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A SURVEY ON MANET ROUTING PROTOCOLS

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Abstract-Mobile Ad Hoc Networks (MANETs) are kind of wireless network with self-administrating characteristics, where the nodes get associated in a spontaneous or ad hoc basis. MANET is not an infrastructure based network and there exist no centralized resources. Framing a route between source and destination is a challenging task in MANET. Various protocols are involved in Mobile Ad hoc Network for communicating and transferring of packets from peer to peer networks. Due to mobility of mobile nodes in the network, topology changes continuously, thus each protocol uses different methods for transferring data in network to the end points. This paper provides various types of routing protocols used in MANET and its uses.

Keywords-[Proactive, Reactive, Hybrid, Routing, Protocols]

1. INTRODUCTION

Mobile Ad hoc networks have several advantages such as ease of deployment, speed of deployment and decreased dependency on a fixed infrastructure. However unique characteristics of MANET's topology such as open peer-to-peer architecture, dynamic network topology, shared wireless medium and limited resourcepose a number of non-trivial challenges to security design. Some of the issues and challenges that designer of secure protocols are described in this paper. These issues are analyzed with respect to the primary goals of a secure protocol – confidentiality, integrity and availability, authenticity and non-repudiation.

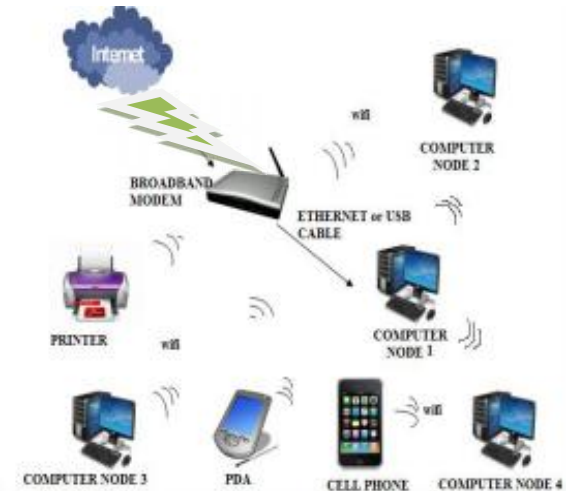

Figure 1: Mobile Ad-Hoc Network

Besides several advantages MANET's have several limitations. Nodes have limited battery-power. An efficient routing protocol is required because of dynamic topology of the network. Several routing protocols like DSR, AODV, etc. are used for routing the data packet from source to destination. Routing protocols are divided into three categories- reactive, proactive and hybrid. In MANETs with each node acting as a router and dynamically changing topology the availability is not always guaranteed. It is also not guaranteed that the path between two nodes would be free of malicious nodes. The wireless links between nodes are highly susceptible to link attacks. Stringent resource constrains in MANETs may also affect the quality of security. At the time of excessive computations is required to perform some encryption and decryption acts. The vulnerabilities and characteristic make a case to build a security solution, which provides security services like authentication, confidentiality, integrity, non-repudiation and availability. In order to achieve the goal which we need a mechanism that provides security in each layer of the protocol.Protection of MANETs can be divided into two categories, such as protection of the routing functionality and protection of the data in transmission. The way of approaching the MANETs protection can also be divided into two categories, such as proactive and reactive.

Routing in MANET

MANET protocol can be divided into

1. Proactive routing or table driven routing.
2. Reactive routing or on demand routing
3. Hybrid routing.

Proactive Routing the nodes in a mobile ad hoc network continuously evaluate routes to all reachable nodes and attempt to maintain consistent, up-to-date routing information. When a network topology change occurs, respective updates must be propagated throughout the network to notify the change. Using proactive routing algorithms, mobile nodes proactively update network state and maintain a route table and route.

Reactive routing protocols for mobile ad-hoc networks routing paths are searched only when needed. A◊ route discovery operation invokes a route determination procedure. The discovery procedure terminates either when a route has been found or no route available after examination for all route permutations. In a mobile ad hoc network, active routes may be disconnected due to node mobility. Hence route maintenance is an important operation of reactive routing protocols. On comparison to the proactive routing protocols for mobile ad hoc networks, less control overhead is a distinct advantage of the reactive routing protocols.. However, when using reactive routing protocols, source nodes may suffer from long delays for route searching before they can forward data packets. For eg.{AODV, DSR} Hybrid routing protocol: to combine the merits of both proactive and reactive routing protocols and overcome their shortcomings.

Hybrid routing protocols for mobile ad hoc networks exploit hierarchical network architectures. Proper proactive routing approach and reactive routing approach are exploited at different hierarchical levels,respectively. For eg. {ZRP, HARP}.

2. Types of Proactive Routing Protocols

Cluster head Gateway Switch Routing Protocol (CGSR)	CGSR routing protocol forms the multicasting networks. In this protocol, Number of nodes forms the clusters in this protocol. Each node maintains neighbor node information and also consists of next hop, where as cluster head will be chosen dynamically by using cluster head election procedure. Packets are sent directly from source node to cluster head then forwarded to the gateway or boundary nodes that are formed based on the communication ranges between the cluster heads. Gateway node will further forwards the packets to the nearest destination cluster head.
Directional Flow Routing (DRF) Protocol	DFR protocol is the source routing protocol. Packets are routed based on DFV (Directional Flow Vector) with varying time. In high mobility rate, DFR protocols route the Packets efficiently to destination. All the nodes maintain the information's such as relative position and velocity information about the neighborhood nodes. DFR protocol first uses the route discovery method to route the packets from source to destination, once the packets reaches its destination, Computation of the Direction Flow Vector is calculated by finding relative velocity and location positioning between source and sink.
Wireless Routing Protocol (WRP)	four tables are maintained in this WRP protocol, they are 1. Distance table (DT)-contains nodes neighbor information. 2. Routing table (RT)-stores destination information with regular updating. 3. Link-cost table (LCT)-provides link cost to each neighbor. 4. Message Retransmission list table (MRL)-contains retransmitting message that are updated correctly.
Fisheye State Routing (FSR) Protocol	It is based on proactive link state routing protocol. Network is divided into different scopes while communicating. This protocol allows for exchanging of link state message at different intervals between nodes. To reduce the size of link state message, periodic updates are required. From the protocol name, it specifies fish eye that caches pixels near focal. Likewise this protocol maintains accurate distance and quality path of neighbor nodes.
Destination Sequenced Distance Vector (DSDV) Protocol	DSDV protocol is a table driven, pro-active protocol based on the Bellman-Ford Routing algorithm. This algorithm

	helps in solving Routing loop problem, which occurs when an error in operation of routing results in group of nodes, path to particular destination forms a loop.
Source Tree Adaptive Routing (STAR) Protocol	In this table driven protocol, it works based on link state algorithm. Source tree maintains the priority based destination in set of links. Least overhead routing approach (LORA) is used to exchange routing information and change in link state updates its results only changes occurs. Router communicates with neighbor of source tree, which has available destination. If any node doesn't contain destination, source initiates absence message and sent it to the neighbor.
Topology Broadcast Reverse Path Forwarding (TBRPF) Protocol	In TBRPF, each node consists of the state of each link in the network. The protocol uses the concept of reverse path forwarding (RPF) to disseminate its update packets in the reverse direction along the spanning tree, which is made up of minimum-hop path from the nodes leading to the source of the update message. Transmission of the routing messages is very less, since only differences in current and old network states are sent via networks.
Link Cluster Architecture (LCA)	Routing Protocol Constructing an LCA is to reduce the routing-related control overhead involved with searching for the destination node in a large network. Each master node can easily maintain the location information of ordinary nodes in its cluster using local communications.LCA improves the scalability and reduces routing-related control overhead.
Hazy Sighted Link State Routing (HSLS) Protocol	In this protocol, it provides the optimal route for communication and forwarding of set of messages by using link state algorithm. Periodic link state updates are included in this hazy protocol in order to maintain the available information to be consistent.
Optimized Link State Routing (OLSR) Protocol	OLSR protocol is proactive in nature and it uses the link state algorithm. All the links with neighbor nodes are stored and flooded in the entire network. This protocol minimizes the size of control packet. All the nodes in the OLSR protocol sends packets to destination by recent activity from hop to hop mechanism. It exchanges topology information with all other nodes of the network regularly.

3. Types of Reactive Routing Protocol

Ad-Hoc On Demand Vector (AODV) Routing Protocol	AODV protocol is also known as on demand protocol, it works by establishing the path for packet routing from source to destination. It is source-initiated routing scheme capable of both unicast and

	multicast routing. Route discovery process begins with RREQ(Route REQuest) messages are sent to destination by broadcast method via intermediate nodes, once the messages reached destination, Further destination will send the RREP(Route REPly) messages are on the same route.
Associative-Based Routing (ABR) Protocol	In ABR, the destination node provides the preferred route, by node associativity mechanism. ABR does not work for small networks, as it provides route discovery in faster manner and produces the shortest paths through associativity. The mobility of nodes are observed by any other nodes in the whole network. Each node consists of information about associativity by forwarding messages periodically, by identifying itself and updates the associativity information to its neighbours
Dynamic Source Routing (DSR) Protocol	From the name suggests, It works on the concept of source initiated and on the basis of demand, path will be established between source and destination. It is designed specifically for use in multi-hop wireless ad hoc networks of mobile nodes. 1. Route maintenance and 2. Route discovery.
Temporally-Ordered Routing Algorithm (TORA)	Routing Protocol TORA is an on-demand routing protocol, It limits the control message propagation in the highly dynamic mobile computing environment. Each node has to explicitly initiate a query when it needs to send data to a particular destination. The key feature of TORA is that reaction to link breakage or failures and it deletes the invalid routes, and searches for new routes and builds route with distributed algorithm as the basis.
Load Balancing Routing (LBR) Protocol	This on-demand routing protocol uses the concepts of node activity and traffic interference to select the best source-destination path that would encounter the minimum traffic load in transmission and minimum interference by neighboring nodes. The activity of a node is defined as the number of active s-d the node is part of. The traffic interference at a node is the sum of all the activities of the neighbors of the node. For a given source s and destination d, LBR chooses an s-d path such that the sum of the traffic interferences and the activities of the intermediate forwarding nodes on the path is the minimum.
Light-Weight Mobile Routing (LMR) Protocol	The LMR protocol is based on-demand routing protocol, which uses a flooding technique to determine its routes. A node maintains the multiple

	routes to each required destination. This increases the reliability of the protocol by allowing nodes to select the next neighbor available route to a particular destination without initializing a route discovery Procedure.
Link Lifetime Based Backup Routing (LBR) Routing Protocol	Link lifetime based Backup Routing (LBR) is also known as reactive protocol increases the stability of route. It provides the shortest path between source and destination via limited flooding as the preliminary path, and then makes the backup path at each link in the preliminary path by considering link lifetime.
Scalable Source Routing (SSR) Protocol	Scalable Source routing protocol is also known as on demand routing protocol that uses the peer-to-peer overlay network. It combines the source routing along with virtual ring. Virtual ring helps to route the packets by considering the physical networks that changes dynamically by providing virtual address to be static. Each node involved in virtual ring consists of Unique ID which stays constant during routing helps to avoid flooding .Packets are routed along the virtual ring by knowing predecessor and successor nodes, so that delivery of packets are guaranteed. This protocol provides efficient message routing in dynamic topology and requirement of memory space is very less.
Split Multi-Path Routing (SMP) Protocol	In this routing protocol, two paths will be established such as Primary path and Backup path. It follows the mechanism as in the DSR routing protocol, when a source needs to send a packet, it then first establishes the Route Request (RREQ) to destination. Only the specific destinations are allowed to reply by Route Reply (RREP) message back to the source. Multiple routes are established to reduce route recovery and control overhead. In this protocol, per packet allocation mechanism is included so as to distribute packets evenly to all active session in multiple routes, thus leads to effective utilization of network resource and network congestions are prevented.
Caching And Multipath (CHAMP) Routing Protocol	Champ protocol works on the basis of reactive protocol, it provides combined packet caching and increases fault tolerant method and routes are kept newer by using Round-Robin allocation algorithm .Each node maintains two states in it, Route Cache, Route Maintenance.
Relative Distance Microdiscovery Ad-Hoc Routing (RDMAR) Routing	This on demand protocol reacts to the link failure that is localized to the small regions that is nearer to

Protocol	change. By knowing the Relative Distance (RD) between the two terminals, query floods are localized. On each transfer of data, route discovery between 2 terminals are triggered, so as to calculate the RD. no periodic beacons are stored to update the routing tables thus it reduces the bandwidth utilization and more scalability and minimizes the flooding by reducing route request to certain number of hops.

4. Types of Hybrid Routing Protocol

Zone Routing (ZRP) Protocol	ZRP protocol performs both the reactive and proactive routing method; it maintains up-to-date topological information of a zone at each node. For each node, routing zone is defined and overlap between the zones of neighbor nodes.
Zone-Based Hierarchical Link State (ZHLS) Routing Protocol	ZHLS is a hybrid protocol, within each node in the network zone, consists of Zone ID, Node ID and location information. Intra-Zone method is used by implementing shortest path algorithm results in up-to-date information. Inter-Zone method is used to obtain node topology information. Every node in Zone, finds the gateway zone and neighbor node, when the packets are sent from source, data are received from destination, if destination is within zone, else source generates location request and broadcast to all nodes. Communication overhead and storage requirements are reduced in this protocol.
Core Extraction Distributed Adhoc Routing (CEDAR) Routing Protocol	In CEDAR protocol, first phase performs the core finding a core route from the source node to the destination and the second phase provides calculating feasible path over core path. A node tries to send request to the destination by considering core information's stored in table of each node, then core node in the destination replies with reply message. If any path becomes failure, source nodes stops sending packets and reinitiate the route establishment process. Thus the Traffic overheads are reduced by utilizing core nodes and perform quality-of-service with the core elements.
Dynamic Zone Topology Routing Protocol (DZTR)	Overlapping zones- every node finds its zone and updates its routes to all nodes which are present inside the zone. Non overlapping zones-every zone has its unique ID, to assign node in the corresponding zone and helps in route discovery and transmission of data

CONCLUSION

Multiple protocols get proposed daily for MANET to solve the existing and new issues. We don't know the type of protocol and whether it solved the issues in MANET. This paper presents a survey on various types of Routing protocols such as Table-driven, On-demand and Hybrid routing protocols and their working in the MANET network and also provides the clear view over the MANET Routing Protocol and its functions.

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