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Adaptive Discrimination Detection for DDoS Attacks from Flash Crowds Using Flow Correlation Coefficient with Collective Feedback

N. V. Poorrnima[1], K. Chandra Prabha[2], B. G. Geetha[3]
[#]*Department of Computer Science and Engineering.K.S.Rangasamy College of Technology.*
[*]*Department of Computer Science and Engineering.K.S.Rangasamy College of Technology.*

Abstract: *A Distributed denial of service (DDoS) attack is a most popular and crucial attack in the internet. Its motive is to make a network resource unavailable to the legitimate users. Botnets are commonly the engines behind the attack. In our deep study of the size and organization of current botnets, found that the current attack flows are usually more similar to each other compared to the flows of flash crowds In this paper we are concentrating flash crowd and DDoS there are two steps involved, first it is necessary to differentiate normal traffic and flashcrowd by using Flash Crowd Detection Algorithm. Second we have to differentiate flash crowd and DDoS by using Flow Correlation Coefficient (FCC). By using this FCC value, algorithmproposedcalled Adaptive discrimination algorithm is used to detect the DDoS from the flash crowd event. And a sequential detection and packing algorithm used to detect the attacked packets and filter it out.By using above mentioned algorithms we can improve the accuracy in filtering the attacked packets and also the time consummation is reduced.*
Index Terms*—DDoS attacks ,flash crowd event, discrimination.*

I. Introduction

A network is a group ofor two or more computer systems linked together. There are many types of computernetworks are available. Communication between the systems are carried out by message passing, while passing message some types of attacks may occur to collapse the actual message. The attacks are classified as two types they are Active and Passive.An "active attack" tries to change system resource.A "passive attack" tries to learn or make use of information from the system but does not affect system resources(E.g., see: wiretapping). We are concentrating on Active attacks .Our focus is DDoS (Distributed Denial of Service Attack) it is one type of active attack.

DDoS stands for Distributed Denial of Service attack. It is a form of attack where a lot of zombie computers (infected computers that are under the control of the attacker) are used to either directly or indirectly to flood the targeted server(s) – victim, with a huge amount of information and choke it in order to prevent legitimate users from accessing them (mostly web servers that host websites). In most cases, the owners of the zombie computers may not know that they are being utilized by attackers. In some cases, there is only a periodic flooding of web servers with huge traffic in order to degrade the service, instead of taking it down completely.

In recent days DDoS is one of the main threats in the internet. there are many solutions have been proposed but still there is a problem in the internet world for that we are proposing an efficient algorithm to detect the attack and also filtering the attacked packets .

In general computing environment, a denial-of-service attack (DoS attack) or distributed denial-of-service attack (DDoS attack) is an attempt to make a machine or network resource unavailable to the legitimate (actual) users.

Types of DDoS attacks are

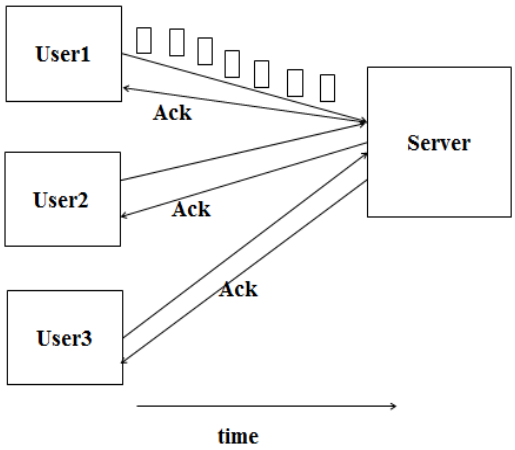
- Consumption of computational resources
- Disruption of configuration information
- Disruption of physical network components

Current DDoS attack remains a high security threat to IT security on the Internet. The attacks are carried out by attack tools, worms, and botnet with the help of attack variants of packet transmission such as TCP/SYN, UDP and HTTP request floods [5]. These are the sources of DDoS attack. They are powerful and can crush any serverand host. Now the main challenges for DDoS attack detection are *flash-crowd attack*. Flash-crowd attack [6] is the phenomenon of a high dense of illegitimate packets from attack sources. The attack traffic is viewed the same as legitimate users' traffics (called *flash crowd*). Attack sources pretend to be real usersand pump a large

volume of request packets that flood thetarget victim. In this case, the defense/detection system could be beaten and the server has difficulty surviving the attack which causes it to crush or degrade the servers' performance.
Statistical-based defense systems [7] against DDoS attacks based on header information from IP packets such as IP address, time-to-live (TTL), protocol type (port number), etc. The detection can discriminate "normal" traffic from "abnormal" traffic which is more likely to be an attack. However, some botnets, e.g. Mydoom can bypass detection approaches through the victim. This is because the approaches consider the Transport layer and/or Network layer. Therefore, the botnets which generate similar legitimate HTTP packets can avoid detection. Even though the attacking HTTP traffic isaggregated, they still look like flash crowd.

Heuristic-based defense systems [8] against DDoS attack based on the threshold value. Each approach may need to calculateits own threshold value to critic the current observing traffic. The drawback of heuristic detection approaches is their inability toconsider legitimate traffic mixed with attacking traffic. Hence,packets from legitimate users may be blocked or eliminatedduring attack incidents occur.

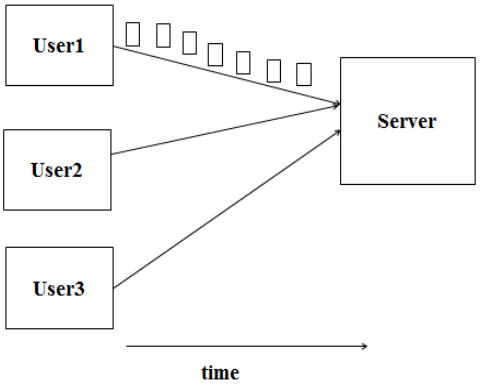
In this paper we propose solution to detect the traffic pattern of the packet by perceiving packet arrivals. Proposed technique is an effective method to discriminate packets among DDoS attack sources and actual users. . The packets from the attack sources must beeliminated, but the user packets must get through the server.
The contributions of the paper are listed as follows
•*Fast detection*: The system must be able to detect the DDoS attacks in time.
• *Reliability*: The system must not cause false positive and false negative in results.
• *Accuracy*: The system mustbe able to respond as soon as the flash-crowd trafficarrives at the server.
• *Flexibility*: The system must be able to detect all form of attack packets such as malformed IP, TCP,UDP, ICMP, etc.



A.Fig-1(normal traffic)

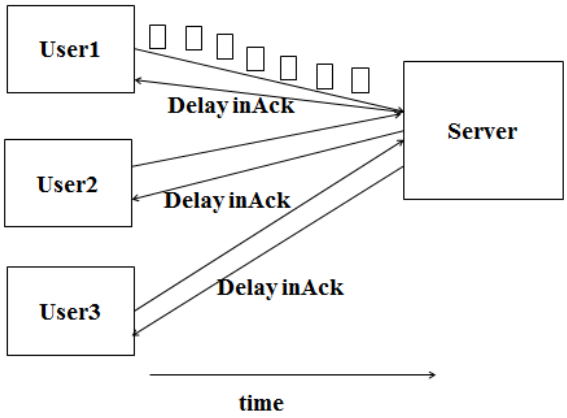
In the above diagram the users are sending data packets to the server with in the time period as mentioned in the fig-1, acknowledgement is received by the user. For eg. Number of packets sent by the user is 50 per second means, if number of packets has increased means traffic will also increase either it would be a flash crowd or DDoS.

Flash crowd is also one type of attack; it is a large surge of traffic on a particular web site Causing dramatic increase in server load and putting severe strain in network on the network link leading to the server which results in considerable increase in packet loss and congestion.



B.Fig-2(DDoS attack)

In the above diagram users are sending packets to the server. If the acknowledgement is not received means there is a DDoS attack.



C.fig-3(flash Crowd attack)

In the above diagram users are sending high volume of packets to the server. Congestion will occur acknowledgement will come but some delay will arise then it is a flash crowd event.

II. Related Works

As the damage by DDoS attack increases, a great number of detection methods have been presented. Many of these methods are based on identifying anomalies in network traffic.

Ke Li, Wanlei Zhou [1] proposed novel approaches usingprobability metrics to discriminate DDoS and flash crowd attacks .These methods identify the flash crowd attacks efficiently from the DDoS attacks and also minimizes thefalse positives and false negatives while identifying theattacks. Probability metric approach failed to maintain thesame accuracy to discriminate the flash crowd attack forhuge attack traffic.

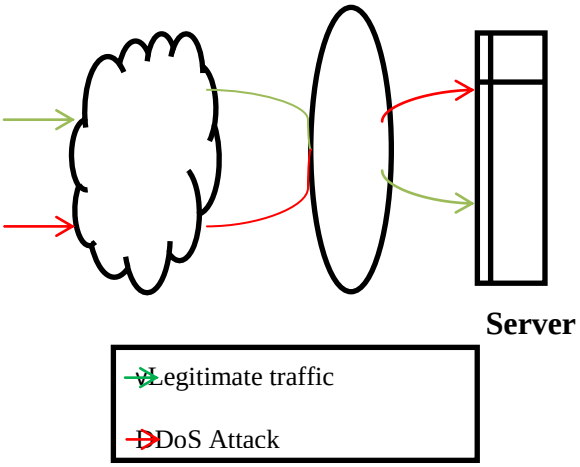
Shui Yu, Theerasak Thapngam [2] proposed three metricsfor information distance measures, the Jeffrey distance, the Hellinger distance, and the Sibson distance used todiscriminate the flash crowd and DDoS attacks. The flowsimilarities are used to calculate the information distance andthey proved that Sibson distance metric is more accurate indiscrimination flash crowd attack. But the accuracy of discrimination the attacks are limited to 65%, which resultsthe poor accuracy.

Theerasak Thapngam, and Gleb Beliakov [3] proposed a discrimination method based on the packet arrival patterns.Pearson's correlation coefficient is used to define the packetpatterns. Here patterns are defined by using the repeatedproperties observed from the traffic flow and also calculatesthe packet delay. Defining the packet pattern anddiscrimination the flash crowd attacks using pattern orpacket delays are difficult for large flows.

Jie Wang, Raphael C.W.Phan, John [4] simulated both DDoS traffic and Flash Crowds traffic by designing a special test bed-based simulation method with Spirent Test Center hardware platform. This method detects only port basedflash crowd attacks but they failed to detect for applicationand other flash crowd attacks.

III. Proposed Work

Consider the situation where a server is overwhelmed byflash crowd flows and/or DDoS attacks as illustrated in Fig.4.A server connects to the Internet and provides a service topublic Internet users. Legitimate users do not harm the serveror the service. However, the busy server could suffer a *flash crowd* (FC) event which is observed as a sudden high demand in service requests from Internet users. A flash crowd couldoverwhelm a server and create a DoS condition which results in either a delay of response or a complete crash.



D.Fig-4

DDoS attack is; however, more harmful than a flash crowd.Zombie machines (or bots) are compromised and controlled byattackers. The (botnet) attacks could be synchronized to overwhelm the victim in a specific period of time. The situation could be worse when a flash crowd merges with a DDoS attack as shown in Fig. 1. This accelerates the DoDS condition to the server.

IV. Adaptive discrimination detection

By using Discrimination Algorithm we can differentiate the DDoS from flash crowds. Flow Correlation Coefficient value is calculated for similar two suspicious flows to differentiate DDoS attacks from Flash crowds. In this paper the Adaptive Discrimination Algorithm is used, in that previous FCC (Flow correlation Coefficient) value is given as a feedback value to the input. By using this method the hackers cannot judge the feedback value and they cannottrace the detection strategy. We can detect the attack and also filter it out by using the sequential packing and detection.

V. Sequential detection With Packing

We assign a sequential ID for all packets which are participating in the transfer, the given a set of suspect IDs, we first randomly assign (i.e., distribute their requests) them to the available testing serversin set A, where each server will receive requests fromapproximately the same number of clients, For each test round, we identify the IDs on thenegative servers as legitimate clients, and "pack" them into a number of non-testing machines. Since they need no moretests, only normal services will be provided for the fourth coming rounds. As more testing servers will speed up the tests, given at most server machines in total, as long as all identified legitimateclients can be handled by the non- testing capacity servers.Ifany server containing only one active ID is found underattack, the only ID is surely an attacker. Then its ID isadded into the black-list and all its requests are dropped.Iterate the algorithm until all IDs are identified, malicious,or legitimate. Via the "packing" strategy, legitimate clientscan exempt from the influence of potential attacks as soonas they are identified.

VI. Results And Discussion

In this paper ,Our main motive is to discriminate flash crowd attacks from genuine flash crowds. Found that DDoS attack flows own higher similarity compared with that of flash crowd flows under the current conditions of botnet size and organization. We used the flow correlation coefficient as a metric to measure the similarity among suspicious flows to differentiate DDoS attacks from genuine flash crowds. We theoretically proved the feasibility of the proposed detection method. Future work is to investigate the possibility of organizing a super botnet, which has a sufficiently large number of live bots to beat the proposed method.

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