



Performance Analysis of Reactive Routing Protocol in MANET

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Abstract— *The Aim of this dissertation is Performance comparison of DSR,AODV routing protocols with respect to average energy consumption, To evaluate network load balancing proposed routing protocol , To analyze the effect of random based mobility model on the performance of re-acting routing protocol AODV and DSR, To Investigate energy aspects of various reactive protocols DSR,AODV, To Investigate Power consumption aspects of the MANET routing protocols, reduce mobile node workload and guarantee timeliness , Various important performance metrics of MANET such as average end to end delay packets dropped, packet delivery ratio, average energy consumed will be investigated to confirm the best routing protocol using NS 2.35 simulation. Our basic goal is to present vast information related to AODV protocol and modifications done to it to analyze its performance using different performance metrics such as packet delivery ratio, routing load,average end-to-end delay, throughput, jitter and packet drop rate. Our future research will be towards the enlargement of load balancing and highly energy efficient scheme for the mobile adhoc network.An effort to devise a scheme for the two protocols Adhoc on Demand Distance Vector Routing(AODV) and Dynamic Source Routing(DSR) have been compared using simulation,it would be interesting to note the behaviour of these protocols on a real life test bed.In this work the other network parameters such as number of mobile nodes,traffic type CBR,Simulation area etc. are kept constant,where as the simulation time is varied in the three different simulation scenarios.it would be interesting to observe the behaviour of these two protocols by varying these network parameters.*

Keywords— *Mobile adhoc network(MANET); DSR,AODV.*

I. INTRODUCTION

Mobile nodes in MANET are connected by wireless links and each node acts as a host and router in the network. They are characterized by their reduced memory, storage, power and computing capabilities. Mobile nodes are classified into two groups: Small Mobile Hosts (SMH) with reduced power, memory, storage and computing capabilities and Large Mobile Hosts (LMH) with more storage, power, communication and computing facilities than the SMHs. We focus especially on routing protocol for real-time applications where a number of them, including defense applications. Researches focus either on load aware for improving energy efficiency. The main problem is to choose the efficient, reliable and correct routing protocol to route real-time flows with respect to their deadlines without overload intermediate mobile nodes. Based on dynamic source routing (DSR) we introduce the Energy and Delay-aware Dynamic Source Routing protocol (ED-DSR) for MANET. ED-DSR is a routing protocol which uses information from the physical layer and the MAC layer in choosing routes, focusing on the energy efficiency, load aware and deadline guarantee of intermediate nodes without disturbing the flows already in their queue. Our goal in this paper is to evaluate network load balancing proposed routing protocol and its ability to reduce energy consumption, reduce mobile node workload and guarantee timeliness.

MANETs stands for Mobile Ad hoc Networks. Mobile implies "mobility". Ad hoc is a Latin word and it means "for this only". Ad hoc Networks are infra structure-less decentralized and self organizing. These networks are more economical over other networks as no infra structure costs are being involved. Ad hoc networks can be quickly and inexpensively set up whenever needed as no access points or base stations are involved. Wireless multi-hop ad-hoc networks are formed by a group of mobile users or mobile devices spread over a certain geographical area. We call the users forming the network as nodes. Each node is equipped with a radio transmitter and receiver which allow it to communicate with the remaining nodes. Nodes in an ad-hoc network can generate data and forwards to any other node in the network. Ad-hoc networks are more robust than conventional wireless networks because of their non hierarchical distributed control and management mechanism.

1. An Overview Of Ad Hoc On Demand Distance Vector (AODV) And Dynamic Source Routing (DSR) Routing Protocols

A. Dynamic Source Routing

DSR is a reactive (on-demand) routing protocol i.e. the routes are established only on-demand. It eliminates the concept of table-driven strategy. It doesn't use hello packet to inform its neighbors' of its presence. It uses source routing

mechanism. To establish a route it sends route request packet to all nodes in the network, where Route Request packet is a broadcast packet. After receiving the RREQ packet the intermediate nodes will broadcast the packet to its neighbors if they have not forwarded already. RREQ packet contains sequence number and the path it travelled on its header. DSR uses route-cache at intermediate nodes. Route cache is a memory that stores all information extracted from the source route contained in the data packet. On receiving the RREQ it responds to the source node with a unicast packet in the reverse path of RREQ packet. In DSR, once the route is established between source and destination node the sender specifies the complete path on the packet header that the packet needs to traverse in that route to reach the destination. Once the link is broken between nodes Route Error messages are generated and sent to all nodes in the network. It maintains multiple routes per destination. In practical scenario, it consumes more power when compared to AODV protocol.

B. Ad hoc On-Demand Distance Vector(AODV)

AODV is a reactive routing protocol i.e. the routes are established only on-demand. The path with highest sequence number is considered to be the most recent path. Once AODV protocol is enabled each and every node stores the next hop information for packet transmission. In AODV, the source node broadcasts the RREQ packet when it doesn't have the valid route to the destination. An intermediate node that receives a RREQ packet replies to the source node using a RREP packet provided the destination sequence number should be greater than or equal to the sequence number contained in the RREQ packet. A node will update the path to a particular destination if the sequence number of the packet received is greater or equal to the sequence number stored previously on that node. Sequence numbers are used to avoid loop formations. Intermediate nodes make a note of source IP address and broadcast ID of every RREQ packets to avoid forwarding duplicate RREQ packets. In AODV, all nodes maintain a table instead of route-cache memory. It is a loop free routing protocol. Once the source node receives the RREP packet it starts forwarding the data packets to the destination.

2. Energy optimization in DSR and AODV

An energy efficient routing protocol decreases the power consumption of the nodes by routing data on paths that consume the least amount of energy. There are some special mechanisms to achieve this goal. This is used in efficient caching technique for storing information to propose an energy efficient routing protocol. They showed that it has a better performance in terms of energy savings compared to DSR protocol. Moreover, proposed a loop-free energy conserving scheme which tries to decrease routing and storage overhead to provide optimization of resources use in large scale networks. It is based on source routing and named Energy Conserving Dynamic Source Routing (ECDSR). They also evaluated the performance of this scheme by simulation and showed better results. Furthermore proposed a comprehensive energy optimized routing algorithm based on AODV protocol. This algorithm was created based on the combination of device runtime battery capacity and the real propagation power loss information. Moreover proposed algorithm used the AODV routing protocol to select the optimal route based on the basis of the maximum energy of each route. Furthermore proposed a new routing algorithm based on the energy level of the node. The results showed the advantages of this protocol in terms of energy consumption. In addition investigated AODV based algorithm with less energy consumption during route founding by establishing routes that are lower congested than the others. Their scheme decreased more than 20 % of total energy consumption. This is presented new routing protocol EMRP by combining the prediction of the node mobility and residual energy state. According to simulation results, EMRP can increase the lifetime of the network.

II. RELATED STUDY

Jihen Drira Rekik et.al.[1]- Choosing the shortest path for real-time flows is insufficient. Respecting the deadline can not be insured nor guaranteed neither with exhausted energy resource nor with overloaded intermediate mobile nodes. The main problem is to choose the reliable, efficient and correct routing protocol to route real-time flows with respect to their deadlines within MANET constraints. This paper introduces the Energy Delay aware based on Dynamic Source Routing, ED-DSR. ED-DSR efficiently utilizes the network resources such as the intermediate node energy and load in order to balance traffic load. It ensures both timeliness and energy efficiency by avoiding low-power and busy intermediate nodes.

G.Rajkumar,et.al.[2]- The main objective of the paper is to increase the throughput thereby reducing the routing overhead and jitter between nodes. To achieve this, it is proposed to go for reactive routing protocols. Proactive routing protocols use table-driven Amit Kumar Sanghi strategy that is the routing tables are exchanged periodically between nodes which results in more energy consumption. To overcome these problems, we go for DSR and AODV. These routing protocols use on-demand strategy that is the routes are established from source node to destination only on demand which minimizes the jitter level.

Amit Kumar Sanghi et. al.[3]- Mobile ad hoc networks (Manets) are gaining a lot of concentration in research in recent times due to their importance in enabling mobile wireless nodes to communicate without any existing wired or predetermined infrastructures. One of the main features of mobile ad hoc network lies in the vibrant topology. As the nodes move within the network, the links between nodes are often formed and broken down. The node flexibility affects not only the source and destination, as in a conventional wireless network, but also the intermediate nodes. This happens

on account of the multichip nature of the ad hoc network. Because of this the resulting routes can be extremely volatile, making successful ad hoc routing highly flexible and dependable on these topologies changes occurring due to efficient reaction to it. Structure of the network changes rapidly. This is mainly due to the mobility of nodes. The nodes in the network not only act as hosts but also as routers that route data to or from other nodes in network.

Mehdi Barati et. al.[4]- Proposing energy efficient routing protocols for Mobile Ad hoc Network (MANET) and Wireless Sensor Network is an challenging task. Many different routing protocols based on different features have been proposed to the performances of many of these routing protocols have been evaluated focusing on metrics such as delay, routing overhead, and packet delivery. However, no studies have been done to investigate energy aspect of these routing protocols. Thus, this paper will discuss about the power consumption aspect of the MANET routing protocols. A performance comparison of Dynamic Source Routing (DSR) and Ad hoc On-Demand Distance Vector (AODV) routing protocols with respect to average energy consumption and routing energy consumption are explained thoroughly. Finally, an evaluation of these routing protocols based on energy consumption is presented.

Rashmi Rohankar et. al. [5]- With emerging trend in technology wireless networks allow user to travel from one location to another. Mobile Adhoc network (MANET) is one of the subareas of wireless network that dynamically form infrastructure less temporary network. MANET is a collection of intercommunicating mobile nodes forming a temporary network without any centralized administration. Due to the dynamic property of mobile nodes in MANET, they require good routing protocol. This paper analyzes the effect of random based mobility models on the performance of Proactive Routing Protocol (DSDV-Destination Sequence Distance Vector) and Reactive Routing Protocol (AODV- on Demand Distance Vector, DSR- Dynamic Source Routing). Performance analysis is done with respect to end-to-end delay, throughput and Packet delivery ratio for varying node densities.

Muhammad Imran Malik et.al.[6]- Mobile ad hoc networks (MANETs), due their inherent resource constraints and other limitations has prompted the researchers to device energy and bandwidth efficient transmission techniques and protocols. This objective has confronted scientists with the conflicting requirements of energy efficiency and latency. Most of the well known energy efficient protocols like ad hoc on demand distance vector (AODV) protocol and dynamic source routing (DSR) protocol although provide solution for the efficient utilization of the battery power of network nodes but on the other hand, end to end transmission delays are not catered properly. In this paper we proposed a novel cross layer approach to mitigate the latency issues inherently present in the AODV at the same time maintaining the efficient use of battery power. We used received Log-Likelihood ratios (LLR) at each node as the decisive parameter whether or not to participate in the transmission. Hence the nodes deciding against taking part in transmission save lot of energy. The proposed LLR based approach adapts itself according to the nature of traffic. If there is real time traffic, the nodes operate at high transmission power and in case of non real time traffic the transmission power is low. We have applied these modifications in the AODV and the resulting scenario has been simulated with the NS2. Simulation results proved that our scheme conforms to the standards of real time traffic as well as maintain the same energy efficiency.

G. Rajkumar et.al.[9] - The main objective of the paper is to increase the throughput thereby reducing the Network Load and end to end delay between nodes. To achieve this, it is proposed to go for reactive routing protocols. Proactive routing protocols use table-driven strategy that is the routing tables are exchanged periodically between nodes which lead to more bandwidth and power consumption. To overcome these problems, we go for DSR and AODV. These routing protocols use on-demand strategy that is the routes are established from source node to destination only on demand which minimizes the delay and packet loss. Using "Network Simulator 2.35" the performance of AODV and DSR protocols are compared for large number of nodes in the presence of ambient noise level whereas in the existing works lesser number of nodes is only considered. From our results it is evident that AODV protocol consumes lesser power than DSR and in the presence of high network load, AODV outperforms DSR by yielding higher throughput with less delay.

Sajal Sarkar et.al.[10]- In this paper, we propose a mobility factor based path selection scheme in Mobile Ad-hoc Network (MANET). In MANET, Nodal mobility is one of the important issues to determine the potential capacity of ad hoc networks. Various mobility metrics have been proposed in the literature as measurement of topological changes in networks. All such metrics describe the link or path stability to allow adaptive routing in MANET based on predicted link behaviour. We investigate and find that a path can become reliable and the average throughput of the network can increase if we select a route considering the mobility of the network nodes. Our proposed scheme selects the nodes to construct a path based on their mobility. In our work a trust value is generated by a trust module that calculates and compares mobility of the concerned nodes. Simulation results show that our proposed scheme performs better than pure Ad hoc On-Demand Distance Vector (AODV) and Dynamic Source Routing (DSR) protocols.

David B.Johnson et.al.[11]- In this paper the authors evaluated the operation of DSR through detailed simulation on a variety of movement and communication patterns, and through implementation and significant experimentation in a physical outdoor ad hoc networking test bed have constructed in Pittsburgh, and have demonstrated the excellent performance of the protocol. In this paper, they described the design of DSR and provide a summary of some of simulation and test bed implementation results for the protocol. The Dynamic Source Routing protocol (DSR) is a simple and efficient routing protocol designed specifically for use in multi-hop wireless ad hoc networks of mobile nodes. The

protocol is composed of the two mechanisms of Route Discovery and Route Maintenance, which work together to allow nodes to discover (Figure 2.1) and maintain source routes to arbitrary destinations in the ad hoc network. The use of source routing allows packet routing to be trivially loop-free, avoids the need for up-to-date routing information in the intermediate nodes through which packets are forwarded, and allows nodes forwarding or overhearing packets to cache the routing information in them for their own future use. DSR is also one of the few Ad Hoc Routing Protocols that have been implemented and evaluated in a real test bed. DSR was used in many performance comparisons, evaluating studies, and was used as a reference for a lot of other protocols.

III. PROPOSED WORK

The Objective of this work is to evaluate two routing protocols based on demand behavior namely, the Adhoc on Demand Distance vector(AODV) and the Dynamic Source Routing(DSR),for wireless Adhoc networks based on performance.This evaluation is to be carried out through exhaustive literature review and simulation. This paper focus on power consumption aspect of MANET routing protocols. Different energy efficient routing protocols have become studied. On metrics such as average routing overhead, end delay and packet delivery ratio.Evaluation of routing protocols based on energy consumption is presented.

The General objectives can be studied as follows:

- 1)Get a General Understanding of Adhoc networks.
- 2)Literature Review of AODV and DSR.
- 3)Generate a Simulation Environment that could be used for further studies.
- 4)Implement AODV and DSR routing protocols for wireless Adhoc networks.
- 5)Analyze the protocols and through simulation and verify it on the basis of Literature Review.
- 6)Discuss the Result of the Proposed Work.

IV. RESULTS AND DISCUSSION

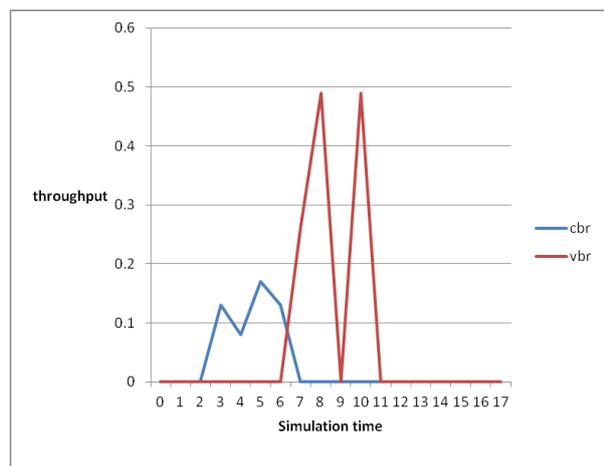
In this section the results obtained are presented from the simulations. This section focuses on result and its analysis based on simulation performed in NS-2.34 Simulator. To compare the performance of DSR and AODV. Consider the performance metrics of throughput and simulation time. Table 1 represents AODV,Table 2 represents DSR.AOVV and DSR also represents graphically.

TABLE 1. AODV

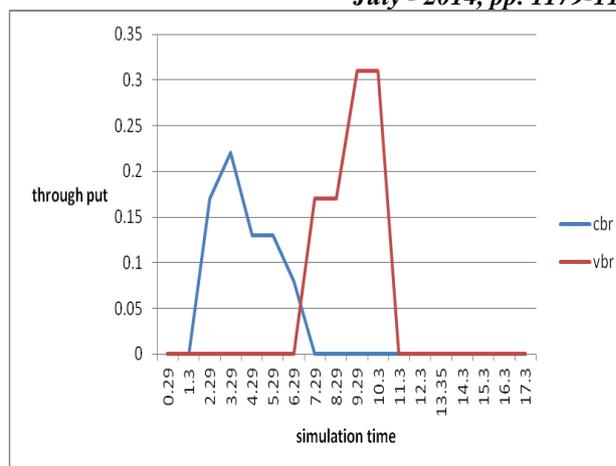
simulation time	Cbr	Vbr
0.05	0	0
1.05	0	0
2.05	0	0
3.04	0.13	0
4.04	0.08	0
5.04	0.17	0
6.04	0.13	0
7.04	0	0
8.04	0	0.49
9.04	0	0.13
10.05	0	0.53
11.05	0	0.13
12.05	0	0
13.05	0	0
14.05	0	0
15.05	0	0
16.05	0	0
17.05	0	0

TABLE 2. DSR

simulation time	Cbr	Vbr
0.29	0	0
1.3	0	0
2.29	0.17	0
3.29	0.22	0
4.29	0.13	0
5.29	0.13	0
6.29	0.08	0
7.29	0	0.17
8.29	0	0.17
9.29	0	0.31
10.3	0	0.31
11.3	0	0
12.3	0	0
13.35	0	0
14.3	0	0
15.3	0	0
16.3	0	0
17.3	0	0



GRAPH AODV



GRAPH DSR

V. CONCLUSION

This project compared the performance of AODV and DSR routing protocols for Ad-hoc networks using ns-2 simulation. We have presented a detailed performance comparison of important routing protocols for mobile Ad-Hoc wireless networks. AODV and DSR are reactive protocols. Both reactive protocols performed well in high mobility scenarios than the proactive protocol. The high mobility result in highly dynamic topology i.e. frequent route failures and the changes. Both proactive protocols fail to respond fast enough to the changing topology. Routing overhead in the Proactive protocols remains almost constant. Both AODV and DSR use reactive approach to the route discovery, but with the different mechanism. The DSR uses source routing and the route cache and does not depend on their timer base activity. On the other hand AODV uses routing tables, one route per destination, and sequence number to maintain route. General observation from simulation is that DSR has performed well compared to all other protocols in terms of Delivery ratio while AODV outperformed in terms of Average delay. DSR however generates lower. Three different simulation scenarios are generated and Simulation time has varied from 10 sec, 15 sec and 20 sec. Other network parameters are kept constant during the simulation.

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