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Virtual IP Generation and Allocation Techniques in Mobile Adhoc Networks

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***Abstract* --Mobile ad-hoc networks (MANET) are growing in popularity due to the abundance of mobile devices, the speed and convenience of deployment, and the independence of network infrastructure. In such an IP-based network, IP address assignment to mobile devices is one of the most important network configuration parameters. A mobile device cannot participate in unicast communications until it is assigned a free IP address and the corresponding subnet mask. One of the most important resources is the set of IP addresses that are assigned to the network. When a new node wants to join a network, it has to be assigned an IP address as part of its initialization. For assigning an IP address to nodes one should meet the following requirements:**

- **There should be no conflict in IP address assignment, i.e., at any given instant of time there should not be two or more nodes with the same IP address.**
- **An IP address is assigned only for the duration the node stays in the network. When the node departs the network, its IP address should become available for assignment to other nodes.**
- **A node should be denied an IP address only when the whole network has run out of its available IP addresses. In other words, if any of the nodes has a free IP address, this address should be assigned to the requesting node.**
- **The protocol should handle network partitioning and merging. When two different partitions merge, there is a possibility that two or more nodes have the same IP address. Such duplicate addresses should be detected and resolved.**
- **The protocol should make sure that only authorized nodes are configured and granted access to network resources.**

In the networking or if we are talking about mobile nodes, IP address plays a very important role. In this paper our research work is based on generation and allocation of IP address to the virtual mobile nodes. Basically, whenever a node needs a IP address, it will generate a virtual IP address and allocate that IP address to the particular nodes. We have removed the concept of dynamic allocation of IP address. In dynamic allocation of IP address whenever node needs an IP address, while allocating an IP address to that particular node firstly we have to check that whether this IP address is already allocated or not. If it is already allocated it can be replaced with some other IP address. This process also maintains a table for storing the IP address when there are multiple IP addresses to single node and every time it is checked from the table whether this IP address is in the table or not, if it is in the table it means it is already allocated and we have to choose some other objects. So if we come to our research work it is totally based on virtual generation and allocation of IP address. Every time whenever node needs an IP address It will generate an IP address which is not already generated and allocate that IP address virtually to the mobile nodes.

I. Introduction

The Mobile IP protocol allows location-independent routing of IP datagrams on the Internet. Each mobile node is identified by its home address disregarding its current location in the Internet. While away from its home network, a mobile node is associated with a care-of address which identifies its current location and its home address is associated with the local endpoint of a tunnel to its home agent. Mobile IP specifies how a mobile node registers with its home agent and how the home agent routes datagrams to the mobile node through the tunnel. A mobile node has two addresses - a permanent home address and a care-of address (CoA), which is associated with the network the mobile node is visiting. Two kinds of entities comprise a Mobile IP implementation:

- A home agent stores information about mobile nodes whose permanent home address is in the home agent's network.
- A foreign agent stores information about mobile nodes visiting its network. Foreign

agents also advertise care-of addresses, which are used by Mobile IP. If there is no foreign agent in the host network, the mobile device has to take care of getting an address and advertising that address by its own means.

A node wanting to communicate with the mobile node uses the permanent home address of the mobile node as the destination address to send packets to. Because the home address logically belongs to the network associated with the home agent, normal IP routing mechanisms forward these packets to the home agent. Instead of forwarding these packets to a destination that is physically in the same network as the home agent, the home agent redirects these packets towards the remote address through an IP tunnel by encapsulating the datagram with a new IP header using the care of address of the mobile node.

When acting as transmitter, a mobile node sends packets directly to the other communicating node, without sending the packets through the home agent, using its permanent home address as the source address for the IP packets. This is known as triangular routing. If needed, the foreign agent could employ reverse tunneling by tunneling the mobile node's packets to the home agent, which in turn forwards them to the communicating node. This is needed in networks whose gateway routers check that the source IP address of the mobile host belongs to their subnet or discard the packet otherwise.

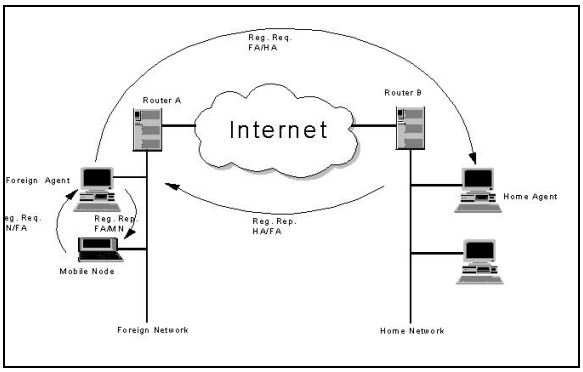

Figure 1 shows Communication between Router, Home Agent and Foreign Agent

II. Related Work

Our work is based on Virtual Mobile IP approach. In Virtual Mobile IP allocation we develop a new algorithm which generates virtual IP address when there is need of generation of IP address.

Virtual IP Based Autoconfiguration

In this technique every node has its two IP addresses one is home address which is permanent and other is load IP address which is temporary, if two or more nodes allocate same IP address this can be remapped and allocate the new IP address to all nodes. For this technique we develop an algorithm for the generation of virtual mobile IP. This algorithm is as follows:

A. Algorithm

Step A: while node_ traversed(true)

1. *Maintain routing_table(RREQ,RREP's)*
2. *Maintain list of home IP's (i.e. permanent IP).*
3. *Maintain on load IP's (i.e. temporary IP).*
4. *check_conflict()*

End of step A loop

```
check_conflict()
{
        If node_path<IP(true)
        {
        generate new_IP()
        }
        else
        {
        check IP_match()
        transmit_exit()
        }

}


node_path_IP(Boolean)

{

        If(node_id(i)_IP ==
node_id(i+1)_IP)
        {
        generate_new_IP()
        }
        Else
        {
        Transmit data()
        }
}

Generate_new_IP()
{
```

1. *found network class*
2. *check of allocated IP's*
3. *count= lost IP generated*
4. *new IP=count(lost)*
5. *allocate IP*
6. *exit*

}

So by using this technique we can send data from one node to another very easily. It also helps us to save time , reduce number of computations which are used in the form of tables in technique dynamic address allocation , number of overheads, number of other resources can also be shared easily.

In dynamic allocation of IP address whenever node needs an IP address, while allocating an IP address to that particular node firstly we have to check that whether this IP address is already allocated or not. If it is already allocated it can be replaced with some other IP address. This process also maintains a table for storing the IP address when there are multiple IP addresses to single node and every time it is checked from the table whether this IP address is in the table or not, if it is in the table it means it is already allocated and we have to choose some other objects. So if we come to our research work it is totally based on virtual generation and allocation of IP address. Every time whenever node needs an IP address It will generate an IP address which is not already generated and allocate that IP address virtually to the mobile nodes.

III. Simulations

Basically every node has its own IP address. While sending data if any node has conflict of same IP address it will resolve that conflict and remap that IP address. In figure 2, it shows that conflict arise in NODE2 to NODE 4 i.e. both nodes has same IP address

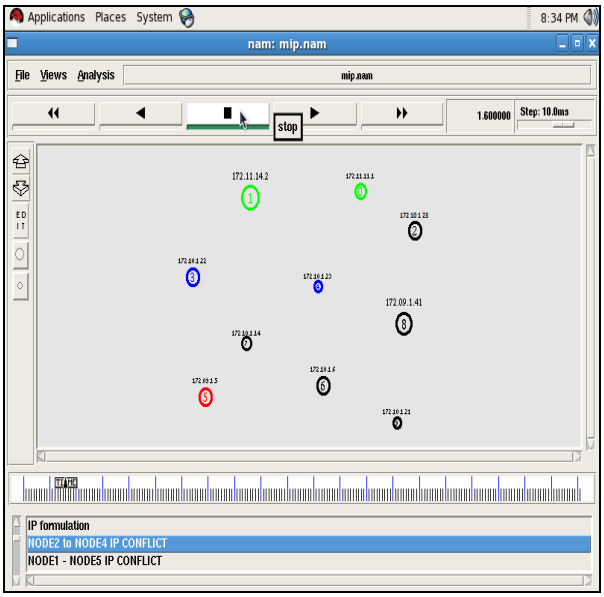

Figure 2 shows Conflicts between Node 2 and Node 4

In Figure 3 It shows the remapping of IP address and resolving conflicts between node 2 and node 4.

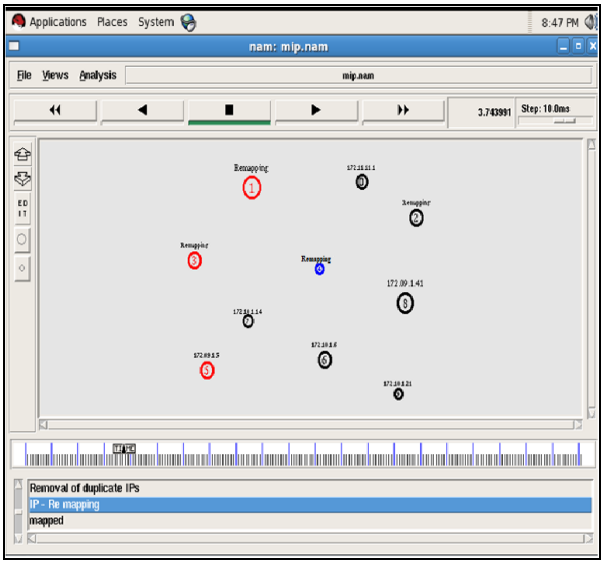

Figure 2 shows Remapping of IP Addresses

Figure 4 shows the removal of duplicate IP address and mapping the new IP address.

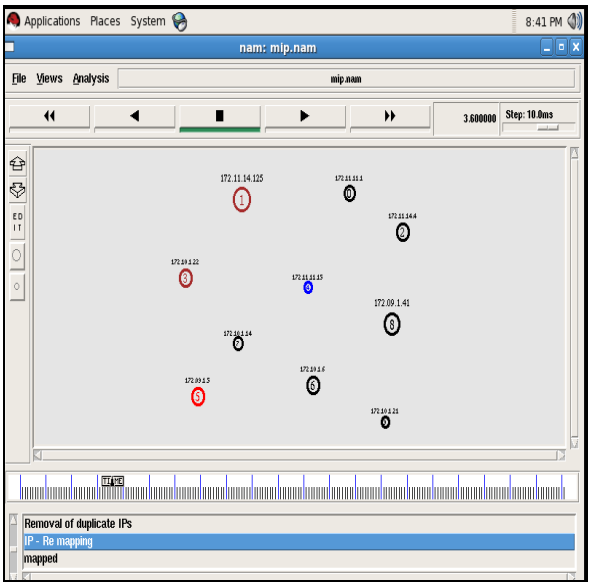

Figure 3 shows Allocation of new IP Addresses

These are the simulation of showing when two or more nodes have same IP address, it is to be remapped and assigned a new mobile IP.

IV. Conclusion

Mobile IP generation is weak in terms of algorithmic approach, thus, making it an over head task that takes large computations in terms of generating IP. In our research work, we have implemented two techniques: Generation of IP addresses virtually and Allocation of IP address virtually. In these techniques we have implemented virtual IP address on basis of above discussed algorithms. The technique proposes the methodology of allowing to generation and allocation of IP address virtually. The simulation results have demonstrated some important characteristic.

The technique used in this research work solves the problem of dynamic allocation of IP addresses, no need to maintain a table for storing the IP addresses. This technique decreases the number of computations which are used in table i.e. every time we need not to check from the table that whether this address is already allocated or not.

V. Future Work

Using virtual mobile IP improves the overall performance of transfer of data in the network therefore it is recommended to use in several areas of research areas which are neglected due to time constrained. Further research in this area of Mobile IP could be explored. The work reports in this thesis are limited to mobile IP.

In Future, work can be done regarding routing on basis of secure automatic IP identification, generation and allocation. IP identification also increases the reliability in the area of secure connections. As Future work can also be carried to optimize the network by carrying packet monitoring that will evaluate number of nodes joining and leaving the particular group.

The above discussed approach can also helps to decrease latency time, delays and number of overheads. Number of resources can also be shared easily if we are using virtual mobile nodes. And it also helps to less wastage of memory while allocating mobile IP. So the parameters like latency, Node Failure ratio, Join ratio and Network size can also be researched in future.

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