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Proficient ID Allocation for MANETs

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Abstract
A Mobile Adhoc Network (MANETs) is a self-configuring and de-centralized network. The nodes in the MANETs are dynamic in nature, which are communicating through the wireless links. Owing to lack of infrastructure, many situations like partitioning, merging, node joining and leaving occurs in the MANETs. Because of these situations, id allocation becomes a severe issue in the MANETs. The proposed method – Robustness identification scheme (RIS) will resolve address conflict while partitioning and merging of networks. The RIS makes use of filter for allocating id, which resolves id conflicts. The hash of the filter is a signature of the network, which is used as a network partition identifier.

Keywords*- Robustness Identification Scheme (RIS); id allocation; filter; MANET.*

INTRODUCTION

A MANETs comprises set of mobile nodes communicating through the wireless links. The nodes are dynamic in nature [5]. Due to the lack of infrastructure and dynamic nature, unpredictable movement of nodes and unpredictable topologies are expected. As the topology get changes, routing also get change. So, as far as the routing is important, id allocation is also one of the important issues in MANETs. Because of these, any node can join the network and leave from the network, which causes the partitioning and merging of networks. So the address allocation becomes a severe problem for the above cases. Generally the IP assignment solutions can be categorized into either reactive or proactive [6]. The reactive protocol requires permission from all the nodes in the network for assigning new IP address, whereas in the proactive approach, each node can independently assign a new IP address without asking permission from any other node in the network.

DIFFICULTIES OF ADDRESSING

The allocation of address becomes complex whenever more number of nodes tends to join the network at same time. Another situation like a network having six nodes, due to the dynamic nature three of the nodes get partitioned from the network and the partitioned network may join the same network further as shown in figure2, at that situation address llocation becomes difficult.

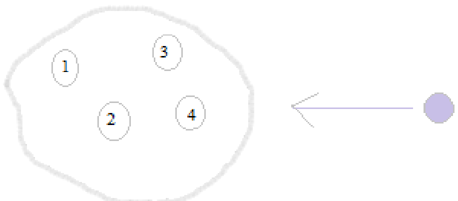

Fig. 1. *Joining of nodes.*

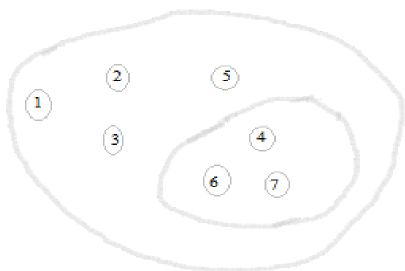

Fig. 2. *Network having Partitions.*

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GENERAL REQUIREMENT FOR ADDRESS ALLOCATING PROTOCOL

- There should not be any conflict while assigning IP address to the joining node or merging of networks.
- Because of dynamic nature the nodes can free to move in any direction which makes the nodes to stay in network for certain time duration. So the IP address should be assigned only when the node stays in the network.
- Within the network, if any unused IP address available, then this address should be assigned to the requesting node.
- The protocol should handle the network partitioning and merging events.
- When two different MANET networks which are differently configured, tends to merge, there is a possibility of two nodes having the same IP address, such duplicate address should be detected and resolved.

ROBUSTNESS ADDRESSING SCHEME (RAS)

The robustness addressing scheme (RAS) makes use of filter for allocating the IP address to the nodes in MANETs. The main objective of the RAS is as follows

- To dynamically auto-configure the addresses.
- When there is an occurrence of joining of node, the address collision should be identified and solved with low control load.
- When there is an occurrence of network partitioning and merging, address conflicts should be detected and resolved.

Initialization.

The initialization could be of two ways, one is gradual initialization and another is abrupt initialization. The joining of nodes occurs after some interval is called the gradual initialization. The node which wants to join the network will reaches one after another with long interval between them. The joining of nodes occurs at the same time is called the abrupt initialization. The proposed method RAS makes use of gradual initialization as well as abrupt initialization. A node that wants to join the network, will listen the network for certain time duration say listening or waiting time of the network. Within the listening time duration, if the HELLO message is not being received, then the current node initiates the network. The initiator may start alone or with many initiators by using HELLO message and AREQ message as shown in figure 3 and 4. After initialization, the filter is updated and finding the hash of this filter, which is the signature of filter. This filter signature is useful in detection of merging events. The filter signature is used as the network partitioned identifier. This filter signature is used in the HELLO message.

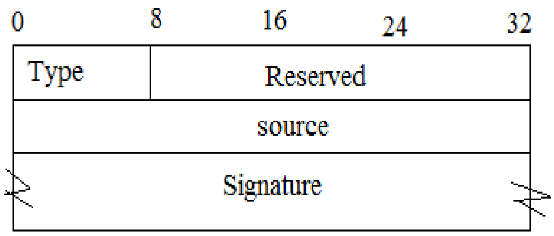

Fig. 3. *HELLO message.*

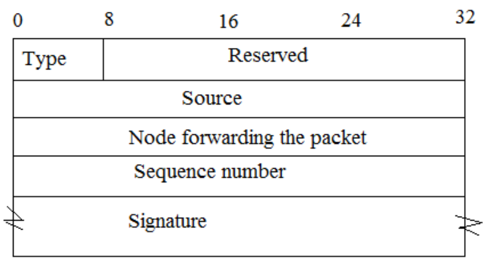

Fig. 4. *AREQ message.*

Joining

The joining of node occurs, when a node approaches an already formed network. Each node in the network will be having address filter and broadcasting the HELLO message, the new node which is in the vicinity of network will receive a HELLO message and request for address filter to interacting node by using address filter (AF) message as shown in figure 5, with setting the parameter I=1.

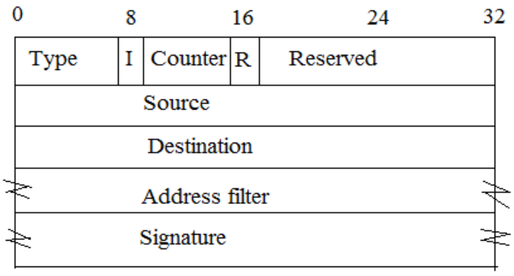

Fig. 5. *address filter (AF) message.*

Merging
Whenever two different MANET networks tend to join, merging occurs, which is identified by setting the parameter I=0 in address filter message. The partitioning information is shared between the networks by using the partition message as shown in figure 6.

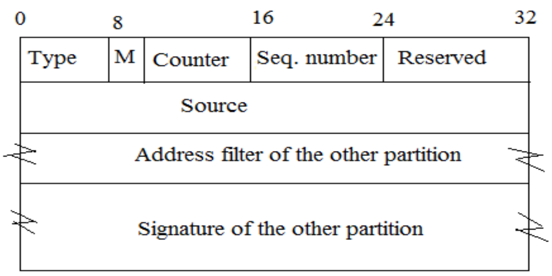

Fig.6. *Partition message.*

Leaving or Departure.
The node which leaving the network, its address should be available for other joining node. The departing node floods the network with a notification for proper shut down, which will make the removal of address from its address filter. If the node does not notify the network, the address remains allocated on the filter, which will make the scarcity of address after several departures. This can be identified in the address filter by fraction of bits 1 in the AF every time the filter is updated. If the fraction reaches a threshold, all the nodes reset their address filters.

IMPLEMENTATION

Analyzing the performance of network, while entering the nodes into the network and leaving from the networks. For knowing the information about neighbor, calculating the neighbor details based on distances. The performance of the network is analyses by calculating the throughput, packet delivery ratio and delay. A network is initialized, which consists of 11 nodes as shown in figure 7.

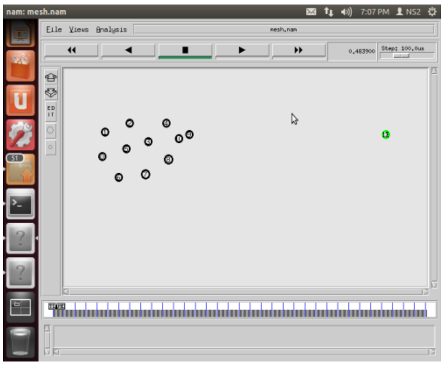

Fig. 7. *Initialization of network.*

After initializing a network, each node broadcasts a HELLO message. First the node 0 sends the HELLO message to neighbor node 1, as shown in Figure 8.

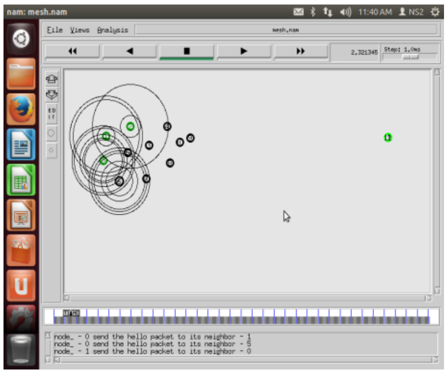

Fig. 8. *Hello Packet Transmission.*

Because of dynamic nature of nodes, node 5 leaving the network and is deleted from the network as shown in figure 9.

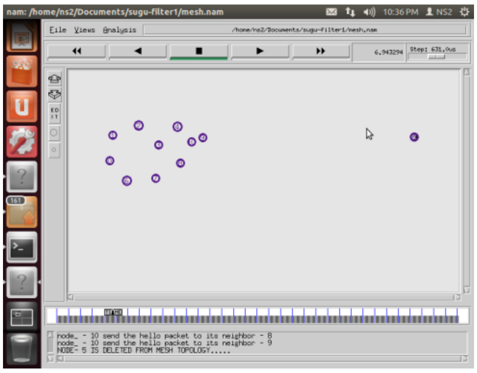

Fig. 9. *Node 5 deleted from the network.*

Now the new node 11 is added to the network as shown in figure 10 and packet is transmitted as shown in figure 11.

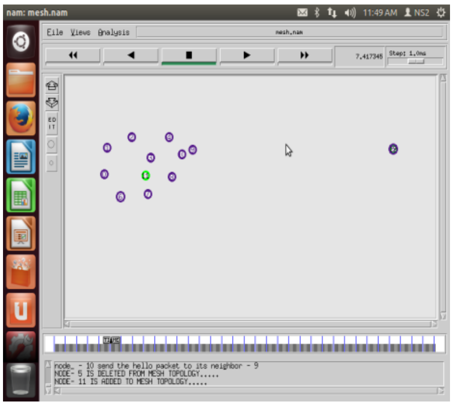

Fig. 10. *Node 11 added to the network.*

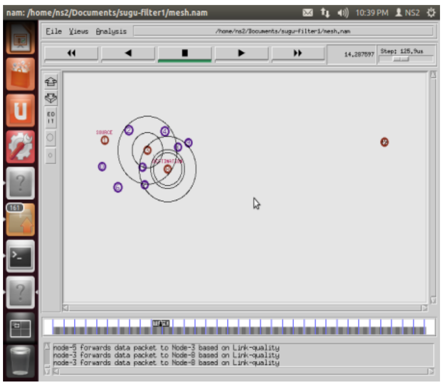

Fig. 11. *Transmission of Packet from Source to Destination.*

RESULT ANALYSIS

The throughput is defined as the number of packet successfully received to the total number of packet transmitted. The performance of the network is having high throughput as shown in figure 12.

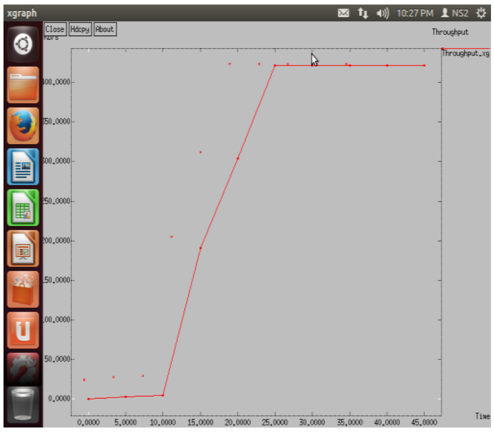

Fig. 12. *Throughput.*

Packet delivery ratio is defined as the ratio between number of packet successfully received and the number of packet send. The above network is having high PDR as shown in figure 13 and less latency as shown in figure 14.

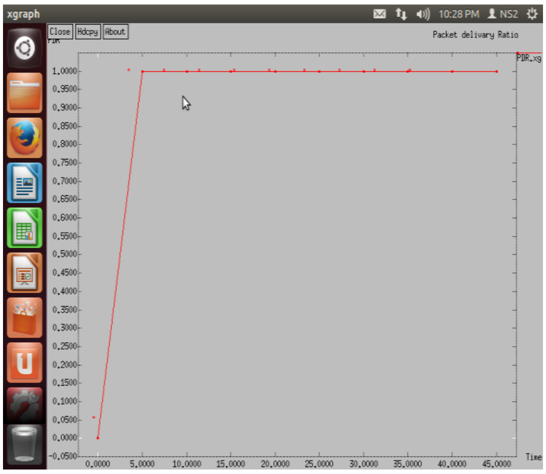

Fig. 13. *Packet Delivery Ratio.*

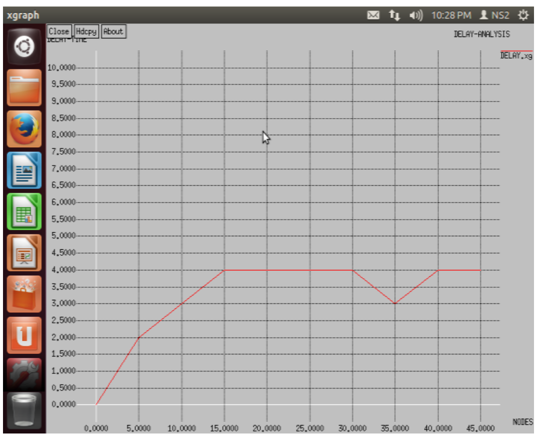

Fig. 14. *Delay.*

The address allocation details before the deletion of node in the network is shown in figure 15.

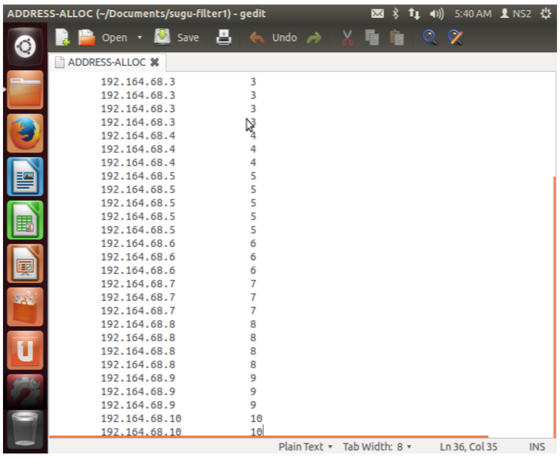

Fig. 15. *Address Allocation before Deletion of Node.The address allocation after the deletion of node in the network is shown in figure 16.*

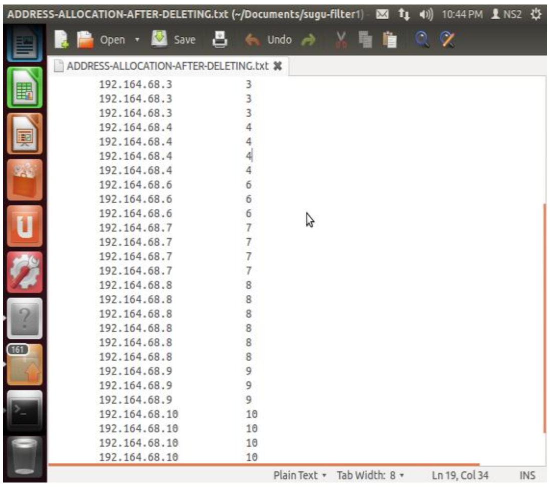

Fig. 16. *Address Allocation after Deletion of node.*

CONCLUSION

The performance of the above network is having high throughput and high packet delivery ratio with less latency. However packet transmission undergoes even for the deleted node in the above network. Future work involves a filtering concept to avoid unnecessary packet transmission for the deleted nodes. The partitioning and merging events will be solved by using RAS.

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