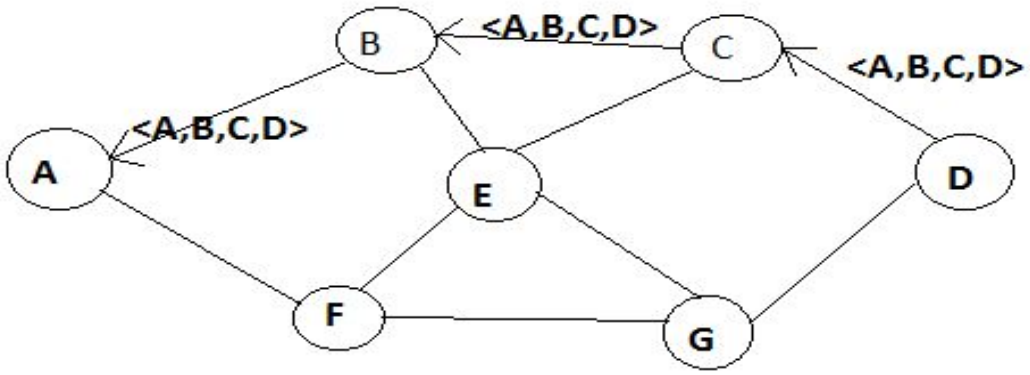


Figure 1.5: Route Selected between Source and destination

As given Figure 1.5, the route is made between the starting node and destination node. The route has been selected by hop count and sequence number. The route which have minimum hop count and higher sequence number is selected as the best route. Once the optimal route has been selected, the confirmation packet is unicast via this route only [7].

Advantages of DSR:

Main advantages of DSR protocol are:

1. Whenever we need route, we discover the route.
2. Node links are stored in route buffer.
3. Simple process for route.
4. Overhead is less.
5. Reduces cost as it is stored in buffer, again and again not need for route discovery.

Disadvantages of DSR:

Main disadvantages of DSR protocol are:

1. Not much efficiency.
2. Consume more time.
3. Again and again we have to discover path.
4. If link broken again we have to again discover the path.
5. Collision can occur.

1.6.3 Destination sequence distance vector protocol (DSDV)

It is proactive routing protocol, each node will maintains routing information for all known destinations. If no node want the data then also it process the information like it send the data, it broadcast the data. It is well known table driven protocol. To solve the problem of distance vector problems, we have to add the sequence number to every node in routing table. Every node is having a counter so whenever they send table the counter is increased. Counter value will be used as a time stamp i.e. sequence number. If a node receiving a table from another node, node will update in only one case if the receiving table has a updated information. So how table would know this table is having a updated information or not it will check sequence number.

If that sequence number is higher means that information is a updated information. DSDV routing entry include- <destination, nest hop, distance, sequence number>. Sequence number is originated from the destination. It ensures loop freely.

Advantages of DSDV:

Main advantages of DSDV protocol are:

1. Routing information is updated periodically.
2. No latency caused by route discovery.

Disadvantages of DSDV:

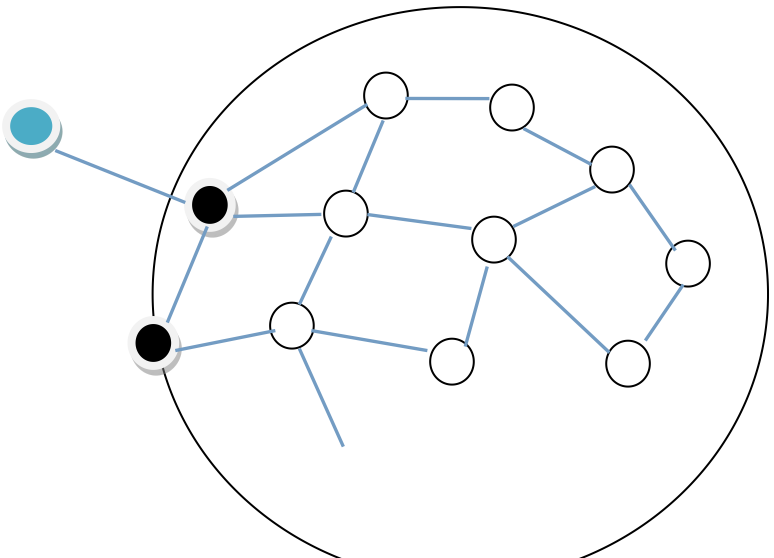
Main disadvantages of DSDV protocol are:

1. Overhead in traffic, even if there is not change in topology.
2. Maintain that route also which are not used also.
3. No sleeping nodes.

1.6.4 Zone-Based Hierarchical Link State Routing Protocol(ZRP)

In this protocol, Network is categorized into non-overlapping zones. It has two level of topology i.e. node level & zone level. In node level it tells connection of nodes to each other physically of a zone. And the zone level tell us about how connection of zones are establish. Neighbor node information is contained by last node and propagated by zone while zone LSP has the zone information and globally it propagate [8].

It uses hybrid approach. Its motive is to overcome long delay and large bandwidth. Each zone has a variable zone in the network. Geographical measurement can't find the size of a zone but is mentioned by a radius of length ρ, where ρ is the number of hops to perimeter of the zone. For other protocols it provide us framework.



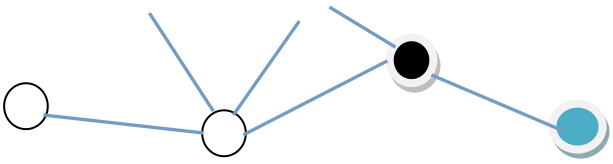


Figure 1.6 Zone Protocol

Interior nodes are white in colour, peripheral nodes are black in colour and blue colour nodes are outside the routing zone.

Main types of ZRP protocols are:

1. Intra Zone Routing Protocol (IARP)
2. Inter Zone Routing Protocol (IZRP)
3. Border cast Routing Protocol (BRP)

1. Intra Zone Routing Protocol: To connect by interior nodes of its zone and limited by the zone radius [6] than IARP is used by the nodes. Inside the zone routes maintained and furthermore every node is like to update the routing information for finding the peripheral nodes.

2. **Inter Zone Routing Protocol:** We use this for communication of different zones. It enhanced route discovery. Advantages provided by the IERP needs to be local connected provided by the IARP. By using broadcasting process, BRP is only used to transfer peripheral nodes by route request, thus route discovery process is done.

3. Bordercast Routing Protocol: It is used to forward route request generated by the IERP to the peripheral nodes. Furthermore it can also used for topology information which is provided by the IARP to construct broadcast tree.

Table 1.1 Comparison of Routing Protocols

Parameters	**Table-driven (Proactive)**	**On-Demand (Reactive)**	**Hybrid**
Memory Used	Higher	Dependent on no. of Routes needed	Depends on size of Each zone or cluster
Path Availability	Always Available	Calculated per requirement	Depends upon position of end point
Periodic Updates	Mandatory always	No need	For intra-zone communication
Delay	Low	High	Low for local destinations and high for inter zone
Expandable	100 nodes	More than 100	More than 1000
Traffic Overhead	High	Low	Low as compare to other two types
Routing Details	Stored in the table	Does not stores	Depends upon requirements
Routing Topology	Mostly plane	Plane	Tree

1.7 Optimization Technique

Optimization techniques are those which give the best fit solution. It is used to solve complex computational solutions [9]. It finds out the best result from the given feasible solutions. There are several techniques which are based upon the natural phenomena. These techniques are as following:

1. Bee Colony Optimization
2. Ant Colony Optimization
3. Cuckoo Search Algorithm

1.7.1 Bee Colony Optimization(BCO)

This is nature inspired technique. It is based on swarm intelligence technique. It is meta-heuristic technique which is concern with memory based searching. Bee colony optimization technique is used to find the best path from the number of the solutions. It is bottom-up approach used to solve complex combination problems. It is decentralized and self operating technique. These are categorized into two types, these different types always present in the bee hive and they are in hundred and thousand in numbers which work together. There is one Queen Bee which presents in the bee hive and lay eggs. Drone are also in many number which companion with female queen bee. Other bees are as follow:

1. Scout Bees
2. Forager Bees

Scout bees are present in large quantities which are go outside in the search of the food. These bees go outside in direction to reach at the food source of good quality in the direction of the sun. Them these bees are out of energy, they come back to hive. Then they communicate with the forager bee to tell them the direction of the food. They communicate with the form of well organized sequence which shown as digit 8 [25].After the communication forager bees go outside for the collection of the food which is selected by the scout bees. Forager bees only go to that direction where best quality food is available. So scout bees are used for the path construction and forager bees are used for the path selection. Waggle dance tells about the direction and purity of the stuff in the direction of sun. Path testing is used in BCO algorithm to selects paths. In BCO algorithm, maximum numbers of faults are detected in minimum number of time with the help of last forager bee. It is a global optimizer which an effective searching process.

1.7.2 Ant Colony Optimization

Ant Colony Optimization is a probalistic and meta-heuristic technique. It is also natural insipid technique which is meta-heuristic in nature and used to solve complex combination problems. It uses the previous results to find out the present optimal paths. It is dynamic in nature. It gives the idea for team coordination, their behavior and functionality. It is also based upon swarm intelligence. Ant starts from nest to reach to destination and follow different paths. Each ant secretes pheromone trails to attract other ants following that path. The path which has the highest pheromone trails

are the optimal paths compared to others. So the path is depending upon the trails. It is also upgradable technique according to the secrete pheromone trails. When they ant's returns back to the home they follow the same as the path of starting not the shortest path [10].

1.7.3 Cuckoo Search Algorithm

Cuckoo search is one of the optimization algorithms which is used in various fields of image processing, networking, artificial intelligence. This search carries concept from various cuckoo spices. Earlier this algorithm is used for complex computational problems. Later on this research is applied with PSO and Genetic algorithm and finds out that it achieves better results than PSO and Genetic algorithms. Basically cuckoo search is deal with multimodel problems naturally and effectively. The french mathematician Paul Pierre Levy introduces a species called Levy Flights is similar to cuckoo as well, on which all CS algorithm revolves. The behavior of OOP(obligatory brood parasitism) based on cuckoo. In which some birds and fruit insects follow the heavy tailed probability distribution step size. These distribution step size formulated into algorithm and introduce a new idea, all other existing algorithm are compared in CS with numerous connection problems. Cuckoo hashing a technique for resolving hash collision in the table to value the hash function. In cuckoo search algorithm basically we use this to find the shortest path from source to destination also it find the best node in the network.[11].

CHAPTER 2

LITERATURE SURVEY

I cited some papers and journal articles that are related to our work or have provided insight or inspiration for this effort. In order to provide a context for our contributions, I review some of them that have been particularly useful.

Parminder kaur et al. [12] , it is discussed that using the parameters average transmission delay, end-to-end delay, throughput. AODV have more delay than OLSR in case of Average Transmission delay(Delay increases with large variation of source nodes), OLSR have more end to end delay than AODV and AODV perform much better than OLSR when we take the case of throughput. The performance of AODV is best than OLSR means concluded reactive routing protocol is better than proactive and in future they plan for implementation attacks in same network and performance analysis of same network.

Krunal S Bhavsar et al. [13], it is discussed that using these parameters bandwidth, throughput and packet loss. AODV routing protocol is best acceptable for general mobile Ad Hoc networks as it consuming bandwidth very less and overhead is also low when compared with DSDV routing protocol. So here also reactive routing protocol is better than proactive.

S. Poornima et al. [14], it is discussed that using these parameters end-to-end delay, PDR(packet delivery ratio), routing overhead,optimal path performance metrics. AODV keeps on improving in packet delivery ratio with dense networks. TORA performs much better in packet delivery owing to selection of better routes using acyclic graph. The AODV is better for moderately dense networks where as the OLSR performs well in sparse networks. Here also reactive routing protocol is much better than proactive routing protocol. As for future that we can effort to enhance Ad Hoc network routing protocol by tackling core issues.

C. Thanka Saranya et al. [15], it is discussed that using these parameters PDF(Packet Delivery Fraction), throughput, end to end delay. Compared to DSDV & OLSR routing protocols the throughput of AODV is much greater, the average end to

end delay of AODV is less than both DSDV & OLSR routing protocols, the performance of AODV is better than OLSR & DSDV protocol. It concluded the results show that AODV protocol performance is better than other two protocols. So the conclusion comes that reactive routing protocol is much better than proactive routing protocol.

Ambrish Gangal et al. [16], The objective of this paper is to analysis about techniques types which is used in load balancing for Ad Hoc networks. From transmitting the data it has a problem of failure link in manet by this there is a decrease in performance of network and reliability. The most forwarded and energy efficient technique is multi path routing. By novel technique we can remove the failure of link problem in future.

The throughput of generation of packets and receiving of packets, sends and receive the jitter and end to end delay are the parameters for the comparison in **Teglovy Singh Chohan** et al. [17] paper. Analysis of jitter though number of generation of packets in AODV is somewhat more but the rate of dropping packets is much less in case of DSDV as the number of drop packets and packets which are lost is more in case of AODV. If we consider jitter, it is high at the case of DSDV and values which is high in case of AODV. End to end delay is less in AODV case as compared to DSDV. End to End delay impacts the performance of network as fast the nodes are communicating in a scenario of wireless so AODV is better.

DSR, AODV AND TORA that are based on protocol parameters in **Dr. R Shanmugavadivu** et al. [18] such as route discovery, route maintenance, network node overhead. AODV performance is considering its ability to manage the connection by exchange of information periodically, which is TCP requirement. When we have large number of network AODV is best. If we talk about real time traffic then also AODV is considered on DSR. AODV is based on discovery of route and maintenance of route mechanism. AODV packet size is uniform and non uniform for DSR. DSR is capable for networks which have a mobility rate moderate. Whereas for huge network which is having dense population of nodes TORA is suitable. For multiple routes and multicasting it is best supportive.

Aman Kumar et al. [19] paper, we consider the performance of these proactive routing protocols i.e. OLSR, Improvement Destination-Sequenced Distance Vector (I-DSDV), ZRP evaluated for Ipv6 environment on the basis of these parameters end to end delay, PDF(packet delivery fraction), overhead in route. The aim of this paper is to survey how these routing protocols behave when we have IPv6 environment. On analysis of observation, it has been seen that OLSR performs better in terms of end to end delay and PDF, whereas ZRP is good in parameters of overhead in route. Thus we have concluded that OLSR and ZRP performance is better as compared to DSDV and I-DSDV. In this proactive routing protocol is much better than reactive routing protocol.

Xiaoyan Hong et al. [20] has given the survey on routing protocols that address scalability. The routing protocols included in the survey fall into three categories: (1) flat routing protocols (2) hierarchical routing approaches and (3) GPS augmented geographical routing schemes. The paper compared the scalability properties and operational features of the protocols and discussed challenges in future routing protocol designs. An adhoc network will be used in various applications ranging from military to commercial, the diversity in routing protocol design is inevitable. In this, a description on various adhoc routing protocols are provided and we have seen the differences. As we see the latest rapid growth of adhoc networks, future research has challenge in the attempt to calculate the best match among scalable routing and media access control, security and service management.

While, **S.S Tyagi**et et al. [6] has provided the simulation based comparison and performance analysis on different parameters like PDF, Average end to end delay, Routing Overheads and Packet Loss. Analysis and investigations are conceded out on three prominent protocols, AODV, DSR and DSDV using ns2. DSDV is chosen as agent of proactive routing protocol while AODV and DSR are the agents of reactive routing protocols. In dense environment, AODV performed better except packet loss. DSR and AODV both performed well. AODV and DSR are proved to be better than DSDV. All the protocols are not suited for all the scenarios. They all have advantages as well as disadvantages also. Although the field of adhoc network is rapidly growing and new developments are coming day by day, still there are many challenges to be met.

Shima Mohseni et al. [21] have presented the analysis study of reactive and proactive Routing Protocols in MANET. In this paper, various routing strategies for routing protocol in MANET have been discussed. While it is not clear that any particular algorithm or class of algorithm is the best for all scenarios, each protocol has definite advantages and disadvantages and is well suited for certain situations.

Helge Wiemann et.al [22] gave basic principles and characteristics of Geo-based routing protocols. The main idea is the use of geographical addresses instead of link-specific addresses like IP-addresses. It provides more scalability. The basic principle is that before sending a packet, it is necessary to determine the destination position.

CH. V. Raghavendran et.al [23] introduced Swam intelligence algorithms for routing purposes. SI adopts natural behaviors of fish, ants, bees and many insects. Although each individual has little knowledge and simply follow basic rules using local information obtained from the environments. Ants routing follows basic mechanism of swam intelligence and gives interesting solution to the problems. Ants routing is dynamic and adaptive in nature which is more popular algorithms based upon researchers. At the end, various bio-inspired algorithm have been discussed.

Rupinder Kaur Gurm et.al [8] described that MANET is a network in which nodes can freely join and leave the network. MANET has some properties like infrastructure-less, dynamic in nature and decentralized control. Due to frequently topology change network performance decreases. Cuckoo search optimization algorithm is a good technique for developing efficient routing protocols for MANETs. CSO is beneficial to find out best optimal path with shortest routing to send data in MANET. In this paper, AODV and DYMO routing protocol with CSO algorithm. Further implemented CSO algorithm on AODV & DYMO protocols using NS2 simulator and compared its simulator results with simple AODV & DYMO protocols.

Dr. Umadevi Chezhiyan et al. [24] they explained the importance of the adhoc networks which communicate and establish path between two end nodes. Routing is the path for path establishment between source and destination to transfer data.

Reactive routing is a performed well in MANET than proactive routing. In this paper various routing protocols with their advantages and disadvantages has been discussed. At the end measurement performance analysis is also done in MANET.

Sweety Goyal et al.[25] explained that ZRP is a combination of active and passive for large network In the process of a protocol, inside the routing area, members maintain timely IARP Routing table. Outside the region, route discovery mechanism has been carried out by the IERP using a routing request and routing reply. Border casting process for routing Borders found that the use of casting BRP. In order to less the quantity of query Traffic, access the control mechanisms and early termination query detector can be used. ZRP is a unique protocol that can be used as routing architecture.

Charu Sharma et al. [26] explained that MANET is a network which can be easily deployed. MANET has no central controller so topology changes dynamically. Topology change is a challenging issue in MANET. In this paper the whole network strategy with performance metrics which are to be used in the OPNET simulation for the analysis has been described. The performance metrics used are throughput, packet queue size, transmitted packet rate and received packet rate and the simulator tool used is OPNET Modeler 14.0.

Prof. B.N. Jagdale et.al [27] described that routing protocol plays an important role in MANET for communication and established path from source to destination. It also helps to discover optimal path for data transmission. AODV, DSDV and DSR, ZRP are the various routing protocol to establish efficient path from source to destination. In this paper two routing protocols has been discussed. In this paper it is concluded that AODV is better than DSDV. DSDV consumes more bandwidth as compared to AODV due periodically broadcast packets. On the other hand, AODV has no need for table maintenance contains less bandwidth and less overhead. Even the throughput is less in DSDV as it continuously broadcast route information, but in case of AODV throughput is stable as it don't needed to maintain any route information.

In this study **Mohamed Elboukhari** et al. [28], performance is calculated in terms of Packet Delivery Ratio, Average End to End Delay, Normalized Routing Load and Average Throughput. In terms of Packet Delivery Ratio, AODV, DSR have higher

value than other protocols (DSDV, OLSR). As table-driven protocols, DSDV and OLSR show the lowest Average End to End Delay (good performance) compared to on-demand protocols (AODV, DSR). DSR demonstrates the lowest Normalized Routing Load than other protocols. In almost all scenarios, AODV and DSR outperform other protocols (DSDV, OLSR) in terms of average throughput. In the future work is to extend the set of the experiments by taking into consideration other simulations parameters (propagation models, MAC protocols, etc.)**.**

Dr. Arvinder Kaur et.al [29] have presented BCO algorithm for maximum fault coverage using two examples whose results are comparable to optimal solution. In this paper, Average Percentage Fault Detection (APFD) metrics and charts have been used to show the effectiveness of proposed algorithms. It is done by study of the natural food foraging behaviors of bees. A good use of the path exploration and path exploitation phenomenon of Scout bees and Forager bees for the prioritization of the fault coverage test suite of the enhanced code is told through BCO algorithm. The proposed BCO algorithm has been explained with examples. C++ compiler has been generated to find out the faults which are maximum in number and in minimum execution of time. With the help of 5 different types of example bee colony concept is explained with showing that maximum faults are covered with their shortest path.

Charanjeet Singh et al. [30], we have discussed various routing protocols for Mobile Ad Hoc Networks. We have analyzed the parameters of protocols i.e. Loop Free, Distributed, Multicast Routes, QoS Support, Periodic Broadcast, Demand based Operation. The AODV and DSR are Reactive Routing Protocols i.e. it establish the Route on demand. But in DSDV, each node maintains routing information for all destinations. And it regularly updates their routing tables, so consumes more bandwidth as compared to AODV. In future, practical implementation of these protocols for adhoc network is to be analyzed for accurate and absolute result.

The table 1.2 summarizes the work done by various researchers related to performance analysis of MANETs routing protocols.

Table 1.2: Analysis of protocols

Authors name	**Protocols used**	**Simulator**	**Performance**	**Variable**

reference			Metrics	Parameters
C.Thanka Saranya et al.	DSDV, OLSR, AODV	NS2	End to End Delay, Packet Delivery Ratio, Throughput	Number of Nodes, Speed, Pause time, Transmission Power
T.Singh Chohan et al.	AODV, DSR	GLOMOSIM	End to End Delay, Throughput	Number of nodes, Speed, Pause time
S.Poornima et al	AODV, OLSR, TORA	NS2	End-to-End delay,Routing Overhead, Optimal path, PDR	Traffic Loads, Movement Patterns
Mohamed Elboukhari et al.	AODV, DSR,OLSR,DSDV	NS2	Packet Delivery Ratio, Normalized Routing Load, MAC load and Average End to End Delay	Number of Sources, Speed, Pause time
Charanjeet Singh et al.	AODV, DSR,DSDV	NS2	Packet Delivery Ratio, Routing Overhead, Normalized Routing Overhead and Average End to End Delay	Speed
S.S. Tyagi et al.	AODV, DSR, DSDV	NS2	Packet Delivery Ratio, Average End to End Delay and Routing Overhead	Pause Time
Prof.B.N. Jagdale et al.	DSDV, AODV,DSR,ZRP	NS2	Less overhead, throughput	Number of Nodes, Speed, Time
B.Chitra et al	AODV, DSR, TORA	QualNet	Network node overhead	Pause Time

CHAPTER 3
PRESENT WORK

3.1 Problem Formulation

In this we have formulated the problem of best optimal path in terms of packet delivery ratio, packet loss, end-to-end delay. Firstly we have compared and analyze the protocols and then to find the best path we used the bio-inspired techniques like bee colony optimization and cuckoo search algorithm.

3.2 Objectives of the study

1. To study and analyze various routing protocols like reactive, proactive and hybrid routing protocols for MANETS.

2. To analyze the performance of AODV, DSR and DSDV routing protocol in terms of PDR, end-to-end-delay and route overhead.

3. To propose improvement in protocol which is higher performance for path establishment between source and destination .

4. To implement proposed improvement and compare with existing protocol in terms of PDR, end-to-end-delay, throughput and packet loss by using two algorithm Bee Colony Optimization and Cuckoo Search Algorithm.

3.3 Research Methodology

In this work, comparative analysis has been done between the proactive and reactive type of routing protocols. We have selected best path to destination in terms of some parameters. In this work, improvement will be proposed in AODV routing protocol using bio-inspired techniques. The bio-inspired techniques are ant colony, bee colony and cuckoo search algorithm. In this work, bee colony and cuckoo search algorithm are combined together and used with AODV routing protocol to establish path to destination. In the proposed technique least suppose path will be established from source to destination using AODV protocol. In the established path hop are 1,3,5,7. The hybrid ant and bee colony algorithm are applied for path establishment and path which is established are having hops 1,3,8,7. The source node select nodes which are common in the paths and select nodes which are node common on the basis of distance from the source node. The node which has minimum distance will be selected as the hop node from source to destination.

We used tool ns2:

In this tool we can analysis the performance of our routing protocols and can improve as we want to modify. Basically ns2 is to support networking. It provides implementation for simulation of routing, and multicast protocols for both wired and wireless networks. It is a tool which tell us the behavior of network, it examine the network and analyze the event occurring on nodes. Platform required to run network simulator are: UNIX, Window 95/98/2000/XP, Linux.

Pseudocode

Set M Mobile Node's

Set S sender and R receiver

Node Routing = AODV

Set Route

{

If (route from S to R found)

{ Check number of route;

If (route => 1) //means alternative route exist in network

{

Find (hop count and sequence number)

Select only 1 routes as a best route //shortest path

Send route acknowledge through all exist path } }

Else {route is not common} } {

Source send(adjacent nodes distance)

{

Adjacent nodes revert back to source which distance

Check(Node which has least distance from source node)

{

Increment-Q;

Store incoming data;

}

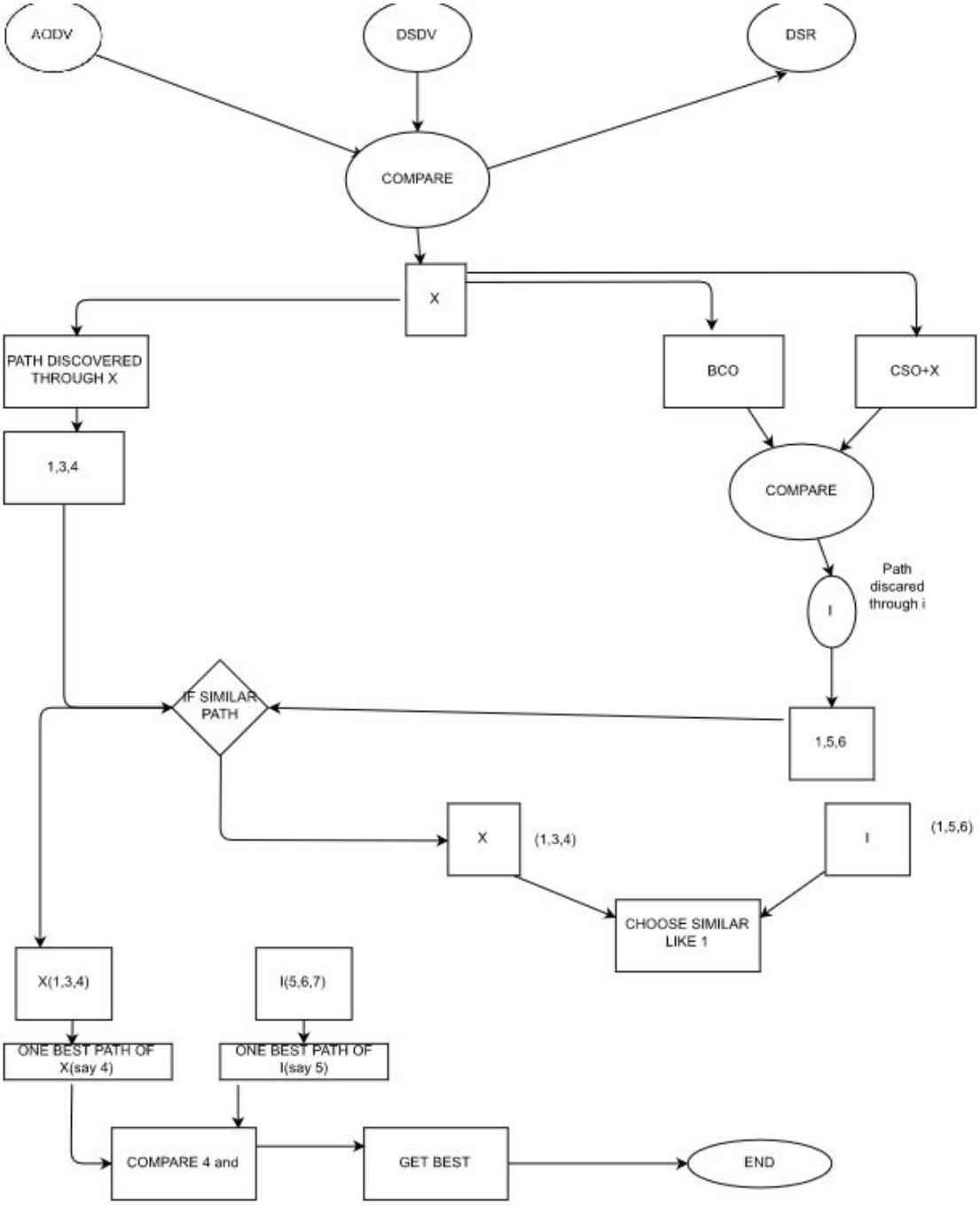
Receiver receives data from I

node;

Send ACK to sender S;

} } }

FLOWCHART:



CHAPTER -4

RESULTS AND DISCUSSION

4.1 Experimental Results

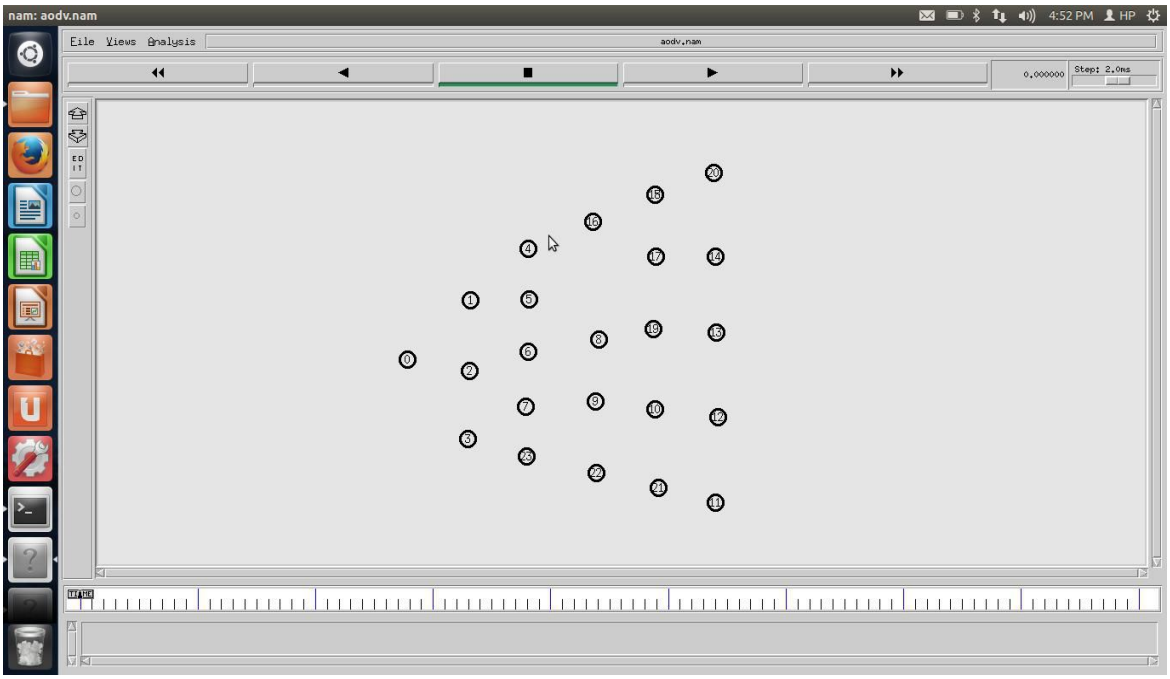


Figure 1.7: Network Deployment

As illustrated in Figure 1.7, the network is deployed with the finite number of mobile nodes. In the network source and destination nodes are defined and source node is responsible to establish path to destination.

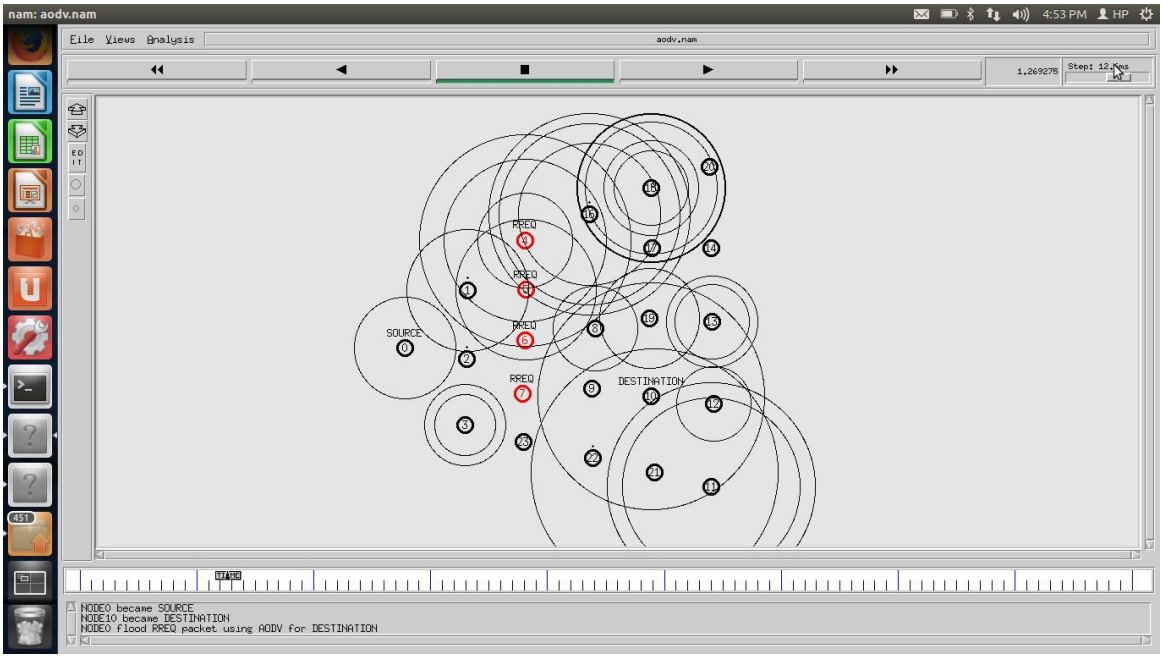


Figure 1.8: Path Establishment

As illustrated in Figure 1.8, the network is deployed with the finite number of mobile nodes. In the network source and destination nodes are defined and source node is responsible to establish path to destination. The source node use AODV routing protocol for path establishment from source to destination. The source node flood route request packets in the network to establish path to destination.

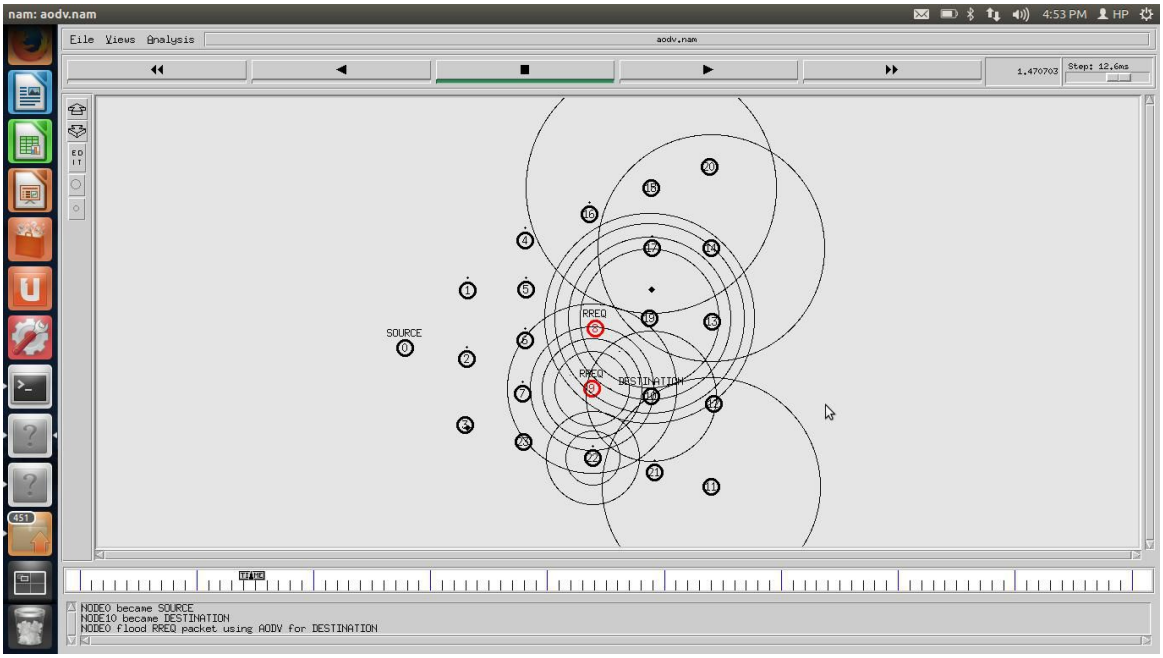


Figure 1.9: Path Establishment

As illustrated in Figure 1.9, the network is deployed with the finite number of mobile nodes. In the network source and destination nodes are defined and source node is responsible to establish path to destination. The source node use AODV routing protocol for path establishment from source to destination. The source node flood route request packets in the network to establish path to destination.

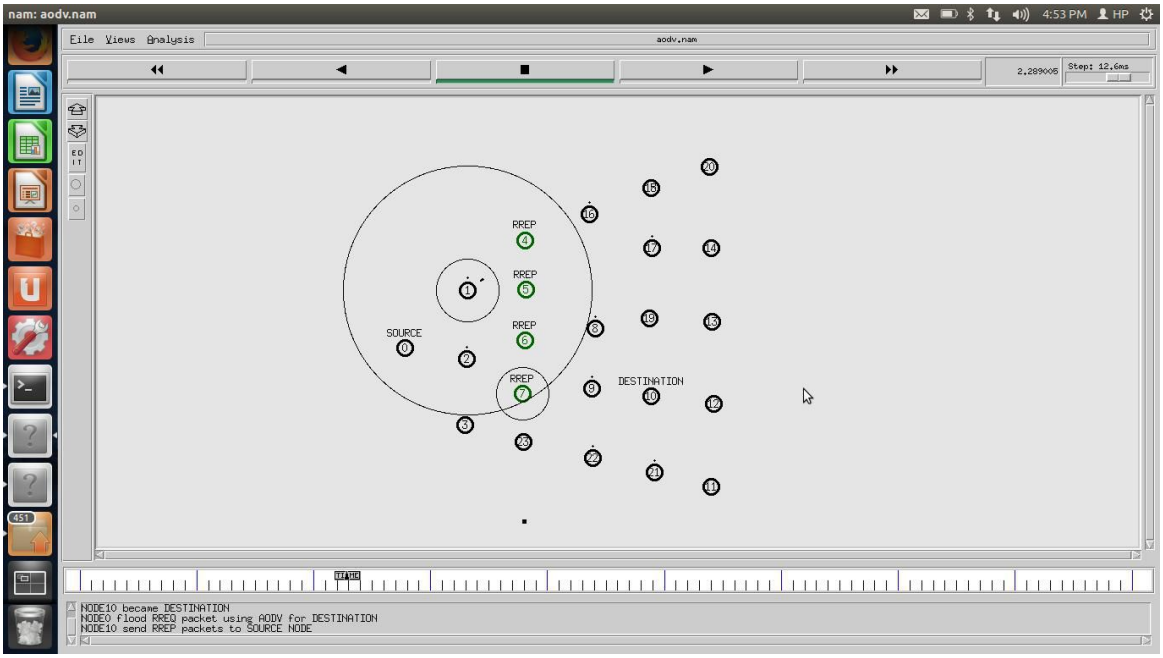


Figure 1.10: Path Establishment

As illustrated in Figure 1.10, the network is deployed with the finite number of mobile nodes. In the network source and destination nodes are defined and source node is responsible to establish path to destination. The source node use AODV routing protocol for path establishment from source to destination. The source node flood route request packets in the network to establish path to destination. The adjacent nodes of destination will respond back with route reply packets to source node.

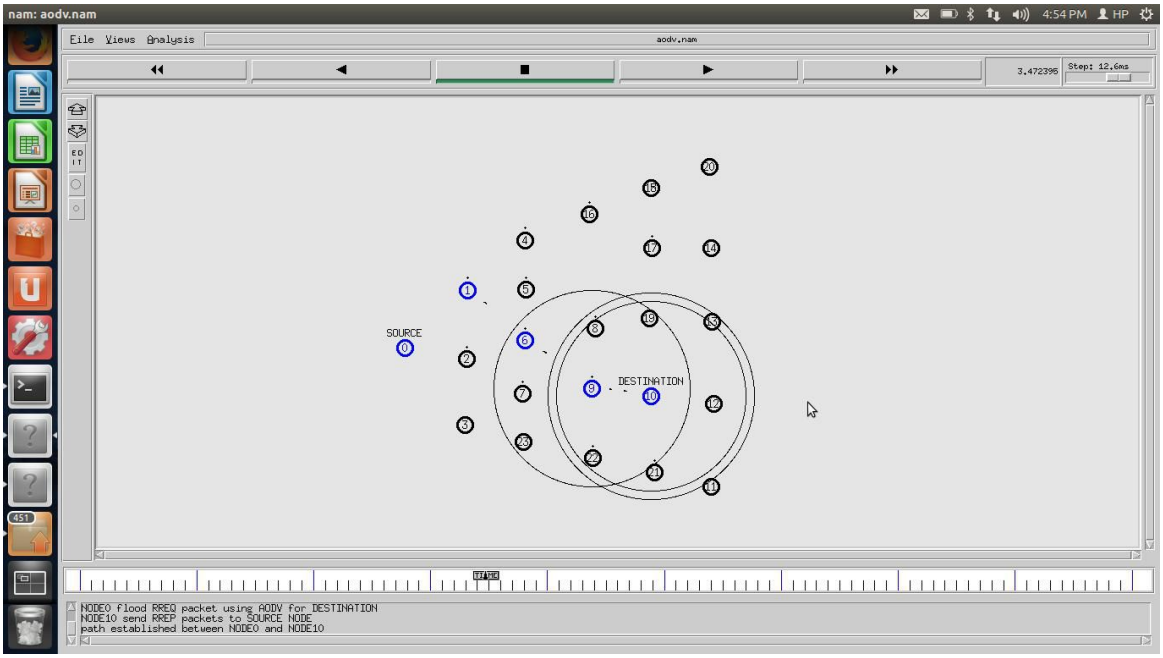


Figure 1.11: Path Established

As illustrated in Figure 1.11, the network is deployed with the finite number of mobile nodes. In the network source and destination nodes are defined and source node is responsible to establish path to destination. The source node use AODV routing protocol for path establishment from source to destination. The source node flood route request packets in the network to establish path to destination. The adjacent nodes of destination will respond back with route reply packets to source node. The source selects best path from source to destination on the basis of hop count and sequence number.

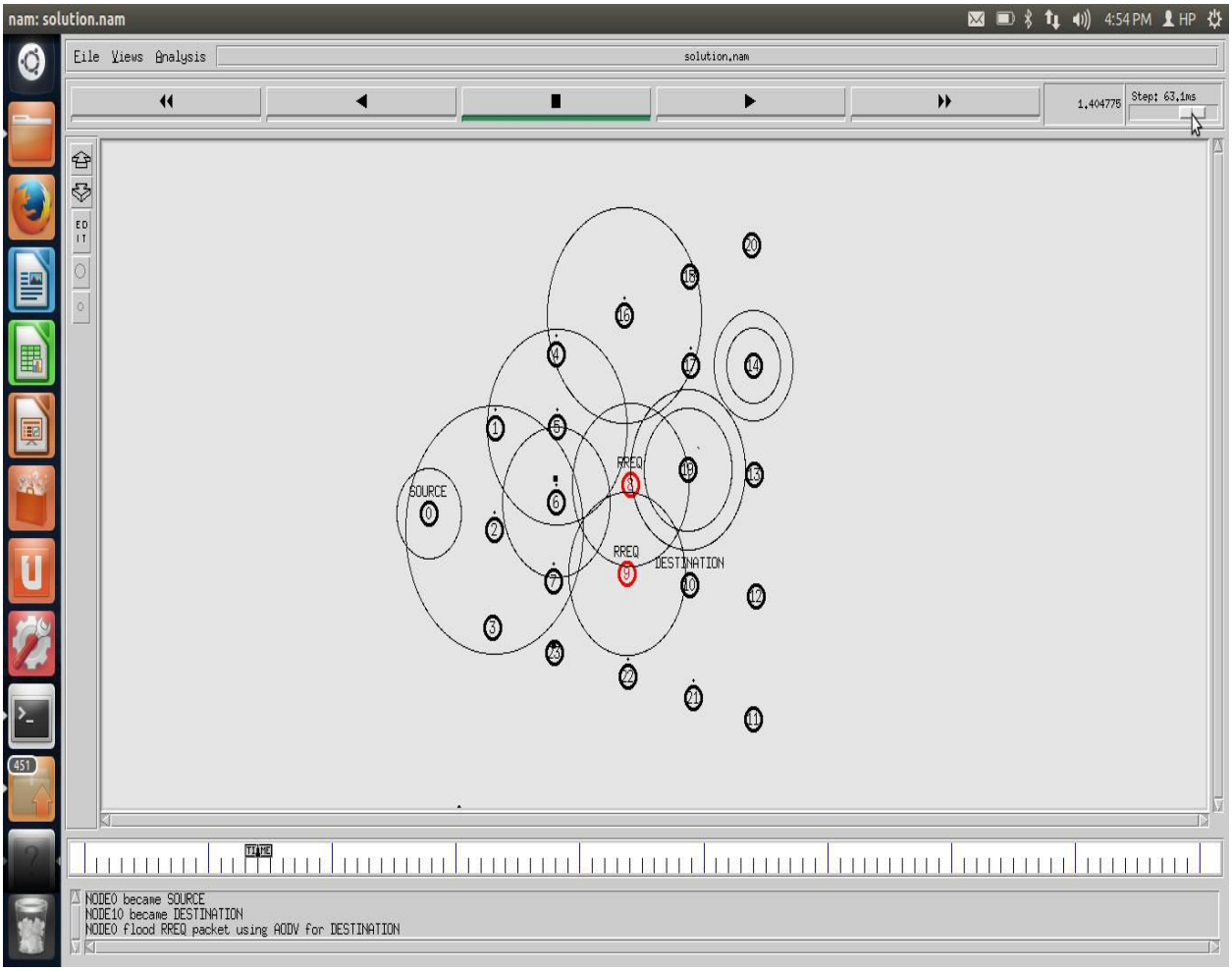


Figure 1.12: Proposed technique

As shown in Figure 1.12, the source and destination nodes are defined in the network. The source node flood route request packets in the network to establish path to destination.

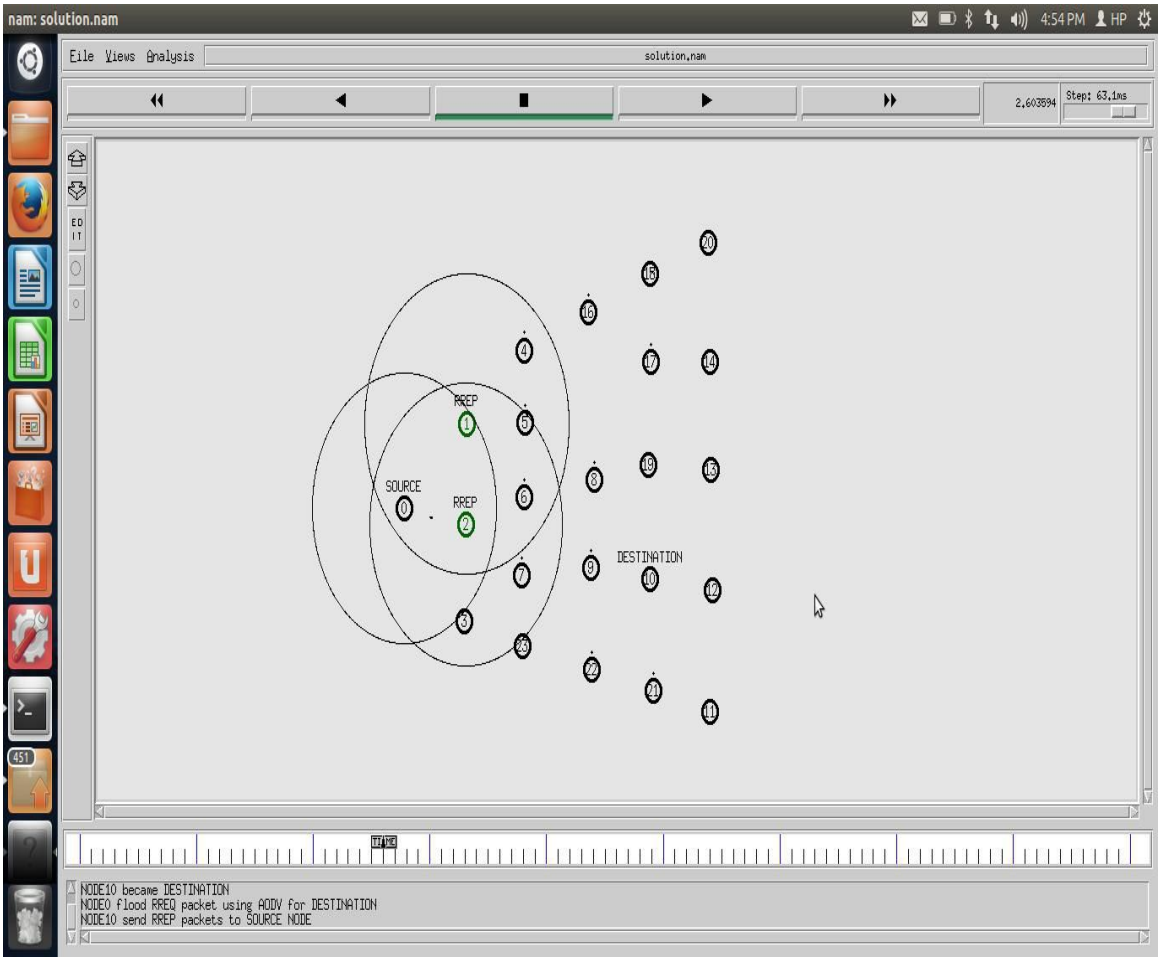


Figure 1.13: Route reply packets

As illustrated in Figure 1.13, the source node flood route request packets in the network. The adjacent nodes of destination will respond back to source node with the route reply packets.

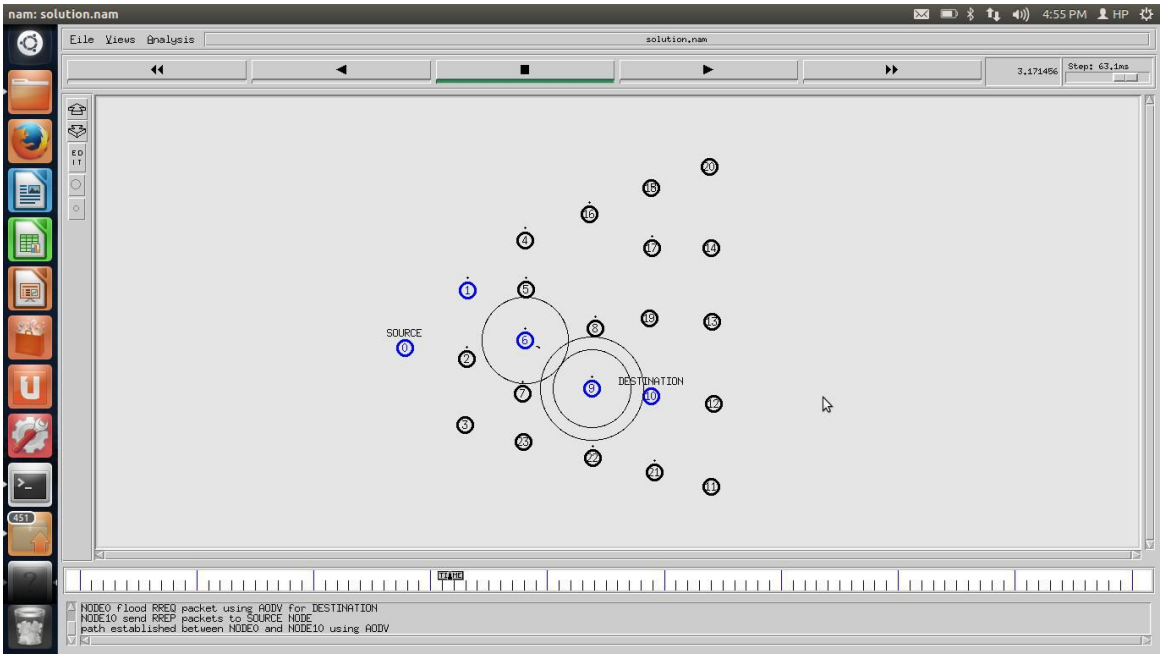


Figure 1.14: Route reply packets

As illustrated in Figure 1.14, the source node flood route request packets in the network. The adjacent nodes of destination will respond back to source node with the route reply packets. The DSR protocol is used for path establishment from source to destination.

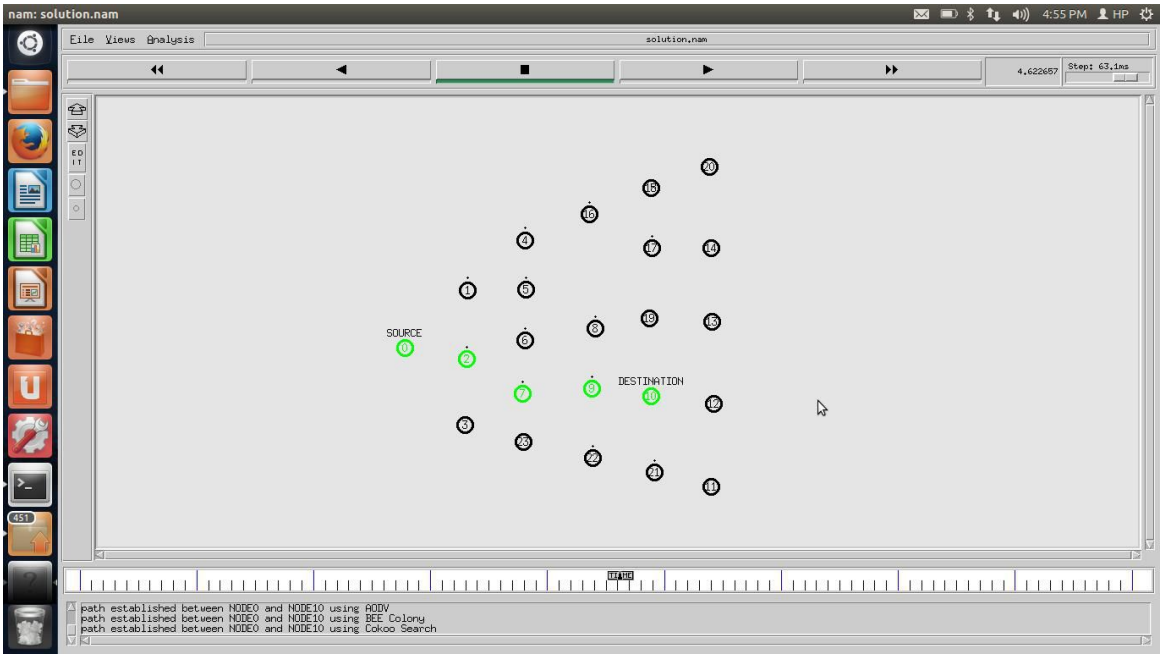


Figure 1.15: Final path established

As illustrated in Figure 1.15, the source node flood route request packets in the network. The adjacent nodes of destination will respond back to source node with the route reply packets. The proposed protocol is used for path establishment from source to destination.

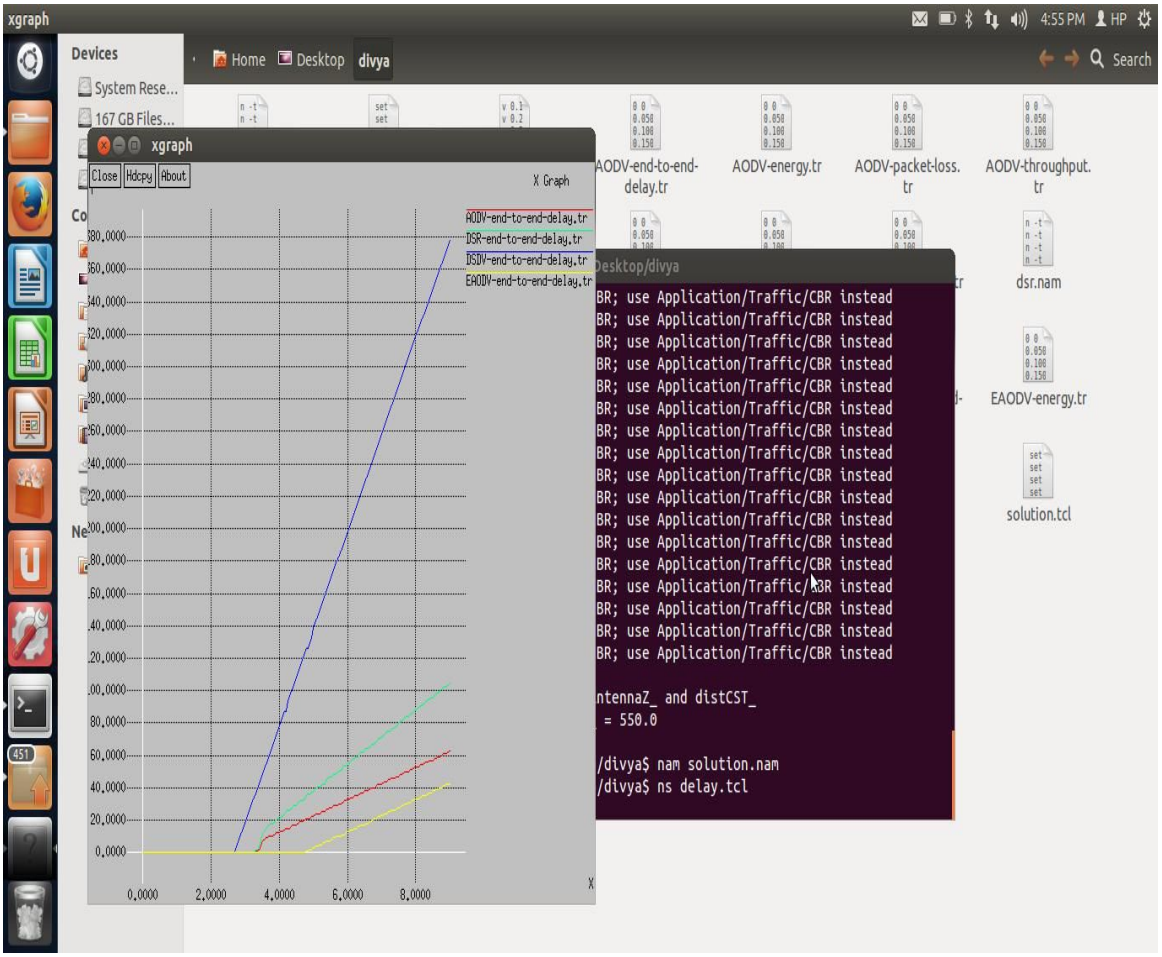


Figure 1.16: Delay graph

As shown in Figure 1.16, the AODV, DSR, DSDV and hybrid routing protocols are compared in terms of delay. It is been analyzed that proposed routing protocol has least delay as compared to other routing protocols.

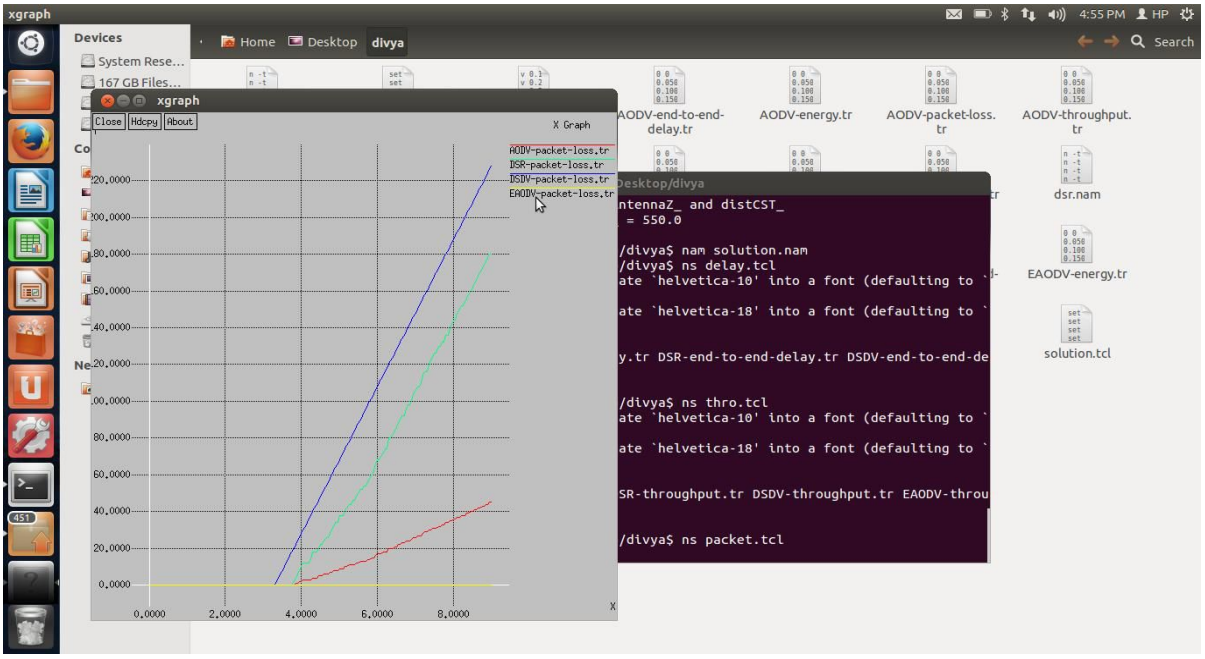


Figure 1.17: Packet loss graph

As shown in Figure 1.17, the AODV, DSR, DSDV and hybrid routing protocols are compared in terms of packet loss. It is been analyzed that proposed routing protocol has least packet loss as compared to other routing protocols.

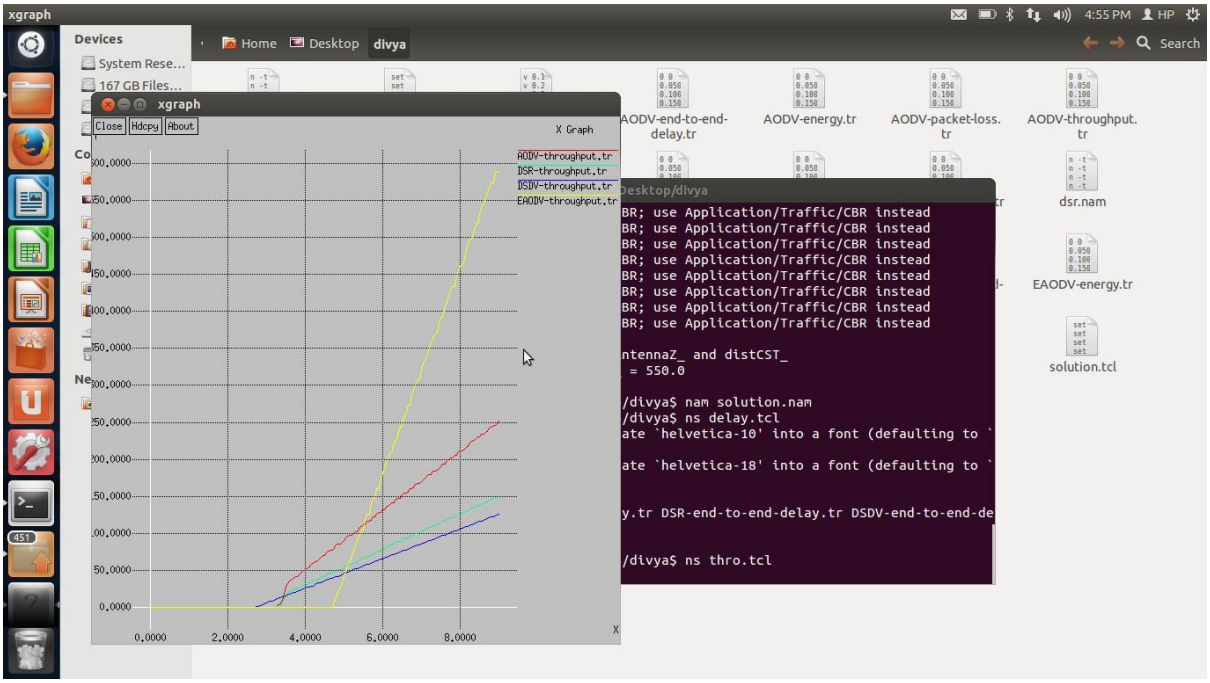


Figure 1.18: Packet Delivery Ratio graph

As shown in Figure 1.18, the AODV, DSR, DSDV and proposed routing protocols are compared in terms of packet delivery ratio. It is been analyzed that hybrid routing protocol has maximum packet delivery ratio as compared to other routing protocols.

4.2 Comparison with existing technique

Table 1.3: Results

PROTOCOLS	PACKET DELIVERY RATIO	DELAY(sec)	Packet loss
AODV	250	60	42
DSR	150	110	180
DSDV	130	370	220
EAODV	600	40	10

We have compared all results and we get Eaodv as a best result.

CHAPTER 5

CONCLUSION AND FUTURE SCOPE

5.1 Conclusion

As we know in reactive routing protocol, it is on demand protocol. It discovers the path whenever it is needed. Basically it is a source-initiated route discovery. So there is reduction in routing overhead. Useful when number of traffic sessions is much lower than the number of nodes. So for this we have taken the protocol AODV, DSR, DSDV. Whenever we need route, we discover the route. Node links are stored in route buffer. Overhead is less. As it is stored in buffer, again and again not need for route discovery so less cost. Where as in proactive routing protocol it is called table driven protocol. It is not on demand protocol. So broadcast of message is continue in this. We have taken for this is DSDV (Destination Sequence Distance Vector). So we used the bio-inspired techniques like bee colony optimization and cuckoo search algorithm for best path optimal in terms of packet delivery ratio, end-to-end delay, packet loss.

5.2 Future Scope

Due to random mobility of nodes and decentralized nature, it is a challenging issue to obtain better performance in MANET. Many MANET routing protocols are already designed and tested in different simulators; but up till now, no research effort has been able to provide the optimum routing efficiency to ensure the high network performance. In this work, various reactive protocols like AODV, DSR protocols are compared with proactive routing protocol like DSDV and performance is analyzed in terms of PDR, end-to-end-delay and packet loss. The protocols which has higher performance in terms of defined parameters is selected for improvement for path establishment. The proposed improvement will be based bio inspired techniques like any colony, bee colony and it leads to improvement in network performance in terms of PDR, end-to-end-delay and packet loss. And the future scope for this is it can be more improved by using some other algorithms.

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