Scalable Overlay Multicasting in Mobile Ad Hoc Networks (SOM)

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***Abstract*—Many crucial applications of MANETs like the battlefield, conference and disaster recovery defines the needs for group communications either one-to-many or many-to-many form. Multicast plays an important role in bandwidth scarce multihop mobile ad hoc networks comprise of limited battery power mobile nodes. Multicast protocols in MANETs generate many controls overhead for maintenance of multicast routing structures due to frequent changes of network topology. Bigger multicast tables for the maintenance of network structures results in inefficient consumption of bandwidth of wireless links and battery power of anemic mobile nodes, which in turn, pose the scalability problems as the network size is scaled up. However, many MANET applications demands scalability from time to time. Multicasting for MANETs, therefore, needs to reduce the state maintenance. As a remedy to these shortcomings, this paper proposes an overlay multicast protocol on application layer. In the proposed protocol titled "Scalable Overlay Multicasting in Mobile Ad Hoc Networks (SOM)" the network nodes construct overlay hierarchical framework to reduce the protocols states and constrain their distribution within limited scope. Based on zone around each node, it constructs a virtual structure at application layer mapped with the physical topology at network layer, thus formed two levels of hierarchy. The concept of two level hierarchies reduces the protocol state maintenance and hence supports the vertical scalability. Protocol depends on the location information obtained using a distributed location service, which effectively reduces the overhead for route searching and updating the source based multicast tree.**

Keywords- Ad-hoc networks; multicasting; overlay; GPS; location aware; dynamic mesh; scalability component;

I. INTRODUCTION

A Mobile Ad hoc network (MANET) consists of a collection of mobile hosts forming a dynamic multi-hop autonomous network [1] without the intervention of any centralized access point or fixed infrastructure. MANETs are reconstructed in case of network changes due to mobility of the nodes, therefore known as adaptive networks. This dynamic topology makes the routing in a mobile ad hoc network very challenging, because nodes can move at any time, invalidating a previously discovered route. Infrastructure-free situations, such as for conference, disaster recovery or military operations require coordination among groups of people i.e. multicasting. Multicast routing itself is very tough task in MANETs, because a source needs to update the routes to potentially many group members simultaneously [10]. With growing popularity of wireless networks and significant growth in network capabilities such as, more and more node counts, increased bandwidth, better routing times and decreased latencies, scalability in multicasting becomes more critical issue in MANETs [11].

The dynamic topology of MANETs puts hurdles in building optimal multicast network structures and maintaining group membership in case of tree and mesh based multicast routing. Multicast routing information using either tree or mesh structures need to update due to the mobility patterns of mobile ad hoc networks. Therefore, multicast protocols in MANETs generate many controls overhead for maintaining the bigger multicast tables. This results in inefficient consumption of bandwidth of wireless links and battery power of anemic mobile nodes. Since the traditional protocols involve both the group member nodes and non-member nodes, say, forwarding nodes, to maintain the state information, they will encounter the problem of scalability and become inefficient as the group size grows or the number of groups increases. A scalable multicast routing protocol, based on state reduction and constraining methods, in order to provide robustness and reduced control overhead is a suitable solution to remove the mentioned shortcoming of the multicast routing protocols in MANETs.

The Proposed protocol, Scalable Overlay Multicasting in Mobile Ad Hoc Networks (SOM) is an overlay hierarchical multicast protocol constructed on application layer. In this protocol an overlay virtual multicast packet distribution tree is built on top of the underlying unicast network protocol. To provide better efficiency and scalability using the location information of member nodes, the protocol has been developed as a location-aided protocol. GPS system is employed in mobile nodes to trace their mobility, which effectively reduces theoverhead for route searching and updating the source based multicast virtual tree.

The rest of the paper is organized as follows: Section 2 takes a look at the related scalable multicasting techniques for MANET. The proposed Scalable Overlay Multicasting in Mobile Ad Hoc Networks (SOM) is discussed in Section 3. The performance evaluation of the SOM is followed in Section 4. Finally, section 5 summarizes the study of the work in conclusions.

II. Scalable Multicasting Techniques for MANETs

Several multicast protocols have been developed to provide scalable multicast routing in ad hoc networks. The existing alternatives are characterized by the fact that they construct a multicast structure, either a tree or a mesh above the clusters. To construct and maintain such a structure, the nodes in the network and particularly the partition heads exchange many control messages. This, in turn results in the wastage of network resources like bandwidth and node resource like energy in MANETs. Therefore, multicast protocols in MANETs must lay emphasis to control overhead for periodic reconstruction and maintenance of multicast structure due to the dynamic network topology. Consequently, multicast mechanisms in MANETs are more likely to focus on constraining the network state maintained by these multicast structures, which guarantees the scalability improvement in the protocols.

To improve upon such problems, a number of scalable multicast routing protocols based on three approaches, termed as domain-based (or backbone-based) hierarchical multicasting, overlay-driven hierarchical multicasting and stateless multicasting have been proposed for MANETs, which reduce the state management up to a great extent to support scalability.

A. *Domain-based Hierarchical Multicasting*

Backbone-based protocols such as MCEDAR [4] form clusters of the group members by partitioning the network into equal size regions, with a group leader elected in each region. These group leaders are selected on the basis of topological optimality by conducting a distributed election process among all nodes and are responsible for maintaining the protocol states. The topology induced by the group leaders and paths connecting them form the virtual backbone and the protocol states are confined within this virtual backbone. Multicast packets are then sent among group leader and each group leader forwards packets to members within its region. Thus provides a reduction in state and more flexible control on the protocol state distribution as simple and stable topology is constructed at backbone only by the group leaders. These protocols increase the vertical scalability i.e. support for bigger group size but limited support for horizontal scalability means more number of groups. Since data traffic of all the multicast groups should pass the same set of group leaders, the number of multicast groups that can be supported by the network is limited by the channel bandwidth at each group leader [9].

B. *Overlay-driven Hierarchical Multicasting*

The second category of multicast protocols provide multicasting on application layer using the underlying unicast routing protocol on network layer, therefore, construction of the multicast routing paths and their maintenance is not required in overlay protocols. These protocols are also known as application layer multicast protocols.

Overlay multicast protocols builds the multicast hierarchy in an implicit manner. In general a virtual topology can be built to form an overlay network on top of the physical network. Each link in the virtual topology is a unicast tunnel in the physical network. Mobility has less impact on virtual topology, as it can remain unchanged even if the physical topology changes. The IP layer functionality is limited only to provide a best-effort unicast datagram service, while the rest multicast functionalities such as multicast routing, dynamic membership maintenance and packet duplication are all rendered by overlay network [5]. AMRoute (Ad hoc Multicast Routing Protocol) [14] and PAST-DM (Progressively Adapted Sub-Tree Algorithm on Dynamic Mesh) [13] are overlay multicast protocols. AMRoute initially creates a virtual mesh connecting the multicast group members by using the bidirectional unicast tunnels. After creating a mesh, a virtual multicast tree within the mesh is created among only the multicast members for data packets delivery. The data packet, encapsulated in a unicast packet, is forwarded to other group members. Unlike some other multicast schemes, AMRoute protocol has no special requirements imposed on the unicast protocol. Thus, it can operate seamlessly on multiple domains that use different unicast routing protocols [13]. PAST-DM builds a virtual mesh spanning all member nodes of multicast group. It employs standard unicast routing and forwarding to fulfill multicast functionality. The virtual tree thus created adapts to the changes in underlying physical topology in a fully distributed manner according to the latest local topology information. The participating nodes, keeping in line with state management, maintain only a fisheye view of the dynamic mesh which saves control overhead [5].

These protocols can have only two levels of hierarchy in which the upper level multicast tree span all the group members while in domain based protocols, upper level multicast include only a subset of group members. The overlay-driven hierarchical multicast solution is robust and more scalable with low overhead as they constrain the protocol state distribution within the group members.

C. *Stateless Multicasting*

The stateless multicasting protocols do not maintain any routing structure at the forwarding nodes. DDM (Differential Destination Multicast) [16] and LGT (Location Guided Tree construction algorithms) [6] are stateless multicast protocols. DDM sends each packet encapsulating the whole list of group members in its header, therefore it gives good performance for smaller groups. The LGT constructs the overlay multicast trees (OMT) using a geometric distance between group members.

Like DDM, both PAST-DM and LGT exploit a list of group members included in data packets, to transmit sequentially. This list of group members is separated into small multicast trees which ensure the efficient transmission, which is a problem in case of AMRoute.

D. *Problem in Existing Overlay Protocols*

Since overlay multicast uses the unicast connections at the network layer, therefore more number of packets need to be transmitted in comparison of multicast forwarding at the network layer. The unicast channel at the network layer needs to forward the same packet a number of times due to the mismatch between virtual and physical topology. One more reason of multiple transmission in overlay-driven hierarchical protocols is that every group member in the virtual topology needs to transmit the packet to all of its children using unicast through the physical links at network layer even if many group members are in the range of the sender multicast member.

III. PROTOCOL DESCRIPTION

This section introduces a new multicast protocol, Scalable Overlay Multicasting in Mobile Ad Hoc Networks (SOM), based on the zone routing, location information of the nodes and LARDHR [19] unicast protocol at network layer. In the proposed protocol a dynamic mesh is created which adapt to and reflect the changes in physical topology. By using a dynamic mesh and hence updating the data delivery tree within mesh the differences between the virtual and physical topology can be decreased. Overhead generated in updating the mesh are kept controlled and worth considering as they compensate the redundant multiple transmission of the same packet due to mismatching in the two layer topology over the time. The number of identical packets a link carries is known as stress of a physical link [17]. Therefore the average stress value for the physical links can be optimized which automatically reduces the overall bandwidth consumption and improves data delivery efficiency of overlay multicast.

A. *Zone Routing*

A routing zone is defined for each node separately, and the zones of neighboring nodes overlap. A k-hop routing zone of node S can be defined as a connected topological subgraph, on which node S is aware of the route to any other node [2].

In an ad-hoc network, it can be assumed that most of the traffic is directed to nearby nodes. Therefore, the proactive scope is reduced to a small zone around each node in the SOM protocol. In a limited zone, all nodes proactively keep track of their neighbor nodes, hence in a zone routing network, each node maintains a proactive unicast route to every other node within the specified zone. Each node maintains a Zone Neighbor Table (ZNT) to keep the information of all neighbor nodes in the zone. As justified by the simulation results carried out in [13], the maximum radius of the zone can be limited to a small value, e.g. an average hop length of virtual links on the multicast tree for a group of 20 nodes randomly chosen from a network of 100 nodes is found out to 3.8, hence a zone of 4 hops would be sufficient for similar network. The request to find the group members also will be confined to this zone only. Therefore, membership search requests can be more efficiently performed without exploiting the flooding in the network.

B. *Location Information of Nodes*

The routing performance of any protocol can be significantly improved by utilizing location information of mobile nodes in vicinity as it can be used to forward the packets directly towards the group member.

A node can use Global Positioning System (GPS) to obtain its geographic location information. The locations of other nodes can be obtained by implementing a distributed location service as in [3]. However, in practice, it is difficult to find/maintain node locations with accuracy in an ad hoc environment where nodes move around. Some well-known location-based routing algorithms are location-aided routing (LAR) protocol [8], distance routing effect algorithm for mobility (DREAM) [7], and grid location system (GLS) [15].

In order to exchange location information on the network, special packet types are exchanged among the nodes within the zone.

A LOCN packet as shown in fig. 1 is broadcasted by a node in its zone with TTL value equal to k hops. It is not broadcasted periodically rather only when the node wants to inform other node(s) of its location after a significant movement from the original location. It contains the IP, location (latitude and longitude) of the source node and a timestamp. When a node receives a LOCN packet from another node it unicasts back a location acknowledgement packet LACK as shown in fig. 2. This packet contains the IP and location of the source node, the IP and location of the node acknowledging receipt of a LOCN and a timestamp.

Obtaining the locations of the mobile nodes, distance d between two mobile nodes can be calculated using (1):

$$d = \sqrt{(x2 - x1)^2 + (y2 - y1)^2} \tag{1}$$

where (x1,y1) and (x2,y2) are the locations of two mobile nodes.

C. *Multicast Group Formation at Application Layer*

Initially a dynamic mesh is created involving all the group members. The process of searching for the existing multicast group members is initiated by the source node by broadcasting a multicast group request packet MGREQ, as shown in fig. 3, within its zone. This packet contains the IP and location of the source node, IP of the multicast group, join flag and a timestamp. Each multicast group has a unique multicast group IP (address) [5]. The search process takes place as per the improved expanding ring search algorithm which has an advantage of less overhead over conventional ring search algorithm [18]. The group member that first constructs the tree is designated as the root of the source based data delivery tree.

A multicast group reply packet MGRPL, as shown in fig. 4, is sent in response to a MGREQ packet by a multicast group member through the forward route formed during the transmission of MGREQ. The MGRPL packet contains the IP and location of the multicast group member, the IP and location of the source node, and a timestamp. The virtual multicast tree is constructed on the basis of distance between the group member nodes, which can be calculated using equation (1).

Source Node			Timestamp
IP SRC_IP	Latitude SRC_LOC	Longitude SRC_LNGT	TS

Figure 1. Format of LOCN packet

A node while receiving multiple MGRPL, designates only those members as its children which are having a distance less than threshold i.e. d_thresh. In case many members satisfy the distance criterion, next constraint is put up on the number of children or degree of a node to assure the uniform load distribution among the member nodes of the multicast group. This upper limit on the degree, deg_max, of member nodes in virtual tree can be relaxed in case more members lie in the radio range of a group member. This node records the MGRPL sending nodes as neighbors in its multicast table (MT) with downstream flags and the node receiving the MGREQ, records the sending node as upstream node. The nodes communicating in this way becomes neighbor in the virtual mesh. Thus the multicast table represents the map of virtual topology. When a node reached a maximum of its degree then it stops the member search process, its children nodes then starts the search process in their zone with distance and degree bindings, as shown in fig. 5. With every entry in the multicast table of children nodes one entry is also made in the multicast table of the source node level, therefore total entries at source node represents all the group member nodes. When the total entries in multicast table at source node becomes equal the total members of the group, no further entry is made in the multicast table. If the request node does not receive a MGRPL even after tracing the whole zone by the MGREQ packet, it assumes that the requested multicast group does not exist and becomes the source for that group.

Multicast table, as shown in table 2, is only maintained by the group member nodes. Each entry of Multicast Table contains the multicast group IP address, multicast group member IP address, parent node IP, degree, location of the multicast group member, next hops and timestamp. The Next Hops field is a structure having IP addresses of immediate children and link direction fields. This table has entries for all the members of a multicast group. Entries are made and updated in the multicast table with the reception of MGREQ with join flag set (MGREQ-J), MGRPL and beacon messages.

Table 1: Zone Neighbor Table maintained by each node

Neighbor Node IP	Location		Immediate Next Hop NXT_HOP	Hop Count HOP_CNT	Timestamp TS
	Latitude LAT	Longitude LNGT			
222.24.15.06	420 10’ E	560 40’ S	222.24.15.15	3	15:09 PM
222.24.15.11	550 10’ W	340 33’ S	222.24.15.31	2	15:15 PM
222.24.15.20	230 26’ E	150 14’ N	222.24.15.19	3	15:24 PM
222.24.15.29	450 30’ N	430 20’ E	222.24.15.43	1	15:42 PM

Ack. Node			Source Node			Time-stamp TS
IP ACK_IP	Latitude ACK_LAT	Longitude ACK_LNGT	IP SRC_IP	Latitude SRC_LAT	Longitude SRC_LNGT	

Figure 2. Format of LACK packet

Source Node			Multicast Group IP	Join Flag JF	Time-Stamp TS
IP SRC _IP	Latitu de SRC_ LAT	Longit ude SRC_ LNGT	MG_IP		

Figure 3. Format of MGREQ packet

Multicast Group Member			Source Node			Time-stamp TS
IP TM_IP	Latitude TM_LAT	Longitude TM_LNGT	SRC _IP	Latitude SRC_LA T	Longitude SRC_LNG T	

Figure 4. Format of MGRPL packet

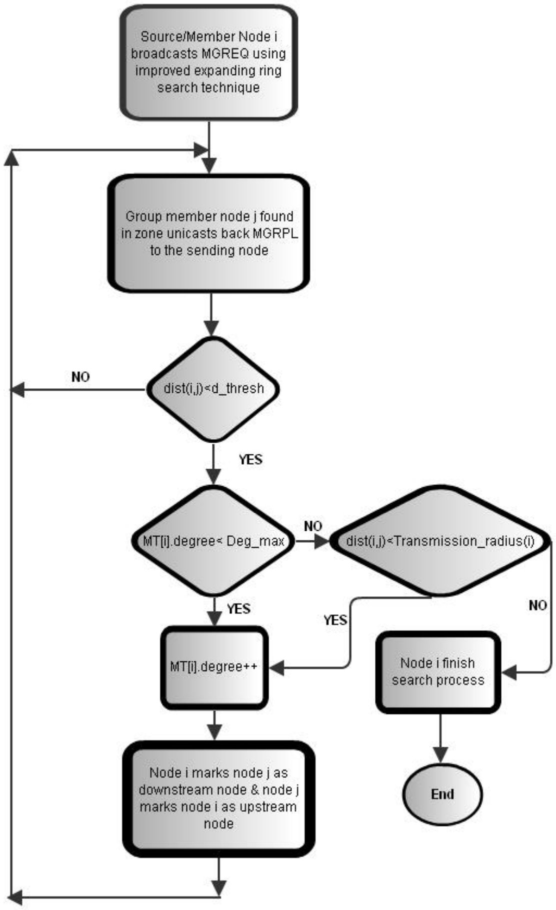

Figure 5. Tree Creation Algorithm at node i

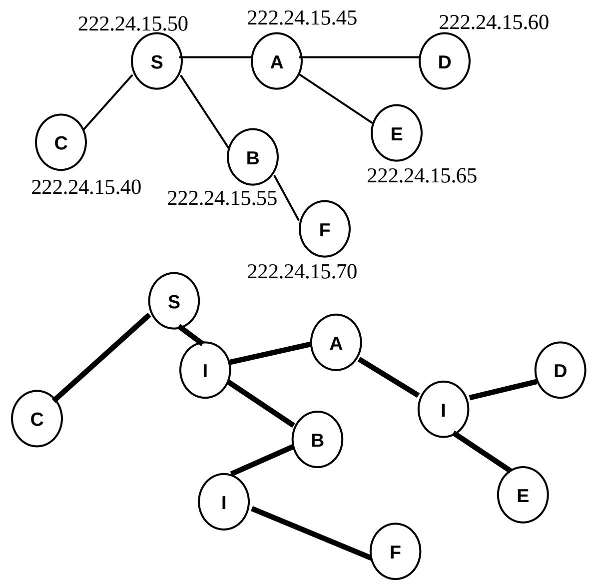

Figure 6. Virtual and underlying physical topology

Table 2: Multicast Table at node 222.24.15.50

Multicast group MG_IP	Multicast Group Member GM_IP	Parent Node PN_IP	Degree	Location of Multicast Group Member		Immediate Next Hops *NXT_ sHOPS	Time-stamp TS
				Latitude GS_LAT	Longitude GS_LNGT		
224.30.15.10	222.24.15.50	Nil	3	420 10’ E	560 40’ S		15:39 PM
224.30.15.10	222.24.15.40	222.24.15.50	0	550 10’ W	340 33’ S		15:40 PM
224.30.15.10	222.24.15.45	222.24.15.50	2	230 26’ E	150 14’ N		15:42 PM
224.30.15.10	222.24.15.55	222.24.15.50	1	450 30’ N	430 20’ E		15:41 PM
224.30.15.10	222.24.15.60	222.24.15.45	0	500 10’ S	220 14’ N		15:43 PM
224.30.15.10	222.24.15.65	222.24.15.45	0	225 65’ E	150 25’ N		15:44 PM
224.30.15.10	222.24.15.70	222.24.15.55	0	215 26’ N	160 14’ E		15:43 PM

** The Next Hops field is a structure having IP addresses of immediate children and link direction fields.*

D. Multicast Tree Creation for Data Delivery Within Mesh

In source based tree, each source has its own shortest path tree (SPT) to get its group members. However shared multicast tree has only one tree which is shared among all group members. Therefore, multicast data traffic from source travels to the shared root and then down through the shared tree to the receivers. By using source based tree, multicast traffic is transmitted directly to the receivers without going through the shared root; therefore, source based tree architecture can reduce network latency and possible congestion at the shared root. For creating a shared based multicast tree the Steiner tree provides a minimum cost tree but it is not a preferred choice as its computation is very complex so gives a burden for anemic mobile nodes with limited computational capability. Moreover it requires information about entire network and whenever a node joins or leaves a rerun of the algorithm is always required. To avoid such problems SOM creates bi-directional source based multicast tree for data delivery at application layer, consisting of only the members of the multicast group. An overlay-driven tree is constructed as shown in figure 6. Node S is the source node which becomes the root of the tree. Node S has 3 children namely A, B and C; node A has two children D and E; node B has F as its only child; and node C has no child. In the multicast table entry 2nd, 3rd and 4th gives details about 3 children of the node S and entry 5th and 6th gives details of children of node A while entry 7th give details of one child of node B. In this way the multicast table has the mapping of virtual topology which also gets updated with the reception of special control packets and the beacon message in absence of any control packets.

E. Maintenance of the data delivery tree

In the ad hoc networks with dynamic topology and more occurrences of link breakages, the maintenance phase is very crucial and should be designed in way as to reduce the overhead of control messages and the re-build latency [11]. The robustness of the multicast mesh at upper layer is adversely affected with the time as the physical topology at lower layer becomes too different with node mobility. Over a period of time due to high mobility among the nodes the overall structure of the tree would be far from optimal, hence increasing the differences between virtual topology and physical topology which in turn increases the consumption of energy resource and bandwidth due to redundant transmission of same packets over unicast links.

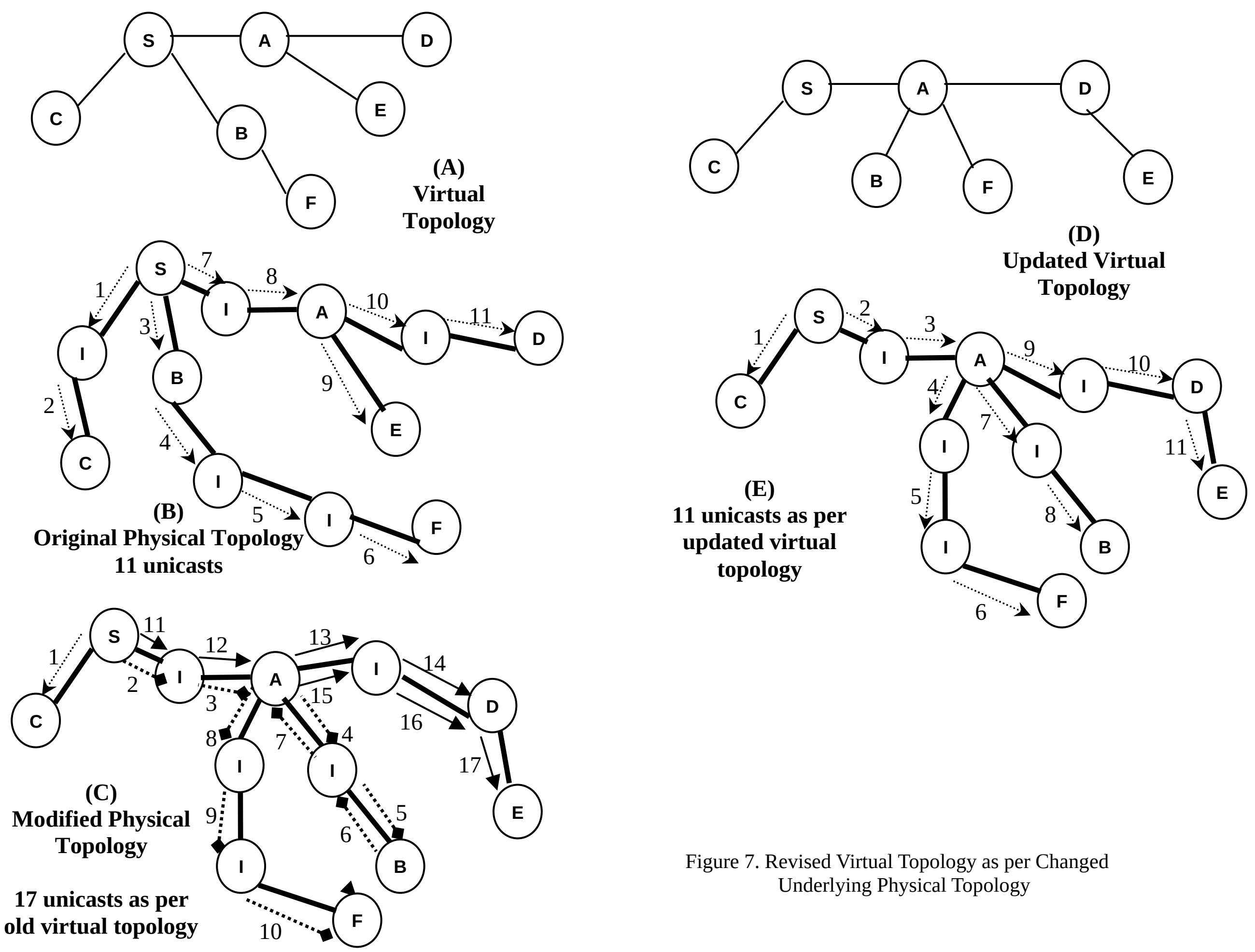

Figure 7. Revised Virtual Topology as per Changed Underlying Physical Topology

As shown in fig. 7 (C), because of the modified physical topology for original virtual topology shown in fig. 7 (A), 17 unicasts are needed while only 11 unicasts were required for same transmission for matched topology shown in fig. 7 (B). In SOM, the mesh is updated regularly and also the preventive maintenance is done which kept the data delivery tree robust also. Entries are added and updated in ZNT on the reception of LOCN and LACK. When a node sends a packet to some node, all of its neighbors hear the transmission and maintains this node as their neighbor in the ZNT with the appropriate value of hop count. Old entries on the basis of time stamp are deleted from the ZNT table to ensure the removal of stale routes from the ZNT. All multicast members update their multicast table with the reception or overhearing of transmission of the MGREQ and MGRPL packets and therefore, the mesh and the data delivery tree within mesh are also get updated with time. If the reception of these packets is delayed beyond a specified interval then the multicast members broadcast beacon messages within their zone in order to adapt the changes of the dynamic network topology. The beacon messages include the IP of a member node, location, the number of their multicast neighbors and IP of its children [12]. Figure 7 (D) shows a changed virtual topology after updating as per the new physical topology, which ensures the reduction in the redundant multiple transmission of the same packet in fig. 7 (E).

F. Preventive Multicast tree Maintenance

A preventive approach in case of the complete depletion of the power sources of a member node of the multicast group is also being used for tree reconstruction prior to link breakages [19]. Route is reconfigured quickly in case of a node goes off because of complete drainage of its energy sources. The power sources of the member node of multicast group is examined periodically and if the power source of a node goes below a threshold value, it is removed from the tree by grafting a link from its parent to its children. As shown in fig. 8, when node A goes off, its children D and E are connected to either its parent node or other member node satisfying the d_thresh and deg_max criterion.

The latency in updating the topology in case of nodes failure is reduced by reconfiguring the routes using preventive approach before the failure of the node.

G. Joining and leaving the group

Leaving and joining a group is performed in very simple and easy way. To join a multicast group a node needs to broadcast a MGREQ with join flag set (MGREQ-J) within the zone. After receiving a MGRPL from one of existing group member the node will become a member of the group whose multicast address has been sent in MGREQ packet. This member node broadcasts its MT entries within the zone along with the MGREQ packet. Only the group nodes of the zone compare this member node's MT entries with their own entries and add new entries in to their MTs if some new entry is found. The member node responding through MGRPL unicasts the packet along with those entries of the MT which are not available in the sending node's MT and these entries are then appended in the MT of the MGRPL receiving node. In case of some duplicate entries, the entry with the latest time stamp replaces the older one. In this way the MT of the group members is exchanged with one another and get updated with time. The new node also captured the total virtual topology with the exchange of multicast table entries.

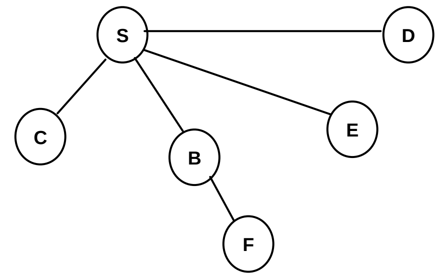

Figure 8. Virtual topology after node A leave the group

Like the joining process, leaving the multicast group also require a node to send an alarm message to its parent node in the virtual topology. In the protocol a non-leaf node wishing to move out of the multicast tree, will broadcast an alarm message to all of its neighbors with TTL value 1 before sending the Leave message. Thus new links are grafted on the tree from the upstream node to the downstream nodes of the leaving node. The children of the leaving node become the children of their grand parent as shown in fig. 8. The multicast table also updated with all entries and all the future transmissions follow the path with as per the updated links. In case of leaf node, the node simply sends the leave message to its one hop neighbor nodes. All the neighbor nodes receiving the alarm packet from any node also remove the related entry from their ZNT, if the entry exists there.

H. Data forwarding

Once the tree is formed within zone, source starts forwarding packets. At every child of this tree, excluding the leaves nodes, the multicast happens through the lower layer protocol. Every child makes duplicate copies of the packet equal to its children and pass on to the lower layer. At lower layer the packet is unicasted to the child member nodes using the proactive route maintained within the zone. When the group members lie within the radio range of a member node then packet is not passed to lower layer for multicasting and forwarding of packet is done at upper layer only by broadcasting within its radio range with TTL=1. This clearly avoids the multiple transmission of the same packet on the unicast links. This approach gives a remedy over the common problem of overlay-driven multicast protocols.

IV. PERFORMANCE EVALUATION

A. *Vertical and Horizontal Scalability*

SOM supports both the scalability, vertical (bigger group size) as well as horizontal (more number of groups). Vertical scalability is achieved due to the fact that state maintenance is confined only to group members. SOM uses source based data delivery tree, therefore the data traffic of all the groups would be passed through the group members and the intermediate nodes fall on the path only. No core or specific group of nodes is responsible for the data traffic forwarding, therefore horizontal scalability is another achievement of the protocol.

B. Less Network Latency and Delay

By using source based tree, multicast traffic is transmitted directly to the receivers without going through the shared root; therefore, source based tree architecture reduces network latency and possible congestion at the shared root. The latency in updating the topology in case of nodes failure is also reduced by reconfiguring the routes using preventive approach before the failure of the node.

Less delay is also achieved as at the lower layer the packet is forwarded using the location information of the child group member of the virtual tree. Besides this, the approach reduces the delay because the multicast happens either at upper layer in case of more group members presence in the radio range of the group node or at lower layer otherwise.

C. Efficient Data Delivery

Due to dynamic mesh creation and regular updation on the basis of LOCN, LACK, MGREQ & MGRPL packets, the mismatch between virtual and physical topology is minimized and this way the multicast tree is optimized which results in less consumption of energy power of nodes and bandwidth of the links. Efficient data delivery is achieved as end result.

D. Moderate Control Overhead

Although additional structure overlay is maintained to provide multicast, extra overhead incurred is kept controlled as many of the tasks related to multicasting are managed by upper layer protocol.

E. Uniform Load Distributiom

By putting a constraint on the degree of a member node a uniform load distribution is assured.

V. CONCLUSION AND LIMITATIONS

In the presenting work a new approach to overlay multicast with dynamic mesh and updated source based data delivery tree within the mesh is proposed. The methodology adopted for the protocol eliminated the drawback of more delay and less data delivery efficiency by using a dynamic mesh. The tree updation with the mesh and hence avoiding the mismatching between virtual and physical topology is the basis of such efficiency of the protocol. The unicast protocol at the lower layer on which SOM depends, uses the location information of the nodes with incorporation of GPS in the nodes and by employing a distributed location service with the communication of relevant packets. It also ensures no extra burden in terms of overhead due to the incorporation of distributed location service for obtaining the physical location of the nodes and for other information sharing. Although an additional structure i.e. an overlay is maintained in order to provide multicast, extra overhead is worth considering in trade of the obtained benefits.

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