Overview Of Comparative Analysis Of Routing Protocols In Mobile Adhoc Networks

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Abstract: *Mobile Ad-Hoc Networks (MANETs) are autonomous and decentralized wireless systems. Mobile Ad hoc Network is a collection of mobile nodes in which the wireless links are frequently broken down due to mobility and dynamic infrastructure. Routing is a significant issue and challenge in ad hoc networks. Many Routing protocols have been proposed so far to improve the routing performance and reliability. This research paper describes overview of the characteristics of routing protocols based on the different performance metrics like packet delivery fraction, Average delay, Normalized Routing load, Throughput and Jitter under low mobility and low traffic network as well as under high mobility and high traffic network. In first section of paper analyse the MANET definition. In second section of the paper described the related work. In the third section describe the types of wireless networks. In fourth section described various routing protocols. Finally present the conclusion and future work with the references.*

Keywords: MANET, Routing protocols, simulators etc.

1. INTRODUCTION

MANET stands for Mobile Ad hoc Network. It is a decentralized autonomous wireless system which consists of free nodes. MANET sometimes called mobile mesh network, is a self configurable wireless network. A MANET consists of mobile nodes, a router with multiple hosts and wireless communication devices. The wireless communication devices are transmitters, receivers and smart antennas. These antennas can be of any kind and nodes can be fixed or mobile. The term node referred to as, which are free to move arbitrarily in every direction. These nodes can be a mobile phone, laptop, personal digital assistance, MP3 player and personal computer. These nodes can be located in cars, ships, airplanes or with people having small electronic devices[7] . Nodes can connect each other randomly and forming arbitrary topologies. Nodes communicate to each other and also forward packets to neighbor nodes as a router. The ability of self configuration of these nodes makes them more suitable for urgently required network connection. For example in disaster hit areas where there is no communication infrastructure. It is greatly desired to have a quick communication infrastructure. MANET is the quick remedy for any disaster situation. MANET is a spontaneous network. It is useful when dealing with wireless devices in which some of the devices are part of the network only for the duration of a communication session.

2. RELATED WORK

Extensive research work has been done in the field of MANET routing protocols. Different routing protocols were simulated in different kind of simulators. Here we will discuss different research papers about MANET routing protocols performance.

A.Boomarani Malany , V.R.Sarma Dhulipala , and RM.Chandrasekaran,[1] presented a paper. In this paper they compared the performance of various routing protocols like Adhoc On-Demand Vector routing (AODV), Fisheye, Dynamic MANET On-demand (DYMO), Source Tree Adaptive Routing (STAR) protocol, Routing Information Protocol (RIP), Bellman Ford, LANd Mark Adhoc Routing protocol (LANMAR) and Location Aided Routing protocol(LAR). In this paper, they compared the routing protocols based on significant performance metrics like throughput and delay. In this experiment they gone through some problems like communication stoppage for short durations, difference in simulation times for same scenario conditions (of course was solved by running the simulator for more than 10 times). They also faced the problem of switching off of the scenario for higher node densities. It might be due to the processor capability (RAM usage). They obtained the consistent results as compared with the literature . They believe that their work could be more intuitive for researchers for protocol selection and their suitability of application in real time scenario analysis in ad hoc networks.

Kumar Manoj, Parmanand, S. C. Sharma & S.P. Singh,[2] had research on to accomplish , a number of ad hoc routing protocols have been proposed and implemented, which include Dynamic Source Routing (DSR), Destination Sequenced Distance Vector (DSDV) and ad hoc on-demand distance vector (AODV) routing. In this paper, they analyze the performance differentials to compare the above-mentioned commonly used ad hoc network routing protocols. They report the simulation results of three different protocols for wireless ad hoc networks having thirty nodes. The performances of proposed networks are evaluated in terms of number of retransmission attempts, Control traffic sent, Control traffic received, Data Traffic sent, Data Traffic received and throughput with the help of OPNET simulator. Data rate 2Mbps and simulation time 20 minutes were taken. For this above simulation environment, AODV shows better performance over the other two on-demand protocols, that is, DSR and DSDV. In this paper, OPNET Simulator has been used, they evaluated the performance of widely used ad hoc network routing protocols. The simulation characteristics used in this research, that is, the control traffic received and sent, data traffic received, throughput, retransmission attempts, and traffic received, are unique in nature, and are very important for performance evaluation of any networking protocol. Performance evaluation results for some ad hoc network protocols were previously reported, which primarily covered the impact of the fraction of packets delivered, end-to-end delay, routing load, successful packet delivery, and control packets overhead. In this paper, they perform a thorough analysis that includes additional parameters. For comparative performance analysis, they first simulated each protocol for ad hoc networks with 30 nodes. In case of wireless LAN, AODV shows good performance for the control traffic received, control traffic sent, and data traffic sent. However, DSDV shows better performance for data traffic received and throughput. DSR and DSDV show poor performance as compared to AODV for the control traffic sent and throughput. However, AODV and DSDV show an average level of performance for the data traffic received and data traffic sent, respectively.

Anuj K. Gupta, Dr. Harsh Sadawarti, Dr. Anil K. Verma,[3] presented a paper. In this paper is subjected to the on-demand routing protocols with identical loads and environment conditions and evaluates their relative performance with respect to the two performance metrics: average End-to-End delay and packet delivery ratio. They investigated various simulation scenarios with varying pause times. In this work is an attempt towards a comprehensive performance evaluation of three commonly used mobile ad hoc routing protocols (DSR, TORA and AODV). Over the

past few years, new standards have been introduced to enhance the capabilities of ad hoc routing protocols. As a result, ad hoc networking has been receiving much attention from the wireless research community. In this paper, using the latest simulation environment NS 2, they evaluated the performance of three widely used ad hoc network routing protocols using packet-level simulation. The simulation characteristics used in this research, that is, packet delivery fraction and end-to-end delay are unique in nature, and are very important for detailed performance evaluation of any networking protocol.

In short, AODV has the best all round performance. DSR is suitable for networks with moderate mobility rate. It has low overhead that makes it suitable for low bandwidth and low power network. Whereas TORA is suitable for operation in large mobile networks having dense population of nodes. The major benefit is its excellent support for multiple routes and multicasting.

Priti Garg, Asma Tuteja,[4] presented a paper. In this paper they comparing the relative performance of Ad hoc routing protocols; they compared on-demand and hybrid protocol; temporally ordered routing algorithm (TORA) and Dynamic Source Routing (DSR). This subjected the protocols to identical loads and environmental conditions and evaluates their relative performance with respect to quantitative metrics; throughput, average delay, packet delivery ratio and routing load. From the detailed simulation results and analysis of presented, they use NS-2 simulator for simulation of DSR and TORA protocol and variation occurs in mobility of packets, time interval between the packets sent and packet size of packets sent in throughout the protocols. The results of the both DSR and TORA routing protocol on various mobility, packet size and time interval metrics have been analyzed. The performance metrics to evaluate performance of DSR and TORA routing protocol includes routing load, average delay, packet delivery ratio and throughput to. Performance of TORA protocol at mobility variation of nodes has better throughput, packet delivery ratio and routing load than DSR protocol. But average delay of DSR is less as compared to TORA. High mobility results in frequent link failures but qualitative metrics throughput, routing load and packet delivery ratio outperforms at High mobility of TORA protocol. The overhead involved in updating all the nodes with the new routing information in TORA. Variation in time interval results better throughput, packet delivery ratio and routing load of TORA protocol but average delay is less in DSR than TORA. At packet size variation routing load, packet delivery ratio and throughput of TORA outperforms.

Shrikant Upadhyay, Pankaj Joshi, Neha Gandotra and Aditi Kumari,[5] had research on , to judge the impact of both reactive as well proactive type protocols by increasing the density of nodes in the network, keeping source node fixed and move the destination node and lastly, keeping the destination node fixed and move source node. In all the three cases, the performance of the routing protocol have been analyzed to improve and select efficient routing protocol for network setup and its designing for practical scenario. The performance matrix includes delivery fraction, packet loss and end to end delay. In this paper does the realistic comparison of three routing protocols DSR, AODV and DSDV in node mobility and node density increase in the network. In first scenario keeping source node fixed and destination node variation DSR routing protocol performance is quite well compared to AODV and DSDV. While keeping the destination node fixed and source node variation they again conclude that DSR performance improves much better compared to AODV as well as DSDV routing so, in second scenario DSR

performs efficient for the network. And the loss would be much in DSDV routing protocol. Finally, in the last scenario of work when the node density increases then DSDV performance deteriorate poorly and it goes nearly to zero value. Also, here the performance of DSR routing protocol is much better than AODV and DSDV. So, under high traffic condition DSR performs well and is good for engineers while designing any ad-hoc real scenario network.

N. Javaid$,A. Bibi, Z. A. Khan, U. Khan, K. Djouani, [6]given a paper in which evaluate and analyze the impact of different networks loads and varying no. of nodes on distance vector and link state routing algorithms. In this paper, they select three well known proactive protocols; Destination Sequenced Distance Vector (DSDV) operates on distance vector routing, while Fisheye State Routing (FSR) and Optimized Link State Routing (OLSR) protocols are based on link state routing and evaluate and compare the effects on the performance of protocols by changing the routing strategies of routing algorithm dms. In this paper also enhance selected protocols to achieve high performance. Performance analysis is done with respect to end to end delay, throughput, normalized routing load for evaluation and comparison of chosen protocols both with default and enhanced versions. For assessment of these protocols, select different traffic rates and scalabilities using NS-2. For scalability analysis, number of nodes are varied from 10 to 100 with packet size of 512bytes. For different traffic rates, 2, 4, 8, 16, and 32packs/s are selected for 50 nodes, whereas, size of the packet is set to 64bytes. To examine the behavior of protocols for both selected scenarios, simulations are run for 900s for packet with speed of 20m/s with pause time of 2s. The sources transmit Continuous Bit Rate (CBR) traffic. Bandwidth provided to all the wireless links is 2 Mbps. The nodes taking part simulation are randomly dispersed in an area of 1000m× 1000m using Random Way point Model. For the analysis, three performance parameters; E2ED, NRL and throughput are computed by using NS-2. Finally, we observed that OLSR is more scalable because of reduction of routing overhead due to MPRs, as OLSR allows retransmission through MPRs. FSR is more suitable for high network loads due to scope routing through GF (no flooding), which reduces broadcasting storm, thus saves, more bandwidth and achieves high throughput when data traffic increase different network and protocol parameters.

3. TYPES OF WIRELESS NETWORKS

The wireless networks types, a small difference between wired and wireless network will be discussed. A network that sends data from one point to another point with cable or wire is called wired network. The data sent over a network which uses wireless medium from one device to another device is called wireless network. In wireless network data is transmitted from one point to another through wireless links. For communication the devices have to be in the transmission or radio range of each other. Wireless networks are divided into two main groups such as infrastructure wireless network and Ad hoc or infrastructure-less network.

INFRASTRUTURE NETWORKS: Fixed network topology is deployed in infrastructure network. These deployed, fixed networks have base stations or access points from which wireless nodes can get connected. All the base stations or access points are connected with the main network through wired links (fiber optic, twisted or coaxial cable) or wireless links. The base station or access point is one of the important units of infrastructure networks. All of the

connections will have to pass from the access point. A wireless node can connect to anyone of the access points in its radio range.

ADHOC NETWORKS: An Ad hoc network is deployed where wireless network infrastructure is not available. This kind of ad hoc network is called infrastructure less network or ad hoc network. In infrastructure or ad hoc network each node is connected through wireless links. These nodes get connected to each other and also act as a router, by forwarding data to other wireless nodes. There is no restriction on these nodes to join or leave the network. Thus the network has no vital infrastructure. Ad hoc networks have two forms; one is static ad hoc networks (SANET), the other is called mobile ad hoc network (MANET). Commercial implementation of ad hoc network becomes possible due to the development of new technology such as 802.11[8].
The main reason to deploy this kind of network is the flexibility and easiness of deployment. MANET is a suitable network for emergency and surveillance use. But with all these qualities, ad hoc network operation is very difficult to handle. Each and every node is responsible for its operation to maintain its routing table and also forwarding packets to its neighbors as routers. MANET has a different topology change while deployed that's why it needs an efficient and reliable routing protocol. The construct of an efficient and reliable routing protocol is a tough and tedious task.

4. ROUTING PROTOCOLS:

There are several kinds of routing protocols for wireless ad hoc networks. These routing protocols are categorized as reactive or proactive routing protocols. The ad hoc routing protocols which have both proactive and reactive merits, is called hybrid routing protocols. The first kind of protocol is called reactive or on-demand routing protocol. The sec kind of protocol is proactive or table driven routing protocol[9]. The first kind of protocol is simply called Reactive MANET Protocol (RMP). In these kinds of protocols the communication is only possible when the source node requests to communicate with the other node. Reactive MANET Protocols are mostly suited for nodes with high mobility or nodes that transmit data rarely.

The sec kind of protocol is simply called Proactive MANET Protocol (PMP). Proactive routing protocol detects the layout of the network actively. A routing table can be maintained at every node from which a route can be determined with less delay. The proactive routing protocols provide good reliability on the current network topology and low latency for deciding a route.

Hybrid protocols exploit the strengths of both reactive and proactive protocols, and combine them together to get better results. The network is divided into zones, and use different protocols in two different zones i.e. one protocol is used within zone, and the other protocol is used between them. Zone Routing Protocol (ZRP) is the example of Hybrid Routing Protocol. ZRP uses proactive mechanism for route establishment within the nodes neighbourhood, and for communication amongst the neighbourhood it takes the advantage of reactive protocols. These local neighbourhoods are known as zones, and the protocol is named for the same reason as zone routing protocol. Each zone can have different size and each node may be within multiple overlapping zone[10].

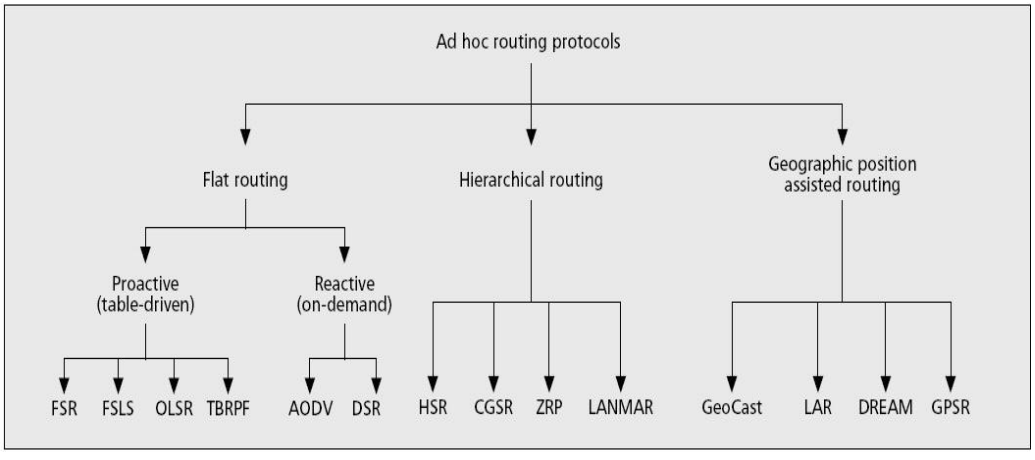

Figure 1**:** Classification of Adhoc Routing Protocol

5. CONCLUSION AND FUTURE WORK

Routing protocols in new modern arena of telecommunications, internet systems and in seamless communication play prominent role to develop better communication between end users. Different routing protocols have different attributes according to their environmental scenarios. The selection of suitable protocol according to the network definitely increases the reliability of that network, for example in case of mobile ad hoc networks routing protocols should be loop free according to our research. The research will not work only optimizing the different parameters also produce new protocols which will be better than the present protocol in one and other environment. The research work will be fruitful and beneficial for the society and researchers. In the future, It is possible to change the mobility and density of the network by directly modifying the speed and the number of nodes. It is also possible to change the characteristics of the network by changing the transmit power (as power increases, the impact of mobility decreases and the effective density increases). Other new protocols performance could be studied.

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