 ISSN: 2321-8169
4060 - 4065

Survey, Overview and Performance Evaluation Of Proactive, Reactive and Hybrid Routing Protocol

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Abstract: A mobile ad hoc network (MANET) is a repetitively self-configuring, mobile wireless node. Routing can takes place proactively (table-driven), reactively (on demand) or in a hybrid manner. This paper, attempts to contribute a study and comparison of reactive, proactive and hybrid routing protocol and comparing their different parameters. It also attempts to compare one of the best algorithms of each of the protocol.

Keywords: *Ad hoc, MANET, proactive, OLSR, reactive, AODV, hybrid, ZRP*

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I. INTRODUCTION

Routing is a process where the packets are transferred from one node to another depending on specific algorithm.

Ad hoc is infrastructure less i.e. it does have a base station for communication between different nodes.

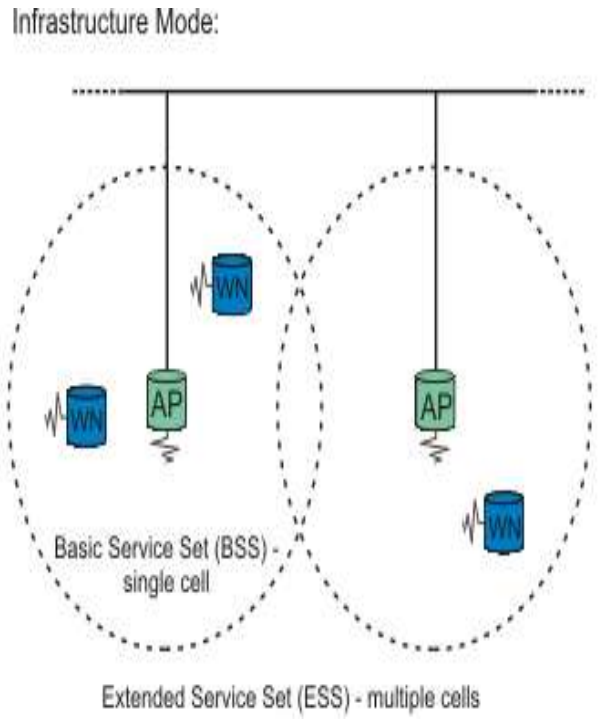

Figure 1: Infrastructure Network

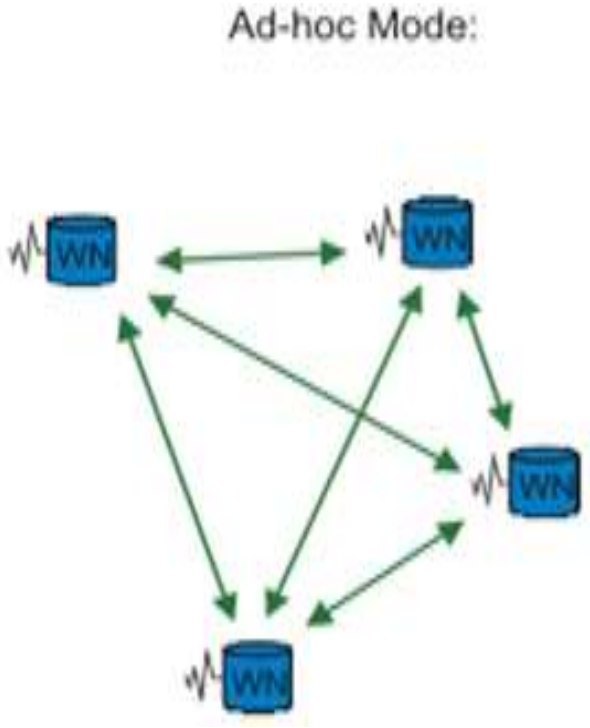

Figure 2: Ad hoc Network

MANET is a self-configuring routing protocol; example of MANET is mesh networking. The nodes keep on changing their position time to time. It mainly concentrates on routing algorithms and their working. MANET has three major protocols:

- Proactive
- Reactive
- Hybrid[1]

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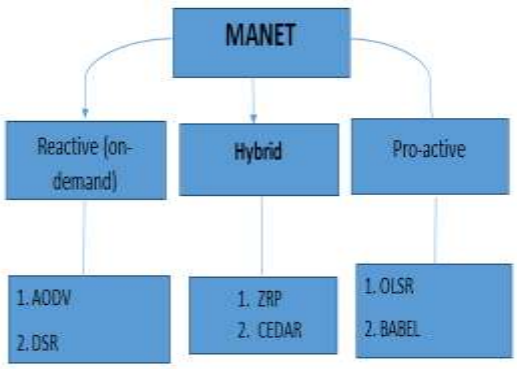

Figure 3: MANET Routing Protocol

II. MANET ROUTING PROTOCOL

A. PROACTIVE ROUTING PROTOCOL

In proactive routing protocol completely depends on routing table. Due to this it is also called table driven routing protocol. Each and every node maintains a routing table of its own. These tables maintain routes to all the destination nodes irrespective of the fact that we may not need all of them in near future. The tables are updated periodically or if any change takes place in the topology. Whenever a node wants to send data to destination it checks for the best route using the routing table. As mentioned earlier there are various protocols in proactive routing, the basic concept for all of them remains the same, they differ in the techniques used to broadcast changes in the network topology. [2]

One of the popular proactive routing protocols is OLSR (*Optimized Link State Routing)*

As stated earlier each node has routing table of its own and this table contains the next hop to the destination node (which may be different for different source nodes) and this table needs to be updated. In OLSR this information is exchanged using Topology Control (TC) packets. In OLSR, control packets are flooded within the network by electing special nodes, called Multi Point Relays (MPRs). This helps to reduce controlled traffic. MPRs are chosen such that the selected node is one hop and this node also deals those neighboring nodes which are two hops aside from the originating node. OLSR works with a periodic exchange of messages like *Hello* messages and Topology Control (*TC)* message only through these MPRs.[3]

WORKING OF MPRs: Suppose node a' has the empty MPR set. a' choose the one hop neighbor nodes which are only neighbor of some two hop neighbor. It is added in the MPR sets. Secondly add the MPR set the neighbor node of a' that covers the largest number of two hop neighbor of a' that are not yet covered by the current MPR set

Let's suppose that there are wireless topologies like figure 4.[3]

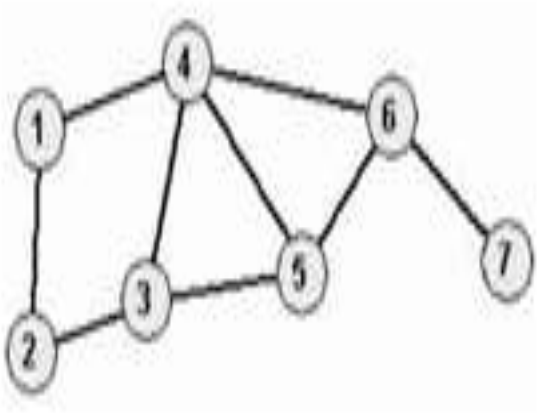

Figure 4: wireless topology [3]

The MPRs are selected. Node A creates the following table:

MPR set	Node
MRP(1)	4
MRP(2)	3
MRP(3)	4
MRP(4)	3,6
MRP(5)	3,4,6
MRP(6)	4
MRP(7)	6

Finally the rout is created from source to destination

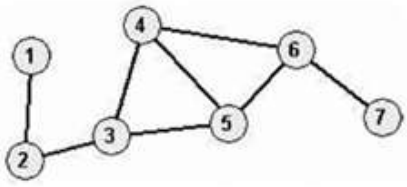

Figure 5: TC route [3]

Drawbacks: OLSR only considers the number of hops and the connectivity between nodes. If nodes are dynamic, the ratio of the success also degrades. [3]

 ISSN: 2321-8169
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B. REACTIVE ROUTING PROTOCOL

In Reactive routing protocol, the routes are not already maintained, like that in proactive. Reactive routing protocol is also called as ON DEMAND Routing Algorithm. In this, route is established only when two nodes want to communicate. When a source node wants to transmit data packet to destination then it first checks the route table, for any path available to the destination node. If there is no valid route found it performs a route discovery procedure. The route is valid until the communication is terminated.

One of best reactive routing protocols is AODV (Ad hoc On Demand Distance Vector Routing).

AODV: It doesn't maintain all routes in the network, but provides quick and efficient route establishment when they are required (on demand), thus providing communication between the nodes with minimal overheads. It is loop free i.e. if it has a choice between two similar routes then it choices one accordingly. [4]

AODV algorithm uses two methods:

- Route discovery
- Route maintenance

ROUTE DISCOVERY:

Route discovery method is initialized by generating the Route Request (RREQ) packet.

RREQ is uniquely identified by combination of Broadcast ID and IP address. Broadcast ID is incremented each time the source node initiates RREQ. [4]

RREQ packet contains:

- Destination node IP address
- Source node IP address
- Current sequence number of destination
- Last sequence number of destination

The connection establishment between source and the destination is done by sending RREQ packet from the source node. Source node broadcasts the RREQ packet to the neighboring nodes and sets a timer, which upon expiration notify the sender to rebroadcast the RREQ packet. If the

Communication request is accepted by the destination nodes, then they send a Route reply (RREP) as confirmation. Every RREQ packet contains a time to live (TTL) value that specifies the number of times RREQ packet should be re-broadcasted. [4]

Destination node creates Reverse route entry in the routing table and that reverse route sends RREP.

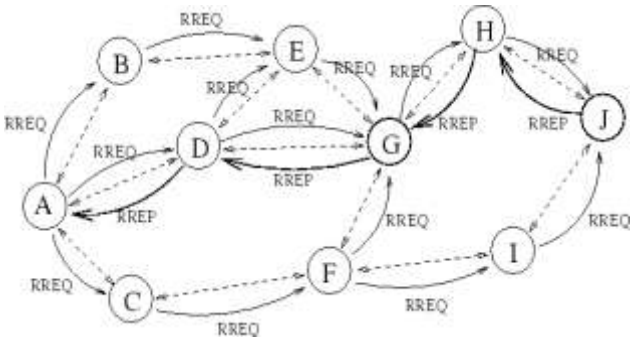

Figure 6: Route request and reply

ROUTE MAINTENANCE:

In reactive, route is maintained as long as it is needed. Nodes in MANET are not static, the nodes move from one place to another. Some nodes move with high velocity.

If the destination or any intermediate node in the path to the destination is moved then Route Error (RERR) packet is generated. This RERR is sent to each predecessor node lying in the route. This process continues until the RERR packet reaches to the source node. After getting RERR message the source node stops sending data and if it wants to continue interrupted data exchange it follows the route discovery procedure. [4]

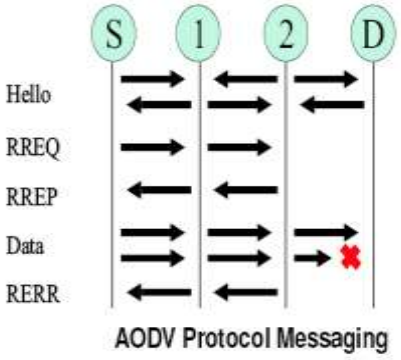

Figure 7: AODV Protocol Messaging

C. HYBRID ROUTING PROTOCOL

Hybrid routing protocol is combination of proactive and reactive routing protocol consisting of disadvantages of proactive and advantages of reactive protocol. Hybrid routing protocol consist of several zones. Each zone consist types of nodes:

i. Internal node
ii. Gateway
iii. Cluster node[6]

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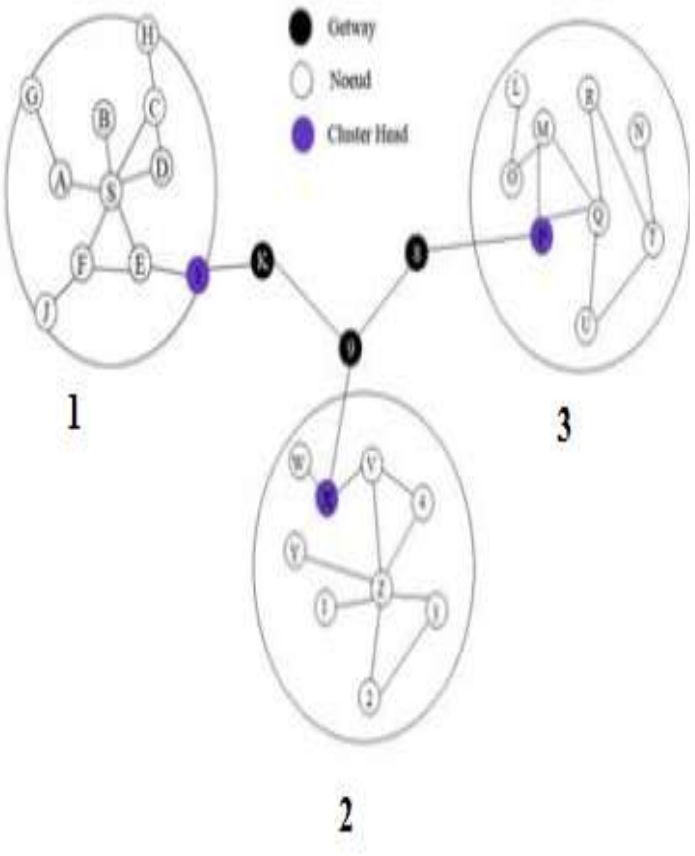

Figure 8: Hybrid Routing Protocol [6]

The above diagram clearly shows the different types of nodes.

The internal nodes are those nodes that lie inside the zone. In the zone 1 of figure 4 the internal nodes of S are {A, B, C, D, E, F, G, H, and J}.

The gateways are those nodes that link two zones of the network. In figure 4, nodes K, L, O.

The cluster heads are those nodes which are those nodes of a zone used to link to gateway for communication. The nodes I, X, P are cluster heads of figure 4.

ZRP (Zone Routing Protocol):

ZRP is a type of hybrid routing protocol it consist of zones depending on the radius (number of hops). The largest traffic is transferred to the nearby neighborhood nodes. The zones consist of two types of nodes:

- Interior nodes
- Peripheral nodes[7]

The number of hops the peripheral nodes are away from the source node is equivalent to the size of radius of the zone.

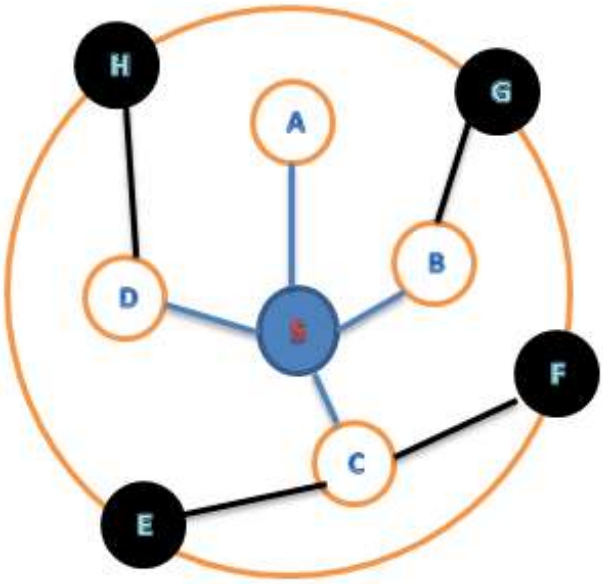

Figure 9: ZRP with radius 2

The intra zone routing protocol (IARP) uses proactive components to transfer packets within the zone. The inter zone routing protocol uses reactive component for zonal communication. In ZRP instead of broadcasting the packets we have border casting [7]

Initially, the data to be transferred is first checked if it's in the same zone proactively (IARP). If the destination is in another zone then packet transmission is done reactively.

The reactive transmission consists of two components route request and route reply. Route request is sent by source to the peripheral nodes using border resolution protocol that initiates border casting. Receiver knows the destination it responds by route reply else by border casting. Redundant requests are discarded i.e. if receiver receives request message from different route then the message is rejected. [7]

The reply to the source is done in two ways. First method is in each hop the node adds its data to the route request so, when the destination receives the request is replies using same path. Secondly, each node stores the data of the previous nodes from which it receives the request packet and thus the reply is given hop by hop [7]

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III. PERFORMANCE COMPARISON

A. Performance comparison between proactive, reactive and hybrid routing protocol. [5],[8],[9]

PARAMETERS	PROACTIVE	REACTIVE	HYBRID
Control Traffic	Reduced, periodic flooding of routing information packets.	Low, route only when there is data to be transmitted and as a result, generate low control traffic	Reduced, periodic flooding of routing informati on packets.
Bandwidth wastage	High, flooding causes bandwidth wastage	Low, on demand route discovery	Reduced, as compared to reactive protocol
Overheads	High, mobility of nodes creates redundant routes	Less, on demand route discovery	Reduced, compared to proactive
Latency	Low no delay because route is already in table	High, requires route discovery time	Reduced, small neighbor hood nodes use proactive protocol
Multicasting/ Unicasting	Supports both	Supports both	Supports both
Multiple route selection	Yes	No multipath	Yes
Network Organization	Flat/ Hierarchical	Flat	Hierarchi cal
Route Latency	Always Available	Available when needed	Both
Topology Dissemination	Periodical	On-demand	Both

B. Performance comparison between proactive, reactive and hybrid algorithms respectively. [5]

PARAMETER	OLSR	ADOV	ZRP
Type of protocol	Proactive	Reactive	Hybrid
Average Jitter	High	Comparatively low	High
Packet Delivery Ratio	Low	High	ZRP starts with higher value for small number of nodes in the network but decreases with higher number of nodes
Normalized Routing load	higher than ADOV but is much lesser than ZRP and increases with the number of the nodes		NRL for ZRP increases with number of nodes and remains much higher in comparison to the other two protocols
Security	No	No	No
Multicast	No	Yes	No
QoS	No	No	No
Power conservation	No	No	No
Periodic broadcast	Yes	Yes	Yes
Loop free	No	Yes	Yes

IV. CONCLUSION

In this paper, we compared the difference performances of proactive, reactive and hybrid routing protocols like Control Traffic, Bandwidth wastage, Overheads, Latency, Multicasting/ Unicasting, Multiple route selection, packet delivery ratio, Network Organization, Route Latency, Topology Dissemination and found hybrid routing to be

better than remaining two. At the same time we also compared a routing protocol from each type respectively

OLSR, AODV and ZRP routing protocol for mobile ad-hoc networks on the parameters like Average Jitter (s), End to End delay (s), Packet Delivery Ratio, Normalized Routing Load, security, multicast, QoS, power conservation, periodic broadcast, loop free which affect the protocols and found that ZRP is the better when compared to others but ZRP shows worst performance in terms of end to end delay, AODV is the highest packet delivery ratio and ZRP is the highest normalized routing load.

REFERENCES:

[1] Srivastava, A. CSE, BBDU, Lucknow, India Mishra, A. ; Upadhyay, B. ; Yadav, A.K.; Survey and overview of Mobile Ad-Hoc Network routing protocols; Advances in Engineering and Technology Research (ICAETR), 2014 International Conference on; Page(s):1 – 6;Date of Conference:1-2 Aug. 2014.

[2] Shenbagapriya, R. ; Vel Tech Multi Tech Dr. Rangarajan Dr. Sankunthala Eng. Coll., Chennai, India ; Kumar, N.; A survey on proactive routing protocols in MANETs; Published in: Science Engineering and Management Research (ICSEMR), 2014 International Conference on; Page(s):1 – 7;Date of Conference:27-29 Nov. 2014.

[3] Sehyun Cho ; ETRI, Univ. of Sci. & Technol., Daejeon, South Korea ; Heasook Park; OLSR Protocol having a link reliability list in the MPR; Published in: Advanced Communication Technology (ICACT), 2010 The 12th International Conference on (Volume:2);Page(s):1231 – 1234; Date of Conference:7-10 Feb. 2010.

[4] ICICES2014 - S.A.Engineering College, Chennai, Tamil Nadu, India ISBN No.978-1-4799-3834-6/14/$31.00©2014 IEEE,"A Survey of Reactive Routing Protocols in MANET", Daxesh N. Patel, Sejal B. Patel, Hemangi R.Kothadiya, Pinakin D. Jethwa, Rutvij H. Jhaveri.

[5] International Journal of Video Image Processing and Network Security IJVIPNS-IJENS Vol: 12 No: 05 22122005-8484-IJVIPNS-IJENS © October 2012 IJENS I J E N S, "Reactive, Proactive MANET Routing Protocol Comparison", K. Ramesh Reddy, S.Venkata Raju, N.Venkatadri.

[6] Wanzhi Qiu ; Univ. of Melbourne, Melbourne ; Skafidas, E. ; Qi Cheng; Hybrid Routing Protocol For wireless sensor networks; Published in: Communications and Information Technologies, 2007. ISCIT '07. International Symposium on; Page(s):1383 - 1388; Date of Conference: 17-19 Oct. 2007

[7] Kanishka Raheja , Sunil Kr Maakar Department of CSE, BRCM-CET (Bahal),India; A Survey on Different Hybrid Routing Protocols of MANET; (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 5 (4), 2014, 5512-5516.

[8] Khanvilkar, T.S. ; Electron. & Telecommun. Dept., STES Sinhgad Acad. of Eng., Pune, India ; Patil, K.P. ;Performance evaluation and comparison of routing protocols in MANETs; Published in: Computing, Communications and Networking Technologies (ICCCNT),2013 Fourth International Conference on; Page(s):1 – 4;Date of Conference:4-6 July 2013.

[9] Bhabani Sankar Gouda, Debasis Patro, Rabindra Kumar Shial; Scenario-Based Performance Evaluation of Proactive, Reactive and Hybrid Routing Protocols in MANET using Random Waypoint Model; Published in: Information Technology (ICIT), 2014 International Conference on; Page(s):47 – 52; Date of Conference:22-24 Dec. 2014.