10/05/2024

Vulnerability Assessment

Esercizio Modulo 3 - Week 12 - D4

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Sommario

Introduzione

L'assessment fa parte dell'esercizio di fine modulo M3 del corso per Cybersecurity Analyst di Epicode. L'obiettivo è analizzare server virtuale Metaploitable 2.0 per individuarne le vulnerabilità critiche, definire i rischi ad esse associati, individuare le azioni correttive e la relativa pianificazione per rendere il server sicuro ed abbattere il rischio di violazioni o exploit.

Metodologia

L'assessment è stato effettuato utilizzando 2 tool Nessus e Nmap:

Nessus è un vulnerability scanner in grado di analizzare server e apparati di rete e restituire dei report dettagliati sulle vulnerabilità riscontrate indicando i dettagli delle vulnerabilità, i CVE, i rischi e le soluzioni da adottare per mitigare o risolvere le vulnerabilità.

Nmap («Network Mapper») è uno strumento open-source per la network exploration e l'auditing. È stato progettato per scansionare rapidamente reti di grandi dimensioni, ma è indicato anche per l'utilizzo verso singoli host. Nmap usa pacchetti IP "raw" (grezzi, non formattati) in varie modalità per determinare quali host sono disponibili su una rete, che servizi (nome dell'applicazione e versione) vengono offerti da questi host, che sistema operativo (e che versione del sistema operativo) è in esecuzione, che tipo di firewall e packet filters sono usati, e molte altre caratteristiche

Ambito dell'assessment

Il server da analizzare è una macchina virtuale installata su Oracle OVM che ha come sistema operativo Metasploitable 2.0, basato su S.O. Linux Ubuntu.

Indirizzo IP 192.168.1.48

Vulnerabilità individuate

A seguito della scansione effettuata tramite Nessus sono state individuate 10 vulnerabilità critiche, 5 di livello alto, 22 di livello medio e o di livello basso. In questo assessment andremo ad analizzare e risolvere solamente le 10 vulnerabilità di livello critico.

Di seguito vengono riportate molte informazioni inerenti le vulnerabilità, tra cui la descrizione, la soluzione proposta da Nessus e i codici CVE delle vulnerabilità cosi da poter andare a raccogliere ulteriori informazioni sulle vulnerabilità su altri siti web come ad esempio il NIST https://www.nist.gov/

192.168.1.48

10	5	22	8	119
CRITICAL	HIGH	MEDIUM	LOW	INFO

Scan Information

Start time:	Wed May 8 14:59:51 2024
End time:	Wed May 8 15:43:52 2024

Host Information

Netbios Name:	METASPLOITABLE
IP:	192.168.1.48
MAC Address:	08:00:27:93:D0:C4
OS:	Linux Kernel 2.6 on Ubuntu 8.04 (hardy)

Vulnerabilities

134862 - Apache Tomcat AJP Connector Request Injection (Ghostcat)

Synopsis

There is a vulnerable AJP connector listening on the remote host.

Description

A file read/inclusion vulnerability was found in AJP connector. A remote, unauthenticated attacker could exploit this vulnerability to read web application files from a vulnerable server. In instances where the vulnerable server allows file uploads, an attacker could upload malicious JavaServer Pages (JSP) code within a variety of file types and gain remote code execution (RCE).

See Also

http://www.nessus.org/u?8ebe6246

http://www.nessus.org/u?4e287adb

http://www.nessus.org/u?cbc3d54e

https://access.redhat.com/security/cve/CVE-2020-1745

https://access.redhat.com/solutions/4851251

http://www.nessus.org/u?dd218234

http://www.nessus.org/u?dd772531

http://www.nessus.org/u?2a01d6bf

http://www.nessus.org/u?3b5af27e

http://www.nessus.org/u?9dab109f

http://www.nessus.org/u?5eafcf70

Solution

Update the AJP configuration to require authorization and/or upgrade the Tomcat server to 7.0.100, 8.5.51, 9.0.31 or later.

Risk Factor

High

CVSS v3.0 Base Score

9.8 (CVSS:3.0/AV:N/AC:L/PR:N/UI:N/S:U/C:H/I:H/A:H)

CVSS v3.0 Temporal Score

9.4 (CVSS:3.0/E:H/RL:O/RC:C)

VPR Score

9.0

CVSS v2.0 Base Score

7.5 (CVSS2#AV:N/AC:L/Au:N/C:P/I:P/A:P)

CVSS v2.0 Temporal Score

6.5 (CVSS2#E:H/RL:OF/RC:C)

References

CVE	CVE-2020-1745
CVE	CVE-2020-1938
XREF	CISA-KNOWN-EXPLOITED:2022/03/17
XREF	CEA-ID:CEA-2020-0021

51988 - Bind Shell Backdoor Detection

Synopsis

The remote host may have been compromised.

Description

A shell is listening on the remote port without any authentication being required. An attacker may use it by connecting to the remote port and sending commands directly.

Solution

Verify if the remote host has been compromised, and reinstall the system if necessary.

Risk Factor

Critical

CVSS v3.0 Base Score

9.8 (CVSS:3.0/AV:N/AC:L/PR:N/UI:N/S:U/C:H/I:H/A:H)

CVSS v2.0 Base Score

10.0 (CVSS2#AV:N/AC:L/Au:N/C:C/I:C/A:C)

Plugin Information

Published: 2011/02/15, Modified: 2022/04/11

Plugin Output

tcp/1524/wild_shell

```
Nessus was able to execute the command "id" using the
following request :



---------------------------------------------      ---------------------------------------------


This produced the following truncated output (limited to 10 lines) :
--------------------------------------------- snip ---------------------------------------------
root@metasploitable:/# uid=0(root) gid=0(root) groups=0(root)
```

32314 - Debian OpenSSH/OpenSSL Package Random Number Generator Weakness

Synopsis

The remote SSH host keys are weak.

Description

The remote SSH host key has been generated on a Debian or Ubuntu system which contains a bug in the random number generator of its OpenSSL library.

The problem is due to a Debian packager removing nearly all sources of entropy in the remote version of OpenSSL.

An attacker can easily obtain the private part of the remote key and use this to set up decipher the remote session or set up a man in the middle attack.

See Also

http://www.nessus.org/u?107f9bdc

http://www.nessus.org/u?f14f4224

Solution

Consider all cryptographic material generated on the remote host to be guessable. In particuliar, all SSH, SSL and OpenVPN key material should be re-generated.

Risk Factor

Critical

VPR Score

5.1

CVSS v2.0 Base Score

10.0 (CVSS2#AV:N/AC:L/Au:N/C:C/I:C/A:C)

CVSS v2.0 Temporal Score

8.3 (CVSS2#E:F/RL:OF/RC:C)

References

BID	29179
CVE	CVE-2008-0166
XREF	CWE:310

Exploitable With

Core Impact (true)

Plugin Information

Published: 2008/05/14, Modified: 2018/11/15

Plugin Output

tcp/22/ssh

32321 - Debian OpenSSH/OpenSSL Package Random Number Generator Weakness (SSL check)

Synopsis

The remote SSL certificate uses a weak key.

Description

The remote x509 certificate on the remote SSL server has been generated on a Debian or Ubuntu system which contains a bug in the random number generator of its OpenSSL library.

The problem is due to a Debian packager removing nearly all sources of entropy in the remote version of OpenSSL.

An attacker can easily obtain the private part of the remote key and use this to decipher the remote session or set up a man in the middle attack.

See Also

http://www.nessus.org/u?107f9bdc

http://www.nessus.org/u?f14f4224

Solution

Consider all cryptographic material generated on the remote host to be guessable. In particuliar, all SSH, SSL and OpenVPN key material should be re-generated.

Risk Factor

Critical

VPR Score

5.1

CVSS v2.0 Base Score

10.0 (CVSS2#AV:N/AC:L/Au:N/C:C/I:C/A:C)

CVSS v2.0 Temporal Score

8.3 (CVSS2#E:F/RL:OF/RC:C)

References

BID	29179
CVE	CVE-2008-0166
XREF	CWE:310

Exploitable With

Core Impact (true)

Plugin Information

Published: 2008/05/15, Modified: 2020/11/16

Plugin Output

tcp/25/smtp

32321 - Debian OpenSSH/OpenSSL Package Random Number Generator Weakness (SSL check)

Synopsis

The remote SSL certificate uses a weak key.

Description

The remote x509 certificate on the remote SSL server has been generated on a Debian or Ubuntu system which contains a bug in the random number generator of its OpenSSL library.

The problem is due to a Debian packager removing nearly all sources of entropy in the remote version of OpenSSL.

An attacker can easily obtain the private part of the remote key and use this to decipher the remote session or set up a man in the middle attack.

See Also

http://www.nessus.org/u?107f9bdc

http://www.nessus.org/u?f14f4224

Solution

Consider all cryptographic material generated on the remote host to be guessable. In particuliar, all SSH, SSL and OpenVPN key material should be re-generated.

Risk Factor

Critical

VPR Score

5.1

CVSS v2.0 Base Score

10.0 (CVSS2#AV:N/AC:L/Au:N/C:C/I:C/A:C)

CVSS v2.0 Temporal Score

8.3 (CVSS2#E:F/RL:OF/RC:C)

References

BID	29179
CVE	CVE-2008-0166
XREF	CWE:310

Exploitable With

Core Impact (true)

Plugin Information

Published: 2008/05/15, Modified: 2020/11/16

Plugin Output

tcp/5432/postgresql

11356 - NFS Exported Share Information Disclosure

Synopsis

It is possible to access NFS shares on the remote host.

Description

At least one of the NFS shares exported by the remote server could be mounted by the scanning host. An attacker may be able to leverage this to read (and possibly write) files on remote host.

Solution

Configure NFS on the remote host so that only authorized hosts can mount its remote shares.

Risk Factor

Critical

VPR Score

5.9

CVSS v2.0 Base Score

10.0 (CVSS2#AV:N/AC:L/Au:N/C:C/I:C/A:C)

References

CVE	CVE-1999-0170
CVE	CVE-1999-0211
CVE	CVE-1999-0554

Exploitable With

Metasploit (true)

Plugin Information

Published: 2003/03/12, Modified: 2023/08/30

Plugin Output

udp/2049/rpc-nfs

```
The following NFS shares could be mounted :
```

20007 - SSL Version 2 and 3 Protocol Detection

Synopsis

The remote service encrypts traffic using a protocol with known weaknesses.

Description

The remote service accepts connections encrypted using SSL 2.0 and/or SSL 3.0. These versions of SSL are affected by several cryptographic flaws, including:

- An insecure padding scheme with CBC ciphers.

- Insecure session renegotiation and resumption schemes.

An attacker can exploit these flaws to conduct man-in-the-middle attacks or to decrypt communications between the affected service and clients.

Although SSL/TLS has a secure means for choosing the highest supported version of the protocol (so that these versions will be used only if the client or server support nothing better), many web browsers implement this in an unsafe way that allows an attacker to downgrade a connection (such as in POODLE). Therefore, it is recommended that these protocols be disabled entirely.

NIST has determined that SSL 3.0 is no longer acceptable for secure communications. As of the date of enforcement found in PCI DSS v3.1, any version of SSL will not meet the PCI SSC's definition of 'strong cryptography'.

See Also

https://www.schneier.com/academic/paperfiles/paper-ssl.pdf

http://www.nessus.org/u?b06c7e95

http://www.nessus.org/u?247c4540

https://www.openssl.org/~bodo/ssl-poodle.pdf

http://www.nessus.org/u?5d15ba70

https://www.imperialviolet.org/2014/10/14/poodle.html

https://tools.ietf.org/html/rfc7507

https://tools.ietf.org/html/rfc7568

Solution

Consult the application's documentation to disable SSL 2.0 and 3.0.

Use TLS 1.2 (with approved cipher suites) or higher instead.

Risk Factor

Critical

CVSS v3.0 Base Score

9.8 (CVSS:3.0/AV:N/AC:L/PR:N/UI:N/S:U/C:H/I:H/A:H)

CVSS v2.0 Base Score

10.0 (CVSS2#AV:N/AC:L/Au:N/C:C/I:C/A:C)

Plugin Information

Published: 2005/10/12, Modified: 2022/04/04

Plugin Output

tcp/25/smtp

20007 - SSL Version 2 and 3 Protocol Detection

Synopsis

The remote service encrypts traffic using a protocol with known weaknesses.

Description

The remote service accepts connections encrypted using SSL 2.0 and/or SSL 3.0. These versions of SSL are affected by several cryptographic flaws, including:

- An insecure padding scheme with CBC ciphers.

- Insecure session renegotiation and resumption schemes.

An attacker can exploit these flaws to conduct man-in-the-middle attacks or to decrypt communications between the affected service and clients.

Although SSL/TLS has a secure means for choosing the highest supported version of the protocol (so that these versions will be used only if the client or server support nothing better), many web browsers implement this in an unsafe way that allows an attacker to downgrade a connection (such as in POODLE). Therefore, it is recommended that these protocols be disabled entirely.

NIST has determined that SSL 3.0 is no longer acceptable for secure communications. As of the date of enforcement found in PCI DSS v3.1, any version of SSL will not meet the PCI SSC's definition of 'strong cryptography'.

See Also

https://www.schneier.com/academic/paperfiles/paper-ssl.pdf

http://www.nessus.org/u?b06c7e95

http://www.nessus.org/u?247c4540

https://www.openssl.org/~bodo/ssl-poodle.pdf

http://www.nessus.org/u?5d15ba70

https://www.imperialviolet.org/2014/10/14/poodle.html

https://tools.ietf.org/html/rfc7507
https://tools.ietf.org/html/rfc7568

Solution

Consult the application's documentation to disable SSL 2.0 and 3.0.
Use TLS 1.2 (with approved cipher suites) or higher instead.

Risk Factor

Critical

CVSS v3.0 Base Score

9.8 (CVSS:3.0/AV:N/AC:L/PR:N/UI:N/S:U/C:H/I:H/A:H)

CVSS v2.0 Base Score

10.0 (CVSS2#AV:N/AC:L/Au:N/C:C/I:C/A:C)

Plugin Information

Published: 2005/10/12, Modified: 2022/04/04

Plugin Output

tcp/5432/postgresql

33850 - Unix Operating System Unsupported Version Detection

Synopsis

The operating system running on the remote host is no longer supported.

Description

According to its self-reported version number, the Unix operating system running on the remote host is no longer supported.

Lack of support implies that no new security patches for the product will be released by the vendor. As a result, it is likely to contain security vulnerabilities.

Solution

Upgrade to a version of the Unix operating system that is currently supported.

Risk Factor

Critical

CVSS v3.0 Base Score

10.0 (CVSS:3.0/AV:N/AC:L/PR:N/UI:N/S:C/C:H/I:H/A:H)

CVSS v2.0 Base Score

10.0 (CVSS2#AV:N/AC:L/Au:N/C:C/I:C/A:C)

References

XREF	IAVA:0001-A-0502
XREF	IAVA:0001-A-0648

Plugin Information

Published: 2008/08/08, Modified: 2024/04/03

Plugin Output

tcp/0

```
Ubuntu 8.04 support ended on 2011-05-12 (Desktop) / 2013-05-09 (Server).
Upgrade to Ubuntu 23.04 / LTS 22.04 / LTS 20.04 .

For more information, see : https://wiki.ubuntu.com/Releases
```

61708 - VNC Server 'password' Password

Synopsis

A VNC server running on the remote host is secured with a weak password.

Description

The VNC server running on the remote host is secured with a weak password. Nessus was able to login using VNC authentication and a password of 'password'. A remote, unauthenticated attacker could exploit this to take control of the system.

Solution

Secure the VNC service with a strong password.

Risk Factor

Critical

CVSS v2.0 Base Score

10.0 (CVSS2#AV:N/AC:L/Au:N/C:C/I:C/A:C)

Plugin Information

Published: 2012/08/29, Modified: 2015/09/24

Plugin Output

tcp/5900/vnc

```
Nessus logged in using a password of "password".
```

Azioni correttive attuate per eliminare la vulnerabilità

Le azioni correttive adottate per la risoluzione delle 10 vulnerabilità critiche individuate sono 3 e sono le seguenti:

1) 61708 - VNC Server 'password' Password

Per questa vulnerabilità è stata modificata la password di default di VNC andando a settare una password robusta, di seguito i comandi eseguiti:

```
msfadmin@metasploitable:~$ sudo su
root@metasploitable:/home/msfadmin# cd /root/.vnc/
root@metasploitable:~/.vnc# vncpasswd
Using password file /root/.vnc/passwd
Password:
Warning: password truncated to the length of 8.
Verify:
Passwords do not match. Please try again.

Password:
Verify:
Would you like to enter a view-only password (y/n)? y
Password:
Verify:
root@metasploitable:~/.vnc# _
```

2) per la vulnerabilità “20007 - NFS Exported Share Information Disclosure” una possibile soluzione era quella di andare a chiudere la porta 1524, pertanto è stato installato il firewall **Ufw** (**U**ncomplicated **f**ire**w**all), Ufw è l'applicazione predefinita in Ubuntu per la configurazione del firewall. Sviluppato per semplificare la configurazione di iptables, **Ufw** offre un modo semplice per creare un firewall basato su protocolli IPv4 e IPv6.

Dopo averlo installato si è provveduto ad andare a bloccare tutto il traffico sulle porte TCP 1524 e UDP 1524

```
root@metasploitable:~/.vnc# sudo ufw status
Firewall loaded

To                         Action  From
--                         ------  ----
1524:tcp                   DENY    Anywhere
1524:udp                   DENY    Anywhere

root@metasploitable:~/.vnc#
```

3) L'installazione del firewall ha permesso anche la risoluzione delle restanti 8 vulnerabilità, in quanto ha provveduto a bloccare il traffico sulle porte aperte, quindi per mezzo del firewall è possibile ora monitorare e gestire il traffico in entrata sul server. Come si può notare nell'immagine seguente, tramite nmap è stata fatta una scansione prima e dopo l'installazione del firewall e come si può notare le porte che prima erano aperte e raggiungibili, ora sono chiuse ed è possibile andarle a gestire cosi da avere un server più sicuro.

```
kali@kali: ~
File  Actions  Edit  View  Help

┌──(kali㉿kali)-[~]
└─$ nmap 192.168.1.48
Starting Nmap 7.94SVN ( https://nmap.org ) at 2024-05-10 13:52 EDT
Nmap scan report for 192.168.1.48
Host is up (0.0098s latency).
Not shown: 977 closed tcp ports (conn-refused)
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 0.52 seconds

┌──(kali㉿kali)-[~]
└─$ nmap 192.168.1.48
Starting Nmap 7.94SVN ( https://nmap.org ) at 2024-05-10 13:56 EDT
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 3.66 seconds

┌──(kali㉿kali)-[~]
└─$ nmap -sS 192.168.1.48
```

Risultato scansione dopo le azioni correttive

Andando ad effettuare una scansione dopo le azioni correttive possiamo vedere che Nessus non rileva più vulnerabilità sul server target.

192.168.1.48

0	0	0	0	4
CRITICAL	HIGH	MEDIUM	LOW	INFO

Scan Information

Start time:	Fri May 10 14:54:43 2024
End time:	Fri May 10 15:08:19 2024

Host Information

IP:	192.168.1.48
MAC Address:	08:00:27:93:D0:C4

Conclusioni

L'adozione di un firewal software e l'adozione di password robuste ci ha permesso di risolvere le 10 vulnerabilità critiche segnalate da Nessus ed inoltre ci ha permesso di poter gestire le porte aperte su Metasploitable andando cosi ad aumentare il livello di sicurezza del server.