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Development of Bait Detection Approach with Increased Security and Reliability against Colloborative Attacks in Manets

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ABSTRACT:
Protecting the network layer from malicious attacks is an important and challenging security issue in mobile ad hoc networks (MANETs). A gray hole is a node that selectively drops and forwards data packets after it advertises itself as having the shortest path to the destination node in response to a route request message from a source node. The proposed system is a security mechanism defend against a cooperative gray hole attack on the well known AODV routing protocol in MANETs. Instead, it protects the network by detecting and reacting to malicious activities of any node. We have presented a mechanism for detection of malicious grayhole nodes in MANETs. Due to their occasional misbehavior, the gray holes are very difficult to detect. The proposed security mechanism increases the reliability of detection by proactively invoking a collaborative and distributed algorithm involving the neighbor nodes of a malicious gray whole node. The proposed system in each node should be cooperative with each other so, easily prevent the gray whole attack**.**

I. INTRODUCTION

In the next generation of wireless communication systems, there will be a need for the rapid deployment of independent mobile users. Significant examples include establishing survivable, efficient, dynamic communication for emergency/rescue operations, disaster relief efforts, and military networks. Such network scenarios cannot rely on centralized and organized connectivity, and can be conceived as applications of Mobile Ad Hoc Networks. A MANET is an autonomous collection of mobile users that communicate over relatively bandwidth constrained wireless links. Since the nodes are mobile, the network topology may change rapidly and unpredictably over time. The network is decentralized, where all network activity including discovering the topology and delivering messages must be executed by the nodes themselves, i.e., routing functionality will be incorporated into mobile nodes.

The set of applications for MANETs is diverse, ranging from small, static networks that are constrained by power sources, to large-scale, mobile, highly dynamic networks. The design of network protocols for these networks is a complex issue. Regardless of the application, MANETs need efficient distributed algorithms to determine network organization, link scheduling, and routing. However, determining viable routing paths and delivering messages in a decentralized environment where network topology fluctuates is not a well-defined problem. While the shortest path (based on a given cost function) from a source to a destination in a static network is usually the optimal route, this idea is not easily extended to MANETs. Factors such as variable wireless link quality, propagation path loss, fading, multiuser interference, power expended, and topological changes, become relevant issues. The network should be able to adaptively alter the routing paths to alleviate any of these effects. Moreover, in a military environment, preservation of security, latency, reliability, intentional jamming, and recovery from failure are significant concerns. Military networks are designed to maintain a low probability of intercept and/or a low probability of detection. Hence, nodes prefer to radiate as little power as necessary and transmit as infrequently as possible, thus decreasing the probability of detection or interception. A lapse in any of these requirements may degrade the performance and dependability of the network.

In mobile ad-hoc networks where there is no infrastructure support as is the case with wireless networks, and since a destination node might be out of range of a source node transmitting packets; a routing procedure is always needed to find a path so as to forward the packets appropriately between the source and the destination. Within a cell, a base station can reach all mobile nodes without routing via broadcast in common wireless networks. In the case of ad-hoc networks, each node must be able to forward data for other nodes. This creates additional problems along with the problems of dynamic topology which is unpredictable connectivity changes.

Mobile devices identities or their intentions cannot be predetermined or verified. Therefore nodes have to cooperate for the integrity of the operation of the network. However, nodes may refuse to cooperate by not forwarding packets for others for selfish reasons and not want to exhaust their resources. Various other factors make the task of secure communication in ad hoc wireless networks difficult include the mobility of the nodes, a promiscuous mode of operation, limited processing power, and limited availability of resources such as battery power, bandwidth and memory. Therefore nodes have to cooperate for the integrity of the operation of the network. Nodes may refuse to cooperate by not forwarding packets for others for selfish reasons and not want to exhaust their resources.

II. RELATED WORK

There are two sources of threats to routing protocols. The first comes from external attackers. By injecting erroneous routing information, replaying old routing information, or distorting routing information, an attacker could successfully partition a network or introduce a traffic overload by causing retransmission and inefficient routing. The second and more severe kind of threat comes from compromised nodes, which might (i) misuse routing information to other nodes or (ii) act on applicative data in order to induce service failures.

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Personal Area Networking and Bluetooth

A personal area network (PAN) is a short-range, localized network where nodes are usually associated with a given person. These nodes could be attached to someone's pulse watch, belt, and so on. In these scenarios, mobility is only a major consideration when interaction among several PANs is necessary, illustrating the case where, for instance, people meet in real life. Bluetooth is a technology aimed at, among other things, supporting PANs by eliminating the need of wires between devices such as printers, PDAs, notebook computers, digital cameras, and so on, and is discussed later. Such networks can be used to enable next generation of battlefield applications envisioned by the military including situation awareness systems for maneuvering war fighters, and remotely deployed unmanned micro-sensor networks. Ad Hoc networks can provide communication for civilian applications, such as disaster recovery and message exchanges among medical and security personnel involved in rescue missions.

III. ATTACKS ON MOBILE ADHOC NETWORK

Attacks on mobile ad hoc networks can be classified into following two categories:

Passive Attacks:

A passive attack does not disrupt proper operation of the network. The attacker snoops the data exchanged in the network without altering it. Here, the requirement of confidentiality can be violated if an attacker is also able to interpret the data gathered through snooping. Detection of passive attacks is very difficult since the operation of the network itself does not get affected. One way of preventing such problems is to use powerful encryption mechanisms to encrypt the data being transmitted, thereby making it impossible for eavesdroppers to obtain any useful information from the data overheard. There is an attack which is specific to the passive attack a brief description about it is given below:

Active Attacks:

An active attack attempts to alter or destroy the data being exchanged in the network, thereby disrupting the normal functioning of the network. It can be classified into two categories external attacks and internal attacks. External attacks are carried out by nodes that do not belong to the network. These attacks can be prevented by using standard security mechanisms such as encryption techniques and firewalls. Internal attacks are carried out by compromised nodes that are actually part of the network. Since the attackers are already part of the network as authorized nodes, internal attacks are more severe and difficult to detect when compared to external attacks. Brief descriptions of active attacks are given below.

IV. DENIAL OF SERVICE

In this type of attack, an attacker attempts to prevent legitimate and authorized users from the services offered by the network. A denial of service (DoS) attack can be carried out in many ways. The classic way is to flood packets to any centralized resource present in the network so that the resource is no longer available to nodes in the network, as a result of which the network no longer operating in the manner it was designed to operate. This may lead to a failure in the delivery of guaranteed services to the end users DoS attacks can be launched against any layer in the network protocol stack. On the physical and MAC layers, an adversary could employ jamming signals which disrupt the on-going transmissions on the wireless channel. On the network layer, an adversary could take part in the routing process and exploit the routing protocol to disrupt the normal functioning of the network. For example, an adversary node could participate in a session but simply drop a certain number of packets, which may lead to degradation in the QoS being offered by the network. On the higher layers, an adversary could bring down critical services such as the key management service. nodes B and C cannot hear each other, and that M is a malicious node attempting a denial of service attack. Suppose S wishes to communicate with X and that S has an unexpired route to X in its route cache. S transmits a data packet toward X with the source route S --> A --> B --> M --> C --> D --> X contained in the packet's header. When M receives the packet, it can alter the source route in the packet's header, such as deleting D from the source route. Consequently, when C receives the altered packet, it attempts to forward the packet to X. Since X cannot hear C, the transmission is unsuccessful.

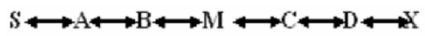


FIG: Denial of service attack

Jamming:

In this form of attack, the attacker initially keeps monitoring the wireless medium in order to determine the frequency at which the destination node is receiving signals from the sender. It then transmits signals on that frequency so that error-free reception at the receiver is hindered. Frequency hopping spread spectrum (FHSS) and direct sequence spread spectrum (DSSS) are two commonly used techniques that overcome jamming attacks.

SYN Flooding:

In this form of attack, a malicious node sends a large amount of SYN packets to a victim node, spoofing the return addresses of the SYN packets. The SYN-ACK packets are sent out from the victim right after it receives the SYN packets from the attacker and then the victim waits for the response of ACK packet. Without any response of ACK packets, the half-open data structure remains in the victim node. If the victim node stores these half-opened connections in a fixed-size table while it awaits the acknowledgement of the three-way handshake, all of these pending connections could overflow the buffer, and the victim node would not be able to accept any other legitimate attempts to open a connection. Normally there is a time-out associated with a pending connection, so the half-open connections will eventually expire and the victim node will recover.

However, malicious nodes can simply continue sending packets that request new connections faster than the expiration of pending connections.

Distributed DoS Attack:

Distributed denial of service attack is more severe form of denial of service attack because in this attack several adversaries that are distributed throughout the network collude and prevent legitimate users from accessing the services offered by the network.

AODV (Ad hoc on demand Distance Vector Routing)

The Ad hoc On Demand Distance Vector (AODV) routing algorithm is a routing protocol designed for ad hoc mobile networks. AODV is capable of both unicast and multicast routing. It is an on demand algorithm, meaning that it builds routes between nodes only as desired by source nodes. It maintains these routes as

V. DYNAMIC SOURCE ROUTING PROTOCOL (DSR)

Dynamic Source Routing (DSR) is a routing protocol for wireless mesh networks. It is similar to AODV in that it forms a route on-demand when a transmitting computer requests one. However, it uses source routing instead of relying on the routing table at each intermediate device. Determining source routes requires accumulating the address of each device between the source and destination during route discovery. The accumulated path information is cached by nodes processing the route discovery packets. The learned paths are used to route packets. To accomplish source routing, the routed packets contain the address of each device the packet will traverse. This may result in high overhead for long paths or large addresses, like IPv6. To avoid using source routing, DSR optionally defines a flow id option that allows packets to be forwarded on a hop-by-hop basis. This protocol is truly based on source routing whereby all the routing information is maintained (continually updated) at mobile nodes. It has only two major phases, which are Route Discovery and Route Maintenance. Route Reply would only be generated if the message has reached the intended destination node (route record which is initially contained in Route Request would be inserted into the Route Reply).To return the Route Reply, the destination node must have a route to the source node. If the route is in the Destination Node's route cache, the route would be used. Otherwise, the node will reverse the route based on the route record in the Route Request message header (this requires that all links are symmetric). In the event of fatal transmission, the Route Maintenance Phase is initiated whereby the Route Error packets are generated at a node. The erroneous hop will be removed from the node's route cache; all routes containing the hop are truncated at that point. Again, the Route Discovery Phase is initiated to determine the most viable route. For information on other similar protocols, see the ad hoc routing protocol list.

Consider a source node that does not have a route to the destination. When it has data packets to be sent to that destination, it initiates a Route Request packet. This Route Request is flooded throughout the network. Each node, upon receiving a Route Request packet, rebroadcasts the packet to its neighbors if it has not forwarded it already, provided that the node is not the destination node and that the packet's time to live (TTL) counter has not been exceeded. Each Route Request carries a sequence number generated by the source node and the path it has traversed. A node, upon receiving a Route Request packet, checks the sequence number on the packet before forwarding it. The packet is forwarded only if it is not a duplicate Route Request. The sequence number on the packet is used to prevent loop formations and to avoid multiple transmissions of the same Route Request by an intermediate node that receives it through multiple paths. Thus, all nodes except the destination forward a Route Request packet during the route construction phase. A destination node, after receiving the first Route Request packet, replies to the source node through the reverse path the Route Request packet had traversed. Nodes can also learn about the neighboring routes traversed by data packets if operated in the promiscuous mode (the mode of operation in which a node can receive the packets that are neither broadcast nor addressed to itself). This route cache is also used during the route construction phase.

VI. EVENT SCHEDULER:

In this Event scheduler while we processing many data's at a time it will process one by one FIFO concept, so there is no congestion while transferring the packets.

Packets

It is the collection of data, whether header is called or not, all header files where present in the stack registers

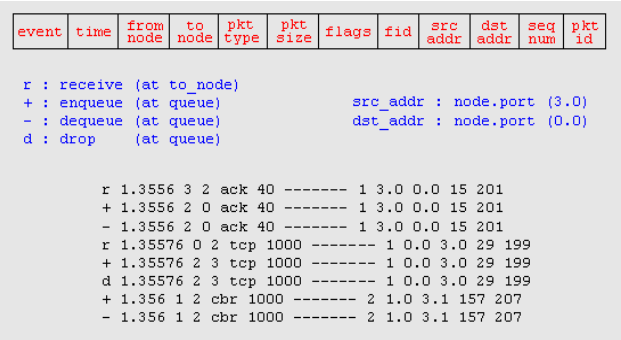


FIG: Trace of a packet

Creating network topology (Physical layer)

The Physical Layer is the first and lowest layer in the seven-layer OSI model of computer networking. The implementation of this layer is often termed PHY.The Physical Layer consists of the basic hardware transmission technologies of a network. It is a fundamental layer underlying the logical data structures of the higher-level functions in a network. Due to the plethora of available hardware technologies with widely varying characteristics, this is perhaps the most complex layer in the OSI architecture.The Physical Layer defines the means of transmitting raw bits rather than logical data packets over a physical link connecting networking nodes. The bit stream may be grouped into code words or symbols and converted to a physical that is transmitted over hardware.

Transport Connection (Transport Layer)

Transport layers are contained in both the TCP/IP which is the foundation of the INTERNET and the OSI model of general networking. The definitions of the Transport Layer are slightly different in these two models. The most well-known transport protocol is the (TCP). It lent its name to the title of the entire Internet protocol suite TCP/IP. It is used for connection-oriented transmissions, whereas the connectionless user datagram suite (UDP) is used for simpler messaging transmissions. TCP is the more complex protocol, due to its design incorporating reliable transmission and data stream services.

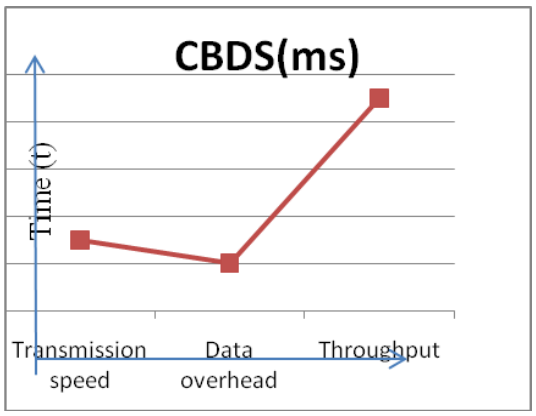
Generate Traffic (Application Layer)

In TCP/IP, the Application Layer contains all protocols and methods that fall into the realm of process-to-process communications via an Internet Protocol (IP) network using the Transport layer protocols to establish underlying host-to-host connections.

VII. PERFORMANCE ANALYSIS

Comparision analysis between BFTA and CBDS

.No	Parameters	BFTA(m.s)	CBDS(m.s)
1.	Transmission speed	2.5	3
2.	Data overhead	5	2
3.	Throughput	3	9



Number of nodes(ms)----------→

Fig: Figure shows that the increased throughput, transmission speed ,less overhead of CBDS while comparing with BFTA.

VIII. CONCLUSION AND FUTURE WORK

In this paper the routing security issues of MANETs, are proposed. One type of attack, the black hole, which can easily be deployed against the MANET. The percentage of packets received through the proposed method is better than that in AODV in presence of cooperative black hole attack. The CBDS detecting malicious nodes in MANETs under gray/collaborative black hole attacks. Our simulation results revealed that the CBDS outperforms the DSR, 2ACK, and BFTR schemes, chosen as benchmark schemes, in terms of routing overhead and packet delivery ratio. Any detected malicious node is kept in a black hole list so that all other nodes that participate to the routing of the message are alerted to stop communicating with any node in that list. Our proposed detection scheme takes advantage of the characteristics of both the reactive and proactive schemes to design a DSR-based routing scheme able to detect gray hole/collaborative black hole attacks in MANETs.

It intends to 1) investigate the feasibility of adjusting our CBDS approach to address other types of collaborative attacks on MANETs and to 2) investigate the integration of the CBDS with other well-known message security schemes in order to construct a comprehensive secure routing framework to protect MANETs against miscreants.

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