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Rushing attack prevention algorithm for manet using random route selection to make DSR and AODV more efficient

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Abstract

Mobile ad hoc network(MANET) is a self deployed system of nodes which are free to mobile any where in the network. MANET does not require fixed infrastructure or centralized administration such as base station or access node. Nodes in the network work as host as well as router to forward the data via wireless links. Multiple senders and receiver are involved in the communication because no direct connection between the nodes as result of this security is essential in the MANET. *Rushing attacks is also a type of security major in the MANET. Rushing attack cause the node to keep is isolate and scarce legitimate user in the MANET. In the MANET multicasting is widely used in multicasting one source node send data to many nodes as consequence of this multicasting transmission cost is reduced. But major drawback here is that while sending packets to multiple nodes mobile ad hoc network become unprotected because any node can be malicious node. There are different type of attacks in the MANET for example rushing attack, black hole attack, jelly fish attack, neighbor attack.This paper is based on rushing attack. In rushing attack the attacker quickly forward the packet in order to get easily access the route discovery path so that the attacker easily get the information of the network and resist all other valid node to get correct information. Once the route established between attacker and the destination all the information received by the destination will false or tempered. In MANET once the established every time data transmission path will be the same.*

In this paper we have proposed ***Rushing Attack Prevention Algorithm For MANET Using Random Route Selection to make DSR and AODV more efficient****. This is time based approach also. This algorithm has removed some drawback of DSR and SDSR algorithm and it can be more efficient.*

Keywords

Ad hoc networks, Rushing attacks, DSR, SDSR, Denial of service, Random Route Selection, Average time, MANET

I. Introduction

The communication and transmission is very important for the various application such as emergency , military service and different type of rescue operation. Some application exist in the world where we cannot deploy fixed infrastructure or no centralized administration can work. For all these type of requirements MANET is very much useful because in the MANET all node are mobile they can move to anywhere in the network and established path for data transmission. In MANET no fixed infrastructure is required or no central administration is required. MANET is very important for commercial use also like exhibition or conference attained by bureaucrats. There are so many problems with the MANET which effects security and reliability of the communication and transmission occur in the mobile ad hoc network. With the demanding use of mobile phone technology, wireless communication and transmission of data became more important. As a result of the MANET, the advantages of wireless communications which include reducing the infrastructure requirements and encouraging mobile networks, motivated researchers to search for a new network which uses a Cellular system without depending on fixed infrastructure. Nowadays, the development of Wi-Fi and laptops has made MANETs a popular and important research topic for development of our nation and world, more than ever before. However, there are many challenges facing MANETs, such as power, unreliable physical channels, range limitations and half of the dual wireless without the support of any infrastructure. On the other hand, there are many advantages for using these networks, for example, self infrastructure, reduced cost, speed of deployment, etc.

This paper attempts to provide an efficient method using random route selection to reduce rushing attack problem in MANETs and it will highlight some of the research that has

been done in the security area, and analyses the types of security threats facing these networks. Particularly, it analyses rushing attack, how it happens and possible best solutions to prevent this from the related works.

II. Releted Work

Some of the previous work on secure routing protocols such as SAODV and SDSR will be discussed in this section.

A. Secure Ad Hoc On-Demand Distance Vector Protocol (SAODV): This protocol is an extension of the Ad hoc On-demand Distance Vector protocol. In addition, it suggests a pre-established public key infrastructure which hands out signed public keys to other nodes in the network. Thus, those nodes can verify signatures or encrypt the traffic to other nodes. Because of using the private key of the source via a signature, all static sections of RREQ or RREP are protected from any alteration. What is more, the mutable part and the hop count are protected by using hash chains, otherwise attackers or malicious node can cut or shorten routes or increase their length. The source of the packet can compute the hash chain by using the hash function and a random number as a begging value (seed). After this, the result which is called the top hash and (seed) are saved in the packet. All the nodes that forward the packet compute a new hash chain as well as increase the hop count, which can be done via doing the hash function to the hash value in the packet or request. Therefore, all nodes can now verify whether the hop count and the place in the hash chain is the same or not. However, rejecting unwanted traffic is still possible through increasing the hop count by an arbitrary number.

B. Secured Dynamic Source Routing Protocol (SDSR): In order to reduce overhead in the network, instead of forwarding all packets or route requests, existing on demand routing protocols forward the first packet and then discard the rest. Unfortunately, this can assist rushing attack, as explained in the previous paper. The network shown in Figure 1 describes how rushing attack can occur via this function.

As shown in this figure, when the source node A initiates the RREQ to the destination node G, if the RREQs is forwarded by a malicious node which in this example is supposed to be node B, all the RREQs that come from node B will reach the destination earlier than any RREQs that are forwarded by other nodes, as shown in Figure 2.

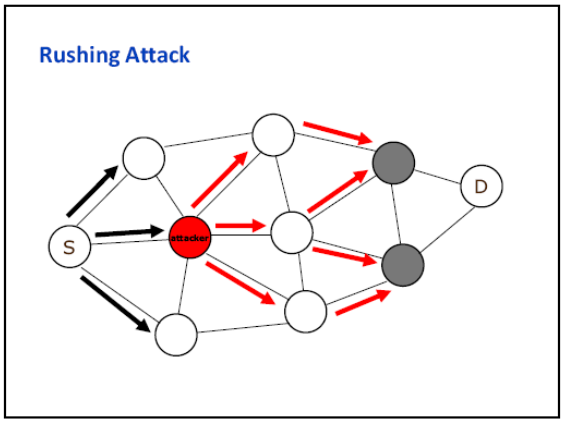

Fig-2 Rushing Attack

As shown above, all the legitimate RREQs cannot reach the destination before the attacker's RREQs. Therefore, the network will be exposed to the security risks from rushing attack. As a result of this risk, this property needs to be changed to protect networks from this kind of attack. SDSR, which is based on the DSR protocol functionality, has been shown to successfully address this problem. In SDSR, instead of forwarding the first RREQ when it arrives, which could have been sent by the attacker, every node waits for a particular time before forwarding the RREQs according to the algorithm of SDSR.

III. Existing Security Threats in MANET

Security in mobile ad hoc networks can be defined as the protection of the communications between the mobile nodes in the communications environment. Compared with wire line networks, the unrivalled features of mobile ad hoc networks create a number of problems to security design, such as a highly dynamic network topology, stringent resource constraints, peer-to-peer network architecture and a shared wireless medium. Although mobile ad hoc networks (MANETs) offer huge advantages such as easy of deployment, speed of deployment and decreased dependence on infrastructure, security is a primary concern to system security designers for many reasons. First, wireless networks are considered very vulnerable "to attacks ranging from passive eavesdropping to active interfering". Second, security 2011 Third International Conference on Intelligent Networking and Collaborative Systems mechanisms face some difficulties in communicating due to the lack of a Trusted Third Party (TTP) or an online Certificate Authority (CA). Third, due to power limitations and computation capabilities, mobile devices are more susceptible to Denial of Service attacks (DoS) and are unable to perform computation-heavy algorithms such as public key algorithms. Fourth, adversaries can use trusted nodes to attack the network. In other words, it is more important to protect the network from inside attacks than outside attacks because these are more difficult to detect. Finally, the movement of the mobile nodes creates difficulties in detecting old routing information and false routing information. Therefore, security should encompass a number of features that must be addressed such as confidentiality, availability, authentication, integrity and non-repudiation. Malicious nodes can easily impact the correct functions of DSR by fabricating routing details, impersonating other nodes to disrupt availability, confidentiality and integrity. The following are considered common ways to attack DSR

- The RREQ, RREP and ERR can be forwarded, modified, fabricated or impersonated incorrectly.
- Delete ERR message to prevent searching for other routes.
- The attacks can be replayed.
- Overload via sending route control messages or forming loops which can causes DoS (denial of service).
- Salvage a correct route instead of failed route.
- Cause route cache poisoning, which is classified as a passive attack against route integrity (24).
- An illegitimate node can be used to eavesdrop on the traffic destined for another device or node.
- A tunneling attack can be implemented by conspiracy to pull traffic to object packets or collect information.
- The protocol performance may be degraded via lengthening the path.

IV. Drawback In Dsr And Sdsr Algorithm

A. Existing problem in DSR algorithm: According to the study done before in the DSR Algorithm when packets send from source to destination its forward number of packets , but to reduce the overhead , denial of service , eavesdropping and delay this protocol accept only first packet and select the path to reach the destination. Because of this rushing attack can occur easily we can analysis that if first node is malicious node and then the path which is selected for data transmission will be unbelievable following are the problem can occur via this problem.

- We can loss confidentiality of the data.
- Packet dropping.
- Integrity of data will not be there.
- Etc.

B. Existing problem with SDSR algorithm: According to the study done before in the SDSR algorithm this is developed to overcome the shortcoming of the DSR algorithm. In the SDSR algorithm node wait for the particular time and then forward the packet so that the problem can be short out. Further we can analysis that if eavesdropping occurs the malicious node will keep the packet for particular time and then forward the packet. By the result of this rushing attack can occur again and node can be isolate. The above drawback can occurs again.

V. Proposed Solution

Here to overcome the shortcoming of the DSR and SDSR algorithm we are proposing algorithm which based on the random route selection and time based also.

For example anyone want to send data from source S to destination D adjacent for node S are C , B , D , E and time to reach these node from source are t1,t2,t3,t4 respectively. If we assume t1 is smaller and t4 is highest then According to DSR algorithm C node first receive the data and make the path for data transmission. Further we take SDSR algorithm according to which packet will wait for the particular and the data transmission will start.

According to our propose algorithm we do not fixed the path for data transmission. The first solution , Our algorithm will select the random path for every time data transmission so that the malicious node cannot continue to harm our data. Second , our algorithm will calculate the average travel time from source to the adjacent node. As state above t1 , t2 , t3 and t4 are travel time from source to adjacent node.

Tavg = (t1+t2+t3+t4)/4

If any packet which is taking time less than Tavg the node will discard all the packets. As per our algorithm all the packet which received after taking at least Tavg time that packet will only be acceptable.

Algorithm used in the proposed solution

```
static void  route_Sel_function(void)
{
  static final_route;
  int i;
  int j;
  int init_time;
  int avg_time;
  int k;
  int type1;
  int pkt_time[50];
  int route_sel[50];
  int node_sel[50];
  int temp;
  i = 1;
  type1 = op_intrpt_type();
  while (type1 != OPC_INTRPT_REMOTE_START_RCV)
   {
            type1 = op_intrpt_type();
   }
  init_time = op_sim_time();
  op_intrpt_schedule_self (op_sim_time() + 5,0);
  i = 0;
  while(1)
  {
      type1 = op_intrpt_type();
      if(type1 == OPC_INTRPT_REMOTE_START_RCV)
        {
          pkt_time[i] = init_time - op_sim_time();
          i = i + 1;
        }
      if (type1 == OPC_INTRPT_SELF)
       {
          if (op_intrpt_code() == 0){
          break;
        }
   }
  }

  j = i;
  avg_time = 0;
  for(i=0;i<j;i++)
  {
      avg_time = pkt_time[i] + avg_time;
  }
  avg_time = avg_time/j;
  k = 0;
  for(i=1;i<j;i++)
 {
     if(pkt_time[i] > avg_time)
    {
      route_sel[k] = node_sel[i];
      k = k + 1;
  }
  }
  temp = op_dist_uniform(k);
  final_route = route_sel[temp];

}
```

VI. Results

Here is the comparison between existing DSR and proposed method when security attack is there.

Blue graph: existing DSR or AODV
Sky Blue graph: proposed metho
Red graph: when attack
Green graph: for secured SDSR or SAODV

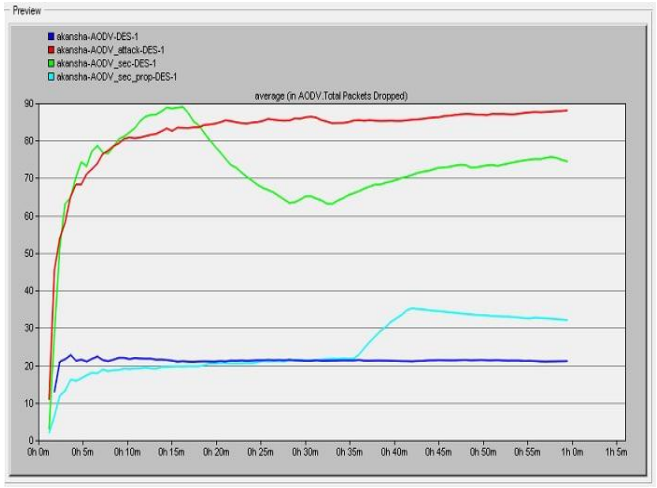

Figure :1
X Axis: Time in hours and minutes
Y Axis: Number of packets

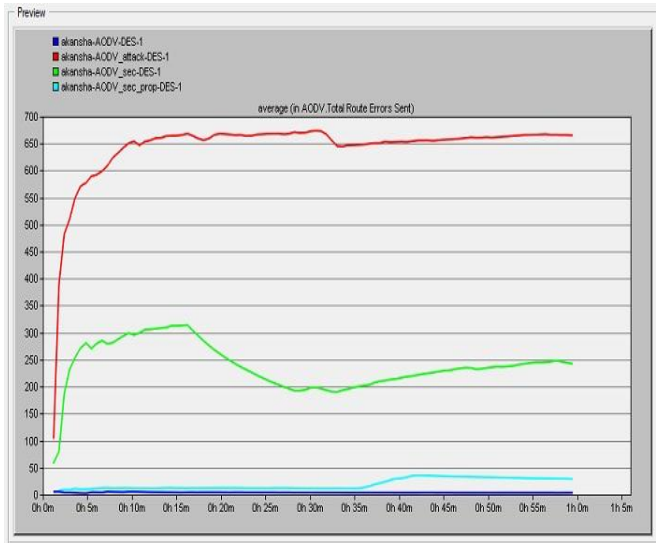

Figure 2 :
X Axis: Time in hours and minutes
Y Axis: Number of errors sent

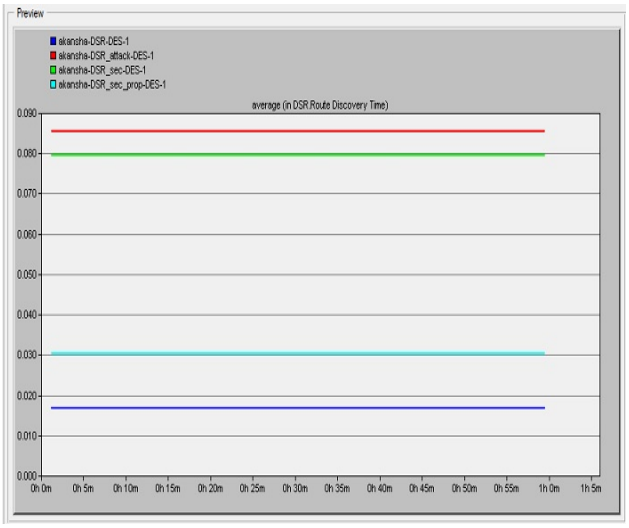

Figure 3:
X Axis: Time in hours and minutes
Y Axis: Route Discovery time in seconds

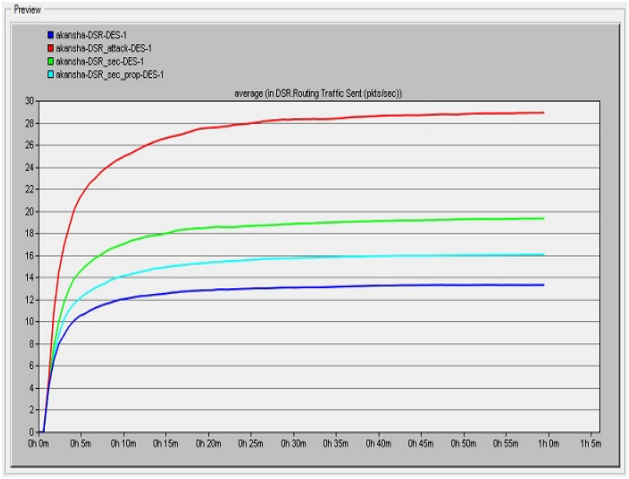

Figure 4 : X Axis: Time in hours and minutes
Y Axis: Number of Packets sent

As per all the above figures our proposed algorithm is giving best results to make DSR and AODV more efficient.

VII. CONCLUSION:

As an introduction to the work in this thesis, basic information about the features and applications of ad hoc networks and rushing attack was given. The issue of security , confidentiality and data integrity in mobile ad hoc networks was addressed by examining various previous important routing protocols such as AODV, DSDV, DSR. Different types of attacks which threaten MANETs were overviewed, for example, modification, impersonation, fabrication, wormhole and the lack of cooperation. Previous work in the area of rushing attack was explained and described, along with the solutions that can assist in preventing rushing attack. This paper proposed the best solution in detail for preventing rushing attack in mobile ad hoc networks, SDSR and DSR developed to improve security in this network, with two important goals in mind.

- To lower overhead
- To ensure there are safe neighbors in the network.

This thesis proposed two solutions: firstly, to reduce overhead by using the DSR algorithm and secondly, the message that received by the destination node itself to

determine the safest and fastest route. Finally, in the proposed future work, our aim to further develops the security of Mobile Ad hoc Networks was outlined. In future work, we will try to implement this solution on other attacks to see the results that can be achieved with this protocol. Furthermore, other weaknesses of this protocol will be addressed in order to improve it.

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