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Performance evaluation of AODV and DSR based routing protocol for mobile adhoc network

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Abstract **- The significance of ad-hoc wireless is growing in the wireless sector. Ad-hoc wireless networks offer an edge over other developing network technologies such as Internet Protocol (IP) or cell coverage. Manet (Mobile Ad Hoc Network) is a network of mobile phone users that interact over a limited wireless connection and battery life. Meanwhile, various protocols for ad-hoc routing have been developed. Ad hoc routing methods, on the other hand, are not without flaws. This shows an AODV-EXT-BP-DSR half-breed convention. You'll find all of the characteristics of both AODV and AODV in this convention. This suggested convention contains better information because of the AODV convention, and the DSR protocol makes it more dependable. It also reduces energy usage and improves information transmission efficiency by using the Bayesian probability hypothesis.**

Keywords - Adhoc Wireless Network; Routing; Adhoc Routing Protocol; Ad-hoc On-demand Distance Vector(AODV); Dynamic Source Routing (DSR); Destination-Sequenced Distance-Vector(DSDV).

I. INTRODUCTION

During the preceding two decades, wireless connections have witnessed rapid growth and widespread use. Advances in communication theory and the invention of low-cost, power-efficient mobile devices are largely responsible for wireless systems' success. Wireless communication networks provide bandwidth and services that are equivalent to

ISSN- 2394-5125 VOL 07, ISSUE 02, 2020

conventional networks [1].

Wireless local area networks (WLANs), cellular wide area networks (WANs), and wireless personal area networks (WPANs) are all becoming more common. Millions of mobile professionals and many big organizations use wireless technology to handle business difficulties and achieve a competitive edge. In telecommunications, wireless communication is used to send data across short or long distances.

For today's generation, the computer sector has emerged as a lifeline. Infrastructure networks, in which each mobile unit inside the network connects to and interacts with the closest base station, and Ad hoc networks, which lack infrastructure support [1], are the two kinds of mobile networks. MANETs (massively parallel ad hoc networks) are self-organizing, self-configuring networks that do not need any kind of permanent infrastructure. Because all nodes are dynamically and randomly positioned, they must relay packets for other nodes in order to transport data throughout the network.

MANETs (Mobile Ad hoc Networks) are made up of a collection of wireless mobile devices with no fixed infrastructure [2]. Quick deployment, low cost, flexibility, inherent mobility support, and resilience are all benefits of MANETs. Military, search and rescue, temporary networks, and mobile computing may all benefit from MANETs with these qualities [3]. Dynamic topologies, bandwidth limits, variable capacity connections, energy-constrained operation, and insufficient physical security are all characteristics of MANETs. As a consequence, standard wired network routing approaches are inadequate for this sort of dynamic environment. It's simple to understand why an on-demand technique is widely used in Wireless Ad-Hoc Network scenarios [4] due to bandwidth constraints. The goal of MANET routing is to find the best way to the destination by taking into account communication overhead, latency, and power while using the majority of available hosts to reduce transmission failure. Machine learning and data mining have been utilized by some academics to reduce energy usage [5][6][7].

ISSN- 2394-5125 VOL 07, ISSUE 02, 2020

II. RELATED WORK

The DSR protocol is a reactive, on-demand routing system that selects the best route automatically as and when it is required. The DSR routing protocol, for example, may be used to govern networks without the need for a central server. This protocol finds pathways between the source node and the destination node as part of the route discovery process. Data packets in DSR retained the routing information of all intermediate nodes in their headers in order to reach a certain destination. If the routing information for a source node changes at any time, DSR updates the routing information [10]. Intermediate routers do not need routing information in order to route traffic, but they do retain it in case they need it. DSR intended to decrease network overhead and enable wireless networks by developing self-organizing and self-configuring protocols. The DSR protocol's routing consists of two phases. During route discovery, the source node builds a route by flooding route request packets (RREQ).

An RREQ has two IP addresses: the source and the destination. While it's conceivable that the current node isn't a target, it's more probable that the trajectories of nearby nodes will be combined. Each mobile host in the Adhoc network has a route cache to learn new routes. Before delivering the packet on its journey, the receiving host checks its route cache for a source path to the destination. If a route entry is discovered, a packet is sent depending on it. If no route entries are identified, the sender may use the route discovery approach to find a route. While waiting for the route to be determined, the sender host might broadcast or forward additional packets. It's crucial to keep in mind that after you've found the route, you'll use it to transmit.

A route may be maintained in two ways: by recognizing hop-by-hop at the data connection layer and by acknowledging end-to-end at the data connection layer. Hop-by-hop acknowledgement, a data connection layer approach that permits early packet detection and retransmission, allows for early packet detection and retransmission. If the data connection layer detects a catastrophic transmission fault, an error packet is issued to the sender. The route error message contains information about the node that reported the

ISSN- 2394-5125 VOL 07, ISSUE 02, 2020

issue and who tried to transmit the packet. The hop is deleted from a node's cache and any routes that contain it are compressed when an erroneous route packet is received. As a consequence, end-to-end acknowledgement is used when wireless communication between two hosts does not work equally effectively in both directions. It is feasible to communicate between the two end nodes and perform route maintenance.

Transport layer acknowledgements or responses were used to communicate the condition of the route from one host to another. With end-to-end acknowledgment, there's no way of knowing which hop went wrong. DSR has the benefit of not needing the network to provide frequent updates on neighbors or connection status information. By eliminating the need for regular changes to be delivered over the network, this reduces network overhead. For both activities, DSR functions on a demand basis. Several routes to the same destination may be saved by a node. It's done in DSR by listening to passing traffic or storing other routes while looking for a single one. Because alternate routes to the destination are already available, DSR will utilize a caching route instead of a route discovery if a route fails. DSR routing technology is distinguished by [8] in addition to network flexibility.

The DSR routing protocol allows data to be sent across a variety of networks. When nodes from various types of networks form Ad hoc networks, DSR considers them as Ad hoc networks, and the protocol handles them accordingly. Unidirectional connections are allowed. There are many methods to enhance the basic route-finding algorithm. Each route request may contain a counter to reduce excessive broadcasts. The number is incremented by one for each node that rebroadcasts the request. If nodes are aware of the maximum network diameter, they may refuse a request if the counter surpasses it. A node may store path segments from recent requests. These components may now be used to react to other route requests considerably faster. A node may use packet headers to update its cache while forwarding other packets.

To guarantee that all routes have the most up-to-date route information, this protocol

ISSN- 2394-5125 VOL 07, ISSUE 02, 2020

employs destination sequence numbers. Each node has a distinct sequence number. When an intermediate node receives a broadcast packet from a neighbor, it saves the information in its route table and creates a reversal path. As a result, when it reaches its destination or intermediary node, it sends an RREP (route reply) packet back to the neighbor who sent it.

When nodes migrate, the topology changes, and the goal is to build routing paths with less RREQ packets than the other protocol. The modified AODV protocol (R-AODV) uses reverse route discovery to identify routes on demand. This is accomplished by the destination node sending an R-RREQ message to identify the source node after receiving an RREQ message from the source node. When the source node gets an R-RREQ message, data packet transmission commences immediately.

Because only active routes are documented in AODV, this is the case. As a consequence, this protocol lacks scalability, performs poorly in large networks, and does not support asymmetric connections [9]. In today's ad-hoc networks, routing strategies produce a separate route for each source and destination combination. Links in a route may become momentarily unavailable due to node mobility, node failure, and the dynamic features of the radio channel, making it invalid.

In its approach, Method [10] incorporates elements of both DSR and ADR. It employs bobby-hop coordination in the same way as DSR does, and it employs DSDV in the same way that DSR does. This is because, for example, each center is aware of the DSDV system. In addition, each relationship's core points are recorded in their own coordination table. In an organization or division, there is a database that keeps track of all the center points. Furthermore, each center communicates the whole of its coordination table to its neighbors. As a result, you may be certain that your neighbor's bob will direct you to a successful destination. There is no limit to how many times you may check for quality issues.

ISSN- 2394-5125 VOL 07, ISSUE 02, 2020

III. METHODOLOGY

AODV and DSR are two conventions that need to be improved. Benefits from the AODV and DSR conventions are integrated [11] [12]. Packets are transmitted using RREQ, a new packet in the upgraded [12] AODV protocol. The number of intermediate nodes between the source and destination is determined using Bayesian Probability. All nodes between a source and a destination are included in the standard AODV protocol. A Bayesian likelihood-based RREQ, on the other hand, will include a predetermined number of hubs. There will be no need for duplicate bundle retransmission as a result of this. It also helps to lessen the quantity of congestion in the workplace. It also cuts down on the quantity of energy used. As a consequence, routing overhead is reduced to a minimum. When compared to the basic RREQ system [12], a reduction of 3.3 percent in power utilization was realized.

Some of the advantages of the DSR method are as follows: If a route is kept, it is just between nodes. This saves you both time and money. The route may also be stored to save time on route discovery. From a single route detection, route cache information from intermediate nodes may be used to build several routes.

The AODV convention has various benefits, including the ability to post courses on demand and the ability to utilize objective arrangement numbers to find the best appropriate courses. There has been a decrease in the quantity of As a consequence, the HELLO messages that allow course preservation are restricted in scope, avoiding needless overhead in the system.

The following are the stages of the hybrid AODV EXT BP DSR protocol:

Step 1: Create your MANET by broadcasting an RREQ message on your local network [12] and assigning mobile nodes using the AODV EXTBP protocol [11].

Step 2: As with AODV [12], a Bayesian probability is utilized to determine how many

ISSN- 2394-5125 VOL 07, ISSUE 02, 2020

hubs are saved in the RREQ-header on MANET and if a backlink is established. The RREQ will be predicated on a Bayesian probability of one if there are only five hubs in a network. If the probability is 0.50, only n/2 hubs will get messages.

According to study, when the probability is between 0.3 and 0.4, power consumption is optimal [12]. This is particularly true for businesses with fewer than 30 hubs and probability values of 0.3 or 0.08. Parceling is most likely to happen in companies with 70 to 100 hubs, with a probability of 0.5. You may see a list of the hubs you've gathered in the RREQ when you arrive at the target.

Step 3: In RREP postings, node lists are added. To unicast RREP postings, reverse links and node-list are utilized, while forward links are supplied as in AODV. Even for an intermediate node, the node-list for the remaining route to the destination may be generated using nodes discovered in the RREQ obtained, as well as nodes found in its routing-table for the remaining route to the destination, as long as its routing table has been updated.

Step 4: When the root node delivers data to a destination, it includes Node-list in the packet-header, which sends the packet to all forward connections and the node-list.

IV. RESULT ANALYSIS

MATLAB is used as a network simulator for the performance analysis of DSR, AODV, and Hybrid Routing Protocols. The purpose of this set of experiments is to evaluate and compare the performance of AODV, DSR, and Hybrid Routing Protocols in Mobile Ad hoc Networks.

Figures 1 and 2 provide a graph showing the relationship between throughput and the number of nodes. The throughput of the hybrid protocol is greater and stays constant as the number of nodes density increases. It is due to the use of optimal route finding and local repair in the event of a connection failure.

ISSN- 2394-5125 VOL 07, ISSUE 02, 2020

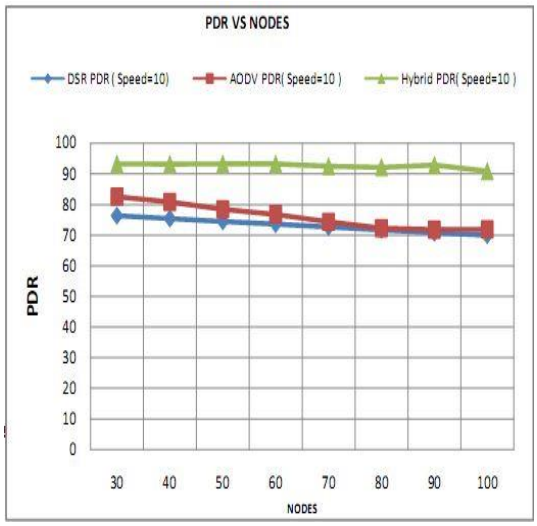

Figure 1 Throughput vs. nodes for node speed 10 m/s

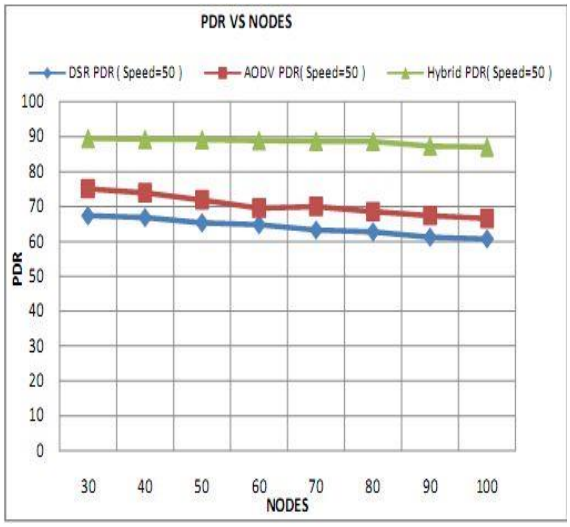

Figure 2:- packet Delivery ratio vs. nodes for node speed 50 m/s

There is a decrease in throughput as the number of nodes on a network increases. Routing takes longer to transmit packets to the destination because of the retransmission attempts because packets sent to the destination are lost during transmission. The hybrid protocol's throughput decreases somewhat as the node's speed rises. The throughput of the Hybrid Routing Protocol improved at node speeds of 10 m/sec and 50 m/sec, respectively, as compared to DSR and AODV Routing protocols. According to DSR, the lowest and maximum improvements in comparison to AODV Routing Protocol are 17.4 percent and

ISSN- 2394-5125 VOL 07, ISSUE 02, 2020

28.1 percent, respectively.

For both AODV and DSR, energy consumption increases as the number of nodes grows, but the hybrid protocol's energy consumption is exceptionally low at both low and high speeds. This is shown in Figures 3 and 4. When comparing low and high node speeds for the Hybrid Protocol, there is no difference in energy consumption.

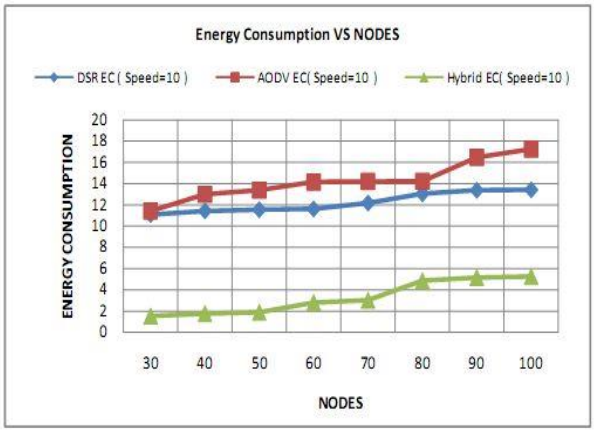

Figure 4:- Energy consumption vs. no. of nodes 10m/s

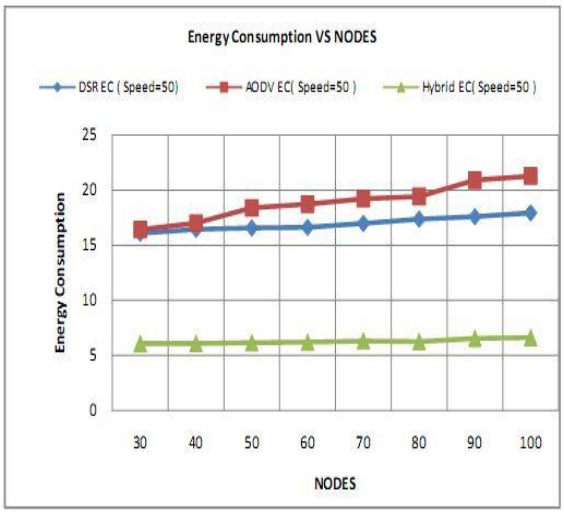

Figure 4:- Energy consumption vs. no. of nodes for 50m/s

Nodes traveling at 10 m/sec and 50 m/sec were found to use less energy using the Hybrid Routing Protocol than with the DSR and the AODV protocols. Both DSR and AODV

show gains of 86.36 and 63.12 percent when compared to DSR and AODV, respectively.

CONCLUSION

It is a network of mobile phone users that communicate by utilizing very restricted wireless connection and a short battery life, referred to as MANET (Mobile Ad Hoc Network). Many protocols for ad-hoc routing have been created during this time period as well. Ad hoc routing approaches, on the other hand, are not without their drawbacks. In this image, you can see an AODV/EXT/BP/DSR half-breed convention. It includes all of the properties of both AODV and this recommended convention, and it contains more information because of the AODV convention, and it is more trustworthy because of the DSR protocol. By using the Bayesian probability hypothesis, it is also possible to minimize energy consumption and information transmission efficiency.

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