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Research paper

A survey on MANET protocols in wireless sensor networks

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Abstract

In Wireless sensor networks and ad hoc networks nodes have a freedom to move from one place to another, they are self-configuring this type of the structure fulfil the requirements of several application. A survey on the different MANET protocols will be done in this paper. Mainly this paper will focus on the Quality of Service on the different parameters like Throughput and Delay between different protocols like AODV (Ad Hoc on Demand Distance Vector), DSDV (Destination-Sequenced Distance-Vector Routing), DSR (Dynamic Source Routing), and TORA (Temporary Ordered Routing Algorithm). DSDV is called as proactive protocol because they know everything about the nodes in the network before the communication start. DSR, AODV, TORA protocols are called reactive protocol because nodes in this network do not know anything about network. They are also called ON-DEMAND routing protocols. After this analysis you will come to know which MANET protocol is best for different application.

Keywords: *AODV (Ad Hoc on Demand Distance Vector), DSDV (Destination-Sequenced Distance-Vector Routing), DSR (Dynamic Source Routing), and TORA (Temporary Ordered Routing Algorithm), QoS (Quality of Service).*

1. Introduction

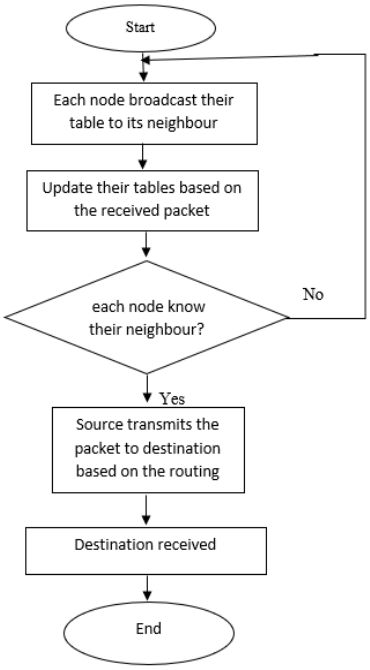
MANET Wireless Sensor Networks are started early 1970's with the military application, later on they are done with many modifications now they are used in many applications including medical application for monitoring [1]. Topology of the ad hoc network is not fixed they will change according with requirement. In present day situation it is very difficult to deliver information from one place to another place with wired networks. But with help of wireless sensor networks data will transmitted and data will receive at any not-accessible place, because of this characteristic they are used in many applications. MANET protocols mainly consist of base station, nodes, sensors, sink, and source. All this sensor run with the battery which are connected with the solar panels. Coast of this network is very low. This sensor collects information about changes in the temperature and they directly communicate with the destination node in the network. The range of the sensors are very low so if they want to cover large area they have to increase the size of the network. They are various type of the networks are there among them three are MANET (Mobile Ad-hoc Network), VANET (Vehicular Ad-hoc Network), WSN (Wireless Sensor Network) [2][3]. In MANET Protocol they are three different types of protocols they are Proactive protocol, Reactive protocol, Hybrid protocol. Proactive protocol is also called as "Table-Driven" protocol because every node in this network maintain a table for the information about all the nodes in network about their position, energy. They will participate in the network with already know information. Reactive protocol is also called as "ON-DEMAND" protocol because nodes in the network do not know anything about neighbor nodes in the network. Whenever you required to know about the 'N' node before you reach destination at that point of time the route discovery will be initiated. It is a kind of reactive nature. So, this routing is called as Reactive protocol. Hybrid routing is the combination of the Proactive and Reactive protocols. If the network is small Proactive protocol will give the best performance because the nodes in the network know about their neighbor. If network is large Reactive protocol is good because information about the neighbor is big it will reduce the bandwidth of the network if we store information about the neighbor in the nodes. So, for very large networks we will use Hybrid protocol for certain boundary they will act as a proactive protocol after that boundary they will act as reactive protocol.

We use this MANET wireless network in the place where there is difficult to survey. Their application in the vehicles give rise to VANET networking, in this networking vehicles will communicate with each other for road safety. Application for this network are in the field of medical, environment, military now a day they are used for the mobile tracking and for social networking.

2. Routing protocols

Destination-Sequenced Distance-Vector Routing (DSDV): In this protocol each node maintains a separate routing table that contain the shortest path and the first node in that shortest path to every other node in the network. This is an extension of the Distance Vector Routing protocol. Working principle both of the protocols are same but in Distance Vector Routing protocols there is problem called "Count to infinity problem" when any of node miss from the network. To over this protocol DSDV is introduced. In this protocol every node is having a counter, every destination is having a sequence number. The node will update its table only when the it receives the information from the high sequence number.

Flowchart of DSDV protocol:



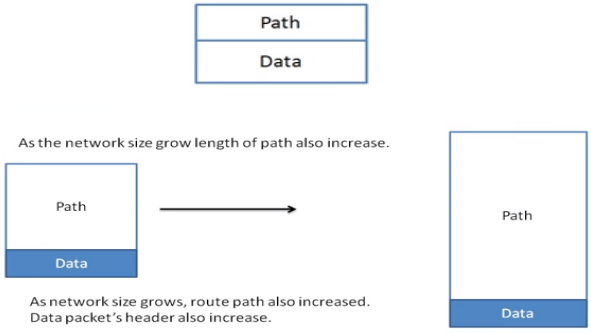
Dynamic Source Routing(DSR): This protocol falls under the reactive routing protocol. This protocol does not maintain information about feature purpose. This means if any node wants to send the information then it will start rout discovery [4]. This protocol takes two steps to route a packet from source to destination.

Step 1: Node discover route when it is needed. That is the reason this protocol is called as reactive protocol. In this step source node will create request packet and send to its neighbor whether it have any information about the destination. Request Packet contain unique ID, list of the node (initially empty), source, destination. Neighbor check whether it know information about destination or not, if not it will insert its id in packet and broadcast to its neighbor. This process will continue till it find destination. When request packet reaches the destination then destination came to know that source want to route with me.

Step 2: In this step destination node send a "Route Reply Packet" which contain route record. It will send packet in the order mentioned in the request packet. After that source will send data to the destination.

If any link broken then information is broadcasted to make them update to their cached route this is called "Route Maintenance".

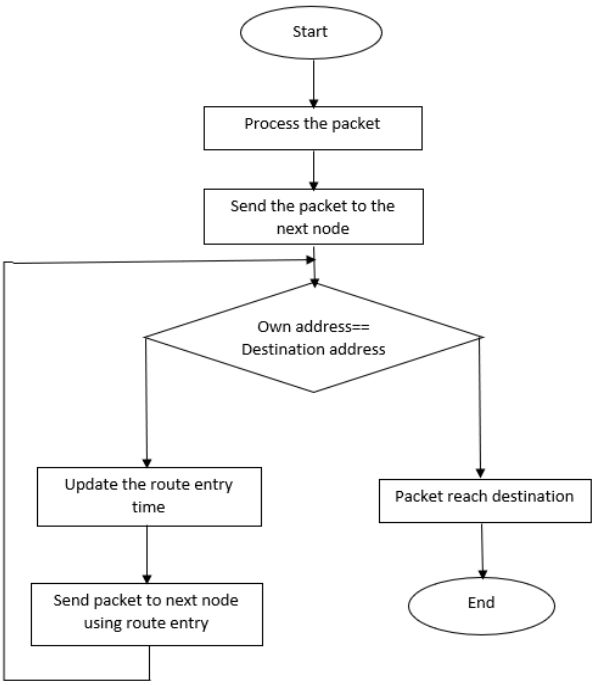
Ad hoc On-Demand Distance Vector Routing(AODV): This protocol falls under the reactive routing protocol. This protocol does not maintain information about feature purpose. This means if any node wants to send the information then it will start rout discovery. It is a extension of Dynamic Source Routing. The main disadvantages in DSR is whenever a node find out a destination the path will include in the data itself which means the data packet carries the entire route for example if network is small then path is also small, when network is large then path is also large in this case network bandwidth will increase.



In DSR network bandwidth will not utilize fully. Another disadvantage is in DSR for one destination multiple route will possible.

In AODV the routes are created when needed, so they are called "On-Demand". In this also we have two steps, REQUEST broadcasting to find a route, REPLAY packet is used to set up a forward path. AODV maintain all the route in the form of table which is not contain in the DSR [5]. If any entry maid in the timer also associated in the table, that timer will tell about at what time that table got updated. It also contains destination sequence number. It will help when the link is broken between the nodes. This sequence also avoid count to infinity problem.

Flowchart of AODV:



Temporally Ordered Routing Protocol (TORA): In this routing protocol routing takes place in three steps create routing, erasing routing, route maintenance. Each node has an array of its neighbor height. This height is not a single value it contains five attributes. First three attributes are used for reference and last two are used as offset with respect to reference. Five attributes are time, own-id, reflection bit, order of node, destination-id respectively. Initially height of every node is set to null. The height of the destination node is always zero. When ever node want to know the destination path then it will generate a query packet which contain destination address then that node will broadcast to its neighbor this process will continue until it finds destination. Then destination generate a update packet and broadcast it then nodes in the network update their height according to received packet. A node can transmit the data only when its height is high than its neighbor height. TORA only works in downstream fashion but it does not work in upstream fashion. If any link is broken then route is maintained by the route maintenance.

3. Results and discussion

(i) The author in [6] compare the MANET protocols using parameters like jitter [7], average delay [8] and energy efficiency.

Average jitter: From the figure 1 he says that DSR have highest jitter value.

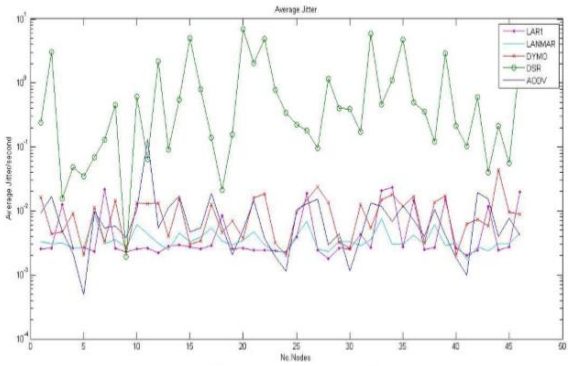


Figure 1: Jitter

Delay: It is calculated by finding the difference of time between first transmitted packet and first received packet. From the figure 2 he says that DSR having high delay time when compared with all protocols in MANET. AODV and LANMAR protocols performed better than all the protocols.

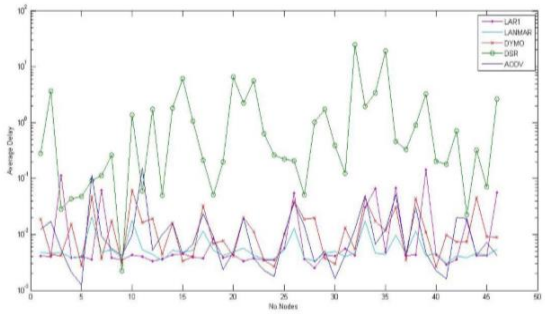


Figure 2: Delay

Energy consumed: It give the information about how much energy consumed for packet to reach the destination. From figure 3 he says that AODV protocol consume less energy to reach the destination while remaining protocols are unstable after certain peak point.

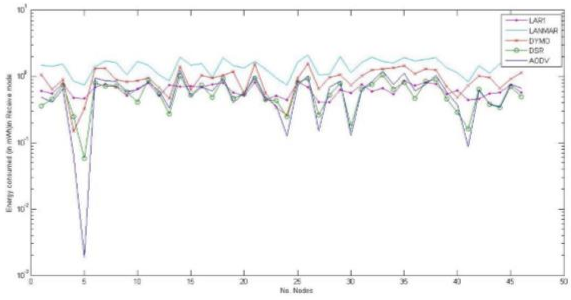


Figure 3: Energy Consumed

(ii) The author in [9] compare AODV and TORA protocol based on the parameters throughput and delay with different number of nodes.

Throughput: From figure 4 author says that when we consider less number of nodes (less than 25) throughput of both the network are similar to each other.

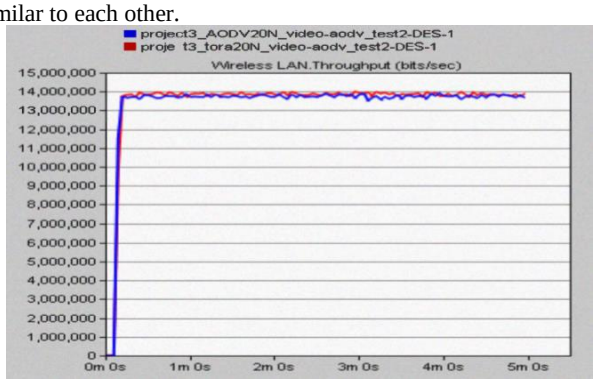


Figure 4: Throughput of AODV vs. TORA for 20 nodes

If we consider more number of nodes (more than 25) AODV protocol is performing better than the TORA protocol.

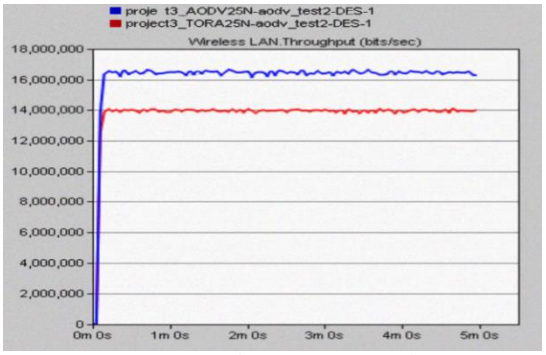


Figure 5: Throughput of AODV vs. TORA for 25 nodes

4. Conclusion

In this paper we compared different protocols in MANET. From all the mentioned results we can say that reactive protocols are more efficient than the proactive protocol. Based on the parameters AODV protocol is more efficient protocol when compared to DSR, DSDV and TORA protocols. For future extension we are going to modified AODV protocol by controlling the packets which are moving in different path to reach the destination, then we can save a lot of energy. This will increase the energy efficient. If we combine AODV protocol with any greedy protocol then we can increase the application of the MANET protocols. This paper will give main idea about selection of the protocol for development of wireless sensor network.

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