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# THE COMPARATIVE STUDY OF ADHOC NETWORK ROUTING PROTOCOLS

**BALAMURUGAN.G[1], SAKTHIVEL PUNNIAKODI[2], JAYANAVITHRAA.C[3]**

M.Tech., Dept., of CSE, Manakula Vinayagar Institute of Technology, Pondicherry, India[1]

M.Tech., Dept., of CSE, Manakula Vinayagar Engineering College, Pondicherry, India[2]

M.Tech., Dept., of CSE, Christ College of Engineering and Technology, Pondicherry, India[3]

**Abstract**: In order to maintain a serious of communication network in the adhoc domain is critically complex. Adhoc network is said to be infrastructure less network to form a communication network, we need to follow some of the protocols; there is a major issue for the selecting the protocols in the adhoc domain .In this paper, we argued some of the functional &their technical purpose of the protocol.

**Keywords**: adhoc domain, communication network, protocols.

## I. INTRODUCTION

In this network layer, we prefer to process packets by the routing ,Routing is an important issue for the network model, it is used for the selection of best path from source to destination this routing method constitute an set of rules for the communication is called as the routing protocol. In this there are two modes of network connection may exist; wired network and the wireless network; Adhoc network that relies on the wireless network. The main scheme of the routing protocol lies on the major two types namely,

- Topology based routing
- Geographic based routing

**Types of topology routing**

Proactive based (table driven)
→ (dsdv, star, cgsr, wrp)
Reactive based (on demand)
→ (aodv, tora, dsr)

**Types of geographic based routing**

(1) GPSR (Greedy Perimeter Stateless Routing)
(2) GSR (Geographic Stateless Routing)
(3) GF (Advanced Greedy Forwarding)
(4) RB-DV (Position-Based Routing with Distance Vector Recovery)
(5) RANT (Greedy Routing with Abstract Neighbor Table)
(6) SR (Geographic Source Routing)
(7) eOpps (Geographical Opportunistic Routing )

## II. PROACTIVE BASED (TABLE DRIVEN)

Proactive routing carries features that the routing information such as the next forwarding Hop is maintained in the background regardless of communication requests the control packets repeatedly broadcast and flooded in adhoc nodes for the maintenance of the paths or the link states between the pair of adhoc nodes where some of paths are never used A table driven is then constructed within a node such that each entry in the table indicates the next hop node toward a certain destination. The advantage of the proactive routing protocols is that there is no route discovery since route to the destination is maintained in the background and is always available upon lookup.

### DSDV(THE DESTINATION SEQUENCE DISTANCE VECTOR ROUTING PROTOCOL)

The destination sequence distance vector routing protocol (dsdv) is one of the first protocols proposed for adhoc wireless networks .It is an enhanced version of the first protocols proposed for the distributed bellman ford algorithm where every node on the network have the shortest path to connect each other. It incorporates table updates with the increasing sequence number tags to avoid loops ,to oppose the count-infinity trouble also for the fast convergence .It routes to al destinations are readily available at every node at all times .the table exchanged between neighbors at regular intervals to keep an update observation of topology of the network. The table contains 2 type of update:

- Incremental updates
- Full dumps

An incremental update handles a single network data packet unit (NPDU), while a full dump may take a multiple NPDU's.

### WRP (WIRELESS ROUTING PROTOCOL)

Wireless routing protocol (WRP) parallel to DSDV, succeed to the properties of Bellman-Ford distributed algorithm .To oppose the count to infinity crisis and to facilitate faster convergence, it employs a sole method of maintaining information as regards the shortest distance for all destination node. Since WRP, similar to DSDV, maintain an update in the network, every node has as route to traversal destination node in the network .It varies in table maintenance and in the update events .While dsdv maintains one topology table, while WRP uses a below tables for maintenance of more precise information.

Routing table (RT), Message retransmission table (MRT), Distance Table (DT), Link cost table (LCT)

The DT contains the view of neighbor node and also matrix where each element contains the distance of a node reported by a neighbor for a destination in the network .The RT contains the update view of the network for all known destination .The LCT contains the cost of relay

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message through each link. The MRL contains an update message that is retransmitted and upholds a counter for each entry in the network.

**Cluster-Head Gateway Switch Routing Protocol**

The cluster - head gateway switch routing protocol (CGSR) uses a hierarchical network topology, unlike other table driven routing approaches that employ flat topologies. CGSR organizes nodes into the clusters, with coordination between the members of each cluster entrusted to a special node named as the cluster-head. This cluster-head is elected dynamically by employing a least cluster change (LCC) algorithm. In this a node to be a cluster –head only if it comes under the range of another cluster-head, where the tie is broken either using the lowest ID or higher connectivity algorithm. Cluster provides a mechanism to allocate bandwidth, which is limited resource, among different clusters, thereby improving reuse.

**Source-Tree Adaptive Routing protocol**

Source tree adaptive routing protocol (STAR) proposed by Garcia-Luna-Aceves and Spohn is a variation of table – driven routing protocols, with the least overhead routing approach (LORA) as the key concept rather than the optimum routing approach (ORA) that was employed by earlier table driven routing protocols .the ORA protocols attempt to update routing information quickly enough to provide optimum paths with respect to the defined metric but with LORA, the routing protocol attempts to provide feasible paths that are not guaranteed to be optimal ,but involve much less control overhead .

TABLE 1
MERITS AND DEMERITS OF PROACTIVE

| PROTOCOLS | ADVANTAGE | DISADVANTAGE |
|---|---|---|
| DSDV | *LESS DELAY, HIGH MOBILITY ,HIGHLY DYNAMIC* | *STALE ROUTING IS OCCURRED* |
| WRP | *FAST CONVERGENCE ,GREATER PROCESSING POWER* | *NOT SUITABLE FOR HIGHLY DYNAMIC* |
| CGSR | *BANDWIDTH UTILIZATION* | *INCREASE IN PATH LENGTH* |
| STAR | *LOW COMMUINCATION OVERHEAD* | *REDUCES THE CONTROL OVER HEAD* |

## III. REACTIVE BASED ON DEMAND

Reactive routing process is described as route only when it is essential for a node to communicate with each other node. It maintains only the routes that are presently in use, thereby reducing the load on the network. Reactive routings classically have a route discovery phase where query packets are flooded into the network in search of a path. The phase completes when a route is found.

**AODV**

In Ad Hoc On Demand Distance Vector (AODV) (Perkins, 1999) routing, upon liberation of a broadcast query (RREQ), nodes trace the address of the node by distribution of the query in their routing table. This process of recording its preceding hop is called backward learning. Upon incoming at the destination, a respond packet (RREP) is then sent through the entire path obtained from backward knowledge to the source. At all stop of the path, the node would record its earlier hop, thus establishing the forward path from the source. The flooding of query and distribution of reply establish a full duplex path. After the path has been recognized, it is maintained as long as the source uses it. A link breakdown will be reported recursively to the source and will in turn prompt another query-response procedure to find a new route.

**PGB – Preferred Group Broadcasting**

(PGB) (Naumov, 2006) is a broadcasting mechanism that aims to decrease broadcast overhead connected with AODV's route discovery and to provide route constancy particularly significant in adhoc nodes where moving nodes are used as wireless hosts. Based on the received signal of the broadcast, receivers can decide whether they are in the preferred group and which one in the group to broadcast. Since only one node is allowed to broadcast and since the preferred group is not unavoidably the one that makes the most progress towards the destination, route discovery. Another drawback is that broadcast can suspend if the group is found to be vacant (possibly because of sparse networks). Packet replication can happen as two nodes in the preferred group can transmit at the same time. According to Naumov et al. (2006), the way to contract with transmits replication is to add packet's predecessors into the packet. This creates the same type of overhead in the packet as DSR.

**DSR – Dynamic Source Routing**

(DSR) (Johnson, 1996) uses source routing, that is, the source indicate in a data packet's the progression of nodes on the routing path. In DSR, the query packet copies header IDs of the center nodes and it is traversed. The destination then recovers the whole trail from the query packet and uses it to respond to the source. As a result, the source can found a path to the destination. If we allow the destination to send multiple route replies, the source node may receive and store multiple routes from the destination. An unconventional route can be used when some link in the current route ruptures. Low mobility in the network have an beneficial over AODV since the unconventional route can be tried before DSR initiates another flood for route discovery.

**Difference between AODV and DSR:**

There are two main differences between AODV and DSR. The first is that in AODV data packets carry the destination address, while in DSR; data packets carry the full routing information. This means that DSR has potentially more routing expenses than AODV. Also, as the network diameter increases, the amount of overhead in the data packet will continue to increase. The second difference is that in AODV, route reply packets carry the destination address and the sequence number, whereas, in DSR, route reply packets carry the address of each node along the route.

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**TORA – Temporally Ordered Routing Algorithm**

(TORA) (Park, 2007) routing belongs to an ancestors of link reversal routing algorithms where there a directed acyclic graph (DAG) based on the destination is built over the height of the tree root at the source. In directed acyclic graph the flow of packets and ensures arrive at skill to every nodes. When a node has a packet to throw, it broadcasts the packet. Its neighbor only has to broadcast the packet if it is the sending node is based descending link based on the DAG. A node would build the directed graph by broadcasting a query packet. Upon receiving a query packet, if a node has a descending link to the destination, it will broadcast a reply packet; otherwise, it simply drops the packet. A node, upon in receipt of a reply packet, will inform its pinnacle only if the height from the reply packet gives the minimum of all the heights from reply packets it has received so far. It then rebroadcasts the reply packet.

The advantages of TORA are that the implementation of the algorithm provides a route to all nodes in the network and that it has condensed far-reaching control messages to a set of neighboring nodes. However, due to this maintenance of these routes can be overwhelmingly heavy, in particular in highly dynamic.

**Evaluation of the Topology-based Routing:**

Jaap et al. (2005) has evaluated AODV, DSR and TORA. DSR suffers from a very high delay because source routes change incessantly due to high mobility. Its route overhead is analogous to yet higher than AODV since DSR keeps route information within the packet header. The common characteristic among all four routing protocols is that presentation degrades as network densities increase, indicating their scalability problem.

## IV. GEOGRAPHIC BASED ROUTING

In geographic (position-based) routing, the forwarding choice by a node is first and foremost made based on the position of a packet's destination and the position of the node's one-hop neighbors. The location of the destination which has been stored in the header of the packet by the source. The situation of the node's with one-hop neighbors is obtained by the beacons sent occasionally with random jitter (to prevent collision).

Nodes that are within a radio range will become neighbors of the node. Geographic routing assumes each node recognize its location, and the sending node identifies the receiving node's location by the rising attractiveness of Global Position System (GPS) unit from an involved direction-finding System and the recent research on location services (Flury, 2006; Li, 2000; Yu, 2004), respectively.

Since geographic routing protocols do not exchange link state information and does not maintain recognized routes like proactive and reactive topology-based routings , they are more robust and hopeful to highly dynamic environments .In other words, route is determined based on the geographic location of the neighbor nodes, and the packet is sent. There is no need of link state exchange or route setup.

**GPSR – In Greedy Perimeter Stateless Routing**

(GPSR) (Karp, 2000), a node forwards a packet to the neighbor which is geographically nearer to destination .This mode of forwarding is termed as the greedy mode. When a packet is in local maximum, a recovery mode is used for forward a packet which is closer to the destination, where the packet encountered the local maximum. The packet forwarding in greedy mode when a node reaches whose distance to the destination is closer than the node at the local maximum to the destination.

**AGF (**Advanced Greedy Forwarding**)**

Naumov et al. (2006) observed two problems with GPSR in Adhoc networks. First, due to the mobile nature, a node's neighbor table often contains archaic information of neighbors' position. The problem can be solved by increasing beacons frequency, yet such a solution only increases congestion and brings in potential collisions. To address these two problems, the authors proposed Advanced Greedy Forwarding (AGF) that incorporates the nodes direction in the beacon packet and the travel time, including the time to process the packet, up to the current forwarding node within the data packet. With the total travel time, each forwarding node can better conclude the divergence of the destination's original location and approximation its current location. Results have shown at least three times of improvement in packet delivery ratio to GPSR.

**PRB-DV (Position-Based Routing with Distance Vector Recovery)**

(PBR-DV) based on AODV-properties of restoration source packets drop into a local maximum. The node at the local maximum would broadcast a request packet, which is in the node's position and also destination's location. While receiving a request packet, a node verifies if it is nearest to the destination. If it is not, it carry out the node, which it receives the request and rebroadcasts the request, otherwise it sends a reply to the node. As the reply packet travels back to the local maximum node, every transitional node will record the previous node from which it receives the reply packet so that the local maximum node can maintain a route to a closer node than itself. The disadvantage of this scheme is that addition flooding is necessary to discover the non-greedy part of the route. There is no assessment done comparing PRB-DV to GPSR nor AODV thus performance in packet delivery and overhead is uncertain.

**GRANT(Greedy Routing with Abstract Neighbor Table )**

(GRANT) (Schnauzer, 2008) uses the concept of comprehensive greedy routing where every node knows its x hop neighborhood. This gives every node a distant sighted vision of the best route to take to avoid local maximum.

**GSR (Geographic Source Routing)**

(GSR) (Lochert et al., 2003) relies on the accessibility and computes a Dijkstra shortest path on the overlaid graph where the vertices are junction nodes. The sequence of junctions establishes the route to the destination. Packets

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are then forwarded greedily between junctions. GSR does not consider the connection between two junctions; therefore, the route might not be connected through. Revival when such a case happens is greedy forwarding.

**GeOpps (Geographical Opportunistic Routing)**

(GeOpps) (Leontiadis, 2007) takes benefit of the optional routes of nodes' direction-finding system to select vehicles that are likely to move closer to the final destination of a packet.

TABLE II
CLASSIFICATION OF GEOGRAPHIC ROUTING

| Protocol | type | Sub types | overhead | Model |
|---|---|---|---|---|
| AODV | TOPOLOGY BASED | REACTIVE | PATH STATES | PROBABILISTIC |
| PGB | TOPOLOGY BASED | REACTIVE | PATH STATES | PROBABILISTIC |
| DSR | TOPOLOGY BASED | REACTIVE | PATH STATES | BLOCKING |
| TORA | TOPOLOGY BASED | REACTIVE | PATH STATES | UNKNOW |
| GPSR | POSITION BASED | NON OVERLAY | BEACONS | PROBABILISTIC |
| AGF | POSITION BASED | NON OVERLAY | BEACONS | PROBABILISTIC |
| PRB-DV | POSITION BASED | NON OVERLAY | BEACONS AND PATH STATES | UNKNOW |
| GRANT | POSITION BASED | NON OVERLAY | TWO HOP BEACONS | BLOCKING |
| GEOPPS | POSITION BASED | DTN | BEACONS | NONE |

## V. CONCLUSION

The characteristics of routing protocols that have either been used or designed specifically for adhoc networks .The functionalities indicate whether they are topology-based or position-based and whether they are proactive or reactive. The visual projection describes the control packets related with the successful process of the protocols. Finally, the mobility model and propagation model present protocol evaluation.

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## BIOGRAPHIES

**BALAMURUGAN. G,** Completed Bachelor degree in information technology at 2013 and pursuing Master Degree in computer science and engineering under Pondicherry university, [MIT] Manakula Vinayagar Institute of Technology.

**SAKTHIVEL PUNNIAKODI,** Completed Bachelor degree in information technology at 2013 and pursuing Master Degree in computer science and engineering under Pondicherry university, [SMVEC] Sri Manakula Vinayagar Engineering College

**J AYANAVITHRAA. C,** Completed Bachelor degree in information technology at 2013 and pursuing Master Degree in computer science and engineering under Pondicherry university (Christ College of Eng. and Tech)