Study of Mobile Adhoc Network Scenario for Selection of Routing Protocol

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ABSTRACT

We discuss in this paper with basic introduction of MANET and its pros and cons and an attempt has been made to explain the all technology, problems, advantages, disadvantages and protocols used in on demand reactive routing protocols OR power routing protocols for mobile Ad hoc wireless network. A mobile Ad-Hoc network (MANET) is a collection of two or more devices or nodes or terminals with wire less communication i.e mobile adhoc wireless network and networking capability that communicate with each other without the aid of any centralized administrator also the wireless nodes that can dynamically form a network to exchange information without using any existing fixed network infrastructure. And it's an autonomous system in which mobile hosts connected by wireless links are free to be dynamically and same time act as routers at the same time. It then defines various protocols participated in routing through MANET.Ad Hoc Network must be able to adapt to changing network of this type at any time.The main classes of routing protocol are Proactive, Reactive and Hybrid.

Keywords: Adhocnet work, Aodv, Mtpr, Manet, Manet Routing Protocols, Hybrid Routing Protocol

INTRODUCTION

A mobile ad hoc network is a collection of wireless nodes that can dynamically be set up anywhere and anytime without using any pre-existing network infrastructure. It is an autonomous system in which mobile hosts connected by wireless links are free to move randomly and often act as routers at the same time [1].

MANET Features:

1) Autonomous terminal: In MANETthe mobile nodes can also perform switching functions as a router. So usually endpoints and switches are indistinguishable in MANET [2].

2) Distributed operation: The nodes involved in a MANET should collaborate amongst themselves and each node acts as a relay as needed, to implement functions e.g. security and routing.

3) Multi-hop routing: Basic types of ad hoc routing algorithms can be single-hop and multi-hop, based on different link layer attributes and routing protocols. When delivering data packets from a source to its destination out of the direct wireless transmission range, the packets should be forwarded via one or more intermediate nodes.

4) Dynamic network topology: Since the nodes are mobile, the network topology may change rapidly and unpredictably and the connectivity among the terminals may vary with time.

5) Fluctuating link capacity: The nature of high bit-error rates of wireless connection mMANET might be more profound. In some scenarios, the path between any pair of users can traverse multiple wireless links and the link themselves can be heterogeneous [3].

6) Light-weight terminals: The MANET nodes are mobile devices and light weight. These devices need optimized algorithms and mechanisms that implement the computing and communicating functions.

Pros and Cons of MANET:
Pros
    a)   AODV greatly reduced the number of routing messages in the network.

b) Since it is bandwidth efficient so it consumes less battery power.
c) The main advantage of AODV protocol is that routes are established only when one node raises a demand to communicate with another node [4].
d) To overcome the counting to infinity problem like in other distance vector routing protocols AODV uses sequence numbers to find the fresh route to the destination.
e) The proactive limits the proactive overhead to the size of the zone.
f) The reactive search limits to the border nodes outside of the zone.

Cons

a) Overhead on the bandwidth, because RREQ & RREP packets needs to carry a lot information to validate a route.
b) If the intermediate node does not have the latest destination sequence number it can lead to stale entries.
c) Multiple RREP packets in response to a single RREQ packet can lead to large control overhead.
d) The hello messages add a significant amount of overhead to the protocol.
e) Large overlapping of routes.
f) Longer delay if route not found immediately.
g) Core nodes movement affects the performance of the protocol.
h) High power required for the working of MANET [5].

2. Routing Protocols

Routing is the most fundamental research issue in MANET and must deal with limitations such as high power consumption, low bandwidth, high error rates and unpredictable movements of nodes.
Generally, current routing protocols for MANET can be categorized as:

2.1 Proactive (Table-Driven) Routing Protocols

Proactive routing protocols rely on the periodic collection and exchange of topology information by all the nodes to its neighbouring nodes. Routes are discovered for every mobile node of the network, without any requests from the nodes. Each node has to maintain one or more tables to store routing information, & response to changes in network topology by broadcasting & propagating [6][7][8].

The main *disadvantages* of Proactive Routing protocols are:

a) Wastage of bandwidth due to unnecessary advertising of routing information.
b) Maintaining a routing table for each node and advertising of this table leads to overhead, which consumes more bandwidth.
c) Regular update of its routing tables uses up battery power.
d) Slow reaction on restructuring and failures.
e) Many redundant route entries to the specific destination needlessly take place in the routing tables.

2.2 Reactive (On-Demand) Routing Protocols

Reactive routing protocols have been introduced to prevent the periodic routing information exchange as in Proactive routing protocols, which consumes an essential amount of the available network resources. In reactive routing protocols, when a node requires a route to a destination, it initiates a route discovery process. On-demand routing protocols were designed with the aim of reducing control overhead, thus increasing bandwidth and conserving power at the mobile stations [9].

Advantage
a) These are bandwidth efficient protocols. Routes are discovered on demand basis.
b) Less Network communication overhead is required in this protocol.

Disadvantages
a) High latency time is required in finding the route to the destination,
b) Flooding to can lead to network clogging.
c) RREP, RREQ & RERR messages leads to Control overhead.

2.3 Hybrid Routing Protocols

Hybrid protocols combine the features of reactive and proactive protocols [10].

Advantage

Main feature of Hybrid Routing protocol is that the routing is proactive for short distances to shorten the routing discovery time and toReduce the memory size where asreactive for long distances to reduce the size of the routing table and overhead as long distance destination nodes do not maintain routing information due to large overhead.

Disadvantages
The common disadvantage of hybrid routing protocols is that the nodes have to maintain high level topological information which leads to more memory and power consumption.In this protocol Large overlapping of routes is not possible and longer delay if route is not found immediately.

3. ENERGY EFFICENT ROUTING PROTOCOLS

3.1 Minimum Total TransmissionPower Routing (MTPR) scheme
A proposal which especially focused on the design of power-aware routing protocols providing efficient power utilization is MTPR. The Minimum Total TransmissionPower Routing (MTPR) scheme [4, 5, 8] tries to minimize the total transmission power consumption of nodes participating in an acquired route.
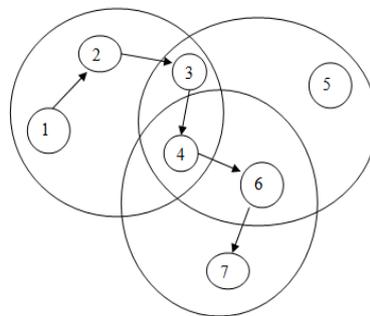
Fig 3.1: Packet move from source node 1 to destination node 7 using MTPR

It inherently accepts the possibility that the participation of more nodes in forwarding packets will increase the end-to-end delay. Moreover, because MTPR fails to consider the remaining power of nodes, it might not succeed in extending the lifetime of each host [11].
Limitations
   a) The network will be congested as the packets has to routed from multiple nodes.
   b) More number of nodes has to participate in forming a routing path.
   c) It will always select its nearest neighbouring node.

3.2 Min-Max Battery Cost Routing (MMBCR)
In MBCR only total battery cost function is considered so the route containing nodes with less remaining battery is still selected. To avoid using specific nodes in which cost function is modified to avoid selecting routes containing nodes with less battery capacity [12].

Advantages
   a) The battery of each host will be used more fairly than in previous scheme.

Disadvantages
   a) No guarantee that minimum total transmission path will be selected.
   b) It can consume more power to transmit user traffic.
   c) Reduces lifetime of all nodes.

3.3 Local Energy-Aware Routing (LEAR)
LEAR is originated from DSR but modifies DSR's route discovery procedure in order to choose mobile nodes with enough battery capacity as data relays. Hence it can avoid the early "death" of partial mobile nodes due to energy depletion. In LEAR, a mobile node decides whether to process a RREQ depending on its residual battery capacity. If battery capacity is higher than the threshold, the mobile node forwards the RREQ packet, otherwise, it drops the RREQ. Hence, when the RREQ arrives at the destination, it contains a route with all intermediate nodes with satisfyingenergy levels.When an intermediate node receives the duplicated RREQ, it adjusts (or reduces) it's thresholdtoallow forwarding to continue. It aims to balance energy consumption with shortest routing delays [13].

3.4 Ad hoc On-demand Distance Vector routing (AODV)

AODV is an on-demand routing algorithm that determines a route only when a node wants to send a packet to a destination.It uses shortest path scheme which is based on Dijkstra algorithm. AODV is distance vector type routing where it does not involve nodes to maintain routes to destination that are not on active path. As long as end points are valid AODV does not play its part. Different route messages like Route Request, Route Replies and Route Errors are used to discover and maintain links. UDP/IP is used to receive and get messages. AODV uses a destination sequence number for each route created by destination node for any request to the nodes. A route with maximum sequence number is selected. To find a new route the source node sends Route Request message to the network till destination is reached or a node with fresh route is found. Then Route Reply is sent back to the source node. The nodes on active route communicate with each other by passing hello messages periodically to its immediate neighbour [14]. If a node does not receive a reply then it deletes the node from its list and sends Route Error to all the members in the active members in the route. AODV does not allow unidirectional link.

Advantages
   a) It is bandwidth efficient so it consumes less battery power.
   b) To overcome the counting to infinity problem like in other distance vector routing protocols AODV uses sequence numbers to find the fresh route to the destination.

Disadvantages
   a) Overhead on the bandwidth, because RREQ & RREP packets needs to carry a lot information to validate a route.
   b) The hello messages add a significant amount of overhead to the protocol.

3.5 Hybrid Routing Protocols

Hybrid protocols combine the features of reactive and proactive protocols. These protocols have the advantage of both proactive and reactive routing protocols to balance the delay which was the disadvantage of Table driven protocols and control overhead (in terms of control packages). Main feature of Hybrid Routing protocol is that the routing is proactive for short distances to shorten the routing discovery time and toReduce the memory size whereas reactive for long distances to reduce the size of the routing table and overhead as long distance destination nodes do not maintain routing information due to large overhead [15] [16].

Disadvantages
   a) Large overlapping of routes.
   b) Longer delay if route not found immediately.
   c) Core nodes movement affects the performance of the protocol

5. CONCLUSION AND FUTURE SCOPE

After study it conclude that complexity difficulties comes in the random mobility of node. Each routing protocol has unique features. Based on network environments, we have to choose the suitable routing protocol. Proactive routing protocols are best suited in small networks. In large and dense network, reactive routing approach plays a major role. Reactive routing protocols use destination sequence number and feasible distance to ensure a loop free routing. Hybrid routing protocols use reactive and proactive approach in routing operations. Till today there are various issues in MANET, but at what speed new routing strategies are growing, soon ad-hoc networks will reach to its advance stage.

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