IMPLEMENT AND EVALUATE MUTUALEXCLUSION ALGORITHM FOR MOBILEADHOC NETWORK

Mamatha T
Research Scholar at
Department of Computer Science & Engg.
Sachdeva Engg. College for Girls,
Gharuan
.
.

Er.Prabhjeet Kaur
Assistant Professor
Department of Computer Science & Engg.
Sachdeva Engg. College for Girls,
Gharuan

Abstract

This work presents an overview of the Distributed Mutual Exclusion algorithm and various enhanced variations done on Distributed Mutual Exclusion (DME).
In DME, permission-based algorithm is used for discovering clusters of the nodes. The initial point selection effects on the results of the algorithm, both in the number of clusters found and their cluster headers. Methods to enhance the permission-based clustering algorithm are discussed. With the help of these methods, increase the concurrency between the nodes, decrease the synchronization delay and decrease response time. Some enhanced variations improve the efficiency and accuracy of algorithm. Basically in all the methods the main aim is to increase the life of each node in the network or increase the battery power which will decrease the computational time. Various enhancements done on DME are collected, so by using these enhancements, one can build a new hybrid algorithm which will be more efficient, accurate and less time consuming than the previous work.

IndexTerms - MANET, Adhoc Network, Mutual Exclusion, Mobile Distributed File System, ClusterNodes

1. INTRODUCTION TO MANET

1.1 Features of MANET

- Partitioned operations: MANET has large number nodes and they co-operate with each other by relying on each other.
- Autonomous terminal: In MANET every node acts as an independent terminal and performs its task as a host or a router. So, the end points and the switches are nt detected properly.
- Multi hop routing: MANET has the ability to transfer data from one end to another that is from one source to another desired location with the help of wireless transmission range. It is very important to forward the data packets from one to another through linked nodes.
- Dynamic network topology: The mobiles nodes are used create path between the other nodes as the nodes are moving forward and creating [1] their own path.
- Fluctuating link capacity: MANET shares its one path of communication with many sessions. This path has noises, fading, interference, disturbances and short bandwidth as compared to the guided network. In many cases the path can be transverse between the multiple wireless links and heterogeneous links.
- Light weight terminals: The nodes present in the MANET are moving in random motion consisting CPU processing tendency, small size and low power consumption.

1.2 Types of MANET

The types of MANETs are:

a) **Vehicular ad hoc network (VANET):** When the fundamentals of the mobile ad hoc networks are applied then it leads to the implementation of VANETs and has the ability to have communication with the other vehicles and equipments also.
b) **Internet Based Mobile Ad hoc Networks (IMANET):** It supports the internet protocols like TDP/UDP and IP. It has network layer routing protocols which are connected to the moving nodes and establishes the routers.
c) **Intelligent vehicular ad hoc networks (INVANET):** In this type of network, it consists of artificial intelligence services and handles the unexpected conditions like vehicle collision and accidents.

d) **Flying ad hoc network (FANET):** It is made [2] up of unmanned aerial vehicles and provides mobility and connectivity in remote areas.

1.3 Routing Protocol in MANET

There is certain set of rules used to navigate the path of data packets from one location to another in any wireless network. It is mainly divided into two parts which are described as follow:

i. **Proactive Routing:** It is commonly known as table driven routing protocol. It is very beneficial for datagram traffic and gathers all substantial signal traffic and power consumption values. It is very important to update the routing tables when the data topology is changed. Such routing protocols are not sufficient for large scale networks as it is very difficult to maintain the record of each and every node present in the routing table. There are different types of routing tables present in the MANET like DSDV, OLSR, WRP, QDRP and many more.

ii. **Reactive Routing:** It is also known as demand routing protocol and is beneficial to discover the route of protocol whenever required. The discovered route is set up by the node as per their demands. The source will then verify the route so that the route is available to transmit the data from one to another. DSR, AODV, LMR, TORA, LQSR etc are certain examples of such type of routing protocol.

iii. **Hybrid Routing:** Its characteristics are inherited from the reactive and proactive routing protocols. Its main objective is to ruin the reduced [3] controlled traffic from the proactive type of routing protocol. The maintenance of routing table will delay the discovery of route.

1.4 Applications of MANET

The MANET is widely used network in commercial, military and other private industries. MANET plays very significant role in all the fields and performs some specific task in every area. It allows the user to exchange and access the information as per their geographical location or closeness to the infrastructure. As per the infrastructure of the network, all the nodes present inside the MANET are moving from one point to another and their communication is active and interactive at the same time.

i. **Military Sector:** There is availability of computers is almost military region, so it enables the ad hoc network to manage the military based tasks having some advantages over other common place networks. It has a communication network between the soldiers, vehicles and military based information.

ii. **Commercial Sector:** It is most widely used in case of emergency or rescue operations and create data network along with the interactive equipments which is already available with the rescuers and makes the task easier to perform. It has other applications also which includes ship-to-ship ad hoc mobile communication, law enforcement and so on.

iii. **Sensor Networks:** It is made up of many small sensors which are used to identify the number of properties present in any field. It has temperature, pressure, toxins, pollutions and many more. It is very difficult to transmit such a huge data through computers. So, it is made up of small independent sensors having computing capabilities hence, it cannot fails the transmission of data from one node to another. It also plays an important role in the future needs also and especially in case of homeland security.

1.5 MANET Architectural Model

The basic structure of MANET stores the IP architecture and performs all the tasks in synchronized manner. It is referred to the multi hop packet-based wireless network and it is made up of mobile nodes which is interact and move simultaneously without disturbing any wired fixed in the infrastructure. They are well maintained [4] and able to adapt networks which are created and destroyed without seeking nay help from the centralized administration. This characteristic enables it to be used in almost every field like in civilian and military situations.

It is categorized into three parts which are described as follow:

i. **Enabling Technologies**: Based on the area of coverage, it is further classified as follows:
   - BAN (Body Area Network): Its communication range varies from 1 to 2 meters, having enhanced connectivity along with the wearable computing appliances.
   - PAN (Personal Area Network): Its communication range varies up to 10 meters and provides satisfactory connectivity between the moving and stationary devices.
   - WLAN (Wireless Local Area Network): Its communication range varies from 100 meters to 500 meters and link single building or a group of building together.

ii. **Networking:** Many principles of the networking are modified in MANET architecture in order to have self configuration, dynamic, unstable and interactive environment. The protocols are initially targeted in order to make [5] use of it for the hop transmission purposes by enabling the technologies having end-to-end reliable

services from transmitter to the receiver. It is very important for the sender to recognize the receiver present within the network in order to repeat the end-to-end communication. Its main objective is to provide location of the required nodes from sender devices to the receiver's desired location.

iii. **Middleware & Application:** WiFi, Bluetooth, WiMAX and Hyper LAN are some examples of developed technologies of the WSN. This encourages the deployment of the ad hoc in almost every field performing some specific applications like in home networking, law enforcement, commercial and educational applications. MANET is used to adopt all the information in order to access the middleware instead of depending on the other applications in order to handle the services whenever they are used.

2. RESOURCE ALLOCATION

Resource allocation is widely used to achieve various objectives in expanding use of MANET. The main objective is to strategically break as resource-intensive task into small data fragments or smaller processing units and used to allocate the pieces having multiple nodes called service centres, so that each service provider processes the pieces and offers complete services to the nodes. In this manner, the resource allocation improves the performance of the system. It plays an important role to improve the reliability of a system. For example, a mobile distributed file system uses resource allocation to distribute file fragments to multiple service centres so that data can be stored more reliably.
Resource allocation can be used with the help of mobile ad hoc networks. A Mobile AdHoc Network (MANET) is an infrastructure less network, where mobile nodes can communicate with each other while freely moving. Since a MANET requires no infrastructure, it is useful for applications where no infrastructure is available, e.g., disaster response and military. However, due to the dynamic nature of MANETs (e.g., node mobility, uncertainty in communication links, and the limited energy of nodes), directly applying [6] resource allocation to MANETs is very challenging. For example, depending on the network topology, accessing service centres may incur large overhead, or some service centers may become unreachable. Therefore, resource allocation must estimate topological changes and take the estimation into account in selecting service centers. At the same time, resource allocation must ensure energy efficiency by minimizing the energy consumption of the system for accessing the service centres.

2.1 Literature Review

Ji-Young Jung et.al (2018) discussed [7] the key issues of MANETs with respect to the bandwidth utilization, fairness, and scalability, quality of services, energy efficiency and mobility.
Aleksandr Timoshenko et.al (2017) describes [8] possible scenarios and transceivers structures for providing synchronization in MANET-based distributed radar and communication systems.
Nitin Rathod et.al (2017) examines [9] the directing convention which is more dependable for video streaming is specified in this paper. Some well-known routing protocols in particular Ad-hoc On-request Distance Vector (AODV), Ad-hoc On-request multipath Distance Vector (AOMDV), Enhanced Video Streaming in MANET (EVSM) have been considered and on the premise of throughput, normal network delay, packet delivery ratio these protocols are tasted in this paper.MANET is a self-sorting out, decentralized, framework less, multi hop, remote system of cell phones. Routing protocols assume a crucial part in transmission of information over the network.
Marcelo Petri et.al (2017) presents [10] a genetic algorithm for resource scheduling in service discovery of MANETs in case of emergency. The shared resources are ambulances or support cars.
Bhavin Rana et.al (2017) developed [11] energy efficient routing strategy which was the combination of LEACH and AOMDV routing protocols. LEACH is used for the generation of cluster and provides information related to the energy of nodes, when the energy of the particular node is increased then LEACH will automatically choose the node for data transmission. On the other hand, AOMDV is used for multipath routing.
Malihe Saghian et.al (2015) proposed [12] a middleware architecture which is based on the Publish-subscribe system. This system is used to locate and discover the resources present in the mobile ad hoc networks. It has the ability to adjust the quality of services, load balancing and prioritization and they all can work under the broker failures.
Leszek T. Lilien et.al (2015) introduced [13] an application of Opportunistic Resource Utilization Networks, which is the advanced type of Mobile Ad Hoc Networks used for the ad hoc networking of Unmanned Aerial Vehicles (UAVs) in surveillance missions.

3. PRESENT WORK

3.1. Problem Formulation

The mobile ad hoc network is the decentralized type of network in which mobile nodes can join or leave the network when they want. The routing and resource management are the critical issues of the wireless sensor networks. This work is related to resource management in mobile ad hoc networks. The mutual exclusion is the efficient approach for

the resource management. In the technique of critical section, the resources get reserved for the task execution. The technique of mutual exclusion can be further improved which can reduce the time for the resource reservation

3.2. Objectives

1. To study and analyze various techniques for the resource reservation in mobile ad hoc networks
2. To propose novel approach for the resource reservation in mobile ad hoc networks
3. Implement proposed approach and compare with existing in terms of certain parameters

3.3. Research Methodology

The algorithm supposed to execute in a system involving of 'M' clusters and 'N' nodes, each cluster have one cluster leader. Nodes are categorized as 0, 1……N-1, and cluster leaders are considered as 0, 1……..M-1.We will presume that there is a unique time stamp of node 'I'. In addition, the planned algorithm precedes the ensuing hypothesis on the nodes and clusters:

- Nodes need unique ids.
- No fresh cluster will be created while initialization.
- Global clock is maintained on each node for synchronization.
- Clustering of nodes and selection of cluster head is base on node unique ids.
- Size of cluster is fixed.
- Handshake protocol is used for reconfiguration of clusters.
- No node can move at the same time as the cluster configuration is in progress.
- No two clusters are related with each other.
- Status of nodes: IN CS ,Wait RP,IDLE

The execution of proposed algorithm is shown in given below figure. Node 10 sends request for CS to cluster leader 20 by specify in its request message its id, cluster leader id and timestamp. As cluster leader 20 does not have CS therefore it enqueues node 10's request and promote forward it to cluster leader 19 which is present in its Info_set.After receiving request from cluster leader 20, cluster leader 19 sends leader reply message, in case, its node does not want CS otherwise it enqueues request of cluster leader 20. Cluster leader 20 allowed its node 10 to enter the CS after getting leader reply message. The overall working of the proposed algorithm is presented in four scenarios [4].

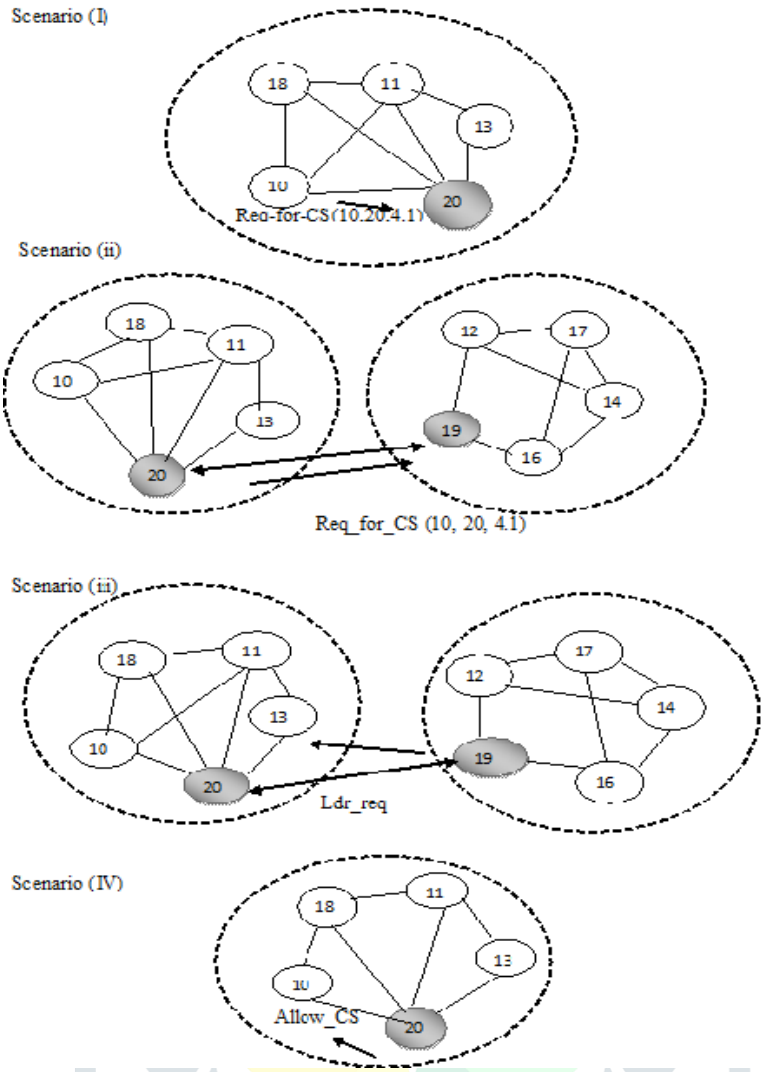

Figure 3.1 Execution of proposed work [7]

4. RESULTS AND ANALYSIS

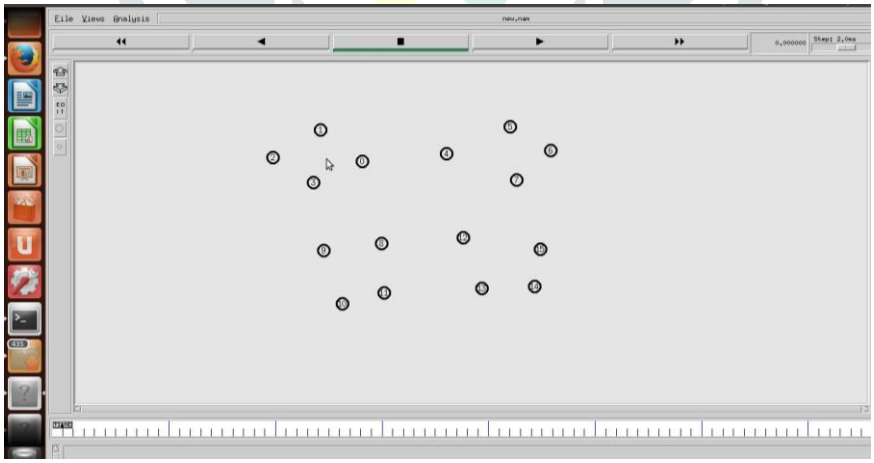

Fig 1: Network Deployment

As illustrated figure 1, the network is deployed with fixed number of mobile nodes. The whole network is divided into fixed size clusters. In each cluster, cluster head will be selected and this cluster heads are responsible for the assignment of resources.

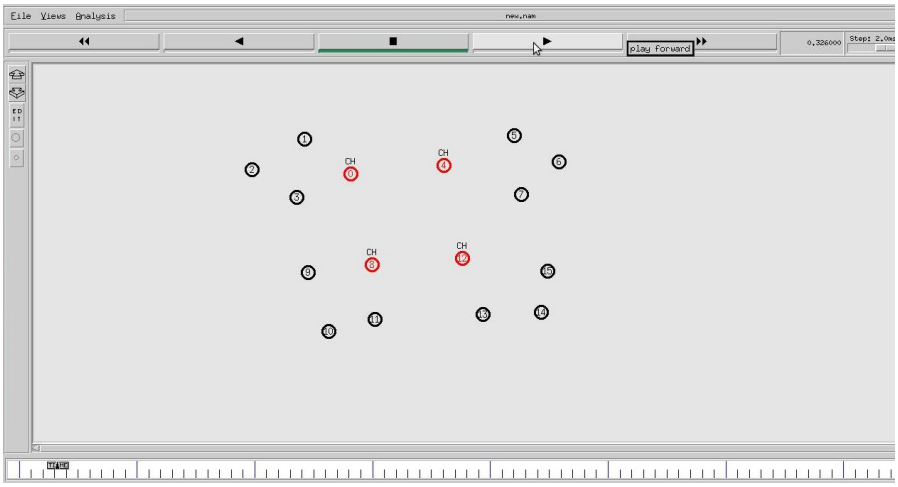

Fig 2: Cluster head selection

In each cluster, cluster head will be selected and this cluster heads are responsible for the assignment of resources.

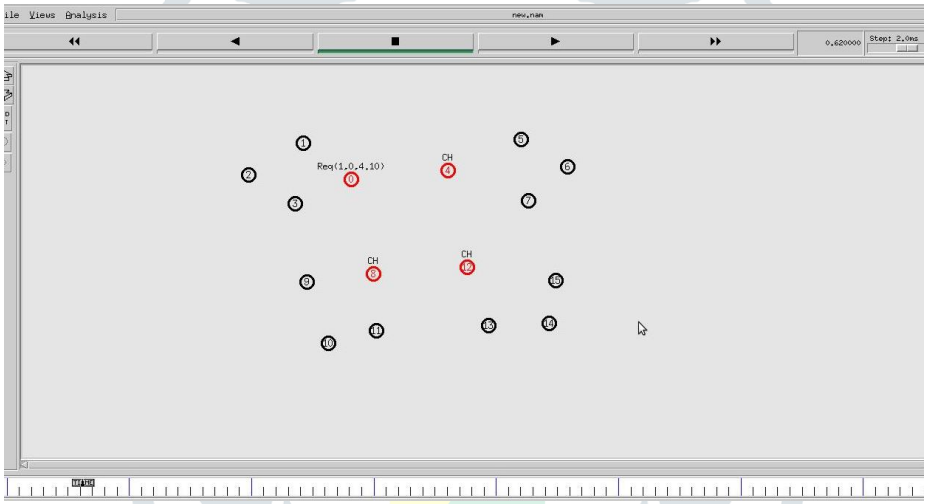

Fig 3: Cluster head selection

The source node is requesting for the resources to cluster head.

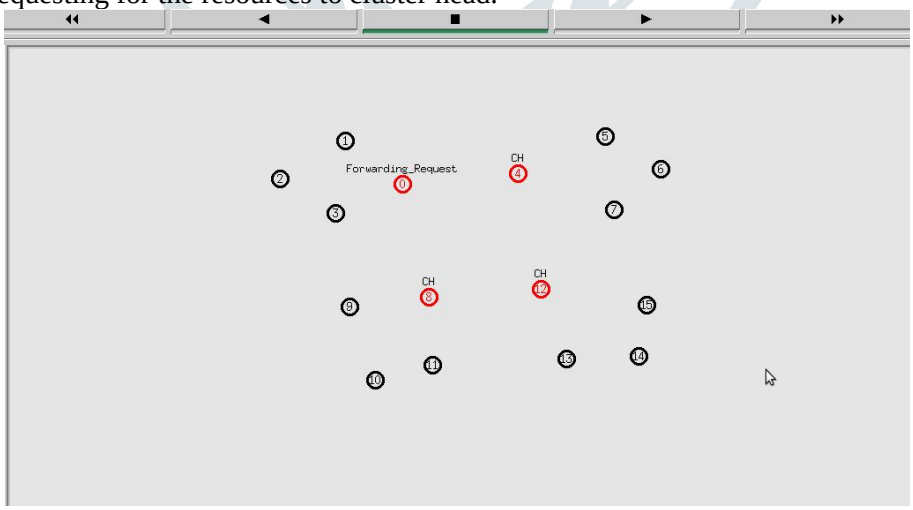

Fig 4: Cluster head selection

The cluster head don't have resources and this request is forwarded to another cluster head.

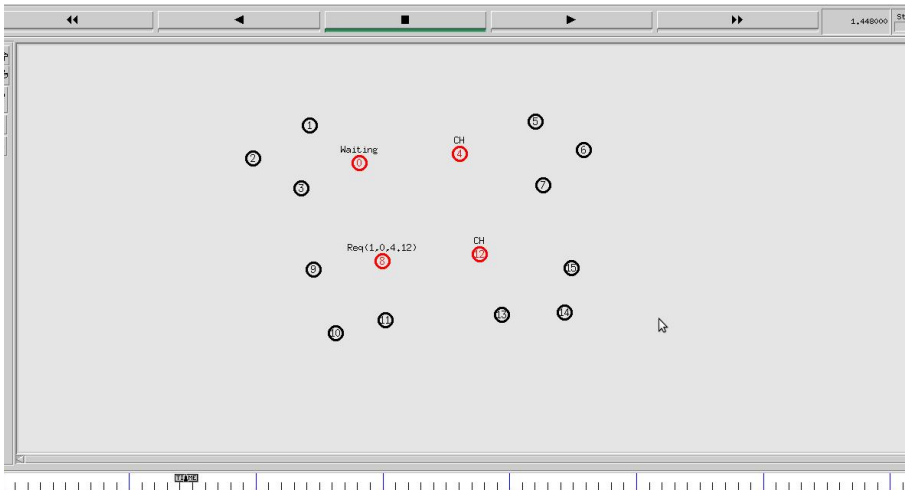

Fig 5: Cluster head selection

As illustrated figure 5, the network is deployed with fixed number of mobile nodes. The cluster head is forward request to another cluster head and that cluster head again forward request to another cluster head.

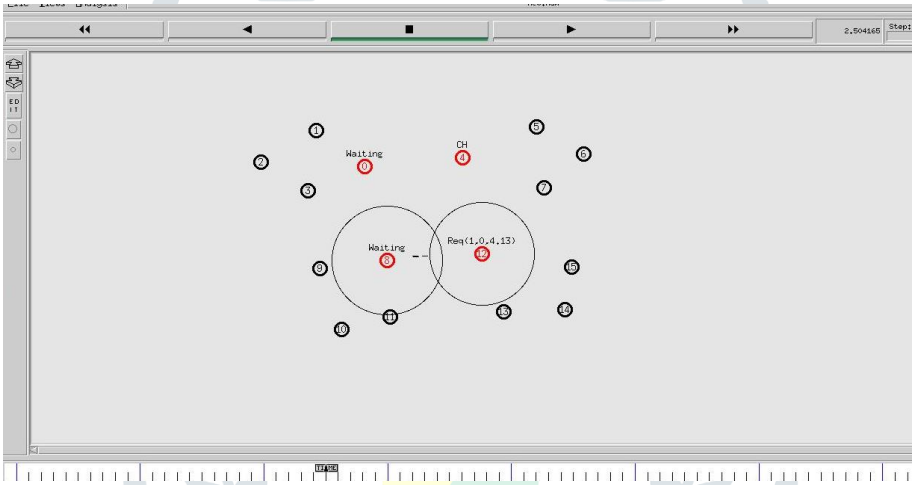

Fig 6: Cluster head selection

The cluster head is forward request to another cluster head and that cluster head again forward request to another cluster head.

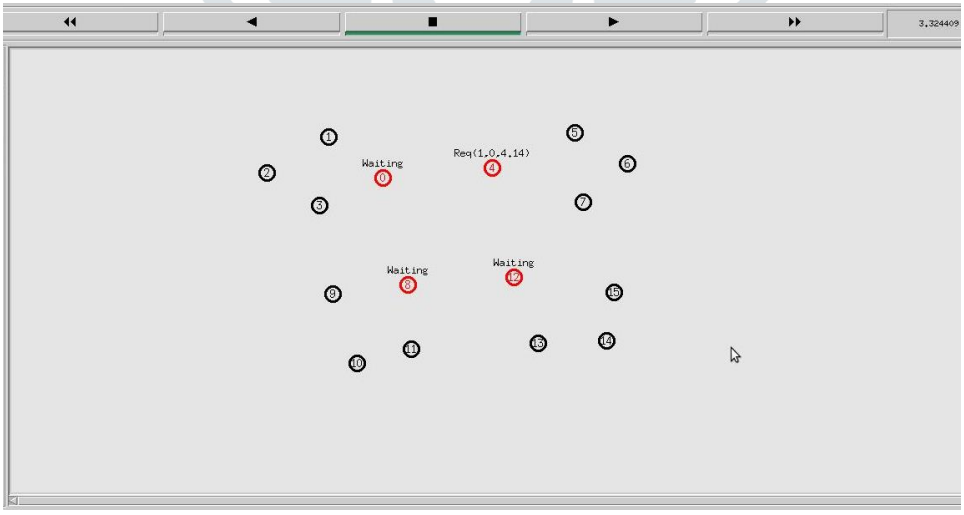

Fig 7: Cluster head selection

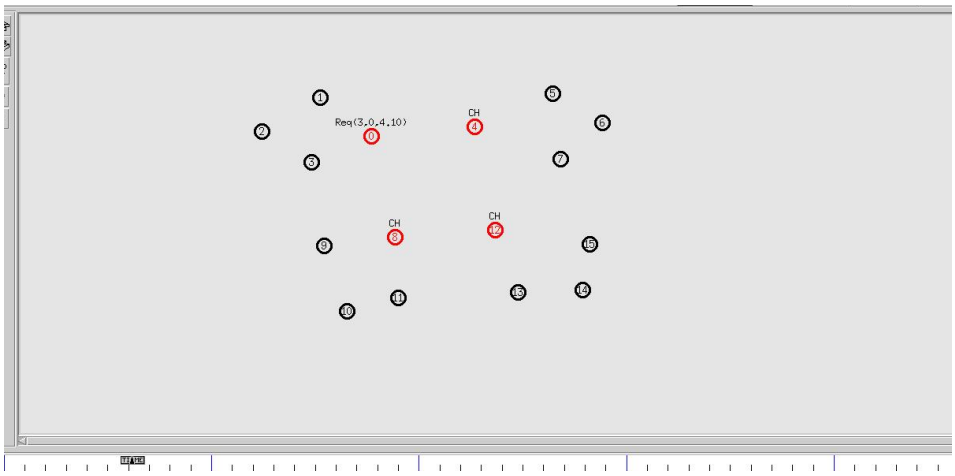

Fig 8: Source node send request

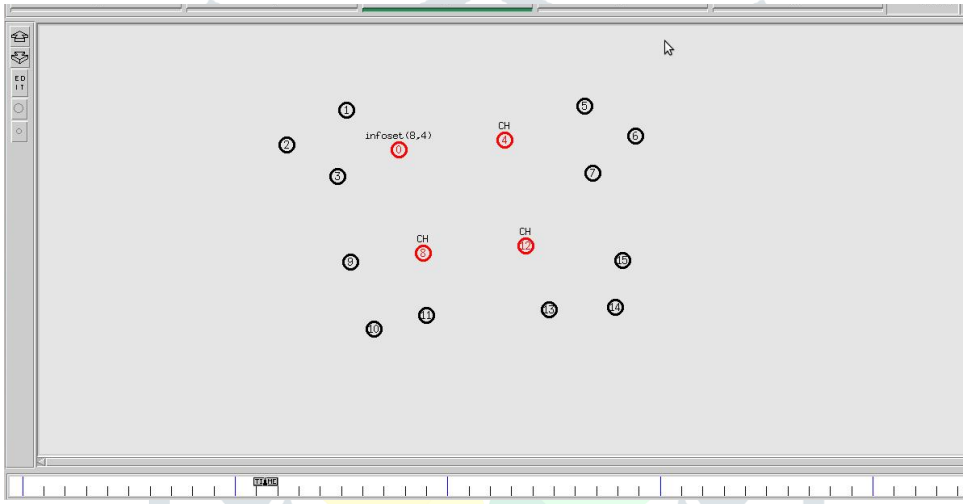

Fig 9: Infoset selection

As illustrated in figure 9, the network is deployed with fixed number of nodes. In each cluster, cluster heads are selected. The source node send request to its cluster head to enter into critical section. The cluster head will check it infoset and forward request to nodes which are in the infoset.

5. Conclusion

The mobile ad hoc network is the decentralized type of network in which mobile nodes can change its location any time. The routing, security, quality of service and resource reservation are the major issues of mobile ad hoc network. This work is based on the resource reservation scheme in mobile ad hoc network. The technique of token passing is the used in the previous times for the resource reservation. The condition of dead lock is created for the resource reservation which affects the performance. In this research work, the novel approach will be proposed for the resource reservation which improve network performance

References

[1] Alex Hinds, Michael Ngulube, Shaoying Zhu, and Hussain Al-Aqrabi, "A review of routing protocols for mobile ad hoc networks" International Journal of Information and Education Technology, Vol. 3, No. 1, February 2013.
[2] Zakir Hussain , Dr. Balakrishna R, A survey on manets– types, characteristics, applications and protocols used.
[3] Mr. L Raja, Capt. Dr. S Santhosh Baboo, "An Overview of MANET: Applications, Attacks and Challenges" International Journal of Computer Science and Mobile Computing, Vol.3 Issue.1, January- 2014.
[4] Kayna Mahajan, Harjit Singh, "MANET its types, challenges goals and approaches: A review" International Journal of Science and Research, Volume 5 Issue 5, May 2016.
[5] Shuyao Yu, Youkun Zhang, Chuck Song, and Kai Chen. A security architecture for Mobile Ad Hoc Networks.
[6] Y. Hu, A. Perrig, and D. Johnson, "Ariadne: A Secure On-demand Routing Protocol for Ad Hoc Networks," ACM MOBICOM, 2002.

[7] Ji-Young Jung, Hyun-Ho Choi, and Jung-Ryun Lee, "Survey of Bio-Inspired Resource Allocation Algorithms and MAC Protocol Design Based on a Bio-Inspired Algorithm for Mobile Ad Hoc Networks", 2018, IEEE
[8] Aleksandr Timoshenko, Ksenia Molenkamp, Alexey Volkov, Alexey Solodkov, "Synchronization and Performance of MANET-based Obstacle Detection Systems", 2017, IEEE
[9] Nitin Rathod and Nilima Dongre, "MANET Routing Protocol Performance for Video Streaming", 2017, IEEE
[10] Marcelo Petri, Janine Kniess and Rafael Stubs Parpinelli, "Scheduling Services for MANETs Using Genetic Algorithms", 2017, IEEE
[11] Bhavin Rana and Dhaval Rana, "Energy Efficient Load Balancing with Clustering Approach in MANET", 2017, IEEE
[12] Malihe Saghian, Reza Ravanmehr, "Publish/subscribe middleware for resource discovery in MANET", 2015, IEEE
[13] Leszek T. Lilien, Lotfi ben Othmane,2 Pelin Angin,3 Bharat Bhargava,3 Raed M. Salih,1 Andrew DeCarlo, "Impact of Initial Target Position on Performance of UAV Surveillance Using Opportunistic Resource Utilization Networks", 2015, IEEE
[14] Megha Patidart, Mayank Kumar Sharma2, Aaquil Bunglowala, "Multilevel Authentication for Resource Allotment in MANET", 2014, IEEE
[15] Shilpa Shashikant Chaudhari1, Rajashekhar C. Biradar, "Resource Prediction using Wavelet Neural Network in Mobile Ad-hoc Networks", 2014, IEEE
[16] Dr. Paul C. Hershey, Dr. Mu-Cheng Wang and Dr. Steven A. Davidson, "Real-time Communications Resource Allocation Process, Architecture, and Algorithm", 2013, IEEE
[17] Shital Umredka, Sitendra Tamrakar, "Recent Traffic Allocation Methods in MANET: A Review", 2013, IEEE
[18] Jochen Furthmuller and Oliver P. Waldhorst, "Evaluating the Energy Consumption of an Incentive System for Resource Sharing in MANETs", 2012, IEEE
[19] Shaopeng Wu, Rolando Carrasco, Satnam Dlay, "A Mixed Data Flow and Local Feedback in the Resource Allocation of Ad Hoc Networks", 2008, IEEE