Review on Routing Protocols of Mobile Ad-hoc Network MANET

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ABSTRACT: A Mobile Ad-Hoc Network (MANET) network operates without any physical fixed infrastructure and centralized access point. MANET is astatic in nature. Routing in Ad-hoc networks is a challenging due to mobility of nodes [3]. In this paper, we analyse AODV, DSDV and DSR routing protocols for MANET, a detailed simulation based performance analysis carried out of Ad- Hoc On-Demand Distance Vector(AODV) [14], Destination Sequenced Distance Vector (DSDV), and Dynamic Source Routing(DSR) based on network infrastructure of network size, node mobility and pause time [1]. Performance matrix includes parameters like average End-to-End delay, throughput analysis, number of nodes, number of packet drops and packet delivery ratio etc. using NS-2 as network simulator.

KEYWORDS:MANET (Mobile Ad-Hoc Network), AODV (Ad- Hoc on-Demand Distance Vector), Destination-Sequenced Distance Vector (DSDV), Dynamic Source Routing (DSR).

I.INTRODUCTION

A mobile ad hoc network (MANET) is a combination of wireless mobile nodes that dynamically creates the network in the absence of fixed physical infrastructure. They offer quick and easy network deployment in situations where it is not possible otherwise. Ad-hoc, which means for this or for this only [1]. MANET network is an autonomous system of mobile nodes connected by wireless links each node works as a router and an end system for all other nodes in the network. Nodes in mobile ad-hoc network are free to travel and organize themselves in an arbitrary fashion. Each user is free to rove about while communication with others [4]. The path between each pair of the users may have multiple links and the radio between them can be heterogeneous [7]. This allows an association of various links to be a part of the same network. As nodes may be mobile, incoming and outgoing the network, the topology of the network will change continuously. The popular WI-FI protocol like IEEE 802.11 is capable of providing ad-hoc network facilities at low level, when access point is not available [4,7].
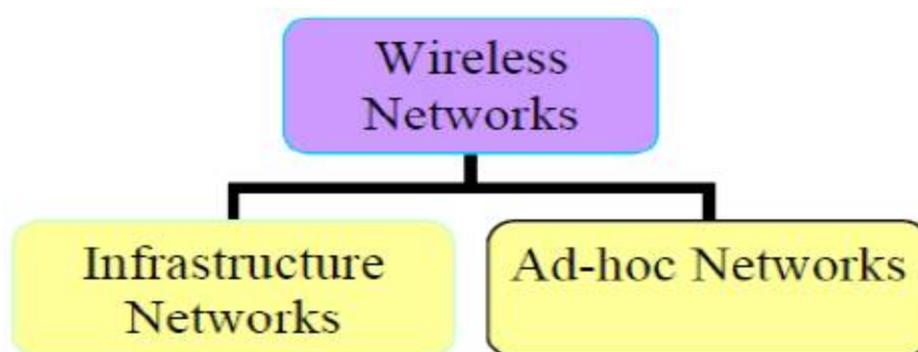

Fig.1 Wireless Network Categories

However in this case, the nodes are limited to receive and send information but do not route anything across the network. MANET networks can operate in a separate fashion or could possibly be connected to a larger network such as the Internet [1,4,14,3]. Mobile ad-hoc networks make the dream of getting connected anywhere and at any timeinto reality. Typical applications include a disaster recovery or a military operation [5]. Not bound to specific situations, these networks may show better performance in other places [6]. For example, we can imagine a group of peoples with

laptops, in a business meeting at a place where no network services is present. They can easily network their machines by forming an ad-hoc network. This is one of the examples where these networks may possibly be used. MANET will establish and maintaining the ad hoc network through the use of routing protocols. Though there are so many routing protocols available, this paper considers AODV, DSDV and DSR for performance [8] comparisons due to pause time [5]. These protocols are analysed based on the important metrics such as throughput, packet delivery ratio and average end-to-end delay [11]. Most of the research study shows that DSR and AODV are performing well depend upon the environment, among the reactive protocols. In the case of proactive, OLSR protocols are performing well. The performance of different proactive, reactive and hybrid protocols have analysed by different researchers [4]. The comparative analysis of AODV, DSDV, and DSR [14]is proposed in this paper.

Mobile Ad Hoc Network

A mobile Ad-hoc network (MANET) is composed of the mobile devices which communicate through wireless links without any fixed physical infrastructure which does not have any fixed topology. Routing in such networks is one of the major concerns because of mobility of nodes and absence of centralized administration. In this paper we evaluate the performance of Ad-hoc On Demand Distance Vector (AODV), Destination-Sequenced Distance Vector (DSDV), and Dynamic Source Routing (DSR) protocols under different performance parameters like PDF, average end-to-end delay and throughput, routing overhead and packet loss using simulator keeping packet size of 500 bytes.

Fig.2 Ad-hoc Network

II.LITERATURE REVIEW

(1)**January 2015, Prabhu.K, SenthilKumar.C:**In this paper several anonymity enhancing techniques are surveyed for the protection of anonymity communication in mobile ad hoc networks (MANETs). The present survey includes various attacks and its corresponding protocols used for mitigating anonymous communication in MANETs [11]. Finally comparative measures of each method are presented which provides the significance and limitations of each protocol on various attacks in mobile ad hoc networks (MANETs).

(2) **August 2015, authors RjabHajlaoui, Sami Touil and Wissemachour**:This paper aims at providing a new schema to improve Dynamic Source Routing (DSR) Protocol. The aim behind the proposed enhancement is to find the best route in acceptable time limit without having broadcast storm [12]. Moreover, O-DSR enables network not only to overcome congestion but also maximize the lifetime of mobile nodes. Some simulations results show that the Route

Request (RREQ) and the Control Packet Overhead decrease by 15% when O-DSR is used, consequently. Also the global energy consumption in O-DSR is lower until to 60 %, which leads to a long lifetime of the network.

(3)**January 2015, N.Kohila, R. Gowthami**:This paper concentrates on routing techniques which is the most challenging issue due to the dynamic topology of ad hoc networks.The mobile nodes can receive and forward packets as a router. Routing is a critical issue in MANET. Therefore focus in this paper is to compare the performance of three routing protocols DSDV, DSR and AODV for CBR traffic by varying no. of nodes in terms of packet delivery ratio, end to end delay, routing overhead and throughput [7]. The simulation is carried out on NS2.We evaluate the both on demand protocols DSR and AODV based on packet delivery ratio, packet delivery latency, mobility variation with total number of errors, packet and normalized routing overhead, end-to-end delay by varying in node density. The performance and characteristics are explained by the graph models.

(4)**2015, AmrutaKodole, Prof. P. M. Agarkar**: In reactive routing protocols, route discovery process is used to search a route between source and destination. Broadcasting mechanism is used for route discovery, where each node sends a received route request packet to other nodes in the network until it finds a path to the destination. Broadcasting causes many problems such as redundant retransmissions, collisions and contentions [8]. This paper provides an overview of routing protocols which can overcome broadcast storm problem, reduce routing overhead and improve the routing performance.

(5)**2015, Amita Pandey**: Wireless devices are constantly grooving in communication field having more computing speed and a number of features, while shrinking in weight and size [9]. The ad hoc network is made up of multiple nodes connected by links since link can be connected as well as disconnected at any time. The ad hoc network inherits the some traditional problem of mobile communication as well as wireless. Routing in mobile ad hoc networks in challenges task due to its frequent changes in topology. We discuss in this paper routing protocol, challenges and security of ad hoc network.

(6)**September 2013, authors Ankur O. Bang, Prabhakar L. Ramteke**: In this paper we focus on the evolution of the MANET, the challenges in it and a wide area of its applications. In the first section we provide a brief information about the history and evolution of MANET , next to it we discuss the major challenges in Mobile Ad Hoc Networks and towards the end we mentioned some of the application of MANET [10].

(7)**August 2009, authors Chai KeongToh**:This article discusses the various load metrics and summarizes the principles behind several existing load balanced ad hoc routing protocols. Finally, a qualitative comparison of the various load metrics and load balanced routing protocols is presented [13].

(8)**2013, Adnan Nadeem and Michael P. Howarth**:In this paper, we present a survey of the main types of attack at the network layer, and we then review intrusion detection and protection mechanisms that have been proposed in the literature [14]. We classify these mechanisms as either point detection algorithms that deal with a single type of attack, or as intrusion detection systems (IDSs) that can deal with a range of attacks. A comparison of the proposed protection mechanisms is also included in this paper. Finally, we identify areas where further research could focus.
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III.OVERVIEW OF ROUTING PROTOCOLS

Classification of routing protocols in MANET‟s can be done depends on routing strategy and network structure. Routing protocols can be categorized as:
1. Table-driven or proactive routing protocol
2. On-demand or reactive routing protocol and
3. Hybrid routing protocol.

Table-driven (proactive): The proactive routing protocols maintained the Routing Table at each node and with this table, nodes transmits the packets to the other nodes in the network. This protocol was motivated for the use of data exchange along changing and arbitrary paths of interconnection which may not close to any base station. Some of the

existing proactive ad-hoc routing protocols are: Destination Sequenced Distance vector, Wireless Routing Protocols, Cluster head Gateway Switching Protocol, Global State Routing, Fisheye State Routing, Hierarchical State Routing, Zone Based Hierarchical Link State and Source Tree Adaptive Routing.

On-demand (Reactive): These protocols enable dynamic, self-starting, multihop routing between mobile nodes wishing to establish and maintain an Ad-hoc network. This protocol does not require nodes to maintain routes to destination that are not in active communication and obtain routes quickly for new destination by route discovery procedure. Reactive protocols are being more efficient at signalling and power consumption, suffers longer delay while route discovery. Proactive and reactive protocols have been improving to be more scalable, secure and to support higher quality of service. Some of the reactive protocols are: Cluster Based Routing Protocols (CBRP), Ad-hoc On Demand Distance Vector (AODV), Dynamic Source Routing (DSR), and Temporary Ordered Routing Algorithm (TORA).
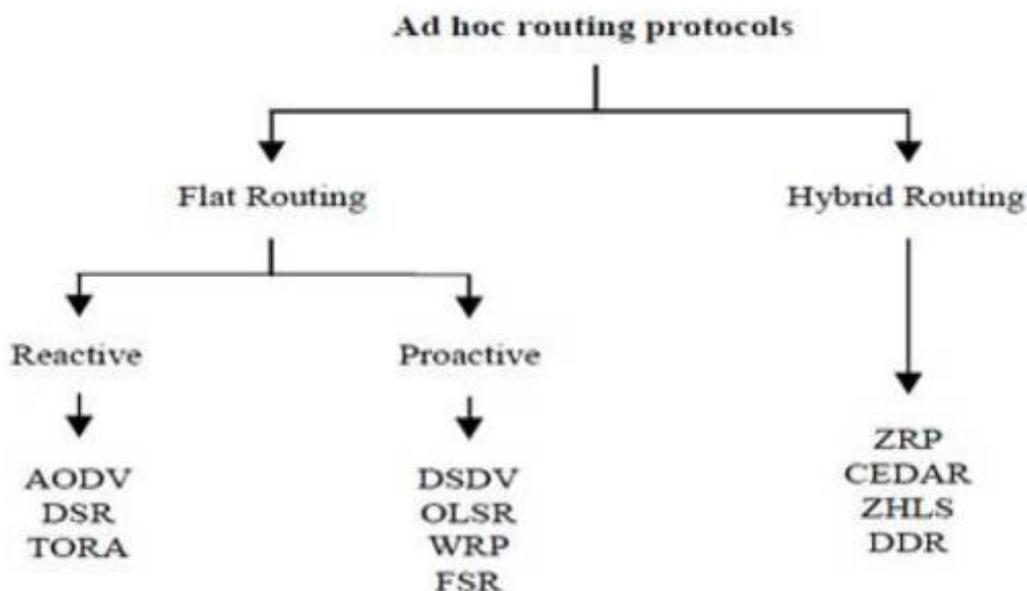

Fig.1: Classification of Routing Protocols

IV.ROUTING PROTOCOLS IN MANET

Ad-Hoc on Demand Distance Vector Protocol (AODV): The Ad-hoc On-Demand Distance Vector protocol is a very simple, efficient and effective routing protocol for mobile Ad-hoc networks which do not have fixed topology. Every node in the network acts as a specialized router and the routes are obtained as needed, which makes the network self-starting. As the protocol does not require periodic global advertisements, the demand on the available bandwidth is less. A monotonically increased sequence number counter is maintained by each node in order to supersede any stale cached routes. The route discovery process consists of a route-request message (RREQ) which is broadcasted [3]. If a node has a valid route to the destination, it replies to the route-request with a route-reply (RREP) message. The destination node uses the so called reverse route entry in its routing table, which contains the no. of hops to source node, address of the source node, and the address of the node from which it receives the message i.e. the next hop's address. Coping up with dynamic topology and broken links: When the nodes in the network move from their places and the topology is changed or the links in the active path are broken, the intermediate node that discovers this link breakage propagates an RERR packet. And the source node re-initializes the path discovery if it still desires the route. This ensures quick response to broken links [3,4,7].

Whenever an AODV router receives a request to send a message, it checks its routing table to see if a route exists. Each routing table entry consists of the following fields: Destination address, Next hop address, Destination sequence number, Hop count.

Four types of messages used by the nodes in the AODV to communicate among each other. Route Request (RREQ) and Route Reply (RREP) messages are used for route discovery. Route Error (RERR) messages and HELLO messages are used for route maintenance.

Destination-Sequenced Distance Vector (DSDV): It is a proactive type of routing protocol which is a modification of Bellman Ford routing algorithm. It was developed in 1994 by C. Perkins and P. Bhagwat. DSDV protocol adds a new attribute, sequence number, to each route table entry at each node. Routing table is maintained at each node and with this table; node transmits the packets to other nodes in the network. This protocol was motivated for the use of data exchange along changing and arbitrary paths of interconnection which may not be close to any base station [14]. These stations list for all the available destinations, and the number of hops required to reach each destination in the routing table. The routing entry consists of a sequence number which is originated by the destination station. In order to maintain the consistency, each station transmits and updates its routing table periodically. The packets broadcasted between stations, indicate which stations are accessible and how many hops are required to reach that particular station [11]. The packets may be transmitted containing the layer 2 or layer 3 addresses. DSDV protocol requires that each mobile station in the network must constantly advertise its own routing table to each of its neighbours. Since, the entries in the table my change very quickly, the advertisement should be made frequently to ensure that every node can locate its neighbours in the network. This strategy is placed, to ensure the shortest number of hops for a route to a destination; in this way the node can exchange its data even if there is no direct communication link. The data broadcast by each node will contain its new sequence number and the following information for each new route:
– The number of hops required to reach the destination and
– The new sequence number, originally stamped by the destination
– The destination address.
DSDV protocol guarantees loop free paths and count to infinity problem is also reduced. DSDV maintains only the best path instead of maintaining multiple paths to every destination. With this, the amount of space in routing table is reduced [11].

Dynamic Source Routing (DSR) Protocol: Dynamic Source Routing protocol is an on demand routing protocol. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet [6]. The sender explicitly lists this path in the packets header, identifying each forwarding hop by the address of the next node to which to transmit the packet on its way to the destination host. It allows nodes to dynamically discover a source route across multiple network hops to any destination in the ad hoc network. When using source routing, each packet to be routed carries in its header the complete, ordered list of nodes through which the packet must pass [7,2]. A key advantage of source routing is that intermediate hops do not need to maintain routing information in order to route the packets they receive, since the packets themselves already contain all necessary routing information. DSR is broken down into three functional components:
Routing, Route discovery and Route maintenance.
(1) Routing has already been described and is relatively trivial.
(2) Route discovery is the mechanism by which a node wishing to send a packet to a destination obtains a path to the destination.
(3) Route maintenance is the mechanism by which a node detects a break in its source route and obtains a corrected route.

V.CONCLUSION AND FUTURE WORK

At first studying these three protocols AODV, DSDV and DSR and then comparing these three protocols according to different performance parameters.The effort has been made on the comparative study of Reactive, Proactive and Hybrid routing protocols has been presented in the form of table. There are various shortcomings in different routing protocols and it is difficult to choose routing protocol for different situations as there is trade-off between various protocols. There are various challenges that need to be met, so these networks are going to have widespread use in the future the simulation to compare the performance of two on-demand (DSR and AODV) and one table driven (DSDV) routing protocols on different performance parameters packet delivery ratio, end-to-end delay, routing overhead and

throughput. The results showed that the performance of the two reactive protocols (DSR and AODV) was better than DSDV. The overall performance of DSR was better than the other two protocols except in the case of end to end delay.

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