International Journal of Engineering and Advanced Technology (IJEAT)
ISSN: 2249-8958 (Online), Volume-8 Issue-5, June 2019

A Novel Protocol for Infrastructure Based and Infrastructure less Multicasting Routing in Mobile Adhoc Networks

Gurjeet Singh, Vijay Dhir

Abstract: ***In this paper we have evaluated the performance of a Novel protocol advanced Weighted Cumulative Expected Transmission Time (aWCETT) and compare it with infrastructure based and infrastructure less multicasting casting routing protocols in mobile adhoc networks in terms of end to end delay, throughput and packet loss in NS-2. Hence a Novel protocol advance Weighted Cumulative Expected Transmission Time (aWCETT) is selected one of the best routing protocol for infrastructure based as well as infrastructure less environment.***

Keywords: DVMRP, PIM-SM, PIM-DM, CBT, WCETT, aWCETT, MANET & NS-2.

I. INTRODUCTION

MANET is a separate set of the mobile users establishing a short-term network which can communicate through comparatively bandwidth restricted wireless links. Network topology might change quickly and unexpectedly because of the nodes being mobile. Arrangement of MANETs can be done with no infrastructure or other management authority. It can be done with the help of nodes cooperating with each other with no centralized servers. Network is then decentralized as every network activity such as finding topology and delivering messages is used by mobile nodes. There are wireless links in MANETs and they operate separately. They are not centralized, they are autonomous and they can configure themselves.

II. INFRASTRUCTURE BASED ROUTING PROTOCOLS

The group communication is established in effective manner in multicasting routing when a similar message or a similar stream of information should be sent to different recievers. Multicast directing has pulled in a great deal of consideration in gathering focused figuring because of supporting information transmission from a solitary source hub to different goals simultaneously. The upside of multicast directing lies in its capacity of lessening the correspondence cost and sparing the system assets by sending just a single duplicate of the message over the mutual connection prompting distinctive goals. These routing protocols include:

Manuscript published on 30 June 2019.
* Correspondence Author (s)
Gurjeet Singh, Ph.D Research Scholar, Deptt of CSE, Sant Baba Bhag Singh University, Jalandhar
Dr. Vijay Dhir, Professor, Deptt of CSE, Sant Baba Bhag Singh University, Jalandhar

© The Authors. Published by Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP). This is an open access article under the CC-BY-NC-ND license http://creativecommons.org/licenses/by-nc-nd/4.0/

a) Distance Vector Multicast Routing Protocol (DVMRP)
b) Multicast Extension to Open Shortest Path First (MOSPF)
c) Protocol Independent Multicast Sparse-Mode (PIM-SM)
d) Protocol Independent Multicast Dense-Mode (PIM-DM)
e) Core-Based Tree (CBT)
f). Weighted Cumulative Extended Transmission Time (WCETT)

2.1 Distance Vector Multicast Routing Protocol (DVMRP)

DVMRP was modeled by S. Deering and standard was defined in RFC 1075 and is DVMRP is an internet routing protocol that provides an well organized equipment for message multicast within an autonomous system to a group of hosts across an internetwork which is suitable for use, but not between different autonomous system. Based on the Routing Information Protocol (RIP), this is an alteration and improvement to protocols of the Reverse Path Forwarding (RPF) family, made to fit the handling of group routing. Every node that sends information holds its own routing information (the group's spanning tree), which is created and updated when the multicast source sends a periodic burst of data to all nodes in the network, and only the nodes requesting the multicast transmissions acknowledge. The routing is then resolved using the Bellman-Ford algorithm (distance vector). When a multicast packet is received by router in DVMRP broadcast the packets and waits for the acknowledgement. The router which does not belong to the group prevents further sending of packets. The graft message is sended upstream if any of the routers wants to join the group.

2.2 Multicast Extension to Open Shortest Path First (MOSPF)

MOSPF is a protocol for the multicasting purpose. The location of multicast destinations is advertised by describing a new OSDF link state.
Shortest path is calculated from the multicast packet path.
MOSPF involves topology exchange and membership information in a small domain known as autonomous system.

1. The link state techniques are used to construct its routing table in dense mode.
2. The OSPF area is flooded with MOSPF routers with information about group receivers.
3. The MOSPF routers have same view of group membership.

4. MOSPF, a new OSPF advertisement is added describing multicast locations. The current state table information is maintained and the group information is broadcasted across the network.
5. Distribution tree changes with the change of network topology change as OSPF independently construct unicast routing topology.

2.3 Protocol Independent Multicast Sparse-Mode (PIM-SM)

PIM-SM is a routing protocol planned for sparse distribution of receivers. This protocol belongs to a single distribution tree per group for the class of router-based schemes, But it supports both shared tree and source specific tree and basically aims at "multiple-sender-group" scenario. The routers RPs (RP-set) acts as a sparse-mode domain and at given time each group has a single RP. The message RP is send to a certain group to receive multicast messages to join message to that group.

1. PIM-SM creates a shared tree from RP to all the hosts which have joined the multicast group.
2. Receivers are always expected to send join messages to a router acting as a core.
3. Data is always distributed over this shared distribution tree.
4. The multicast group sends the data to the RP first then the data is forwarded down to all the receivers of the shared tree.
5. PIM-SM generates periodic control messages to refresh the multicast forwarding states on the router.

1.4 Protocol Independent Multicast Dense-Mode (PIM-DM)

PIM−DM is a algorithm which is source specific and planned for opaque receiver distribution. In addition, it is independent of unicast routing protocol. Dense-mode PIM assumes that receivers start receiving the packets when source starts sending all downstream data packets. Packets are distributed to all the areas using the multicasting technique. If some areas does not belong to a group then DIM-PM will set a "Prune State" A rooted tree is used for forwarding the packets in all branches. The friendly interface list becomes NULL if the prune messages were received from downstream routers. To maintain a strategic distance from prune storms, prunes must not be sent upstream for each datum bundle coordinating a negative cache entry. Some policy for sending the prune upstream is required. The Prune data can be erased occasionally with which the packets will be send downstream routers.

2.5 Core Based Trees (CBT)

CBT is based on the use of a certain node as the group's core. This core maintains the distribution tree for the entire group and all the group's details sent to the core before being forwarded to the group. (Ballardie, 1994) The core doesn't have to be an active participant in the multicast group. The distribution scheme is built according to the paths of "join"/"leave" IGMP messages sent to the core, which results in low control overhead and no data sent to users not participating in the group (except for the core).

On the other hand, sending all data via the core means there is practically no use of optimal routing, and even worse, all transmissions run on the same few lines, causing high loads in large groups.

2.6 Weighted Cumulative Expected Transmission Time (WCETT)

WCETT is a routing protocol [1] which is used to choose the best way between source cognitive client node and destination cognitive client node. The routing procedure starts at a point when a route is required from one side to another and the route request is started by the source node (RREQ) packet over the network. The WCTT [6] contains the fixed value for route request (RREQ) packet forwarded by a node contains the determined value. At a point when a node is free or there is no transmission on the node and the (RREQ) packet gets at a node, it starts retransmitting the RREQ in two cases: The value of WCETT is not entered in the routing table due to on the off chance that the arrangement number of route request (RREQ) packet is new. In second case the route request (RREQ) of same arrangement number has been calculated the sequence number of route request (RREQ) isn't new, yet its WCETT esteem is littler than the past RREQ of a similar sequence number. This process will help the network to find the most reduced cost.

III. INFRASTRUCTURE LESS ROUTING PROTOCOLS

There is a changing topology and fixed infrastructure [5] in MANET in which nodes are used in utilized in case of emergency with no infrastructure available. In view of the system structure along which multicast bundles are passed on to various recipients, multicast conventions can be completely arranged into two sorts, specifically tree-based multicast and mesh based multicast. The tree structure is known for its effectiveness in using the network resource ideally, while tree based protocols are commonly increasingly proficient as far as information transmission. Work based protocols are progressively strong against topology changes because of accessibility of numerous excess ways between versatile nodes and result in high packet delivery ratio. On the other hand, multicast work does not perform well as far as vitality productivity since work put together protocols depend with respect to communicate flooding inside the work and consequently, including a lot more sending nodes than multicast trees.

a) Multicast Ad hoc On-demand Distance vector protocol (MAODV)

b) Protocol for Unified multicasting through Announcements (PUMA)

3.1 Multicast Ad hoc On-demand Distance vector protocol (MAODV)

MAODV constructs a shared tree which is linked by all sources and recipients for a group. In this whenever the tree is damaged, it repairs the newly active sources to the multicast tree to activate it to find the position to group joins and attachment. The transmitting paths for data packets to reconnection a shared tree are localized. The group sequence number in multicast group disseminating for packet floods and group periodic link broken to detection requires in MAODV. The shared tree between multicast senders and recipients group are created by MAODV.

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication (BEIESP)
© Copyright: All rights reserved.

The multicast sender or receiver for a group has been assigned as a group leader of each group. Individual data packets are transmitted to all the nodes on the list and does not received the data packets from the nodes which it was received. The multiple nodes accepts the transmitted packets which are broadcasted to each neighbor. The on demand routes are constructed and destination sequence numbers are used to find the current route to the receiving end. The disadvantage of MAODV's is that as a packet travels longer routes it suffers from high End-to-End Delay within the shared tree.

3.2 Protocol for Unified Multicasting through Announcements (PUMA)

PUMA can send multicast [3] data to several groups. The sender does not require to link with the group to transmit the data. If the node knows the destination it begins to transmit packets and specifies the same route for the group. When multicast group routes the data along the network it establish the connectivity list in the network at every node and helps all the nodes to construct the mesh. Each node use ID, sequence number and distance. There are so many routes to the network. But if the route changes all the nodes have to construct their link lists. In MANET the multicast routing structure constructs a functions to accomplish a very simple signaling derives for PUMA protocol. PUMA protocol has one of the advantage is that it has high packet delivery ratio and limited traffic. In other words, mobility, number of senders, multicast group size and traffic load is changed when the control overhead of PUMA is almost constant. It also provides the highest packet delivery ratio for all scenarios. The PUMA provides the redundancy to the region containing the receivers constructed by the mesh, thus decreasing of unwanted transmitting of multicast data packets. The multicast data packets move node to node until it reaches the mesh network. The packets are then broadcasted within the mesh network, and all the group members use a packet to detect and discard duplicates. The packets are detected if the packets are duplicate then discarded.

IV. RELATED WORK

L.M Kola and M. Velempini [1] has recently emerged and provides an broadband internet access for a high speed wireless technology and delivers combined wireless communication solutions. The new platform is established for high speed broadband communication and integrating the traditional with new wireless technologies such as cognitive radio technology. The performance of network routing protocols is decreased in a multi-hop ad -hoc cognitive radio network environment, which are adapted from the traditional wireless networks. The current routing protocols can be adapted and optimized to endeavor the performance of the cognitive radio network.

Chitra K [2] proposes Hierarchical Routing Protocol with Multiple Transceiver. At the point when the source needs to transmit the data packets to destination this routing technique can be used for the establishment of the route. In this strategy, grouping is done and afterward utilizing system source connector, cluster head selection is done. After that source transmits packet dependent on the proposed information spread model with various handsets which builds the transmission run and provides clear line of sight for routing in FSO.

Punitha P [3] In MANET every host acts as a router when it is forwarding a packet for other hosts. Here, routing protocol helps the intermediate nodes to forward a packet when the mobile nodes are not in the same transmission range therefore the routing protocol plays an important role in MANET for determining a route. Advantages is nodes are self-organized and self- healing and self-management. The nodes in Ad-hoc network need not depend on any hardware and software, so it can connect and communicated quickly. My works concentrate on Delay minimization, Energy consumption, and Load balancing between source nodes to destination node. Cross layer is a combination of physical layer, data link layer, network layer. In this work is used in military applications. This paper proposed algorithm is Neighbor- Coverage Based Topology Control Algorithm ITCDNCPR, algorithm concentrates on both is covered and uncovered area in a network based on a signal strength.

Rao A.L.N [4] Infrastructures less system which makes the ad -hoc organize in which execution and securities are its two noteworthy issues. Security is tedious task because of its self arranging highlight giving runtime organize. So an efficient and strong algorithm is required to setup so that various eavesdropping activity can be avoided. As each time hubs leaves or goes along with it needs to recover another session key for maintaining secrecy. This paper proposed another key management scheme to improve the network security with less versatility overhead and less key distribution time.

Rashid Umair [5] MANETs forms a dynamically changing network and consist of a group of mobile nodes that use the existing infrastructure. Each node in the network can act as a individual node to its nearest neighbor. The communication is ensured between distant nodes for relaying data to neighboring nodes. The network life time is increased by the information dissemination mechanism pattern which consumes extra node energy thus making energy a critical parameter. This paper proposes a new MEAODV protocol for energy and mobility aware routing.

Tyagi Shobha et al [6] The fundamental structure of MANETs depends on best effort delivery of data and does not make any guarantees with respect to guaranteeing Reliability or Quality of Services. Seeing the present interest of multimedia applications and need of being constantly connected with or without internet is always attracting the researchers to evolve the MANETs(Mobile Ad -hoc Networks) so as to guarantee the assurance of administrations regarding quality. In this paper the author have fundamentally analyzed the essential AODV a reactive routing protocol of MANET, with all its positive and negative attributes. AODV is examined for QoS provisioning and to support QoS, a Reliability aware variation of AODV is proposed. This reliability aware variation of AODV depends on presenting stability to routers. The chosen routes are constrained with End-to-End Delay and width parameters to provide quality services to application layer.

Mangrulkar R.S [7] MANET is a self configuring and infrastructure less wireless network. The data packets are successfully transmitted and depends on the cooperation of every node in the network.

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication (BEIESP)
© Copyright: All rights reserved.

Each node in the network can act as a router because this type of network do not have permanent base station. Security is very important in MANET due to its openness, decentralized, self organizing nature and it is vulnerable to various attacks.

V. PROPOSED ALGORITHM

Algorithm: advanced Weighted Cumulative Expected Transmission Time (aWCETT)
Inputs: source node, destination node
Output: multicasting paths from source node to destination node with trust value
Step 1: Begin
Step 2: At source node RtReq packet is created from source node with destination address
Step 3: source node multicasts RtReq packet.
Step 4: For each neighbor node of source node
Step 5: While (RtReq not reached to destination node)
Step 6: RtReq is further multicasted
Step 7: end loop
Step 8: RtRep is created at destination node with trust value=0;
Step 9: next node = destination node
Step 10: (While next node is not source node)
Step 11: next node = next adjoining router
Step 12: search for entry of next node in trust table
Step 13: Calculate value of next node
Step 14: increment RtRep with trust value + = calculated trust value
Step 15: RtRep to next node using unicasting
Step 16: End Loop
Step 17: if (next node is source node)
Step 18: Route is stored in routing table of source node
Step 19: End if
Step 20: End for
Step 20: threshold value = average trust value (all possible routes)
Step 21: For each route
Step 22: if (trust value of route < threshold value)
Step 23: abolish the route r from the routing table
Step 24: end if
Step 25: end for
Step 26: while (source has a data packet to send)
Step 27: for i = 1 to n (number of routes from source to destination)
Step 28: use route i to send data packet
Step 29: end for
Step 30: end while
Step 31: End

VI. RESULTS

As well as Infrastructure based protocols we have evaluated the performance of a Novel protocol advanced Weighted Cumulative Expected Transmission Time (aWCETT) and compare it with Weighted Cumulative Expected Transmission Time (WCETT), DVMRP, CBT, PIM-SM and PIM-DM in terms of routing overhead, network resource usage, throughput, packet delivery ratio and end to end delay in NS-2. As well as Infrastructure less protocols we also have evaluated the performance of a Novel protocol advanced Weighted Cumulative Expected Transmission Time (aWCETT) and compared it with MAODV and PUMA in terms of routing overhead, throughput, packet delivery ration and end to end delay in NS-2. The obtained results are illustrated below. Multicast routing protocols are compared on the basis of different Performance Metrics.

6.1 End to End Delay

End to end delay [7] refers to time taken by a packet to be passed over a network from source to destination. The delay for CBT was relatively more than the other protocols. CBT protocol likewise made a shared tree but the delay was a lot higher. This is because of the operation time at the RP. The delay has a fairly consistent value for all the four protocols. The second highest delay is created by PIM-SM. All the three Remaining Protocols indicates practically constant delay after one second which isn't the situation in CBT.

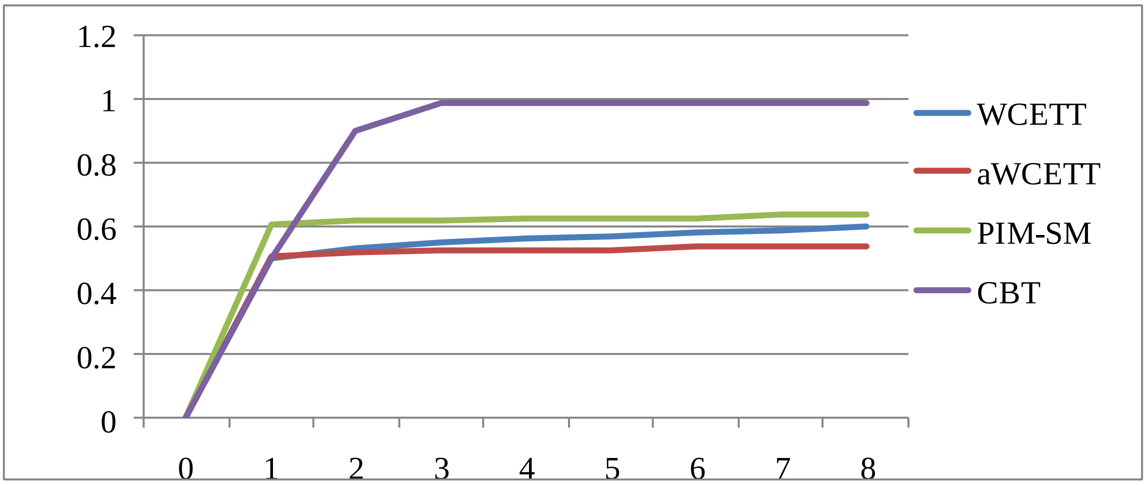

Figure 1.1 End To End Delay (Infra. Based)

End to End delay for different Protocols according to varying topology is shown in table 1.1. For real time application or critical applications end to end delay should be less.

Published By:
Blue Eyes Intelligence Engineering & Sciences Publication (BEIESP)
© Copyright: All rights reserved.

Lesser the end to end delay better will be the performance. End to End delay for all Multicast routing protocols is shown in the graph corresponding to the simulation time. End to End delay bears large variation in the graph, somewhere it is more and somewhere it is less. aWCETT is better than WCETT when comapred according to end to end delay metric. And among WCETT, PIM-SM and CBT. The advanced Weighted Cumulative Expected Transmission Time (aWCETT) provides less end to end delay.

Table 1.1 End To End Delay (Infra. Based)

No. of Group Members	Four	Eight	Sixteen	Thirty Two
WCETT	$10426964 \times (10)^{-9}$	$10426984 \times (10)^{-9}$	$10426949 \times (10)^{-9}$	$10426958 \times (10)^{-9}$
PIM-SM	$10426571 \times (10)^{-9}$	$10426727 \times (10)^{-9}$	$10426853 \times (10)^{-9}$	$10426789 \times (10)^{-9}$
aWCETT	$10426856 \times (10)^{-9}$	$10426967 \times (10)^{-9}$	$10426769 \times (10)^{-9}$	$10426770 \times (10)^{-9}$
CBT	$11227 \times (10)^{-6}$	$11227 \times (10)^{-6}$	$11227 \times (10)^{-6}$	$11227 \times (10)^{-6}$

In ad-hoc networks End to End to End delay is as following.

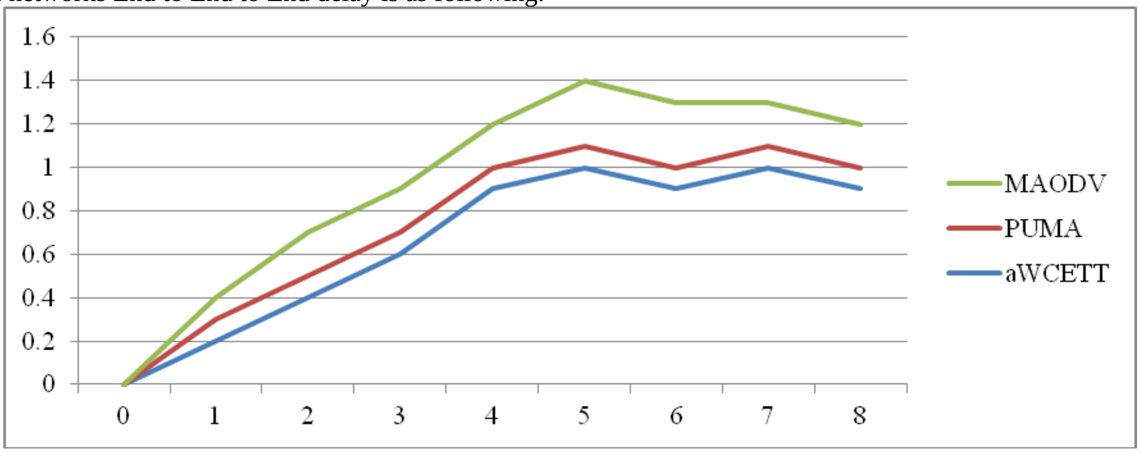

Figure 1.2 End To End Delay (Infra. Less)

From the three protocols MAODV, PUMA and aWCETT. MAODV has high End to End delay. aWCETT has less End to End Delay. MAODV and PUMA are both receiver-oriented and mesh-based protocol deliver single routes from source to destinations. WCETT, on the other hand[6] a WCETT is a tree based protocol and delivers a multiple route between source and destinations.

Table 1.2 End To End Delay (Infra. Less)

No. of Group Members	Four	Eight	Sixteen	Thirty Two
MAODV	$9724180 \times (10)^{-9}$	9784379 x (10)-9	$1 \times (10)^{-6}$	$2125430 \times (10)^{-6}$
PUMA	$9613170 \times (10)^{-9}$	9673288 x (10)-9	$1 \times (10)^{-6}$	$1014320 \times (10)^{-6}$
aWCETT	$1 \times (10)^{-16}$	$1 \times (10)^{-16}$	$1 \times (10)^{-16}$	$1 \times (10)^{-16}$

The above Figure 1.2, shows higher End-to-end delay defines that routing protocol in the network is not fully efficient and causes congestion. Among the protocols MAODV, PUMA and aWCETT. aWCETT has lesser values of End-to-end delay. End 2 End delay = time (in seconds) when packet was received by RECIEVER NODE - time (in seconds) when packet was sent by SOURCE NODE (for calculations)

6.2 Throughput

Throughput is how much data can be transferred from one location to another in a given amount of time. Throughput is the speed at which network sends or gets information. Throughput is a lot resistant to characterize and quantify in light of the fact that there are various ways through which throughput can be determined:

- The speed of the packet on the network.
- The speed of the packet for a specific application flow.
- The speed of the packet of host to host aggregated flows.
- The speed of the packet of network to network aggregated flows.

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication (BEIESP)
© Copyright: All rights reserved.

We have calculated throughput using following formula: Throughput = Packets received / Packets forwarded

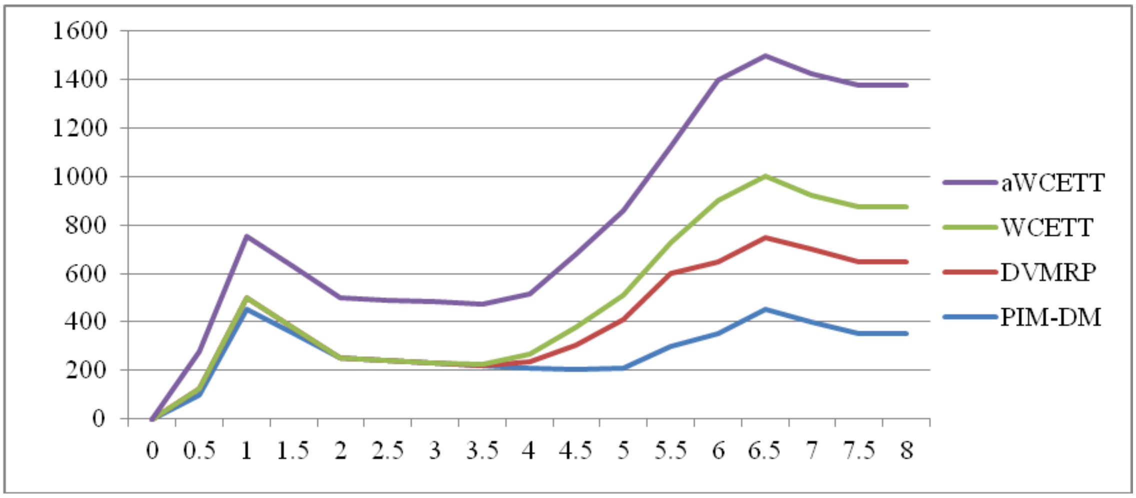

Figure 1.3 Throughput (Infra. Based)

Table 1.3 Forwarded Packets (Infra. Based)

No. of Group Members	Four	Eight	Sixteen	Thirty Two
DVMRP	2424	12143	32001	62444
WCETT	2518	12157	57733	31574
PIM-DM	2783	13241	34378	65478
aWCETT	4321	13804	38466	61574

Throughput of aWCETT is higher than all protocols while PIM-DM does not achieved the expected throughput, same is the case for DVMRP but it performs good as compared to PIM-DM. Both Sparse mode protocols performs very well as compared to both compared to dense mode protocols .The basic reason behind this is initial flooding by DVMRP and PIM-DM . That's why the packets meant for actual receivers are too less as compared to sent packets. In ad-hoc networks aWCETT outperforms when compared with WCETT in light of the fact that it depends on extremely great procedure of declarations.

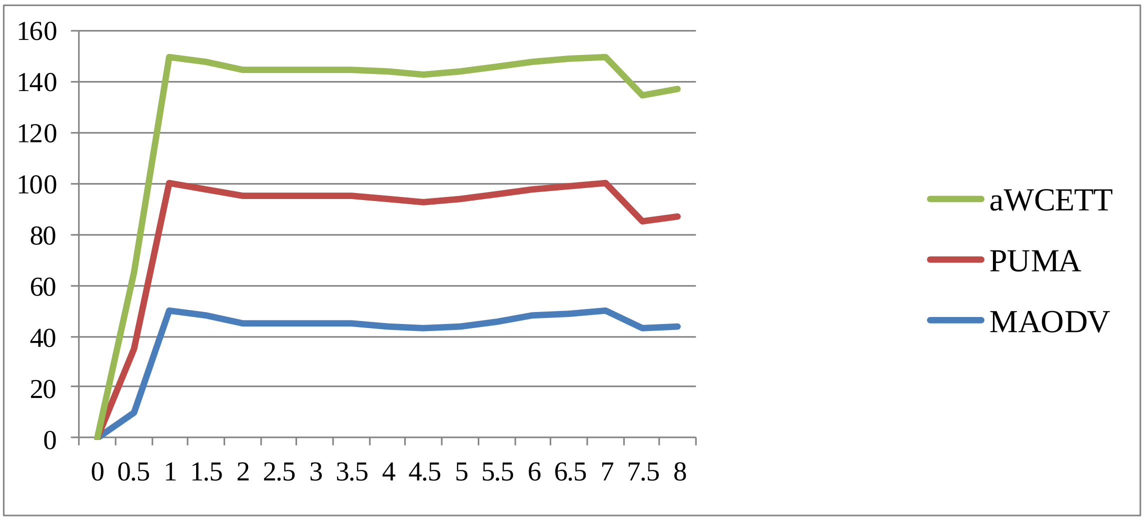

Figure 1.4 Throughput (Infra. Less)

Figure 1.4, shows the Throughput performance for growing number of nodes. The throughput of aWCETT is higher than the MAODV and PUMA.

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication (BEIESP)
© Copyright: All rights reserved.

Table 1.4 Throughput (Infra. Less)

No. of Group Members	Four	Eight	Sixteen	Thirty Two
MAODV	32	39	46	50
PUMA	93	97	100	100
aWCETT	141	145	150	150

6.3 Packet Loss

In Packet Loss [6] there is a failure of one or more data packets which are transmitted from source to destination.

Packet Loss = amount of packets received - amount of packets sent.

There are three sources of packet loss in the network

- A break in Physical connection that prevents the transmission of a packet
- A packet that is damaged by a sound and is recognizing by a checksum failure at downstream node and network congestion that conducts to buffer overflow.

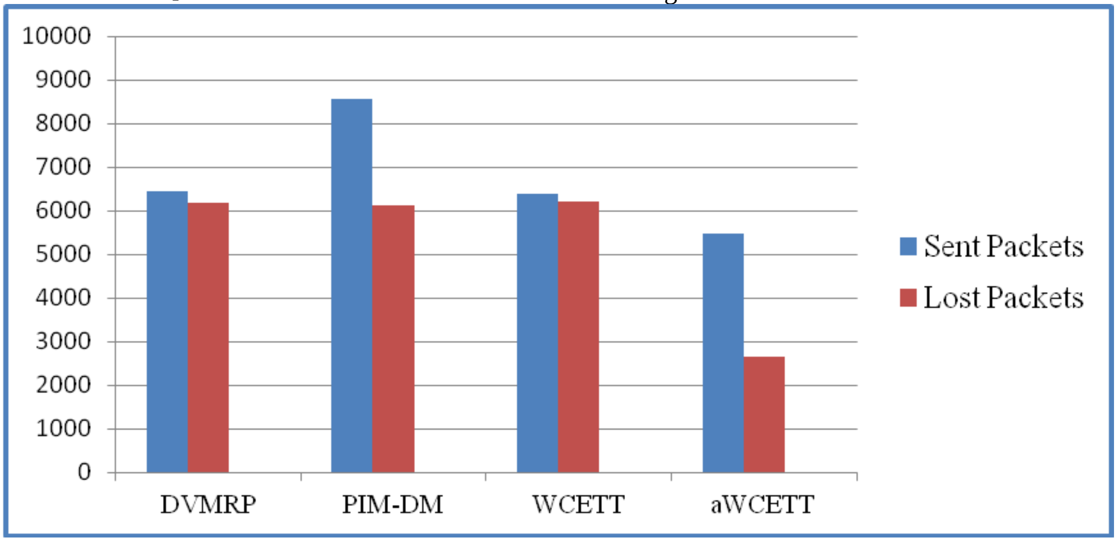

Figure 1.5 Packet Loss (Infra. Based)

The number of packets that are lost during simulations and can be computed by subtracting the no. of received packets from forwarded packets. The no. of Packets lost by aWCETT are much less as compared to all another protocols.

Table 1.5: Packet Loss (Infra. Based)

No. of Group Members	Four	Eight	Sixteen	Thirty Two
DVMRP	5147(5373)	6157(6211)	6154(6447)	6241(7626)
PIM-DM	5357(5444)	6175(6195)	6135(6230)	6154(6252)
WCETT	5245(5608)	6157(6155)	6284(8572)	6974(11463)
aWCETT	3254(5435)	4297(6181)	2647(5470)	4035(6210)

In case of ad-hoc only 10 percent as compared to infrastructure based are forwarded.

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication (BEIESP)
© Copyright: All rights reserved.

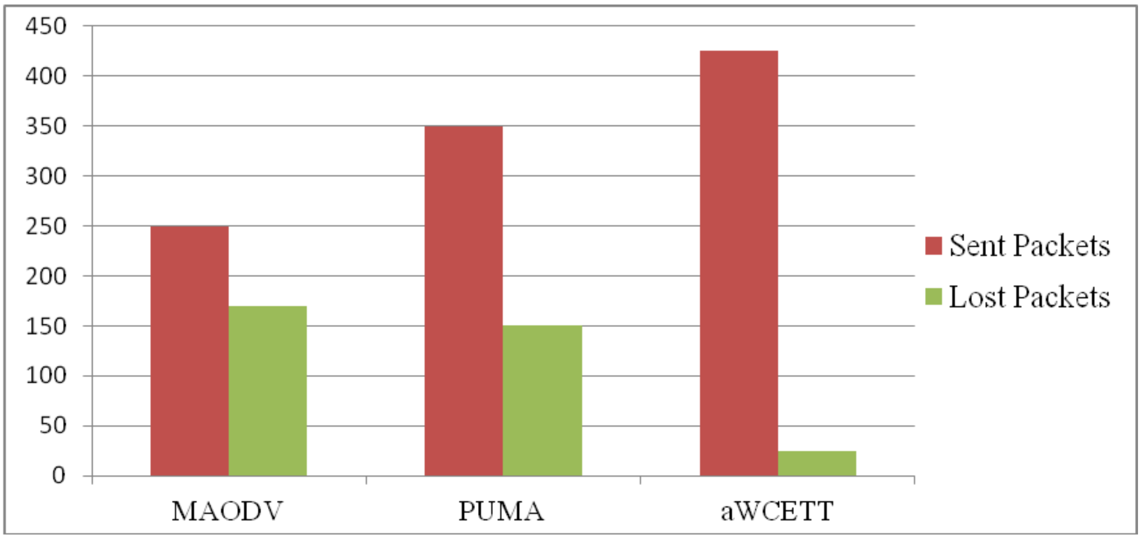

Figure 1.6 Packet Loss (Infra. Less)

The no of packets loss by aWCETT is one fourth of the packets loss by MAODV and PUMA protocols.

Table 1.6 Packet Loss (Infra. Less)

No. of Group Members	Four	Eight	Sixteen	Thirty Two
MAODV	20(100)	70(150)	100(200)	120(250)
PUMA	20(100)	30(200)	45(300)	50(350)
aWCETT	10(200)	10(250)	15(350)	20(425)

VII. CONCLUSION

In this research work, a novel advanced Weighted Cumulative Expected Transmission Time multicast routing protocol has been proposed and implemented using NS-2 software tool. A study has been made in the field of multicast routing in a mobile ad hoc network environment. When Multicast routing protocols are compared on the basis of End to End delay then all protocol shows very different results then aWCETT give better performance that is less delay, while CBT has maximum delay so it best to choose aWCETT. Multicast routing protocols performance differed when compared in terms of performance metrics. The experimental results suggest that configuration parameters do indeed play a role in how well the various multicast routing protocols perform. A network designer should be aware of this fact and should choose an appropriate Routing Protocol. When Multicast routing protocols are compared on the basis of Network Resource Usage then aWCETT only give better performance that is less no. of Link utilized, while DVMRP has maximum and almost equal value of no. of links utilized so it best to choose aWCETT in concern of utilizing less network resources and same is the case for overhead traffic percentage. Less the value of these two metrics more will the performance of the protocol. When Multicast routing protocols are compared on the basis of throughput then aWCETT give Best performance as compared to all while WCETT is also giving better results as Compared to both dense mode Protocols. When Multicast routing protocols are compared according to packet loss, then the numbers of Packets lost by aWCETT are much less as compared to all another protocols. Understandably, aWCETT protocols behave as a 'best-case' protocol for all scenarios in infrastructure based and infrastructure less environments. As multicasting is used in various applications, different in their requirements, a protocol suited best for one application will be totally out of place with another. But still on the basis of different parameters aWCETT performs better. aWCETT incurs far less overhead as compared to other protocols and it has higher packet delivery ratio and throughput. The lesser values of End-to-End delay imply a better performance than other protocols. Hence the Novel advance Weighted Cumulative Expected Transmission Time (aWCETT) protocol is selected one of the best multicasting routing protocol for infrastructure based as well as infrastructure less environment.

REFERENCES

1. L.M Kola and M. Velempini "The Design and Implementation of the WCETT Routing Algorithm in Cognitive Radio Based Wireless mesh Networks" Hindawi Journal of Wireless Communication (2018) Volume 2018 pp 1-8.
2. Benamar Kadri, Mohammed Feham and Abdallah M'hamed (2008), 'Securing reactive routing protocols in MANETs using PKI', Security and Communication Networks, Vol. 2, Issue 4, pp.341-350.
3. Anand Patwardhan, Jim Parker, Anupam Joshi, Michaela Iorga and Tom Karygiannis (2005), 'Secure Routing and Intrusion Detection in Ad -hoc Networks', In Proceedings of the 3rd International Conference on Pervasive Computing and Communications, pp. 191-199.

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication (BEIESP)
© Copyright: All rights reserved.

4. A. L. N. Rao "A Framework to improve the Network Security with Less Mobility in MANET" International Journal of Computer Applications (0975 – 8887) Volume 167 – No.10, June 2017
5. Rashid Umir "An Energy Efficient Technique in MANETs modified Trust based Route selection Algorithm" International Journal of Pure and Applied Mathematics Volume 119 No. 18 2018, 3215-3222
6. Shobha Tyagi "A QoS aware variant of AODV with probabilistic broadcast of control packets in MANETs" 4th International Conference on Reliability, Infocom Technologies and Optimization (ICRITO) 2015.
7. R. S. Mangrulkar "Implementation and Testing of Peer to Peer Web Caching Technique for Mobile Ad-Hoc Network" International Journal of Computer Applications (0975 – 8887.
8. B. Wang and S. K. S. Gupta, On Maximizing Lifetime of Multicast Trees in Wireless Ad -hoc Networks, Proceedings of the IEEE International Conference on Parallel Processing, 2003. International journal on applications of graph theory in wireless ad -hoc networks and sensor networks (GRAPH-HOC) Vol.2, No.2, June 2010
9. B. Kaliaperumal, A. Ebenezer, Jeyakumar, Adaptive core based scalable multicasting networks, INDICON, 2005Annual IEEE (2005) 198–202, December.
10. Lee et al, "Transient and steady-state performance of routing protocols: Distance-vector versus link-state, Internetw" Res. Exper., vol. 6, no. 2, pp. 59–87, Jun. 2004.
11. Marina and Dass " Performance Comparison of two on demand routing protocols for mobile adhoc networks" Research Personal Communications, Vol 8, No.1 PP. 16-28.
12. Liu et al "A Secure Ad-Hoc Routing Approach Using Localized Self-Healing Communities," Proc. Sixth ACM Int'l Symp Mobile Ad -hoc Networking and Computing, pp. 254-265.
13. Ali Ghaffari "Tree-based reliable and energy-aware multicast routing protocol for mobile ad hoc networks" The Journal of Supercomputing 74(11) · August 2018.
14. Devkumari D. "A reliable multicast protocol for wireless mobile multi-hop ad-hoc networks", IEEE Consumer Communications and Networking Conference (2004) 146–151.
15. Papanna N. "EELAM: Energy efficient lifetime aware multicast route selection for mobile ad hoc networks" applied Computing and Informatics (2018), https://doi.org/10.1016/j.aci.2017.12.003.

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication (BEIESP)
© Copyright: All rights reserved.