

Compendious Discourse Concerning MANET Routing Protocols & Simulation Tools

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Abstract—Now a days, Mobile Ad Hoc network is the most trendy topic for researchers. Mobile Ad Hoc network is infrastructure less wireless network that is made up of different mobile devices that creates link with other nodes on the fly and also changes their links between nodes more frequently. This type of network is more useful when one wants to get connected with some nodes for a particular session and does not wants to create a dedicated link for all the time. This paper entitles the brief discussion about MANET, various Routing protocols used to route data between these nodes. The purpose of this study is to provide the brief knowledge about MANET network. Moreover, this study entitles some of the simulation tools used in analyzing the performance of the Mobile Ad Hoc Network.

Keywords— *MANET, Routing Protocols, Simulation Tools, Types of MANET.*

1. INTRODUCTION

An Ad Hoc network refers to the type of network that is established between different nodes for a particular session. This type of network does not require an infrastructure for establishing connection with different nodes involved in a network. Mobile Ad Hoc network is the type of wireless ad hoc network that is made up of different number of mobile devices, that does not requires an infrastructure to communication with other nodes in the network.

Mobile Ad Hoc Network (MANET) is based upon IEEE 802.11 standard. Moreover, any node in mobile ad hoc network can move in any direction at anytime [1]. Nodes involved in mobile ad hoc network changes links with other nodes more often. Therefore, different routing mechanisms are to be used, so that data in such type of network is delivered from source to destination in a secured and efficient way.

2. REVIEW OF RELATED WORK

In past several years, there are various studies about MANET have been reported. MANET becomes the most popular field of research in past few years, just because of its mobility and easily adaptive changing environment. This section describes the study of MANET by various researchers and their ideas about MANET.

Renu Dhir and Vanita Rani describes, MANET as a self configuring infrastructure less network of mobile devices that are free to move in any direction and at any time [1].

Simarpreet Singh et. Al. describes the types of MANET Routing Algorithm in three types like, based on the information that can be used to build routing table, based on when routing table build and some hybrid routing algorithm made from the combination of other routing protocols [2]. Mohammed Othman e.t. al. describes in their study about various routing protocol used to route data in MANET in various situation and also describes the brief study of Metrics involved in MANET performance issues [3]. Sujata V. Mallapur e.t. al. specifies different simulation tools involved in measuring the performance of MANET routing protocols and their pros and cons for using these tools [4].

3. TYPES OF MANET

Mobile Ad Hoc network (MANET) can be classified into different categories. This section entitles some of the categories of MANET.

3.1 VANET (Vehicular Ad Hoc Network)

VANET is self configuring Mobile Ad Hoc network, which is used for communication between different mobile nodes i.e. running vehicles for sharing of information while travelling. The main aim of this type of the network is to provide traffic information to the vehicles travelling across a particular area for the purpose of security and traffic management. The communication in VANET can be possible in three ways such as, Vehicle-to-Vehicle, Vehicle to Road Side, Inter-Road side Communication.

3.2 Internet Based Mobile Ad Hoc Network (iMANET)

iMANET is the infrastructure less wireless mobile ad hoc network which allows the independent mobile nodes to be connected with large number of nodes at wide area with the help of internet. Now, normal MANET network is replaced by iMANET for connection between nodes.

4. ROUTING PROTOCOLS

Routing is the method to find the best available path to travel a data packet across the network. MANET supports different routing protocols to travel data across the network in an optimized way. Some of the routing protocols are discussed in following sections.

4.1 Proactive Routing Protocol

In proactive routing protocol each node maintains an updated list of routes to other nodes in network by flooding the routing table in network periodically.

Examples of Proactive Routing Protocol

- Cluster Gateway Switch Routing (CGSR)

In CGSR each node finds best route over the cluster head so that a node should send data to other nodes in network. Network in CGSR is divided into different parts (clusters). Moreover, each cluster includes the predefined number of nodes which are controlled by a node termed as Cluster Head. Each node maintains two nodes maintains to table for routing information such as, Routing information table and Cluster Member Table.

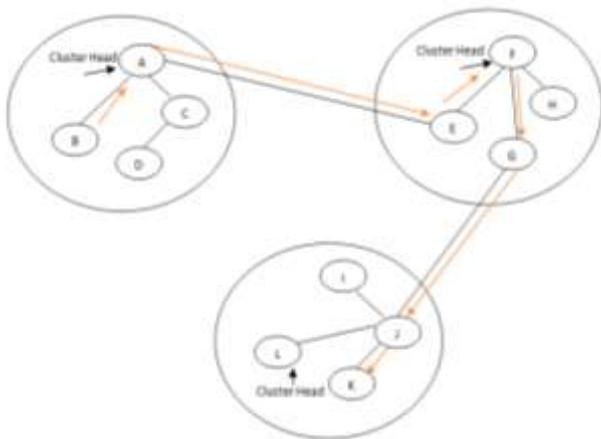


Figure 4.1.1 CGSR based Routing

Figure 4.1.1 provides the scenario of CGSR based routing algorithm. The whole network is divided into different set of cluster with predefined number of nodes in each cluster. Each cluster have a cluster head which connects each node in cluster with other node in same cluster or different number of nodes in different cluster in

network. The figure 4.1.1 shows that is node B wants to send data to node K, then the path B-A-E-G-J-K should be followed.

- Wireless Routing Protocol (WRP)

WRP is proactive Routing Algorithm based on Bellmen Ford Algorithm. WRP reduces the number of loops involved in the network. Each node in the network should maintain 4 tables mainly distance table, routing table, link cost table and message transmission list.

In WRP, each node sends the routing information to its neighbor in the form of messages. If any updations occur in the network node sends the update message to its neighbor so that each node maintain updated information about route from other node. But, if no updations are done is route each node sends Hello message to its neighbor to provide signal of its connectivity.

4.2 Reactive Routing Algorithms

Reactive routing algorithm includes the set of protocols for providing on demand routing information to the nodes involved in the network. Reactive routing are also termed as on demand routing algorithm, in which nodes does not maintain updates information about the path from source to destination instead, the routing information is stored by some node is stored according to the requirement occur to send data packet [9].

Examples of Reactive Routing Algorithm

- Ad-Hoc On-Demand Distance Vector (ADOV)

Ad-Hoc On-Demand Distance Vector routing is based on Bellman Ford Distance Vector Routing algorithm. ADOV is capable of both unicasting and multicasting of data packet [8]. In ADOV network each node maintains the information about direction to send the data packet.

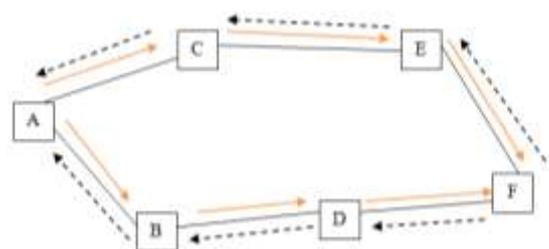


Figure 4.2.1 Routing in ADOV from Node A-Node F

Figure 4.2.1 shows the scenario of routing procedure of ADOV. Here node A wants to send data to node F. Firstly, to get path Node A broadcasts the Route Request Message (RREQ) in network through path A-C-E-F and A-B-D-F.

then node F replies the path by Reply Route (RREP) message from path D-B-A and E-C-A. if any error occurs while transmitting route, the nodes immediately sends Route Error (RRER) message to the originating node. In this way, route information is provided to each node dynamic on-demand basis.

- Signal Stability Routing Protocol (SSR)

SSR routing protocol is On-Demand routing in which the routing information is provided on the basis of stability of signal between nodes and the stability of the nodes. This offers the advantage of choosing the best available path with stronger connectivity. SSR protocol is further based upon two other protocols like Dynamic Routing Protocol (DRP) and Static Routing Protocol (SRP). DRP maintains the Signal Stability Table and Routing Table. SRP passes the packets up the stack if the receiver is available and otherwise, it forwards the packet to other nodes.

4.3 Hybrid Routing Protocols

Hybrid routing protocols provides the facility of both proactive and reactive routing algorithms. Initially to fill the routing table of each node proactive routing is done and for updations of Routing information table reactive routing is performed.

Examples of Hybrid Routing Protocols

- Zone Routing Protocol (ZRP)

In ZRP network is divided into routing zones, according to the distance between nodes in the network. Each zone in ZRP defines the minimum range for a node to maintain the constant connectivity with other nodes in zone. ZRP uses both proactive and reactive routing algorithms. Proactive routing in ZRP is used upon the small neighborhood of the node and reactive routing in ZRP is used for route discovery from particular source to destination [5,7].

In ZRP proactive is termed as intra-zone routing and reactive is termed as inter-zone routing.

5. MANET SIMULATION TOOLS

There are different simulators available for measuring the performance of different routing protocols of MANET. This section describes list of some of the simulation tools and the environment in which these tools are capable to run.

5.1 Network Simulator-2 (NS-2)

NS-2 is a discrete event simulator that helps to testing and simulates the behavior of different routing protocols used in mobile ad hoc network. NS-2 is second version of network

simulator. Other versions are NS-1 and NS-3. NS-2 is capable of working in Linux and windows environment. However, NS-2 worked more efficiently in Linux Environment. To run NS-2 in windows environment a third party software cygwin is required. It provides a UNIX like environment in windows environment. NS-2 has been written in 2 languages such as, C++ and Object Oriented Variant Tool Command Language (OTCL). NS-2 is the open source simulation tool [6].

5.2 DIANEmu Simulator

DIANEmu is a tool used to implement ad hoc network on high level. By high level it means simulation is done at application layer level protocols. DIANEmu is written in JAVA programming language. It offers the advantage like protocol that is run on simulation device can directly run on real environment without any protocol change. To run DIANEmu Apache Ant is used. DIANEmu tool is freely available over the internet.

5.3 GloMoSim Simulator

GloMoSim refers to Global Mobile Information Systems Simulation Library developed by University of California, Los Angeles (UCLA).GloMoSim was used to simulate discrete event in wireless and wired network. But, now GloMoSim is only used in wireless ad hoc network. It is written in Parsec (c-based) language which is a parallel programming language. To run GloMoSim Java SDK and Visual Studio is required. GloMoSim is an open source software.

5.4 OPNet

OPNet refers to as Optimized Network Engineering Tool developed by MIT (Massachusetts Institute of Technology). OPNET provides an interactive development environment by allowing the design and study of networks, devices, protocols, and applications. It is well suited for the use by Commercial organizations. OPNet is written in C programming language and is commercially available simulation tool.

6. CONCLUSION

In nutshell, we can say that Mobile Ad-Hoc network if the type of wireless ad-hoc network that is made up of multiple mobile nodes that can move in any direction and at any time and also does not require an infrastructure to establish network. For travelling data in such network careful routing is required. This study includes different routing algorithms used to provide route information to nodes and also provides method to travel data across the network.

This study also entitles some of the simulation tools used to simulate the behavior and performance of Mobile Ad-Hoc with different set of metrics. The further scope of this study is to apply different metric by some simulation tool and will also include the study of MANET with different Queuing models.

7. REFERENCES

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