

Security Of Dynamic Domain Name System Servers Against DDOS Attacks Using IPTABLE And FAIL2BA

Ibnu Muakhori¹, Sunardi², Abdul Fadlil³

^{1,2,3}Magister Teknik Informatika, Universitas Ahmad Dahlan, Yogyakarta

Email: ibnu0176@gmail.com¹,sunardi@mti.uad.ac.id²,fadlil@mti.uad.ac.id³

ARTICLE INFO	ABSTRACT
Article history: Received: 12/02/2020 Revised: 09/03/2020 Accepted: 01/05/2020	Availability, integrity and confidentiality are the main objectives of information security and server security. These three elements are links that are interconnected in the concept of information protection.Distributed Denial of Service (DDoS) is an attack to make online services, networks and applications not available by flooding data traffic so that services is unvailable or availability aspects disrupted. This attack resulted in huge losses for institutions and companies engaged in online services and web- based applications being one of the main targets of attackers to carry out DDoS attacks. Countermeasures that take a long time and large recovery costs are a loss for the institution or company that owns the service due to loss of integrity. NDLC (Network Development Life Cycle) is a method that has stages namely analysis, design, simulation, prototyping, implementation,
Keywords: Security, DDNS, DDoS, Fail2ban	monitoring and management. The NDLC method used aim for the results obtained focused and detailed. Snort IDS applied on the DDNS server functions to record when there is a DDoS attack. Implemention fail2ban as realtime preventation tool on the server by configuring based on the rules applied to fail2ban. The results showed Snort IDS managed to detect DDoS attacks based on the rules applied to Snort IDS. Realtime prevention using Fail2ban successfully functions as a DDoS attack by blocking the attacker's IP Address.
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1. Introduction

Server security is a top priority for network administrators. Along with the rapid development of the internet world and internet users more and more so that the information stored on the server is very important to maintain. On the other hand the many security threats in computer network systems make network administrators need to anticipate this, especially DDoS attacks. DDoS attacks are attacks that are difficult to overcome. There are several ways to carry out DoS attacks such as shutting down the server so that it keeps the server busy and sends many requests [1]. So that on computer security, objects that need to be protected are computers and information [2].

Fail2ban is a program package to detect failed login attempts and then block the IP address of the original host [Fail2ban.org], Fail2ban works by changing the firewall configuration rules (IPTable) with configurations that are in Fail2ban itself, when Fail2ban runs, it will retrieve over the firewall functions that are on the server [3]. Using Fail2ban "on an Ubuntu server is proven to prevent bruteforce attacks and block the ip address of the attacker [7,9]. Fail2ban can secure various servers and then provide the results of attacks in the form of log data. Based on the above problems, a network administrator needs a system that can provide assistance in preventing DDoS attacks in real time. A system that can help administrators if they are not in place conditions. Through this research, it is expected to facilitate the network administrator in carrying out its functions properly. IPTable and Fail2ban are able to answer the above problems well.

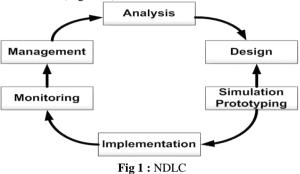
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2. Research Methods

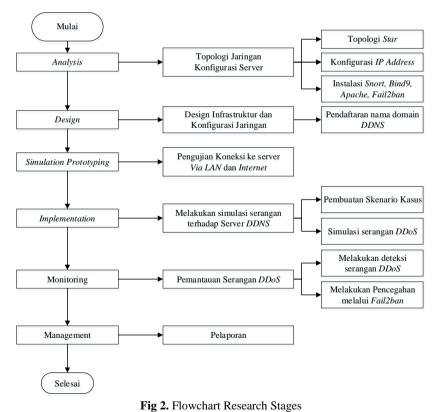
In this study the research method adopted was using the Network Development Life Cycle (NDLC) method. NDLC is a method that relies on previous development processes such as business strategy planning, application development life cycle, and data distribution analysis [4]. The stages of the NDLC method can be explained as follows (Figure 1):



3. Result

a. Research Stages

Stages of research are used as guidelines in conducting research so that the results achieved do not deviate from the goal. Figure 2 shows the flowchart of the stages of the research to be carried out. The stages begin with Analysis, Design, Simulation Prototyping, Implementation, Monitoring and management.



b. Testing Scenario

The testing scenario uses 2 tools, LOIC and Dark Fantasy, with 2 scenarios, namely: 1. Scenario of Attack Through Local Network (LAN)

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2. Scenario of Attack Through the Internet Network

c. Network Design

Network design uses star topology which can be seen in Figure 3.

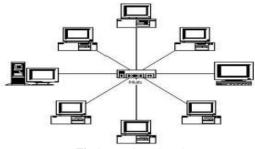
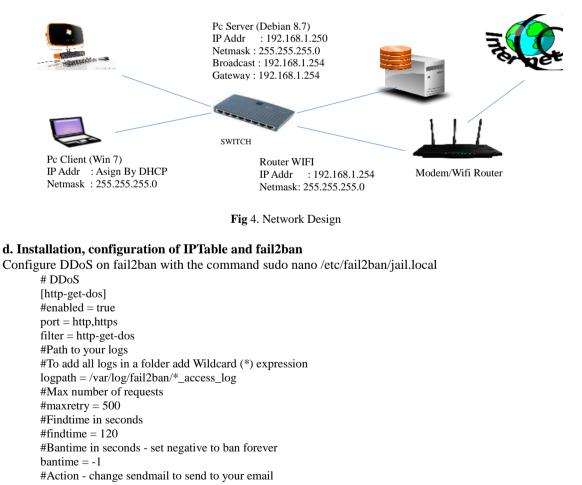


Fig 3. Topology Star[8]

The choice of star topology is because the topology uses a switch or hub as a network connection media and is not dependent on other computers.

Based on the star topology, researchers conducted a network design as illustrated in Figure 4



action = iptables[name=HTTP, port=http, protocol=tcp]

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d. **Case Scenario**

Before the test was carried out, researchers recorded the IP address of the attacker's computer. This is intended to make it easier to identify (Table 1 and Table 2).

		able 1	
No		tal (LAN) Attacker	
NO	IP Address Attack	Tools	Port Attack
1	192.168.1.10	cmd	80
2	192.168.1.11	Darkfantasy	80
3	192.168.1.12	Loic	22
4	192.168.1.13	Loic	53
	Ta	able 2.	
	IP Address 1	Internet Attacker	
No	IP Address Attack	Tools	Port Attack
1	104.237.144.6	Cmd	80
2	180.240.190.184	Darkfantasy	80
3	125.160.139.182	Loic	22
4	125.160.139.182	Loic	53

Table 1 and Table 2 show that there are four local IP addresses (LANs) and Internet IP Addresses, each of which is identified as the attacker's IP address and uses predetermined tools.

DDOS Attack Simulation e.

Based on the case scenario, the next process is testing the DoS attack from the Host which acts as an attacker to the DDNS server as set forth in Table 3.

Т	able 3
Simulation	Attacker DDoS

No	Pengujian	Tools yang digunakan	Port Target
1	Attempted DDoS attack via local network and	Command Prompt : Ping tamelin.ddns.net –1 5000 –n 5000 –w 1	80
2	internet	DarkFantasy	80
3		Loic	53 dan 22

Table 3 is an attack step that will be carried out in testing both in the local network (LAN) and through the internet network. In testing it is expected that fail2ban is able to block the attacker's IP Address. The attack simulation can be explained as follows:

Ping of Death Attacks 1)

Attackers do DoS attacks using the Windows command prompt for 30 minutes (Figure 5). The command that is run by the attacking computer is: Ping tamelin.ddns.net -1 5000 -n 5000 -w 1

i i aans	ince is	1000		. .	-	
C:\WINDO)WS\system32\cmd.exe	- Ping tamelin.do	dns.net -l 5000) -n 5000 -w 1		
C:\Users\i	bnu>Ping tamelin	.ddns.net -1	l 5000 -n	5000 -w 3	1	
Pinging tar	melin.ddns.net [125.161.43.3	186] with	5000 byte	es of	data:
Reply from	125.161.43.186:	bytes=5000	time=4ms	TTL=63		
Reply from	125.161.43.186:	bytes=5000	time=5ms	TTL=63		
	125.161.43.186:					
Reply from	125.161.43.186:	bytes=5000	time=4ms	TTL=63		
Reply from	125.161.43.186:	bytes=5000	time=4ms	TTL=63		
Reply from	125.161.43.186:	bytes=5000	time=6ms	TTL=63		
Reply from	125.161.43.186:	bytes=5000	time=4ms	TTL=63		
Reply from	125.161.43.186:	bytes=5000	time=7ms	TTL=63		
Reply from	125.161.43.186:	bytes=5000	time=4ms	TTL=63		
Reply from	125.161.43.186:	bytes=5000	time=4ms	TTL=63		
Reply from	125.161.43.186:	bytes=5000	time=4ms	TTL=63		
Reply from	125.161.43.186:	bytes=5000	time=8ms	TTL=63		
Reply from	125.161.43.186:	bytes=5000	time=4ms	TTL=63		
Reply from	125.161.43.186:	bytes=5000	time=4ms	TTL=63		
Reply from	125.161.43.186:	bytes=5000	time=4ms	TTL=63		
Reply from	125.161.43.186:	bytes=5000	time=5ms	TTL=63		
Reply from	125.161.43.186:	bytes=5000	time=4ms	TTL=63		
Reply from	125.161.43.186:	bytes=5000	time=5ms	TTL=63		
Reply from	125.161.43.186:	bytes=5000	time=4ms	TTL=63		
Reply from	125.161.43.186:	bytes=5000	time=5ms	TTL=63		
	125.161.43.186:					
Reply from	125.161.43.186:	bytes=5000	time=4ms	TTL=63		
Reply from	125.161.43.186:	bytes=5000	time=4ms	TTL=63		

Fig 5. DDoS attacks use Command Prompt

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2) Attack using Darkfantasy

Attack simulation using darkfantasy with the following steps (Figure 6):

C:\Users\ibnu\Downloads\darkfantasy\df.exe Dark Fantasy - Hack Tool .Port Scanning 2.DDOS 3.Banner Grabbing 4.Web spider(gather all URLs for web hacking) 5.FTP Password Cracker 5.Email Scraping 7.IMDB Rating Enter Your Choice: 2 Enter Host Site or movie name(eg:wwww.google.com, www.yahoo.com, Batman, The Flash): tamelin.ddns.net

Fig6. Start a DDoS attack using Darkfantasy

The parameters used by Darkfantasy are as follows: Target site: tamelin.ddns.net

Number of Packets to be sent: 1,000,000

The process of synflooding in dark fantasy can be seen in Figure 7

C:\Users\ibnu\Downloads\darkfantasy\df.exe
[*]FLOODING!
[*]FLOODING! [*]FLOODING!
[*]FLOODING! [*]FLOODING!
[*]FLOODING!

Fig 7. SynFlooding Darkfantasy

3) Attacks using LOIC software Attack simulation using LOIC with the following parameters (Figure 8):
url: the target url is tamelin.ddns.net
IP: LOIC will automatically get an IP Address
Method: TCP
Ports: 53 and 22
Threads: 50 (Number of threads used to attack)
Time out: 9001 (time range of package delivery)

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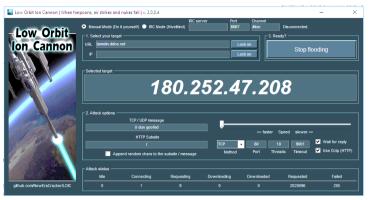


Fig 8. DoS attacks with LOIC

With parameters input to LOIC, it can be seen that the number of connections within 9001 ms, there are 30 connections, and 20 packet requests sent to the server. If the number of failed appearances exceeds the number of requests it can be ensured that the DDNS server has experienced an error.

f. Testing Results

Fail2ban which is used to carry out prevention against DDoS attacks is by blocking IPAddress the attacker has successfully performed its function properly. It can be seen in Figure 9 that the total release block is 102,160 requests. It can be concluded that the blocking process carried out by fail2ban in realtime runs perfectly. The number of packets analyzed by fail2ban is 46 packets (92%) with the breakdown of packets via the IP address protocol V4 of 46, TCP as much as 31, UDP of 15 packets.

X, linactine		
^C*** Caught In	nt-Signal	
Snort processed	acket processing was 6.706755 seconds 1 46 packets. 0 days 0 hours 0 minutes 6 seconds 7	
Bytes in mapp Total allocat Total free sp	ammary: ppped bytes (arena): 782336 eed regions (hblkhd): 21590016 eed space (uordblks): 676400 ace (forsdblks): 105936 smable block (keepcost): 102160	
Packet I/O Tota	als:	
Received:	50	
Analyzed:	46 (92.000%)	
Dropped:	0 (0.000%)	
Filtered:	0 (0.000%)	
Outstanding: Injected:	4 (8.000%) 0	
injected.	9	
Breakdown by pr	cotocol (includes rebuilt packets):	
Eth:	46 (100.000%)	
VLAN:	0 (0.000%)	
IP4:	46 (100.000%)	
Frag:	0 (0.000%)	
ICMP:	O (0.000%)	
UDP:	15 (32.609%)	
TCP:	31 (67.391%)	
IP6: IP6 Ext:	0 (0.000%) 0 (0.000%)	
IP6 Ext: IP6 Opts:	0 (0.000%) 0 (0.000%)	
Frag6:	0 (0.000%)	
ICMP6:	0 (0.000%)	
UDP6:	0 (0.000%)	
TCP6:	0 (0.000%)	
Teredo:	0 (0.000%)	
ICMP-IP:	0 (0.000%)	
IP4/IP4:	0 (0.000%)	
IP4/IP6:	0 (0.000%)	
IP6/IP4:	0 (0.000%)	
IP6/IP6:	0 (0.000%)	

Fig 9. Fail2ban Log





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File	Edit	Selection	Find View	Gete	Teels	Project	Preferences	Help		
								il2ban.log		×
	i	2019-02-06	12:40:03	794 1	Fail2ban	.actions		[7717]:	INFO	Set banTime = 3600
	248	2019-02-06	12:40:03	874 1	Fail2ban	.iail		7717 :		Creating new jail 'apache-badbots'
	249	2019-02-06						7717 :		Jail 'apache-badbots' uses pyinotify {}
	250	2019-02-06						7717 :		Initiated 'pyinotify' backend
	251	2019-02-06						7717 :		Set jail log file encoding to UTF-8
	252	2019-02-06						7717 :		Set maxRetry = 5
	253	2019-02-06						7717 :		Set findtime = 3600
	254	2019-02-06						7717 :		Added logfile = /var/log/apache2/access.log
	255	2019-02-06						7717 :		Set banTime = 172800
	256	2019-02-06						7717 :		Creating new jail 'apache-noscript'
	257	2019-02-06						7717 :		Jail 'apache-noscript' uses pyinotify {}
	258	2019-02-06						7717:		Initiated 'pyinotify' backend
	259	2019-02-06						7717:		Set jail log file encoding to UTF-8
	250	2019-02-06						7717:		Set maxRetry = 6
	261	2019-02-06						7717:		Set findtime = 3600
	262	2019-02-06						7717:		Added logfile = /var/log/apache2/access.log
	263	2019-02-06	12:40:03	943 1	Fail2ban	.actions		7717 :	INFO	Set banTime = 3600
	264	2019-02-06	12:40:03	962 1	Fail2ban	.jail		7717 :	INFO	Creating new jail 'apache-overflows'
	265	2019-02-06	12:40:03	962 1	Fail2ban	.jail		7717 :	INFO	Jail 'apache-overflows' uses pyinotify {}
	266	2019-02-06	12:40:03	970 1	Fail2ban	.jail		7717 :	INFO	Initiated 'pyinotify' backend
	267	2019-02-06	12:40:03	972 1	Fail2ban	.filter		7717 :	INFO	Set jail log file encoding to UTF-8
	268	2019-02-06	12:40:03	973 1	Fail2ban	.filter		7717 :	INFO	Set maxRetry = 5
	269	2019-02-06	12:40:03	974 1	Fail2ban	.filter		7717 :	INFO	Set findtime = 3600
	270	2019-02-06	12:40:03	975 1	Fail2ban	.filter		7717]:	INFO	Added logfile = /var/log/apache2/access.log
	271	2019-02-06	12:40:03	977 1	Fail2ban	.actions		7717]:	INFO	Set banTime = 3600
	272	2019-02-06	12:40:03	994 1	Fail2ban	.jail		7717]:	INFO	Creating new jail 'apache-nohome'
	273	2019-02-06	12:40:03	994 1	Fail2ban	.jail		7717]:	INFO	Jail 'apache-nohome' uses pyinotify {}
	274	2019-02-06	12:40:04	002 1	Fail2ban	.jail		7717]:	INFO	Initiated 'pyinotify' backend
	275	2019-02-06	12:40:04	004 1	Fail2ban	.filter	I	[7717]:	INFO	Set jail log file encoding to UTF-8
	276	2019-02-06						[7717]:		Set maxRetry = 5
	277	2019-02-06	12:40:04	005 1	Fail2ban	.filter	[[7717]:	INFO	Set findtime = 3600
	278	2019-02-06	12:40:04	007 1	Fail2ban	.filter	[[7717]:	INFO	Added logfile = /var/log/apache2/access.log
	279	2019-02-06						[7717]:		Set banTime = 3600
	280	2019-02-06					[[7717]:	INFO	Creating new jail 'apache'
	261	2019-02-06	12:40:04	024 1	Fail2ban	.jail	[[7717]:	INFO	Jail 'apache' uses pyinotify {}
	262	2019-02-06						[7717]:		Initiated 'pyinotify' backend
	283	2019-02-06						[7717]:		Set jail log file encoding to UTF-8
	264	2019-02-06						[7717]:		Set maxRetry = 3
	285	2019-02-06						[7717]:		Set findtime = 600
	286	2019-02-06						[7717]:		Added logfile = /var/log/apache2/access.log
	287	2019-02-06						[7717]:		Set banTime = 3600
	288	2019-02-06	12:40:04	.091 1	ail2ban	.iail		7717]:	INFO	Jail 'sshd' started

Fig 10. Fail2ban.log

192,168,1,250 - KiTTy

root@tamel:					
Chain INPU	[(pol	licy	DROP)		
target	prot	opt	source	destination	
ACCEPT	a11		anywhere	anywhere	state RELATED, ESTA
BLISHED					
ACCEPT	a11		tamelin.ddns.net	anywhere	
ACCEPT	a11		localhost	anywhere	
ACCEPT	tcp		anywhere	anywhere	tcp dpt:ssh
ACCEPT	tcp		anywhere	anywhere	multiport dports h
ttp, https					
ACCEPT	tcp		anywhere	anywhere	multiport dports f
tp,12000:1	2100				
ACCEPT	udp		anywhere	anywhere	udp dpt:domain
ACCEPT	tcp		anywhere	anywhere	tcp dpt:domain
ACCEPT	tcp		anywhere	anywhere	multiport dports s
ntp, urd, su	missi	ion, 2	2525		
ACCEPT	tcp		anywhere	anywhere	multiport dports p
op3,pop3s					
ACCEPT	tcp		anywhere	anywhere	multiport dports i
map2,imaps					
ACCEPT	tcp		anywhere	anywhere	multiport dports m
ysql,postg:	resql				
ACCEPT	tcp		anywhere	anywhere	tcp dpt:8083
ACCEPT	icmp		anywhere	anywhere	
DROP	a11		192.168.1.10	anywhere	
DROP	a11		192.168.1.11	anywhere	
DROP	a11		192.168.1.12	anywhere	
DROP	all		192.168.1.13	anywhere	
DROP	all		1i832-6.members.lino	de.com anywhere	
DROP	all		180.240.190.184	anywhere	
DROP	a11		182.subnet125-160-139	3.speedy.telkom.net.i	i anywhere

Fig 11. Fail2ban.log

Fail2ban saves the detection results in the form of a Log file. Through the Log File it can be seen that there are indications of an attack which causes interference with the DDNS server (Figure 10) and successfully blocks the attacker's IP Address (Figure 11)

•				
		Table 4		
	Blocke	d Local IP Addre	ess Attacker	
No	IP Address Attacker	Tools	Port Attacker	Blokir
1	192.168.1.10	Cmd	80	\checkmark
2	192.168.1.11	Darkfantasy	80	\checkmark
3	192.168.1.12	Loic	22	\checkmark
4	192.168.1.13	Loic	53	\checkmark
		Table 5		
	Blocked	l Internet IP Add	ress Attacker	
No	IP Address Attacker	Tools	Port Attacker	Blokir
1	116.66.249.102	Cmd	80	\checkmark
2	180.240.190.184	Darkfantasy	80	\checkmark
3	125.160.139.182	Loic	22	\checkmark
4	36.84.144.20	Loic	53	\checkmark

After blocking the walk, the attack simulation was again carried out using Darkfantasy and Loic.

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Darkfantasy displays the Unable to connect message (Figure 12), while Loic does not produce the amount of connecting (Figure 13), this indicates that the attacker's IP Address that has been blocked by fail2ban cannot re-attack. In addition to these two tools, access rights through the browser application can no longer be opened by the attacker (Figure 14).

'clear' is not recognized as an internal or external command, operable program or batch file. [*]Ihis program will use HTTP FLOOD to dos the host. [*]It would work only on small websites if done only for one computer. [*]To take down larger websites run the attack from multiple computers. [*] For better performance open multiple instances of this software and attack at the same time.
[*]Host to attack: tamelin.ddns.net
[*]IP of the host: 180.245.46.159
Enter the number of packets to be sent(depends on the site but should be more than 2000 or 3000 for average sites): 50
Unable To Connect. Retrying.
Unable To Connect. Retrying.
Unable To Connect. Retrying.
Subble To Connect. Retrying.
Unable To Connect. Retrying. Unable To Connect. Retrying.
Unable to connect. Retrying.
Unable To Connect. Retrying.
Inable To Connect. Retrying.
Unable To Connect. Retrying.
Unable To Connect. Retrying.

Fig 12. Darkfantasy after the IP Addr attacker is blocked.



Fig 13. Display LOIC after the attacker's IP Address is blocked

tamelin.ddns.net	(i) tamelin.ddns.r	+				
	-		Convert To MP3	Cara setting Mikroti	Membuat SPT Nihil	💮 Trans
		E) (
			-			
		Th	is site can'	t be reached		
		tam	elin.ddns.net re	fused to connect.		
		Try:	Checking the c	opportion		
				proxy and the firewall		
		ERR_	CONNECTION_REFUS	SED		
		R	eload			

Fig 14. Browser application from the attacker

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4. Conclusion

The conclusion that can be drawn from this study is that IPTable and Fail2ban can prevent DDoS attacks by blocking the IP Address of the attacker. The next research is to make security on the types of Bruteforce attacks and security of web server and email server services. It is expected that IPTable and Fail2ban can prevent Bruteforce attacks and secure the service. So that network administrator performance becomes easier.

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