# Performance of mobile IPv6 with different route optimization scheme

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***Abstract- Mobile Internet Protocol version 4, in which the main problem is triangle routing. Mobile node deliver packets to a corresponding node directly but when corresponding node sends packet to the mobile node packet comes to foreign agent via home agent then it comes to mobile node. This asymmetry is called triangle routing. It leads to many problems, like load on the network and delay in delivering packets. The next generation IPv6 is designed to overcome this kind of problem (triangle routing). MIPv6 support host moves from one access point to another access point. To solve the triangle routing problem different route optimization schemes are used which exclude the inefficient routing paths by creating the shortest routing path. These are Liebsch's Route optimization scheme, Light Weight Route optimization scheme & enhanced light weight route optimization scheme. In this paper I have consider only Light Weight Route optimization scheme & enhanced light weight route optimization scheme. I have taken Throughput and Packet delivery fraction, end to end delay & round trip time .Performance metrics to compare these two schemes by using NS-2 simulations. Throughput is the rate of communications per unit time. Packet delivery fraction (PDF) is the ratio of the data packets delivered to the destinations to those generated by the CBR sources. End to end delay includes all possible delays caused by buffering, retransmission delay & propagation & transfer times of data packets. Round-trip time is the time required for a signal pulse or packet to travel from a specific source to a specific destination and back again. By using these parameters I have found that enhanced light weight route optimization scheme performance is better than Light Weight Route optimization scheme.***

***Keywords: Route Optimization Schemes, Performance Result***

## I. INTRODUCTION

As the growth of wireless network technology dimension for accessing mobile network has been increased dramatically. Mobile Internet Protocol version6 is a mobility protocol standardized by the Internet Engineering Task Force (IETF). In Mobile Internet Protocol version6, communications are maintained even though the mobile node (MN) moves from its home network to foreign network. This is because that the MN sends Binding Update (BU) message to its Home Agent (HA) located in the HN [2] to inform the location information whenever the MN hands off (move) to other networks. The Mobile Nodes in the Internet, it requires

## II. THE RO SCHEMES

that the MNs maintain mobility related information and create own mobility signaling message [5]. In other words, the MNs that has limited processing power, battery, and memory resource. To overcome such limitations, IETF has proposed Proxy Mobile IPv6 (PMIPv6) protocol. In PMIPv6, the MN's mobility is guaranteed by the newly proposed network entities such as the local mobility anchor (LMA) and the mobile access gateway (MAG). PMIPv6 causes the triangle routing problem that causes inefficient routing path [4]. In order to establish the efficient routing paths, different Routing Optimization (RO) schemes have been introduced. To solve the triangle routing problems different route optimization schemes are used which exclude the inefficient routing paths by creating the shortest routing path. The RO schemes using correspondent information (CI) message. In this paper I have compare light Weight Route optimization scheme & enhanced light weight route optimization scheme by using NS-2 simulations.

Terminology

1. Local Mobility Anchor: The LMA is the Home Agent of an MN. LMA provides charging and billing services to the MN

2. Mobile Access Gateway: It manages mobility related signalling on behalf of MN's. It is responsible for detecting the MN's attachment or detachment from an access network.

3. Binding Cache Entry: It provides the route information about a communicating node in the networks.

4. Proxy Mobility Agent: PMA is the proxy mobility agent PMA helps to send proxy binding update to LMA on behalf of the mobile.

5. Proxy Binding Update: The PBU is a message sent by a Mobile Access Gateway to the MN's Local Mobility Anchor for establishing or de-establishing a connection between the Mobile Node's.

### *A. Light Weight Route Optimization Scheme (LWRO)*

In Light Weight Route Optimization Scheme Local Mobility Anchor and Mobile Access Gateway are used. To establish the Route Optimization path between the Mobile Node’s we use Local Mobility Anchor and Mobile Access Gateway. In it Mobile Node1 connected to Mobile Access Gateway and the Mobile Node2 connected to Mobile Access Gateway2. The packets from the Mobile Node1 to the Mobile Node2 are passing through the Local Mobility Anchor [7]. When the Local Mobility Anchor received the packet, it knows the path for the packets to the Mobile Access Gateway2, but at the same time, it also sends a corresponding Binding Update to Mobile Access Gateway2. The Mobile Access Gateway1 receives the corresponding Binding Acknowledgment. Now packet is send from Mobile Access Gateway2 to Mobile Node1. Thus packets from the MN1 destined to the MN2 get intercepted by the Mobile Access Gateway1 and are forwarded to the Mobile Access Gateway2, instead of being forwarded to the Local Mobility Anchor. But main problem in LWRO SCHEME

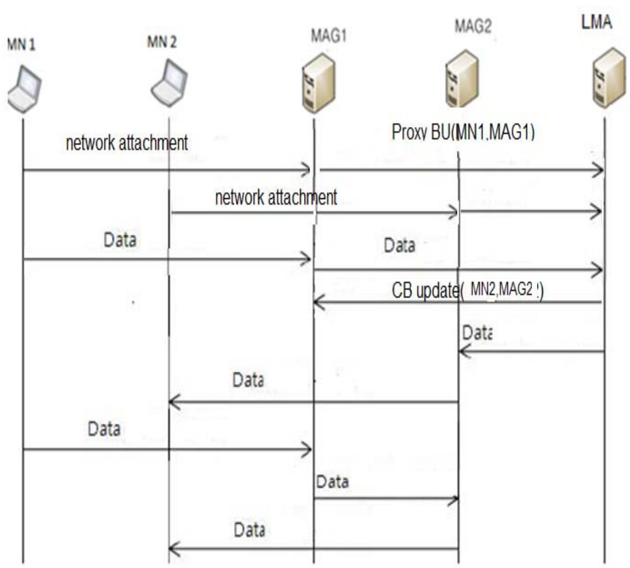


Fig1. Data flow in Light Weight RO Scheme

### *B. Enhance Light Weight Route Optimization Scheme (ELWRO)*

In Enhance Light Weight Route Optimization Scheme Local Mobility Anchor and Mobile Access Gateway are used. To establish the Route Optimization path between the Mobile Node’s we use Local Mobility Anchor and Mobile Access Gateway. In ELWRO scheme in Corresponding Binding Information (CBI) message are used [1] . In MN1 sends data packets to the MN2.First of all MN1 sends the data packets to the Mobile Access Gateway1, and then the MAG1 sends the data packets to the Local Mobility Anchor. The LMA knows the possible setup with RO. The LMA sends Corresponding Binding Information (CBI) message to the MAG1 [1] .Corresponding Binding Information (CBI) message include the MN1's address, the MN2's address, and the MAG2's address information. When the MAG1 received CBI message, then the MAG1 send Correspondent Binding Update message to the MAG2. Correspondent Binding Update message include the MN1's address, the MN2's address and the MAG1's address information The MAG2 sends Corresponding Binding Acknowledgment (CBA) message to the MAG1 for Corresponding Binding (CB) [8]. Now the packets are exchange between the MN1 and the MN2.

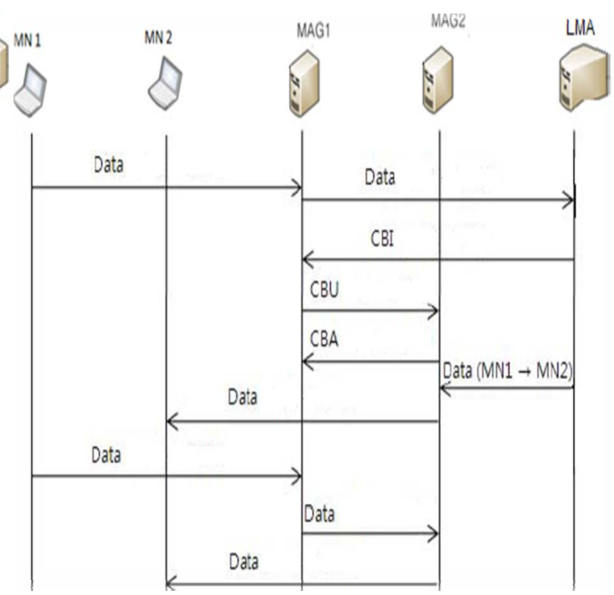


Fig2. Data flow in Enhance Light Weight RO Scheme

### *c. Simulation parameters*

TABLE 1: Parameter value

| ***Simulation parameters*** | |
|---|---|
| simulator | NS-2.34 |
| Simulation area | 450m ×450m |
| Number of nodes | 6 |
| Movement model | Random waypoint |
| Pause time | 6s |
| Traffic type | CBR |
| MAC layer protocol | IEEE 802.11 |

## III. PERFORMANCE METRICS

Performance metric for the above three scheme is given by

1) Throughput: Defined as rate of communication per unit time.
   Throughput = Nr×Ps /(Tstop-Tstart)
   Nr = packet received at destination
   Ps = packet size
   Tstop = stop time
   Tstart = star time

2) end to end delay: ∑ Di/Nr  i= 1 to n
   Nr= no. of packets received at destination
   Di= end to end delay of packets

3) Packet Delivery Fraction: as the ratio of data packets delivered to destination to those generated by CBR source is known as packet delivery fraction

   Pdf=spd/gpcbr
   Spd =sent packet to destination
   Gpcbr =generated packet by cbr

4) Round trip time : Round-trip time is the time required for a signal pulse or packet to travel from a specific source to a specific destination and back again .

## IV. PERFORMANCE RESULT

Throughput**:** As indicated in graph the Enhanced Light Weight route optimization scheme perform better than the light weight route optimization scheme. In ELWRO rate of communication of packets are more with respect to pause time.

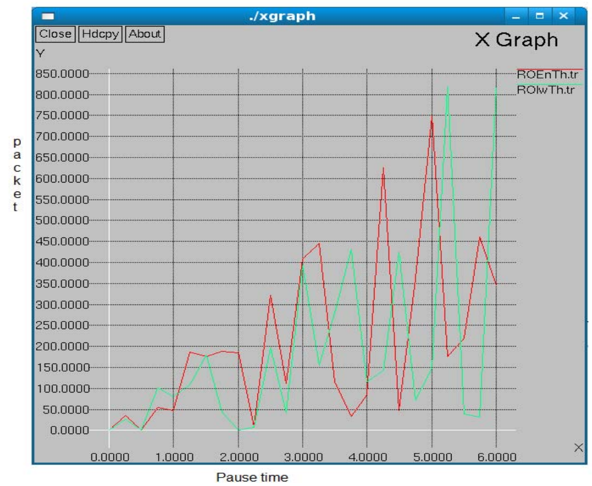


Fig 3 Throughput comparison study graph

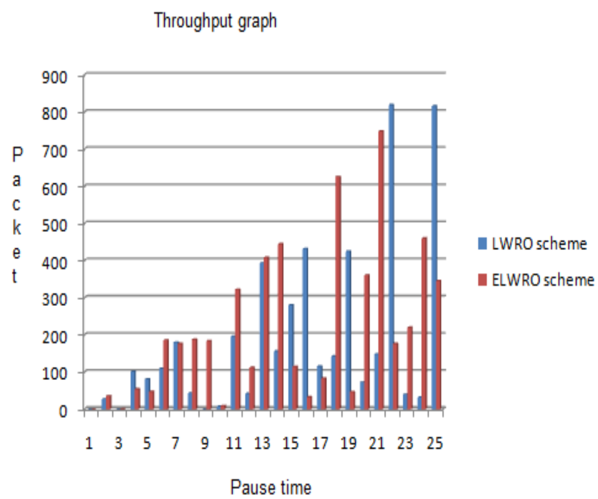


Fig 4 Throughput graph

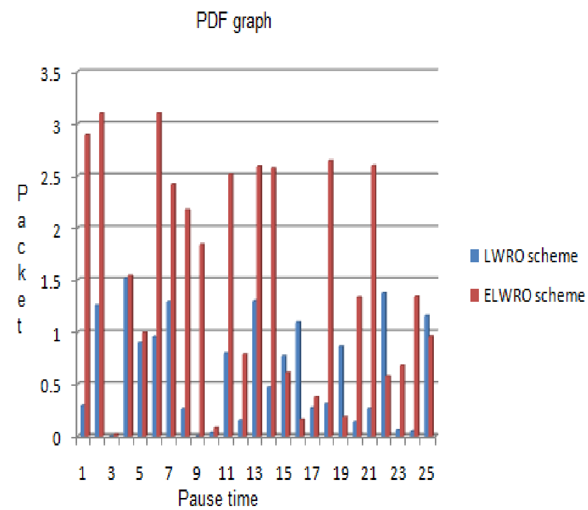


Fig 6 Packet delivery fraction graph

Packet Delivery Fraction**:** As indicated in graph the Enhanced Light Weight route optimization scheme perform better than the light weight route optimization scheme. In Enhanced Light Weight route optimization scheme packet are transmitted between CN & MN more fastly.

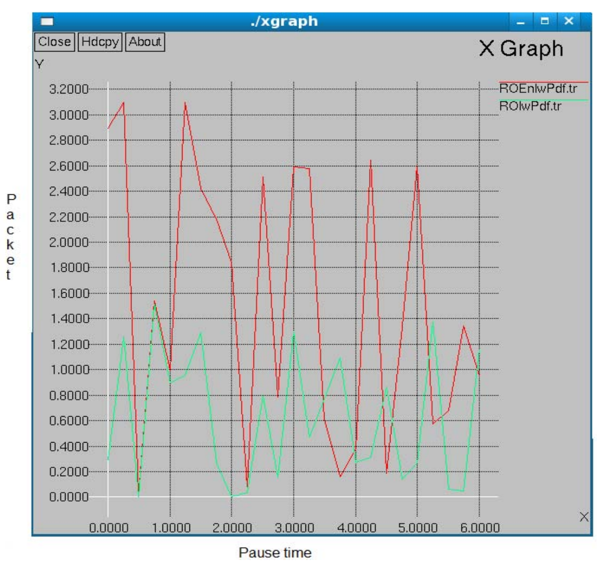


Fig 5 Packet delivery fraction comparison study graph

End to end delay graph**:** As indicated in graph the Enhanced Light Weight route optimization scheme perform better than the light weight route optimization scheme.

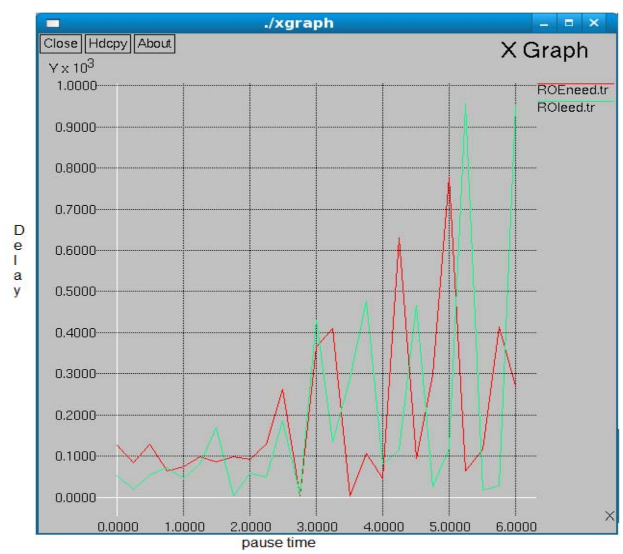


Fig 7 End to end delay comparison study graph

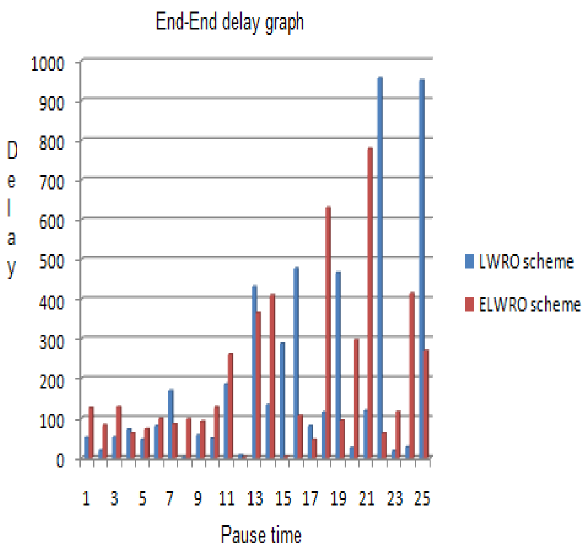


Fig 8 End to end delay graph

Round trip time**:** As indicated in graph the Enhanced Light Weight route optimization scheme perform better than the light weight route optimization scheme. In ELWRO rate of communication of packets are more with respect to pause time.

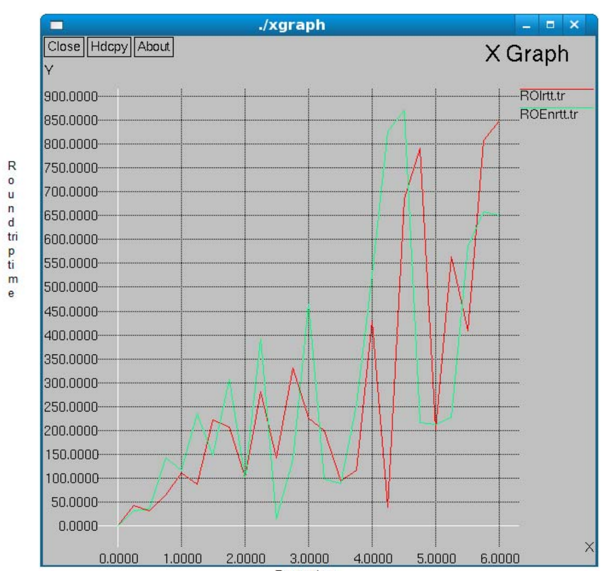


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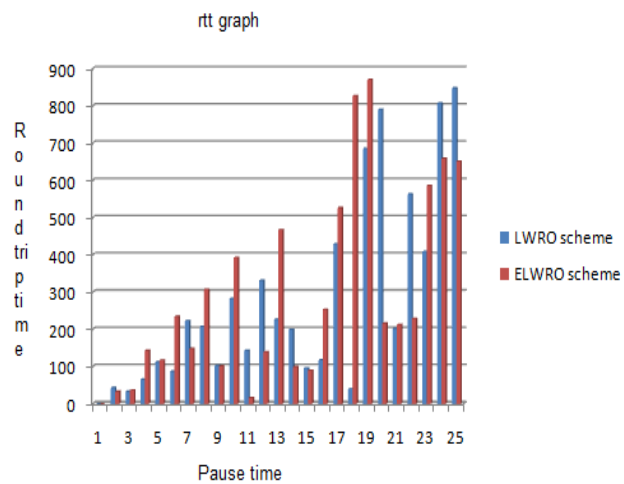
Fig 9 Round trip time comparison study graph




## V. CONCLUSION

In this paper, we have introduced the operation of RO schemes that solve the triangle routing problem and provided the results of performance evaluation. The results of Throughput, Packet Delivery Fraction, end to end delay & round trip time performance evaluation show that performance of our ELWRO scheme is better than LWRO scheme.

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