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Design of Mobile Ad hoc Network with Performance evaluation of AODV and DSDV Routing Protocol

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Abstract:-.
Mobile ad hoc Network [MANET] is a wireless network which is created dynamically without the use of any existing network infrastructure or centralized administration . MANETs are a kind of Wireless ad hoc network that usually has a routable networking environment on top of a Link Layer ad hoc network.Each device in a MANET is free to move independently in any direction, and will therefore change its links to other devices frequently. Each device or node in MANET can act as a source, destination or router. The routing protocols for MANET are mainly classified as Proactive, Reactive and Hybrid. DSDV is a Proactive routing protocol(meaning they find routing paths independently of the usage of the paths).AODV is a Reactive routing protocol (meaning that it establishes a route to a destination only on demand) designed for use in mobile ad hoc networks (MANET). Here we aim at designing a new Mobile Adhoc Network along with studying the performance parameters of MANET like Throughput, Packet Delivery Ratio, Packet Loss Ratio and End to End Delay, for both AODV as well as DSDV routing protocol. Then comparison of these two protocols is done on the basis of the values of performance parameters. This work is carried out by using NS-2 simulation environment.

Keywords:- MANET, AODV, DSDV, Throughput, Packet Delivery Ratio, Packet Loss Ratio and End to End Delay.

I.INTRODUCTION

A. Mobile Ad hoc Network

A mobile ad hoc network (MANET) is a self-configuring infrastructureless network of mobile devices connected by wireless. Ad hoc is Latin and means "for this purpose". Each device in a MANET is free to move independently in any direction, and will therefore change its links to other devices frequently. Each must forward traffic unrelated to its own use, and therefore be a router. The primary challenge in building a MANET is equipping each device to continuously maintain the information required to properly route traffic. Such networks may operate by themselves or may be connected to the larger Internet.

A Mobile Ad-hoc Network (MANET) is a dynamic wireless network that can be formed without the need for any pre-existing infrastructure in which each node can act as a router. Mobile ad hoc network (MANET) is an autonomous system of mobile nodes connected by wireless links. Each node operates not only as an end system, but also as a router to forward packets. The nodes are free to move about and organize themselves into a network. These nodes change position frequently. The main classes of routing protocols are Proactive, Reactive and Hybrid.

Current MANETs are designed mainly for military utility; examples include JTRS (Joint Tactical Radio System) and NTDR (Near-Term Digital Radio).

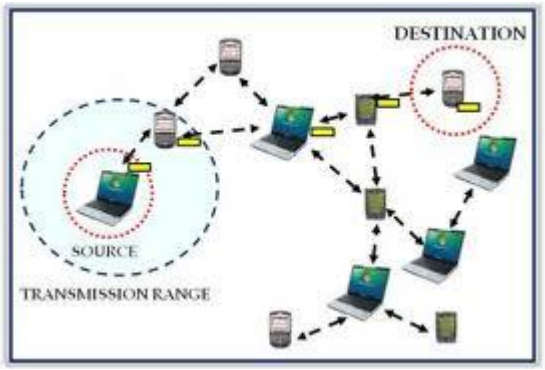

Fig 1.Mobile Ad hoc Network

B.Mobile Ad hoc Routing Protocols

A large number of routing protocols are used in mobile ad hoc networks research and development. On the basis of the functionality these routing protocols have been classified into different categories. This classification is done on the basis of operational mechanism. There are three main type of routing protocols:-pro-active routing , re-active routing and hybrid routing protocol.Pro-active routing, meaning they find routing paths independently of the usage of the paths.Reactive routing protocol, meaning that it establishes a route to a destination only on demand. Third type of routing is hybrid routing, which is the combination of above two routing techniques. Ad hoc On Demand Distance Vector (AODV) which is used in our work is a reactive routing protocol.

II.AODV

Ad hoc On-Demand Distance Vector (AODV) Routing is a routing protocol for mobile ad hoc networks (MANETs) and other wireless ad-hoc networks. It is a reactive routing protocol, meaning that it establishes a route to a destination only on demand. In contrast, the most common routing protocols of the Internet are proactive, meaning they find routing paths independently of the usage of the paths. AODV is, as the name indicates, a distance-vector routing protocol. AODV avoids the counting-to-infinity problem of other distance-vector protocols by using sequence numbers on route updates, a technique pioneered by DSDV. AODV is capable of both unicast and multicast routing.

In AODV, the network is silent until a connection is needed. At that point the network node that needs a connection broadcasts a request for connection. Other AODV nodes forward this message, and record the node that they heard it from, creating an explosion of temporary routes back to the needy node. When a node receives such a message and already has a route to the desired node, it sends a message backwards through a temporary route to the requesting node. The needy node then begins using the route that has the least number of hops through other nodes. Unused entries in the routing tables are recycled after a time.

When a link fails, a routing error is passed back to a transmitting node, and the process repeats.

Much of the complexity of the protocol is to lower the number of messages to conserve the capacity of the network. For example, each request for a route has a sequence number. Nodes use this sequence number so that they do not repeat route requests that they have already passed on. Another such feature is that the route requests have a "time to live" number that limits how many times they can be retransmitted. Another such feature is that if a route request fails, another route request may not be sent until twice as much time has passed as the timeout of the previous route request.

The advantage of AODV is that it creates no extra traffic for communication along existing links. Also, distance vector routing is simple, and doesn't require much memory or calculation.

The AODV Routing protocol uses an on-demand approach for finding routes, that is, a route is established only when it is required by a source node for transmitting data packets. It employs destination sequence numbers to identify the most recent path. The major difference between AODV and Dynamic Source Routing (DSR) stems out from the fact that DSR uses source routing in which a data packet carries the complete path to be traversed. However, in AODV, the source node and the intermediate nodes store the next-hop information corresponding to each flow for data packet transmission. In an on-demand routing protocol, the source node floods the RouteRequest packet in the network when a route is not available for the desired destination. It may obtain multiple routes to different destinations from a single RouteRequest. The major difference between AODV and other on-demand routing protocols is that it uses a destination sequence number (DestSeqNum) to determine an up-to-date path to the destination. A node updates its path information only if the DestSeqNum of the current packet received is greater or equal than the last DestSeqNum stored at the node with smaller hop count.

III.DSDV

DSDV is a table-driven routing scheme for ad hoc mobile networks based on the Bellman–Ford algorithm. It was developed by C. Perkins and P.Bhagwat in 1994. The main contribution of the algorithm was to solve the routing loop problem. Each entry in the routing table contains a sequence number, the sequence numbers are generally even if a link is present; else, an odd number is used. The number is generated by the destination, and the emitter needs to send out the next update with this number. Routing information is distributed between nodes by sending *full dumps* infrequently and smaller incremental updates more frequently. If a router receives new information, then it uses the latest sequence number. If the sequence number is the same as the one already in the table, the route with the better metric is used. Stale entries are those entries that have not been updated for a while. Such entries as well as the routes using those nodes as next hops are deleted. While DSDV itself does not appear to be much used today, other protocols have used similar techniques. The best-known sequenced distance

vector protocol is AODV, which, by virtue of being a reactive protocol, can use simpler sequencing heuristics. Babel is an attempt at making DSDV more robust, more efficient and more widely applicable while staying within the framework of proactive protocols.

IV. DESIGN

The proposed work is simulated in NS2. At first, we created a Mobile Ad hoc Network (with number of nodes as per given in simulation parameter table),this is done with the help of NS2 simulation environment.Next task is implementing an AODV protocol on the created Mobile Ad-hoc Network. Then we have studied the performance parameters of MANET like Throughput, Packet Delivery Ratio, Packet Loss Ratio and End to end delay for AODV routing protocol. Afterwards we implemented DSDV routing protocol on MANET and checked the performance parameters (Throughput, Packet Delivery Ratio, Packet Loss Ratio and End to end delay) of MANET for DSDV routing protocol. Then we compared the performances of AODV and DSDV on the basis of parameter values of Throughput, Packet Delivery Ratio, Packet Loss Ratio and End to end delay.

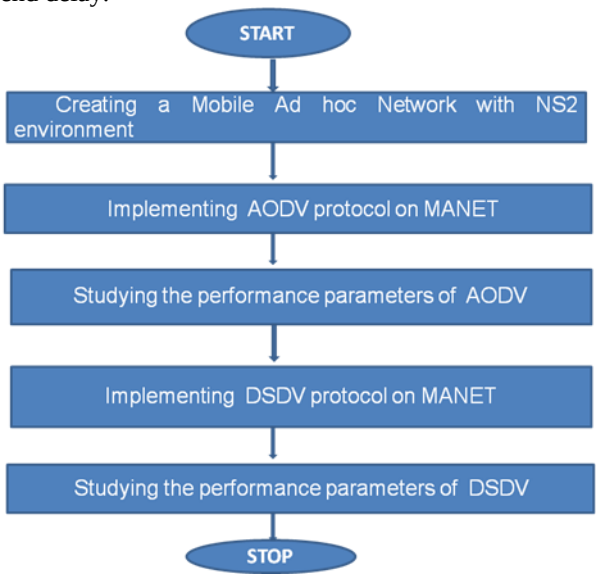

Fig 2.Flowchart of Methodology

V.SIMULATION FOR AODV and DSDV

The NS-2 network simulator is used to create a simulation environment to create a Mobile Adhoc Network and analyze that mobile adhoc network with AODV as well as DSDV routing protocol .

TABLE I.SIMULATION PARAMETERS

Network Simulator	NS 2.34
Operating System	Linux
Simulation Time	20 seconds
Simulation Area	600 × 600 meters square
Number of Nodes	40
Total Data Packets Sent	3104 packets
Data Type	Constant Bit Rate (CBR)
CBR Interval	0.0589second
Data Packet Size	1000 bytes
Number of Connections	12 UDP connection
Propagation Model	Two Ray Ground
MAC Protocol	IEEE 802.11p
Routing Protocol	AODV, DSDV
Speed of Mobile Nodes	2.77 to 15.27 m/s (10 to 55 km/h)
Antenna	Omnidirectional
Radio frequency	2.4 GHz

V. PERFORMANCE EVALUATION

A. Performance Metrics

The performance evaluation have been done on the basis of throughput, PDR, PLR and End to End delay.

· *Throughput*: Throughput is computed as the amount of data transferred (in bytes) divided by the simulated data transfer time.

· *Packet Delivery Ratio* (PDR): PDR is the ratio of the number of packets successfully delivered from source to destination.

· *Packet Loss Ratio(PLR):* PLR is the ratio of the number of packets lost from source to destination.

· *End to End Delay* : End to End delay is defined as the time taken for a packet to reach destination from the source.

B. Result and Analysis

Table II.SIMULATION RESULTS

Parameter / Protocol	DSDV	AODV
Throughput(in kbps)	776.62	800.76
Packet Delivary Ratio(in %)	85.91%	89.09%
Packet Loss Ratio(in %)	14.08%	10.91%
Delay(in msec)	14	11

Table III. SIMULATION GRAPHS

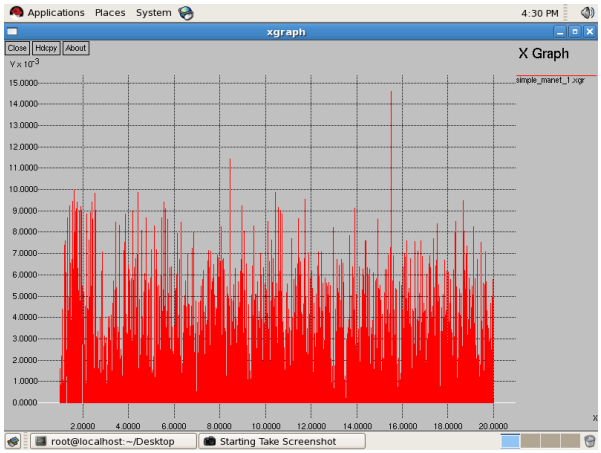

Fig 3.Delay graph for AODV

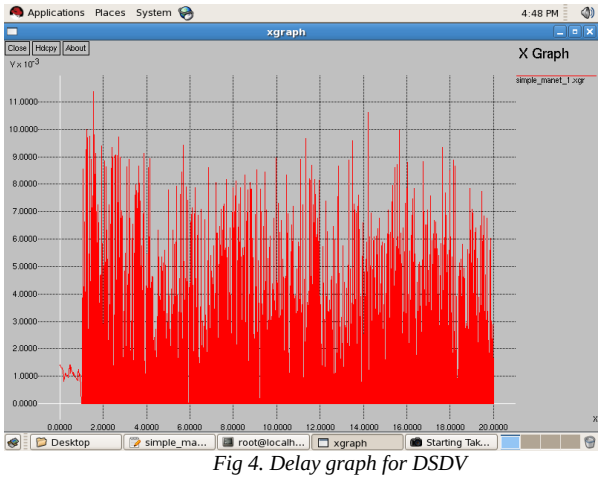

Fig 4. Delay graph for DSDV

C. Output Network Animator Window

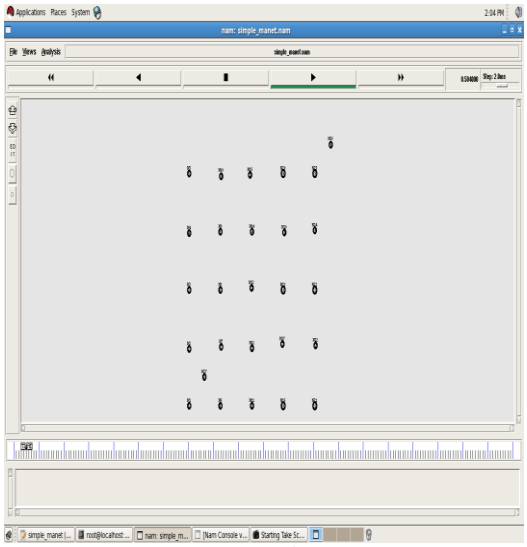

Fig 5. Initial position of nodes in network

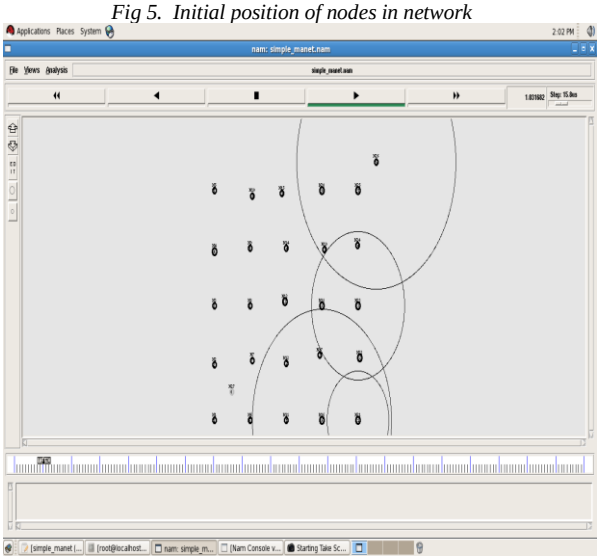

Fig 6. Circles showing coverage area of nodes

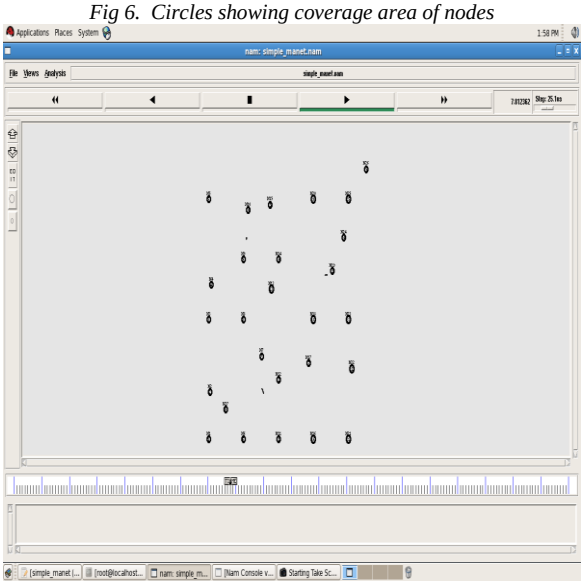

Fig 7. Nodes shown moving as well as transmitting data

VI. CONCLUSION

This paper proposes a new design of mobile ad hoc network with 40 number of nodes. Then the two routing protocols that is AODV, which is a reactive routing protocol and DSDV, which is a Proactive routing protocol are implemented on the Mobile Adhoc Network. Whole work is simulated using NS-2 simulation environment. After doing simulation and performance evaluation of AODV as well as DSDV routing protocols on MANET, it is found that AODV gives better performance as compared to DSDV. Performance parameters like Throughput, Packet Delivery Ratio and Packet Loss Ratio values for AODV are better than that for DSDV. Thus it is concluded that AODV is a better routing protocol than DSDV.

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