nodes. If the MPR set is too large, it will result in more traffic control overhead and if the set of MPR is small, then there will be less traffic control overhead. Whatever happens in OLSR gets started with neighbour sensing which just finds out if there is any change in the 1-hop neighbourhood and the 2-hop neighbourhood. However it can be sometimes problematic to deal with such system because the whole selection process is based upon the selection of MPR which in turn is selected on the basis of range or the distance of the nodes. We have compared the original OLSR with three of its versions that is OLSR-MD, OLSR-ML, and OLSR-ETX and has reached to some conclusions with respect to their performance.

III. PROPOSED SYSTEM

OLSR [1]

The Optimized Link State Routing (OLSR) protocol is a proactive link-state protocol. It uses Multi-Point Relays (MPRs) optimization techniques to provide broadcast structure which is efficient and it also reduces the link advertisements. Various advancements have been proposed to increase the performance of the OLSR and we will present the modifications proposed and their analysis.

OLSR-ETX (Expected Transmission Count) [1]

It is the extension to the OLSR in which the Expected Transmission Count. In order to calculate the ETX for link to neighbour's idea of link quality. That is, to know ETX = 1 / (NLQ * LQ). Hence, new kind of HELLO message, that can be called as LQ HELLO message. The message originator informs about the link quality. Every neighbouring node will put the LQ values of the message with respective NLQ values. Hence via LQ HELLOs we calculate the ETX between each link.

OLSR-ML (Minimum Loss)[2][1]

OLSR-ML is an OLSR link quality extension with minimum loss metric. MPR selection is based upon link quality information from the neighbour. The best MPR is the one to route to any 2-hop neighbour. MPR selection in OLSR-ML is same as in the RFC-3626 because there is lack of traffic.

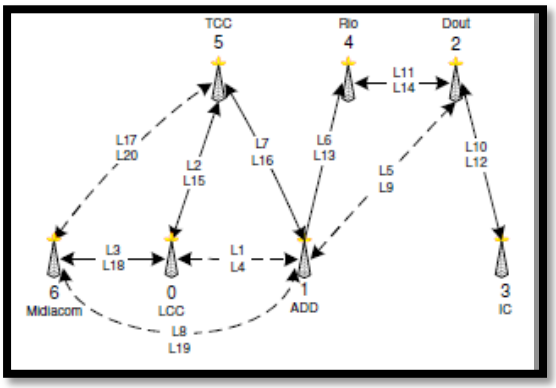

Figure 1: Re-mesh in OLSR-ML

The probability of successful transmission is based upon forward and reverse link delivery ratios. The delivery ratio is the probability that a data packet successfully arrives at the next hop. Expected probability of transmission is successful and acknowledge is the product of the probability of the forward delivery ratio and probability of reverse delivery ratio of the link:

$$\mathbf{Plink = d_f \times d_r}$$

The best route of source is the highest probability of successful transmission of one source to another. i.e. the minimum loss probability.

OLSR-MD (Minimum Delay)[3][1]

The main idea behind the Minimum delay is to measure the link delay between the nodes. It is calculated through the Ad-Hoc network. Therefore, all calculations of routing tables are based upon each neighbouring nodes. Therefore OLSR-MD is the protocol with the route selection between the current node and the other nodes in the network which have the lowest sum of different transmission delays of all the links along the path.

IV. SIMULATION ENVIORNMENT

The Routing protocols OLSR, OLSR-ETX, OLSR-ML and OLSR-MD are under the analysis for this paper. The Fedora OS is used to run the Simulating Software NS2 (Network Simulator 2) version 2.34 for the evaluation. The patch for NS-2.34 to simulate the OLSR is provided by Francisco J. Ross[5]. The further modifications to the UM-OLSR are modified according to the reference paper for this simulation and observations [6][7].

V. RESULTS

End to End Delay: End-to-end delay refers to the time taken for a packet to be transmitted across a network from source to destination. Obtained using the Xgraph and plotting the individual files of the trace obtained.

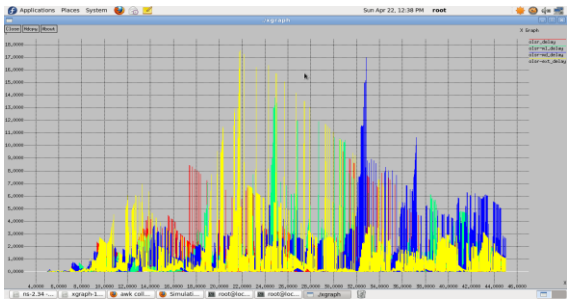

Figure 2: End-To-End Delay

Average Throughput: The Average throughput is the throughput which shows the average bandwidth of the protocol. Below are the results obtained from the trace file used along with the AWK scripts.

Protocol	Avg. Throughput(kbps)
OLSR	7.9
OLSR-ML	27.78
OLSR-MD	245.75
OLSR-ETX	283.04

Table 1: Average Throughput

Normalize Routing Load: The NRL is the load offered on the protocol under the given scenario. Below are the results obtained from the trace file used along with the AWK scripts.

Protocol	Normalized Routing Load
OLSR	0.062
OLSR-ML	0.063
OLSR-MD	0.094
OLSR-ETX	0.052

Table 2: Normalized Routing Load

Packet Delivery Ratio:

Protocol	PDR
OLSR	0.58
OLSR-ML	0.53
OLSR-MD	0.72
OLSR-ETX	0.73

Table 3: PDR

1. The performance of the OLSR and its modifications OLSR-ML, OLSR-MD and OLSR-ETX performed better than the original OLSR under all the conditions. In this simulation OLSR-ETX and OLSR-ML showed the minimum end-to-end delay out of the four protocols.

2. Throughput of the OLSR-MD and OLSR-ETX was very high than the original OLSR.
3. Normalized Routing Load of OLSR-MD was very high due to ETX extensive packets flooding and minimum of the NRL was in OLSR-ETX.
4. Packet Delivery Ratio of OLSR-MD and OLSR-ETX was better than original OLSR.

VI. CONCLUSION

The OLSR-MD and OLSR-ETX performed better than the original OLSR and the results were incomparable as the performance was very high.

Original OLSR drawbacks of low bandwidth and Throughput can be overcome by OLSR-MD and OLSR-ETX as these have min. delay and extended packets that perform better under all the scenarios.

VII. FUTURE WORK

Further Modifications can be done to the OLSR and other routing mechanisms can be followed other than the default MPR defined in RFC-3626. In the OLSR routing protocol, energy optimization can be introduced. By the term energy we mean to say that the power consumption of the protocol can be optimized further. Also apart from selecting the MPR on different grounds another factors like clustering may be merged with OLSR.

VIII. REFERENCES

[1] D. S. P. M. H. D. A. K. Barbara Staehle, "Measuring One-Way Delay in Wireless Mesh Networks - An Experimental Investigation," COST-STSM-IC0703-3940.

[2] "OLSR-ETX," OLSR, [Online]. Available: http://www.olsr.org/docs/README-Link-Quality.html. [Accessed 12 4 2012].

[3] D. V. T. Diego Passos, "Mesh Network Performance Measurements," Brazilian National Research and Education Network.

[4] W. Cordeiro, "Providing Quality of Service for Mesh Networks Using Link Delay Measurements," 2007. [Online]. Available: http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=4317947&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxpls%2Fabs_all.jsp%3Farnumber%3D4317947. [Accessed 12 4 2012].

[5] F. J. Ross, "UM-OLSR for NS2," [Online]. Available: http://masimum.inf.um.es/fjrm/?page_id=116. [Accessed 12 4 2012].

[6] T. K. L. L. Ying Ge, "Quality of Service Routing in Ad-Hoc Networks Using OLSR," HICSS '03 Proceedings of the 36th Annual Hawaii International Conference on System Sciences (HICSS'03) IEEE, 2003.

[7] T. F. Jeremie Leguay, "QoS Routing in OLSR with Several Classes of Service," PERCOMW '06 Proceedings of the 4th annual IEEE international conference on Pervasive Computing and Communications Workshops - IEEE, 2006.