Dos and ARP Spoofing Attacks Analysis through Agent Software

KEYWORDS: ARP cache, ARP spoofing, DoS, TCP/IP

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ABSTRACT *Now a day's networking Hosts face more serious problems from attackers. The Attacker try to hack the IP and MAC address, view the connection, inject information and kill the connection between hosts. Attackers change the information in ARP Table to capture the information from the Host. Previously many tools used to exploit the vulnerabilities in ARP, but all these tools exploit the "weakness" of the original ARP protocol, if we change the definition of the ARP protocol it will create more serious and unacceptable compatibility problems. Some proposals use hardware tools to protect the ARP spoofing and Dos attacks, but the cost of the tools is high. This study demonstrates that we can eliminate most of the ARP threats by installing agent Anti-ARP Spoofing software (DASATA). This prevents from unauthentication information exchange and insecure communications. Agent uses TCP protocol to provide communication among hosts with authentication in transparent and secure manner. TCP/IP [5] is a stable, well-established, complete set of protocols; TCP strength is good failure recovery. We implementing agent software on windows xp and perform some experiments. The result proves that the software installed on hosts is protect from ARP hacking tools, hosts send, and receive packets with authentication.*

INTRODUCTION

ARP is use to bind the addresses, sending an ARP request for each datagram is inefficient; three frames traverse in the network for each datagram (an ARP request, ARP response, and the datagram). ARP maintains a small table of bindings in memory. ARP manages the table as a cache — an entry is replaced when a response arrives, and the oldest entry is removed whenever the table runs out of space or after an entry has not been updated for a long period (e.g., 20 minutes). If the binding is not present in the cache, ARP broadcasts a request, waits for a response, updates the cache, and then proceeds to use the binding. [1]

ARP threats occurs because of the lack of improper authentication and duplicate ARP request and replies. Attacker tries to broadcast the ARP request message to different hosts in the network to manipulate the IP and MAC address of the other host. After receiving ARP request messages from attacker, user host system send response to the attacker system and update the ARP cache table with attacker IP and MAC address. Some persons proposed the solutions for these problems; the results prove that most of the ideas impractical need to change the ARP design framework, high costly hardware need to monitor the malicious ARP threats or ARP packets in Encryption format. [2]

We propose to install software agent, DASATA (agent software) between the IP and MAC layers to provide authentication and perform the following activities

(i) filtering all the incoming and outgoing messages
(ii) maintain the ARP cache table in static mode using the TCP packets

Here we implement agent software on windows xp and perform some experiments. The result proves that the software installed on hosts is protect from ARP hacking tools, hosts send, and receive packets with authentication. [3]. this paper organized as follows: Section 2 Existing ARP threats based on RFC 826. Section 3 Related works about Encryption/Decryption; Hosts based securities, Section.4, we design DASATA architecture and implementation with TCP [5] packets to maintain ARP cache in static and in automatic mode. Section 5 concludes the paper.

EXISTING ARP THREATS

2.1 Denial of Service

A hacker can easily associate an operationally significant IP address to a false MAC address. For instance, a hacker can send an ARP reply associating your network router's IP address with a MAC address that does not exist. Your computers believe they know where your default gateway is, but in reality, they are sending any packet whose destination is not on the local segment, into the Great Bit Bucket in the Sky. In one move, the hacker has cut off your network from the Internet.

2.3 ARP spoofing

The ARP spoofing attack based on impersonating a system in the network, making the two ends of a communication believe that the other end is the attacker's system, intercepting the traffic interchanged.

To achieve this goal, the attacker just needs to send a previously modified ARP packet, method known as packet creating, to the source system of a given communication saying that the destination IP address belongs to his own MAC address. In the same way, it will inform the destination system, through a second crafted ARP packet, that the IP address of the source is associated to his MAC address too. [3]

RELATED WORKS

Many existing systems provide countermeasures for ARP attacks are follows:

(i) Encryption based
(ii) System(host or server) based

I. Encryption Based

A. S-ARP: Secure Address Resolution Protocol

Bruchi et al., proposed SARP (Secure Address Resolution Protocol), is used to provide security for ARP cache table in local area networks (LAN). In these SARP, each host IP-MAC address convert into message digest using hash algorithm. In this approach sender use his private key to create the messagae, receiver verify the senders public key to check the receiving IP-MAC address same as the sender IP_MAC address. [6]

B. P-ARP: A novel enhanced authentication scheme for securing ARP

P Limmaneewichid et al. Proposed P-ARP: (A novel enhanced authentication scheme for securing ARP), they use standard ARP request/reply packets. For ARP trailer they add an authentication data to make use of trailer protocol. The trailer consists of three fields that are the Magic Number, Nonce and Authentication Data. To generate the magic number use the HMAC and hash algorithms. This solution is ineffective against ARP Dos attacks. The Proposed solution slows down the system performance. [7]

(II) System (host or server) based

C. A secure address resolution protocol

Mohamed G. Gouda et al proposed architecture for resolving IP addresses into hardware addresses over an Ethernet. The architecture consists of a secure server connected to the network and two protocols used to communicate with the server: an invite-accept protocol and a request-reply protocol. The invite-accept protocol is used by hosts to register their (IP, MAC) mappings with the server. The request-reply protocol is used by hosts to obtain the MAC address of a host connected to the LAN, from the database of the secure server. [8]

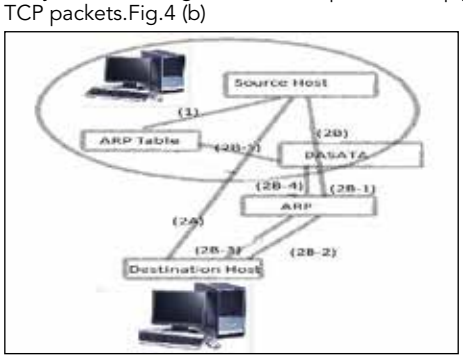
D. Preventing ARP Attacks using a Fuzzy-Based Stateful ARP Cache

Zouheir Trabelsi et al proposed prevention mechanism is based on the use of a stateful ARP cache. When host A generates an ARP request to get the MAC address of host B, an entry is created in its stateful ARP cache, with the status of "Waiting". Host A waits for an ARP reply, within a predefined timeout. If an ARP reply comes, then host A waits another timeout in order to collect other possible ARP replies sent by other hosts in the network. Therefore, among those hosts, only one host is an honest host, which is host B. [9]

PROPOSED APPROACH

Main contribution of this paper is that how to maintain the integrity of ARP cache entries in static mode and automatically update the table when we send and receive the messages. Proposed approach only grants agent the authority to exchange the IP_MAC address, eliminate the ARP protocol threats without requiring of modifying of kernel, and secure server. We implement our idea, DASATA to demonstrate its effectiveness in practice and conducted some experiments in which existing ARP hacking tools were launch.

In the proposed environment we install agent software on all the hosts in the network, software installed system provide communication to exchange the ARP details. Agent protected systems exchange their ARP request and Reply in the form TCP packets.Fig.4 (b)



(a) Proposed approach

If destination hosts MAC address not available in the cache table, send request message to all the hosts in the network through Ethernet. Destination host send reply in unicast, destination host may not have agent software installed or could even be malicious. Agent software intercepts the incoming message from the destination host, updates the cache table and provides connection with that host.

4.1 DASATA Explanation:

Host try to communicate with the other host in network .In this process the source host send request message to the destination host using the IP-MAC of the source host. Destination host receives the message and send reply to the destination host. However, the problem here is attacker try to hack the information of sending and receiving messages from the hosts.

To protect from the above problem we have developed DASATA, which has three components: ARP Filter, ARP Controller, GUI see fig 4.b.

Architecture of DASATA

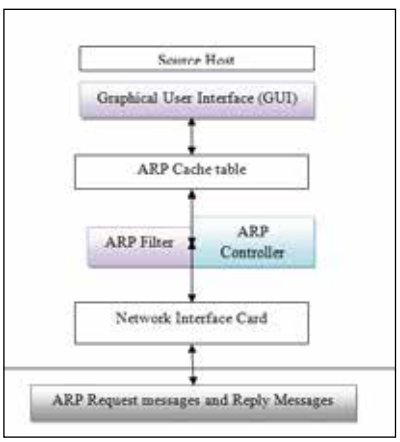


Fig 4.b Protocol of DASATA

ARP Filter and controller implemented between the data link layer and the network interface card. ARP filters possible to intercept the incoming and outgoing packets and maintain the ARP cache table at hosts.

ARP controller is checking the ARP cache table in static mode or not. If any messages are sending and receive from hosts the controller automatically updates the ARP table .DASATA blocks all the incoming and outgoing messages. To exchange mutual authentication IP-MAC address is used. DASATA use TCP packets.

ARP FILTER

We use three hosts to get effectiveness of filter design. DASATA protects the host, gateway and other hosts.

The fundamental principles of filter is

(i) DASATA blocks' incoming and outgoing messages
(ii) Exchange of IP_MAC address in the form encrypted TCP packets to maintain the effectiveness and consistency.

Filter policy address the DASATA host that want to communicate with the other host, first check the other host has DASATA installed or not. If any message comes from the not installed DASATA host, filter check the message and GUI provide information the source host, there is malicious host u need to communicate with that host. Upon receiving conformation, regular ARP protocol is used and host is trusted.

4.2 Algorithms and Flowcharts

Algorithm for Incoming message Request and Response

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- An incoming and outgoing ARP message request

Perform the decryption
Convert TCP packets into IP-MAC pair
Extract IP and MAC of sender
If sender MAC_IP in the ARP cache table

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Replace the MAC address in the cache table
Else
Add entry to the related IP address in the ARP Cache table

- An incoming and outgoing ARP message response

Convert the IP_MAC into the TCP packets
Perform the encryption
Send response

4.3 RESULTS

Result shows that, setting of IP-MAC in to the Static mode. In addition, how the software maintains or controls the ARP cache in static mode when any messages receiving and sending.

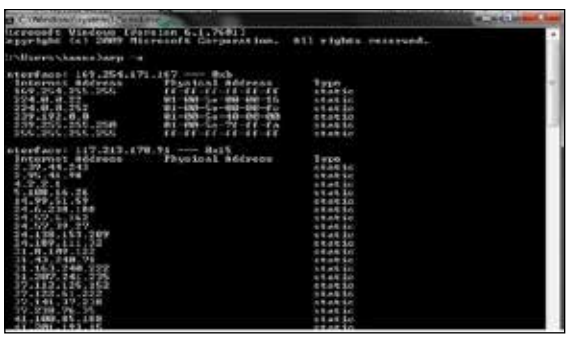

Fig.4.efOutput of DASATA in static

4.4 EVALUATION

To evaluate effectiveness of DASATA, we implemented agent software, installed in a network .The result shows that Agent software installed system protect form ARP threats, other systems comprise in their security.

CONCLUSION

In this paper, we provide how the ARP attacks effectively defeat using the agent software without changing of ARP Kernel. Many approaches propose solutions to ARP attacks, to provide security for ARP, change the kernel, maintain the ARP cache table in dynamic mode.ARP cache is in dynamic mode; attacker can easily capture the information.

We implemented agent software to provide security for ARP, these blocks the unauthenticated exchange of hosts. We perform some experiments using these software, that results show that the ARP cache table automatically updated when message receiving and sending in static mode. The proposed approach DASATA uses TCP packets containing IP_MAC pairs encrypted by a symmetric key, to control the ARP (incoming and outgoing) messages.

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