STUDY ON IP TRACEBACK SYSTEM FOR DDoS

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Abstract: The rapid growth in technology has caused misuse of the Internet like cyber Crime. There are several vulnerabilities in current firewall and Intrusion Detection Systems (IDS) of the Network Computing resources. Automatic real time station chase techniques can track the internet invader and reduce the probability of hacking Due to the recent trends the station chase technique has become inevitable. In this paper, we design and implement IP traceback system. In this design no need to modify the router structure and we can deploy this technique in larger network. Our Implementation shows that IP traceback system is safe to deploy and protect data in Internet from hackers and others.

1 INTRODUCTION

Due to rapidly developed IT technology, internet based technologies are increasing these days. On the other hand, the side effects such as hacking, virus, and message fake also have been increased too. In order to respond these side effects, security systems such as firewall and IDS (intrusion detection system) have been developed and utilized. Nevertheless, these systems can not protect enough from the internet attacks since to the systems are passive, and hacking accidents are continuously increasing.

Therefore, it is necessary to study for reducing hacking accidents by applying the automatic real time chasing which can trace the intentional internet invaders. To solve the problem, the active security system utilizing IP traceback technology is proposed in this paper.

To trace and isolate the network invader based on the active security system, the security mechanism was established by implementing ICMP (internet control message protocol) type traceback message for IP traceback, and designing the agent put in local area network and the server framework put in management network were implemented.

In this paper, we design and implement IP traceback system using iTrace message for response attacker. Section 2 give proposed IP traceback system architecture. Section 3 give implement of IP traceback system using iTrace message. The paper concludes with section 4.

2 PROPOSED IP TRACEBACK SYSTEM ARCHITECTURE

2.1 IP Traceback System

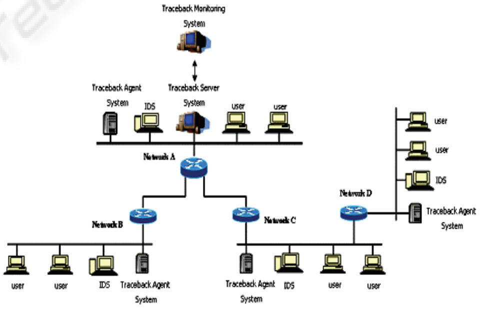

Figure 1: Proposed IP Traceback System Architecture.

Proposed IP Traceback system creates iTrace message and send it to the destination system. Destination system analyzes the iTrace message for an attack. If attack is detected, Destination system collects relevant information. Then, the destination system can traceback attacker using collected relevant information. I-Trace System contains agent system and sever system. Agent system creates iTrace Message and sends to server system. Also, agent system report if abnormal traffic phenomenon happens, it watches relevant IP, and detects system problem, in case of problem occurrence the

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information of relevant system and its Source IP is provided to the server system.

2.2 Proposed Agent System

Figure 2 shows proposed Agent system. Agent systems are installed in router. Router develops authentication host DB at local domain. Router also creates decision router packet using authentication hosts DB. On the other hand, non-authentication hosts are stored in non-authentication hosts DB if hosts source address is not valid or if it causes a quick surge in traffic. This non-authentication host is candidate attacker and cannot forward route packet anymore. If authentication host sends packet, iTrace message is generated with a low probability of about 1/20000.

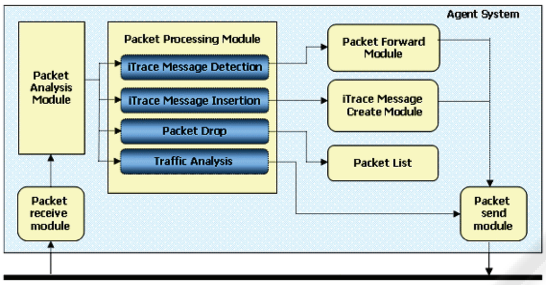


Figure 2: Proposed Agent System.

Agent and Server system share secret key(k) for the Attacker's iTrace Message. Server system create secret Key(k) and send to Agent system. Then Agent system send iTrce Message and hash-value using secret key(k) to Server system. Server system check the iTrace Message and hash-value using secret key(k). Figure 3 shows iTrace Message create module.

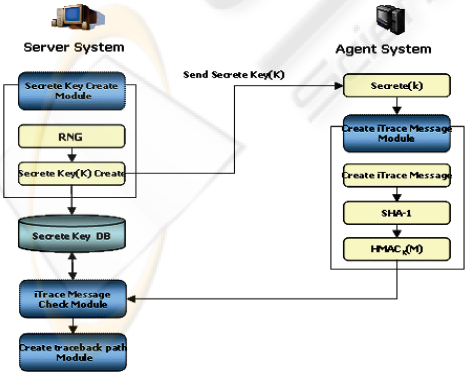


Figure 3: iTrace Message create Module.

2.3 Proposed Server System

Server system monitors entire network by installing many Agent system. Server system monitors entire networks status in real time. If Server system reports attack from IDS, then traceback commences using iTrace message. Figure 4 shows proposed Server System.

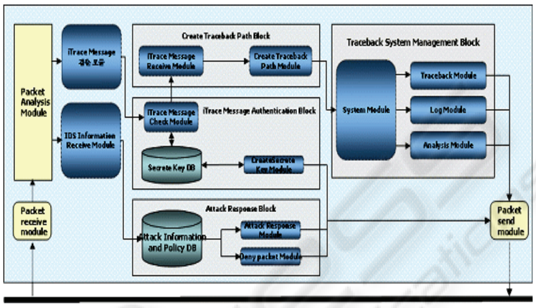

Packet Analysis Module
iTrace Message
IDS Information Receive Module
Create Traceback Path Block
iTrace Message Receive Module
Create Traceback Path Module
iTrace Message Check Module
iTrace Message Authentication Block
Secrete Key DB
CreateSecrete Key Module
Attack Response Block
Attack Information and Policy DB
Attack Response Module
Deny packet Module
Traceback System Management Block
System Module
Traceback Module
Log Module
Analysis Module
Packet receive module
Packet send module

Figure 4: Proposed Server System.

If receive intrusion information in Intrusion Detection System(IDS), server system relevant packet discard and send a iTrace Message creation direction. Server system's authentication verifies iTrace Message

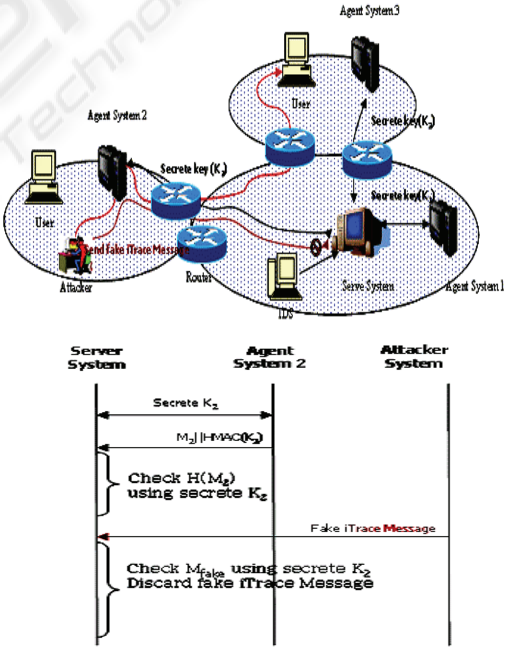


Figure 5: Validate iTrace Message using secrete key.

First, create secret key K_n to share with each Agents in secret key creation module of Server. Server stores secret key K_n that create to secret key

DB and is shared with each Agents. After intrusion occurrence, iTrace Message's validation test that receive from agent uses secret key K_n that before exchange. Figure 5 shows when attacker transmits fake iTrace Message to server through Agent 2. But, server is discard fake iTrace Message that attacker sends creating hash value using secret key K_2 that exchange with Agent 2.

3 PROPOSED IP TRACEBACK SYSTEM

System is developed to be accommodated in any current network configuration. Agent system creates iTrace message and then send it to Server system. As, It is very difficult to load the programming module into router, we use Agent system to analyze incoming/outgoing packet in router. Agent system is developed by using RedHat 9, kernel version 2.6.12.5. And we use C language, gcc egcs-2.91.66 as complier. Although we use Linux system, it can also be module by embedded program. And this module is then included into router.

Agent system linked to each router analyzes the packet coming from Server system for a predefined attack type. Packets that agree with relevant attack type are termed as attack packet. Traceback information stored in DB sorts and identifies victim IP and make a traceback within group by using time stamp.

3.1 Agent System

Packet collection that is being followed in network has critical value that administrator establishes in agent system, and transmit packet header information in iTrace message creation module. Figure 6 shows image that establish critical value in agent system.

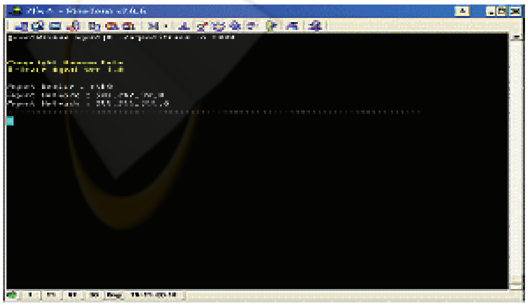


Figure 6: Implement of Agent System.

3.2 Server System

As following figure 7, Server System control entire network and local network traffic. And if received intrusion information from Intrusion Detection System(IDS), Server system validate iTrace Message using secrete key.

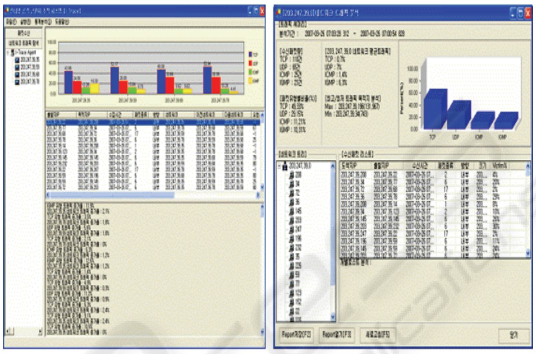


Figure 7: Implement of Server System.

3.3 Attack Path Reconfiguration

Then, continuously keep track of router(Agent) address, traceback node through which packet flow within each group. This process in each network repeatedly reconfigures attack path. Figure 8 shows the attack path and way of traceback.

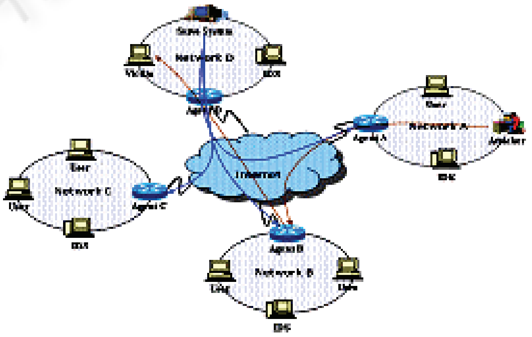


Figure 8: Implement of Server System.

Step 1. Attacker who belong to Network A attempts to attack the victim system belong to Network D.

Step 2. Intrusion Detection System present in Agent detects attack and report it to Server system.

Step 3. Server system identifies and notifies the attack on I-Trace Agent system linked to each router.

Step 4. Server system denies the flow of packets that are forwarded to victim system.

Step 5. Server System analyzes traceback packet included in iTrace message that are received from Agent system and begin traceback. First, Server system check validate of iTrace Message using secrete key(k_n)

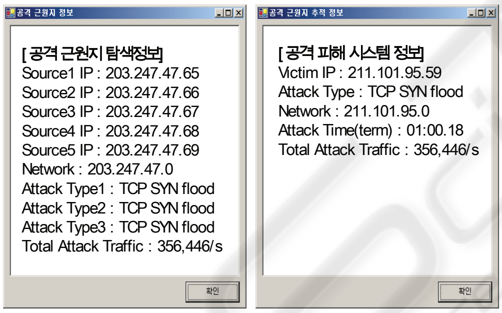
Step 6. Server system chose iTrace that have maximum Timestamp. And Server system store RouterID, Backward Link, Forward Link.

Step 7. Find iTrace Message that have Forward connect to Forward Link and establish traceback path.

Step 8. Repeate step 6, step 7 until do not connect to iTrace Message.

Step 9. Server System make complete traceback path. Traceback attack source.

Figure 9 shows result of IP traceback. In figure 10, we sure do not cause much traffic than PPM packet of basis by way that transmit creating iTrace Message about something wrong packet, and also do not create traffic that iTrace Message can bear to whole network.



[공격 근원지 탐색정보]
Source1 IP : 203.247.47.65
Source2 IP : 203.247.47.66
Source3 IP : 203.247.47.67
Source4 IP : 203.247.47.68
Source5 IP : 203.247.47.69
Network : 203.247.47.0
Attack Type1 : TCP SYN flood
Attack Type2 : TCP SYN flood
Attack Type3 : TCP SYN flood
Total Attack Traffic : 356,446/s

[공격 피해 시스템 정보]
Victim IP : 211.101.95.59
Attack Type : TCP SYN flood
Network : 211.101.95.0
Attack Time(term) : 01:00.18
Total Attack Traffic : 356,446/s

Figure 9: IP Traceback analyzes Attacker and Victim.

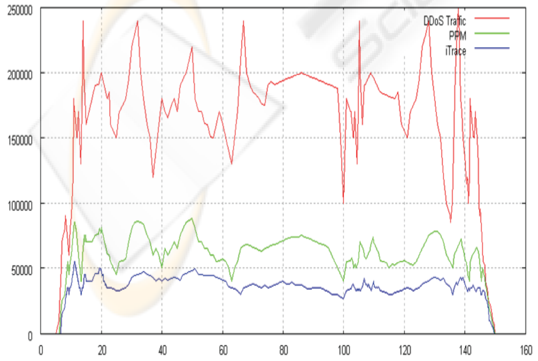


Figure 10: Analysis packet traffic.

4 CONCLUSIONS

IP Traceback is an important technique to traceback attack source address. Many techniques have been proposed but all these techniques have a problem when applied in internet environment. As, it is not easy to load programming module into router, we use linux system as the administrator can access linux router. We design and implement IP Traceback system that uses iTrace message, which can be applied in internet environment. We use authentication/non-authentication host DB for protecting network hosts from attacker and also due fall in traffic rate. We use iTrace message (draft-ietf-itrace-04) that is undergoing advancement due to iTrace message's standardization. Future work is to concentrate on how to implement IP Traceback system in ubiquitous environment.

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