ABSTRACT

A mobile network ad hoc, or MANET, consists of several wirelessly mobile nodes, which suddenly create a link that is not dependent on any infrastructure or centralized managements. One of a major drawback of MANETs is the consumptions of energy as mobiles node must rely on batteries for power because they lack a stable power source. This shortens the network's lifespan because batteries run out quickly whenever the nodes swiftly travel and relocate within the network. Through the use from the fitness functions approach to improve an energy consumptions within the ad hoc on Demand Multi path Distances Vectors (AOMDV) routings system, the study presented in this paper sheds light on this particular problem of energy use in MANET. FF-AOMDV, or Ad-Hoc On demand multipath Distance Vector with Function of fitness is the name of the suggested protocol. To ensure that minimize energy consumption during multipath routing, the function of fitness is utilized to determines used for determining the best route from a source to the destination. A two utmost widely suggested protocols in this field, AOMDV then ad hoc On Demands Multi path Routing by Life Maximization's (AOMR-LM), were compared with a performance of an propose FF-AOMDV protocols use a Network Simulator version-two(NS-2). By altering a node speeds, packets size, and replication time, Performance measures for consumption of energy, speed, delivery of packets ratio, end-to-end delay, network longevity, and routing-related overhead ratios were used to evaluated the comparisons. The outcomes unequivocally show that, for most of the functionalitys of networks metrics and parameters, the suggested FF-AOMDV outperformed AOMDV in its performance. and AOMR-LM.

CHAPTER 01
INTRODUCTION

1.1 Overview Of Project

An ad-hoc mobile network(MANET) is a grouping among mobile nodes which construct a short term network with no any pre-existing facilities. Since any device within a MANET has the freedom to go in any direction, it will often switch ties with other devices. It could take many hops to reach different nodes because to the nodes' constrained transmitter range. The node mobility causes the network's to fluctuate constantly. Each node in a MANET takes part in routing by forwarding data for other nodes; hence, the network connection determines which nodes send data dynamically. Applications for mobile Ad-hoc network are numerous and beneficial in many circumstances.

Proactive, or table-driven, and reactive, or on-demand, are the two main categories of router protocol that are used in MANETs. Distance on-demand and ad hoc Routings using Vectors (AODV), ad-hoc on demands multi path Distances Vector Routers (AOMDV), and dynamic sources routing (DSR) are a few examples of reactive or on-demand protocols. These methods select a route based only on a minimum-hop measure; energy is not taken into account. DSR is an easy-to-use, on-demand MANET routing mechanism. DSR controls packet forwarding throughout a networks by using source routes.

One crucial aspect regarding mobile ad-hoc network is the effective node-energy consumption. The ad-hoc networks experiences network partitioning and communication failure as the results of a node dying from energy exhaustion. In wireless mobiles ad-hoc connection, energy is limited, therefore It is now essential to create router protocols that account for it. These protocols are intended to reduce an amount of energy that mobile node in the network use in ordered to increase the network's longevity. Consequently, we introduce a unique router protocol that generates reactive and multipath routings, taking into account of current node transmissions power then remaining energy as per energy metrics, in order to maximize networks lifetime then decrease mobile node energy consumption.

Because ties in MANETs are severed when the battery runs out, a mobile node's short battery life has an impact on the network's ability to survive. For this reason, the routers protocols that take into accounts an energy of mobile nodes is necessary to ensure network connection and increase network lifespan. Routing protocols that are power-aware address methods for lowering mobile nodes' battery usage. The fundamental method of this strategy is to route traffic through nodes whose batteries are more fully charged. As per a result's, a network lifetime will lengthen.

1.2 MANET

An array of mobiles node they are able to moves and communicate simultaneously without requiring any type of fixed wiring infrastructure is refers to a MANET (Mobile Ad hoc Network), that is a multihop packet based wireless network. In actuality, MANETs are self-organizing and adaptable networks that are capable of spontaneous formation and deformation without the requirement for centralized management. An acronym for "Mobile Ad Hoc Network" instead An ad-hoc network connction that is capable of dynamically configuring itself and changing locations is called a MANET. Since MANETs are movable, they link to other networks via wireless connections. An alternative connection method, such satellite or cellular service, may be used instead of a regular Wi-Fi network.

1.2.1 MANET Functions

The MANET working group's objectives is to define IP routing protocol capabilities they can be applied to wireless routing applications in both static and dynamic topologies that have higher dynamics because of node motion and other variables. The strategies aim to tackle situations where MANETs, which are positioned at the periphery of an IP infrastructure, are somewhat light in weight and work in a variety of wireless and hardware contexts. It is recommended that MANET functionalities and standards allow hybrid mesh infrastructures, such as a combination of mobile and stationary routers. The Working Group will create two standards tracks for protocol routing specifications by utilizing well-developed elements from earlier research on experimental reactive and proactive protocols.

These include MANET Protocols: Reactive (RMP) and Proactive (PMP) Should there be noticeable similarities between the RMRP and PMRP protocol modules, the Working Group may choose to adopt a converged strategy. IPv6, as well as IPv4, will both be functional. The needs and problems related to security of routing will also be covered. Additionally, a scoped forwarding

protocol that effectively floods data of packet to all participant node within the MANET will be developed by the MANET Working Group. Simplifying a best efforts multicast forwarding function is the main goal of this method. The WG work will be restricted to routing layer design concerns, and the protocol's application is only meant to occur within MANET routing domains.

1.2.2 Features of MANETs:

- Every node functions as both a host and a router within a MANET. In other words, it behaves independently.
- Every MANET node serves as a host and a router simultaneously. In other words, its conduct is independent.
- Multi-hop radio relaying: MANETs are capable of do multi-hop routing when a message's sources and destinations node remain outside of radio range.
- The distributed nature of host setup, routing, and security operations. Here, a centralized firewall is not there.
- Features that are lightweight, low power, and have less memory are characteristics of mobile nodes.

1.3 Project Objective

- The process of translating a user-oriented description of the input into a computer-based system is known as input design. It is imperative that this design prevents mistakes during the data input process and provides management with the appropriate guidance to ensure accurate information is obtained from the computerized system.
- It is accomplished by designing data entry interfaces that are easy to use in order to manage enormous volumes of data. Ensuring error-free data entering is the main goal of input design. The data entry page's architecture makes it feasible to manipulate any type of data. It also provides options to view records.
- It will verify the data's correctness when it is input. Screens can be uses to assist enter data. When necessary, appropriate notifications are sent to prevent the user from being lost in the moment. Therefore, the goal of input design is to produce an intuitive input arrangement.

1.4 Organization of Chapters

We provide an overview of the project and introduce the project concept in Chapter 1. In Chapter 2, we go over the project domain and provide a thorough description of the systems that are currently in place through a reviewing of a literature on the subject. Next, we gave a presentation on the strategies and tactics we had suggested. We also included a list of benefits for utilizing our suggested strategy in our proposal. Next, we provided a tabular depiction of the disparities between the current system and our suggested system, along with the benefits of our suggested system. We conducted a system analysis of the suggested procedures in Chapter 3. Our project's hardware then softwares needs were enumerated in Chapter 4. We introduced the modules and their descriptions in Chapter 5. Following that, we also included the Use-case and Class diagrams for our project. We wrapped up our proposal in Chapter 6, and in Chapter 7, we enumerate the references we used to support our suggested approach.

CHAPTER 02

LITERATURE SURVEY

2.1 LITERATURE REVIEW

- **Using clusters to allocate dispersed tasks based on consensus**

  The Consensus-Based Bundle Algorithm (CBBA) has a new modification shown in this research that we call Cluster-Formed Consensus-Based Bundle Algorithm (CFCBBA). Through issue splitting and parallel cluster processing, CF-CBBA is intended to minimize an amount of communications need to accomplish a distributed job allocation process. It have been demonstrated that when assigning tasks, CF-CBBA requires less communication than baseline CBBA. The speed at which tasks are assigned, the levels of communications required to meet the demands of strategies for distributing tasks like CBBA, and the effectiveness with which a mission—a collection of tasks—is carried out by a team of robots—a collective—are the three main aspects of job distribution that has been researched.

- **Design for implementing the AoDv protocol for routing**

  Until far, the majority of research on Ad-hoc routings protocols has been undertaken primarily through simulation. The challenge of developing a genuine implementation among the strongest arguments for using simulation. An emulator's code is confined in a single, well defined and accessible logical component. However, developing an implementation necessitates using a system with the large numbers of components, many of which have scant or non-existent documentation. The routers protocol is just one of an many components of the system that the implement developers have to be familiar with, along with their intricate relationships. Furthermore, the new sets of features have to be added to enable the routers protocol since Ad-hoc routings methods differ greatly from conventional routing protocols. This article outlines an event trigger necessary for ad-hoc On demand Distances Vectors (AODV) functioning, In addition, design options and choices we made regarding the AODV routing protocol as implemented by our AODV-UCSB.This study aims to help customers identify the implementation architecture that best

suits their requirements and to support academics in creating their own ad hoc, on-demand routing methods.

- **Protocol for optimal link state routing (olsr)**

  We provide and analyse an Protocol for optimal link state routing (olsr) for mobile wireless networks in this study. The proactive (or table-driven) protocol is built upon the link state algorithm. It uses a recurring message exchange to keep track of the network's topology at every node. Owing to its ability to compress message sizes and decrease the number of retransmissions required to flood a network with these messages, OLSR is an improvement over pure link state protocols. To do this, the protocol floods its control messages in an inexpensive and effective manner using the multipoint relaying mechanism. It offers the most efficient routes Regarding the number of hops, which are accessible right away when needed. Big, dense ad hoc networks are the ideal environments for the suggested protocol to be used in.

- **Mobile Ad-hoc protocol's routing performance assessment using simulation within a cluster of unmanned aerials**

  In the setting the group of unmanned aerials vehicle that are autonomous. (UAVs), this research assesses a performance of several ad-hoc routers protocols. It was suggested that there is a strong likelihood that a wireless networks of node having a mean of 5.1774 log n neighbours. Where n is a total number of network nodes—won't split apart. Spatial multiplexing of the wireless channels is leveraged by reducing transmissions range , executing multi-hop routing between nodes, all the while guaranteeing network connection is maintained. In the context of a cluster of uncontrolled aerial vehicles, the suggested procedure is assessed using the OPNET network simulation tool for the Adoring Perimeter Stateless routers , optimizing links States Routing (OLSR), and ad-hoc on demand distances vector (AODV) routing protocols.

2.2 Existing System and Proposed System

2.2.1 Existing System:

- An Energy-entropy Multipath Routing optimization algorithm based on GA (EMRGA) was proposed by Sun et al. for MANET.

- The protocol's main goal was to determine each route's minimal node residual energy while choosing a path based on descending node residual energy.
- It can extend the lifetime and energy variance of the entire network by balancing the battery power consumption of individual nodes.

2.2.2 Disadvantages of Existing System:

- Reduced ratio of packet delivery
- Low-Speed Transmission
- Elevated Final-to-final latency
- Increased energy usage and decreased network lifespan.

2.2.3 Proposed System:

- We suggested a novel multipath routing system that combines an AOMDV protocols with Function for fitness, which we named the FF-AOMDV routing protocol.
- Typically, when a source node broadcasts an RREQ, many routes to the destination will be discovered. packets of data are sent via these routes without the quality of the routes.
- The route selection will change greatly when the suggested method is used to the same case. The sources nodes uses three different sorts of information when it broadcasts and receives an RREQ To ascertain the quickest, most efficient routing path while consuming the least amount of energy.

2.2.4 PROPOSED SYSTEM ADVANTAGES:

- High ratio of packet delivery.
- A higher throughput.
- Minimal latency between ends.
- Decreased energy use and extended network longevity.

2.3 FEASIBILITY STUDY

In the stages entails analysing the project's viability and presenting an proposal for a business that comprises a very basic project strategy and some total estimates. The proposed system's viability must be investigated during system analysis. This is to variety sure an business won't be burdened

in a suggested method. A basic grasp of an systems primary needs is necessary for feasibility study. The subsequent trio of elements are essential to the feasibility analysis:

- **Financial Impactivity**

  The purpose of the researches is to evaluate the system's potential financial impacts on a company. The corporation has a certain amount of money to dedicate to system research's then development. The costs have to make sense. Because a majority of the technologies utilized were publicly accessible, the designed system was also possible to be implemented within the allocated budget. All that needs to remain bought were the personalized goods.

- **Technical Achievement**

  The purpose of a researches is to evaluate the system's technical needs, or its technical feasibility. Any systems that are creates must not place a heavy burden on the technological resource have available. High demands will result for the technology resource which are therefore available. Consequently, the customer will face strict requirements. Since deploying the designed system would only need minimum or null changes, it must have modest requirements.

- **Availability in Social Science**

  Evaluating the degree of user acceptability of the system is one of the study's objectives. This involves teaching the user how to operate the technology effectively. The system must be accepted by the user as a requirement rather than as a danger. The techniques used to familiarize and educate the user about the system will determine the extent of adoption by the users. Since he is the system's last user, his confidence must be increased in order for him to offer some helpful critique, which is greatly appreciated.

2.4 Hardware and Software Requirements

Hardware Specification

- Processor - Pentium –III
- Speed - 1.1 Ghz
- RAM - 256 MB(min)
- Hard Disk - 20 GB

- Floppy Drive - 1.44 MB
- Key Board - Standard Windows Keyboard
- Mouse - Two or Three Button Mouse
- Monitor - SVGA

Software specification

- Operating system : LINUX
- Tool : Network Simulator-2
- Front End : OTCL (Object Oriented Tool Command Language)

CHAPTER 3

SYSTEM DESIGN

3.1 System Perspective

Every node in a MANET serves as both a host and a router. Stated differently, its actions are independent. Multi-hop radio relaying: MANETs can employ multi-hop routing, distributed host configuration, routing, and security when a message's source and destination are outside of radio range. There is no centralized firewall on this system.

3.2 System Architecture

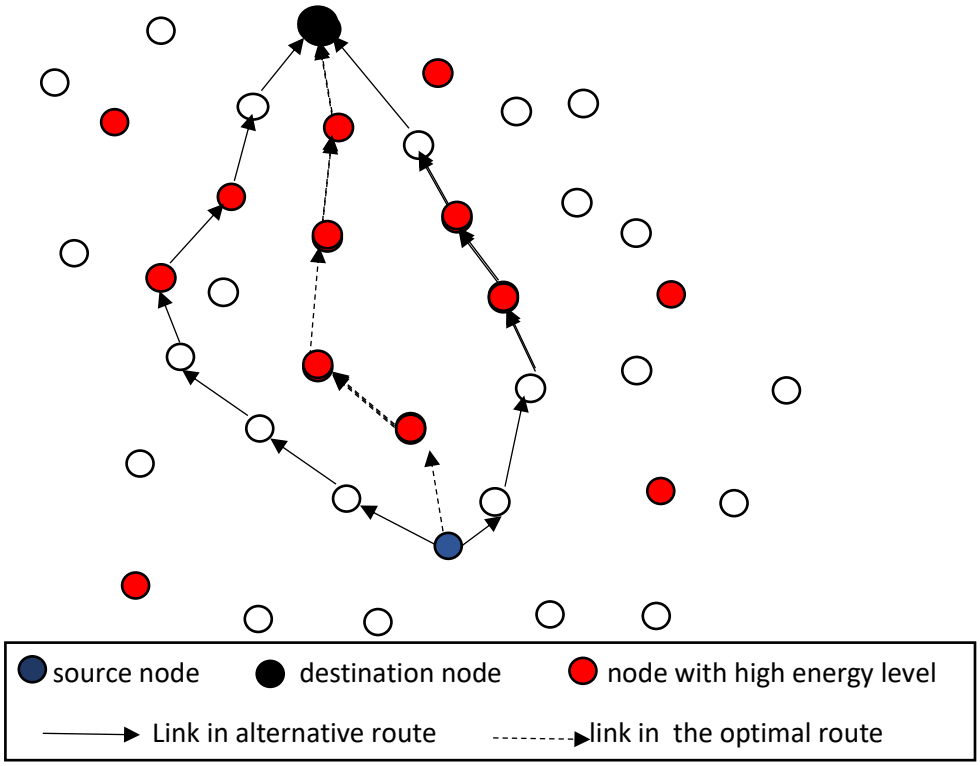

Fig.4.2 System Architecture

In this system design, the bottom right blue-filled circles represents the source nodes, while the top black-filled circle represents the destination nodes, where data transmission ends. Since high energy's nodes are more like to be selected in an effort to prolong the network's lifespan, they are essential to its efficacy. Red-filled circles are use to depict these nodes. White circles represent additional networks nodes that are involved in data transit.

CHAPTER 4
DETAILED DESIGN

5.1 Data Flow Diagram

- The bubble chart is another name for the DFD. A system may be represented using this straightforward graphical formalism regarding the input data it receives, the different operations it performs on that data, and the output data it generates.
- One of the most important modeling tools is the DFD diagram. The components of an systems are modeled use it. Those elements consist of an system procedure, an data it use, an outside party that communicates within it, then a information flows insideit.
- DFD illustrates the flow of information through the system and the many changes that alter it. This method using visuals to demonstrate that informations flows and the changes made to data as it goes from input to output.
- Another name for DFD is a bubble chart. Any degree of abstraction may be utilized to portray a system using a DFD. DFD can be segmented into stages that matched scalating functional detail and information flow

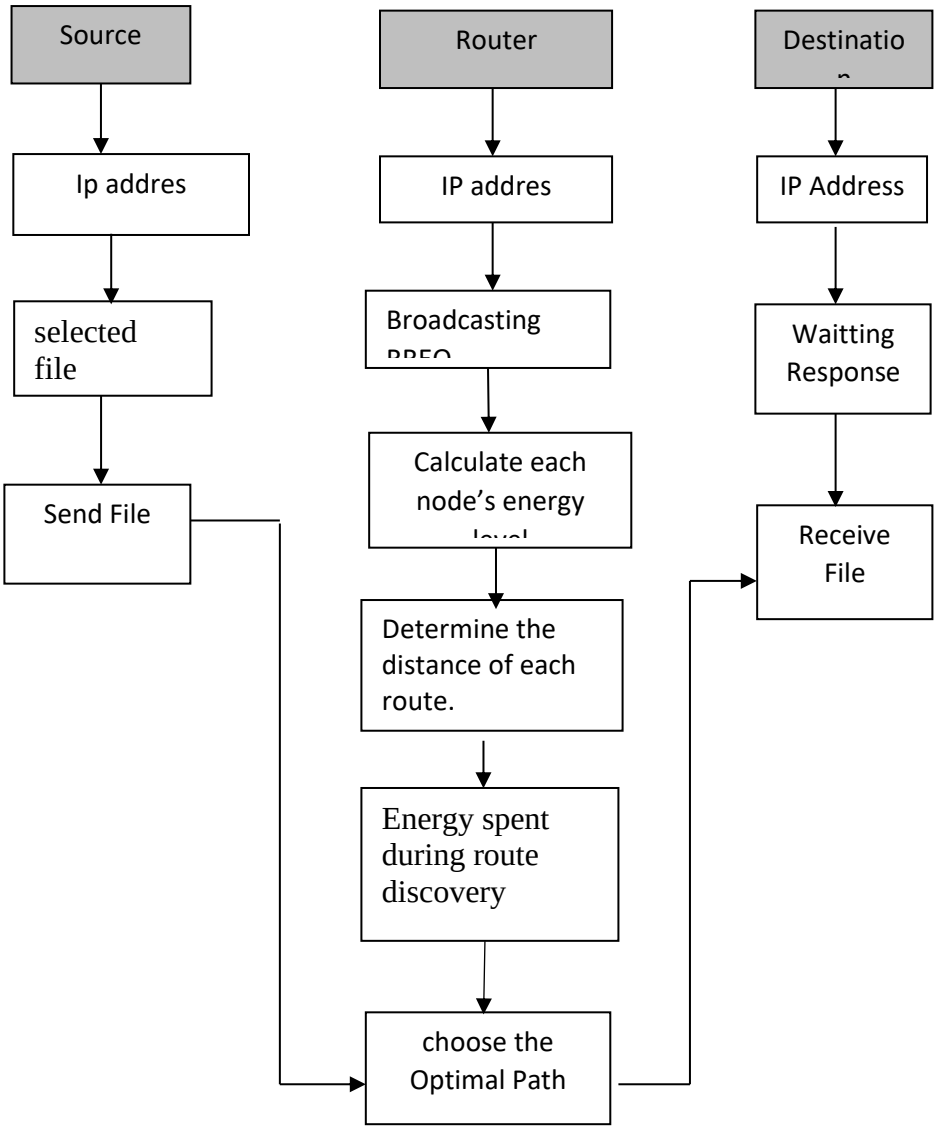

Fig 5.1 : Dataflow Diagram

5.2 Usecase Diagram

Considering the UML , the uses of case diagrams is a particular sort of conduct diagrams that remains produced from and described by a research of use cases. Providing an graphic representation is its goal. summary of a functionality's that a system offers Regarding the actors, use cases (representations of their goals), then any interdependencies within those scenarios. A

use-case diagram's primary goal is to display which actors receive which system functionalities. It is possible to demonstrate the roles of the system's actors.

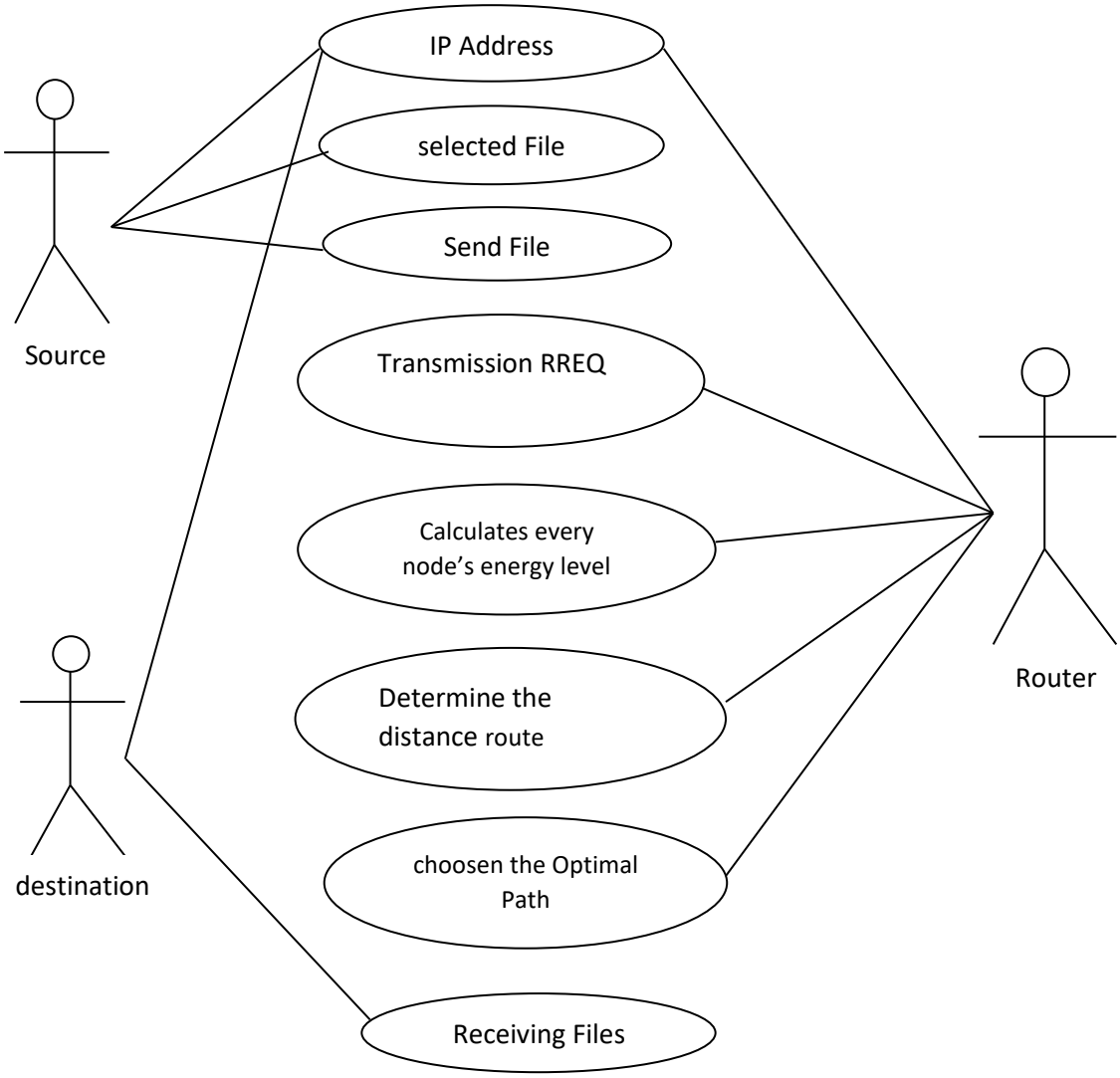

Fig 5.2 : UseCase Diagram

5.3 Class Diagram

A class diagram, as used in software engineering, is a sort of static structural diagram in an uml that illustrates a system's classifications, characteristics, functions, and relationships among the classes. It indicates which class has the data.

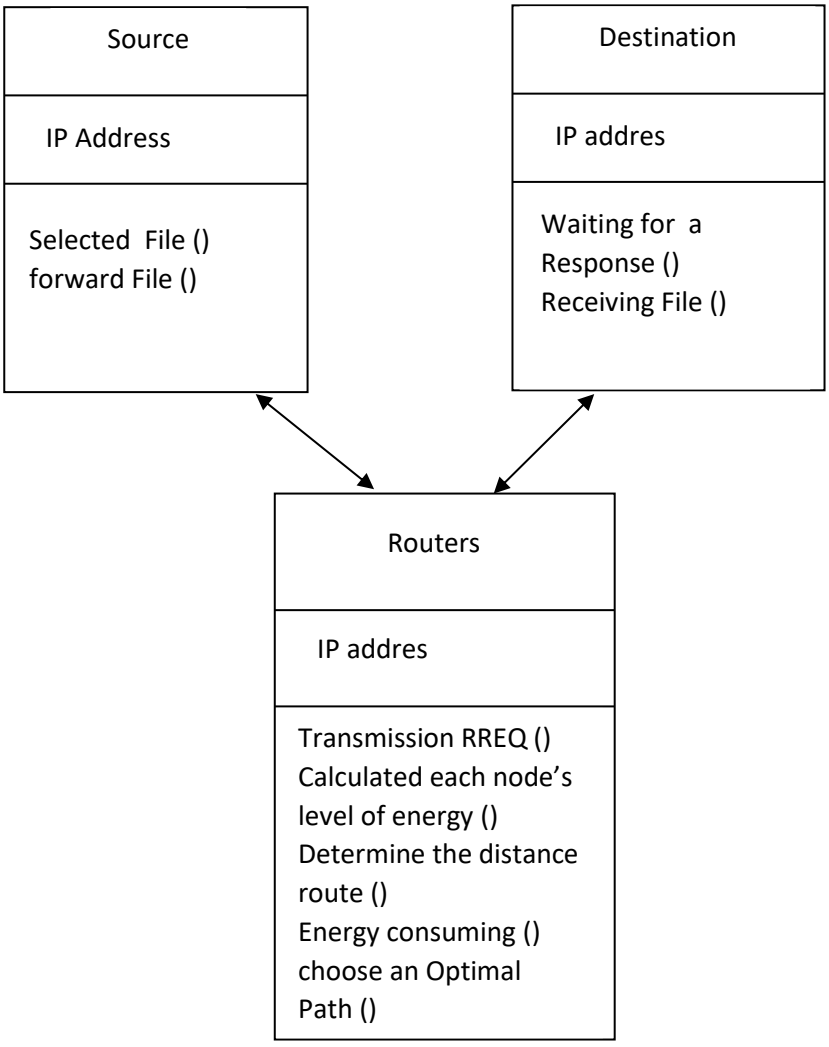

Fig 5.3 : Class Diagram

5.4 Sequence Diagram

In UML, one kind of interaction diagram that is put to use is the sequence diagram. illustrates relationships then sequence in which processes operate beside one another. This structure is a Messages Sequencing Charts. Additionally, diagrams of sequences are timing diagrams, event diagrams, and event scenarios.

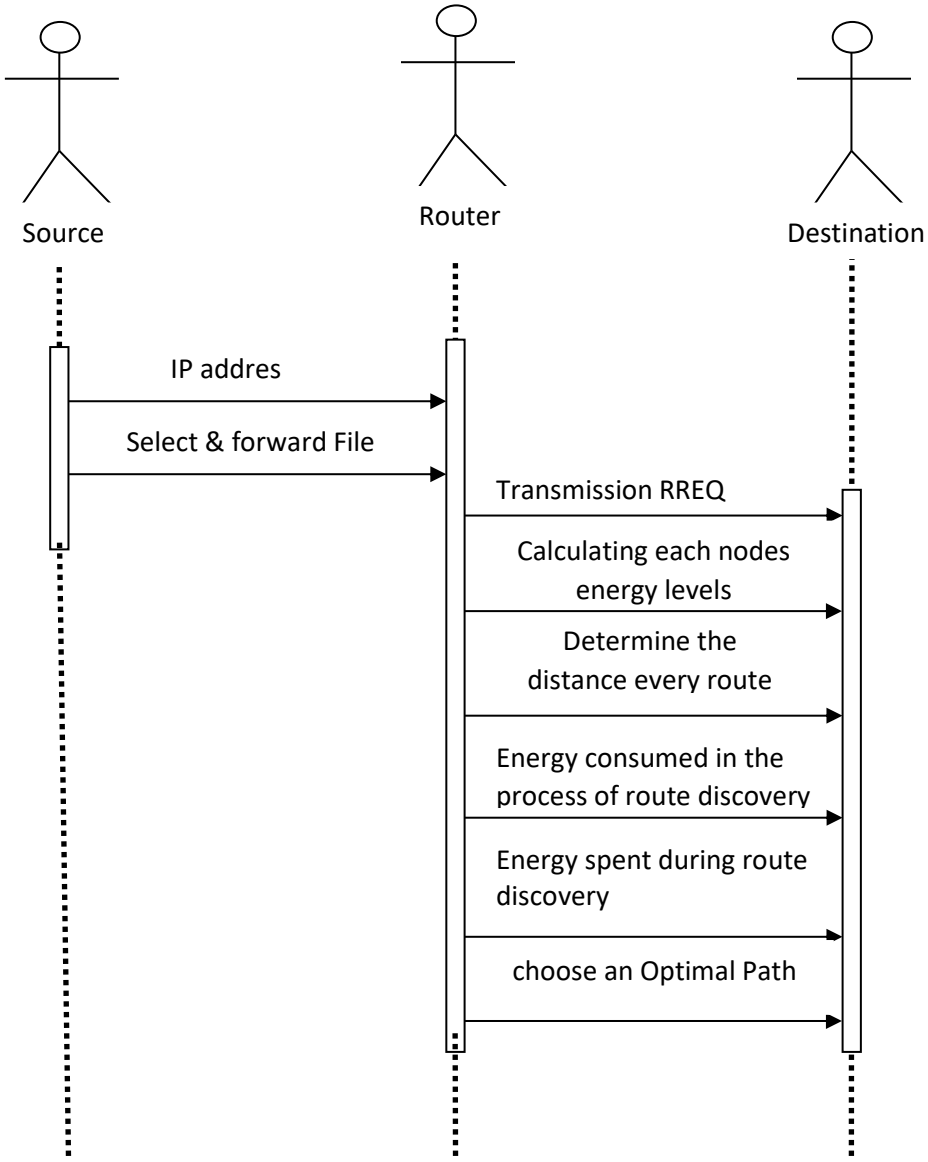

Fig5.4 : Sequence Diagram

5.5 Activity Diagram

Workflows comprising sequential activity and action with provision for choice, iteration, and concurrency are represented graphically using activity diagrams. Activity Using diagrams in a UML allows you to explain the step-by-step operational and business processes among the parts of the system. An activity diagram displays the total control flow.

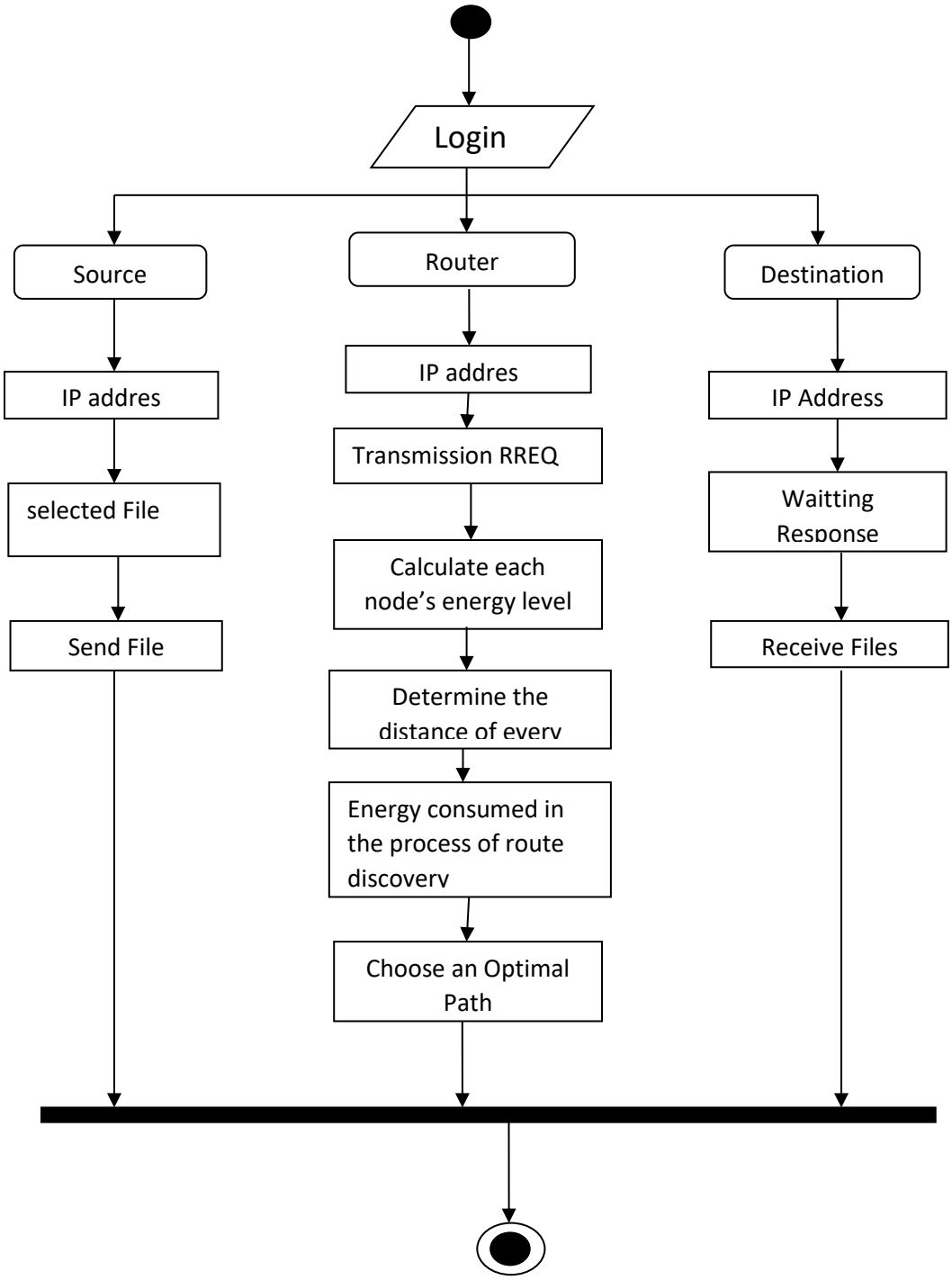

Fig 5.5: Activity Diagram

CHAPTER 5

MODULE DESCRIPTION

5.1 Modules

- ✓ Simulation Model
- ✓ Fitness Function
- ✓ FF-AOMDV

5.2 Module Descriptions

➢ Simulation Model:

The network architecture may fluctuate arbitrarily since the nodes' movement and distribution are unpredictable in this simulation model, which uses the Constant Bit Rate (CBR) as a traffic source with 36 mobile nodes dispersed randomly inside a 1500 m* 1500 m networked region. Each node's starting energy level was set to 100 joules, and the nodes' transmission distance was set at 250 m. Three distinct situations were selected in order to assess their impact on the suggested FF-AOMDV protocol's performance. In the first scenario, we changed the packet size to 64, 128, 256, 512, and 1024 bytes while maintaining a fixed node speed of 2.5 meters per second and a simulation time of 50 seconds. For every run and every simulated protocol, the other network settings remain the same. In the subsequent instance, we adjusted the node speed to range from 0 to 2.5, 5, 7.5, and 10 seconds while maintaining a constant packet size and simulation duration of 256 bytes and 50 seconds, respectively. Lastly, we adjusted the simulation period in the third scenario (10, 20, 30, 40, and 50 seconds) while maintaining a fixed node speed and packet size of 2.5 meters per second and 256 bytes, respectively.

➢ Fitness Function:

Numerous optimization techniques, including the algorithm of genetic, being colony algorithms, firefly algorithm, and particle swarm optimization algorithm, include the fitness function as an optimization strategy. Depending on a goal of the study, the function of fitness determines which element in the optimization process is most crucial. There may be several factors in this process. The fitness factor for a MANET is typically bandwidth, latency, energy, and distance. This is consistent with the goals of any routing protocol

design, which are to optimize network resources. The Particles Swarm optimizations (PSO) method includes the function of fitness they are employs of the studies. It was used to wireless sensor networks to maximize the backup plan in an event that is main route malfunctioned. The subsequent components have a impacts on selecting the best route:

- ✓ The functions of each node's leftover energy
- ✓ The connections' distance functions that link the nearby nodes
- ✓ The nodes' energy usage
- ✓ Delays in nodes' communication

➢ FF-AOMDV

When a source node broadcasts an RREQ, it often finds many routes to the destination. packets of data are sent through these routes without the quality of the routes being known. The route selection will change greatly when the suggested method is uses to a same cases. For the purpose of ascertaining the quickest and most efficient route way having a small quantity of energy consumption, the source node will have access to three different sorts of information when an RREQ is broadcast and received. This data consists of:

- ✓ Details on the energy level of each node in the network
- ✓ length of each route
- ✓ The quantity of energy used throughout the route finding procedure.

The route with the lowest energy consumption may be (a) the shortest distance; (b) the route with the greatest energy level; or (c) a combination of the two. Subsequently, the source node will determine its energy usage and send the data packets over the route with the greatest energy level. Similar to previous multipath routing protocols, this one will furthermore start a fresh route discovery procedure in an events they none of the routes reach the target. A source nodes will choose a different path from the one it is taking database, that is the least complicated route and the quickest path energy consumption, in the case that the chosen route fails. Energy will be used less on best path, which has a shorter distance to the goal.

CHAPTER 6

IMPLIMENTATION ENVIRONMENT

In this project, the simulation tool is called Network Simulator 2. NS was selected as the simulator in part because to its feature set and in part because its open-source code permits future development and customization. Version ns-2.1b9a is a most recent version of NS, while version ns-2.1b10 is presently under development.

6.1 Network Simulation (NS):

For networking research, the object-oriented, discrete event simulator known as Network Simulator (NS) is used. TCP, routing, and multicast protocol emulation over wired and wireless networks is significantly supported by NS. The simulator is the product of continuous study and development. NS is still in the early phases of development and includes the lots of defects they should be fixed, despite the widespread faith in it.

The OTcl1 interpreter serves as an interface for commands and configuration for NS, which is developed in C++. The thorough protocol execution is done by the slower-to-change but faster-to-run C++ portion. The OTcl portion, nevertheless,, is used for simulation configuration; it operates considerably more slowly yet allows for rapid changes. This split-language program method has the benefit of enabling the quick development of huge scenarios. It's enough to know OTcl to only utilize the simulator. However, one drawback is that coding in both languages as well as debugging are necessary for expanding and changing the simulator.

The following can be simulated using NS:

- **Topology:** wireless and wired
- **Algorithms for Scheduling:** RED, Drop Tail
- **Protocols:** TCP and UDP transport protocols
- **Routing:** Both dynamic and static
- **Application:** Traffic generators, HTTP, Telnet, FTP

6.2 Ns-2 User's Point Of View

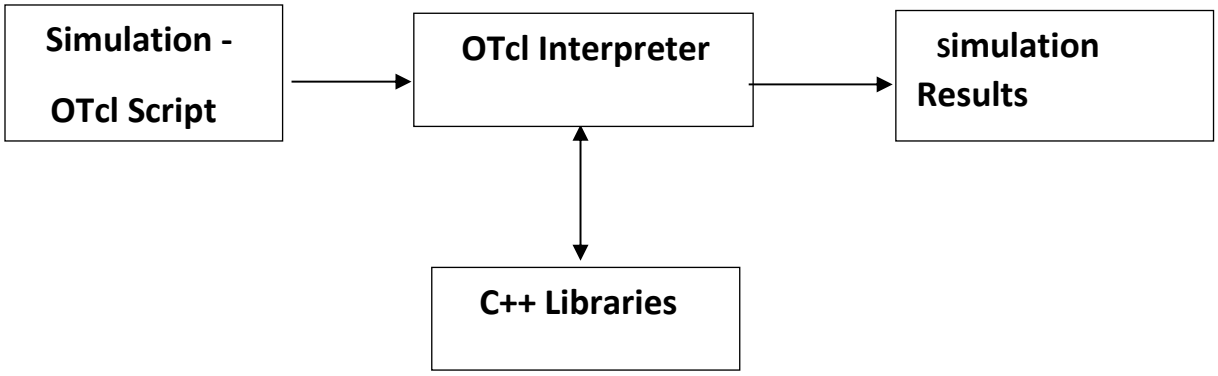

Fig 8.2: Block diagram of Architecture of NS-2

6.3 Tcl Class

The ways to access and interact with the code interpreter are provided by the class Tcl, which also contains the actual instance of the OTcl interpreter. The following operations have methods available in the class:

- obtain a reference to the Tel instance.
- Use the interpreter to invoke OTCL routines.
- Get the finding and provide them to the interpreter.
- Report incorrect condition and depart consistently
- Get the interpreter's immediate attention

6.4 comprehensive Algorithm

We suggested a brand-new multipath routing protocol known as the FF-AOMDV routing protocol, which combines the AOMDV protocol with the Fitness Function. When a source node broadcasts an RREQ, it often finds many routes to the destination. Next, packets of data are transmit across these routes without the quality of the routes being known. The route selection will be completely different when the suggested method is used the identical case. To ascertain the quickest and most efficient route way with the least amount of energy consumption, the source node will have access to three different sorts of information when an RREQ is broadcast and received. These details consist of:

- Details on the energy level of each node in networks.
- The lengths of each route.

- The quantity of energy used during a route finding procedure.

The route with the lowest energy consumption may be (a) the shortest distance; (b) the route with the greatest energy level; or (c) a mix of the two. The source node will subsequently decide the amount energy it has used through delivering the data packets along the route with the highest energy level. In contrast to previous multipath routing protocols, this one will furthermore start a fresh route finding process in the event that none of the existing routes reach the target. A source nodes will Select a different route using its routing database, that is the quickest route with the least amount of energy consumption, in the case that the chosen route fails. The best path, which may be determined as follows, determination use less energy because it is shorter to the goal.

$$\text{OptimumRoutes1} = \frac{\sum V(n_i) \in rENE(V(n_i))}{\sum V \in vENE(V)} \quad (1)$$

The vertices (nodes) in the ideal path are represented by the variable v in this formula. All of the network's vertices are represented by r and V. It selects the route with the highest energy level by comparing all of the routes' energy levels. We will compute the alternate route based on its length. The route with the fewest hops is kept up to date by the AOMDV. The routing table of FF-AOMDV retains information about the route with the least distance after choosing the route with the greatest energy level. The following formula is applied to ascertain the shortest route:

$$\text{OptimumRoutes2} = \frac{\sum e_i (n_i) \in rDIST(e_i(n_i))}{\sum e_i \in E} \quad (2)$$

where ei indicate for the links or edges in the best path. All of a network's edges are represented by r and E. It evaluates and contrasts the connection distances in the optimal route with all of the network's links.

The fitness function's pseudo-code may be found below:

- **Algorithm**

1: Decide on the sources and destinations Location.

2: Start the routes discovery.

3: Disseminate the Routing Packets to a designated node.

4: Modify the Source Routing Table's routing data.

5: Source Start the Beacon.

6: Disseminate the Routing Packet to the designated nodes.

7: Update each node's energy and location data for the whole network in the Source Energy Table.

8: Verify

If(ENE>= high && Dist <= low && Hop count<= low) ……(eq 1 & 2)

Decided the route of communication.

Else if (ENE >= high && Dist >= high && Hop count<= low)……..(eq 1)

Decided the route of communication.

Else if (ENE >= low && Dist >= low && Hop count<= low t_1)……..(eq 1)

Decided the route of communication.

9: Forward the recurring route finding.

10: Send the recurring beacon message.

The FF-AOMDV protocol is executed through simulations. An OTcl script was constructed for this simulation to specify the topology and network characteristics, including a number of nodes, traffic source, queue size, node speed, and routing protocols utilized, among many other details. When the simulation runs, two files are created: a network animator (NAM) to display the simulation and a trace file for processing. A graphical simulation display tool is called NAM. Figure 3 illustrates the FF-AOMDV route selection process depending on particular parameters in order for you to comprehend how the fitness function functions with the AOMDV routing protocol.

6.5 Snapshots

Fig 6.5.1: Desktop of Ubuntu

In the figure showing that ns 2.35 working on Ubuntu operating system and it is the setup of the desktop view of Ubuntu and some apps of Ubuntu

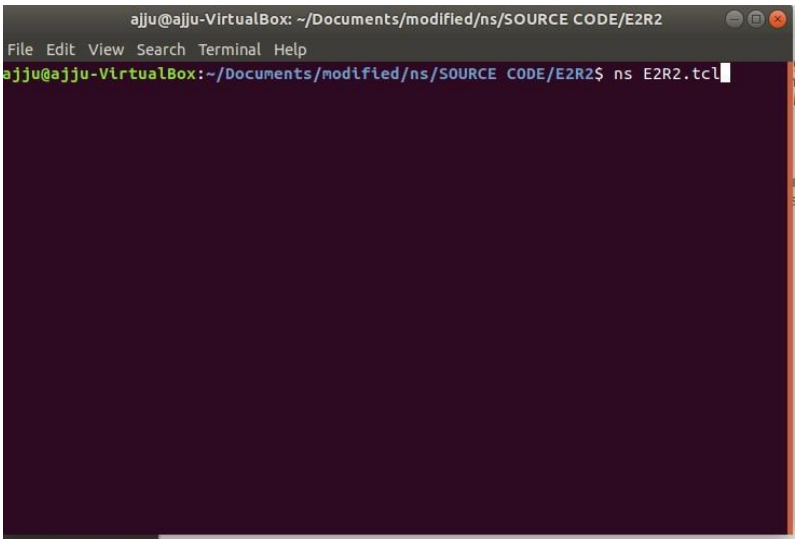

Fig 6.5.2 Terminal

In this terminal we have to run the program of tcl scrpits where ns2 and nam file are already installed in it ns is the command put the file name and run the program

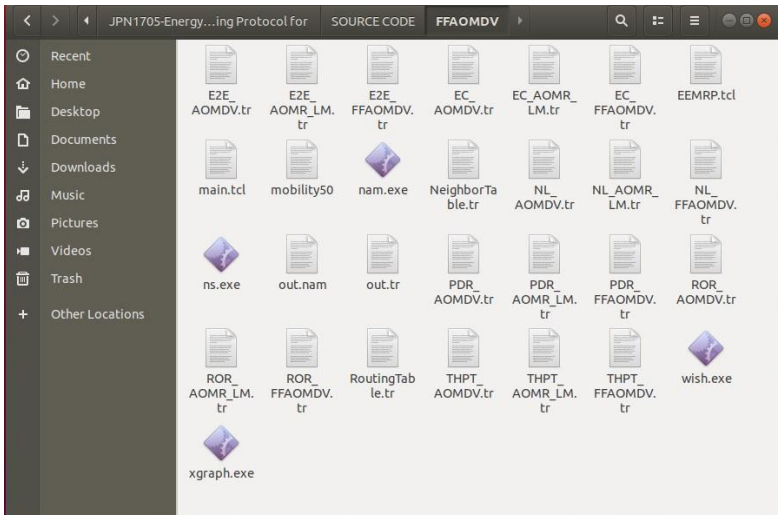

Fig 6.5.3 Folder of the project

In this where project file and contain code and graph values in it we must known the location of the folder to run the program

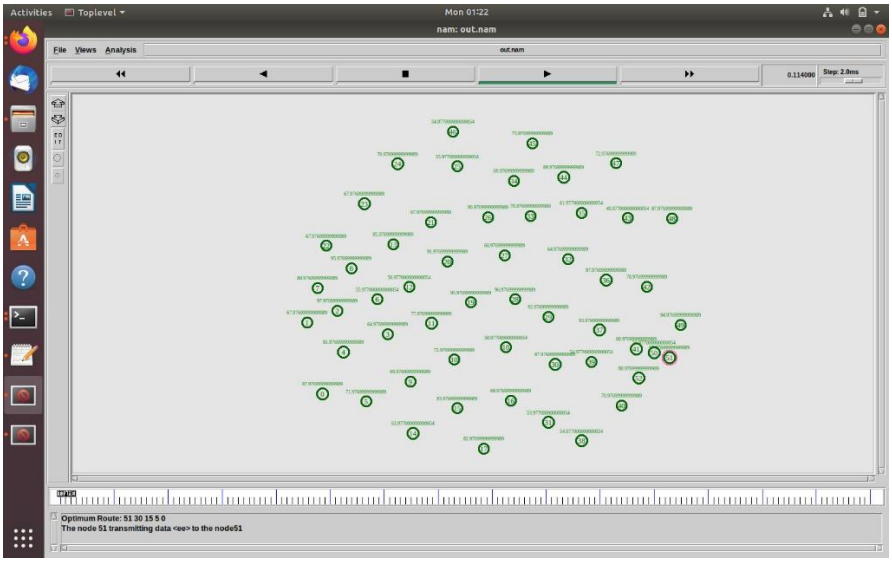

Fig 6.5.4 nodes

Here in the projects I have been taken 53 numbers of nodes with 0 was a base station in it 60 nodes are different heads

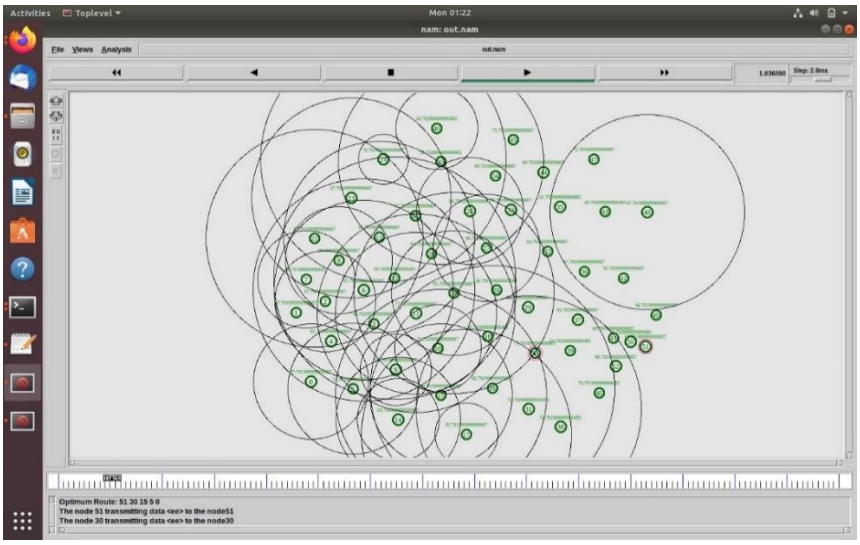

Fig 6.5.5 Networks passes through node

In this images showing that the network that passing through the all 60 nodes and network will pass through all 53 nodes one by one.

Fig 6.5.6 : Packet loss

In this image showing no of packet loss where the data transmit since source to destination it lose of some of a packets then the energy will be lose.

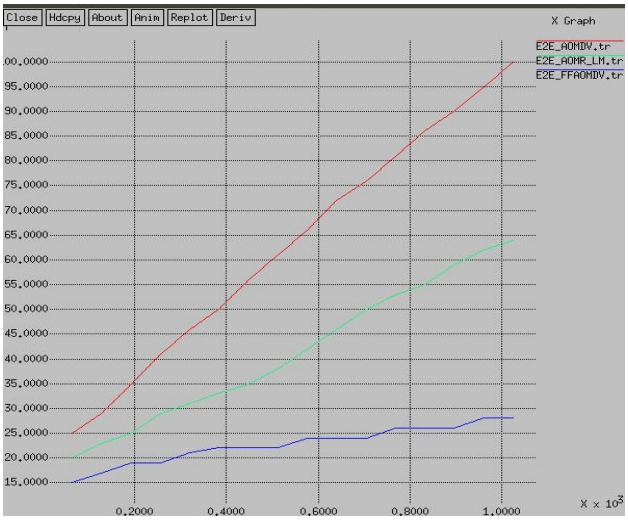

Fig 6.5.7: E2E Delay

E2E Delay :The average duration of time that passes between the packets being generated at the source nodes then it being successfully delivered to the destination node is known as the end-to-end latency.

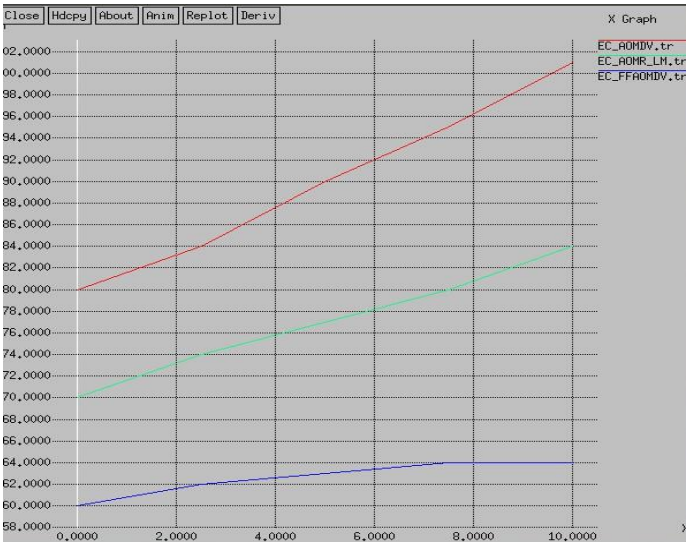

Fig 6.5.8: Energy Consumption

Energy consumption: This is the sum of all the energy used in the network for communication during a given amount of time and in relation to a given data rate. If N is the entire no of nodes in the system and E is the total energy used for communication, then the suggested FF-AOMDV data rate is more efficient than the current protocol. The values are displayed in and the graph plot is displayed. It is the mean amount of energy used by every node in the network.

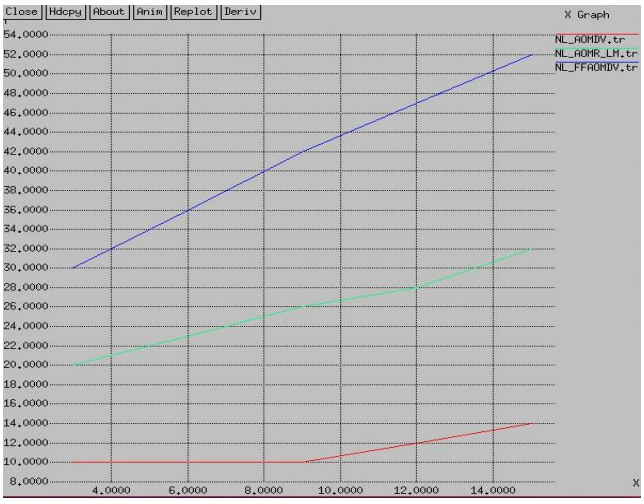

Fig 6.5.9: Network Life Time

Lifetime: An amount of time that have passed since the network's creation (during the simulation) FF-AOMDV, AOMR-LM, and AOMDV's variance in exhausted nodes is displayed. The node speed rises as it approaches (0, 2.5, 5, 7.5, 10) m/s.

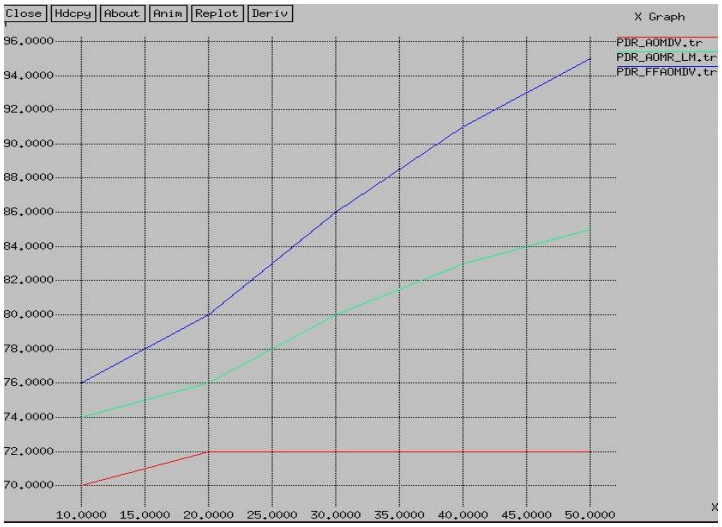

Fig 6.5.10: Delivery Packets Ratio

Delivery Packet Ratio: The Variations in the delivery packets ratio for FF-AOMDV, AOMR-LM, and AOMDV is displayed. As the size of the packet rises to 64, 128, 256, 512, 1024) bytes, they are decline in a p delivered the packet ratio. AOMDV drops from 89.56% to 70.67%, the AOMR-LM drops from 93.12% to 79.9%, and the FF-AOMDV drops from 95.45% to 81.06%. In terms of delivered packets ratio, FF-AOMDV performed better than the two AOMR-LM and AOMDV routing protocols because it chooses less-distant and more dependable routes to reduce packet loss.

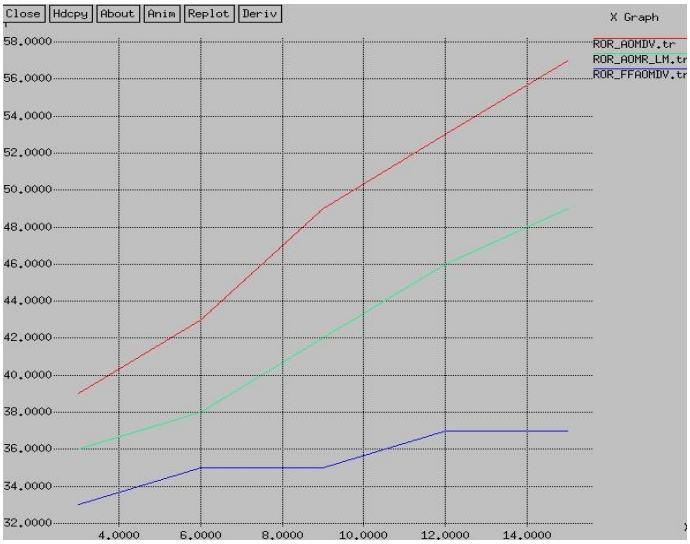

Fig 6.5.12: Ratio of Routing overhead

Ratio of Routing overhead :The difference in the routers overheads ratio between FF-AOMDV, AOMR-LM, and AOMDV. The node speed rises as it approaches (0, 2.5, 5, 7.5, 10) m/s. Additionally, the routing overhead ratio rises.

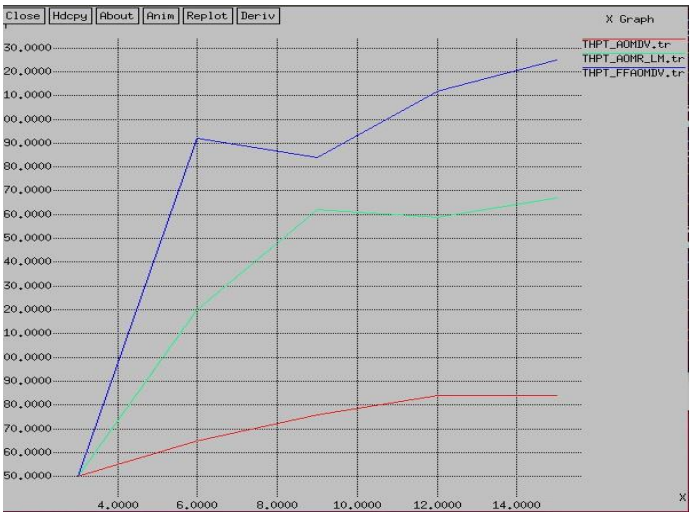

Fig 6.5.13: Throughput

Throughput :The outcomes of the simulations clearly show how much throughput there is for FFAOMDV, AOMR-LM, and AOMDV varies. As the node the throughput of these speeds grows protocols varies. The performance of FFAOMDV drops from 1133.08 Kbps to 965.94 Kbps, AOMR-LM reduces from 1129.68 Kbps to 923.41 Kbps, and AOMDV decreases from 1130.64 Kbps to 721.31 Kbps when the speed of the mobile nodes rises as (0, 2.5, 5, 7.5, 10) m/s.

CHAPTER 7

SYSTEM TESTING

The goals for testing is to finds mistakes. The goals for testing is to finding every potential flaw or vulnerability in the working product. It offers a means of testing function of individuals parts, subassembly, assemblies, and final products. Software testing is the process of an ensuring that the product meets user expectations and needs and doesn't malfunction in the way there is undesirable. Different test kinds exist. Every test type responds to a certain testing need.

7.1 Types of Tests

➢ Unit Test

The procedure of designing in the unit tests, test cases make certain that the the core logic of the program is operates properly and they program inputs result in legitimate outputs. Validation should be done on all internal code flows and decision branches. This testing of the application's separate software components. Prior to integration, it is completed following the conclusion for a single unit. This invasive structural examination is dependent upon an understanding of its structures. Unit tests evaluate a particular application, system configuration, or business process at the level of components.

- **Test strategy and approach**

  Functional assessments will be meticulously prepared, and testing in the field will be carried out by hand.

- **Test objectives**
  - ✓ Every field entry needs to function correctly.
  - ✓ You have to click the designated link to initiate each page.
  - ✓ There have to be no delays in the entering screens, texts, or answers.

➢ Integration Testing

The aim of integration tests intend to evaluate integrated software components to see if they function as a single unit. Testing is event-driven then focus mostly based on the essential outcomes of fields or screens. Integration tests verify that even though unit testing successfully shown that every element was satisfied alone, the assembly of parts is accurate then consistent. Integration testing is done to find any problems that can arise from merging several components.

- **Functional Test**

  Functional tests provide meticulous evidence that the functionalities under evaluation are accessible in compliance with user manuals, system documentation, and business and technical requirements.

  Focusing on requirements, important Whether they are distinct test cases or functionality, functional tests are organized and prepared. Furthermore, testing needs to consider certain techniques, data fields, sequential processes, and systematic coverage related to identifying business process flows.

- **System testing**

  Testing with the system confirms that every prerequisite is satisfied by the unified software platform as a whole. It puts a setup to the test to be able to guarantee dependable outcomes. The configuration-oriented an example of this is the system integration test. a system examination. System evaluation emphasizes pre-driven process connections key places of integration and is grounded in procedure flows and descriptions

- **Black-Box Testing**

  Software testing "black box" means doing it lacking any idea of the inner works, the testing module's architecture, or language. similar as black box tests, which comprise most other test types also needs to be developed from an official original text, such the set of guidelines or specifications document. The testing methodology employed here regards the software under examination as a "black box." It is impossible to "see" inside. Not considering the operation within the program, the test generates as well as responds to outputs.

- **White-Box Testing**

  An illustration of white box testing is a kind of software testing in which the tester is privy to the program's internal mechanisms, composition, and language—or at the very least, what the purpose of it is. It possesses a purpose. It's employed to evaluate areas that are difficult to reach from a black box's level.

- **Acceptance testing**

  Users' Acceptance of Any project's testing phase is crucial, and it involves an abundance of end user input Additionally, it ensures that the system meets the functional specifications.

- **Test Result:** Every test scenario that was previously describe was successful. No flaws were found.

7.2 TEST CASES

SL.NO	TEST CASES	EXPECTED OUTPUT	RESULTS
01	Ubuntu 18.04 operating system installation	Installed successfully	PASS
02	NS2 2.3.5 simulator installation	Installed successfully	PASS
03	nam file installation	Installed successfully	PASS
04	xgraph file installation	Installed successfully	PASS
05	Write code in text editor	Written successfully	PASS
06	open terminal to run the code	Running successfully	PASS
07	Open nam window for animated output	Open successfully	PASS
08	Open xgraph window for plotting output	Open successfully	PASS

CHAPTER 8

CONCLOUSION AND FUTURE ENHANCEMENT

8.1 Conclusion

In this study, we presented a novel energy-efficient multipath routing algorithm, namely FF-AOMDV, and simulated it using NS-2 in three distinct scenarios with variable simulation times, size of packets, then node speeds. Five (5) performance indicators (delivery ratio of packets, Throughput's , End-to-end latency, consumption of energy, and Network lifespan) were we used to assess these scenarios. The suggested FF-AOMDV algorithm outperformed both AOMR-LM and AOMDV in terms of performance, delivery ratio of packets , and end-to-end latency, based on the simulation findings. Additionally, it outperformed in terms of AOMDV of longer network lifetime and greater energy conservation.

8.2 Future Enhancement

This study might been uses in the number of scenarios for future work to improve network lifetime and usage of energy. For example, bandwidth is another resource of networks that may remain taken into accounts as an additional fitness value. In they instance, when selecting, consideration will be given to energy, distance, and bandwidth. routes to the target. In essence, this shall consider a variety of network resources, extending the lifetime of an networks and improving QoS. Testing a function of fitness using a different multipath routers protocol with a mechanism other than AOMDV and comparing the outcomes with the suggested FF-AOMDV is an additional option.

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APPENDIX

USER MANUAL

- Open Virtual Machine and Ubuntu software
- Open the documents where is the source code saved
- Open terminal to run source code
- Put commands with .tcl extension
- Graphs files are saved in the .tr file
- Enter the sensor id to send query

OUTPUT

- Open nam file for animated output
- Open xgraph for plotting output