European Journal of Molecular & Clinical Medicine
ISSN 2515-8260 Volume 7, Issue 4, 2020

Advanced Load balancing Congestion control Multipath routing with Random Early Detection using Fractional order Particle Swarm Optimization in MANETs

C.Mohanadevi[1] Dr.S.Selvakumar[2]
[1]*Associate professor in the Department of Electronics and Communication Engg., Mailam Engineering College, Villupuram, Tamilnadu, India.*
[2]*Professor, Department of Computer Science and Engg., GKM College of Engg. and Technology, Chennai, Tamilnadu, India.*
[1]*devibalacm@gmail.com* [2]*sselvakumar@yahoo.com*

Abstract— An infrastructure built in the Manet platform which is reliable to challenge the IT development communities of data stream in high dimensional data cluster modeling. This paper is based on reducing energy consumption and packet loss that leads to congestion control using random early detection (RED) and advanced load balancing in MANETs. Thus, this paper introduces an efficient routing technique called advanced load balancing Multipath routing using AOMDV protocol with fractional order particle swarm optimization (MRFPSO) in MANETs to efficiently balance the load among multiple path by reducing congestion using random early detection. This paper introduces a congestion control mechanism and an advanced load balancing mechanism during the data transmission process. The advanced load balancing mechanism is the selection of a gateway node by using link cost and the path cost to efficiently distribute the load by selecting the most desirable paths. The parameters in this paper in terms of control overhead, packet delivery ratio, average delay and packet drop ratio are found.

Keyword: - MANET, RED, AOMDV, MRFPSO, Routing, Load balancing, queue, Congestion.

1. Introduction

Ad hoc networks are self-organizing ,rapidly deployable,and dynamically reconfigurable networks without any fixed infrastructure. A mobile ad hoc network (MANET) is formed by a group of mobile wireless nodes communicating with each other via wireless links in a distributed fashion without any centralized administration or infrastructure. The nodes are mobile and can instantaneously and dynamically form a network on the fly when it is needed. All the mobile nodes can operate as host as well as a router to forward data. Mobile nodes undergo direct communication via wireless links if within the radio transmission range of each other or else they reach each other using routers through multi-hop. MANET nodes have limited communication resources like bandwidth, buffer space, battery power etc. MANETs has a wide area of applications in military and other practical application like emergency rescue, battlefield communication or exploration mission and in commercial applications like conference, course training, lectures, museum visits, multi-party gaming in conference room or classroom settings, city tours, peer-to-peer applications, e-gaming etc.

The mobility of nodes made it hard to find out a network topology used by nodes at any time for routing. Also the node mobility provides dynamic changing topology and breakage of route frequently which results in degradation of upstream on wireless network since it cause high loss of packets and delay while searching a new route. The low power battery operating nodes reduce their transmission range to nodes closer to them.

A. Advanced Load Balancing in MANETs

As mobile nodes communicate via bandwidth-constrained, variable capacity, error-prone ,and insecure wireless channels and also wireless links have significantly lower capacity than wired links and hence congestion is more challenging. Also the limited battery power of the mobile nodes reducing the processing power limits the services and applications that can be supported by each node. Heavy load can exhaust nodal resources like bandwidth, processing power, battery energy and memory storage. Also, if any heavily loaded node is congested, it can cause packet loss and buffer overflow which results in longer end-to-end delay, degradation in throughput and loss of transport connections.

MANETs resource constraints impose a need of proper distribution of the traffic among the mobile hosts. Since heavily loaded hosts results in congestion and large delay or results in quick energy depletion causing network partitions and failure of application sessions. Hence load balancing is essential for better utilization of MANET resources and improvement of MANET performance. Load balancing in MANET can reduce traffic congestion as well ad load imbalance, thereby minimizing end-to-end packet delay and maximizing lifetime of mobile nodes, etc. Load imbalance being a most critical issue in the networks, can be overcome by fair distribution of load among nodes in the network to enhance the network performance.

B. Multipath routing for advanced load balancing

The unpredictable environment , the unreliable wireless medium, and the mobile nodes can lead to various faults in MANETs. These faults can be compensated by multipath routing which enable a single source to establish multiple routes to a single destination node in single route discovery which in turn provide route resilience, higher aggregate bandwidth, and smaller end-to-end delays and better load balancing. Load balancing can be achieved by MANET multi-path routing protocols .Multipath routing between any source –destination pair of nodes balance the load more evenly throughout the network and remove the latency in route discovery after a link break by utilizing the availability of multiple route path. It is believed that multipath routing balances the load significantly better than single path routing and multipath routing results in higher throughput. The number of paths and distance of node from center are the two parameters affecting the load while using multi path routing .

The route discovery in multipath routing has more overheads than in single path routing.

C. Congestion control using Random Early Detection(RED)

Random early detection (RED) gateways for congestion avoidance detects congestion by computing the average queue size. Congestion is found by noticing the dropping packets arriving at the gateway or by setting a bit in packet headers. If the size of the queue becomes large than the threshold value, then a probability function of queue size is determined and insists the network to reduce the window size to reduce cingestion or to slow down the propagation of packets from the source. Thus congestion can be reduced beforehand so that the performance of network will be improved. For RED algorithm, a TCP can be used to guide the pathway.

2. Proposed system

A. Review

In the proposed system, the Multipath backbone Routing for load balancing in MANET technique for congestion control multipath routing in manet to efficiently balance the traffic load. Here, the selection of source node is done and it possesses good link status while minimizing the total path cost. Once, the load is detected by the candidate node, then immediately the packets are fragmented and load is distributed though the selected source node.

The selected node is in three useful paths and efficiently distributed the traffic load. Also, for efficient flow distribution a node availability degree standard deviation parameter is decreased the packet drop and increases the packet delivery ratio. In such a way the next implemented phase some error correction techniques such as network coding or forward error correction (FEC) can be implemented in the multipath routing in order to recover the packet losses due to transmission failure. The main advantages of proposed system are a connectivity factor to provide the node density adaptation. This technique increases the system performance by decreasing the overhead and the packets that are retransmitted. The performance

evaluation based on NS2 simulations shows that reduce the routing overhead for multimedia traffic due to the neighbor coverage knowledge and the probabilistic mechanism.

B. Particle Swarm Intelligence

Swarm intelligence (SI) is a type of artificial intelligence based on the collective behavior of decentralized, self-organized systems. SI system are typically made up of population of simple agents or boids interaction locally with one another and with their environment.

C. Fractional order Particle Swarm Optimisation

The Fractional order Particle Swarm Optimisation (FPSO), is a stochastic algorithm technique for solving computational problems which can be reduced to finding good paths through graphs. This optimization technique is inspired in the way swarms behave and its elements move in a synchro-
nized way, both as a defensive tactic and for searching
food. The particle movement is character-ized by two vectors, representing its current position x and velocity v .

F. Steps for the Algorithm

- Step-1: Distribute N nodes on XY-Plane randomly by using rand () function
- Step-2: Elect Cluster-Head initially
- Step-3: Find the distance of each node to CH
- Step-4: Form the cluster of each CH depending up on the distance
- Step-5: Assign initial energy to each node of cluster
- Step-6: Data transmission takes place cluster member of each cluster to respective CH
- Step-7: Elect CH maximum residual energy

Energy is most considerable parameter in cluster formation. The initial energy of the whole network is calculated and the energy of the network after processing the schedule, reflects the energy consumed during communication.

G. Calculation of Load

- Load = no of packets released / total number of packets
- Load is defined as exceed number of packets present in the node with respect to total number of packets.

H. End-to-end delay

The delay time is calculated using optimal delay broadcasting algorithm which means each node sends the neighbor discovery phase to neighbors, from the time taken by source node for broadcasting packets to its neighbor the delay is calculated and nodes are arranged in ascending order in terms of low delay node as first neighbor. Delay can be given by the ratio of time taken by the data packets to reach the target destinations.

Delay D = [∑ (Time taken to receive the packets-Time taken to send the packets)]/Total number if packets received

3. Performance Metrics

1.**Packet delivery ratio***:* It is the ratio of the data packets delivered to destination nodes to those sent by source nodes.

2. End-to-end delay: This is the average time taken for the data packetsto travel from source to destination and the propagation time.

3.Routing packet overhead: It is the ratio of the number of control packets to the number of data packets.

4.Throughput: This is the *n*umber of packets sent or received per unit time in the network.

4. Simulation Results

Network simulator 2 is used as the simulation tool in this paper. The Packet Delivery Ratio performance is depending on the percentage of receiving and sending. The proposed method with advanced load balancing improves network performance in terms of Packet Delivery Ratio. The delay is

decreased and provides reliable path for data delivery. The routing overhead is less and thus the throughput is increased.

5. Conclusion

The simulation result of Proposed FPSO based congestion control scheme using AOMDV is evaluated through performance metrics and the proposed scheme improves the data receiving, throughput and packet delivery ratio. Using advanced load balancing scheme the proposed system maintains good network performance. The AOMDV protocol handles load by choosing aliter path and the established path is congestion controlled by RED the proposed MRFPSO scheme improves the load balancing by providing the average queue size in the available network.

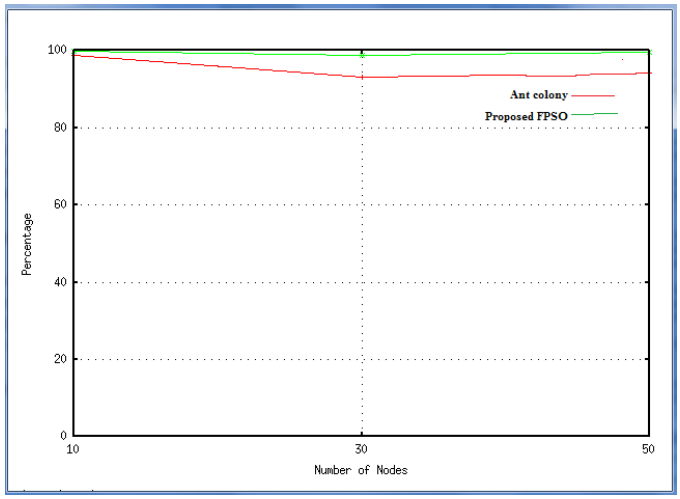

Fig 1. Packet Delivery Ratio

6. REFERENCES

[1] Islam, M.T., Thulasiraman, P. and Thulasiram, R.K.: 'A Parallel Ant Colony Optimization Algorithm for All-Pair Routing in MANETs', Proceedings of International Parallel and Distributed Processing Symposium, 2003.

[2] Yin S. and Lin, X.: 'MALB: MANET Adaptive Load Balancing', IEEE 60th Vehicular Technology Conference VTC 2004- Fall, 2004.

[3] Wang, G., Cao, J., Zhang, L., *et al*.: 'A Novel QoS Multicast Model in Mobile Ad Hoc Networks', Proceedings of the 19th IEEE International Parallel and Distributed Processing Symposium (IPDPS), 2005.

[4] Mueller, S. and Ghosal, D.: 'Analysis of a Distributed Algorithm to Determine Multiple Routes with Path Diversity in Ad Hoc Networks', Third International Symposium on Modeling and Optimization in Mobile, Ad Hoc, and Wireless Networks, 2005.

[5] Frias, V.C., Delgado, G.D. and Igartual, M.A.: 'Multipath Routing With Layered Coded Video To Provide QoS for Video-Streaming Over MANETs', 14th IEEE International Conference on Networks (ICON '06).

[6] Souihli, O., Frikha, M. and Hamouda, M.B.: 'Load-balancing in MANET shortest-path routing protocols', Ad Hoc Networks, 2009.

[7] Tekaya, M., Tabbane, N. and Tabbane, S.: 'Multipath Routing with Load Balancing and QoS in Ad hoc Network', IJCSNS International Journal of Computer Science and Network Security, August 2010.

[8] Toh, C.K., Le, A. and Cho, Y.: 'Load Balanced Routing Protocols for Ad Hoc Mobile Wireless Networks', IEEE Communications Magazine, 2009.

[9] Liu, C., Liu, K. and Li, L.: 'Research of QoS-aware Routing Protocol with Load Balancing for Mobile Ad hoc Networks', 4th International Conference on Wireless Communications, Networking and Mobile Computing (WiCOM).

[10] Ganjali, Y. and Keshavarzian, A.: 'Load Balancing in Ad Hoc Networks: Single-path Routing vs. Multi-path Routing', Twenty-third Annual Joint Conference of the IEEE Computer and Communications Societies INFOCOM.

[11] IETF MANET WG (Mobile ad hoc network), http://www.ieft.ora/html.charters/manet-charter.html.
[12] M. Ali, B.G. Stewart, A Shahrabi, A Vallavaraj, "Congestion adaptive multipath routing for load balancing in Mobile Ad hoc Networks", IEEE International Conference on Innovations in Information Technology (IIT), 18-20 March 2012.
[13] Christian Lochert, Bjorn Scheuermann, Martin Mauve, " Survey on Congestion Control for Mobile Ad-Hoc Networks", Wiley Wireless Communications and Mobile Computing, Vol.5, pp.655–676, 2007.
[14] Hui Cheng, Jiannong Cao," A Design Framework and Taxonomy for Hybrid Routing Protocols in Mobile Ad Hoc Networks", IEEE Communication Survey, Volume 10, No. 3 3rd Quarter 2008.
[15] M. Tarique, K.E. Tepe, S. Adibi, S. Erfani, "Survey of Multipath Routing Protocols for Mobile Ad Hoc Networks," Journal of Network and Computer Applications, Vol. 32, No. 6, pp. 1125-1143, 2009.
[16] M. Gunes, U. Sorges, I. Bouazizi, "ARA The Ant-Colony Based Routing Algorithm for MANETs, in: International Workshop on Ad Hoc Networking (IWAHN 2002), Vancouver, British Columbia, Canada, August 18-21, 2002.
[17] Saleh A. Alghamdi Load Balancing ad hoc On-demand Multipath Distance Vector (LBAOMDV) Routing Protocol EURASIP Journal on Wireless Communications and Networking, Springer Open Access, 2015.
[18] Chintan Kanani, Amit Sinhal, "Ant Colony Optimization based Modified AOMDV for Multipath Routing in MANET" International Journal of Computer Applications (0975 – 8887) Volume 82 – No.10, November 2013.
[19] E. Selvi M.Ss., and shashidara "an efficient routing optimization using secure reverse Multicast bellman ford ad-hoc routing using aomdv protocol in manet" ARPN Journal of Engineering and Applied Sciences ©2006-2015 VOL. 10, NO. 9, MAY 2015Asian Research Publish Network.
[20] Manjinder Kaur, Dr. Vinay Chopra, "Implementation of Rank Based ACO approach with Load Balancing in Ad hoc Network for Multipath Routing Mechanism" International Journal of Computer Science & Engineering Technology (IJCSET) Vol. 7
No. 06 Jun 2016.
[21] Aws Kanan, Taisir Eldos, Mohammed Al-Kahtani "Mobile Ad Hoc Networks Routing Using Ant Colony Optimization" World of Computer Science and Information Technology Journal (WCSIT) ISSN: 2221-0741 Vol. 3, No. 6, 105-109, 2013.
[22] Manpreet Kaur, Gurpreet Singh, "ACO Agent Based Routing in AOMDV Environment" MATEC Web of Conferences · DOI: 10.1051/matecconf/20165702005 March 2016.
[23] S. Kanimozhi Suguna , Dr.S.Uma Maheswari "Comparative Analysis of Bee-Ant Colony Optimized Routing (BACOR) with Existing Routing Protocols for Scalable Mobile Ad Hoc Networks (MANETs) based on Pause Time" IJCSNS International Journal of Computer Science and Network Security, VOL.12 No.4, April 2012.
[24] Yuhui Deng, Lin Cui, Deng Deng Liu "Ant colony-based energy control routing protocol for mobile ad hoc networks under different node mobility models" EURASIP Journal on Wireless Communications and Networking December 2016, .
[25] M.Manjunath, D.H. Manjaiah "Comparative Study of AODV, SAODV, DSDV and AOMDV Routing Protocols in MANET Using NS2", International Conference on Computing and Intelligence Systems Volume: 04, Special Issue: March 2015Pages 1174 – 1180.
[26] The ns Manual for practice is available at link http://www. isi.edu/nsnam/ns/doc.