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DDOS Attacks and its Prevention at ISP Level

Mr. A. D. Talole, Mr. S. R. Todmal

Student, [1]JSPM's ICOER, Wagholi, Pune.

Associate Professor, [2]JSPM's ICOER, Wagholi, Pune.

Abstract

Distributed Denial-of-Service (DDoS) assailment's are a critical threat to the Internet. Count for DDoS attacks on internet accommodations incremented nowadays. DDOS assailment's are targets internetwork. It is hard to detect DDOS attack in network. The quandary to detect redress DDOS attacks can be solved by simpler mechanism in internet. Information theory predicated metrics can be habituated to solve this quandary. The proposed scheme has two phases: Comportment monitoring and Detection. In the first phase, the Web utilizer browsing comportment (HTTP request rate, page viewing time and sequence of the requested objects) is captured from the system log during non-attack cases Predicated on the observation, Entropy of requests per session and the trust score for each utilizer is calculated. This is get performed by Facade Layer. In the detection phase, the suspicious requests are identified predicated on the variation in Entropy and a Rate Limiter is introduced to downgrade accommodations to malignant users. It is get performed by BlackHole. In integration, a scheduler is included to schedule the session predicated on the trust score of the utilizer and the system workload.

Keywords: Distributed DoS, Collaboration, Virtual Rings, Botnet, Application Layer Entropy.

1. INTRODUCTION

DDoS attacks spread due to number of hosts on the network. These remote hosts i.e. Botnets are astronomically immense amassments of computers infected by worms or Trojans which are remotely controlled by hackers. Remote assailants can then give commands to the infected computer via the bot and force it to perform malevolent actions. In this context, a bot is very akin to a backdoor program, which is withal forcibly planted on a computer and utilized by a remote assailer to direct the infected machine. A DDoS attack typically use two types of components: agents, which run on compromised hosts and engender the authentic attack messages; and a handler, which is a program that controls the agents, telling them when to assail, what to assail, and how to assail Agents are withal referred to as bots, and an amassment of hosts that are running bots that are controlled by a single assailer is called a botnet. The figure 1.1 illustrates the steps of a typical DDoS attack. First, an assailer compromises vulnerably susceptible hosts in the Internet and deploys attack implements (agents) on them. Next, the assailant disseminates an assailment command from the handlers to the agents, injuctively authorizing the agents on what to assail, when to assail and how to assail. Starting at the injuctively authorized attack time, agents engender attack traffic towards to the target to carry out the assailment.

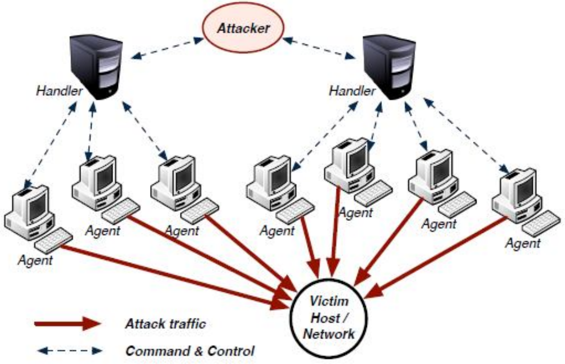


Figure 1.1: Distributed Denial of Service Attack

1.1 LITERATURE SURVEY

J. Franccois [1] in FireCol model suggests collaborative system that detects flooding DDoS attacks as far as possible from the victim host and as proximate as possible to the assailment sources. Here, a botnet tracker is utilized in order to cease the operation of the remote control network. After tracking, Firecol sempiternally shuts down the assailing source and hence the system is bulwarked from further attacks. A single Intrusion Obviation System (IPS) or Intrusion Detection System (IDS) can marginally detect such DDoS attacks, unless they are located very proximate to the victim. However, the IDS/IPS may crash because it requires to deal with an inundating volume of packets. FireCol relies on a distributed architecture composed of multiple IPSs composing overlay networks of aegis rings around subscribed customers.

Rajdeep Singh [2] discussed some attacks on MANET and DDOS withal provide the security against the DDOS attack. Each contrivance in a MANET is independently free to move in any route, and therefore change its connections to other contrivances frequently. MANETs are a kind of wireless ad hoc networks that conventionally has a routable networking environment on top of a link layer ad hoc network. There are many security attacks in MANET and DDoS (Distributed denial of accommodation) is one ofthem.

Mukesh Kumar [3] proposed a technique that can obviate a concrete kind of DDoS attack denominated flood attack which Incapacitate IP Broadcast. MANET has no clear line of bulwark so it is accessible to both malignant assailants and legitimate network users. In the presence of bellicose nodes, one of the main Challenges in MANET is to design the robust security solution that can obviate MANET from sundry DDoS attacks. Alternatively, congestion algorithms are habituated for detection of DDoS attacks.

A. Kazmanovic, J. Ioannidis [4],[5] gives benefit of being able to detect an assailment in the routing infrastructure, thus being able to halt the assailment afore it reaches its intended victim. These two approaches are not ideal solutions. Statistical approaches require human intervention to monitor the networks for upsurges, so they are both labour intensive and inefficient. The congestion adaptation approaches may only apply simplistic signatures so as to not impede on the throughput of traffic. This information is too computationally exhaustive to be efficacious within the routing infrastructure. Vikas Chouhan [7], proposed a system which uses hop count as their quantification to detect if the packet emanates from same source or different. The paper utilizes the final Time To Live (TTL) value and approximately estimates the initial TTL values. With these values, the Hop count for a packet can be quantified. For every source, its hop count is maintained. If the value of Hop count varies considerably, then it is considered to be a spoofed packet betokened for attack. But this system may again fail to estimate the Hop count if the assailant does not utilize the standard values for initial TTL in the packets.

J. Yuan [10] have proposed method predicated on only on a few observation points can monitor the macroscopic effect of DDoS flooding attacks Engendering bulwarks against flooding-predicated, distributed denial-of-accommodation (DDoS) attacks requires authentic-time monitoring of network-wide traffic to obtain timely and consequential information. Haplessly, perpetually monitoring network-wide traffic for suspicious activities presents arduous challenges because attacks may arise anywhere at any time and because assailers perpetually modify attack dynamics to eschew detection. In that paper, they proposed a method for early attack detection. They showed that such macroscopic-level monitoring might be habituated to capture shifts in spatial-temporal traffic patterns caused by sundry DDoS attacks and then to apprise more detailed detection systems about where and when a DDoS attack possibly arises in transit or source networks. They withal showed that such monitoring enables DDoS attack detection without any traffic observation in the victim network.

1.2 DDOS ATTACK MECHANISM

Early DDoS attacks stringently exploited low-level protocols in Layers 3 and 4. Today, the assailment's have spread their leg onto the Layer 7 (Application Layer) additionally. In fact, many assailment's utilize an amalgamation of vectors, for instance, commixing network floods with Application Layer strikes (HTTP Attacks). Figure 3.2 explicates that number of client shares a server to exchange the information, among them one or more than one act as an assailer. Simple Network Attacks (Layers 3 and 4) mainly involve flooding target systems with traffic over the lower layers of the network stack.

1.3 ISP CHALLENGES

To know the ISP Challenges, following definitions in Figure 1.2 must be known to end user.

a) Source
A source is as a device that can generate Internet traffic. The source could be a university's mail server, a company's web server or a home PC connected to the Internet. When the source is used to generate attack traffic, it becomes an attack source.

b) Third Party
A third party is as a device that is not compromised but is used by an attacker to generate attack traffic without notice.

c) Victim
A victim as a system that provides an Internet service and whose service is disrupted during an attack.

d) Target
A target is as a system that is being attacked or will be attacked by an attacker. If the services of a target are damaged during an attack, then the target becomes a victim. The victim could be a government's web server, a regional DNS server or an ISPs router.

e) Router
The term edge router refers to the router that provides access to the internet for the sub network. For incoming traffic, the edge router can be described as the last-mile router. For outgoing traffic, the edge router can be described as the first-mile router.

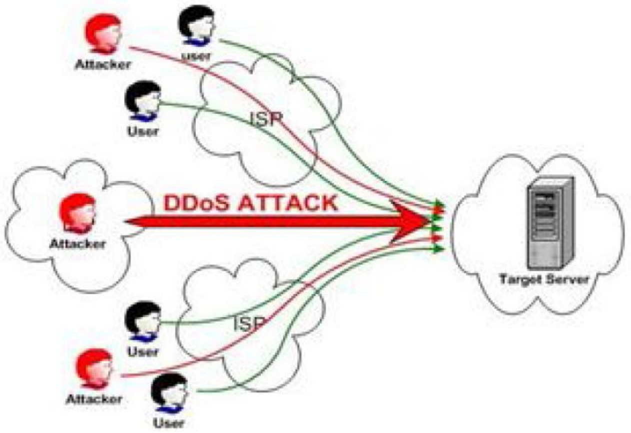


Figure1.2: DOS Attack via ISP

1.4 FACADE LAYER

A Facade is an object that provides a simplified interface to a more sizably voluminous body of code, such as a class Library.

A Facade can:

a) Make a software library more facile to utilize, understand and test, since the Façade has convenient methods for mundane tasks;

b) Make the library more readable, for the same reason;

c) Reduce dependencies of outside code on the inner workings of a library, since most code utilizes the Facade, thus sanctioning more flexibility in developing the system;

d) Wrap a poorly designed amassment of APIs with a single well-designed API.

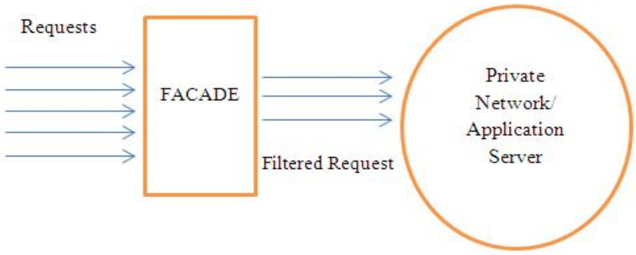


Figure 1.3: Facade Layer

A Facade layer which is incipient software layer is the intermediate between the client and the authentic application, his is shown in Figure 3.4 Fundamentally utilizer wants to assail the web server. Facade sits in front of the web server and receives each and every request emanating from any client. This layer suspects the utilizer for DDOS attack and finds the DDOS attack. This assailment detection transpires on Facade layer which makes the genuine application server to stay consummately away from the assailment's. If this layer detects the assailment, utilizer does not clock the utilizer, it start forwarding that user's requests for current session to BlackHole. That assailer will not receive any replication from the server as it goes to Ebony Aperture. When utilizer commences the incipient session, Facade layer has it's anterior activity logs that how lamentable or good that utilizer was. As per user's history, Facade again suspects him and forwards his requests to ebony aperture very anon. As utilizer is not blocked in incipient session, he has ability to cope up from suspicious demeanour of Facade.

1.5 BLACKHOLE

Figure 1.3: BlackHole

The most recent distributed denial of accommodation survey shows that in denial of accommodation attack, the total time an assailment is active. Packet rates and bandwidth used during attacks supplementally is more in number. BlackHole techniques cover all traffic from reaching its destination by ravaging or blocking the voluminous requests. Ebony holing is a mundane bulwark against spam, in which an Internet accommodation provider blocks packets from a domain or IP address, but the technique can be used against DDOS attacks. The quandary with a DDOS assailment is that not only is the website in question affected, but supplementally others that are sharing the same servers or even routers. Thus, an assailment on one agency can affect others if they are proximately networked. All website traffic, covering both legitimate users endeavouring to access information and the unauthentically spurious attack requests, is sent into null route. The requests aren't processed in any way. Anything endeavouring to access the website is simply dropped.

2. ARCHITECTURAL DESIGN

As shown in Figure 1.4, proposed system contains Admin Model which further consists of-
1) FACADE MODEL
2) BLACKHOLE MODEL

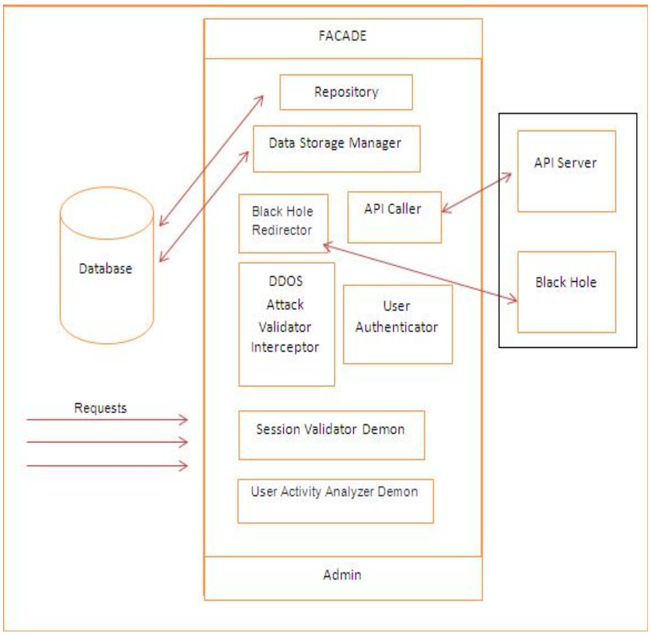


Figure 1.4: System Model

2.1 FACADE MODEL:

a) Database and Database Repositories: This module contains the physical database and the repository which queries and fetch the needed data. Repository uses java and
hibernates.

b) DataStoreManager: This module manages all the Add and Update queries and functions to DB. Every request to Update or Add any record will go through this module.

c) UserAuthenticator: This module validates the user's credentials and on success allows user to go further.

d) DDOS AttackValidatorInterceptor: This interceptor intercepts each and every request and check if the current request is a DDOS attack or a suspicious request or a valid non attack request.

e) SessionValidatorDemon: This module is a background job which validates and expires the use's current session. This is configurable demon which can be configured as per requirements.

f) User ActivityAnalyzerDemon: This module keeps eye on all the activities on user and keeps record of each activity. This information is used in future to determine if user’s request is DDOS attack or not.

g) BlackHoleRedirector: If DDOS attack is detected, this module redirects the requests to Black Hole before entering to system.

h) APICaller: If incoming request is valid then API Caller will call the actual API
server and receives the response from it. This response will be sent to User as actual response keeping the record of it.

2.2 BLACKHOLE MODEL

This module further contains following sub modules:
a) BlackHole: This is a system which kills the incoming requests and all parameters of that requests. This module is totally isolated form other modules.

b) APIServer: This is a server which has the actual application and can only be called by the FACADE layer. This returns data in JSON format. This is complete different
box which sits after Facade.

3. METTHODOLOGY

There will be no process of data in proposed application. Therefore, there is no requirement for dataset. As shown in Figure 7.8 The input is http Requests which will come in different numbers (quantity). Also there is a process to send malicious requests to Black Hole. Hence, Information based system is desired to detect the attack. The process which will be used for doing this is as follows:

3.1 ENTROPY CALCULATION

Need: The Entropy is required to measure changes of randomness of requests in a session for a given time interval, i.e. measurement of flow of routers which is measured by using standard variation of flow of routers (number of packets transferred via a particular router).
Entropy measures time-variant packet dynamics. The entropy of network traffic should vary immediately on the router. Entropy variation is a technique for identifying the vulnerable request from the attacker. It monitors the packet flows in router, and when the packet count exceeds the prescribed limit, the vulnerability is detected. The entropy maintains the threshold level for providing uninterrupted communication in the internet.

Let the request in a session be denoted as ri j, where I, jeI, a set of positive integers. i denotes the request number in session j.
Let the request in a session be denoted as rij, where I, j € I, a set of positive integers. ‘i’ denotes the request number in session ‘j’.
Let |rj, t| denote the number of requests per session j, at a given time ‘t’.
Then,

$$|(rj, t)| = \sum_{i=1}^{\acute{\omega}} rij \qquad (3.1)$$

For a given interval Δt the variation in the number of requests per session j is given as follows:

$$\mathbf{Nj\ (rj,\ t+\Delta t) = |\ (rj,\ t+\Delta t)| - |\ (rj,t)|} \qquad \mathbf{(3.2)}$$

The probability of the requests per session j, is given by,

$$Pj(rj) = Nj\ (rj,\ t+\Delta t) / \sum_{i=1}^{\acute{\omega}} \sum_{j=1}^{\acute{\omega}} Nj\ (rj,\ t+\Delta t) \qquad (3.3)$$

Let R be random variable of the number of requests per session during the interval Δt, therefore the Entropy of requests per session is given as:

$$\mathbf{H(R) = -\sum_{j} Pj(rj) \log Pj(rj)} \qquad \mathbf{(3.4)}$$

Based on the characteristics of entropy function, the upper & lower bound of the entropy H(R) is defined as:

$$\mathbf{O \leq\ H(R) \leq \log N} \qquad \mathbf{(3.5)}$$

Under Dos Attack, the number of request increases significantly & the following equation holds

$$\mathbf{|H(R) - C| > threshold,\ t} \qquad \mathbf{(3.6)}$$

Where, C is maximum capacity of the session.

3.2 RATE LIMITER

Need: To avoid falsely detection, rate-limiter is required.
Once the entropy is calculated, compute the degree of deviation from the predefined entropy. The system first sets a threshold for acceptable deviation. If the computed deviation exceeds the threshold, then the session is forced to terminate immediately. Otherwise, second level filter is applied by the rate limiter. The system also defines a threshold for validating a user based on the trust score. A user is considered to be legitimate only if the trust score exceeds the threshold. Otherwise, the user is considered malicious and the session is dropped immediately. The legitimate sessions are then passed to the scheduler for getting service from the server.

3.3 SCHEDULER

Need: For legitimate user, scheduler schedules the session based on user with highest trust score policy.
The well-behaved users will have a little or no deviation. In such case, the legitimate user gets a quicker service. In addition to the scheduling policy, system workload is also considered before scheduling the request for getting service. Based on trust value, if it is below the minimum value then request is directly rejected. If it is above the minimum value then the scheduler decides whether to redirect it to the server based upon its trust value. If total number of on-going sessions and number of waiting sessions is less than the threshold value of server then all requests are redirected to BlackHole. Otherwise requests up to threshold value are redirected to server in decreasing order of trust value.

3.4 MONITORING ALGORITHM

Input: System Log or Http Requests
1. Extract the request arrivals for all sessions, page viewing sequence of requested objects of each user from the system log.
2. Compute the entropy of the requests per session using the formula:

$$H(R) = -\sum_{j} Pj(rj) \log Pj(rj) \qquad (3.7)$$

3. Compute the trust score for each every user based on their viewing time accessing behavior.

3.5 DETECTION ALGORITHM

1. Input the predefined entropy of requests per session trust score for each user.
2. Define the threshold related with the trust score (Tts)
3. Define the threshold for allowable deviation (Td)
4. For each session for waiting for detection
5. Extract the requests arrivals
6. Compute entropy for each session using (3.4)

$$H_{new}(R) = -\sum_{j} Pj(rj) \log Pj(rj) \qquad (3.4)$$

7. Compute the degree of deviation:

$$D = |\, H_{new}(R) \,| - |H(R)| \qquad (3.8)$$

8. If the degree of deviation is less than allowable threshold (Td) users trust score is greater than threshold (Tts) then
9. Allow the session to get service from the web server
Else
10. The session is malicious;
Drop it.

3.6 DETECTING AND PREVENTING DDOS ATTACK

A DDOS attacks occurs when multiple client requests stopping the servers functionality. In order to test this, kindly issue single request to server. Afterwards when this number goes to beyond limit it will detect the attack will prevent next requests.

4. ANALYSIS OR TEST SPECIFICATION

Testing is like an investigation step that provides the quality of information. Testing is basically to validating and verifying that application meets the requirement that its developed and it is works as expected. It is document describing the scope, approach, resources and schedule of intended activities. The objective of our test plan is to find and report as many bugs as possible to improve the integrity of the system. Although exhaustive testing is not possible, a broad range of tests is exercised to achieve the goal of bug free and accurate results in software.

The software testing is done for all components in every module of software. The input and output of each module are tested to be accurate and valid for giving particular ataset. The results of modules are compared to existing protocols results.

4.1 TESTING OF LOGGED USER

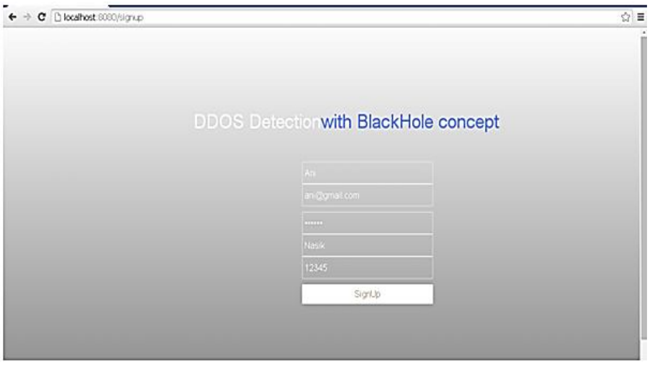
Different logged users are tested in Table 4.1 Testing of logged User. It shows that user will be treated as attacker afters he crosses the trusted score. After expiry of session Attacker is get blocked for further processing.

Table 4.1: Testing of logged User

Test Number	Logged in Users	Attackers	Attackers Detected	Number of Attackers Redirected to BlackHole
1	01	00	00	00
2	01	01	01	01
3	05	01	01	01
4	10	03	03	03
5	21	18	18	18
6	10	05	05	04 (Session Expired of Attacker 1)

4.2 RESULT TABLES AND DISCUSSIONS

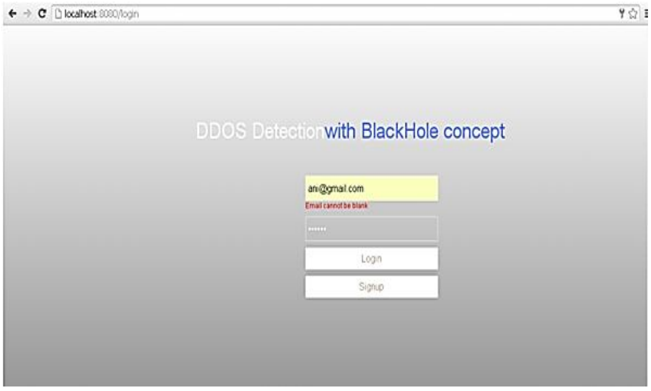
The results of my dissertation are explained in this section .Snapshots of simulation work done and the tables that are generated as below. The snapshots are divided according to the processing and are: As shown in Figure 4.3, Client sends one request. But when these requests are sending one after another as multiple requests as shown in Figure 4.4, Facade Layer will clarify that attack takes places. Now after limited attempts, to prevent this attack requests from client is blocked as shown in Figure 4.5 Figure 4.6 After limited time of span, there will be no services offered or no transaction is performed with blocked client as it is get forwarded to BlackHole. This is shown in Figure 4.6 Figure 4.7


localhost:8080/signup

DDOS Detection with BlackHole concept

Ani
ani@gmail.com
••••••
Nasik
12345

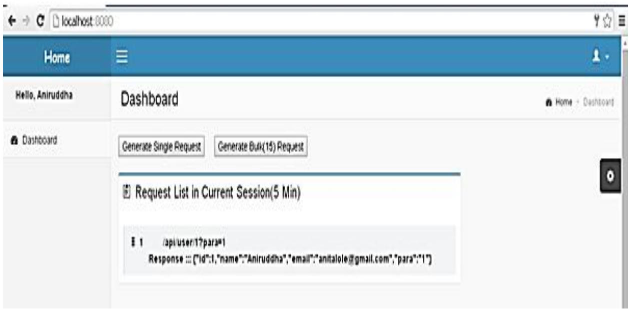
Figure 4.1: Admin Window


localhost:8080/login

DDOS Detection with BlackHole concept

ani@gmail.com
Email cannot be blank
••••••

Figure 4.2: Login Window



```
1    /api/user/1?para=1
  Response ::: {"id":1,"name":"Aniruddha","email":"anitalole@gmail.com","para":"1"}
```

Figure 4.3: New user request for accessing application

Figure 4.4 shows that when the user is suspected attacker that is, it is the user who is going to attack On web service which is detected by the FACADE layer, the admin will show that the user will create DDoS attack on server. If logging procedure gets continued then that user will be blocked by server for future. When the new user requests for permission to access the web service, the server always calculates trust score for that user by following formula:

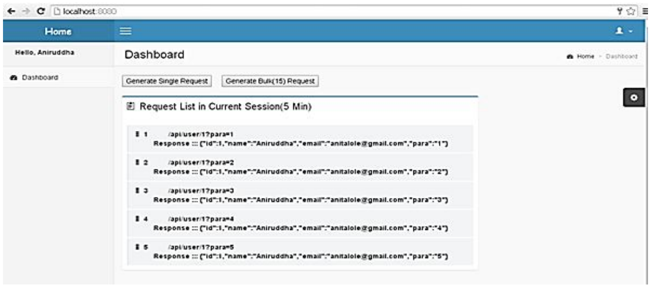
Trust Score=

$$\sum_{S=0}^{n} = \text{number of requests in current session / number of sessions}$$

Where,

s= number of sessions

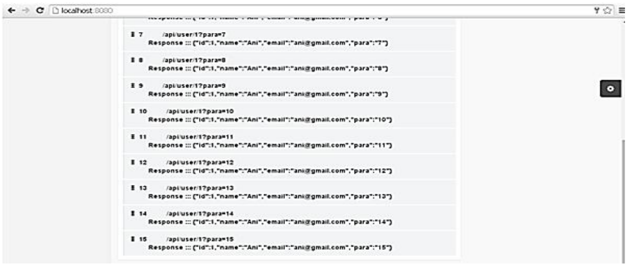
So for this session, maximum numbers of requests are 20 and sessions are 2. So, the trust score is 10.



```
1    /api/user/1?para=1
  Response ::: {"id":1,"name":"Aniruddha","email":"anitalole@gmail.com","para":"1"}
2    /api/user/1?para=2
  Response ::: {"id":1,"name":"Aniruddha","email":"anitalole@gmail.com","para":"2"}
3    /api/user/1?para=3
  Response ::: {"id":1,"name":"Aniruddha","email":"anitalole@gmail.com","para":"3"}
4    /api/user/1?para=4
  Response ::: {"id":1,"name":"Aniruddha","email":"anitalole@gmail.com","para":"4"}
5    /api/user/1?para=5
  Response ::: {"id":1,"name":"Aniruddha","email":"anitalole@gmail.com","para":"5"}
```

Figure 4.4: New user request accessed by system till Trust score (For our system Trust score=10)

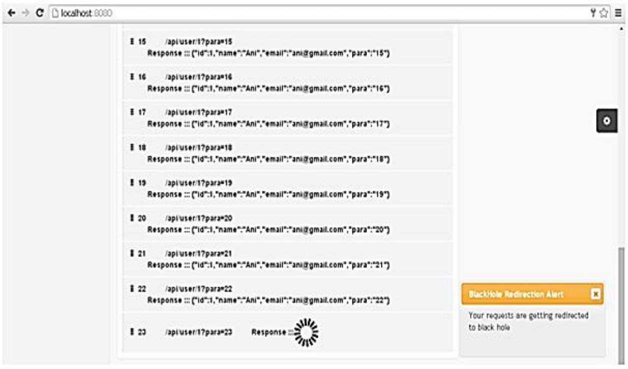
Figure 4.4 shows that, sometimes, the user is genuine, that is, due to some network problem or any other issue the requests may be repeated so the threshold value is considered. The threshold value here introduced is 5 as the user can make more 5 requests. The threshold value gives the genuine users a chance to access the service.



```
7    /api/user/1?para=7
  Response ::: {"id":1,"name":"Ani","email":"ani@gmail.com","para":"7"}
8    /api/user/1?para=8
  Response ::: {"id":1,"name":"Ani","email":"ani@gmail.com","para":"8"}
9    /api/user/1?para=9
  Response ::: {"id":1,"name":"Ani","email":"ani@gmail.com","para":"9"}
10    /api/user/1?para=10
  Response ::: {"id":1,"name":"Ani","email":"ani@gmail.com","para":"10"}
11    /api/user/1?para=11
  Response ::: {"id":1,"name":"Ani","email":"ani@gmail.com","para":"11"}
12    /api/user/1?para=12
  Response ::: {"id":1,"name":"Ani","email":"ani@gmail.com","para":"12"}
13    /api/user/1?para=13
  Response ::: {"id":1,"name":"Ani","email":"ani@gmail.com","para":"13"}
14    /api/user/1?para=14
  Response ::: {"id":1,"name":"Ani","email":"ani@gmail.com","para":"14"}
15    /api/user/1?para=15
  Response ::: {"id":1,"name":"Ani","email":"ani@gmail.com","para":"15"}
```

Figure 4.5: Request access by layer for new user till buffering value that is 15 (Trust score + threshold value + Buffering value))

Figure 4.5 shows that, sometimes, the user who after requesting again and again then the user goes in buffer. The buffer is used for collecting those users who are requesting continuously. The buffer value has taken 5. When the buffer becomes active, the scheduler comes in working. So for more 5 requests the user will get to take permission for access.



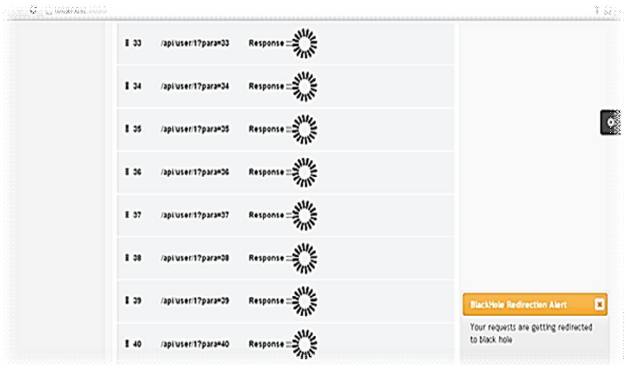
```
15    /api/user/1?para=15
  Response ::: {"id":1,"name":"Ani","email":"ani@gmail.com","para":"15"}
16    /api/user/1?para=16
  Response ::: {"id":1,"name":"Ani","email":"ani@gmail.com","para":"16"}
17    /api/user/1?para=17
  Response ::: {"id":1,"name":"Ani","email":"ani@gmail.com","para":"17"}
18    /api/user/1?para=18
  Response ::: {"id":1,"name":"Ani","email":"ani@gmail.com","para":"18"}
19    /api/user/1?para=19
  Response ::: {"id":1,"name":"Ani","email":"ani@gmail.com","para":"19"}
20    /api/user/1?para=20
  Response ::: {"id":1,"name":"Ani","email":"ani@gmail.com","para":"20"}
21    /api/user/1?para=21
  Response ::: {"id":1,"name":"Ani","email":"ani@gmail.com","para":"21"}
22    /api/user/1?para=22
  Response ::: {"id":1,"name":"Ani","email":"ani@gmail.com","para":"22"}
23    /api/user/1?para=23    Response :::
```

BlackHole Redirection Alert

Your requests are getting redirected to black hole

Figure 4.6: Next request for user after the limit that is after buffering

Figure 4.6 & 4.7 shows that, after completing maximum allowed requests for the user that is the maximum number of requests required for accessing the web service for the next requests the user get blocked get forwarded to BlackHole.



```
33    /api/user/1?para=33    Response :::
34    /api/user/1?para=34    Response :::
35    /api/user/1?para=35    Response :::
36    /api/user/1?para=36    Response :::
37    /api/user/1?para=37    Response :::
38    /api/user/1?para=38    Response :::
39    /api/user/1?para=39    Response :::
40    /api/user/1?para=40    Response :::
```

BlackHole Redirection Alert

Your requests are getting redirected to black hole

Figure 4.7: Admin window showing results for blocked user when it will log in

4.3 DETAILED RESULTS

Performance of proposed system for Attack detection using entropy with trust score gives following result table. Table 4.2 shows show attacker when trying to enter system will be identified from system. In this system attacker is found on basis of trust score and it will be blocked and get forwarded to BlackHole. According to performance analysis in attack case it is observed that DDOS attack positively affects the network and this scheme is successfully defending the network. Additionally it provides the protection against such attacks. The actual application is totally isolated and away from user access areas due to the intermediate layer (FACADE).

Table 4.2: Result Table

Sr. No	Attack exists	Users Involved	Attack Detected	Users Detected / Blocked	Time Taken (Minutes)
1	NO	04	NO	00	02
2	YES	01	YES	01	01
3	YES	03	YES	03	02
4	YES	12	YES	10	05

The results also shows that the system uses pre available information metric for existing users and starts monitoring new users immediately as well. Also, as the system contains a scheduler and rate limiter it downgrades the service will be blocked for next request redirected to BlackHole to malicious user requests. Thus with 12 users it is downgraded to 02 users. The highly encoded token service is used for management of requests for authentication. Implementations Results also gives the exact timing required for new user requests, detecting the attacks and block them. Also due to use of trust score, threshold and buffer the system is flexible and adjusts user's number with the variable requests. Only the genuine users to be enter that is only the trustworthy users will access the web services. The web services will always safe in this case.

5. SUMMARY AND CONCLUSION

It is a technique which provides the ability to drop undesirable traffic which enters a bulwarked network. This scheme provides double check point to detect the maleficent flow from the mundane flow. It validates the legitimate utilizer predicated on the antecedent history. Predicated on the information metric of the current session and the user's browsing history, it detects the suspicious session. It will be intended for network design architects, support engineers, and marketing professionals who are responsible for orchestrating, designing, implementing, and operating networks. Proposed way uses pre available information metric for existing users and starts monitoring new users immediately as well. Every request has to pass the multiple checks to reach to its web-service destination. The intermediate layer (FACADE) keeps the actual application totally isolated and away from user access areas. This application uses pre available information metric for existing users and starts monitoring new users immediately as well. System also has a scheduler and rate limiter to downgrade the service to malicious user requests. Proposed system also has ability to block suspicious or malicious users. System provides workaround to traditional systems of DDoS detection and keeps trust level for individual user.

Initially,

a) Default Threshold Value=5

b) Default Trust Score Value=10

c) User Trust Score (for initial or First) User Trust Score=10

For Session-1 Si={1}
No. of Requests=13
To check whether Attack takes place or not:
Formula:- No. of Requests < (User's Trust Score + Threshold)
=13 < (10+5) **is True**
Hence, No Attack takes place.

For Session-2 Si={1,2}
No. of Requests =15
New Trust Score for User = (Old Trust Score + Last No. of Requests)/2
= (10+13)/2 = 11
To check whether Attack takes place or not:
Formula:- No. of Requests < (User's Trust Score + Threshold)
= 15 < (11+5) **is True**
Hence, No Attack takes place.

For Session-3 Si={1,2,3}
No. of Requests =35
New Trust Score for User= (Old Trust Score + Last No. of Requests)/2
= (11+15)/2 =13
To check whether Attack takes place or not:
Formula:- No. of Requests < (User's Trust Score + Threshold)
=35 < (13+5) **is False**
Hence, Attack takes place.
Now, Request after User's Trust Score + Threshold, (i.e.13+5=18) will go to BlackHole.

6. FUTURE ENHANCEMENT

1. Project can be made more portable to attach it with any web application developed in any platform.
2. System can be improved by using a queue which can store few requests (if servers are overloaded) and process when server gets under loaded.
3. Project can be easily integrated with Machine Learning strategies.
4. Proposed system if combined with suitable hardware devices such as router or network controller, the security may be enhanced and for an effective defence may be established.
5. The cloud environment may also look at this mechanism as a service in future.

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AUTHOR

Aniruddha Talole received the B.E. in Computer Engineering from Pravara Rural Engg. College, Loni, Savitribai Phule Pune University in 2010. He is currently pursuing his Master's degree in Computer Engineering from JSPM's Imperial College of Engineering & Research, Pune, Savitribai Phule Pune University Former UoP. This paper is published as a part of the research work done for the degree of Masters.

Prof. S. R. Todmal is an Associate Professor in Department of Information Technology in JSPM's Imperial College of Engineering & Research, Pune, Savitribai Phule Pune University. He is member of LMISTE , IACSIT. His teaching domain is Data Communication, Fundamentals of Data Structures, Software Engg., Processor Architecture & Interfacing.