International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 10 Issue 6 ǁ 2022 ǁ PP. 602-605

Under Traffic Manets Cyber Security, Basic Functionality Protocols: AODV, DSR, AND HORA

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Abstract – *A mobile ad hoc network (MANET) is a system with no fixed infrastructure. Mobile nodes in a MANET connect and interact with one another over wireless networks, with no central management. MANET mobile nodes serve as both a host and a router to establish and sustain connectivity. As a result, each node has equal responsibility for determining the most efficient path and performing rectification when the route becomes invalid. Routing in a MANET becomes difficult owing to factors such as continual node mobility, frequent topology changes, restricted bandwidth, and energy depletion. Because routes are identified only when a demand is expressed, reactive routing systems are also known as on-demand routing protocols. By simply keeping information for active routes, these protocols decrease the overhead associated with proactive protocols, and hence the former are favored over the latter. This study provides an overview as well as a comparative analysis of reactive routing protocols such as DSR, AODV, DYMO, and TORA in order to determine which protocol is best suited under which conditions.*

Key Words: *Reactive Routing Protocols, Dynamic SourceRouting, Ad-Hoc on Demand Distance Vector*

Date of Submission: 29-05-2022 Date of acceptance: 10-06-2022

I. INTRODUCTION

Because of the widespread usage of wireless communication, MANETs are becoming more popular. MANET is an autonomous system composed of a number of mobile nodes that connect wirelessly with one another and establish a network on their own. It is an infrastructure-free network with an ad hoc topology. For example, VANET allows wireless communication between cars and between vehicles and roadside infrastructure. MANET's spontaneous network creation capability allows them to be used in sectors such as military applications, search and rescue operations, emergency and disaster relief communication, education virtual classrooms, and so on. The nodes in a MANET may move freely or join the network randomly and at random, modifying the network's topology. Routing protocols are classified into three types depending on route discovery mechanisms: proactive, reactive, and hybrid protocols.

The distinction between proactive (table-driven) and reactive (demand-driven) procedures is determined by when and how the routes are built and stored. In proactive protocols, all network nodes preserve routing information in one or more routing tables.

Each node communicates with every other node, and routing information is updated as the topology changes [1]. Reactive protocols, on the other hand, are known as demand-driven protocols since routes are found and built only when demand is expressed by any node. Hybrid protocols incorporate the qualities of proactive and reactive treatments together.

Route discovery and route maintenance are two strategies used by reactive routing technologies. These protocols deliver data to the node that presently has an urgent need for that message [2]. The route discovery mechanism is used by the source node to determine whether or not there is a route to a destination; if there is, the packet is sent straight via an already established path; otherwise, the flooding routing method is used to find a new way. Flooding is a straightforward routing strategy in which a sender node distributes packets over all accessible links. After identifying all pathways, the routing information for the path selected by the source node is duplicated in the routing table. A source node, on the other hand, detects a topological change in the network by employing the route maintenance mechanism.

There are several protocols that fit within the reactive routing category. This research investigated four popular protocols: DSR, AODV, DYMO, and TORA.

Ad hoc On-demand Distance Vector (AODV):

AODV stands for source-driven routing protocol. It is an expanded form of DSDV (Destination Sequenced Distance Vector, a proactive routing protocol) since it uses sequence numbers to detect stale entries

for destination nodes. The AODV protocol successively performs activities such as path discovery, route table management, path maintenance, and local connection management [3]. AODV uses other fields in addition to sequence numbers, such as flexible loop-free, self-starting, and grows to high numbers of mobile nodes. AODV's goal is to decrease the requirement for system-wide broadcasts. The primary distinction between AODV and Dynamic Source Routing (DSR) is that DSR employs source routing, in which a data packet contains the whole route to be traveled. The AODV protocol uses a basic request-response mechanism for route finding [4]. AODV allows the development of routes to particular destinations. Destinations and does not need nodes to maintain these routes while not in active connection. The "counting to infinity" issue is avoided by using AODV destination sequence numbers. As a consequence of this attribute, AODV is loop-free. Source Routing on the Fly (DSR)

The DSR protocol is a reactive routing protocol that shares several features with AODV. DSR is a very efficient routing technique that has been suggested for use in multi-hop mobile Ad hoc networks. It is divided into two phases: route discovery and route maintenance. These stages aid in locating and maintaining the proper source routes to the destinations. Source Routing is a loop-free routing method in which intermediary nodes do not need routing information and nodes may store routing information for later use. Each node in DSR inspects each packet for source route information and then forwards it depending on this routing information. If no routing information is detected in the packet, it will offer the source routing based on the route. When the destination is unknown, the node caches the packet and sends route queries to all neighboring nodes to determine the routing information to the destination. Finally, it returns the Route acknowledgement to the source. Algorithm for Temporary Ordered Routing (HORA)

II. LITERATURE SURVEY

A survey of routing protocols in MANET was undertaken by Geethu Mohandas et al. [1]. Basic routing protocols, location-based protocols, and security-based protocols were the three categories they divided routing protocols into. They also compared various techniques to determine which was the most efficient. As a result of the review of publications, it was established that research in the private sector is restricted. Basic protocols such as AODV focus solely on identity-based routing. Neither location nor o2n security for routing are addressed in such protocols.

Anuj K. Gupta et al. [8] used Fedora 10 as the operating system to create the DYMO routing protocol. Ns2.34 has been put on the platform for simulations, together with add-on applications such as etc. The simulation was run with different pause times. They discovered that DYMO, as the successor to AODV, outperforms AODV in every situation.

Mohammad Ali Mostafavi et al. [9] used OPNET 14.5 Modeler to simulate the performance of the ADOV, DSR, and OLSR routing protocols. They used three different scenarios: network delay, network load, and network throughput. In comparison to OLSR and AODV, they discovered that the DSR protocol has a low average network burden but the biggest average network delay. AODV, on the other hand, performs better in terms of average network delay and network throughput**.**

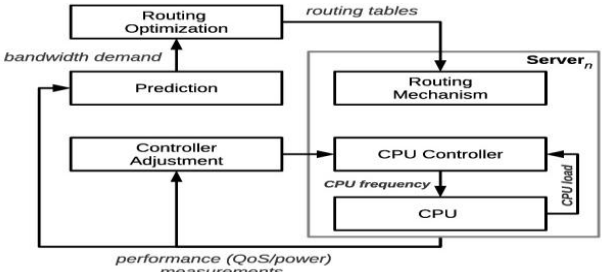
IMPLEMENTATION

HORA is a reactive routing system that uses the link reversal algorithm [3]. It is successful in overcoming the current constraints of MANETs[4]. HORA has four primary tasks that are equivalent to constructing, optimizing, deleting, and maintaining routes[2]. HORA determines the amount of routes that exist between a source mobile node and a certain destination node. As a consequence, there are sometimes numerous paths to a given destination, none of which is necessarily the shortest. Instead than utilizing the quickest way to determine routes, the HORA algorithm keeps the next destination in mind while forwarding packets.

It is an on-demand routing protocol started by the source. It not only determines the best route from point A to point B, but it also locates all possible paths. Only neighbor nodes near the topological change occurrence get control messages in HORA. Routing information about neighboring nodes is kept for this purpose. The protocol handles tasks including route construction, route maintenance, and route erasure. TORA lowers network control messages by having nodes inquire for a route only when they need to transmit a packet to a destination. HORA established the network in three phases.

1. Designing the paths from the source to the goal.
2. Keeping the roads open
3. Remove invalid routes.

Architecture diagram:



On-demand Dynamic MANET (DYMO):

The Internet Engineering Task Force has currently standardized the Dynamic MANET On-demand (DYMO) routing protocol for multi-hop wireless communication in ad-hoc networks (IETF). Using the route accumulation function, DYMO considerably decreases routing overhead, simplifying protocol implementation [5]. DYMO is based on the AODV reactive routing system, but with several additional characteristics [6]. Route Discovery and Route Maintenance are two tasks performed by DYMO.

Route Exploration:

Except for the path accumulation feature, the DYMO route finding procedure is similar to the AODV routing protocol. When a source node has to interact with a destination node that is not in its routing table, the discovery of routes operation is conducted. An RREQ packet is generated by a source node and sent to its neighbors. If a neighbor has an entry to the destination node, it responds by sending an RREP packet to the found and accumulated route. If the source node does not receive the RREP packet within the TTL value specified, the RREQ packet is rebroadcast. DYMO is well-known as an energy-saving procedure. As a low-energy node, you may choose not to participate in the route discovery process.

Routing Upkeep:

This is done to avoid previously existing routes in the routing database and to reduce packet loss when a connection fails. When a link to another node fails, a node creates an RERR packet and sends it to the nodes that are affected by the connection failure. A node that receives the RERR message, changes the routing database, and removes the broken link items.

Advantages:

1. The operation of DYMO is dependent on the sequence number assigned to each packet, which is used for loop-free routing.
2. Because DYMO is a reactive protocol, it does not store the network topology explicitly. Rather, nodes only compute a unicast route to the intended destination when it is required [7].
3. As a result, only a small amount of routing information is transferred, reducing network traffic overhead and thereby saving bandwidth and electricity.

Disadvantages:

1. It performs poorly when the user's mobility is limited [8].

III. RESULT AND DISCUSSION

Parameters	**DSR**	**AODV**	**HORA**	**DYMO**
Packet delivery Ratio	Lowest	Highest	High	Low
End-to-end delay	Less	Highest	Same as DSR	Lowest
Through-put	Lowest	Highest	Lower Than AODV	Low
Routing Approaches	Reactive Dynamic	Reactive aodv	Reactive	Reactive

IV. CONCLUSION:

MANET is beneficial because it may be set up at any time and in any location, and it can be used when a permanent infrastructure cannot be built. Because of its dynamic nature, routing becomes challenging. The purpose of this work is to compare the performance of four commonly used flat-routing protocols in MANETs:

DSR, AODV, TORA, and DYMO. These routing protocols were investigated to see what their advantages and disadvantages were. It was revealed that choosing the most efficient strategy from among them is difficult. Each procedure tested performed well in certain situations but had drawbacks in others. This research sets the stage for more investigation. Extensions to present conventional routing protocols in terms of security, efficient resource utilisation, and QoS may be possible.

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