QUALITY OF SERVICE FOR MOBILE AD-HOC WIRELESS NETWORKS

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Abstract: Mobile ad-hoc network (MANET) is a wireless network without infrastructure. Nodes can commutate each other without central infrastructure; because they are self organised and self configurable with easy deployment. To commutative each other it is required efficient routing protocols in MANET technology. In these we find out an efficient routing protocols for routing, and we had considered differ approaches like routing load, end to end packet delivery and performance of protocols. To analysis this we implemented two different routing protocols which are proactive and reactive. To analysis these aspects we used HTTP high and lower load traffic. And we conclude the efficiency of a network can be achieved by choosing the best suitable protocols based on the network requirement.

1. Introduction:

Wireless networking is an emerging technology that allows users to access information and services electronically, regardless of their geographic position. Wireless networks can be infrastructure networks or infrastructureless (Ad-hoc) networks. n Ad-hoc network is a collection of mobile nodes which forms a temporary network without the aid of centralized administration or standard support devices regularly available in conventional networks. These nodes generally have a limited transmission range and, so, each node seeks the assistance of its neighboring nodes in forwarding packets and hence the nodes in an ad-hoc network can act as both routers and hosts, thus a node may forward packets between other nodes as well as run user applications. By nature these types of networks are suitable for situations where either no fixed infrastructure exists or deploying network is not possible. Ad-hoc mobile networks have found many applications in various fields like military, emergency, conferencing and sensor networks. Each of these application areas has their specific requirements for routing protocols. Since the network nodes are mobile, an Ad-hoc network will typically have a dynamic topology which will have profound effects on network characteristics. Network nodes will often be battery powered, which limits the capacity of CPU, memory, and bandwidth. This will require network functions that are resource effective. Furthermore, the wireless (radio) media will also affect the behavior of the network due to fluctuating link bandwidths resulting from relatively high error rates. These unique features pose several new challenges in the design of wireless, ad-hoc networking protocols. Network functions such as routing, address allocation, authentication, and authorization must be designed to cope with a dynamic and volatile network topology. In order to establish routes between nodes which are farther than a single hop, specially configured routing protocols are engaged. The unique feature of these protocols is their ability to trace routes in spite of a dynamic topology. Routing Protocols in Ad-hoc networks can be basically classified as Proactive (table driven) routing protocols and Reactive (ondemand) routing protocols [3]. In Proactive routing, routes to all destinations are computed a priori and link states are maintained in node's routing tables in order to compute routes in advance. In order to keep the information up to date, nodes need to update their information periodically. The main advantage of proactive routing is when a source needs to send packets to a destination, the route is already available, i.e., there is no latency. The disadvantages of proactive routing are some routes may never be used and dissemination of routing information will consume a lot of the scarce wireless network bandwidth when the link state and network topology change fast. (This is especially true in a wireless Ad-hoc network.) In Reactive routing, protocols update routing information only when a routing requirement is presented. This implies that a route is built only when required. The main advantage of Reactive routing is that the precious bandwidth of wireless Ad-hoc networks is greatly saved. The main disadvantage of Reactive routing is if the topology of networks changes rapidly, a lot of update packets will be generated and

disseminated over the network which will use a lot of precious bandwidth, and furthermore, may cause too much fluctuation of routes.

1.1 Wireless and Mobile Ad hoc network.

Wireless networks use some sort of radio frequencies in air to transmit and receive data instated of using physical connection (like cables). The most important part of wireless network is avoiding lying most expensive cables and maintenance cost. A MANET is a distributed wireless network without any fixed infrastructure. That means no centralized server is required to maintain the state of the clients. Ad hoc network is a collection of wireless mobile, forming temporary network connections each other without any centralized management [1]. Mobile Ad-hoc networks are self-organizing and self-configuring multi path networks, where the structures changes dynamically depends on network, this happens due to wireless nodes [2]. The nodes in the network acts as hosts and routes data packets from sources to designation in network. Nodes in the network utilizes same wireless channels and engages them for forwarding the data packets in network [3]. In MANET, a wireless node can be the source, the destination, or an intermediate node of data transmission. When a wireless node plays the role of intermediate node, it serves as a router that can receive and forward data packets to its neighbor closer to the destination node. Due to the nature of an ad-hoc network, wireless nodes tend to keep moving rather than stay still. Therefore the network topology changes from time to time.

Wireless ad-hoc network have many advantages:

- Low cost of implementation: Ad hoc networks can be implemented on the fly; hence no expensive infrastructure such as copper wires or data cables is required.
- Fast deployment: Ad hoc networks are very convenient and easy to deploy since there are no cables involved. Implementation time is short.
- Dynamic Configuration: Ad hoc network configuration can change dynamically over time. When compared to configurability of LANs, it is very easy to change the network topology of a wireless network.

But while coming to mobile ad hoc network transferring packets from source node to destination node can be done by co-operating all the nodes in the network. So when the data sent from source node to destination node it is required a router. Thus one of the most important issues is routing. This thesis focuses mainly on routing issues in ad hoc networks. So to commutate each node in the ad hoc network uses routing protocols [4][5]. There are different types of routing protocols used in the network.

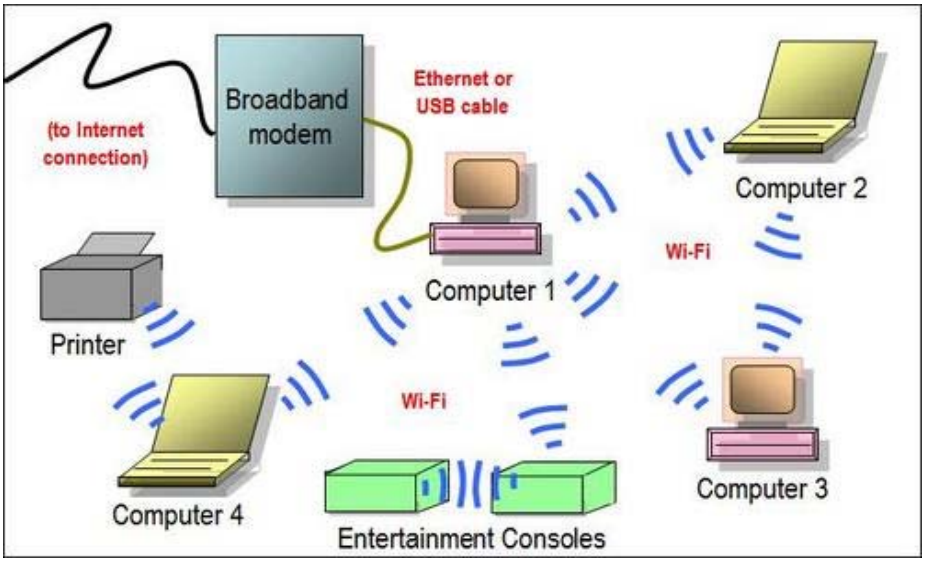
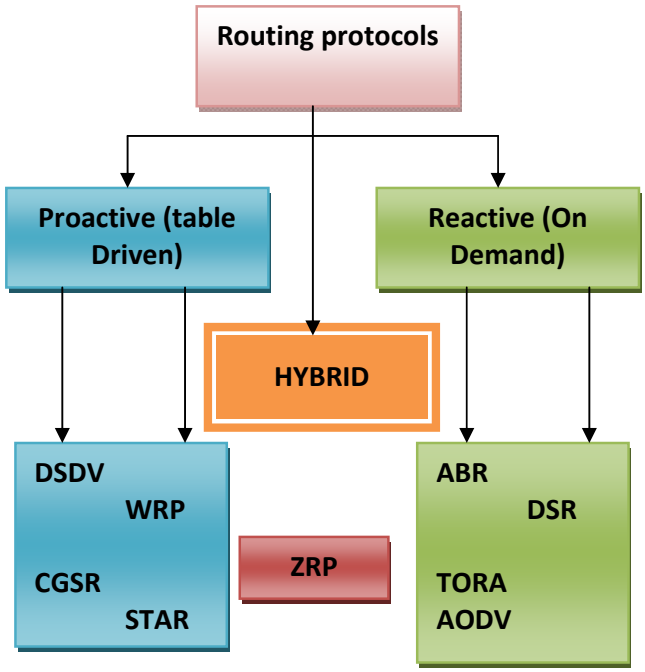


Figure1: Ad-hoc network.

1.2 Routing protocols

Routing protocols are the back bone of ad-hoc network. In the real time world routing rotocols are divided in to two parts. In the rest ofchapter about all the protocols discussed detailed.

1) Proactive routing protocols.
2) Reactive routing protocols.



1.1 Figure routing protocols

1.3 Aim and Objectives:

In ad hoc network portable devises establish communications without central infrastructure. While moving mobile nodes randomly without central infrastructure raises various problems like security, routing and link break etc. This may be causes routing problems. And while moves in the network each node is end system, but any ho it routes packets. These address issues due to Routing protocols, which are used efficient routing under mobile ad hoc network (MANET). The main objective of this proposed project is studying of mobile ad hoc network routing protocols in grid environment, and implementation of proactive and reactive routing protocols, by using OPNET simulator performance matrices and average end to end delay, packet delivery fraction, average routing load and data packets lost should be calculated. And also the study of analysis discussed that which is the better one and which is should be implemented in MAINT technology.

1.4 Aim of the project:

Wireless routing protocols project is challenging then wired, because wireless contains mobility. So it is important that to understand performance of routing protocols in variation in mobile technology.

- So I have to evaluate performance of proactive in packet delivery fraction i.e. It is the ratio of packets delivered to that generated by the traffic generator.
- And have to evaluate routing protocols average End to End packet delivery time.
- And Routing load i.e. it is the number of routing packets required to be sent per data packet delivered.

1.5 Approach and Methodology:

There is some techniques are chosen for network performance elevation. There is three different techniques are there to perform this 1) analytical modeling 2) simulation 3) measurement.

1.5.1 Techniques of performance elevation:

Most of the developers, scientist and other professionals main objective is providing the highest performance for given cost. So there is some techniques to overcome those are analytical modeling, simulation, measurement. Simulation is chosen because it is suitable to get most of the details and less accusation is required to compare to analytical modeling. And it is having best accuracy for detail information gathering and cost efficacy also.

1.5.2 Network Simulators:

Many network simulators are available like NS2, GLOMOSIM, OPNET etc. But **OPNET** Network simulator is

chosen for the proposed project. OPNET GURU is chosen because of supports networking research education purpose only. In OPNET there are two types of edition s are available 1) enterprise 2) OPNET GURU edition (for education). OPNET is mostly suitable for designing of new protocol and quality analysis for traffic. OPNET GURU edition, freely available on internet websites. OPNET is one of the most of the researchers will be used in the world. Because it is easy to use, and all the components are drag and drop facility. OPNET is program which is completely written in C++ and other programs. OPNET is primarily useful at local area network. It is very easy to use. To work with this simulator there is lot of documentation is available which is written by the developers. How to install and what is the basic needs to install OPNET is given in the chapter of network simulators.

1.5.3 Simulation type:

The proposed paper runs under 2mbps bit rate. And the fixed number of packet sizes of 512 bytes with a pause time. The simulation uses 10 different nodes with one source and destination and by 1 getaway. The scenario contains exact way of each node and the exact packets source by each node, and with that exact time at which each change in motion or packet sources is to occur. The trace file created by each run, it the file stored in disk, and it is analyzed using a variety of scripts, and the file is calls trace file which file that counts the number of packets successfully delivered and the length of the paths taken by the packets, as well as additional information about the internal functioning of each scripts executed. This data is further analyzed with graphical mode graphs.

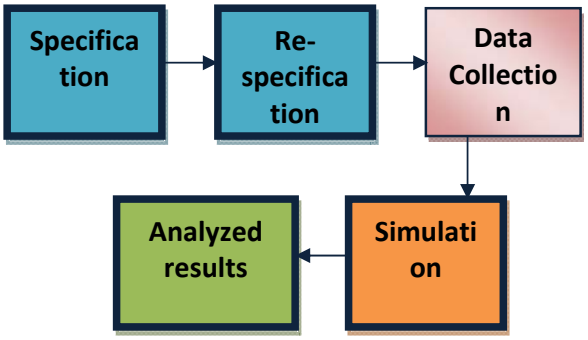


Figure 1.3 OPNET simulation data transfer

1.5.4 Quality matrices:

The performance matrices is measures there different approaches 1) average end to end delay 2) packet delivery 3) routing load.

- **Packet delivery ratio:** It is the total no of data packets delivered to the destination generated by CBR (content bit rate) from sources. The packet delivery ratio show the successful data packets delivered from sources to destination. The complete and correctness routing protocol which give the better and effective performance.

$$PktDelivery\% = \frac{\sum_{1}^{n} CBRrecv}{\sum_{1}^{n} CBRrecv} \times 100 \ldots\ldots Equation1$$

Packet delivery ratio formula.

- **End to end delay:** There is possibility of delay by buffering during route discovery latency or may be queuing in the interface queue or delay at MAC retransmission or may be time factor. This causes end to end delay of data packets. The time difference between every CBR packet sent and received was recorded, dividing the total time difference over the total number of CBR packets received gave the average end-to-end delay for the received packets.

$$Avg\_End-to-End\_Delay = \frac{\sum_{1}^{n} (CBRsentTime - CBRrecvTime\_)}{\sum_{1}^{n} CBRrec} \ldots\ldots Equation2$$

Formal for end to end delay Routing load

The number routing data packets transmitted per data packet delivered at destination. And also transmitted by each hop from source to destination.

1.6 The rest of papers organized

The rest of papers organized as follows: chapter gives a brief overview of generic area and identification of proactive and reactive routing protocols in MAINT network. Chapter 3 describes relative work done by others in order to solve the current state problem. Chapter 4 describes regarding OPNET simulator and the way of solving the problem by using different methodology. Chapter 5 describes analysis of project, performance evaluation of the results and mentioning the achievements from this work with future directions for research and objectives. Chapter 6 describes conclusion of the project which is archived by this project.

2. Conclusion:

We implemented two different types routing protocols in this project proactive and reactive. This two routing protocols implemented OPNET simulator. The significant observation is, simulation results agree with expected results based on theoretical analysis. The performance of these two protocols measured with different scenario like 1) packet delivery fraction 2) packet delay at end to end point 3) routing load. All this scenario of performance is I comparison of protocols.

The simulation results show that proactive routing protocols are better performance then reactive. It is also observed that the in heavy traffic load performance of the AODV is good. And when number of nodes are increased the performance will goes down for DSR. While working with OLSR, OLSR show small difference in entire simulation. Finally, based on our simulation results collected using our network conditions we conclude that the performance of the network rely on the network conditions and we confirm that the efficiency of a network can be achieved by choosing the best suitable protocols based on the network requirement as our results show performance variation on changing the network conditions.

3. References:

[1] David B. Johnson and David A. Maltz. Dynamic source routing in ad hoc wireless networks. Technical report, Carnegie Mellon University, 1996.

[2] Xiaoyan Hong, Kaixin Xu, and Mario Gerla. Scalable routing protocols for mobile ad -hoc networks. 2002.

[3] Mehran Abolhasan, Tadeusz Wysocki, and Eryk Dutkiewicz. A review of routing protocols for mobile ad hoc networks. Technical report, Telecommunication and Information Research Institute, University of Wollongong, Wollongong, NSW 2522; Motorola Australia Research Centre, 12 Lord St., Botany, NSW 2525, Australia, 2003.