www.eminencejournal.com ISSN: 2394 - 6636
INTERNATIONAL JOURNAL OF BUSINESS MANAGEMENT AND SCIENTIFIC RESEARCH
VOL : 26, February , 2017

ROUTING PROTOCOLS FOR MANET WITHIN MULTICHANNEL

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Abstract
Mobile ad hoc networks (MANETs) are autonomously self-organized networks without infrastructure support. In a mobile ad hoc network, nodes move arbitrarily; therefore the network may `experience rapid and unpredictable topology changes. Because nodes in a MANET normally have limited transmission ranges, some nodes cannot communicate directly with each other.The increase in availability and popularity of mobile wireless devices has lead researchers to develop a wide variety of Mobile Ad-hoc NETworking (MANET) protocols to exploit the unique communication opportunities presented by these devices. Devices are able to communicate directly using the wireless spectrum in a peer-to-peer fashion, and route messages through intermediate nodes, however the nature of wireless shared communication and mobile devices result in many routing and security challenges which must be addressed before deploying a MANET. In this paper we investigate the range of MANET routing protocols available and discuss the functionalities of several ranging from early protocols such as DSDV and DSR to developing and improving MANET routing. we also reviewed literature on the topic of securing MANETs communication with the use of routing protocols. In which also make comparison on the performance of AODV and DSR routing protocols using in Multichannel communication. Evalute the performance of AODV& DSR protocols together.

Keywords--- AODV ,DSR,MANET,Multi channel, Routing protocols.

INTRODUCTION

Wireless technologies such as Bluetooth or the 802.11 standards enable mobile devices to establish a Mobile Ad-hoc Network (MANET) by connecting dynamically through the wireless medium without any centralized structure . MANETs offer several advantages over traditional networks including reduced infrastructure costs, ease of establishment and fault tolerance, as routing is performed individually by nodes using other intermediate network nodes to forward packets , this multi-hopping reduces the chance of bottlenecks, Considering the special properties of MANET, when thinking about any routing protocol, generally the following properties are expected, though all of these might not be possible to incorporate in a single solution.

- A routing protocol for MANET should be distributed in manner in order to increase its reliability.
- A routing protocol must be designed considering unidirectional links because wireless medium may cause a wireless link to be opened in unidirection only due to physical factors.
- The routing protocol should be power-efficient.
- The routing protocol should consider its security.
- A hybrid routing protocol should be much more reactive than proactive to avoid overhead.
- A routing protocol should be aware of Quality of Service (QoS).

This paper is structured as follows,discusses the core requirements of a MANET routing protocol, (a) discusses MANET routing principles, (b) investigates some of the earliest MANET routing protocols; DSR and DSDV.(c) Proposed MANET routing protocol and Compare the performance of AODVa and DSR protocols.

MANET ROUTING PRINCIPLES

MANET routing protocols could be broadly classified into two major categories: Proactive and Reactive.

A. Proactive Routing Proactive protocols rely upon maintaining routing tables of known destinations, this reduces the amount of control traffic overhead that proactive routing generates because packets are forwarded immediately using known routes, however routing tables must be kept up-to-date; this uses memory and nodes periodically send update messages to neighbours, even when no traffic is present, wasting bandwidth. Proactive routing is unsuitable for highly dynamic networks because routing tables must be updated with each topology change, this leads to increased control message overheads which can degrade network performance at high loads.

B. Reactive Routing Reactive Protocols use a route discovery process to flood the network with route query requests when a packet needs to be routed using source routing or distance vector routing Source routing uses data packet headers containing routing information meaning nodes don't need routing tables; however this has high network overhead. Distance vector routing uses next hop and destination addresses to route packets, this requires nodes to store active routes information until no longer required or an active route timeout occurs, this prevents stale routes. Flooding is a reliable method of disseminating information over the network, however it uses bandwidth and creates network overhead, reactive routing broadcasts routing requests whenever a packet needs routing, this can cause delays in packet transmission as routes are calculated, but features very little control traffic overhead and has typically lower memory usage than proactive alternatives, this increases the scalability of the protocol.

C. Hybrid Routing Hybrid protocols combine features from both reactive and proactive routing protocols, typically attempting to exploit the reduced control traffic overhead from proactive systems whilst reducing the route discovery delays of reactive systems by maintaining some form of routing table . The two survey papers successfully collect information from a wide range of literature and provide detailed and extensive reference material for attempting to deploy a MANET, both papers reach the conclusion that no single MANET routing protocol is best for every situation meaning analysis of the network and environmental requirements is essential for selecting an effective protocol. Whilst these papers contain functionality details for many of the protocols available, performance information for the different protocols is very limited and no details of any testing methodologies is provided, because of this the validity of some claims made cannot be verified.

Based on the method of delivery of data packets from the source to destination, classification of MANET routing protocols could be done as follows:

- Unicast Routing Protocols: The routing protocols that consider sending information packets to a single destination from a single source.
- Multicast Routing Protocols: Multicast is the delivery of information to a group of destinations simultaneously, using the most efficient strategy to deliver the messages over each link of the network only once, creating copies only when the links to the destinations split. Multicast routing protocols for MANET use both multicast and unicast for data transmission

  Multicast routing protocols for MANET can be classified again into two categories: Tree-based multicast protocol and Mesh-based multicast protocol. Mesh-based routing protocols use several routes to reach a destination while the tree-based protocols maintain only one path.

EARLY MANET ROUTING PROTOCOL

In which compares the proactive Destination Sequenced Distance Vector (DSDV) protocol and the reactive Dynamic Source Routing (DSR) protocol; these protocols were developed in 1994 and were amongst the earliest MANET routing protocols identified using the previous survey papers.

A.Destination Sequenced Distance Vector (DSDV) The proactive DSDV protocol was proposed by and is based upon the Bellman-Ford algorithm to calculate the shortest number of hops to the destination. Each DSDV node maintains a routing table which stores; destinations, next hop addresses and number of hops as well as sequence numbers; routing table updates are sent periodically as incremental dumps limited to a size of 1 packet containing only new information. DSDV compensates for mobility using sequence numbers and routing table updates, if a route update with a higher sequence number is received it will replace the existing route thereby reducing the chance of routing loops, when a major topology change is detected a full routing table dump will be performed, this can add significant overhead to the network in dynamic scenarios.

B. Dynamic Source Routing (DSR) The reactive DSR Protocol was developed by, operation of the DSR protocol is broken into two stages; route discovery phase and route maintenance phase, these phases are triggered on demand when a packet needs routing. Route discovery phase floods the network with route requests if a suitable route is not available in the route . DSR uses a source routing strategy to generate a complete route to the destination, this will then be stored temporarily in nodes route cache . DSR addresses mobility issues through the use of packet acknowledgements; failure to receive an acknowledgement causes packets to be buffered and route error messages to be sent to all upstream nodes. Route error messages trigger the route maintenance phase which removes incorrect routes from the route cache and undertakes a new route discovery phase.

PROPOSED PROACTIVE ROUTING PROTOCOLS: MAJOR FEATURES

A.Dynamic Destination-Sequenced Distance-Vector Routing Protocol (DSDV) The protocol Destination-Sequenced Distance-Vector routing (DSDV) is a Proactive routing protocol that solves the major problem associated with distance vector routing of wired networks i.e., Count-to-infinity, by using destination sequence number. The DSDV protocol requires each mobile station to advertise to each of its current neighbors. However, this protocol requires each node to maintain 4-routing tables. These routing tables cause a significant amount of memory overhead at each node as the size of the network increases.

B.Wireless Routing Protocol (WRP): WRP belongs to the general class of path-finding algorithms, defined as the set of distributed shortest path algorithms that calculate the paths using information regarding the length and second-to-last hop of the shortest path to each destination. WRP reduces the number of cases in which a temporary routing loop can occur. For the purpose of routing, each node maintains four things: 1. A distance table 2. A routing table 3. A link-cost table 4. A message retransmission list (MRL). WRP uses periodic update message transmissions to the neighbors of a node. The nodes in the response list of update message (which is formed using MRL) should send acknowledgments. If there is no change from the last update, the nodes in the response list should send an idle Hello message to ensure connectivity. A node can decide whether to update its routing table after receiving an update message from a neighbor and always it looks for a better path using the new information. If a node gets a better path, it relays back that information to the original nodes so that they can update their tables. After receiving the acknowledgment, the original node updates its MRL. Thus, each time the consistency of the routing information is checked by each node in this protocol, which helps to eliminate routing loops and always tries to find out the best solution for routing in the network.

C.Cluster Gateway Switch Routing Protocol (CGSR): CGSR considers a clustered mobile wireless network instead of a ‘‘flat’’ network. For structuring the network into separate but interrelated groups, cluster heads are elected using a cluster head selection algorithm. By forming several clusters, this protocol achieves a distributed processing mechanism in the network. However, one drawback of this protocol is that, frequent change or selection of cluster heads might be resource hungry and it might affect the routing performance. CGSR uses DSDV protocol as the underlying routing scheme and,

hence, it has the same overhead as DSDV. However, it modifies DSDV by using a hierarchical cluster-head-to-gateway routing approach to route traffic from source to destination. Gateway nodes are nodes that are within the communication ranges of two or more cluster heads. A packet sent by a node is first sent to its cluster head, and then the packet is sent from the cluster head to a gateway to another cluster head, and so on unti lthe cluster head of the destination node is reached. The packet is then transmitted to the destination from its own cluster head.

D.Global State Routing (GSR): The protocol Global State Routing (GSR) is based on the traditional link state algorithm; GSR has improved the way information is disseminated in link state by restricting the update messages between intermediate nodes only. Accordingly, this improvement has decreased the number of control messages significantly. The protocol Fisheye State Routing (FSR) is the descendent of GSR. The FSR reduces the big size of update messages in GSR by updating the network information for nearby nodes at a higher frequency than for the remote nodes. This improvement makes the FSR more suitable for large networks. However, increasing in the size of network comes at the price of reduced accuracy.

E.Hierarchical State Routing (HSR): HSR combines dynamic, distributed multilevel hierarchical clustering technique with an efficient location management scheme. This protocol partitions the network into several clusters where each elected cluster head at the lower level in the hierarchy becomes member of the next higher level. The basic idea of HSR is that each cluster head summarizes its own cluster information and passes it to the neighboring cluster heads using gateways. After running the algorithm at any level, any node can flood the obtained information to its lower level nodes. The hierarchical structure used in this protocol is efficient enough to deliver data successfully to any part of the network.

F.Zone-Based Hierarchical Link State Routing Protocol (ZHLS): In ZHLS protocol,the network is divided into nonoverlapping zones as in cellular networks. Each node knows the node connectivity within its own zone and the zone connectivity information of the entire network. The link state routing is performed by employing two levels: node level and global zone level. ZHLS does not have any cluster head in the network like other hierarchical routing protocols. The zone level topological information is distributed to all nodes. Since only zone ID and node ID of a destination are needed for routing, the route from a source to a destination is adaptable to changing topology. The zone ID of the destination is found by sending one location request to every zone.

PROPOSED REACTIVE ROUTING PROTOCOLS : MAJOR FEATURES

A.Associativity-Based Routing (ABR) ABR protocol defines a new type of routing metric “degree of association stability” for mobile ad hoc networks. In this routing protocol, a route is selected based on the degree of association stability of mobile nodes. Each node periodically generates beacon to announce its existence. Upon receiving the beacon message, a neighbor node updates its own associativity table. For each beacon received, the associativity tick of the receiving node with the beaconing node is increased. A high value of associativity tick for any particular beaconing node means that the node is relatively static. Associativity tick is reset when any neighboring node moves out of the neighborhood of any other node.

B.Signal Stability–Based Adaptive Routing Protocol (SSA) SSA protocol focuses on obtaining the most stable routes through an ad hoc network. The protocol performs ondemand route discovery based on signal strength and location stability. Based on the signal strength, SSA detects weak and strong channels in the network. SSA can be divided into two cooperative protocols: the Dynamic Routing Protocol (DRP) and the Static Routing Protocol (SRP). DRP uses two tables: Signal Stability Table (SST) and Routing Table (RT). SST stores the signal strengths of the neighboring nodes obtained by periodic beacons from the link layer of each neighboring node. These signal strengths are recorded as

weak or strong. DRP receives all the transmissions and, after processing, it passes those to the SRP. SRP passes the packet to the node's upper layer stack if it is the destination. Otherwise, it looks for the destination in routing table and forwards the packet. If there is no entry in the routing table for that destination, it initiates the route-finding process. Route-request packets are forwarded to the neighbors using the strong channels. The destination, after getting the request, chooses the first arriving request packet and sends back the reply.

C.Temporarily Ordered Routing Algorithm (TORA) TORA is a reactive routing protocol with some proactive enhancements where a link between nodes is established creating a Directed Acyclic Graph (DAG) of the route from the source node to the destination. This protocol uses a ''link reversal'' model in route discovery. A route discovery query is broadcasted and propagated throughout the network until it reaches the destination or a node that has information about how to reach the destination. TORA defines a parameter, termed height. Height is a measure of the distance of the responding node's distance upto the required destination node. In the route discovery phase, this parameter is returned to the querying node. As the query response propagates back, each intermediate node updates its TORA table with the route and height to the destination. This protocol has an interesting property that it frequently chooses the most convenient route, rather than the shortest route. For all these attempts, TORA tries to minimize the routing management traffic overhead.

D. Cluster-Based Routing Protocol (CBRP) CBRP is an on-demand routing protocol, where the nodes are divided into clusters. When a node comes up in the network, it has the undecided state. The first task of this node isto start a timer and to broadcast a HELLO message. When a
cluster-head receives this HELLO message, it replies immediately with a triggered HELLO message. After that, when the node receives this answer, it changes its state into the member state. But when the node gets no message from any cluster-head, it makes itself as a cluster-head, but only when it has bidirectional link to one or more neighbor nodes. Otherwise, when it has no link to any other node, it stays in the undecided state and repeats the procedure with sending a
HELLO message again. Each node has a neighbor table. For each neighbor, the node keeps the status of the link and state of the neighbor in the neighbor table.

E. Dynamic Source Routing (DSR): DSR allows nodes in the MANET to dynamically discover a source route across multiple network hops to any destination. In this protocol, the mobile nodes are required to maintain route caches or the known routes. The route cache is updated when any new route is known for a particular entry in the route cache. Routing in DSR is done using two phases: route discovery and route maintenance. When a source node wants to send a packet to a destination, it first consults its route cache to determine whether it already knows about any route to the destination or not. If already there is an entry for that destination, the source uses that to send the packet. If not, it initiates a route request broadcast. This request includes the destination address, source address, and a unique identification number. Each intermediate node checks whether it knows about the destination or not. If the intermediate node does not know about the destination, it again forwards the packet and eventually this reaches the destination.

F.Ad hoc on-Demand Distance Vector Routing (AODV): AODV is basically an improvement of DSDV. But, AODV is a reactive routing protocol instead of proactive. It minimizes the number of broadcasts by creating routes based on demand, which is not the case for DSDV. When any source node wants to send a packet to a destination, it broadcasts a route request (RREQ) packet. The neighboring nodes in turn broadcast the packet to their neighbors and the process continues until the packet reaches the destination. During the process of forwarding the route request, intermediate nodes record the address of the neighbor from which the first copy of the broadcast packet is received. This record is

stored in their route tables, which helps for establishing a reverse path. If additional copies of the same RREQ are later received, these packets are discarded. The reply is sent using the reverse path.

EVALUTE THE PERFORMANCE OF REACTIVE & PROACTIVE TOGETHER

In which make comparison on the performance of AODV and DSR routing protocols and evalute the performance of AODV& DSR protocols together. The Dynamic Source Routing (DSR) protocol requires each transmitted packet to carry the full address from the source to the destination,it is designed for use in a multi-hop environment like wireless mobile ad hoc networks. The Ad hoc on Demand Distance Vector (AODV) routing protocol is based on DSDV and DSR protocols. It provides unicast, multicast, and broadcast communication.

The significance of work towards wireless network and try to evaluate the performance

- To increase the speed of transmit and receive data.
- To achieve better delivary-ratio
- To minimize Transmition delay or media access delay.
- For better performance of QoS & throughput.

COMMUNICATION WITHIN MULTIPLE CHANNEL USING AODV ROUTING PROTOCOL.

This figure shows the result to calculate node to node communication within multichannel using Aodv protocol..

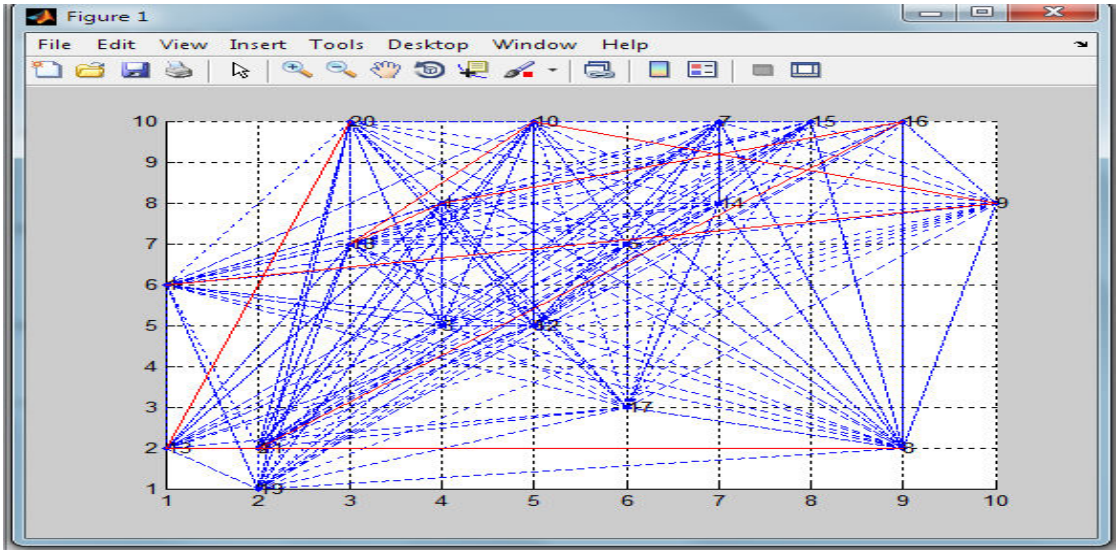

Fig 1: Calculate node to node Performance within multi channel using Aodv protocol

COMMUNICATION WITHIN MULTICHANNEL USING DSR PROTOCOLS.

This result shows the performance of DSR routing protocol for multichannel communicaton DSR protocol are used shortest path method for communication.

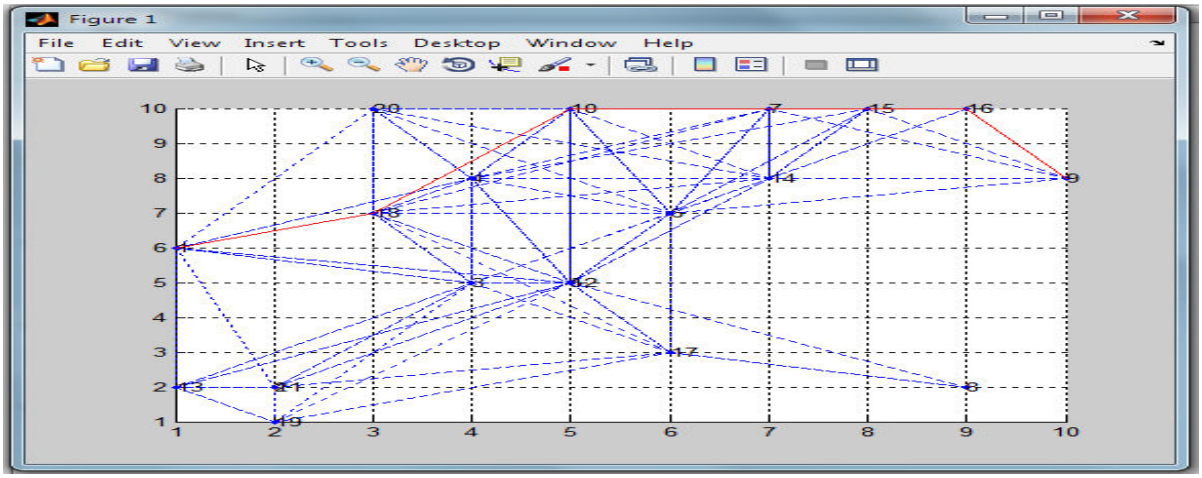

Fig 2:Calculate node to node communication within multichannel using Dsr protocol

CONCLUSION

In this review paper presented schemes identified and reviewed a range of literature on the topic of MANET routing protocols. It also presented schemes to evaluate the performance of Reactive Proactive Protocols for communication Manet within Multichannel. This would be helpful in establishing keys in the network and nodes can communicate data securely without any delay in MANETS .Our goal is to design a multichannel communication in network in that way the problem like transmission delay, security can be solved and to achieve better performance of QoS & throughput . we provide an overview of routing schemes proposed for ad hoc mobile networks. In which make the comparison between AODV and DSR routing protocol performance for transmission.

In future research, to evaluate the validity of the trust during communication through simulations.Working on integrating node trust models with link and path trust models.

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