IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

WORKING PRINCIPLES OF MOBILE AD HOC NETWORK

T.Ramani*, J.Umarani, Dr. P.Sengottuvelan
* Research Scholar, Bharathiyar University, Coimbatore, Tamilnadu.
Research Scholar, Bharathiyar University, Coimbatore, Tamilnadu.
HOD & Associate Professor, Dept of CS, Periyar University, Dharmapuri, Tamilnadu.

ABSTRACT

Mobile Ad Hoc Network is a collection of two or more nodes connected for communication. There are more then ten routing protocols used for redundant transmission. Simulation is one of the technique implementing networks on the computer. It is used to verify and evaluate the performance of the network. The network simulator provides an integrated, versatile, easy-to-use GUI based network. The network simulator allows the researchers to test the scenarios to simulate in real world.

KEYWORDS: MANET, Ad Hoc Routing Protocols, Network Simulation Tools.

INTRODUCTION

Mobile ad hoc network [MANET] consists of group of independent mobile nodes which communicate each other. MANET is an infrastructure-less dynamic network, it does not follows any fixed structure. The topology of an ad hoc network is defined by the geographical positions.

MANET is an autonomous transitory association of mobile nodes that communicate each other over wireless links. It enables communication between nodes that are not directly within each others send range, intermediate nodes act as routers i.e. the nodes themselves are responsible for the creation, operation and maintenance of the network.

The performance of MANET depends upon routing protocols, battery consumption, bandwidth etc.,

ROUTING PROTOCOLS:

i) Proactive Routing:

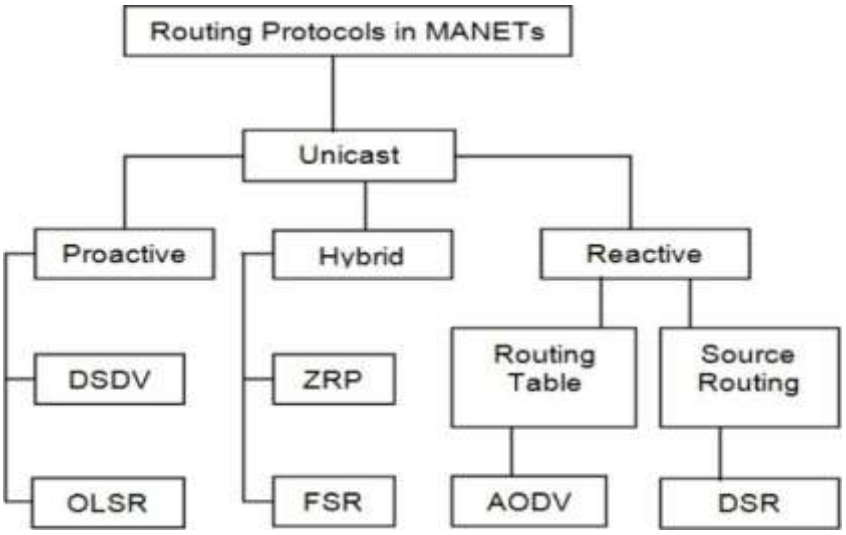
A fixed network node maintains fresh list of destinations and their routes by periodically distributing routing tables throughout the network. The disadvantage is respective amount of data for maintenance and slow reaction on restructuring.

ii) Reactive Routing:

Reactive Routing finds a route on demand by flooding. Flooding is a simple algorithm in which every incoming packet is sent through every outgoing link except the one it arrived on.

iii) Hybrid Routing:

Hybrid Routing combines the advantages of Proactive routing and Reactive routing. This routing is initially established with proactively and then serves the demand from additionally activated nodes through reactive flooding.



Optimized Link State Routing:
The Optimized Link State Routing is a proactive protocol, used for wireless ad hoc networks. In this protocol the node uses hello messages to discover and distribute link state information to compute next hop destination for all nodes in the network. Link-state routing protocol used to perform flooding of topology information. Using hello message the node discovers neighbor information and performs a distributed selection.

Destination-Sequenced Distance Vector routing
Destination Sequenced Distance Vector Routing is a table based protocol, based on Bellman-Ford algorithm. Every node maintains a routing table which records the possible links and distance from each node. Each entry in the routing table contains a sequence number, the sequence numbers are generally even if a link is present; else, an odd number is used. Routing information is distributed between nodes frequently.

Distance Vector Routing:
Distance Vector Routing maintains a routing table, based on calculating the direction and distance to any link in a network. Distance means the next hop address measures the cost to reach a next node.

Global State Routing:
Global State Routing is almost same as DSDV routing, but it progress by decreasing the flooding of routing messages. In this routing, every node maintains a neighbor list, a topology table, next hop table and a distance table. Whenever it accepts a routing message, the node update its topology table and reconstructs its routing table.

Cluster head Gateway Switch Routing:
Cluster gateway routing is building from DSDV protocol. The cluster head manage a group of action. That is, the action is divided into group of nodes. Each node elected by a head, the head connected to each other through a gateway. The routing table records all the information about all nodes and cluster head.

Wireless Routing Protocol:
Wireless routing protocol uses the routing table to stores complete routing of each node. Every node maintains four tables: Distance table, Routing table, Link-cost table and Message retransmission list table. The Message Retransmission List (MRL) used to update a record which needs retransmission. Wireless Routing Protocol use distance information to find the path, such an approach can effectively improve the distance-vector routing.

Fisheye State Routing:
Fisheye State Routing is an enhancement of GSR. In GSR, the large size of update messages are dissipates a substantial amount of network bandwidth. To overcome this problem FSR will use a method where each updated messages would not include information about all nodes. In this way, each node gets accurate information about near neighbors. When the route information becomes more accurate the packet moves closer to the destination.

Ad hoc On-Demand Distance Vector Routing
Ad hoc On-Demand Distance Vector protocol uses the concept of Distance Vector concept, but it does not maintain a routing table. But a node needs to communicate with another node it building a routing table. When a node wants to send data to another node, it sends a Route Request (RREQ) packet to find a destination node. When the destination receives the Request packet from various places, it chooses a shortest path and sent the direction of Route Reply (RREP). In this way the path from source to destination has been established.

Dynamic Source Routing
Dynamic Source Routing (**DSR**) is a routing protocol for Wireless ad hoc network. It is similar to AODV protocol. Dynamic Source Routing used to record information directly in the inside of each packet. This protocol is based on source routing. It has two phases are Route Discover and Route Maintenance. DSR is needed only when the path to find out the path in on-demand.

Route Discovery is similar to AODV, but the different is after Route Request message each hop recorded the ID of the hop, they will have all the nodes in the path of destination. The Route Reply would be generated if the message has reached the destination. The path between source and destination, the nodes record and forward information without reselect the path.

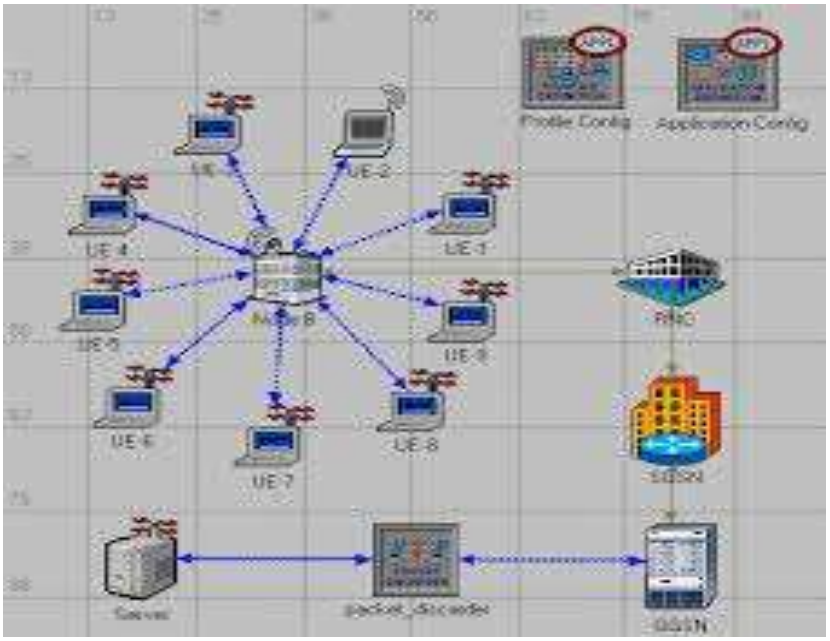
Temporally Ordered Routing Algorithm (TORA):
The link reversal concept will be used in Temporally Ordered Routing Algorithm. It can be used to identify the direction of the path. TORA operation is divided into 3 steps: Route Creation, Route Maintenance and Route Erasure. To establishing the route the network forms a directed acyclic graph (DAG) for designating upstream and downstream. When network topology changes DAG was forced to re-establish.

Cluster based Routing Protocols:
In Cluster Based Routing Protocols (CBRP), all nodes are divided into cluster. Each node maintains a neighbor table which contains the status of the link. The cluster-head maintains the information about the members. For each neighbor cluster, the table has entry that contains the gateway through which the cluster can be reached and the cluster-head of the cluster. When a node connects to another it send a Hello message. Then that node reacts from undecided state into member state.

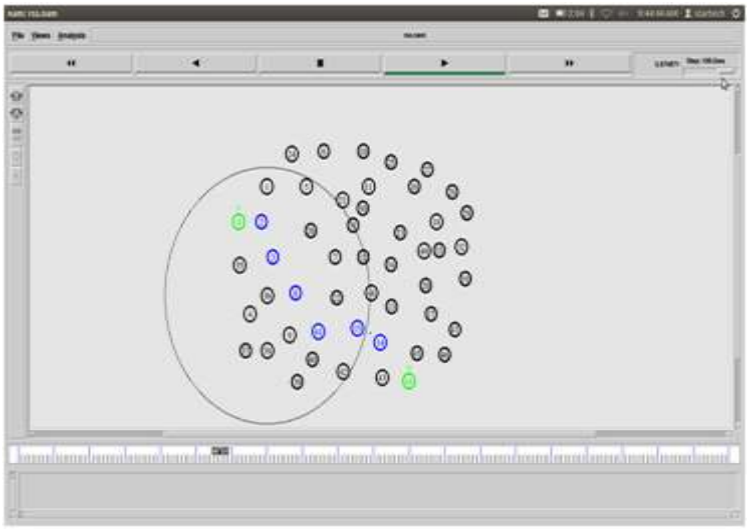
Zone Routing Protocol (ZRP):
Zone Routing Protocol combines two kinds of protocols reactive and proactive. It enables the network to keep the record inside a nose and neighbor node. ZRP allow web of a small number of nodes. It defines a routing zone between a node and all other nodes within a distance. Within the same Zone, the routing is called intrazone routing.

SIMULATION TOOLS
There are several simulator tools

OPNET:
Optimized Network Engineering Tools is one kind of software that provides the performance of the computer networks. It was developed in 1997. OPNET developed by Massachusetts Institute of Technology (MIT). It provides the environment for modeling communication network.



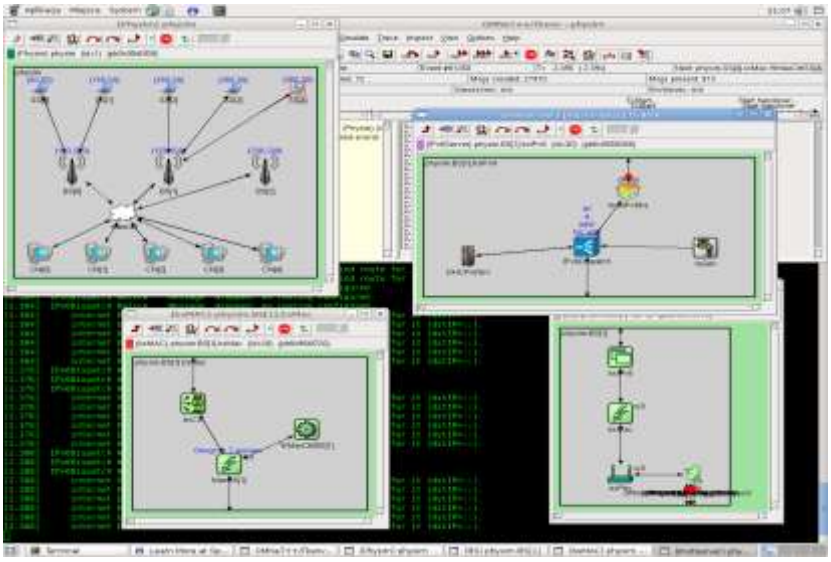
NS-2:
NS2 is a discrete event simulator for simulation of TCP, routing and multicast protocols over wireless networks. It was developed under Virtual Inter Network Testbed in 1995. NS-2 was builds in C++ language and describes the simulation interface through OTCL. The Network Simulator (NAM) used for the graphical view of the network. NAM allows users to forward, stop, pause and play the simulation.



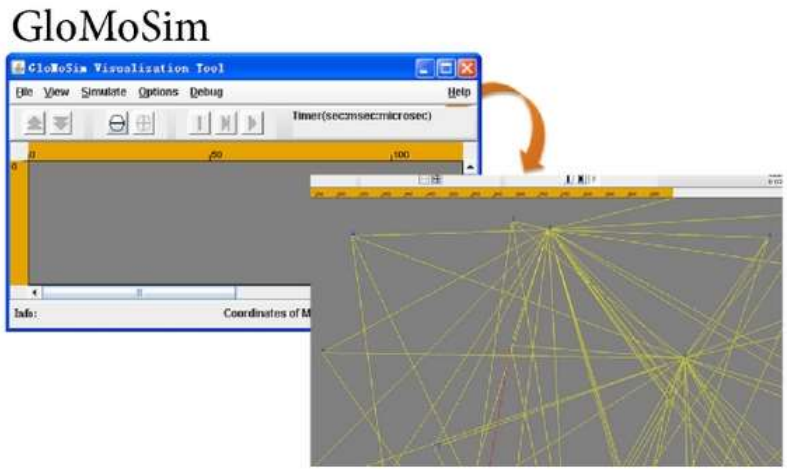
NS3:
The NS3 simulator is a discrete event simulator for Internet systems, started in 2006. It is used to develop new models or maintain existing ones and shared results. It was implemented in C++, some times written in Python language. NS-3 support both simulation and emulation.

OMNET++:
OMNET++ (Objective Modular Network Testbed in C++) has been initiated in 1997. It is not only designed for network simulations, can be used for modeling of multiprocessors, distributed hardware system and performance evaluation. OMNET++ is a discrete event component-based open architecture model. It is used for simulation and queuing network simulations. A Network Description (NED) language used to assemble component model. It contains

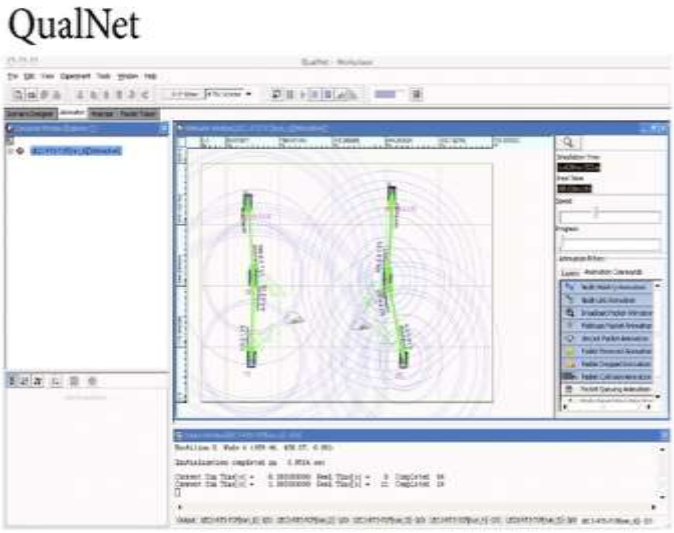
a Graphical Network Editor and Command Line Interfaces for simulation execution. It is also available for both UNIX and Windows based systems.



GloMoSiM:
Global Mobile Information System Simulator Used for large scale wireless environment. GloMoSiM is a parallel discrete-event simulation model based on C++ simulation library. It supports direct satellite communication, multi-hop wireless communication. GloMoSiM stopped releasing updates in 2000. It is now updated as a commercial product called QualNet.



QualNet:
QualNet is a commercial network simulator of GloMoSiM started from 2000 to 2001. It is a ultra high network simulation software that predicts in wired and wireless networking device performance. QualNet implemented by C or C++ and follows a procedural paradigm.



CONCLUSION:

In this paper we presented an extensive assessment about the MANET. Here we distinct the ad hoc network routing protocols and types of simulation tools supported for network communications. We described more then routing protocols for network transmission. These protocols are included in three categories Proactive, Reactive and Hybrid Routing. And we distinct six types of simulation tools that support the performance of the network.

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