Design of Secure Computer Systems

Lab₀₈

SNORT

This LAB will introduce the use of the snort system to provide intrusion detection within a Linux environment.

Name: Rakshita Mathur

Snort

1. Starting and stopping Snort

Snort is installed and working

Command used: ./ start snort.sh in tom@snort window

And to get back to the sport command we use ctrl+c

```
File Edit View Search Terminal Tabs Help

mary@ws2:~ × tom@snort:~

tom@snort:~$ ls

start_snort.sh

tom@snort:~$ ./start_snort.sh

11/12-14:30:03.105599 [**] [1:469:3] ICMP PING NMAP [**] [Classification: Attempted Information Leak] [Priority: 2] {ICMP} 203.0.113.20 -> 203.0.113.10

11/12-14:30:03.105599 [**] [1:384:5] ICMP PING [**] [Classification: Misc activity] [Priority: 3] {ICMP} 203.0.113.20 -> 203.0.113.10

11/12-14:30:03.105834 [**] [1:453:5] ICMP Timestamp Request [**] [Classification: Misc activity] [Priority: 3] {ICMP} 203.0.113.20 -> 203.0.113.10

11/12-14:30:04.526971 [**] [1:1421:11] SNMP AgentX/tcp request [**] [Classification: Attempted Information Leak] [Priority: 2] {TCP} 203.0.113.20:58353 -> 203.0.113.10:705

11/12-14:30:04.530159 [**] [1:1418:11] SNMP request tcp [**] [Classification: Attempted Information Leak] [Priority: 2] {TCP} 203.0.113.20:58353 -> 203.0.113.10:161
```

2. Pre configured Snort rules

And to check whether the snort is up and working we use **nmap www.example.com** and see that snort is showing some alerts, hence it is working.

```
File Edit View Search Terminal Tabs Help
               hank@remote ws: ~
                                                              admin@remote_gw: ~
                                                                                            × £
hank@remote_ws:~$ sudo nmap www.example.com
Starting Nmap 7.01 ( https://nmap.org ) at 2021-11-12 14:30 UTC
Nmap scan report for www.example.com (203.0.113.10)
Host is up (0.000041s latency).
Not shown: 996 closed ports
PORT
       STATE SERVICE
22/tcp
       open
             ssh
53/tcp
             domain
       open
80/tcp open
             http
443/tcp open
Nmap done: 1 IP address (1 host up) scanned in 1.60 seconds
hank@remote_ws:~$
```

Looking at the snort rule we use the command ls /etc/snort/rules/

```
tom@snort:~$ ls /etc/snort/rules/
attack-responses.rules
                                   community-web-dos.rules
                                                                policy.rules
backdoor.rules
                                   community-web-iis.rules
                                                                pop2.rules
bad-traffic.rules
                                   community-web-misc.rules
                                                                pop3.rules
chat.rules
                                   community-web-php.rules
                                                                porn.rules
community-bot.rules
                                   ddos.rules
                                                                rpc.rules
community-deleted.rules
                                   deleted.rules
                                                                rservices.rules
community-dos.rules
community-exploit.rules
                                                                scan.rules
                                   dns.rules
                                  dos.rules
                                                                shellcode.rules
community-ftp.rules
                                   experimental.rules
                                                                smtp.rules
community-game.rules
community-icmp.rules
                                                                snmp.rules
                                   exploit.rules
                                   finger.rules
ftp.rules
                                                                sql.rules
community-imap.rules
                                                                telnet.rules
                                   icmp-info.rules
community-inappropriate.rules
                                                                tftp.rules
community-mail-client.rules
                                   icmp.rules
                                                                virus.rules
community-misc.rules
                                   imap.rules
                                                                web-attacks.rules
                                                                web-cgi.rules
web-client.rules
community-nntp.rules
                                   info.rules
community-oracle.rules
                                   local.rules
                                                                web-coldfusion.rules
                                  misc.rules
multimedia.rules
community-policy.rules
community-sip.rules
                                                                web-frontpage.rules
community-smtp.rules
community-sql-injection.rules
                                                                web-iis.rules
                                  mysql.rules
                                                                web-misc.rules
                                  netbios.rules
community-virus.rules
                                  nntp.rules
                                                                web-php.rules
                                  oracle.rules
other-ids.rules
community-web-attacks.rules
                                                                x11.rules
community-web-cgi.rules
                                   p2p.rules
community-web-client.rules
tom@snort:~$
```

And as snort is an open source software it has a lot of community rules. But we are interested in local rules in which we can write our own rules.

Next we open a rule using the command **nano etc/snort/rules/icmp.rules** and see what it looks like

3. Write a Simple (bad) rule

We open the local rule file using the command: **sudo nano etc/snort/rules/local.rules** And wrote the (bad) rule in the local rule file.

```
File Edit View Search Terminal Tabs Help

mary@ws2:~ × tom@snort:~ ×

GNU nano 2.5.3 File: /etc/snort/rules/local.rules Modified

# $Id: local.rules,v 1.11 2004/07/23 20:15:44 bmc Exp $

# LOCAL RULES

# This file intentionally does not come with signatures. Put your local

# additions here.
alert tcp any any -> any any (msg:"TCP detected"; sid:00002;)
```

After saving the file we could see the rule by using cat etc/snort/rules/local.rules

So when we open a webpage using command: firefox www.example.com

```
hank@remote_ws:~$ firefox www.example.com
```

The web page pops up in the browser.



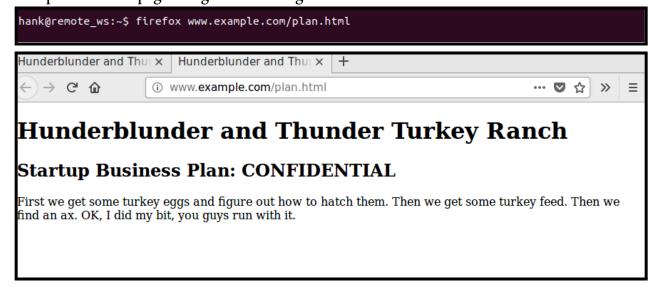
But in the snort window multiple alerts were generating which was not helpful that's why it was a bad rule

```
tom@snort:~$ ./start_snort.sh
11/12-15:10:46.752204 [**] [1:2:0] TCP detected [**] [Priority: 0] {TCP} 203.0.113.20:53270 -> 2
03.0.113.10:80
11/12-15:10:46.752298 [**] [1:2:0] TCP detected [**] [Priority: 0] {TCP} 192.168.1.2:80 -> 192.1
68.1.10:53270
11/12-15:10:46.752333 [**] [1:2:0] TCP detected [**] [Priority: 0] {TCP} 203.0.113.20:53270 -> 2
03.0.113.10:80
11/12-15:10:47.107268 [**] [1:2:0] TCP detected [**] [Priority: 0] {TCP} 203.0.113.20:53270 -> 2
03.0.113.10:80
11/12-15:10:47.107313 [**] [1:2:0] TCP detected [**] [Priority: 0] {TCP} 192.168.1.2:80 -> 192.1
68.1.10:53270
11/12-15:10:47.107728 [**] [1:2:0] TCP detected [**] [Priority: 0] {TCP} 192.168.1.2:80 -> 192.1
68.1.10:53270
11/12-15:10:47.108080 [**] [1:2:0] TCP detected [**] [Priority: 0] {TCP} 203.0.113.20:53270 -> 2
03.0.113.10:80
11/12-15:10:47.439162 [**] [1:2:0] TCP detected [**] [Priority: 0] {TCP} 203.0.113.20:53270 -> 2
03.0.113.10:80
11/12-15:10:47.439370 [**] [1:2:0] TCP detected [**] [Priority: 0] {TCP} 192.168.1.2:80 -> 192.1
68.1.10:53270
11/12-15:10:47.439403 [**] [1:2:0] TCP detected [**] [Priority: 0] {TCP} 203.0.113.20:53270 -> 2
03.0.113.10:80
11/12-15:10:47.446633 [**] [1:2:0] TCP detected [**] [Priority: 0] {TCP} 203.0.113.20:53270 -> 2
03.0.113.10:80
11/12-15:10:47.446857 [**] [1:2:0] TCP detected [**] [Priority: 0] {TCP} 192.168.1.2:80 -> 192.1
68.1.10:53270
11/12-15:10:47.490940 [**] [1:2:0] TCP detected [**] [Priority: 0] {TCP} 203.0.113.20:53270 -> 2
03.0.113.10:80
11/12-15:10:52.452512 [**] [1:2:0] TCP detected [**] [Priority: 0] {TCP} 192.168.1.2:80 -> 192.1
68.1.10:53270
11/12-15:10:52.452661 [**] [1:2:0] TCP detected [**] [Priority: 0] {TCP} 203.0.113.20:53270 -> 2
03.0.113.10:80
11/12-15:10:52.452690 [**] [1:2:0] TCP detected [**] [Priority: 0] {TCP} 192.168.1.2:80 -> 192.1
68.1.10:53270
```

4. Custom rule for CONFIDENTIAL traffic

A confidential rule includes the word "CONFIDENTIAL" in the alert message, and gives the rule its own unique sid.

We open the html page using the following command



```
Lab Report-8 SNORT
```

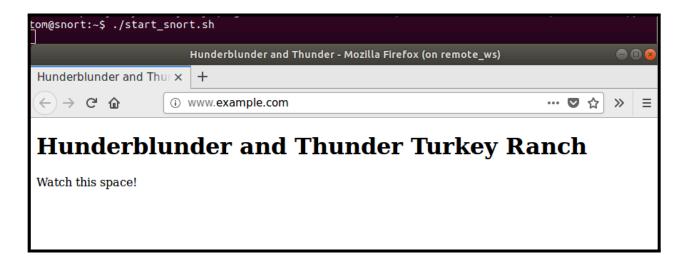
So now in the local rules we write our own rule to detect the word confidential and get an alert message. We save the change.

```
# $Id: local.rules,v 1.11 2004/07/23 20:15:44 bmc Exp $
# LOCAL RULES
# ------
# This file intentionally does not come with signatures. Put your local
# additions here.
alert tcp any any -> any any (msg:"Detected CONFIDENTIAL"; content:"CONFIDENTIAL"; sid:000004;)
```

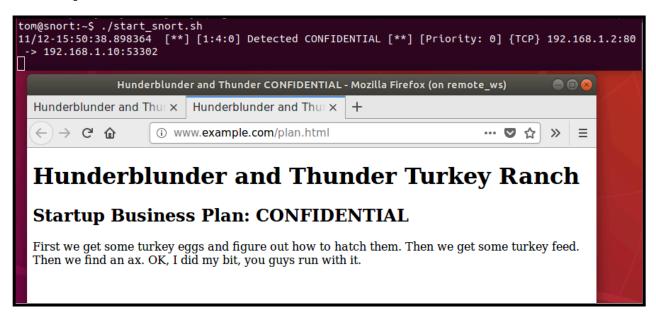
And see the file content using the cat command as: cat etc/snort/rules/local.rules

Then we start snot uing ./start_snort.sh command.

When we run the web page with no confidential information the snort did not show any alerts.



As we cleared the browsing history and re-opened the page with confidential information the snort started showing alerts hence the rule was working properly.



5. Effects of encryption

For this we will clear the history of the browser first. And instead of http we will brows with https and will see if snort can detect the alerts



We see that snort did not show any alert message as it is in the encrypted part.

6. Watching Internal traffic

If we use the nmap command on example.com: nmap www.example.com then the snort is showing all the alerts.

```
tom@snort:~$ ./start_snort.sh
11/12-16:37:21.885563 [**] [1:408:5] ICMP Echo Reply [**] [Classification: Misc activity] [Prior ity: 3] {ICMP} 192.168.1.2 -> 192.168.2.1
11/12-16:37:21.885693 [**] [1:451:5] ICMP Timestamp Reply [**] [Classification: Misc activity] [
Priority: 3] {ICMP} 192.168.1.2 -> 192.168.2.1
```

```
mary@ws2: ~
                                                                tom@snort: ~
mary@ws2:~$ sudo nmap www.example.com
Starting Nmap 7.01 ( https://nmap.org ) at 2021-11-12 16:37 UTC
Nmap scan report for www.example.com (192.168.1.2)
Host is up (0.000040s latency).
Not shown: 996 closed ports
PORT
        STATE SERVICE
22/tcp
        open
              ssh
       open http
80/tcp
443/tcp open https
3306/tcp open mysql
Nmap done: 1 IP address (1 host up) scanned in 1.59 seconds
mary@ws2:~$
```

Now we will change the routing and will see if snort can show us the alert or not

In the gateway we see the rule using the command: cat /etc/rc.local

```
ubuntu@gateway:~$ cat /etc/rc.local
#!/bin/bash
route delete default
route add default gw 203.0.113.1
#
# get ethernet device names for the two lans and the wan interfaces
#
lan1=$(ifconfig | grep -B1 "inet addr:192.168.1.10" | awk '$1!="inet" && $1!="--" {print $1}')
lan2=$(ifconfig | grep -B1 "inet addr:192.168.2.10" | awk '$1!="inet" && $1!="--" {print $1}')
wan=$(ifconfig | grep -B1 "inet addr:203.0.113.10" | awk '$1!="inet" && $1!="--" {print $1}')
#
# flush and delete all chains
#
iptables --flush
iptables --flush
iptables -- t nat --flush
iptables -- delete-chain
iptables -- t nat -- delete-chain
iptables -- t mangle -- delete-chain
iptables -- t mangle -- delete-chain
iptables -- t mangle -- delete-chain
#
# mirror incoming wan traffic to snort
```

We open the file and can see a lot of rules

```
admin@web server:~
                                                                                        ubuntu@gateway: ~
                                                                                                                                    ,FR,
 GNU nano 2.5.3
                                                File: /etc/rc.local
!/bin/bash
oute delete default
oute add default gw 203.0.113.1
lan1=$(ifconfig | grep -B1 "inet addr:192.168.1.10" | awk '$1!="inet" && $1!="--" {print $1}')
lan2=$(ifconfig | grep -B1 "inet addr:192.168.2.10" | awk '$1!="inet" && $1!="--" {print $1}')
van=$(ifconfig | grep -B1 "inet addr:203.0.113.10" | awk '$1!="inet" && $1!="--" {print $1}')
.ptables --flush
.ptables -t nat --flush
ptables -t mangle --flush
ptables --delete-chain
ptables -t nat --delete-chain
ptables -t mangle --delete-chain
                                                        [ Read 52 lines ]
                                                                                          ^J Justify
                                                                                                                 ^C Cur Pos
G Get Help
                     ^O Write Out
                                            ^₩ Where Is
```

And we added the lan 2 command in the file.

Command used: iptables -t mangle -A PREROUTING -i \$lan2 -j TEE --gateway 192.168,3.1

```
#
iptables -t mangle -A PREROUTING -i $wan -j TEE --gateway 192.168.3.1
iptables -t mangle -A PREROUTING -i $lan1 -j TEE --gateway 192.168.3.1
iptables -t mangle -A PREROUTING -i $lan2 -j TEE --gateway 192.168.3.1

#
# Define NAT for traffic from LANs to the WAN
#
iptables --table nat -I POSTROUTING 1 --out-interface $wan -j MASQUERADE
#iptables --append FORWARD --in-interface $lan1 -j ACCEPT
#tptables --append FORWARD --in-interface $lan2 -j ACCEPT
#sudo iptables -A FORWARD -i $wan -o $lan1 -p tcp --syn --dport 80 -m conntrack --ctstate NEW -j$
#sudo iptables -A FORWARD -i $wan -o $lan1 -m conntrack --ctstate ESTABLISHED,RELATED -j ACCEPT
#sudo iptables -A FORWARD -i $lan1 -o $wan -m conntrack --ctstate ESTABLISHED,RELATED -j ACCEPT
sudo iptables -t nat -A PREROUTING -o $lan1 -p tcp --dport 80 -j DNAT --to-destination 192.168.1.2
sudo iptables -t nat -A POSTROUTING -o $lan1 -p tcp --dport 80 -s 192.168.0.0/16 -j RETURN
sudo iptables -t nat -A POSTROUTING -o $lan1 -p tcp --dport 80 -d 192.168.1.2 -j SNAT --to-sourc$
```

And then we apply the rule using: sudo /etc/rc.local

```
ubuntu@gateway:~$ sudo /etc/rc.local
[ ok ] Restarting dnsmasq (via systemctl): dnsmasq.service.
SIOCDELRT: No such process
ubuntu@gateway:~$
```

Now when we use the nmap command the snort will show more detailed alert msg than before as it is seen as an external command.

```
tom@snort:~$ ./start_snort.sh

11/12-16:51:20.132349 [**] [1:469:3] ICMP PING NMAP [**] [Classification: Attempted Information Leak] [Priority: 2] {ICMP} 192.168.2.1 -> 192.168.1.2

11/12-16:51:20.132349 [**] [1:384:5] ICMP PING [**] [Classification: Misc activity] [Priority: 3] {ICMP} 192.168.2.1 -> 192.168.1.2

11/12-16:51:20.132378 [**] [1:408:5] ICMP Echo Reply [**] [Classification: Misc activity] [Priority: 3] {ICMP} 192.168.1.2 -> 192.168.2.1

11/12-16:51:20.132633 [**] [1:453:5] ICMP Timestamp Request [**] [Classification: Misc activity] [Priority: 3] {ICMP} 192.168.2.1 -> 192.168.1.2

11/12-16:51:20.132648 [**] [1:451:5] ICMP Timestamp Reply [**] [Classification: Misc activity] [Priority: 3] {ICMP} 192.168.1.2 -> 192.168.2.1

11/12-16:51:21.503125 [**] [1:1421:11] SNMP AgentX/tcp request [**] [Classification: Attempted Information Leak] [Priority: 2] {TCP} 192.168.2.1:42410 -> 192.168.1.2:705

11/12-16:51:21.574068 [**] [1:1418:11] SNMP request tcp [**] [Classification: Attempted Information Leak] [Priority: 2] {TCP} 192.168.2.1:42410 -> 192.168.1.2:161
```

7. Distinguishing traffic by address

Now we will set snort to fire alert only on external network not on internal network.

So going into the snort rule we will just add the IP address of the gateway in the rule and will save the changes

```
# $Id: local.rules,v 1.11 2004/07/23 20:15:44 bmc Exp $

# LOCAL RULES
# This file intentionally does not come with signatures. Put your local
# additions here.
alert tcp any any -> 192.168.1.10 any (msg:"Detected CONFIDENTIAL"; content:"CONFIDENTIAL"; sid:$
```

The rule is showing in the file

Now we will start the snort and access the website with hank@remote WS

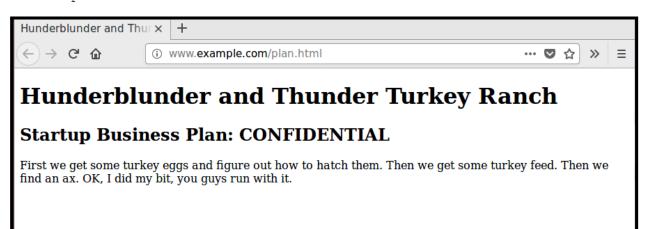
```
hank@remote_ws:~$ firefox www.example.com
```

We see an alert.

```
tom@snort:~$ ./start_snort.sh
11/12-17:11:52.329296 [**] [1:4:0] Detected CONFIDENTIAL [**] [Priority: 0] {TCP} 192.168.1.2:80
-> 192.168.1.10:53354
```

Now if we use some different WS which are local.

```
Nmap done: 1 IP address (1 host up) scanned in 3.01 seconds
mary@ws2:~$ firefox www.example.com/plan.html
```



```
tom@snort:~$ ./start_snort.sh
11/12-17:15:09.925758 [**] [1:402:7] ICMP Destination Unreachable Port Unreachable [**] [Classif ication: Misc activity] [Priority: 3] {ICMP} 203.0.113.1 -> 203.0.113.10  
11/12-17:15:10.768889 [**] [1:402:7] ICMP Destination Unreachable Port Unreachable [**] [Classif ication: Misc activity] [Priority: 3] {ICMP} 203.0.113.1 -> 203.0.113.10
11/12-17:15:11.141198 [**] [1:402:7] ICMP Destination Unreachable Port Unreachable [**] [Classif
ication: Misc activity] [Priority: 3] {ICMP} 203.0.113.1 -> 203.0.113.10  
11/12-17:15:12.243770 [**] [1:402:7] ICMP Destination Unreachable Port Unreachable [**] [Classif
ication: Misc activity] [Priority: 3] {ICMP} 203.0.113.1 -> 203.0.113.10

11/12-17:15:14.931669 [**] [1:402:7] ICMP Destination Unreachable Port Unreachable [**] [Classif
ication: Misc activity] [Priority: 3] {ICMP} 203.0.113.1 -> 203.0.113.10
11/12-17:15:15.782460 [**] [1:402:7] ICMP Destination Unreachable Port Unreachable [**] [Classif
ication: Misc activity] [Priority: 3] {ICMP} 203.0.113.1 -> 203.0.113.10

11/12-17:15:16.143136 [**] [1:402:7] ICMP Destination Unreachable Port Unreachable [**] [Classif ication: Misc activity] [Priority: 3] {ICMP} 203.0.113.1 -> 203.0.113.10

11/12-17:15:17.247395 [**] [1:402:7] ICMP Destination Unreachable Port Unreachable [**] [Classif
ication: Misc activity] [Priority: 3] {ICMP} 203.0.113.1 -> 203.0.113.10  
11/12-17:15:19.939511 [**] [1:402:7] ICMP Destination Unreachable Port Unreachable [**] [Classif
ication: Misc activity] [Priority: 3]
11/12-17:15:20.795695 [**] [1:402:7]
                                                                          {ICMP} 203.0.113.1 -> 203.0.113.10
                                                                          ICMP Destination Unreachable Port Unreachable [**] [Classif
ication: Misc activity] [Priority: 3] {ICMP} 203.0.113.1 -> 203.0.113.10
11/12-17:15:21.153869 [**] [1:402:7] ICMP Destination Unreachable Port Unreachable [**] [Classif
ication: Misc activity] [Priority: 3] {ICMP} 203.0.113.1 -> 203.0.113.10
11/12-17:15:22.251809 [**] [1:402:7] ICMP Destination Unreachable Port Unreachable [**] [Classif ication: Misc activity] [Priority: 3] {ICMP} 203.0.113.1 -> 203.0.113.10
11/12-17:15:24.943051 [**] [1:402:7] ICMP Destination Unreachable Port Unreachable [**] [Classif
ication: Misc activity] [Priority: 3] {ICMP} 203.0.113.1 -> 203.0.113.10

11/12-17:15:25.801460 [**] [1:402:7] ICMP Destination Unreachable Port Unreachable [**] [Classif ication: Misc activity] [Priority: 3] {ICMP} 203.0.113.1 -> 203.0.113.10

11/12-17:15:26.159485 [**] [1:402:7] ICMP Destination Unreachable Port Unreachable [**] [Classif
ication: Misc activity] [Priority: 3]
                                                                         {ICMP} 203.0.113.1 -> 203.0.113.10
11/12-17:15:27.257058 [**] [1:402:7] ICMP Destination Unreachable Port Unreachable [**] [Classif
ication: Misc activity] [Priority: 3] {ICMP} 203.0.113.1 -> 203.0.113.10

11/12-17:15:29.945257 [**] [1:402:7] ICMP Destination Unreachable Port Unreachable [**] [Classif ication: Misc activity] [Priority: 3] {ICMP} 203.0.113.1 -> 203.0.113.10

11/12-17:15:30.808857 [**] [1:402:7] ICMP Destination Unreachable Port Unreachable [**] [Classif ication: Misc activity] [Priority: 3] {ICMP} 203.0.113.1 -> 203.0.113.10
11/12-17:15:31.162886 [**] [1:402:7] ICMP Destination Unreachable Port Unreachable [**] [Classif
ication: Misc activity] [Priority: 3] {ICMP} 203.0.113.1 -> 203.0.113.10

11/12-17:15:32.283415 [**] [1:402:7] ICMP Destination Unreachable Port Unreachable [**] [Classif ication: Misc activity] [Priority: 3] {ICMP} 203.0.113.1 -> 203.0.113.10

11/12-17:15:34.948028 [**] [1:402:7] ICMP Destination Unreachable Port Unreachable [**] [Classif
 ication: Misc activity] [Priority: 3] {ICMP} 203.0.113.1 -> 203.0.113.10
11/12-17:15:35.813679 [**] [1:402:7] ICMP Destination Unreachable Port Unreachable [**] [Classif
```

And we see that it's not generating the alert as it was doing for the external remote server accessing the confidential file.