Enhancement in AODV Protocol for multicasting to improve Performance in Mobile AD-HOC Networks

A DISSERTATION

SUBMITTED BY

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Department of Computer Science and Engineering

In partial fulfillment of the requirements for the
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Of

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Under the guidance of

Mr. ROHIT SETHI

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Abstract

This work presents an overview of the multicasting protocols & various enhanced variations done in multicasting protocols. AODV is a type of protocol where route are established when source want to send packet or data to destination only.used flooding technique for route establishment. The RREQ packet are flooded into network,intermediate nodes which are having the path to destination from source response back with RREP packet . The source node selects best path for destination using hop count and sequence number. But in approach of flooding , the network resources get wasted . The resources are bandwidth, node energy etc. So to remove these problems flooding is replaced by the multicasting in AODV for route establishment between sender and destination.FTHMRP is multicasting protocol which basically resolves the problem of fault between the nodes in any network. The FTHMRP used MAODV apprach for muticating the data. The FTHMRP protocol is the multicasting routing protocol which uses the hierarchical routing in hyper cubic architecture for multicast tree generation. The outcomes of the proposed algorithm of FTHMRP are very good in terms of fault tolerance. This protocol can solve the problem of link failure and fault tolerance. It used the hierarchical routing for multicast tree generation in hyper cubic architecture. When the problem of link failure occurred in the network, FTHMRP protocol reconstructs the new path in minimum amount of time. With some improvement in FTHMRP the proposed algorithm will improve the problem of control overhead using unicasting. In this work, some enhancement in FTHMRP protocol will be done for generation of unicasting tree. . The whole network is divided into regions. The source will communicate with destination using unicasting, which resolves the various network related issues.

Certificate

This is to certify that Komalpreet Kaur has completed M.tech dissertation titled **“Enhancement in AODV Protocol for multicasting to improve performance in MANET**” under my guidance and supervision. To the best of my knowledge, the present work is the result of her original investigation and study. No part of the dissertation has ever been submitted for any other degree or diploma.

The dissertation is fit for the submission and the partial fulfillment of the conditions for the award of M.tech Computer Science & Engg.

Date:

Signature of Advisor

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DECLARATION

I hereby declare that the dissertation proposal entitled, **“Enhancement in AODV Protocol for multicasting to improve performance in MANET”** submitted for the M. Tech. Degree is entirely my original work and all ideas and references have been duly acknowledged. It does not contain any work for the award of any other degree or diploma.

Date:——————

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TABLE OF CONTENTS

List of Figures

Chapter 1

Chapter 3

Chapter 4

Chapter 1
Introdution

MANET is a mobile Adhoc network. In MANET nodes are randomly connected with each other and forming random topology. The node in MANET can act as both routers and hosts. The nodes have ability to self-configure them which makes this technology suitable for providing communication. MANET is a type of wireless network where mobiles nodes or other wireless devices that are connected together to form a network which is independent of any infrastructure. It means there is no base station required in MANET. So the nodes can communicate with other nodes which are in the range of network only. MANET is a type of ad hoc network which have a route able networking atmosphere. Here each node in a network can act as a router and sender node and destination node at the same time and these nodes are independent or free from any restriction to move freely. “Flooding “is a technique which used to forward the data from one node to other one or we can say that sender to destination. So because of this the topology changes frequently and suddenly. In MANET, the information or data packets are routed via intermediate nodes, and these intermediate nodes between the sender and receiver can act as a router. Every mobile node can be switched ON/OFF without any notification to other nodes.

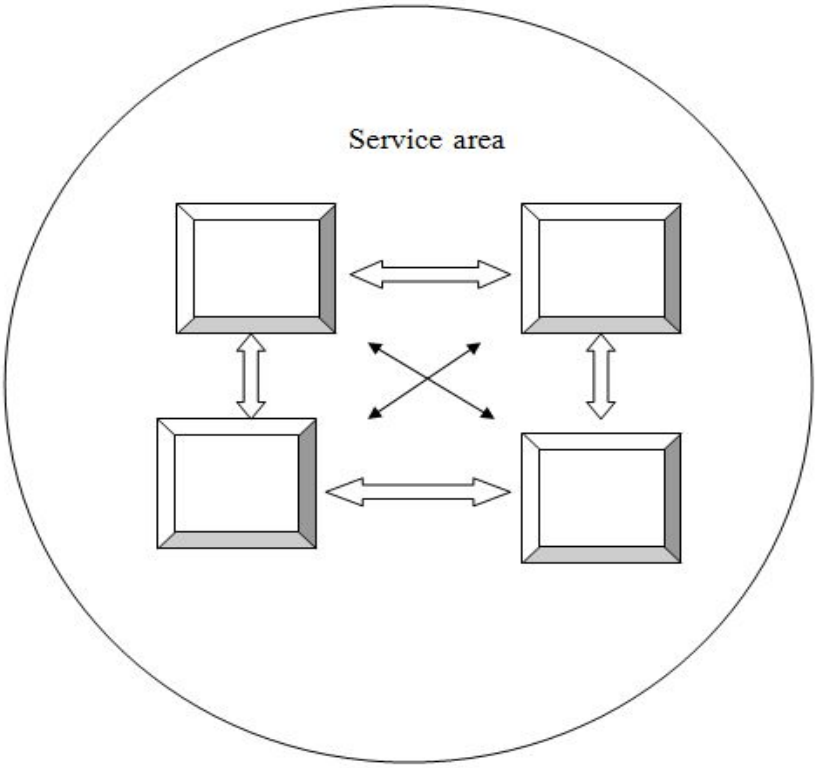


Figure:1.1 Mobile Adhoc Networks

1.1 Various Properties Of MANETS:

No fixed topology: The network topology in MANET is Dynamic in nature because of the mobility of nodes. Nodes may move from anywhere or particular range of each other. This topology is changed because of two things, the routing table and the multicasting table so that increases the difficulty to managing the network.

Limited energy: In MANET nodes uses battery power. To saving the battery power, some nodes may be in quiet mode. In this time they don’t process traffic, or change to normal mode with some latency.

Limited processor: In MANET node have cheaper and slow speed processors, so that the cost of high speed processors are more and. So it will take more time to activate some composite computation.

Limited storage: The mostly mobile nodes have limited storage capability. Because of adhoc devices have the network bandwidth is also limited.

Each node is a router: If any node is out of the range of any fixed node that have not be again reached by any node. They can only be reached any node or sender by packet forwarding of other nodes.

Physical medium sharing: All the devices or nodes in wireless network have share the same physical medium.

Lack of central management: nodes in Ad hoc networks can be maintain anytime and at everywhere. there is no middle intermediate device available.

1.2 There are mainly three types of routing protocols in MANET:

Reactive protocol
Proactive protocol
Hybrid protocol

1.2.1 **Reactive protocol**: In reactive protocol, routes between sender and destination is maintain when there is a need of establishment of route only.

AODV(Ad-hoc On Demand Distance vector): AODV is on-demand routing algorithm that determines a route when any sender node wants to send the data to its destination. Routes are established until they required by the source.. In AODV every node maintained a routing table, which contained the data about that from that position sender send the

data ,and which way node have to send the data to reach its destination.

RREQ: RREQ is a route request packet, which is flooding in whole the network. In AODV if one node is not available for any destination, RREQ packet is flooded.

RREP: RREP is a route reply packet. Means when there is a valid route between sender to destination RREP is unicast to the sender.

RERR: RERR is a route error packet. When any packet is lost, break and have not properly received by the destination then receiver sent the error message to sender that the message is lost or route breakage is there.

1.2.2 Proactive protocol: in proactive routing protocol, the path to all the destination are determined at the start up(means it's a on demand process. e.g. DSDV

DSDV: DSDV is a table driven protocol for Ad-hoc networks. This protocol solve path loop problems. Every entry in the route table contains a sequence no. Sequence no is even if link is present in network, otherwise the value is odd. Destination generates these no's and send this no with its next update value to the sender for next packet. All the path information is distributed between all the nodes by transmitting the full dumps infrequently & small incremental update very frequently.

Routes for same destination are selected on the basis of:

A node which have new sequence no given by the destination.

If the two route have same sequence no , the one with a better cost is taken first.

1.2.3 Hybrid process: In hybrid protocols, both the properties of reactive protocols and proactive protocols are there.

1.3 Concept of single hop and multi hop:

Single-hop nodes are in direct communication and both nodes are in range of each others. The chances of link failure are more in this hop. **Multi-hop**: In this hop nodes are communicate with the help of internal nodes not directly. To reach from source to destination internal nodes participate. Basic type of Ad hoc routing algorithms can be single hop and multihop different. Single hop MANET is simple as compare to multi hop because of structure and implementations, with the lesser cost of functions and applications. In single hop packets are delivered from one source to its destination directly, but in multi hop packets are delivered with the help of indirect nodes.

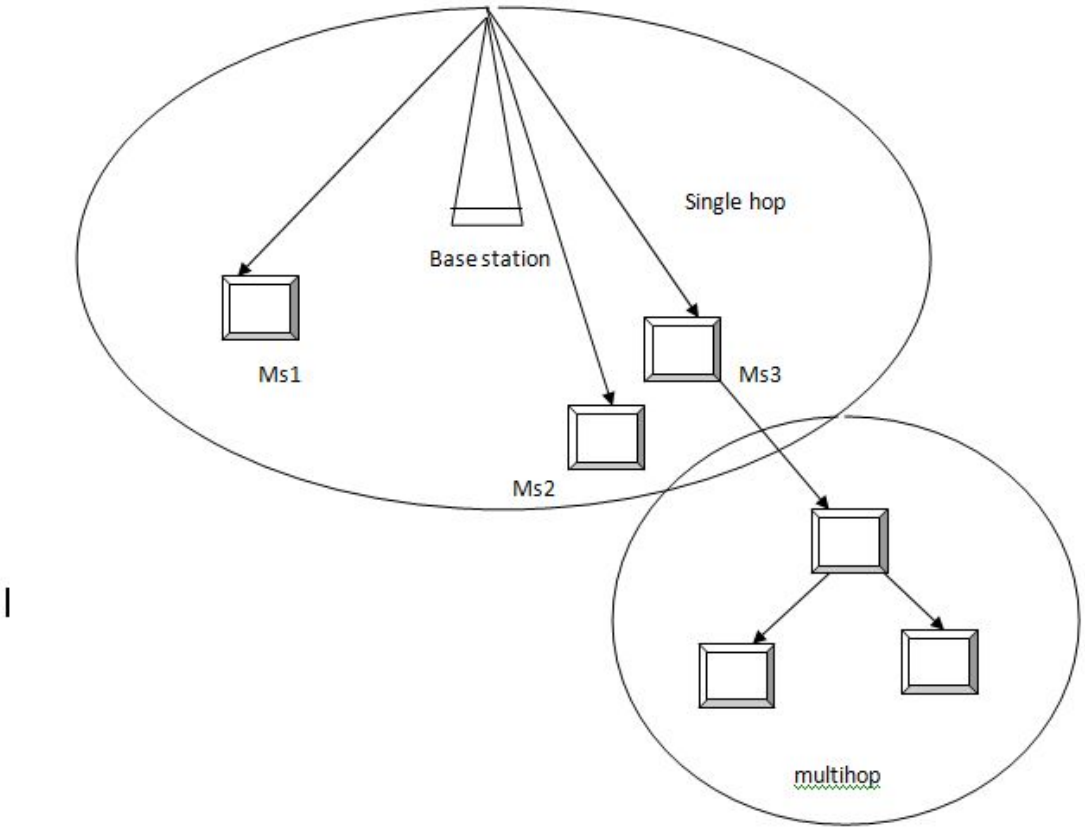


Figure 1.3MANET with single and multihoping

1.4 Advantages of MANET:

The devices can communicate with each other depending upon their range.

In MANET each device and node can move independently in any direction but within range

MANET can be established on the fly.

MANET does not require any physical connection.

1.5 Disadvantages of MANET:

MANET is that it is more helpless because of open medium.

The network topology is changing dynamically.

The absence of centralized medium.

The lack of managing points and lack of a clear line of defense**.**

Limited resources and physical security.

Volatile networks topology makes it so hard to detect malicious nodes.

1.6 Applications of MANET:

Personal area networking: cell phone, laptop ,earphone

Military environments: in battle fields, soldiers , Tanks, Military information headquarters

Civilian environments: Taxi cab network, meeting rooms, Sports stadiums , boats , Small aircrafts.

Emergency operations: Search-and rescue, Policing and Fire fighting

1.7 Challenges in Mobile Environments:

Limited communication bandwidth

Broadcast nature of the communications

Packet loss due to transmission errors

Variable capacity links

Frequent disconnections/partitions

Energy consumption (short battery life).

1.8 Energy Consumption

In MANET, each node has batteries attached to it. These batteries are consumed during the process of transmission. Various reasons are there for the consumption of batteries like transmission, reception and overhearing. It is very difficult to recharge the batteries or very difficult to replace them. To increase the long life of the network, the available battery must be long. For this we need to minimize the energy consumption and mange the energy for long life of network. If the power goes down it will affect the transmission. Various strategies are used to reduce the wastage of energy consumption. Mobile computing or devices are evolving very fast range with the inventions of new advance wireless networking protocols. Wireless transmission, reception, re transmission of data and various another operations, all consume some battery. Energy consumption is an important issue in mobile devices because these devices operate on very limited battery power.

Various reasons are there for battery consumption:

Transmission: when sender some data or packet to its destination

Reception: when receiver consume some battery for receiving upcoming packet

Re transmissions: when any packet is lost and sender have to again send the packet to same destination

Overhearing: when any node is unwanted receiving the others packet.

Packet loss: packet is lost between the path from sender to destination.

1.9 Multicasting

Multicasting means one-to-many, many-to many distribution of data between the nodes in any network. It is a type of group communication in which information is sent by some node to group of destination nodes simultaneously.

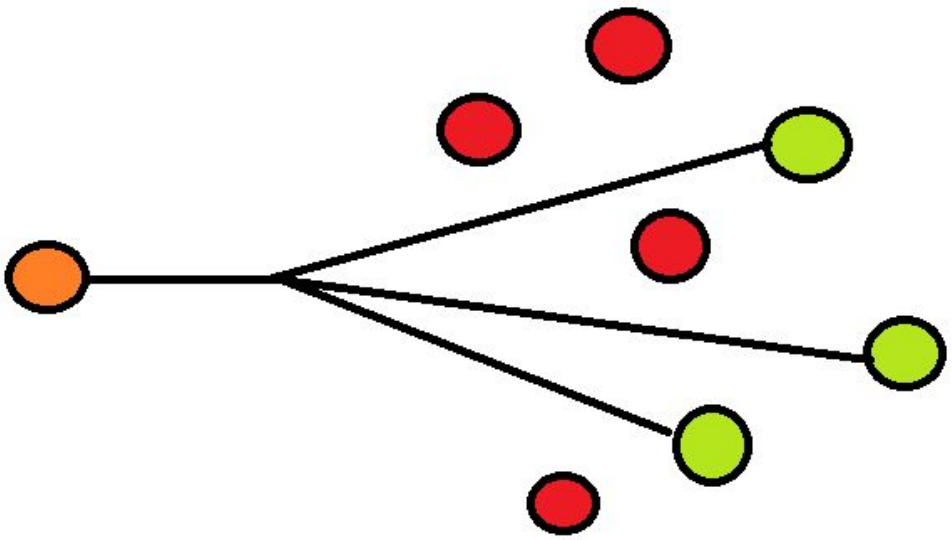


Figure 1.9

Two types of protocols in Multicasting:

Tree based multicasting

Mesh based multicasting

1.9.1 Tree based multicast protocol:

In tree based multicast protocol a shared multicasting routing tree is

used to send or deliver the data from sender to receiver. So many multicast group are there when any node wants to join any multicast group or the node want to send the data to any node of multicast group, if it doesn't has a route to that group it sends the RREQ message to the group. Only The member of that particular group respond for the join request . if any node is not member of that group and it receive the request , node simply receive the request and rebroadcast the RREQ request to the member of group. When the nodes of group are received the request they have to sent back ACK to the requesting node.

1.9.2 Mesh based multicast protocol:

In mesh based multicast tree, both the sender and receiver nodes are fully connected to multicasting group. To join mesh multicast group a node firstly checks its neighboring nodes that they are already member of the mesh multicast group or not. If neighboring nodes are member of the group then requesting node announce its request to the neighboring node for the membership. If no any neighboring node is member of multicast group then requesting node send the request to core of the multicasting group. The path form requesting node to core node of the group is always defined by unicast routing protocol. An ACK packet is sent back to requesting node by the core of the multicast group.

Chapter 2
Literature Review

Before the selection of "**Network Security**" as the broad area of dissertation, many research papers have been referred. These papers helped to find a particular problem area where the work can be carried out for dissertation. Under the network security "**energy consumption**" is a challenges area for do research. These papers are relevant with my problem domain defined below with their purpose of study and year of publication.

"AODV**-RR: A Maximum Transmission Range Based Ad hoc on-Demand Distance vector Routing in MANET" (V.Lalitha, 2014**).In MANET, nodes are battery based devices. Energy has more important consideration for network now these days. In multihop networks the transmission power control scheme is common method in which one node transmits the data packets to its nearest neighboring for which the minimum power is required. But this scheme has not minimized the overall energy consumption in network. Instead of using the low transmission power, the routing strategy can only use those nodes which are allowed to receive and process the routing request based on received signal strength. In this paper researcher used the modified AODV means AODV-RR (Routing Range). AODV-RR is extended version of AODV, in this route request is not broadcast to all the nodes of the network. Request is just send to those nodes which are in the range of the sender node with default path. This AODV-RR performs better function the AODV. The proposed algorithm is AODV-RR algorithm is successfully simulated. With the help AODV-RR, it has

proved the significant improvement in performance of network and reduction of overhead.

“Genetic Algorithms For Energy-Efficient QoS Multicast Routing” (Ting Lu and Jie Zhu 2013) . Energy consumption is considered in wireless adhoc network which prevent the problem more energy consuming batteries, while dividing any network. Power-aware multicasting is proposed algorithm to reduce the energy consumption .This energy- efficient genetic algorithm mechanism is used to solve QoS the multicasting routing problem which is np complete. Genetic algorithms are not purely adequate for delay sensitive types of applications in the MANET, because the genetic algorithms cause various types of iterations. the energy efficient genetic algorithm is used to find the delay constrained multicast tree to reduce the more energy consumption. The proposed genetic algorithm depends on bounded end to end delay and it minimizes energy cost of the multicast tree. Two types of modes are defined here for the genetic algorithms: Energy consumption model, Network model.

“High Stable Power Aware Multicast Algorithm for MANET” (Golla Varaprasad, 2013). Mobile adhoc network is a wireless network without any infrastructure less. A proposed multicast algorithm is used for increasing the lifetime of the mobile and any network of mobile adhoc network. There are two metrics are considered in this paper: Residual battery capacity of any node and Relay capacity of the node. This proposed models is compared with already existing algorithm for e.g multicast incremental power, lifetime- aware- multicasting tree, multicasting-ad-hoc-on-demand –distance vector. This proposed model results at the end or show the best result which increase the life time of node, lifetime of network and also the throughput.

“Assessment of QoS based Multicasting Routing Protocols in MANET” (Dr. Abhay Banyal 2013). MANET is a network which is self mangers and dynamic connections of nodes are there. Group communication is very important thing in MANET, which increase the usability of the network. Group communication scenarios in wireless network are e-education-commerce, searching& rescue operation, audio-video conference, and battlefield. Demand of group discussion in increased or construction of reliable and dynamic type of multicast path which works very efficiently under the above type of environments or dynamic conditions. The propose algorithm has a functionality which give use QoS based multicast to path finding. The QoS parameters are given in tabular form so the new researcher can easily found the problem and work on it.

“Mobility Based Estimation of Node Stability in MANET” (P.I Basarkod 2013). For providing efficient path, robustness and low overhead from sender to destination become a more critical issue in MANETS. For now these days topology change & mobility of nodes is also a crucial issues. So its necessary to check the stability of the node to reduce various issues and more energy consumption in mantes. Role of stability factors plays a important thing to establish a stable path that offers us best packet delivery, less end to end delay and low latency. These paths are founded on the basis on the selection of the stable forwarding nodes which have high stability of link connection between the sender node and receiver node. The link stability factors are computed on the basis of various parameters like received power and distance between the neighboring nodes. The stability is also depending on the self and neighbor nodes mobility. The steps for finding the stability factors are:

All the nodes in MANET find the self stability

Find the neighbor stability of all the nodes in MANET by considering the neighbors stability.

Each node in the MANET will compute the stability factor based on self stability and neighbor stability.

“Broadcasting Approaches for Mobile Ad hoc Networks” (Mohamed Bakhouya2013) .The classification of broadcasting protocols used in MANET and also provide the description of some adaptive broadcasting protocols. Broadcast is an important building block MANETs (mobile ad hoc networks) protocols. Mostly all routing protocols use broadcasting to establish routes from sender to destination or to transmit an error packet for an invalid type of route. Since the communication range between the nodes is limited and nodes are depend on battery, best energy consumption is one of the main key factors to be taken when engineering broadcasting algorithms are used. This proposed algorithm defines a classification of most broadcasting protocols used in MANETs. The ad hoc networks are communication network formed a network without a fixed infrastructure. Broadcasting in MANETs is an important function because it is used for many factors just like, cooperative operation, group discussions and common announcements. Three factors are defined for broadcasting the protocols.

SRB(saved rebroadcast)= no of nodes receiving msg/no of nodes actually rebroadcasting the msg

Reach ability

Latency

Most common static broadcasting protocols are used in MANET. This proposed algorithm solves the problem of dynamic network in which it is

difficult or even impossible to determine the threshold and network topology. This problem is solved by the adaptive protocol.

“Designing Energy Routing Protocol with power consumption optimization in MANET” (Suresh H.N 2013). A new power aware routing protocol EPAR (Efficient Power Aware routing), that increase the network lifetime of MANET.. This paper propose efficient Power Aware Routing (EPAR), it’s a new power aware routing protocol that increases the network lifetime of MANET. Using min-max formulation, EPAR selects the path that has highest or largest packet capacity. This protocol must be able to handle high mobility of nodes which often cause changes in the network topology. The proposed algorithm evaluates three ad hoc network routing protocols (EPAR, MTPR and DSR) in different network scales taking into consideration the power consumption. The proposed algorithm deals with the problem of maximization of the life time of the MANET network, or we can say that maximize the time period during which the network is fully working. For solving this problem EPAR is used which is basically the improvement on DSR. This concludes that EPAR is sufficient for the large scale area, the performance of DSR proved insufficient in this study. EPAR, MTPR and DSR are small size network was comparable. But in large and medium network EPAR and MTPR produced the good result. EPAR is good choice for all the given scenarios.

“Evaluation of Energy Efficiency of MANET Routing Protocols” (Methaq jasam March 2013). The technique defines the study of Reactive routing protocols AODV RIP2 and Position-based routing protocol, (LAR1). The performance of these protocols is based on metric of energy consumption. Today’s word network is becoming an significant part of development of world and demand of user. In MANET nodes are

based on limited power, it requires route protocols to limit the energy consumption and boost the energy life of the nodes. The research paper represent the comparison of reactive protocol, Ad hoc demand distance vector protocol, proactive routing protocol, routing information protocol and various other protocol for increasing the battery power of nodes. They describe evaluations of routing protocols AODV, RIP2 and LAR1 . They evaluate AODV is best choice as compare to the RIP2 and LAR1 protocol. LAR1 is shows better performance than AODV in static motion in some scenario. AODV is best because this protocol which have no need to maintain any path to destination if there is no need to send the data.

"Performance Evaluation of energy consumption in MANET" (Ashish KumarMarch 2012). There is a comparison of the performance of DSDV, DSR, AODV routing protocol with respect to energy consumption. the mobility of nodes in MANET may result in changing topology and high rate of link breakage between the source and destination. Many algorithms are proposed to solve this type of problem. This paper defines the evaluation of the various routing protocols like DSDV, DSR, and AODV with respect to energy consumption. This study has evaluated three ad hoc routing protocols. This proposed algorithm concludes that the existing routing protocol have not been design to provide best energy efficient route. So that they shows significant differences in energy consumption. Every protocol have their own properties, no single protocol is there for qualifying all the performance metrics. For e.g DSDV consumes the minimum energy and maximum amount is consumed in routing overhead.

"Fault Tolerant Hierarchical Multicast Routing Protocol (FTHMRP)" (Kalakruntha theja 2013). Initially times conventional

flat multicasting protocol were used. These type of protocols used the team affinity model. In which tree consist a team rather then any number of individual's nodes which are efficient for large network. This paper resolves the problem of initially conventional flat multicasting protocols. They are not scalable well to any network size and are also not suitable for team multicasting in large scalable mobile adhoc network. To resolve these types of problems FTHMR protocol is used, in which a protocol is develop called hierarchal multicast routing protocol based on hypercube architecture for team multicasting with fault tolerance. This protocol constructs a Hierarchy of team leaders and provides fault tolerant multicasting for those type of data which are sensitive in large scale mobile ad-hoc network. In this paper a algorithm is proposed which is called fault tolerance hierarchical multicast routing protocol. In the hierarchy of this protocol different levels are defined:

Mobile node tier

Hyper-cube tier level 1

Hyper-cube tier level 2

Various operations are there: join multicast group, leave multicast group , tree construction , tree maintenance.

"Position Aware Energy Efficient Multicast Routing in MANET" (V.Meena 2013) . Now these days multicasting routing approach becomes important aspect in MANET, because they manage the group communication effectively. When energy based paths are chosen, the multicast routing protocol have some problems. They are not scalable to support energy efficient paths. In this paper a position based energy efficient multicast protocol is introduced. In this network area is divided into equal number of cells. These cells are hexagonal cells. One cell head is elected for every cell. In this backup of cell head is taken if he contains any multicast member. The proposed algorithm reducing the more energy consume by the nodes because cell head and the forwarding

nodes are only based on highest battery capacity. This protocol increases the lifetime of the node in the network. Position aware energy efficient multicast protocol is source tree multicast routing protocol which provide us scalable energy efficient multicasting. Basically this protocol is used in large scalable or large network of multicast member.

Effect of Mobility and Traffic Models on the Energy Consumption in MANET routing Protocols(Said EL KAFHALI 2013). MANET is a mobile Adhoc network. In MANET nodes are randomly connected with each other and forming random topology. The node in MANET can act as both routers and hosts.Storage capacity and energy is very limited in MANET . Energy consumption is main point to be considered when new routing protocols are generated. In this paper they concentrated on the energy consumption issues of existing protocols using various traffic models like like CBR, Exponential and Pareto.the existing methodology describes the performance comparison of AODV,DSR,DSDV routing protocol for transmission and reception of control packets.

Network Connectivity based Energy Efficient Topology Control Scheme from MANET(Dr.N.J.R.Muniraj 2013) . Due to topology changes our network get failed. Topology change is main issue in MANET. More energy is consumed when the network get partition automatically, beacuse in MANET nodes are moved freely in particular range. The existing methodology is Network Connectivity based energy efficient Topology Control Scheme that is focused on topology change and energy consumption both. Two models, network and interface models are integrated with new proposed methodology for generating high network connectivity. On every node the power consumption is validated. Every factor like power consumption and link availability is monitor periodically.

“OAODV Routing Algorithm for Improving Energy Efficiency in MANET” (Suvarna P. Bhatsangave 2012). The main purpose of proposed algorithm is to describe the problem with AODV Routing algorithm related to improving energy in MANET and also provide the solution of the problem. They introduce the Optimized AODV algorithm to solve the problem that is occurring in AODV. AODV (Ad hoc on Demand distance vector routing protocol) is most widely used routing protocol for an Ad hoc network. In AODV protocol sender forward the RREQ (route request) packet to the network for finding the route to its destination node. The intermediate nodes which are helps for forwarding the packets have less energy and lifetime. As lifetime expires after some time that is node goes down: it could not forward RREP (route reply) on path. Solution to this problem is optimized AODV. This algorithm node does not forward RREQ if they have not sufficient energy and until the node density in its surrounding exceeds a particular threshold. So they conclude that instead of using AODV we have use the Optimized AODV. In AODV the intermediate nodes have not too much energy for forwarding the request from sender to destination. But in OAODV just those nodes are intermediate nodes which have sufficient battery power for sending the RREQ packet and reply with RREP packet. The energy of intermediate nodes are predefined, means energy is predefined for forwarding the packets and also send the response back to the sender.

“MANET: Issues and Behavior Analysis of Routing Protocols” (Gurpinder Singh 2012). The proposed algorithm describes the main issues and protocol of MANET. Mobile Ad hoc networks are collection of nodes which are connected in dynamic manner. Networks are characterized by multi hop wireless connectivity. They describe or provide the means of understanding the issues and protocols using various matrices, throughput and network load. The researcher has described various routing protocols like proactive, reactive protocols.

The proposed algorithm has been made some effort to concentrate on the description about various routing protocols like OSPF, DSR, AODV, TORA and DSDV. This are classified on the basis of quantitative and qualitative metrics and also concentrate on common issues of MANET. At the end they conclude that for 150 nodes TORA creates fewer loads and AODV creates high load for network.

Improved the Energy of Ad-Hoc Networks On-Demand Distance Vector Routing Protocol (AL Gabri Malek 2012). Various methods are defined from last year to reduce the energy consumption by the nodes in MANET. The methodology of this paper defines the simple but efficient algorithm to balance the energy between the nodes in effective manner so energy is consumed in very less amount. The nodes can extending their battery power by ad hoc demand distance vector protocol. The approach proposed by this paper is dynamic distributed load balancing approach which avoids the nodes which are more energy consumptive and chose those paths which are easily loaded.

Energy Saving and Survival Routing Protocol for Mobile Adhoc Network (BAISAKH ,2012). In MANET nodes are independent in nature. All the computation task or configuration task are performed by the nodes itself. Nodes in MANET depends on battery for their life time, the battery power of nodes is very limited.All the task done by the nodes itself consumes lots of battery.when new technology is introduced in MANET, perhaps they consumed some energy for new computations. In existing protocol DSR routing protocol is proposed some modification is done on DSR in this methodology, called as ESSDSR(efficient energy saving and survival DSR) DSR is considered as the powerful protocol because dedicated paths are established . We can keep sending the data to nodes until the path or link is not broken due to any intermediate node go away from its neighboring node. But in ESSDSR data is send over

those nodes which have higher residual battery power. The new path is automatically generated for same destination when any existing path is broken due to node movement.these all reduced the energy consumption in MANETs.

“Energy Efficient Real Time Multicasting Routing in MANET” (Bulent Tavli 2011). The proposed algorithm describe multicasting is done through time reservation using Adaptive Control Energy Efficiency. They also support the QoS facility. MC-TRACE is an energy efficient Architecture for MANET. MC-TRACE is a cross layer design, which add the functions of MAC and the network layer into single unit.. The basic structure behind the multicast part of this construction is to generate active multicast tree bounded by a passive mesh in MANET. Generally in this tree and mesh-based multicasting is combined in this technique. Efficiency of energy is achieve by enable the various mobile devices present in the network to sleep mode frequently and eliminates the unwanted data comes in the network. The algorithm recombined of the tree for and real time data multicasting and highly energy efficient.

“Multicast tree computation in networks with Multicast Incapable Nodes” (Wanjun Haung 2011). Multicast transmission offers an efficient bandwidth when any data, media or information is delivered to multiple destinations in the network. Many existing network doesn’t support multicast because they are not able to make multiple outgoing flow from any incoming flow. This algorithm is proposed for incapable nodes. Firstly the path is computed after that data is sending from source to destination. If any path is not able to found then destination is partitioned into subparts or the subset and path every path to every subset is computed first. This path is computed until the feasible trees can built based on that traverse path which is already

computed. After that no further portioning is possible. There are two methods or procedure for traverse the path computation. This proposed algorithm is called feasible if only no of nodes which are capable of multicast. The main purpose of this algorithm is to find to multicast tree for a given multicast request by all the nodes in the network. In which few nodes are called MI nodes and some nodes are MC nodes. The branching nodes are called MC nodes. Few nodes which are MI nodes never be the branching nodes.

Energy efficient Multicasting Routing Protocol for MAQNET with minimum control overhead. (Pariza Kamboj 2010).MANET is a dynamic ,autonomous network which is composed by various wireless mobile nodes. Multicasting is the main term comes under the MANET because of its broadcasting capability.using multicasting various multicast tree are generated , for maintenance of these trees various contorl messages are required. These overheads consumes the various resources like bandwidth ,energy. The algorithm proposed in this paper present an energy efficient multicasting routing protocol with minimum control overhead. This protocols explain or creates the multicast tree with there some physical location of the nodes with there multicast sessions. Some particular locations are provided to the nodes which reduces the control overhead and energy consumption. Small zones are provided to nodes with the proactive maintenance with in the zone.reduction of latency and link breakage is there is this.

Chapter 3
Present Work

3.1 Problem Formulation

The routes are established between sender to destination using various protocols like proactive protocol and reactive protocols. In proactive protocol routes distances are measured and stored in route matrices.the reliable path are established between sender and destination using these matrices. But these matrices are very difficult to maintain because in MANET nodes are node fixed or no any fixed infrastructure is their for these nodes.in other side AODV is a type of protocol where route are established when source want to send packet or data to destination only. AODV and DSR are two protocols which are used in MANET for route establishment.both use different different algorithm for route Establishment. In AODV Dijkstra algorithm is used, and for DSR Bellman ford algorithm is used for route Establishment.

Both used flooding technique for route establishment. The RREQ packet are flooded into network,intermediate nodes which are having the path to destination from source response back with RREP packet . The source node selects best path for destination using hop count and sequence number. But in approach of flooding , the network resources get wasted .the resources are bandwidth, node energy etc. So to remove these problems flooding is replaced by the multicasting in AODV for route establishment between sender and destination.

3.2 Objectives

Following are the various objectives of this research work

1. To analysis the disadvantages of Multicasting approach for improving the perforamnce for routing protocol.

2. To enhance multcasting protocol for route establishment using unicasting technique.
3. To improve the the network issues like packet loss , throughput, energy consumption.
4. To implement the proposed algorithm and compare the results graphically with existing algorithm.

3.3 Research Methodology:

Firstly we deploy the mobile ad hoc network with infinite number of mobile nodes. All the mobile nodes are randomly deployed into the fixed area. The source and destination are selected for route establishment. For the route establishment source node flood the route request packet in the network and route reply packets are send back to the source by the adjacent nodes. The route is established between source and destination on the basis of hop counts and sequence numbers. The existing technique will be implementing in NS2. The New proposed technique will be based on the location.The entire area in which the network is deployed in being divided into the region.

Algorithm

1. Consider a group Gj = {N1, N2…….Nn}.

2. Measure the distance d of each node from source d (S, Ni) where i=1,2…….n .

3. Sort the nodes Ni in ascending order of d.

4. Create the partitions X1 and X2 of the nodes Ni such that
   X1= {N1…….NQ}
   X2= {NQ+1…….Nn}
   Where Q is the distance threshold.

5. Source unicast the packets to X1.

6. In X2 find a relay node Nr which has max (Ei) .

7. Then S uni-cast the packets to Nr which in turn multicast the packets to the rest of the nodes in X2.

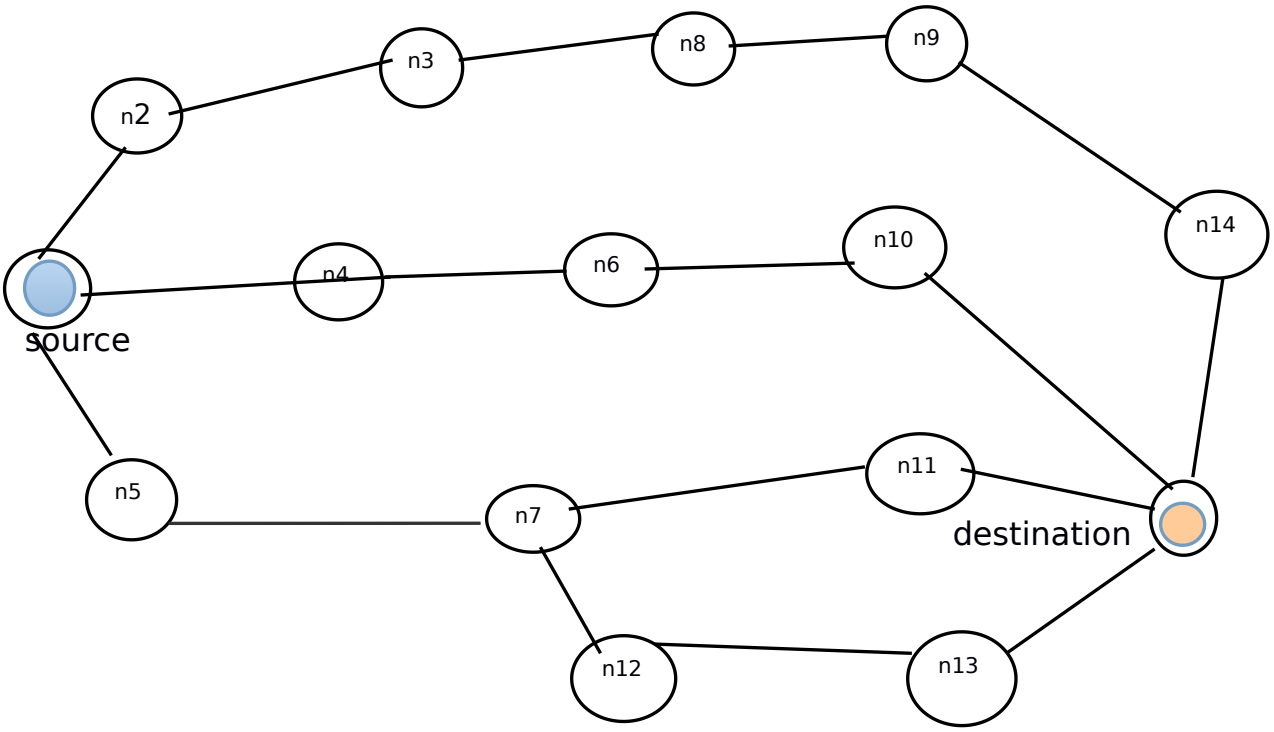


Fig: 3.1.1Flooding packet from source to Destination

First of all, Network is deployed with number of nodes having source and destination and intermediate nodes. Source floods packets in the network. Each node calculates its distance of using Euclidean distance.

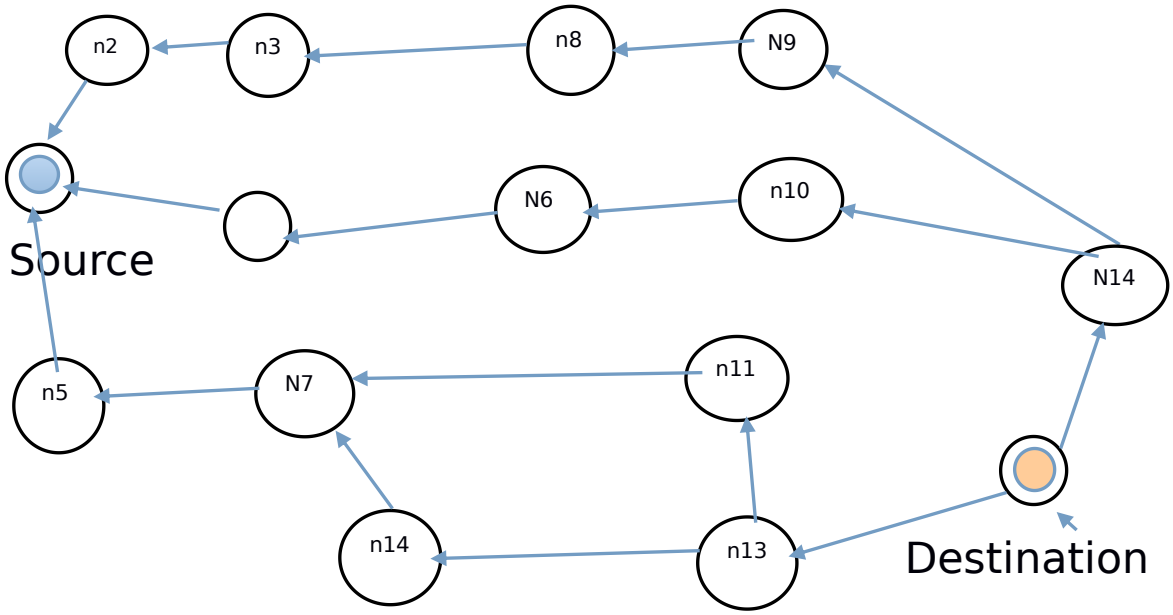


Fig 3.1.2 Reply with Distance from each node

after flooding, each node calculates its distance from each other and send Reply message to source regarding its distance.

In 3rd step, Source divides the network on the basis of Euclidean Distance. Clustering is done on the basis of distance. Nodes which are having similar distance are cluster as one network and having different values are cluster as 2nd network.
1st network have two receivers R1 and R2 and 2nd network has one receiver R3.

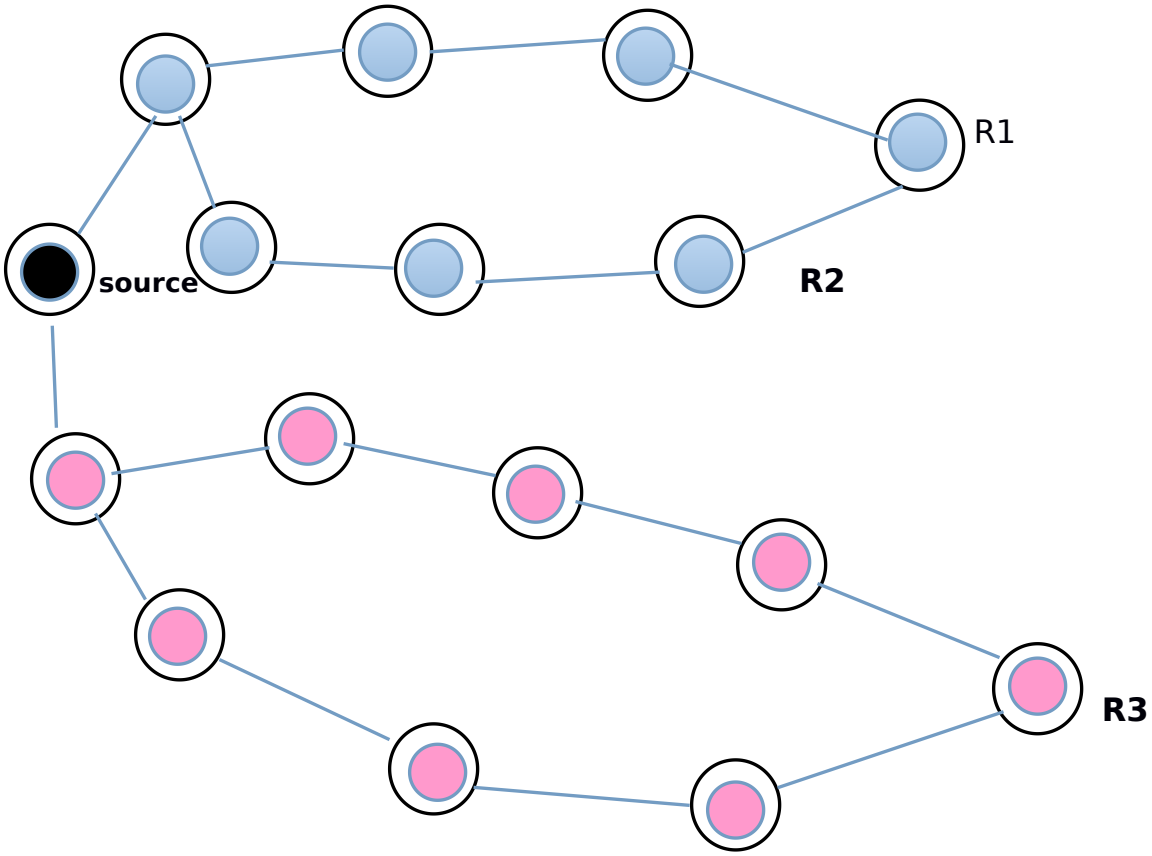


Fig. 3.1.3 Division of network

Source uni-cast Route Request (RREQ) packets from source to destination in the network to get the optimal path.

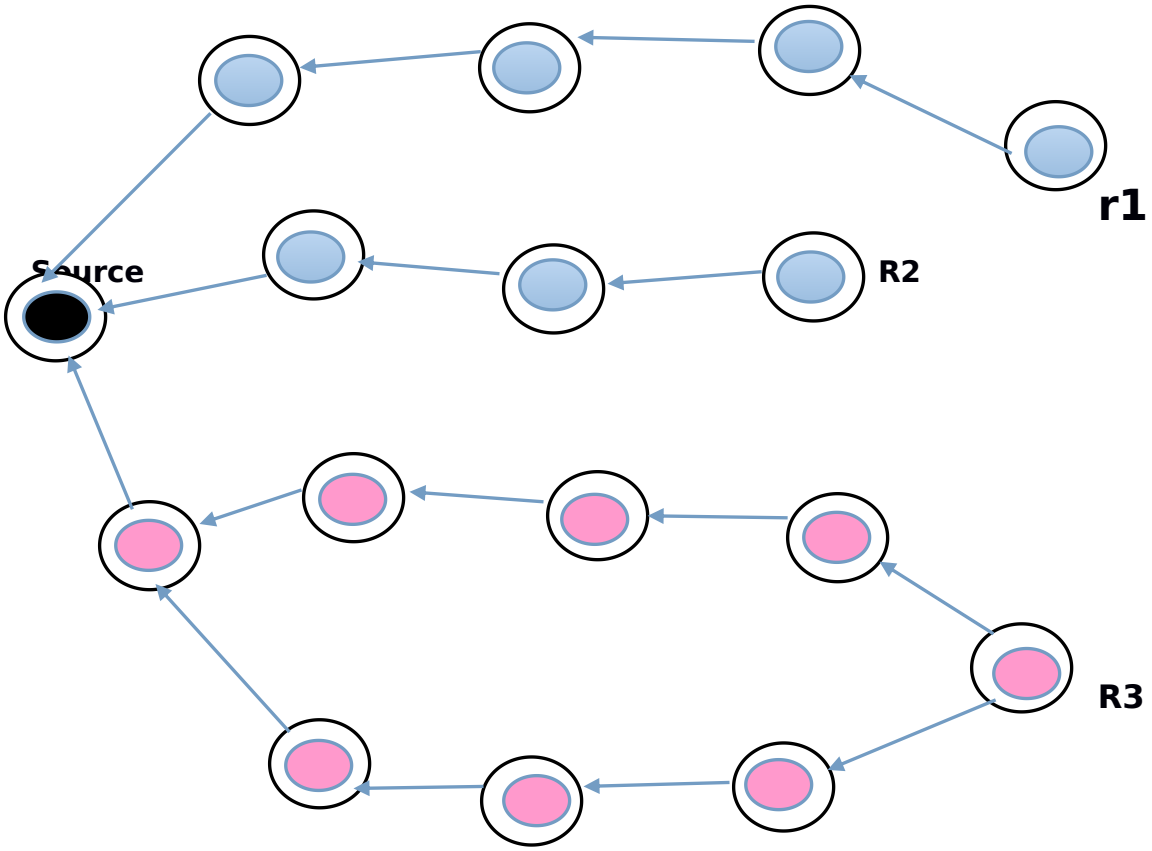
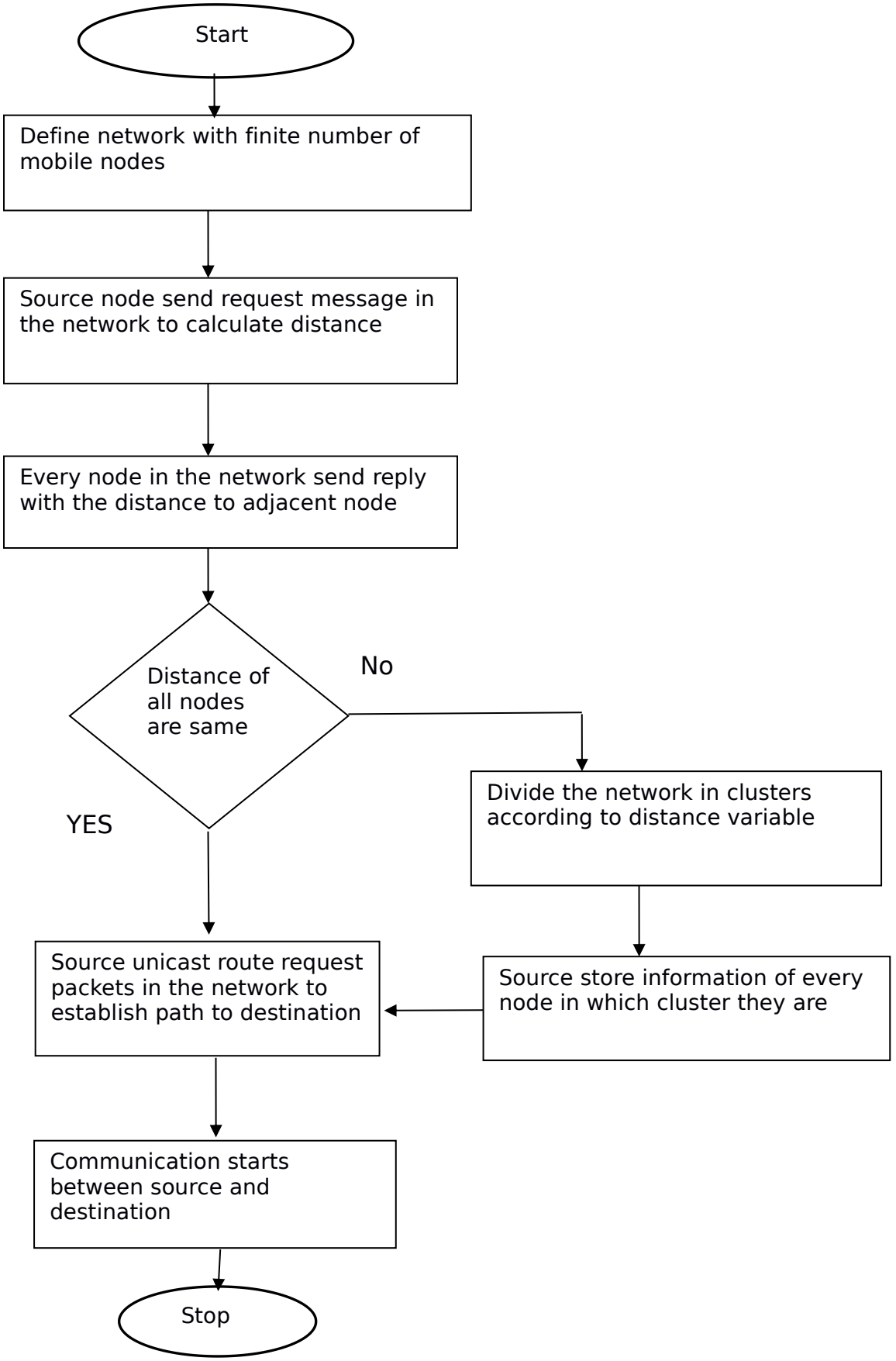


Fig 3.1.4 Path establishment

If the receivers has been found in the part of network for which source is requesting , source gets the RREP from that part of the network. Afterwards the optimal will be established between source and destination.In AODV protocol there is some problem during communication process. AODV has broadcast nature. First of all it floods RREQ packets to all the nodes. The nodes which has destination address sends RREP message to the source nodes. The node which has not destination address also receive RREQ message which is wastage of bandwidth and other resources. To overcome this problem we have to multicasting protocol.


Start
Define network with finite number of mobile nodes
Source node send request message in the network to calculate distance
Every node in the network send reply with the distance to adjacent node
Distance of all nodes are same
No
YES
Divide the network in clusters according to distance variable
Source store information of every node in which cluster they are
Source unicast route request packets in the network to establish path to destination
Communication starts between source and destination
Stop

Chapter 4
Results & Discussions

4.1 Tool

NS2 is open source simulation tool which is running on the LINUX or UNIX. It is a greater simulation tool used for the networking research area.it provides the large support for various protocols like routing protocols IP protocols, such as TCP ,UDP over wired network. It has good capability of graphically detailing network traffic. LAN routing and broadcasting is done by ns2. NS2 originally made for studing the dynamic behavior of flow and congestion control schems for packet switching network. NS2 started for various application in 1989 .

NS2 Overview: NS2 is a simulator using for network area like wired or wireless networks. It is simulated by VINT (Virtual Inter-network Test-bed) project group. It supports simulation of TCP and UDP over wired network. Also useful foe MAC protocols, or multicast protocols over bothy wired and wireless network.

The simulation in ns2 stored in tha trace files according to user requirements, which is take as input for analysis by the different components.

A NAM trace file (.nam) is used for the ns animator to produce the simulated environment.

A trace file (.tr) is used to generate the graphical results with the help of a component called X Graph.

4.2 Problem Implementation

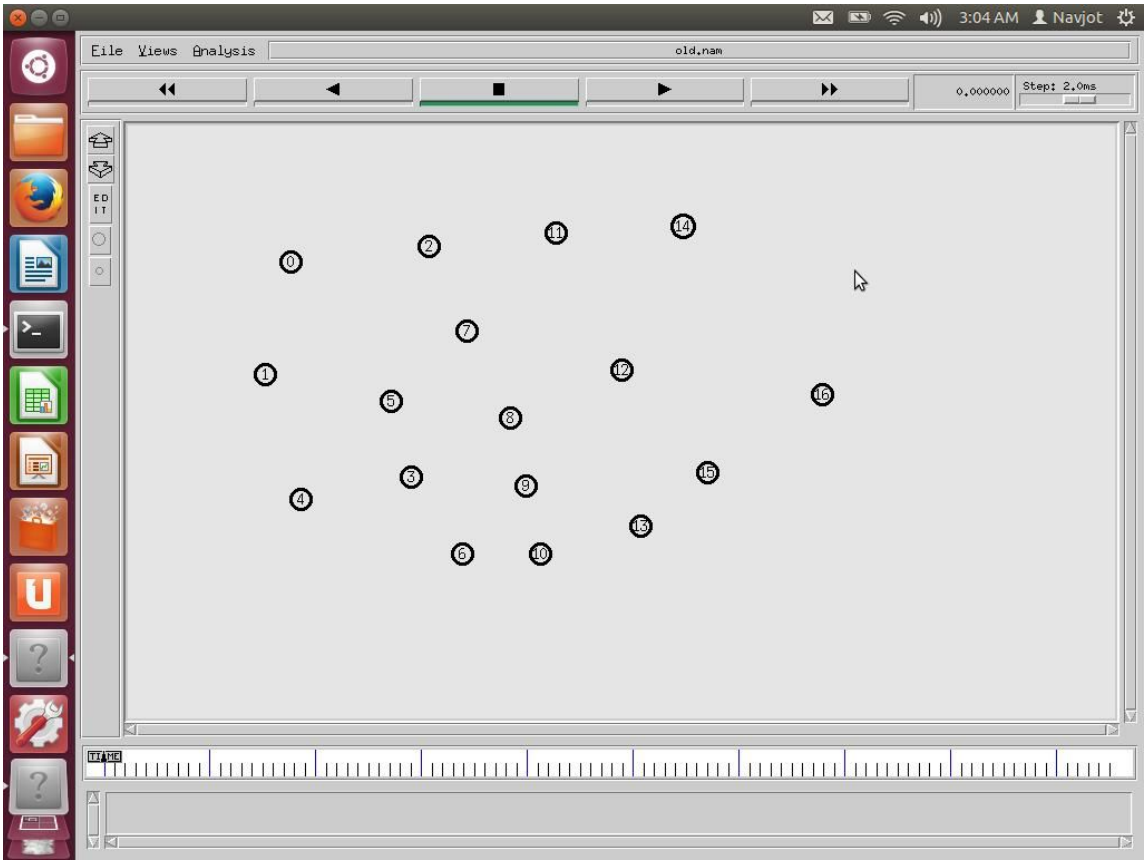


Fig4.1.1: Network Deployed

As illustrated in fig 4.1.1, the network is deployed with some finite number of mobile nodes. These mobile nodes can change their position any time, because in MANET mobile nodes are not fixed or they are self deployed.The black nodes are the finite node we taken for implementing the multicasting protocol for communication.

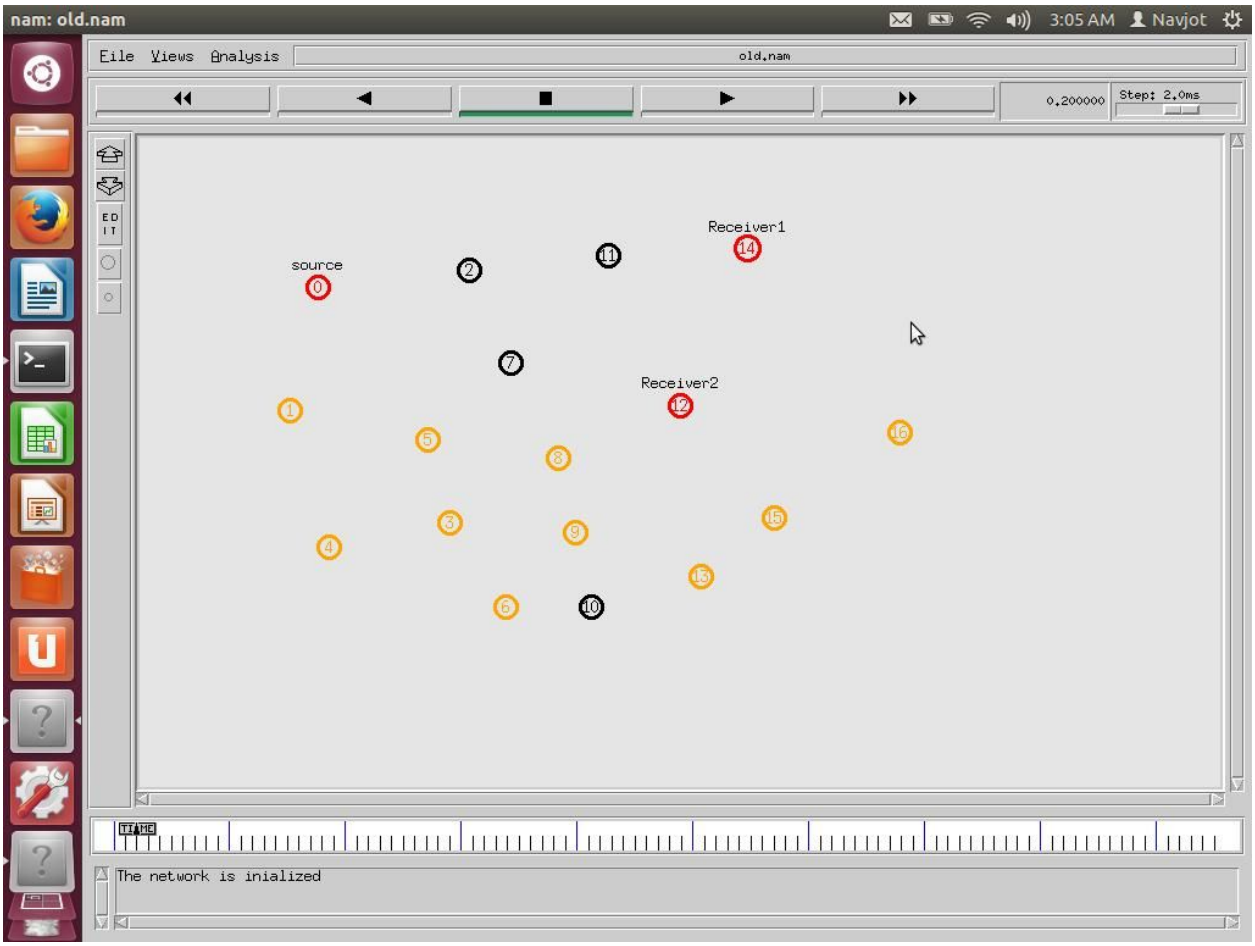


Fig 4.1.2: Network divided into tree

As in fig 4.1.2 , the network in structure of tree, for multicasting the RREQ packets in the network for establishment of path between the sender and destination. There are two receiver in the tree ,receiver 1 and receiver 2. Network is divided into two network, the black nodes are in one group,orange nodes are in one group.the red nodes are two source and receiver nodes which wants to communicate with each other. In this the network is just initialized.

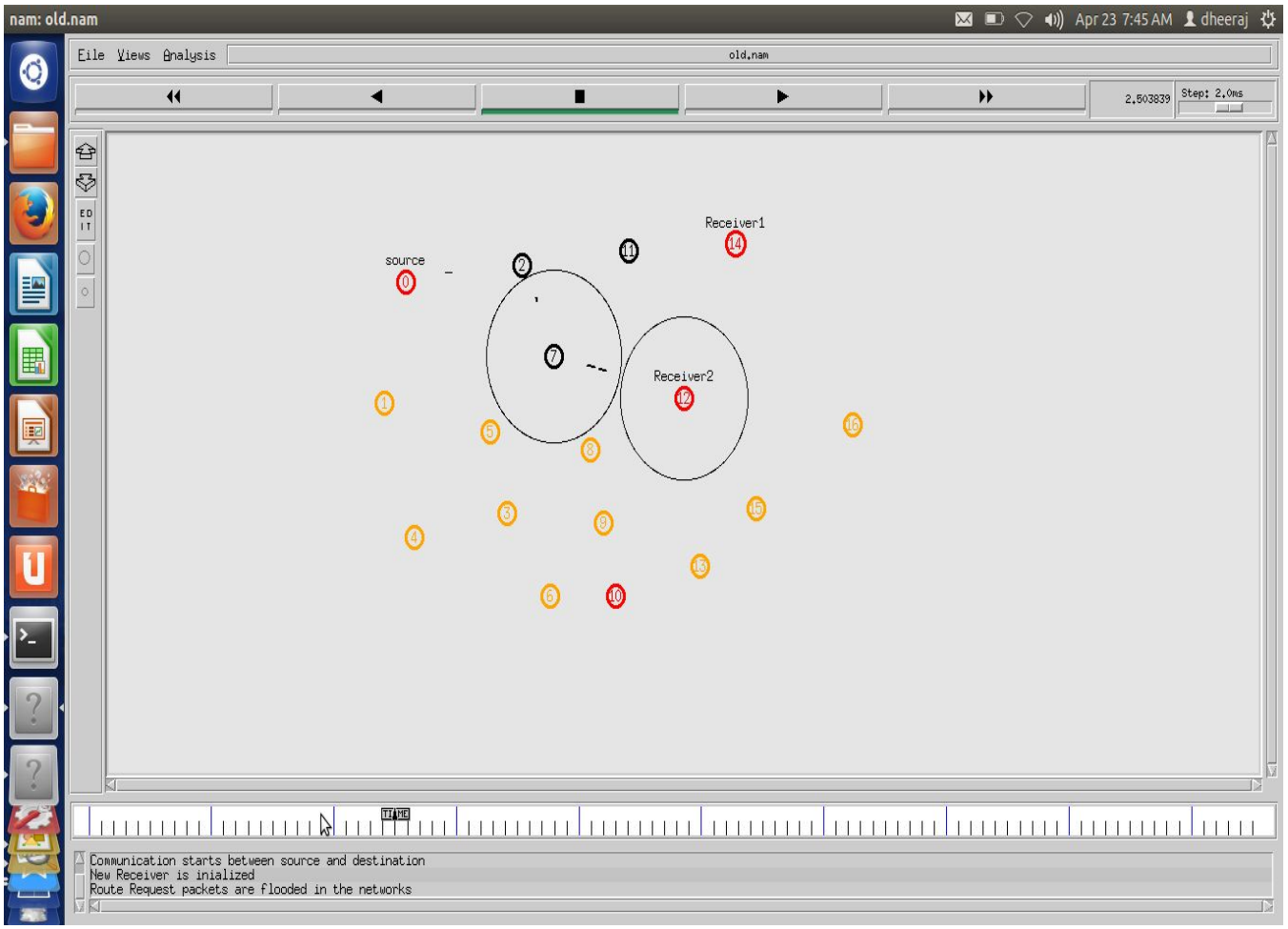


Fig 4.1.3: Predefined Path

Now path is calculation is starting , the path from source to receiver 1 and receiver 2 is already predefined and source node start sending packet to destination. The dotted lines shows that the communications is started. The big circles indicates the antenna signals. Source is communicating with the receiver 2.

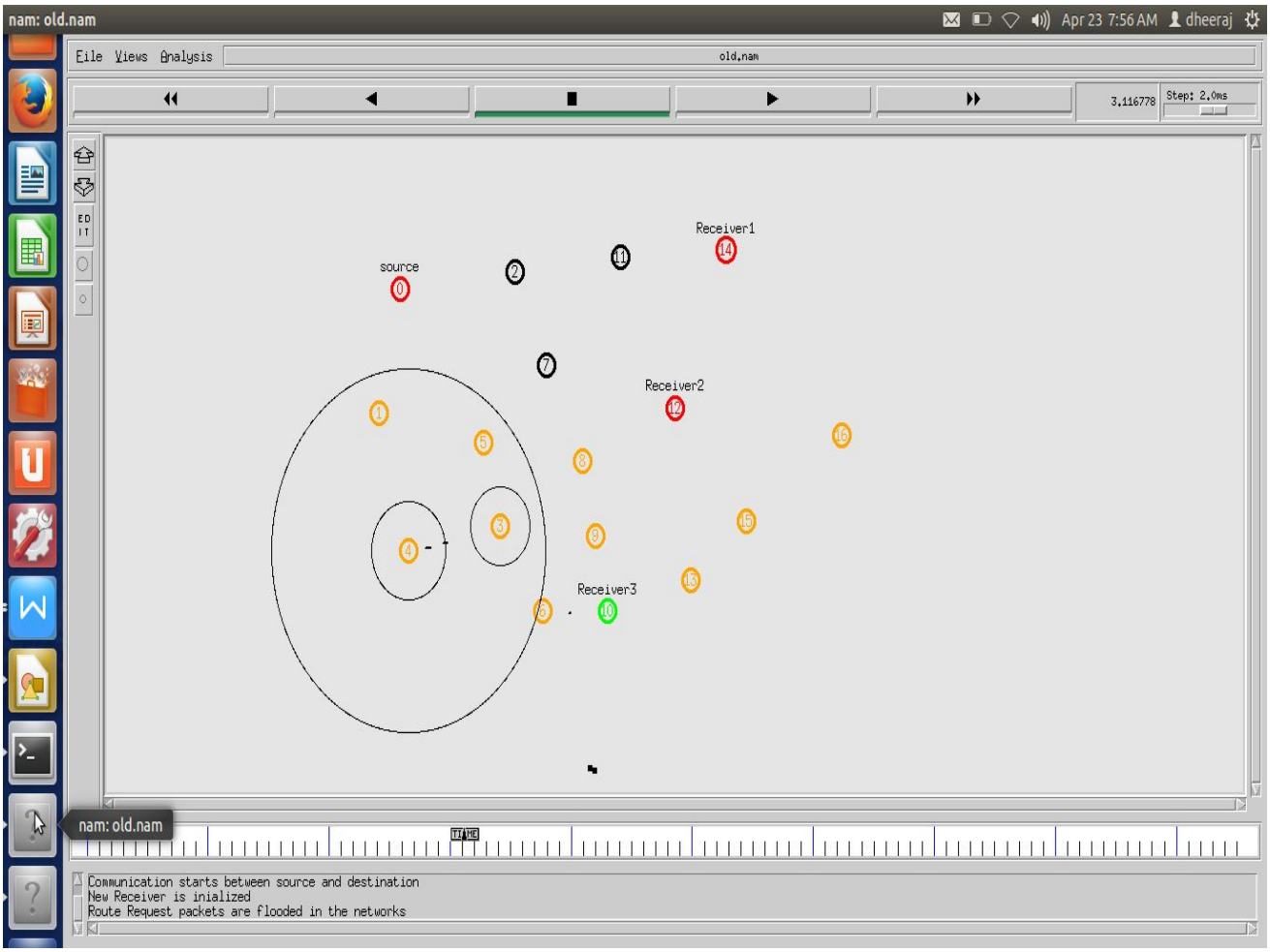


Fig 4.1.4new receiver is selected

In given image new receiver is selected or new node want to communicate with the source. The node which is turned to green now is new receiver wants to communicating with source .its sending the RREQ packets in the networks for accessing the packets.in this diagram the dotted lines showing the RREQ packets through the node 5 and node 6 to source.

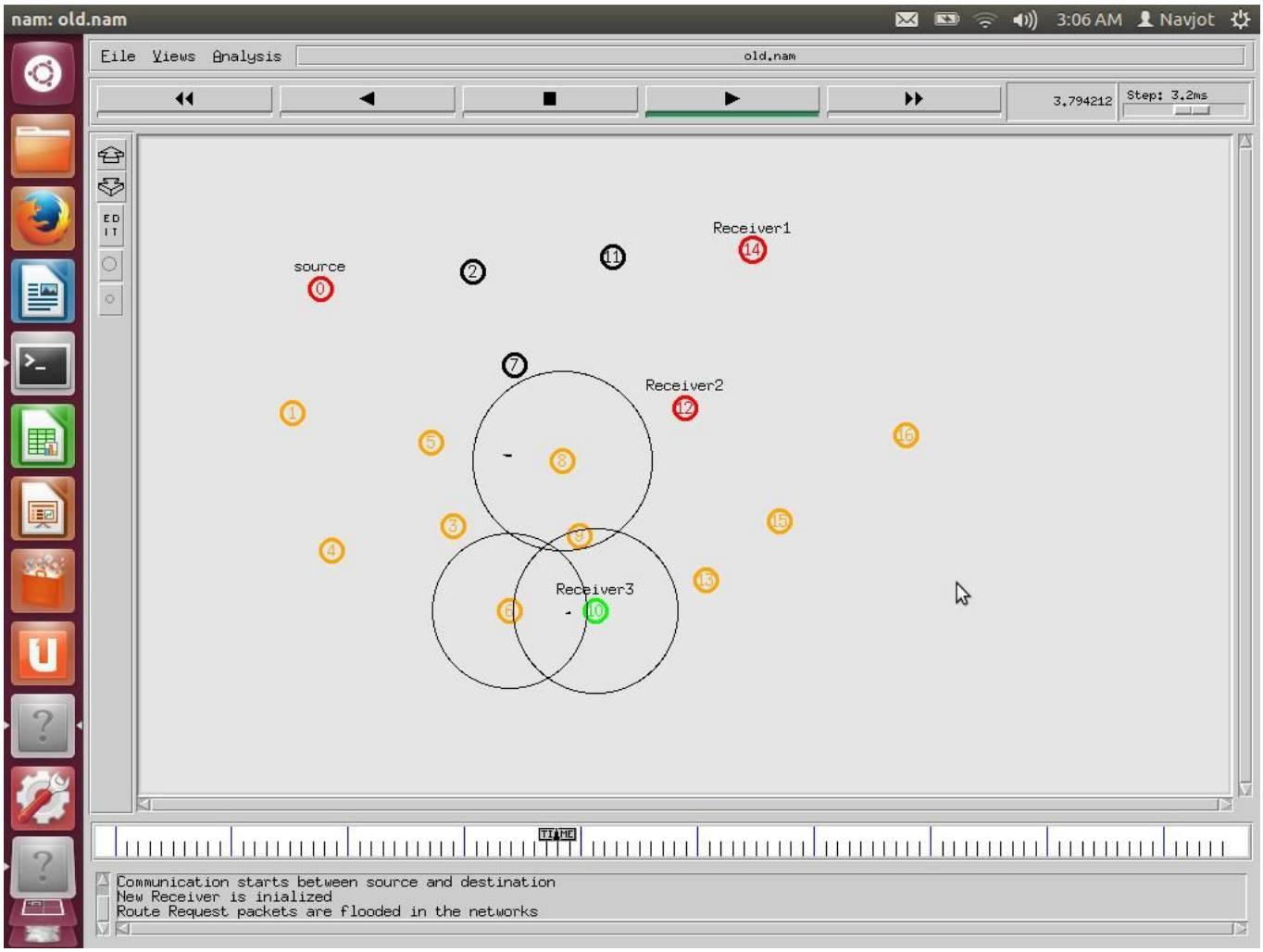


Fig 4.1.5: RREQ packet flooding in network

As illustrated in the figure 5, when the new receiver join the the network, which is named as receiver (R3) the source send route request RREQ packets to establish path to receiver 3. The RREQ packets are flooded in the tree. The circles indicates the signals for sending the RREQ packets.

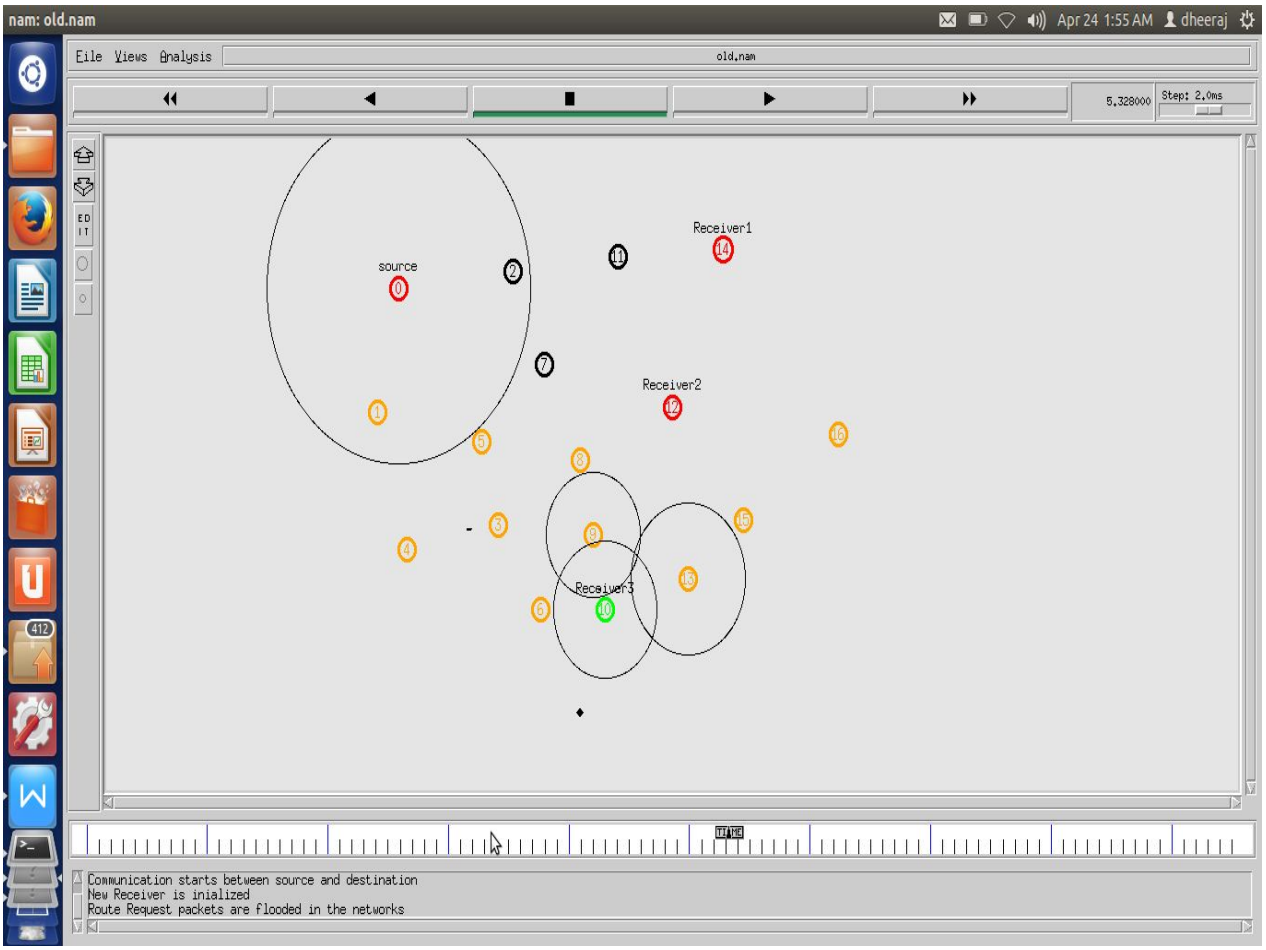


Fig 4.1.6 RREP packets are sent to source for path

RREP packets are sent in the network by intermediate node to source ,they they have path for destination. When the receiver get the RREQ packets from source node through the intermediate nodes,it send back the RREP packets into the network through the intermediate node.RREP packets are are sent on the basis of hop count and the sequence numbers.

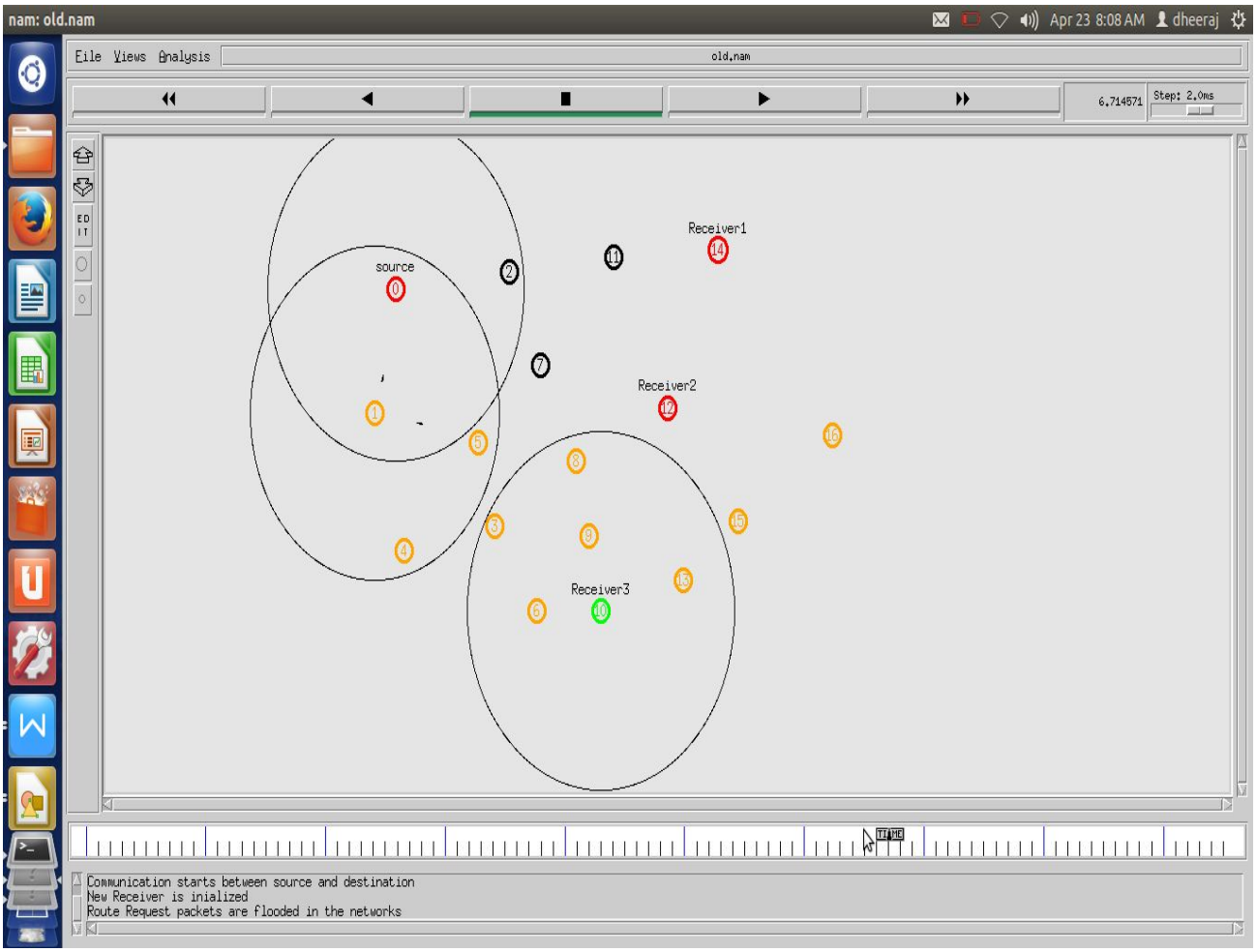


Fig 4.1.6: Establishment of path to new receiver

As illustrated in the figure 6, the new receiver join the network which is receiver 3, the adjacent nodes send route reply packets to establish path to receiver 3.when the RREP packet is received by the source it established thee path to destination for starting the communication.path is going through the nodes 1,5,8,9 to receiver 3.

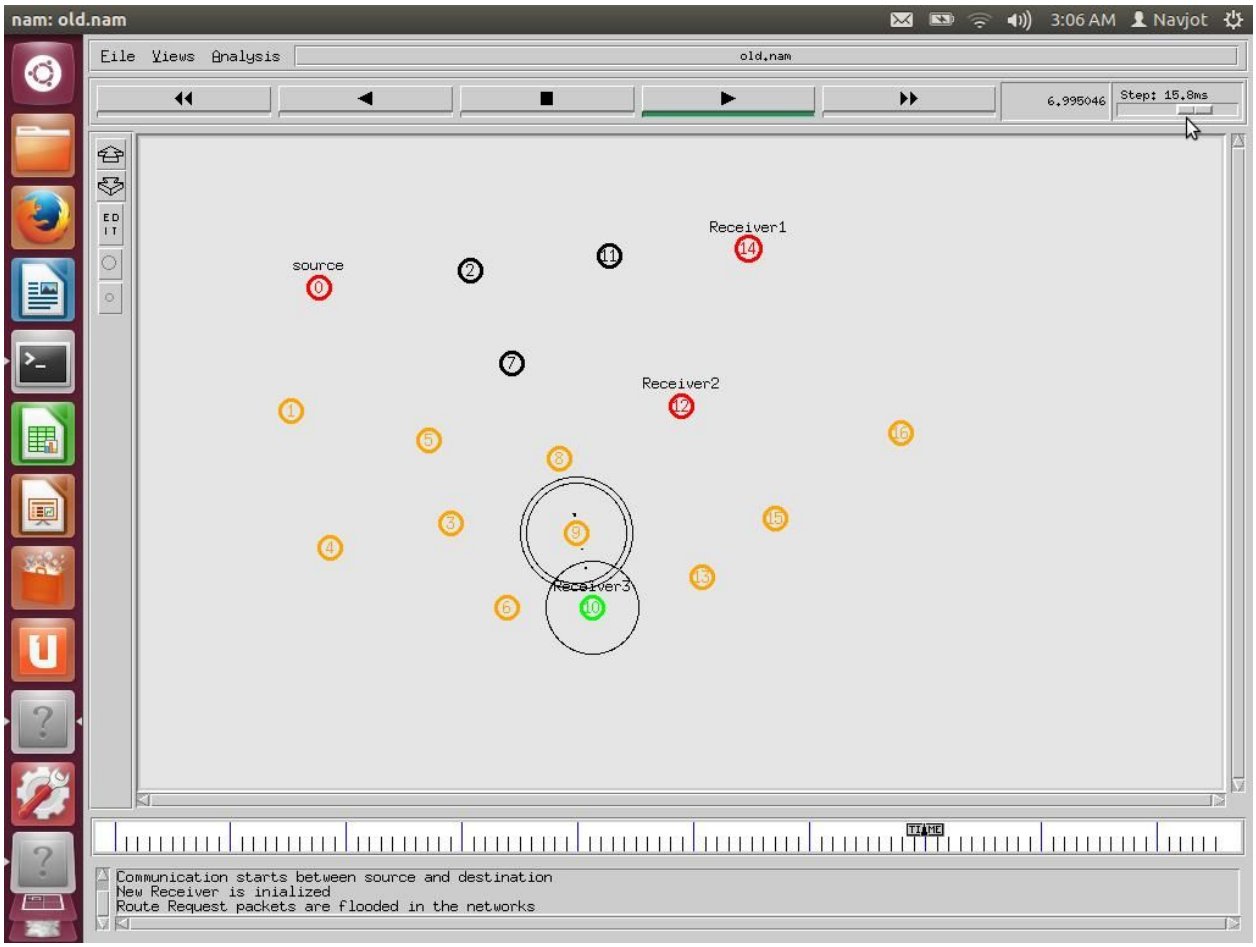


Fig 4.1.7: Route Establishment

As shown in the figure 6, the route between source and destination is established, the source node start sending data packets to receiver 3. Now the route is established from source to receiver 3.

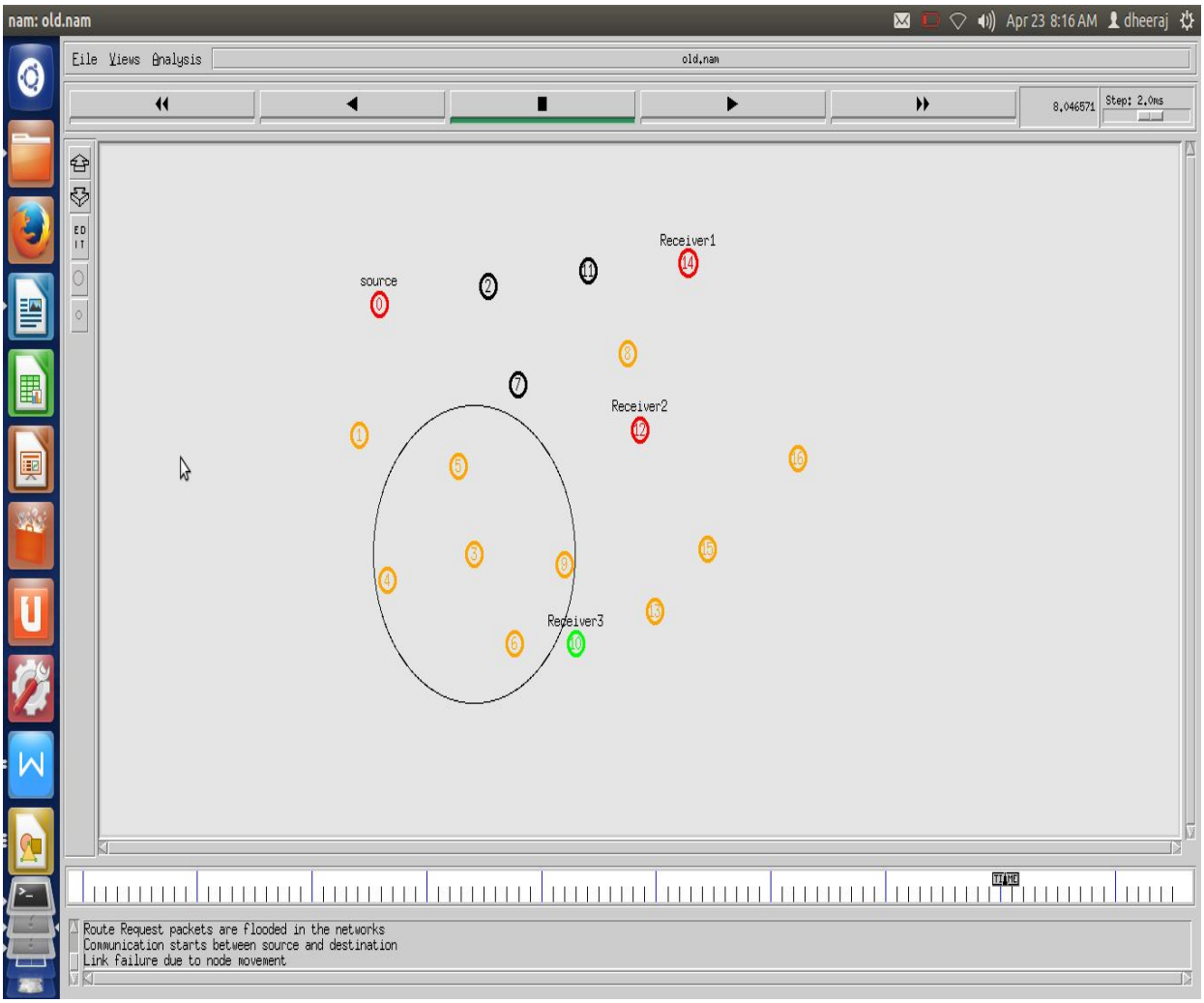


Fig 4.1.8 Node movement form its place

In MANET nodes are not fixed,they can move any where in the network.in given figure node 8 is moved from its location so the path is breaks. Now the path from source to receiver 3 is broken. Means the path already generated from source node to receiver 3 is now broken because the intermediate node is moved from its place.

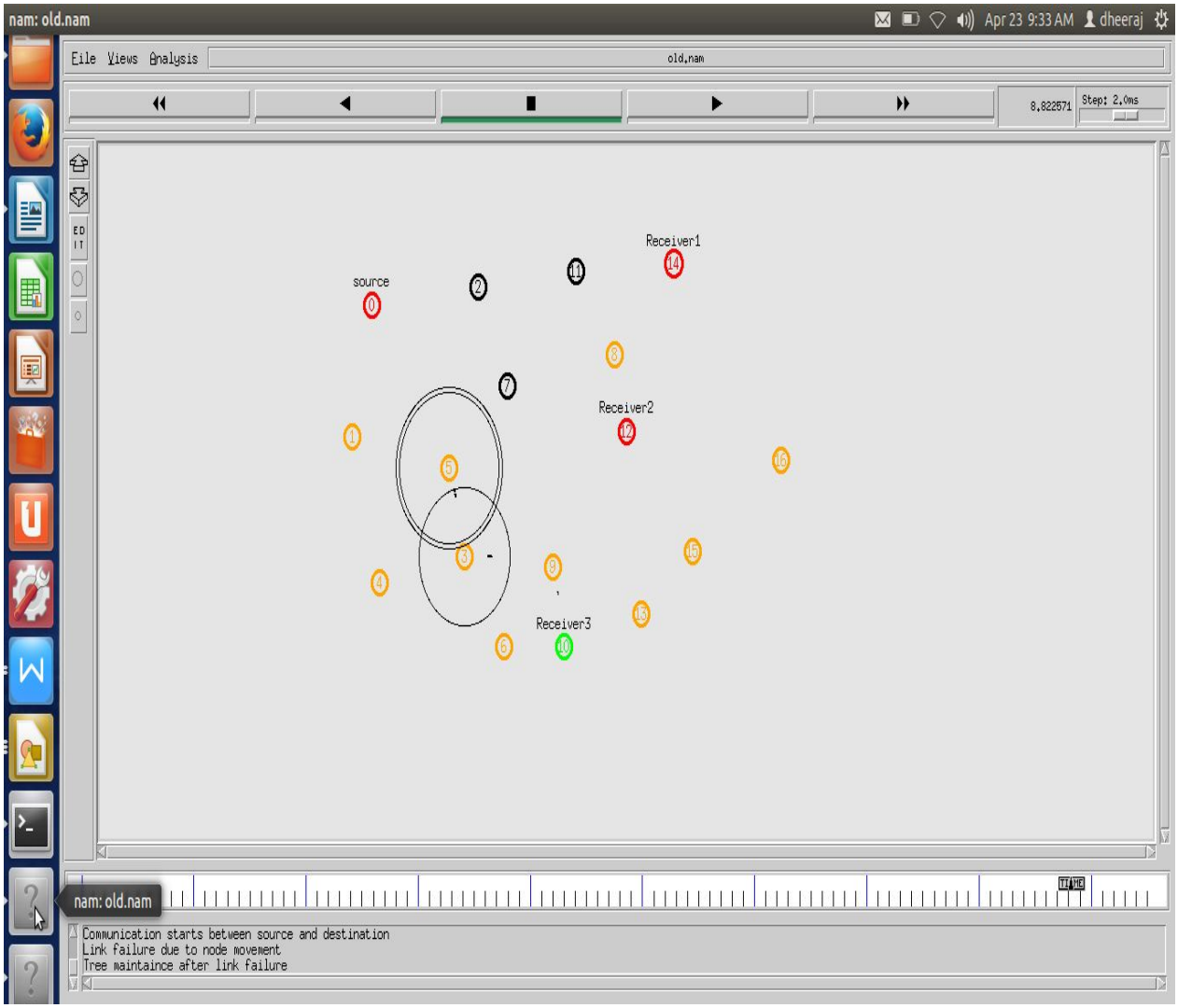


Fig4.1.9 re-establishment of path after node movement

When any intermediate node move form the path from sender to destination,the path or transmission is broken. So the nearest node from source will take the initiate for re-establishment of path. Now the nearest node of source take initiative for reconfigure the path. Now the new path is established on the basis of hop count or sequence number of intermediate node.

4.3. Solution Implementation

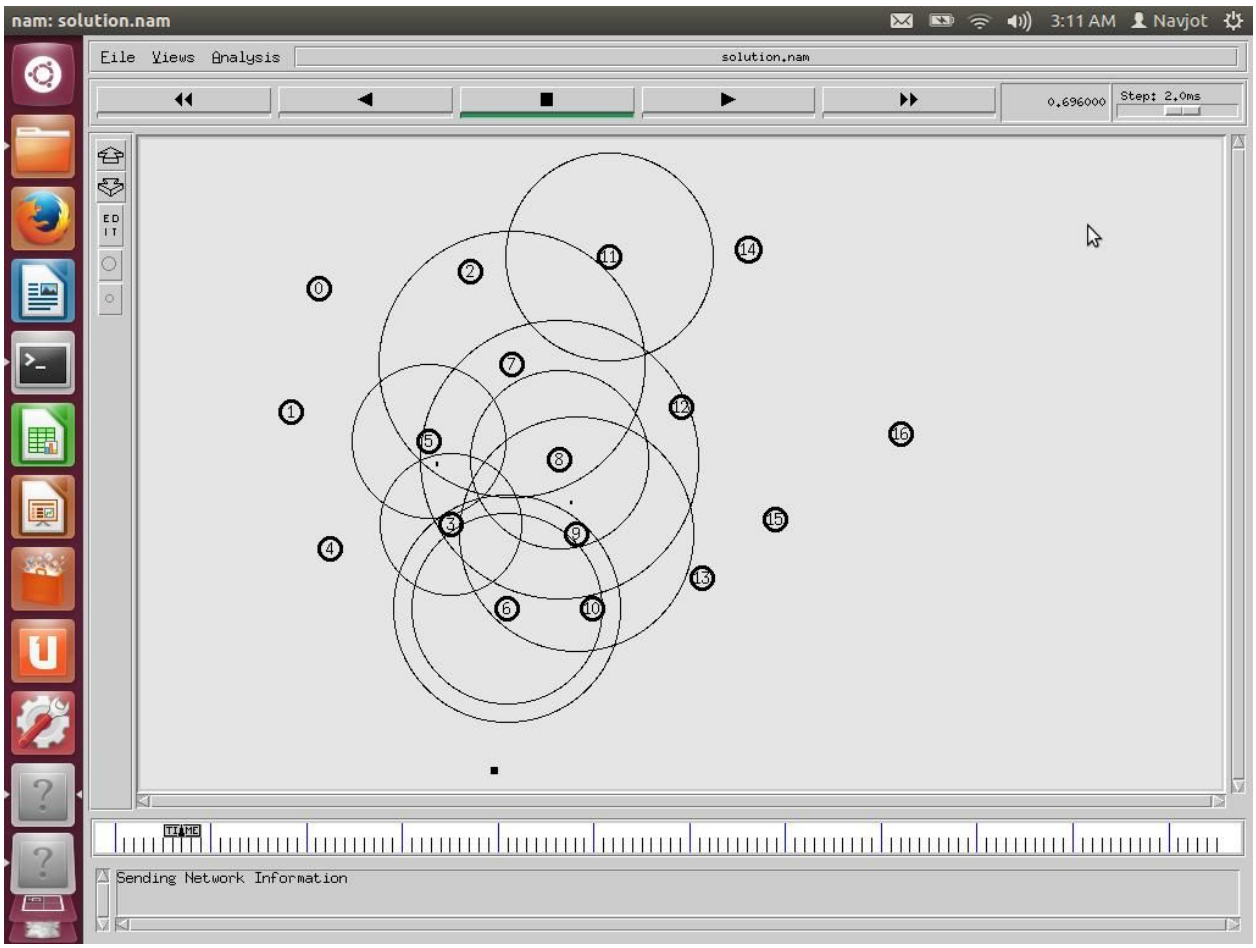


Fig4.3.1: Network Deployment

As shown in the figure 1, the network is deployed with the finite number of nodes and whole network is divides according to location of the mobile nodes. The black colored nodes in this diagram are finite. The circles indicates the signals which are calculating the distance between all the nodes. The information is sending into the network.

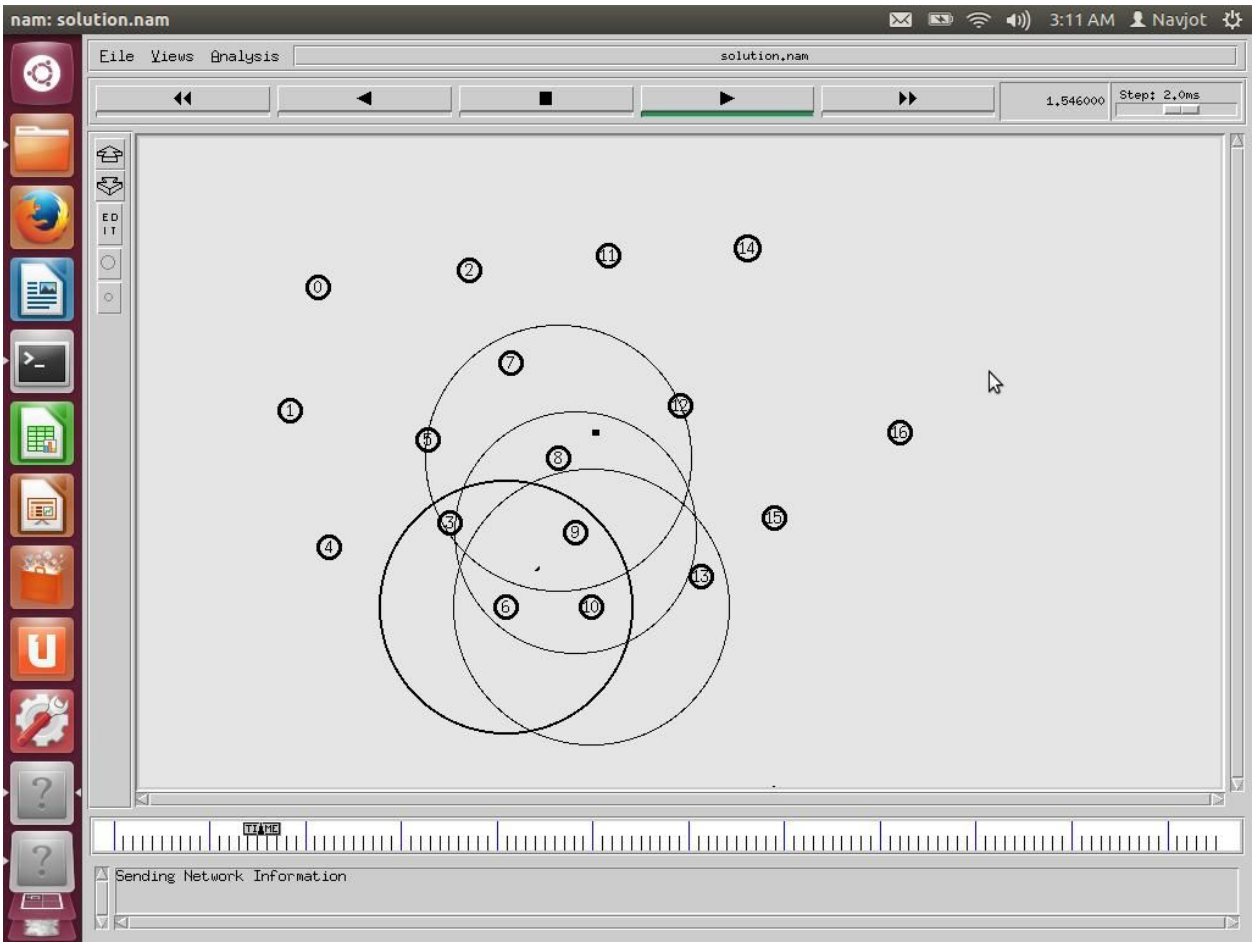


Fig 4.3.2: Dividing network

As shown in the figure 2, the source node flood request message into the network to calculate Euclidean distance of each node in the network.

$$\text{Sqrt}((x_2-x_1)^2+(y_2-y_1)^2$$

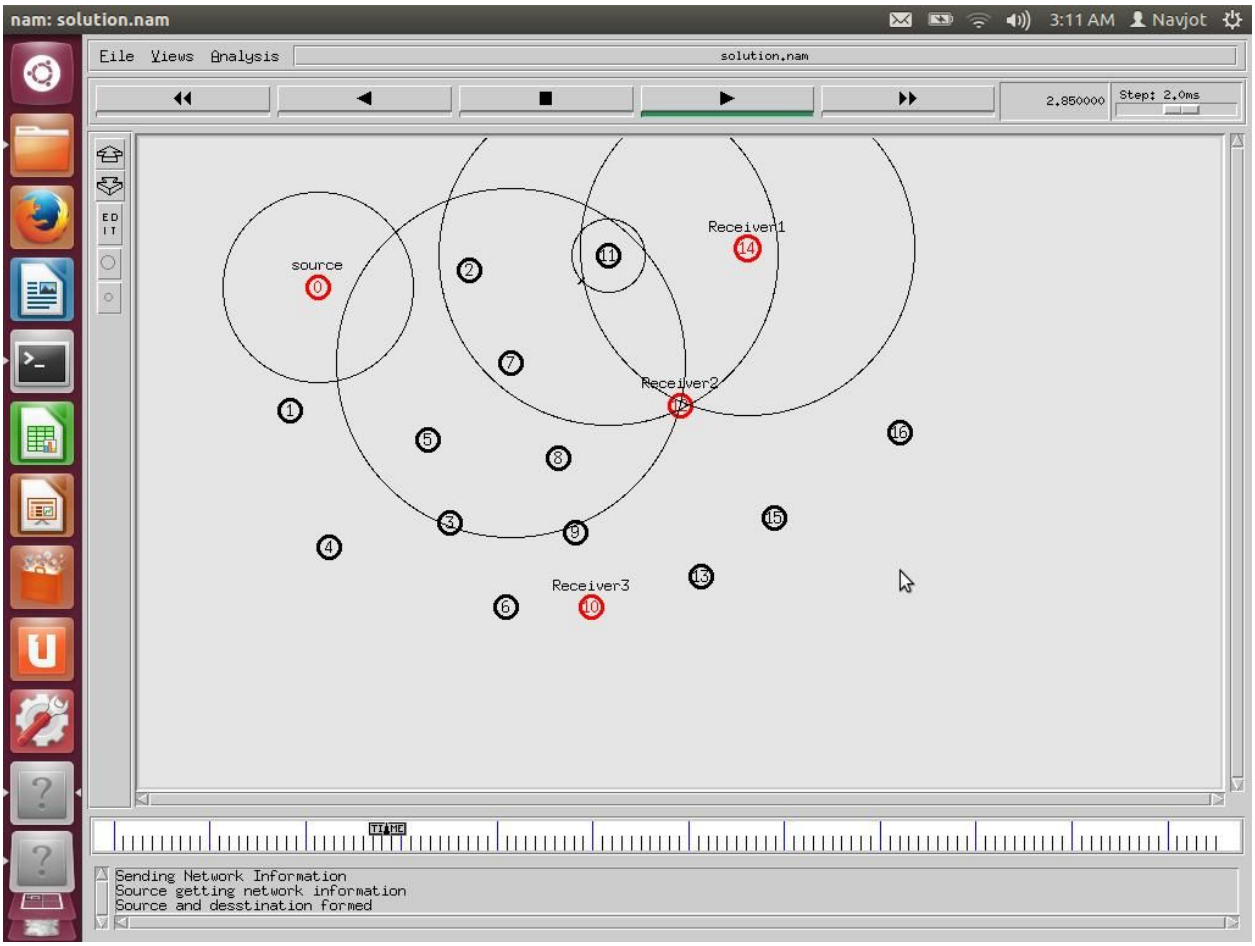


Fig 4.3.3: Dividing network

As shown in the figure 3, the nodes in the network will calculate distance of each others distance. Each node will respond back with calculated distance. Black color nodes are simple nodes we taken for the communication in the network.red nodes are the source and receiver nodes.

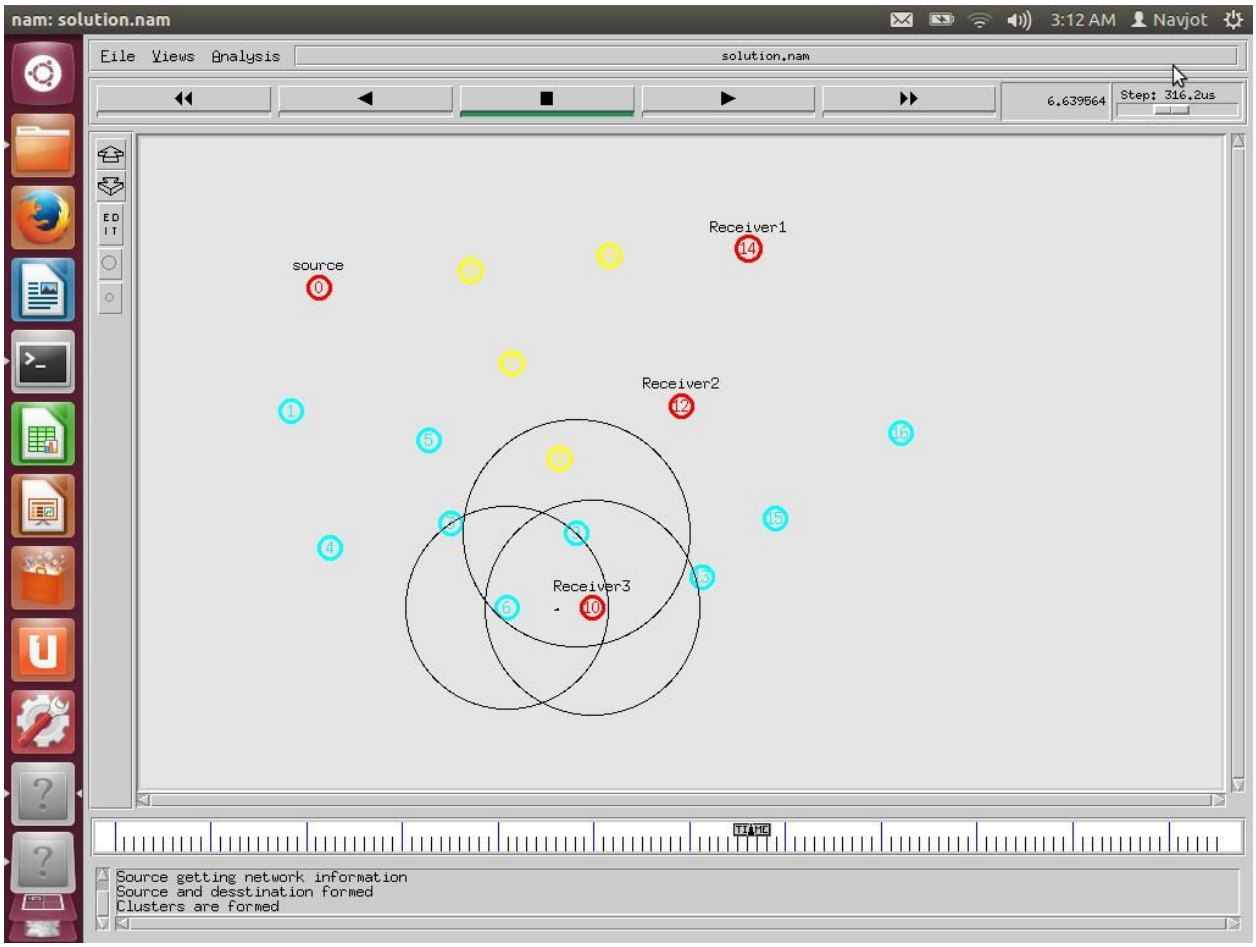


Fig4.3. 4: Dividing network

As shown in the figure 4, the nodes in the network will calculate distance of each others distance. Each node will respond back with calculated distance ,and dividing into the two groups.group 1 contain the nodes with minimum distance from source to destination. Group 2 contains the mobile node with highest distance. Yellow nodes are in one group ,and blue nodes are in group 2.

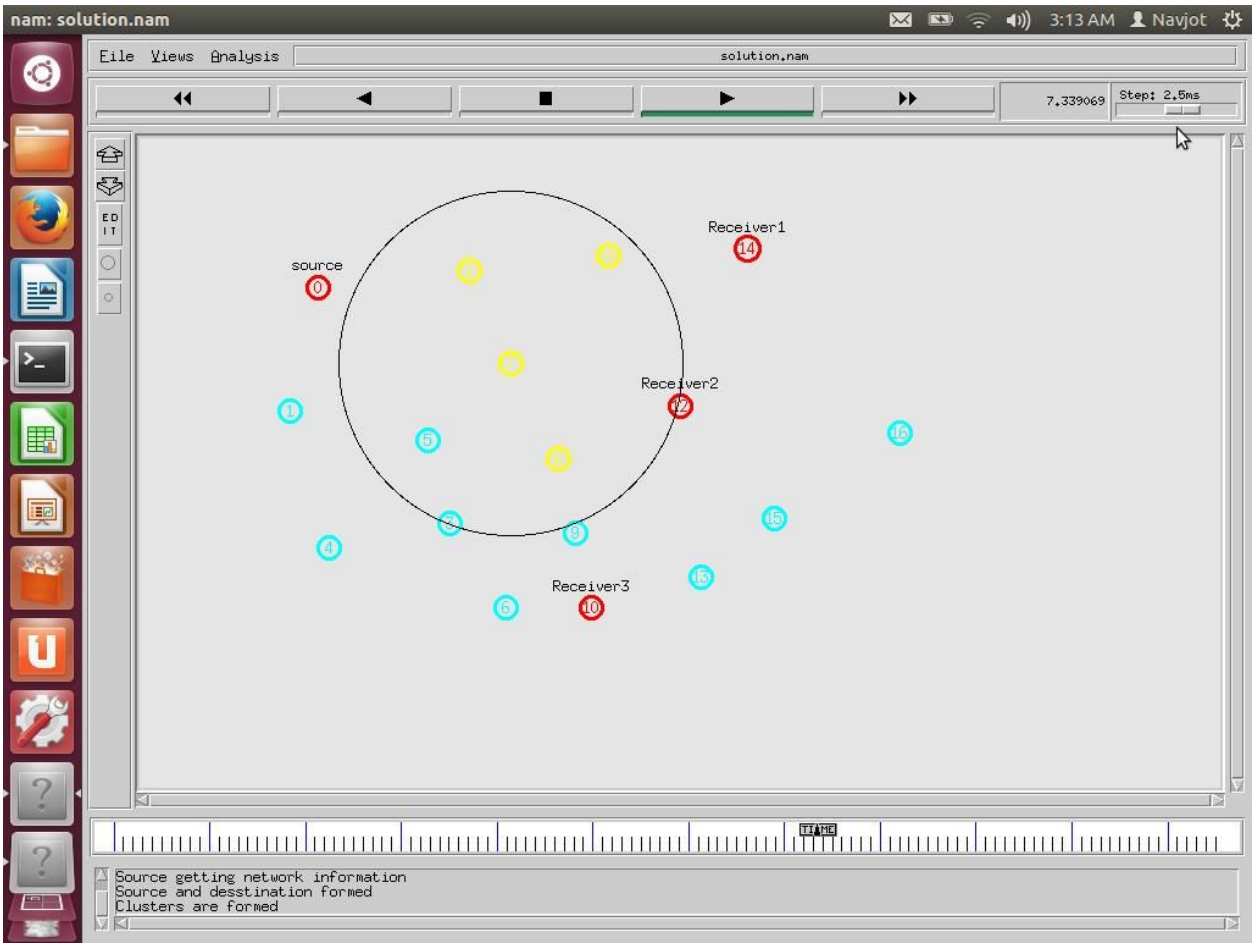


Fig 4.3.5: Division of the network(receivers selected)

As given in the figure 5, in the network distance is calculated of its adjacent nodes. On the basis of distance network is divided into two parts. In two parts receiver are selected for communication.

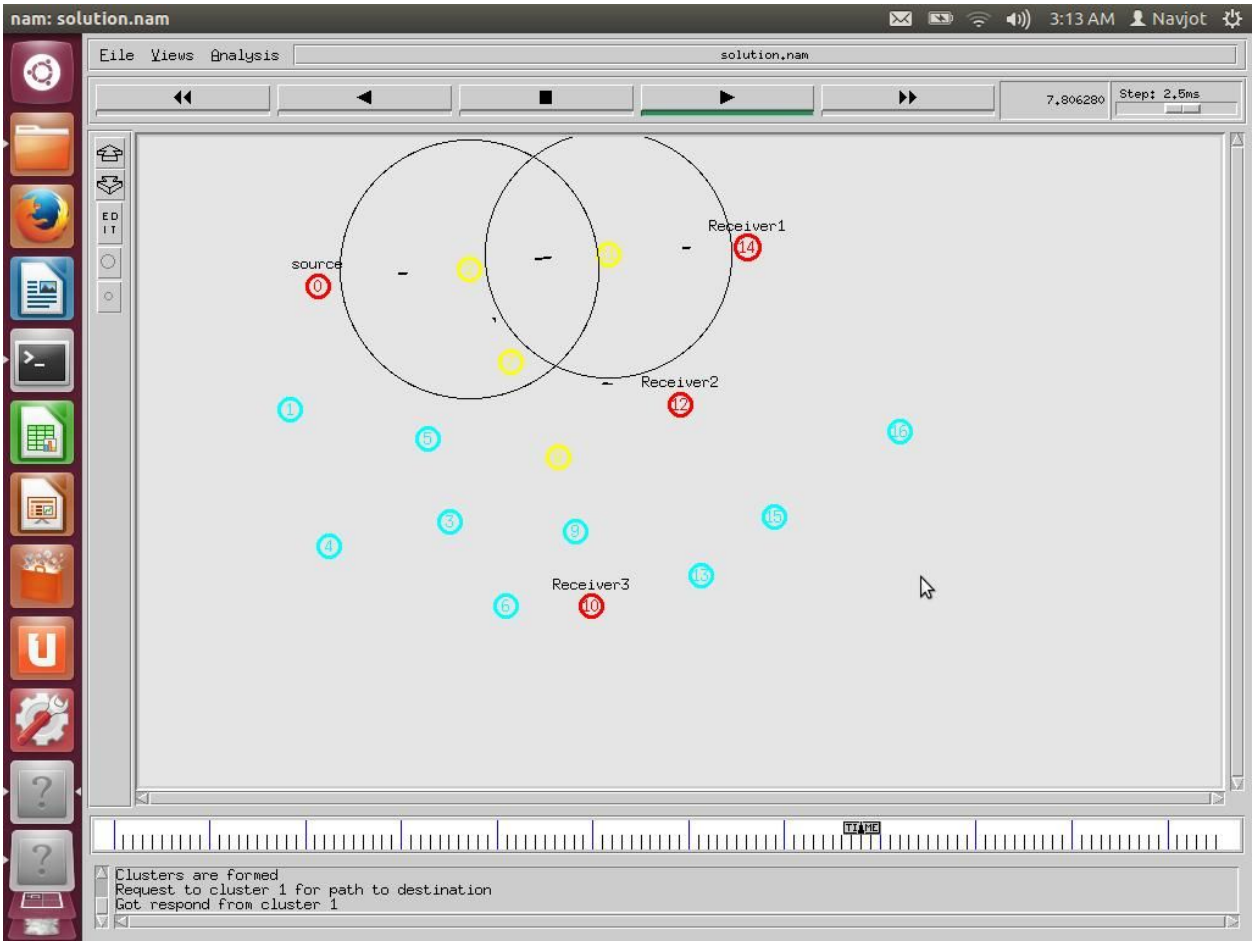


Fig 4.3.6: Route Establishment Process

As illustrated in the figure 6, the source node send uni-casting packets in the each part to establish path to receivers. The path will be established from source to destination.

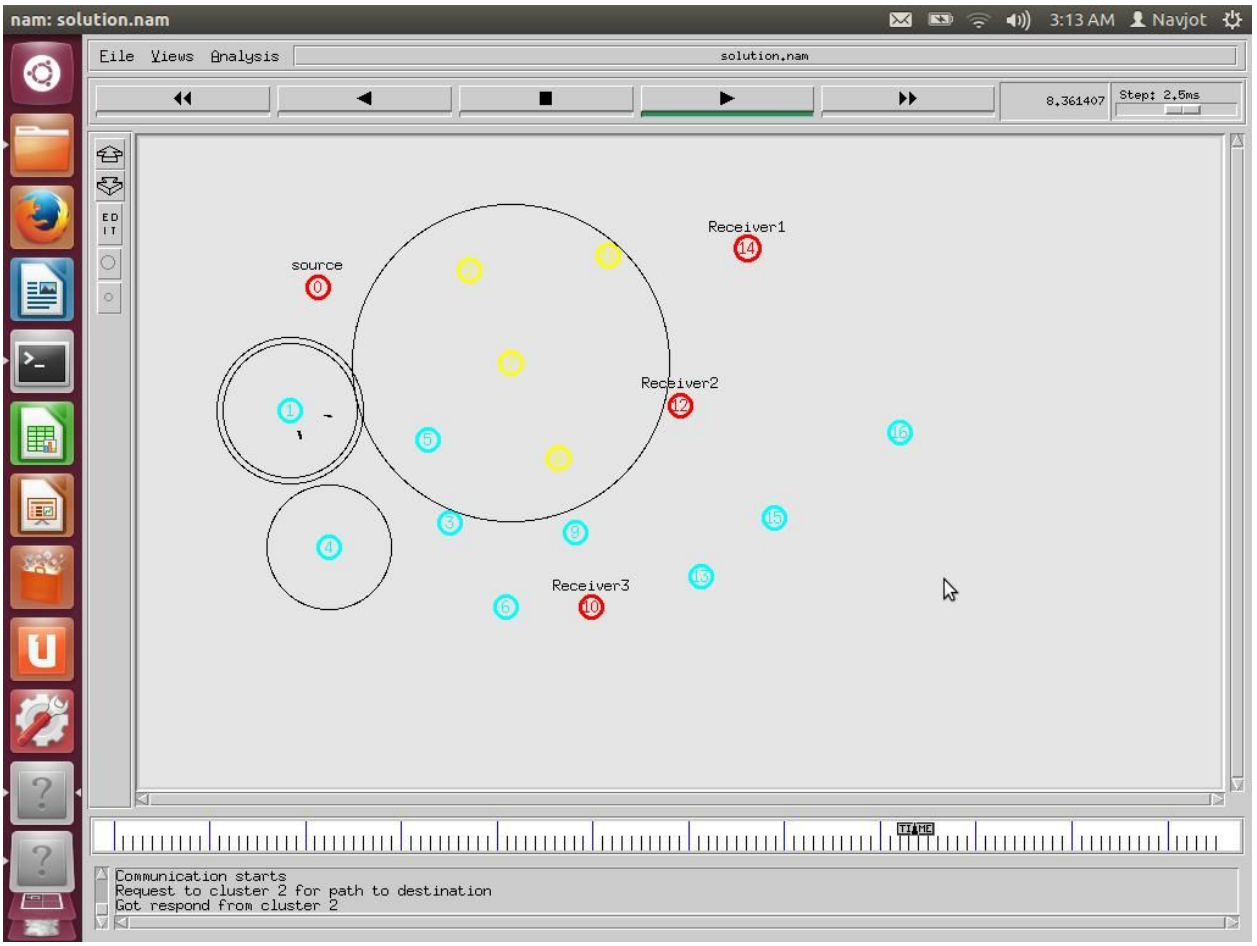


Fig 4.3.7: Route Establishment Process

As illustrated in the figure 7, the source node send uni-casting packets in the each part to establish path to receivers. The path will be established from source to destination. The communication starts from sender to destination.

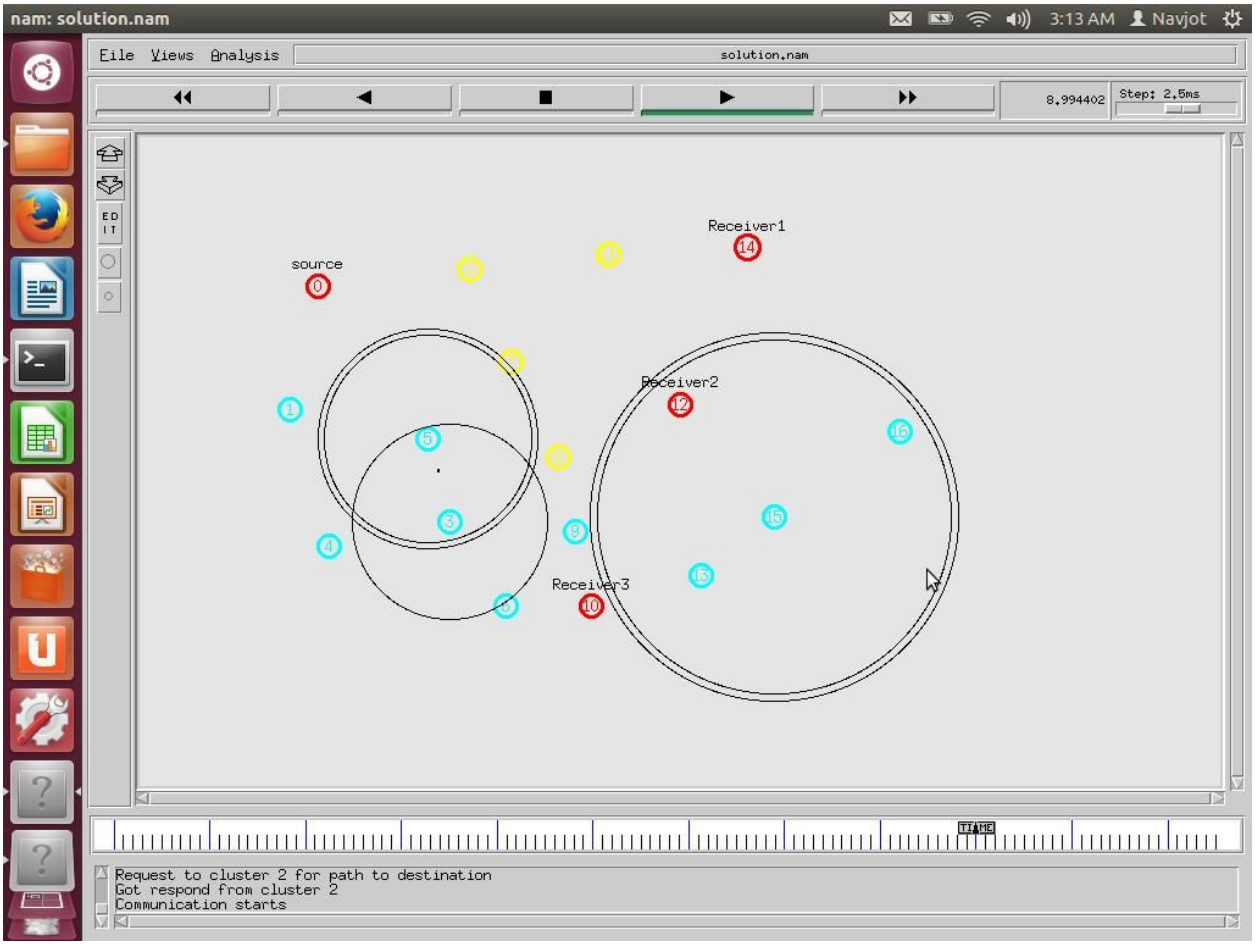


Fig 4.3.8: Communication starts

As illustrated in the figure 8, the source node uni-cast the route request packets in the network to establish path to receiver 3, The optimal path will be selected and data transmission starts between source and destination

4.4 Graphical Representation

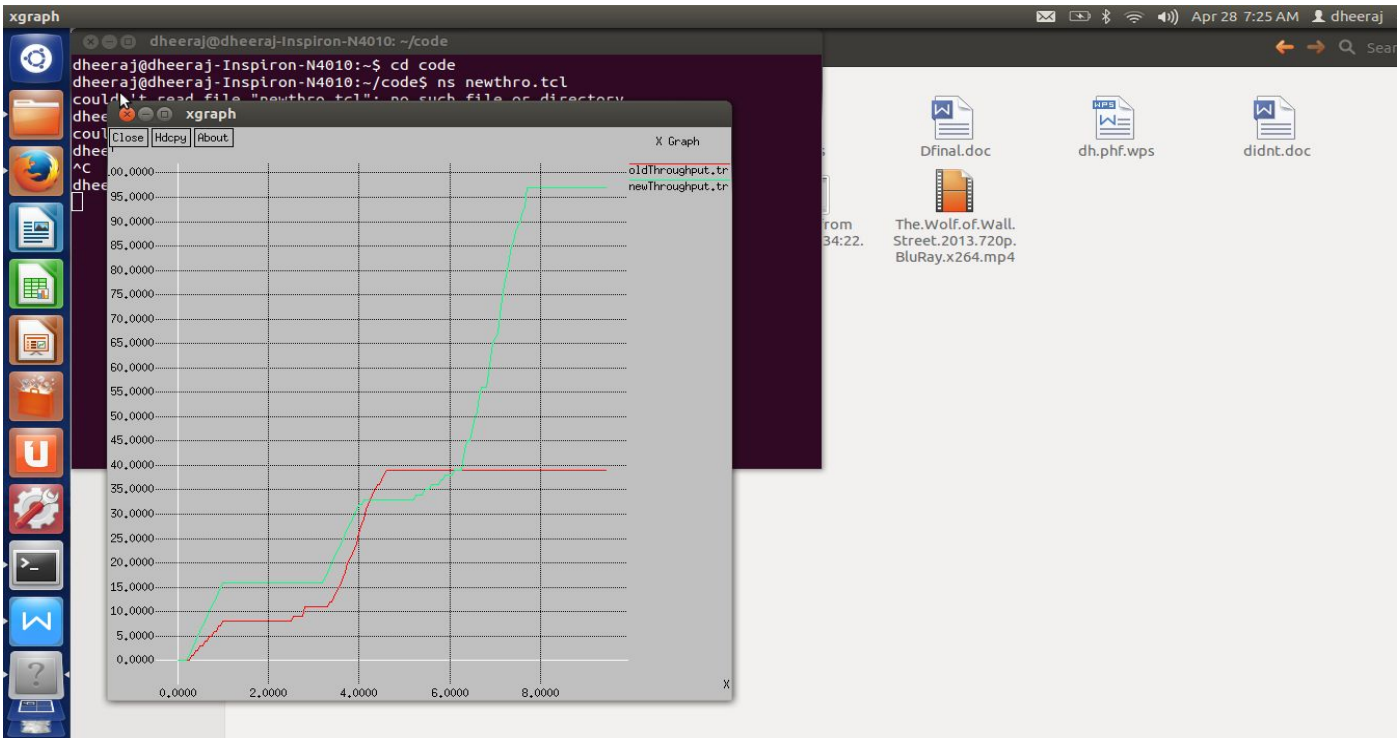


Fig 4.4.1: Throughput Graph

As shown in the figure 1, the green line shows the throughput of the new scenario and red line shows the throughput of the old scenario. The throughput of the new scenario is more as compared to the old scenario. This is due to less packet loss in the network and easy route establishment in between source and destination.

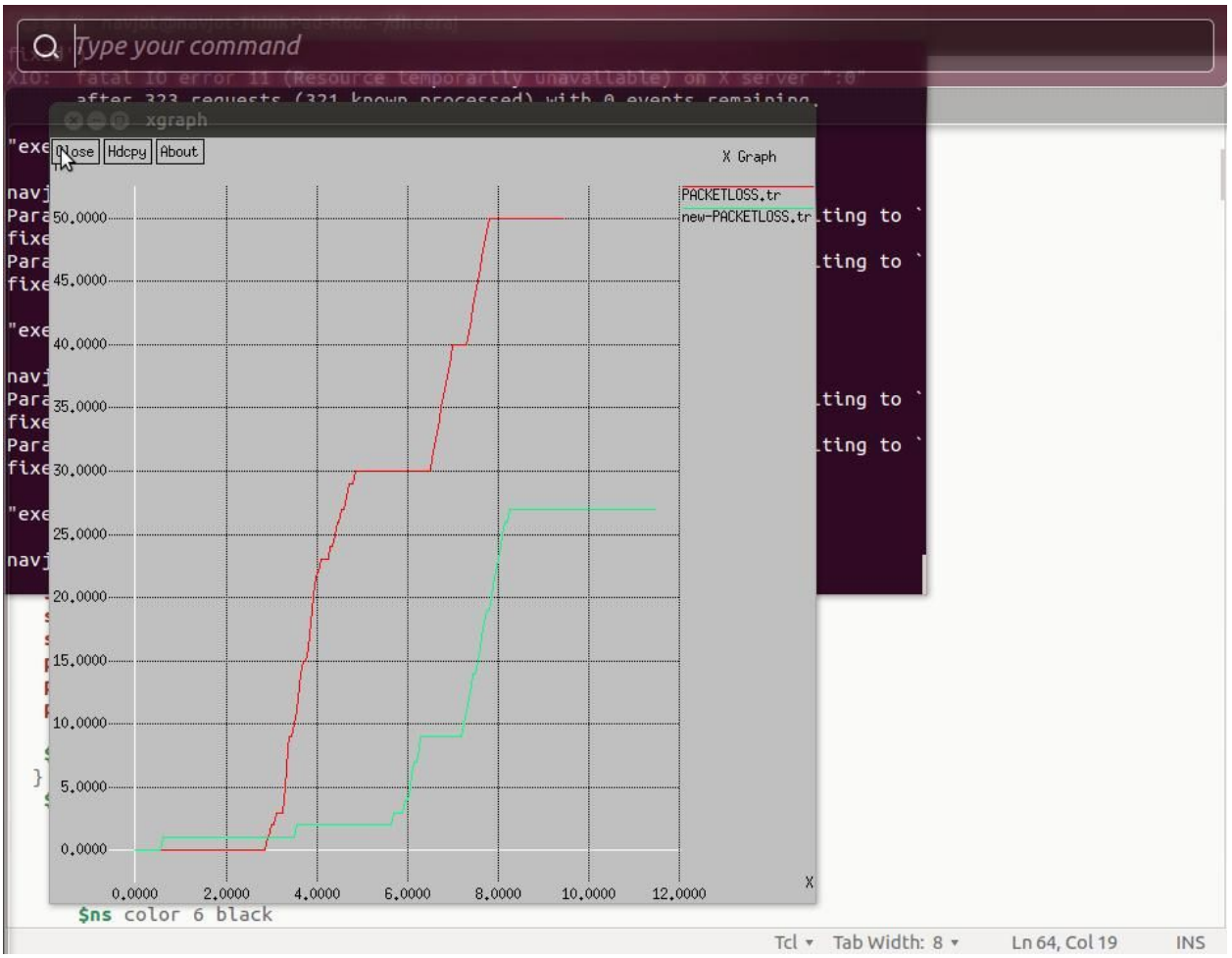


Fig4.4. 2: Packet loss Graph

As shown in the figure 2, the red line shows the old delay and green line shows the new scenario delay. The packet loss in the new scenario is less due to easy path establishment between source and destination

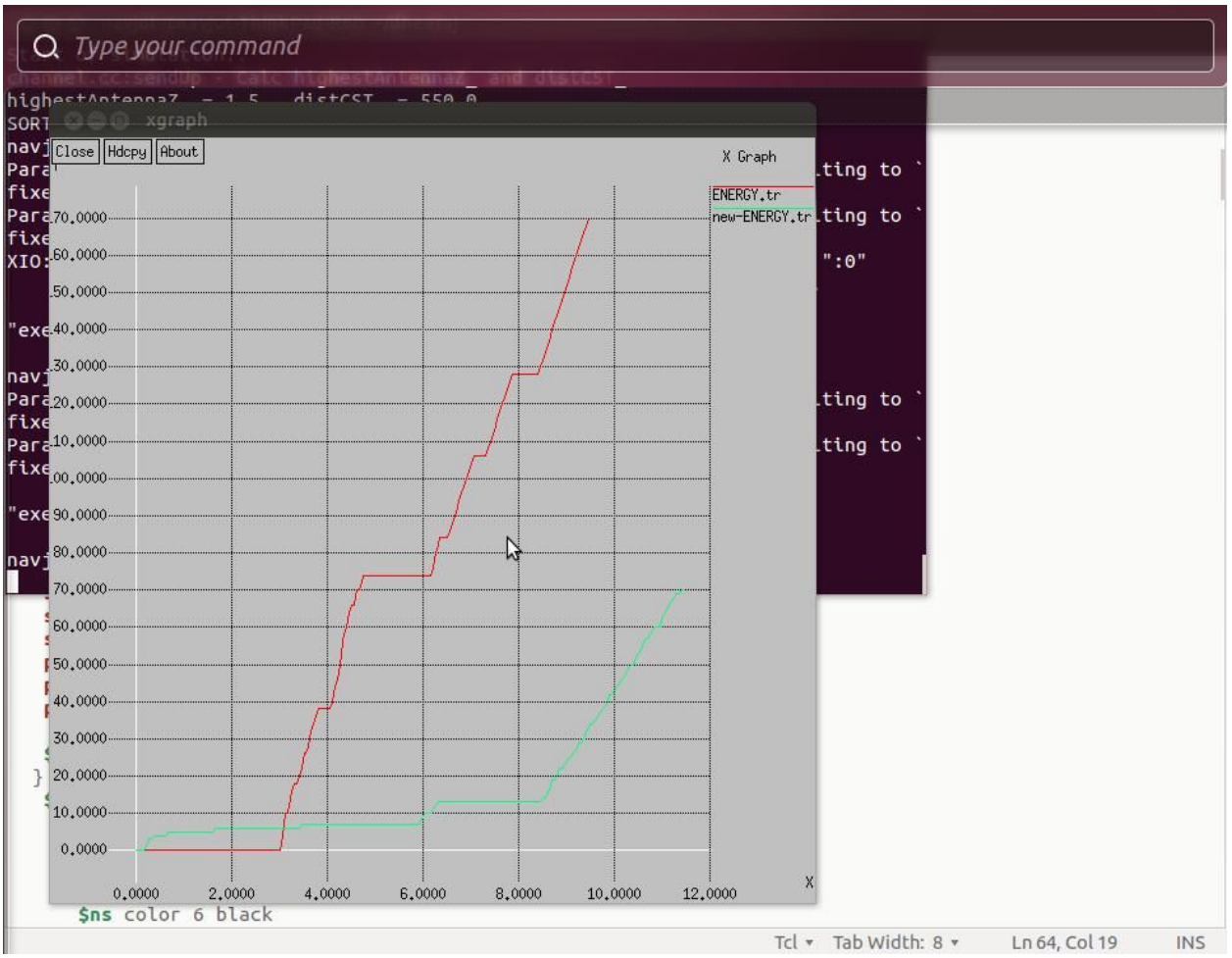


Fig 4.4.3: Energy Graph

As shown in the figure 3, the red lines shows the energy consumption in the multicasting scenario. The green line shows energy consumption of the new scenario. The energy consumption in the new scenario is less as compared to other one .

Chapter 5

Conclusion & Future Scope

5.1 Conclusion

Mobile computing or devices are evolving very fast range with the inventions of new advance wireless networking protocols. Wireless transmission, reception, re-transmission of data and various another operations, all consume some battery. Energy consumption is an important issue in mobile devices because these devices are operates on very limited battery power. To resolve this energy consumption problem between the nodes various multicasting protocols are defined. FTHMRP fault tolerance multicasting routing protocol s a type of protocol used for energy consumption for resolving the fault between nodes. The FTHMRP protocol will recover the link in small amount of time and due to which the chances of fault are reduced in the network. There will some enhancement in FTHMRP using unicasting to establish path between sender to destination. RREQ packet is send between senders to destination through unicasting. So the proposed algorithm will try to remove the problem of packet overhead through unicasting.Unicasting and multicasting are two techniques which are used to forward data from source and destination. In this paper, it is concluded that AODV protocol is much efficient protocol for route establishment. Due the multicasting nature of AODV protocol will reduce throughput of the network. A novel technique has been proposed based upon division of location to enhance the throughput and efficiency of the network. When the network is divided into regions and uni-casting is applied on this , the throughput will increase automatically. The packet loss and energy consumption is also

reduced.

5.2 Future Scope

In proposed methodology the whole network si divided into regions. The source node will communicate with destination using uni-casting approach. In future we will further do some load balancing and also maintain quality of service. In FTHMRP there are three levels of hierarchy,mobile node tier , hyper cube level one ,hyper cube level two. In two levels uni-casting is already done in two hyper-cubic levels. In proposed methodology uni-casting will done in mobile node tier. Multicasting have various issues to resolve.in proposed methodology the problem of throughput,energy consumption, packet loss will reduced.in future will work on load balancing or can maintain quality of service.

Chapter 6

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Chapter 7
Appendix

List of Abbreviations

MANE-Mobile Adhoc Networks

AODV- Adhoc On-Demand Distance Vector Protocol

RREQ- Route Request

RREP-Route Reply

RERR- Route Error

DSDV-Destination Sequence Distance Vector

FTHMRP- Fault Tolerance Hierarchal Multicasting Routing Protocol

EPAR- Efficient Power Aware routing

RIP2- Routing Information Protocol