THINK INDIA JOURNAL ISSN: 0971-1260

Vol-22-Issue-16-August-2019

Classification of Load Balancing Routing Protocols In Mobile Ad Hoc Networks: A Comparative Survey

ISHA

School of Computer Science Engineering

Lovely Professional University. Phagwara Punjab, India

ishu_sharma121@yahoo.com

Ruchita Duggal

School of Computer Science Engineering

Lovely Professional University. Phagwara, Punjab,India

Ruchita.24930@lpu.co.in

,

Abstract: Mobile Ad hoc Networks (MANETS) are the dynamic systems that comprise of portable segments. Such systems have topologies that are independent from infrastructure by having remote correspondence among them. A routing convention in MANET ought to reasonably disseminate the performance degradation of the network amidst the versatile host. An uneven traffic circulation prompts execution debasement of the system. Because of this unsteady nature, scarcely any nodes in the system are exceptionally stacked with routing obligations. This issue lead to the presentation of load balancing algorithms. This study investigates different load balancing algorithms for single path routing; multi path routing and cluster based routing. As of late, multi path routings have achieved more consideration in mobile ad hoc networks when contrasted with other routing schemes because of their capacities and productivity in improving transfer speed of correspondence, expanding conveyance dependability, reacting to congestion and heavy traffic.

1. INTRODUCTION

"A mobile ad hoc network (MANET) is a wireless communication network nodes that are not within direct transmission range establish their communication via the help of different nodes to forward data." The nodes in MANET have restricted transfer speed, support space and battery control. The switches are allowed to move randomly and compose themselves subjectively. In this path, the system's remote topology may change quickly and eccentrically. The system layer has gotten most consideration when dealing with mobile ad hoc networks. Two most significant tasks at the network layer are routing and sending. Information sending controls how these packets are picked from one connection and placed on another link. A protocol related to routing verifies which path a data packet should pursue from the source to destination node.

Distribution of the routine task among the mobile host should be fairly done by the MANET routing protocols. An uneven traffic/load prompts performance decline of the system. Because of this unbalanced nature, some nodes in the system are exceptionally over loaded with routing obligations. This issue leads to the presentation of load balancing algorithms for MANET [1]. Load balancing algorithms are isolated into two fundamental types, which are:

Static routing: In this kind ,the administrator manually assigns the routes so as to advance the information packets in the system, which implies there are fixed routes among sources and destinations, these routes are changed by the director on request, since that the router is not answerable for building the routing table.

Dynamic Routing: The switch is liable for building and exchanging the routing table data happen in the system topology, since that the switch ought to know about the system status so as to take its choice. There is no uncertainty that dynamic routing is more adaptable than static routing since it can distinguish the congestion paths [2].

2. CLASSIFICATION OF ROUTING PROTOCOLS IN MANETS

A. On Bases of Routing Information Update Mechanism

Specially appointed remote system routing conventions can be arranged into three significant classes dependent on routing data update mechanism. Explained as

Table-driven or Proactive routing conventions: In proactive routing, every node needs to keep up at least one table to store routing data, and any adjustments in topology should be reflected by propagating updates all through the system so as to keep up a consistent network view. They endeavor to keep up reliable, up-to-date routing data of the entire system. It limits the delay in communication and enables nodes to rapidly figure out which nodes are available or reachable in the system.

Reactive or on-demand routing protocols: Reactive routing is otherwise called on-request routing convention since they don't keep up routing data at the network nodes if there is no correspondence. This protocol analyze for the path in an on-demand way and built up the communication so as to receive and send the packet in case any node wants to send a packet to the other segment or node.

Hybrid protocols: This type of protocol presents a mixture of models that consolidates Reactive and proactive routing conventions. Nodes within a certain distance inside a specific area or inside a specific geological area are called to be inner side of the routing area of the given node. Routing in a specified zone, a methodology that is utilized by this work is table-driven. On-request methodology is utilized for the segments which are situated in the specified zone,

B. On the Bases of Use of Temporal Information for Routing

The conventions that come under this type of classification would be exceptionally grouped into two standards:

Past temporal information Routing Protocols: These types of protocols gets data about the present status of communications at the hour of routing as well as the past status of the communications to decide the routing choices. For instance, the measurement for routing dependents on the accessibility of remote connections alongside the shortest path searching algorithm, gives a path that may be proficient during path finding times.

Future temporal information routing protocols: The protocols having a place with this classification use data about the normal future status of the remote connects to settle on estimated routing choices. Beside the life of connections which are wireless, future data also include data in regards to the whole life of the node (that depends on the rest of the charged battery , expectation of link availability and expectation of location.

C. Based on Routing Topology

Flat topology routing protocols: Similar to IEEE 802.3 LANs scheme there is also flat addressing scheme which is being used by the protocols which fall under this category. A globally unique addressing mechanism is anticipated to be present for segments in the ad hoc system that are wireless.

Hierarchical based routing protocols: These protocols have a place with this classification utilize an intelligent order in system and technique based on associated addressing. Chain of command would be founded on the geological data or it would be seen on hop-distance.[3]

D. On the Bases of Utilization of Specific Resources

Power-aware based routing: These routing protocols fall under this category targets limiting the utilization of a specific resource in the special wireless networks. These routing choices depend on limiting the power consumption either universally or locally in system.

Geographical information assisted routing: Protocols having a place with this class develop the diminishing of the control overhead and exhibition of routing by viably using the topographical data present for an instance.[3]

3. CLASSIFICATION OF LOAD BALANCING PROTOCOLS IN MANETS

Load balancing is the most essential piece of an optimal network. For example, work completion gets complicated for nodes that do not have any method to disseminate the load and nodes with less handling abilities. Probability of load irregularity could come because of that the handling

intensity of the frameworks are non-uniform for example barely any nodes might be idle and scarcely any will be over-load. At times nodes that have high processing abilities completes their own task rapidly and is also assessed to have lesser load. In this path, within the vision of under-loaded segments, the requirement for the overly loaded segments is unfortunate [2]. Load Balancing Protocols are arranged into three classes relying on the routing procedure:

A. Single Path Load Balancing Routing Protocols

In single path routing, more than one noticeable route might be experienced however just one – the best one discovered, as indicated by a basis is utilized for traffic sending.

1. Load-Balanced Ad hoc Routing (LBAR): "Load-aware destination controlled routing for MANETs" is routing convention which is on-request and that is proposed for delay-delicate systems. It encounters routes with less traffic or load so information packets can be steered with less delay as possible. This type of calculation proposes four phases: Discovery of route; Maintenance of path; Management of Local Connectivity and Computation.

There are two phases in finding the route, backward and forward. In the forward stage of arrangement message sent is communicated that convey the cost data, visible from the source to the destination node. In case of backward stage the acknowledgement message is send by method of dynamic path. Because of versatility if the way breaks down then the destination node picks up the alternative best -cost route and send the acknowledgement message in the stage of path maintenance.

2. Load Sensitive Routing (LSR) convention: "Load Sensitive Routing for Mobile Ad Hoc Networks" relies on DSR. The convention uses arranged heavy data as the fundamental route determination model. The bestest approach to get arranged loaded data in LSR does not require exchange of loaded data periodically among neighboring nodes and is appropriate for any current routing convention. Dissimilar to LBAR and DLAR, LSR doesn't require the destination nodes to wait for all possible routes. Rather, it utilizes a re- route strategy to discover better paths successfully. In view of the underlying status of a functioning part, LSR can scan powerfully for better paths if the dynamic path gets blocked during information transmission. In route disclosure we utilize a redirection strategy like we created in Multi path routing to advance Route Reply (RREP) messages. This technique can give the source node a chance to get better path without an expansion of flooding cost and holding up delay in the destination nodes. In LSR, they adjust the dynamic routes in a route in an alternate setting, by utilizing system load data.

3. Dynamic Load Aware Routing Protocol: (DLAR): "Dynamic Load Aware Routing in Ad Hoc Networks" utilizes the packets quantity in the interface as essential route determination criteria. There are three calculations in choosing the least loaded route. DLAR plot includes the routing load of each half path node and the route with least sum is chosen. In the event that there is a clash between two, then with the briefest hop distance is chosen by the destination. In DLAR

convention just the lengths of immediate interface queues are considered yet the quick length of the queue doesn't give definite traffic at a node.

4. Weighted Load Aware Routing Protocol (WLAR): Weighted Aware Routing Protocol in Mobile Ad Hoc Network is an expansion of AODV, it disperse the deals among specially appointed nodes through load balancing component. They have utilized absolute traffic load, as a route choice measurement. Queue size and sharing nodes are utilized to locate the total traffic. The total traffic is the result of normal queue estimate and number of sharing nodes. In a node the total traffic load is characterized as its own traffic load in addition to the result of the quantity of sharing nodes and its own traffic load. In route discovery stage, when RREQ messages come at middle node, its rebroadcast is dependent on its own total traffic load so that the RREQ's which navigate the intensely loaded route s are dropped or left in transit or at the destination node. Best route will be chosen by the Destination node and answers RREP[1].

TABLE 1: SINGLE PATH LOAD BALANCING PROTOCOLS

Protocol	Extension of	Destination	Main Characteristics
LBAR LBAR	AODV	Designed for delay sensitive applications	A metric that accounts for the shared medium. Best route is the one with min load and min interference from neighboring nodes
LSR	DSR	Prevention of power depletion of nodes	Statistical information to distribute traffic load evenly. Accounts for the shared nature of medium
DLAR	AODV	Efficient utilization of network resources	Monitoring without additional overhead. Destination supported reconstruction of a route in advance
WLAR	AODV	Evenly Load Distribution over paths	Total traffic load on node is calculated .Path load found selects the main path for data transmission

B. Multi Path Load Balancing Routing Protocols

Multipath load balancing routing has been viewed as an attractive option for ad hoc systems administration since it can give adaptation to non-critical failure. The utilization of back up routes prompts makes communication sessions last longer provides robustness to mobility and fading and less packet loss.

1. QoS and Load Balancing AOMDV (QLB-AOMDV): Mohamed Tekaya et al [4] proposed a load balancing approach called QLB-AOMDV. To assemble the LB-AOMDV convention, they reclassify the built of RREP packet by including another character set called buffer_size which take into account the traffic load on the route. This traffic load is imparted as the total of buffer_size of center node for each route among source and goal. Exactly when a transitional node gets a RREP packet, it expands the new field with the size of control of its support. On the other hand, when the source gets RREP packet, it separates the estimation of the buffer_size field by the hopcount of each route among source and destination in order to have blockage level. By utilizing the data in the RREQ message a node can evaluate the connection delay. Therefore, we rethink the built of RREQ message by including two new fields which shows transmission postponement of packet (Delay) and got time of packet (Tr).

2. Ad Hoc On-Demand Multipath Distance Vector Routing Protocol Based on Node State(NS-AOMDV): Jieying Zhou et al [5] proposed another load adjusting approach. In NS-AOMDV, they acquaint node state to improve AOMDV's presentation for selection of principle path. In the hour of routing updating node weight is also updated. NS-AOMDV additionally utilizes the innovation of route demand packet (RREQ) defer sending and energy edge to lower the congestion, maintain a strategic distance from nodes which are low on energy to take part in the path foundation and limit the RREQ communicate storm.

3.Node Centric Load Balancing Routing Protocol(NCLBR): Amjad Ali, et al [6] propose another load offsetting routing convention NCLBR with the accentuation on including a very little routing overhead as conceivable to the activity of this convention. From the interface queue size every node acquires its present congestion status. An interface queue size of 60 is utilized by every node. During activity a queue size of 50 is viewed as the blockage edge. At the point when a node sees that the congestion edge has been come to, it therefore starts dismissing new packets of RREQ so as to not allow any new routes going through it and adding to the present blockage level of the node being referred to.

4. Balanced Reliable Shortest Routing Protocol (BRSR): D.Maheshwari et al [7] proposes another system to accomplish BRSR in Ad Hoc On-Demand Multipath Distance Vector Routing Protocol (AOMDV) with Three-path Filter (TF) component. The choice of BRSR between sources to destination is totally dependent on energy, connect quality so as to improve the information transmission and load balancing. They proposed another field to discover the remaining energy for the whole path and connection quality proportion.

ISSN: 0971-1260

Vol-22-Issue-16-August-2019

Table 2. MULTI PATH LOAD BALANCING PROTOCOLS

Protocol	**Extension of**	**Destination**	**Main Characteristics**
QLB- AOMDV	AOMDV	Designed for better end-to-end QoS requirements	A new key character called buffer_size is utilized which consider the traffic load on the route.
NS-AOMDV	AOMDV	To ease the network congestion	Path weight is calculated and updated at the time of routing information update.
NCLBR	AOMDV	Uses greedy fashion to avoid congestion	Congestion threshold is set. If threshold reaches, RREQ is not forwarded any more.
WLAR	AOMDV	Estimation of link quality and interference	Congestion threshold is set. If threshold reaches, RREQ is not forwarded any more.

C.Clustering Based Load Balancing Routing Protocols

1. Load Balancing Clustering (LBC): It gives an estimation balance of load on the chosen cluster heads. When a node is chosen a cluster head it is attractive for it to remain as a cluster head up to some greater indicated measure of budget, or time. In this calculation every portable node has VID (virtual ID) , the estimation of VID is set as its ID number from the outset and a variable .Initially, portable nodes with the most noteworthy IDs in their neighborhood can resume the cluster head job. Time units that a node can fill in as a cluster head persistently is being limited by Load Balancing Cluster, so when a cluster head drains its length plan, it resets its VID to 0 and transforms into a non-cluster head node. Exactly when two cluster heads move

into the arriving point at run, the one with greater VID wins the cluster head job. The recently picked adaptable node is the one whose past total cluster head serving time is the most limited in its neighborhood and this ought to guarantee great level of energy for being another cluster head.

2.Fuzzy Logic based Clustering Protocol: The Clustering is isolated into three stages: Election of the Cluster Head, Selection of the ClusterHead, and Load Transfer starting with one Cluster Head then onto the next The appointment of the Cluster Head is finished utilizing the LID calculation. The determination of the Cluster Head depends on a Fuzzy choice made by the nodes that will go under various Cluster Head. Load Transfer some portion of the improvements to decrease the impact of expanded load when another node gets conceded into the group. The above calculation functions admirably, however in the event that the node attempts to join at a later stage, the Cluster Heads will in general move this node to another Cluster Head which is moderately under loaded.

4. CONCLUSION

Load balancing is one of the key territories relating to look into in the field of mobile ad hoc networks in this work, Load balancing protocols are overviewed and characterized in three classes which are clustering based load balancing routing protocols, multi path based protocols and single path based protocols. We have gathered and condensed the information regarding protocols and afterward contrasted these protocols with respect to our depicted comparison framework.

REFERENCES

[1] Ali, A. 2001.Macroeconomic variables as common pervasive risk factors and the empirical content of the Arbitrage Pricing Theory. Journal of Empirical finance, 5(3): 221–240.

[2] Basu, S. 1997. The Investment Performance of Common Stocks in Relation to their Price to Earnings Ratio: A Test of the Efficient Markets Hypothesis. Journal of Finance, 33(3): 663-682.

[3] Bhatti, U. and Hanif. M. 2010. Validity of Capital Resources Pricing Model.Evidence from KSE-Pakistan.European Journal of Economics, Finance and Administrative Science, 3 (20).

[4] M. Tekaya , N. Tabbane ,S. Tabbane , “Multipath routing with load balancing and QoS in ad hoc network” , IJCSNS International Journal of Computer Science and Network 280 Security, Vol.10 No.8, August 2010.

[5] J. Zhou , H. Xu , Z. Qin , Y .Peng , C. Lei , “Ad hoc on-demand multipath distance vector routing protocol based on node state” Communications and Network, 2013, 5, 408-413.

[6] A. Ali , H. Wang , "Node centric load balancing routing protocol for mobile ad hoc networks" Proceedings of the International Multiconference of Engineers and Computer Scientists 2012 Vol 1, IMECS 2012.

[7] D. Maheshwari , D. Nedunchezhian , "Balanced reliable shortest route for AOMDV (BRSR-AOMDV) using TF mechanism in MANET" Int.J.Computer Technology & Applications,Vol 4 (6), 902-909.

[8] S. Reathi, T. R. Rangaswamy ,"Dynamic route shortening and route repairing mechanism for mobile ad hoc networks" Journal of Computer Science 8 (8): 1212-1218, 2012.

[9] P. T. Sujatha , V. D. Mytri , A. Damodaram , "A load aware routing mechanism for improving energy efficiency in mobile ad hoc networks" International Journal of Computer Applications (0975 – 8887) Volume 10– No.3, November 2010.

