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Scenario Based Performance and Comparative Simulation Analysis of Routing Protocols in MANET

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ABSTRACT: A mobile ad-hoc network (MANET) is composed of mobile nodes without any infrastructure. Mobile nodes self-organize to form a network over radio links. The goal of MANETs is to extend mobility into the realm of autonomous, mobile and wireless domains, where a set of nodes form the network routing infrastructure in an ad-hoc fashion. The majority of applications of MANETs are in areas where rapid deployment and dynamic reconfiguration are necessary and wired network is not available. These include military battlefields, emergency search, rescue sites, classrooms and conventions, where participants share information dynamically using their mobile devices. These applications lend themselves well to multicast operations. In addition, within a wireless medium, it is crucial to reduce the transmission overhead and power consumption. Multicasting can improve the efficiency of the wireless link when sending multiple copies of messages by exploiting the inherent broadcast property of wireless transmission. Hence, reliable multicast routing plays a significant role in MANETs. However, to offer effective and reliable multicast routing is difficult and challenging. In recent years, various multicast routing protocols have been proposed for MANETs.

KEYWORDS: Mobile ad-hoc network (MANET); Multicast routing protocol; Taxonomy; Mobile node; Routing table

I. INTRODUCTION

Multicasting is the transmission of packets to a group of zero or more hosts identified by a single destination address. MANET [1] is a self-configurable system and hubs are allowed to move in anyplace inside of the scope of the system, so topology might change and this occasion is erratic. MANET member don't require access point or construct stations, and rather depend with respect to one another to build up a makeshift system; peers impart past their individual transmission ranges by steering parcels through halfway nodes. As indicated by these attributes, steering is a basic issue and we ought to pick a proficient directing convention to makes the MANET dependable [4]. MANET having unmistakable sorts of steering convention which working procedure of distinctive conventions might gives diverse result on the diverse sorts of situation. AODV is maybe the most surely understood directing convention for MANET[12], which is a bounce by-jump responsive (On interest) source steering convention, AODV just needs to keep up the steering data about the dynamic ways of the diverse hubs. Dynamic Source Routing (DSR) is a directing convention for remote cross section systems [7]. It is like AODV to make a course when it required on interest. Two sorts of operation have performed by DSR first to find the course for transmission information parcels from source to destination and second to keep up the transmission way where bundles are conveyed. Destination-Sequenced Distance-Vector Routing (DSDV) is a table-driven steering convention for specially appointed portable systems[16]. Untouched, it keep up directing table of which have all data about dynamic hubs. The directing conventions chose for the present assessment research incorporate DSR, AODV and DSDV. These have been chosen in light of the fact that they have been broadly researched in the writing in the course of recent years [3].

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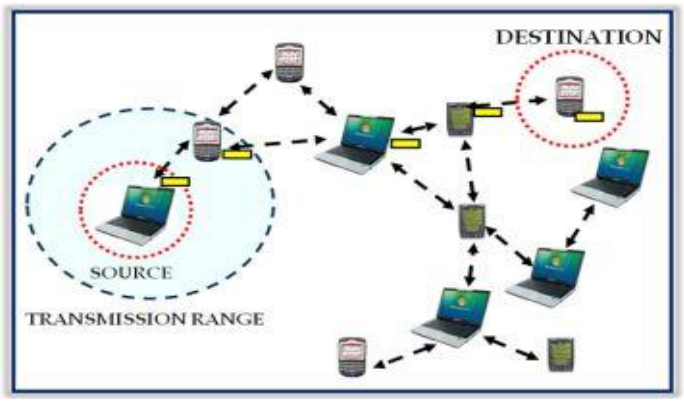

Figure 1.1 Mobile Ad hoc Network

II. ROUTING PROTOCOLS

Depending on the application, different architectures and design goals/constraints have been considered for adhoc networks [5]. Performance of a routing protocol is closely related to the architectural model. So, routing protocols have been categorized under different sections shown in fig. Although aim of these protocols is the same: maximize throughput while minimizing packet loss, control overhead and energy usage still they give different results in different scenarios. Routing protocols are categorized under following headings but they are interrelated or dependent on each other.

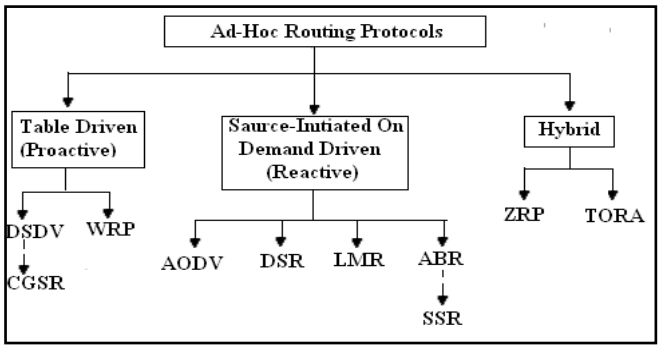

Figure 1.2 Classifications of MANET Protocols

A. Source-Initiated Routing Protocols (Reactive protocols)

Source-initiated routing represents a class of routing protocols where the route is created only when the source requests a route to a destination. Routing process is subdivided into route discovery and route maintenance [19]. The routing process starts with route discovery in which network is flooded with route request packets. Once a route or multiple routes are obtained to the destination. Few of the reactive protocols are under listed:

Dynamic Source Routing (DSR)
Adhoc on demand distance vector (AODV)
Temporally ordered routing algorithm (TORA)
Signal stability based adaptive routing (SSBR)
Ant colony based routing algorithm (ARA)

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B. Proactive Routing Protocols (Table driven)

The class of proactive protocols maintains updated information of routes at every node about the source and destination of a packet[17]. Also, route updates are propagated throughout the network to keep the routing state information up to date. Few of the proactive protocols are as follows.

Destination-Sequenced Distance vector (DSDV)
Optimized link state routing (OLSR)
Cluster head gateway switch routing (CGSR)
Wireless routing protocol (WRP)

C. Hybrid Protocols

The hybrid routing schemes combine elements of reactive and proactive protocols. It has been observed that the areas where the links change relatively slowly are more compliant to proactive protocols whereas the areas of high mobility are more appropriate for reactive protocols.[1] after combining the concepts of both we get hybrid protocols which increases the overall performance of packet routing[14]. Hybrid protocols are as follows:

Zone routing protocol (ZRP)
Fish eye state routing (FSR)
Landmark Adhoc routing (LANMAR)
Distributed dynamic routing (DDR)
Hybrid ant colony optimization (HACO)
Adhoc networking with swarm intelligence (ANSI)

D. Location Aware

Location Aware protocols represent the collection of protocols in which the co ordinates of the respective nodes are determined by Global positioning system and the location of every node is known to every other node. This class of protocols participates in predictive routing[11]. As the position of a node changes due to mobility, routes from source to destination needs to be updated. In [8] authors have used the concept of location aware routing to predict the nodes mobility to find optimized route from source to destination. Few representatives of this class are:

Location Aided Routing (LAR)
Distance Routing Effect Algorithm for Mobility (DREAM)
Greedy perimeter state routing (GPSR)
Dynamic route maintenance (DRM)

E. Multi-path

Adhoc networks are a collection of nodes scattered over a large area and connected through wireless links. Fig .There may be set of hops between source and destination and multiple paths or routes through which the data packets can travel. So the shortest or optimal path for packet delivery should be chosen. The main advantage of this scheme is the path with less number of hops or less congested may be chosen in order to deliver the packet in time securely[13]. Protocols under this section are:

Caching and multipath routing protocol (CHAMP)
Split multipath routing (SMR)
Secure multipath routing (SecMR)

F. Hierarchical Protocols

As the size of network increases, routing table sizes and control packet overhead also increase. The main idea behind hierarchical protocols is to reduce this overhead. Hierarchical ad hoc routing clustering techniques to form tree like structure of nodes. Nodes at the higher levels of the hierarchy provide special services, improving the scalability and the efficiency of routing. [19] Hierarchical state routing (HSR), Core extraction distributed adhoc routing and hierarchical landmark routing are few protocols under this class.

G. Multicast Protocols

Real time applications like video streaming, teleconferencing require the concept of multicasting, where one sender transmits the data to many receivers simultaneously [12]. Although the protocols under this class are source initiated

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Dynamic core based multicast routing (DCMP) Energy efficient multicast routing Genetic algorithms for group multicast Content based multicasting (CBM).

III. EXISTING SYSTEM

In existing framework, inspects two directing conventions for versatile specially appointed networks– the Destination Sequenced Distance Vector (DSDV), the table-driven convention and the Ad hoc On-Demand Distance Vector steering (AODV)[19], an On –Demand convention and assesses both conventions in view of parcel conveyance portion and normal deferral while differing number of sources and stop time in vicinity of UDP movement having 50 hubs in the system. In this situation, all recreation result has finished with 15 and 30 wellspring of hubs. All re-enactment has done in Network Simulator 2. In existing framework having number of test system parameters utilized that is hub development model is Random waypoint, pace of hub is 0.25 m/s, transfer speed of the channel is 2Mb/s and transmission scope of the system is 250m. It likewise depicts the quantity of properties of steering convention and one of the properties Quality of administration clarified in subtle elements. After reproduction it break down that both of the conventions convey a more noteworthy rate of the began information parcels when there is little hub versatility, joining to 100% conveyance proportion when there is no hub movement. The parcel conveyance of AODV is practically free of the quantity of sources. AODV experiences end to end delays. DSDV parcel conveyance division is low for high portability situations. They infer that the AODV convention is the perfect decision for correspondence when the correspondence needs to happen under the UDP convention as the base.

IV. PROPOSED WORK

MANET has various steering conventions having distinctive properties which work in diverse size of the system because of element nature. The target of our work is to look at the execution and discovering re-enactment consequence of three existing steering conventions taking into account Table Driven and On interest conduct, specifically, Destination Sequenced Distance Vector (DSDV), Ad-hoc On-Demand Distance Vector (AODV) and Dynamic Source Routing (DSR) in the vicinity of diverse sorts of situation where ceaselessly expanding the quantity of hubs and they impart or change of parcel conveying from source hub to destination take long time. For versatile specially appointed systems taking into account the execution, and correlation has been made on the premise of their properties like throughput, Packet Delivery Ratio (PDR) and End to End Delay between two distinct situations – one by differing the quantity of hubs, and second by shifting the re-enactment time. In proposed work, we have made an investigative situation that demonstrates an examination structure for the general system conventions execution test. In this situation, we first recreate the general execution of each of the three conventions by utilizing ns-2 test system and discover their name yield. Second, we assess the execution of the convention which depends on three executions metric to be specific end to end delay, bundle conveyance proportion and throughput. At long last, we look at the execution of each steering convention over their outcome and examine the better execution between them.

The fundamental goal is to examine the working of AODV, DSR and DSDV conventions of MANET and to dissect which convention gives best result in distinctive situations. In the study we would perform the following:

i. Consider a MANET: Generally MANET has dynamic topology; power conservation is crucial and has variable capacity wireless links.
ii. Analysis of the protocols AODV, DSR and DSDV: The protocols AODV, DSR and DSDV can then be implemented on that network to observe their working.
iii. Analysis of the traffic pattern: The traffic pattern can be TCP or UDP according to the type of packets transmitted.
iv. Analysis of the functionality of the protocols AODV, DSR and DSDV according to the performance parameters.

V. PERFORMANCE METRIC

Some following important performance metrics can be evaluated:-

i. **Packet Delivery Ratio: -** The ratio of the data packets delivered to the destinations to those generated by the CBR sources. This performance metric will give us how well the protocol is performing in terms of packet delivery at different speeds.

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ii. **Throughput (messages/second): -** The ratio of the number of data packets sent and the number of data packets received. Throughput of the protocol shows number of messages delivered per one second.

iii. **Average End-to-End delay (seconds): -** This metric is calculated by subtracting "time at which first packet was transmitted by source" from "time at which first data packet arrived to destination". This includes all possible delays caused by buffering during route discovery latency, queuing at the interface queue, retransmission delays [16] at the MAC, propagation and transfer times.

VI. SCENARIO OF SIMULATION SETUP

Every single broad reproduction was led utilizing NS-2.35. The recreated system comprised of 50, 75 and 100 hubs arbitrarily scattered in 800x800m territory at the beginning time of the reproduction. All re-enactment parameter are depicted in beneath table 1:

In this situation, I have taken two On Demand (Reactive) directing conventions, in particular AODV, DSR and one proactive steering convention DSDV. For all recreation result assess at diverse reproduction time like 50, 100 and 150 sec. at greatest rate of the hubs is 20 m/s and stop time is steady set to 5ms and the quantity of hubs is fluctuating as 50, 75, and 100. Transmission scopes of the system for conveyance the parcels starting with one hub then onto the next is 250 m.

S. No	Parameters	Value
1	Source Type	MAC
2	Number of Nodes	50, 75 and 100
3	Simulation Time	50, 100 and 150 sec
4	Pause Time	5 ms
5	Environment Size	800x800
6	Transmission Range	250 m
7	Traffic Size	CBR (Constant Bit Rate)
8	Packet Size	512 Bytes
9	Packet Rate	5 packets/sec
10	Maximum Speed	20 m/s
11	Routing Protocols	AODV, DSR & DSDV
12	Simulator Used	NS-2.35

Table 1.1 Simulation Parameter

VII. RESULTS AND DISSCUSSION

SCENARIO 1

In this situation, the execution of convention contrast with deference with their bundle conveyance proportion estimation, and the quantity of hubs joined in a system as fluctuating with reproduction time to changing the quantity of

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associations, through which the correlation charts of AODV, DSDV and DSR got. All perception charts are appeared as below:

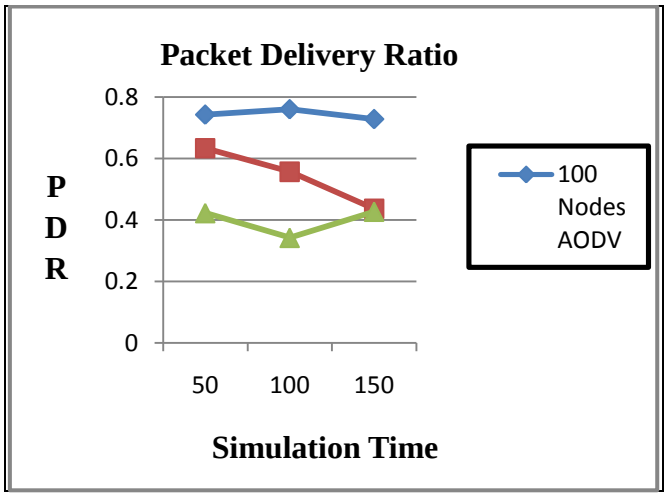

Figure 1.3 Comparison Graph between Packet Delivery Ratio vs Simulation time at 100 nodes

AODV and DSDV is higher than DSR at present for 50 hub in the system yet as the activity will increment with the quantity of hubs, for example, 75 and 100 hubs in the system, the PDR estimation of DSDV is most noticeably bad in more noteworthy number of hubs with long recreation time.

SCENARIO 2

In this situation, the execution of convention looks at between normal End-to-End delay and recreation time alongside vicinity of movement hubs 50, 75 and 100 with fluctuating number of reproduction time i.e. 50, 100 and 150 sec in the system. The correlation diagrams between AODV, DSDV and DSR convention appeared in below.

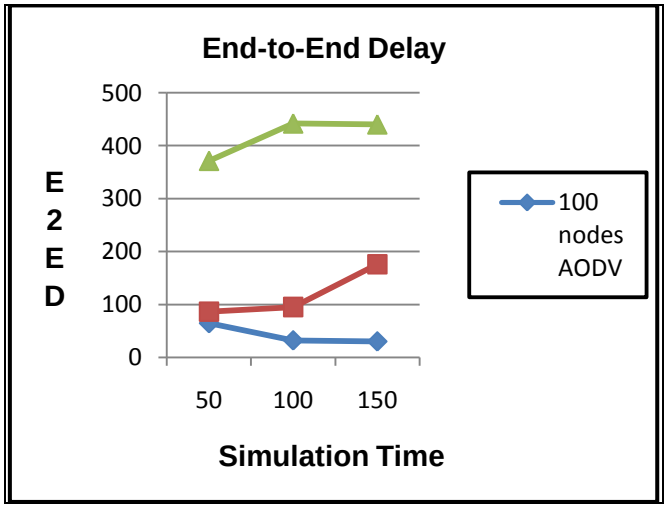

Figure1.4 Comparison Graph between End-to-End Delays vs. Simulation time at 100 nodes

The figure demonstrates that at first for 100 hubs the End-to-End Delay for DSDV indicates most astounding worth as correlation to AODV and DSR. AODV again demonstrate low values at each purpose of re-enactment time in light of the fact that less estimations of AODV demonstrate the better execution.

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SCENARIO 3

In this situation, the execution of convention contrasts and regard to their throughput estimation. All correlation charts of AODV, DSDV and DSR for distinctive hubs with diverse reproduction time appeared in below:

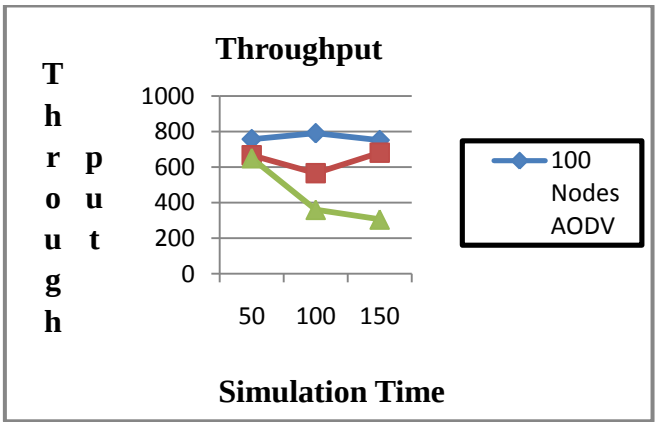

Figure 1.5 Comparison Graph between Throughput vs Simulation time at 100 nodes

The figure demonstrates that at first for 100 hubs the throughput for DSDV indicates less esteem as past situation and AODV indicates most noteworthy quality from gazing purpose of reproduction to end. DSR again demonstrates a normal result in higher number of hubs.

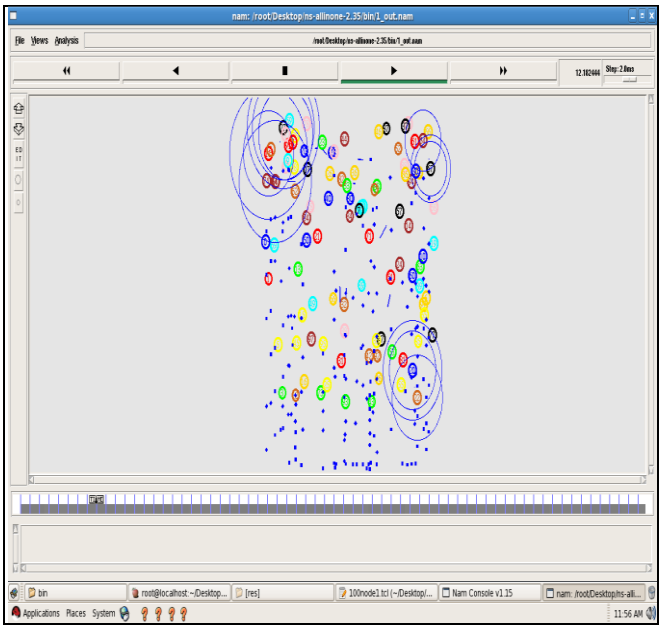

Figure 1.6 DSDV simulation result at 100 nodes running up to 100 seconds

Above figure shows that the network animation (NAM) output of DSDV protocol with presence of 100 nodes in the network and transmitting the data from 0 to 100 seconds.

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VIII. CONCLUSION AND FUTURE WORK

In this proposition, we have looked at the three mainstream steering conventions in the vicinity of diverse situation in system. The execution of DSR, AODV and DSDV directing conventions is dissected with recreation utilizing NS-2.35 test system situation accessible at 50, 75 and 100 hubs and the re-enactment time has changed from 50sec, 100sec and 150 sec on the premise of three parameters Average End-to-End delay, throughput, and bundle conveyance. In this exploration, we infer that the AODV performs better if there should arise an occurrence of bundle conveyance proportion, throughput and normal End-to-End delay at higher number of hubs. In throughput, DSR perform superior to anything DSDV when the reproduction time increments. DSDV performs superior to anything AODV for higher hub portability, if there should be an occurrence of end-to-end defer yet it creates normal result in PDR and throughput in substantial system.

After examination in diverse situation of system it can be down to earth that AODV perform superior to anything DSR and DSDV if there should be an occurrence of PDR and throughput in portability of hubs in long time in light of the fact that it has less directing overhead while DSDV is ended up being best in the event of end-to-end delay when hubs have high versatility considering the above said three measurements.

In future work we need to investigation of dependability of steering convention in vicinity of substantial number of hubs and mindful about which kind of convention gives the best execution if the measure of system will increment reasonably furthermore figured out the reproduction result in vicinity of distinctive situation in expansive size of the system and number of versatile hubs. Besides, these conventions examined don't address security issues; it is fascinating to watch the impacts of security increases to the execution of these conventions. The re-enactment study can be reached out to any future MANET steering conventions to encourage examination of the new convention to the current ones explored in this study. An energy model must be characterized and/or checked. The directing conventions can be tried as far as force utilization. New directing conventions can be produced utilizing power mindful steering. Test conventions in the crossover circumstance. The implementations of different routing protocols in ns2 have to be adapted to use them in hybrid simulations.

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