Final Engagement

Attack, Defense & Analysis of a Vulnerable Network

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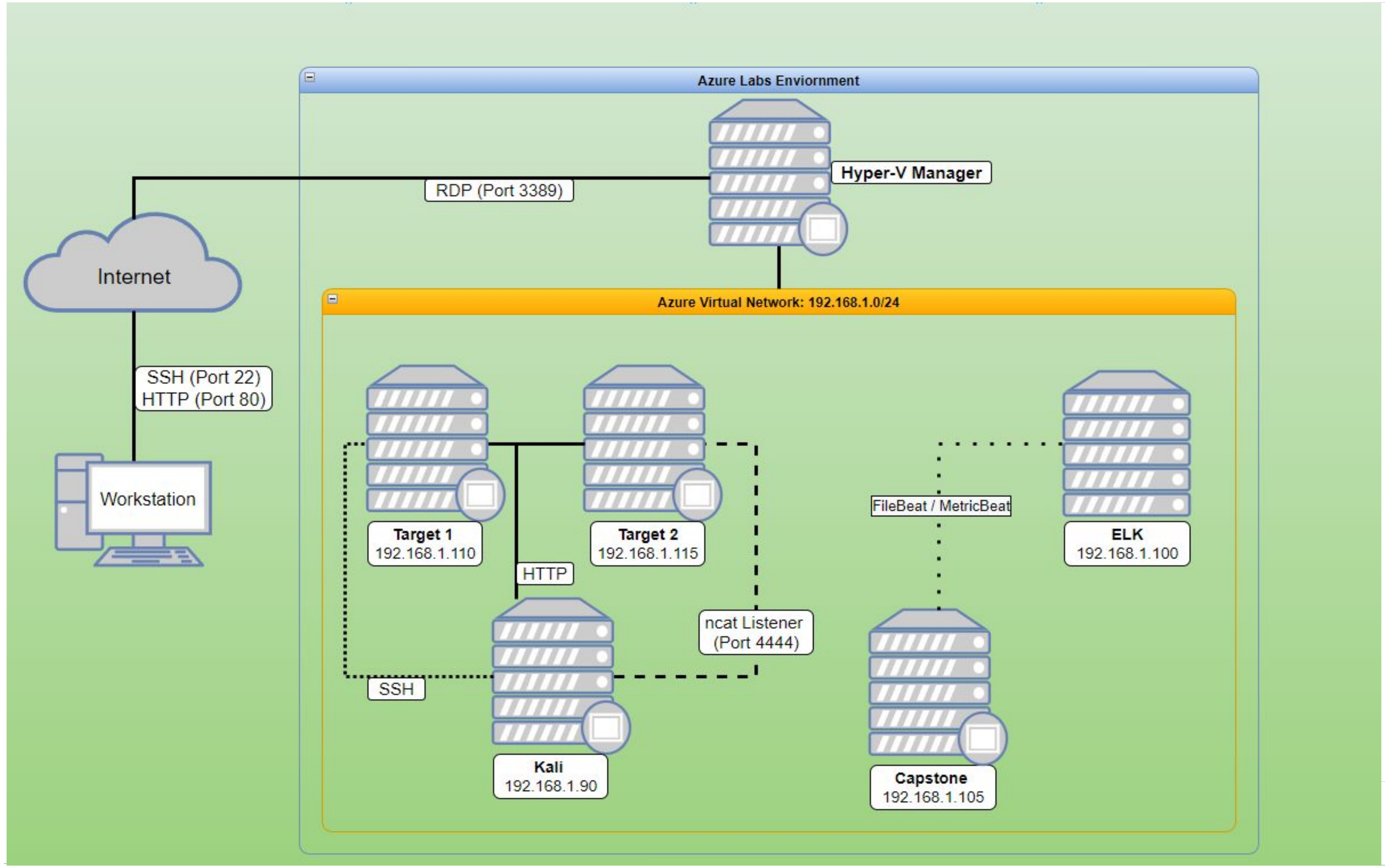
Network Topology



Network
Address Range: 192.168.1.0/24
Netmask: 255.255.225.0
Gateway: 192.168.1.1
Machines
IPv4: 192.168.1.90
OS: Linux
Hostname: Kali

IPv4: 192.168.1.100
OS: Linux
Hostname: ELK

IPv4: 192.168.1.105
OS: Linux
Hostname: Capstone

IPv4: 192.168.1.110
OS: Linux 3.2 - 4.9
Hostname: Target 1

IPv4: 192.168.1.1
OS: Windows 10
Hostname: ML-REFVM-684427

Critical Vulnerabilities: Target 1

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

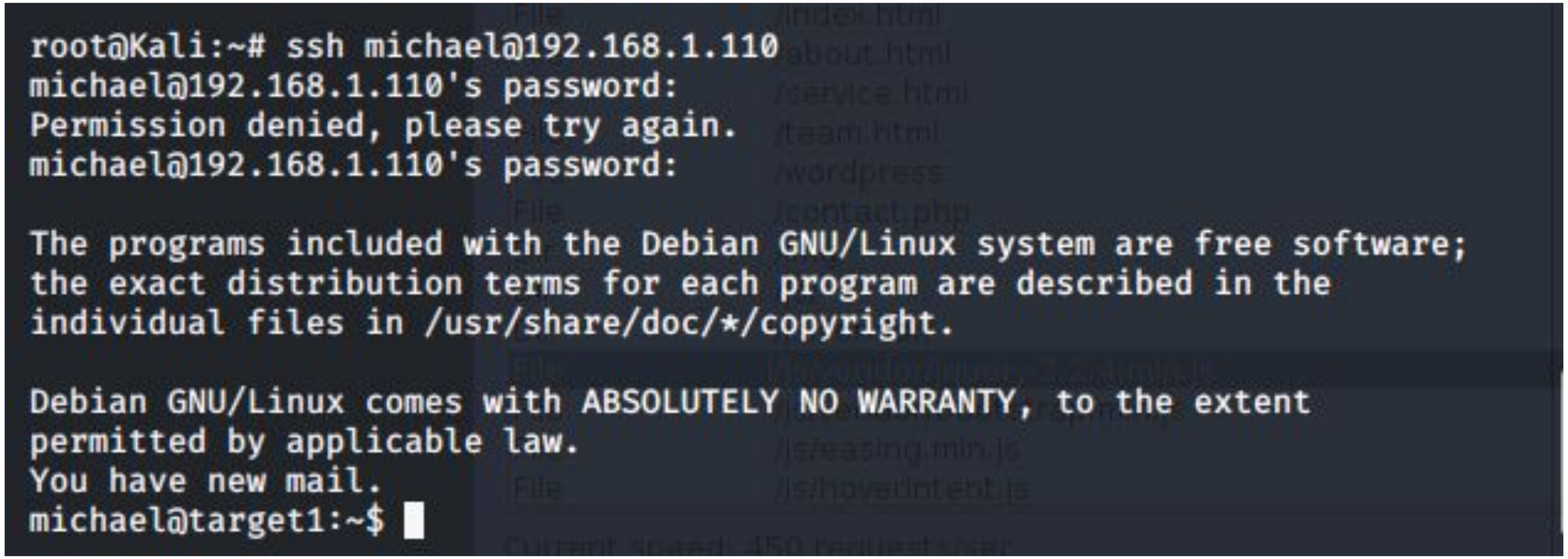
Vulnerability	**Description**	**Impact**
Weak Passwords	Michael’s password is michael	Was able to gain access to protected web pages
Vulnerable WordPress	Not updated, made it easy to enumerate users	Was able to find the user Michael
Unsalted Passwords	Made it easy for John to rip then R.I.P	Made it easy to gather their passwords from common word lists

Exploits Used

Exploitation: Weak Password

Summarize the following:

- Troubleshooting the password with common password malpractices.
  - michael:michael **(Very Weak!)**
- This enables the attacker to SSH into 192.168.1.110, giving access to **Target 1.**



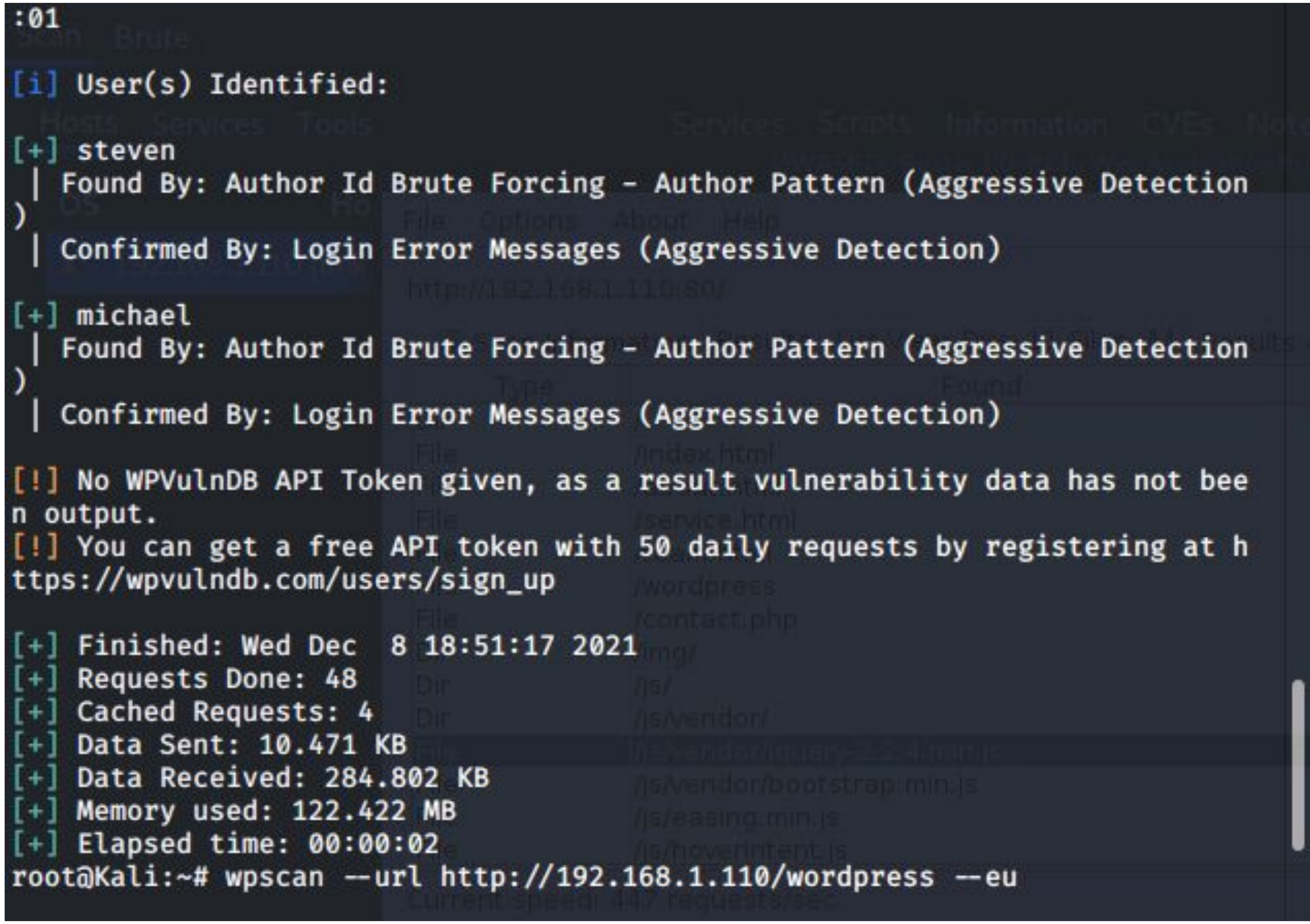
```
root@Kali:~# ssh michael@192.168.1.110
michael@192.168.1.110's password:
Permission denied, please try again.
michael@192.168.1.110's password:

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: Vulnerable WordPress

- With an outdated WordPress, attackers are able to enumerate all the users.
- The Cmd to enumerate

  `wpscan --url 192.168.1.110/wordpress -eu`

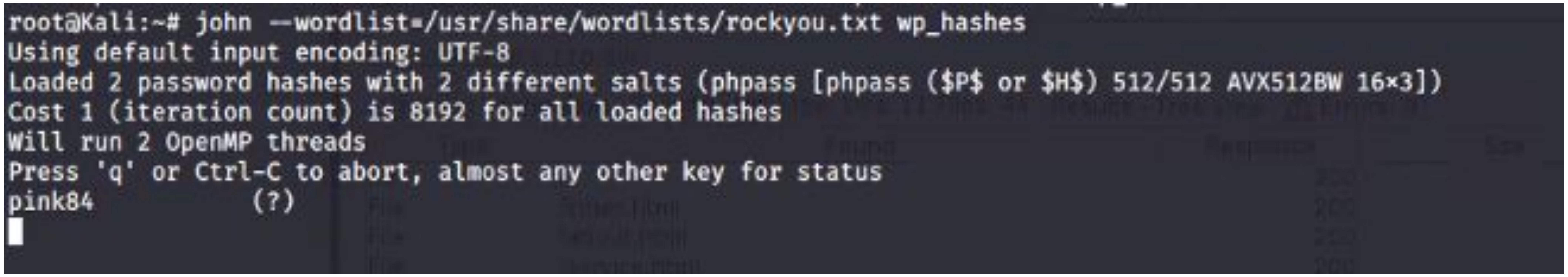
- After enumeration, attacker is able to locate the user Michael.



```
:01

[i] User(s) Identified:

[+] steven
 | Found By: Author Id Brute Forcing - Author Pattern (Aggressive Detection
)
 | Confirmed By: Login Error Messages (Aggressive Detection)

[+] michael
 | Found By: Author Id Brute Forcing - Author Pattern (Aggressive Detection
)
 | Confirmed By: Login Error Messages (Aggressive Detection)

[!] No WPVulnDB API Token given, as a result vulnerability data has not bee
n output.
[!] You can get a free API token with 50 daily requests by registering at h
ttps://wpvulndb.com/users/sign_up

[+] Finished: Wed Dec  8 18:51:17 2021
[+] Requests Done: 48
[+] Cached Requests: 4
[+] Data Sent: 10.471 KB
[+] Data Received: 284.802 KB
[+] Memory used: 122.422 MB
[+] Elapsed time: 00:00:02
root@Kali:~# wpscan --url http://192.168.1.110/wordpress --eu
```

Exploitation: Unsalted Passwords

- John the Ripper is able crack passwords that were unsalted; using a common wordlist made it very easy for John to rip.
- After John ripped the passwords we were able to gain access to Steven with the password **pink84**



```
root@Kali:~# john --wordlist=/usr/share/wordlists/rockyou.txt wp_hashes
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           (?)
```

Avoiding Detection

Stealth Exploitation of [Name of Vulnerability 1]

Monitoring Overview

- Which alerts detect this exploit?
- Which metrics do they measure?
- Which thresholds do they fire at?

Mitigating Detection

- How can you execute the same exploit without triggering the alert?
- Are there alternative exploits that may perform better?
- If possible, include a screenshot of your stealth technique.

Stealth Exploitation of [Name of Vulnerability 2]

Monitoring Overview

- Which alerts detect this exploit?
- Which metrics do they measure?
- Which thresholds do they fire at?

Mitigating Detection

- How can you execute the same exploit without triggering the alert?
- Are there alternative exploits that may perform better?
- If possible, include a screenshot of your stealth technique.

Stealth Exploitation of [Name of Vulnerability 3]

Monitoring Overview

- Which alerts detect this exploit?
- Which metrics do they measure?
- Which thresholds do they fire at?

Mitigating Detection

- How can you execute the same exploit without triggering the alert?
- Are there alternative exploits that may perform better?
- If possible, include a screenshot of your stealth technique.

Critical Vulnerabilities

Critical Vulnerabilities: Target 1

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

Vulnerability	Description	Impact
Brute Force	**Created Alert:** WHEN count() GROUPED OVER top 5 'http.response.status_code' IS ABOVE 400 FOR THE LAST 5 minutes	This Alert is High Reliability because it will reduce the number of false positives and alert when a high number of HTTP Error's are present after 5 minutes
Code Injection attacks (XSS or CRLF)	**Created Alert:** WHEN sum() of http.request.bytes OVER all documents IS ABOVE 3500 FOR THE LAST 1 minute	This is Medium Reliability because some it may generate false positives. There is the possibility that a large, non-malicious HTTP request may trigger the alarm.
Virus or Malware	**Created Alert:** WHEN max() OF system.process.cpu.total.pct OVER all documents IS ABOVE 0.5 FOR THE LAST 5 minutes	This is Low Reliability because this alert will generate a lot of false positives. CPU can spike for several different reasons.

Alerts Implemented

Excessive HTTP Errors

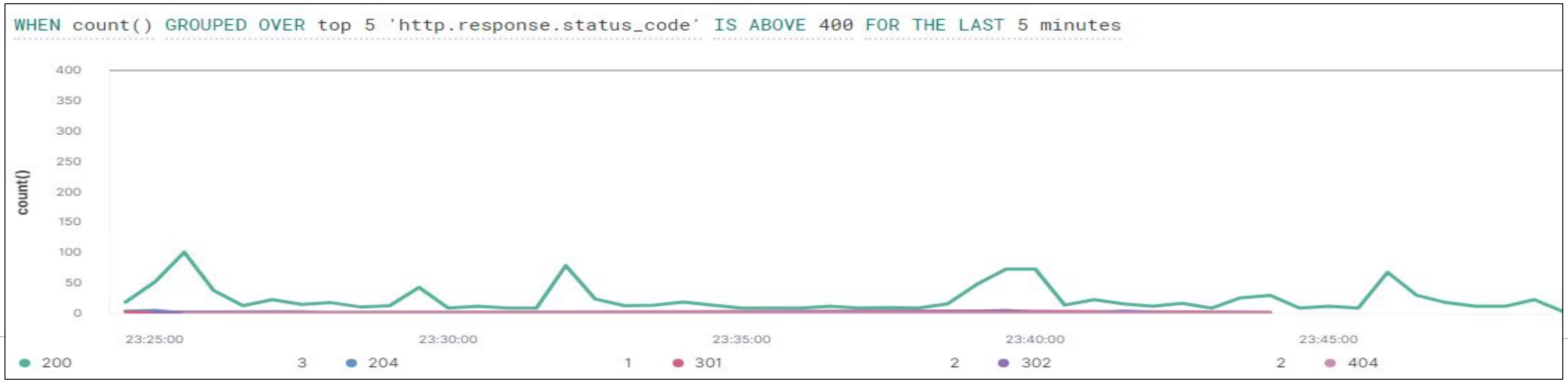
Alert 1 is implemented as follows:

- **Metric**: Packetbeat ('http.response.status_code')

- **Threshold**: WHEN count() GROUPED OVER top 5 'http.response.status_code' IS ABOVE 400 FOR THE LAST 5 minutes

- **Vulnerability Mitigated**: Brute Force Attacks

- **Reliability**: This Alert is High Reliability because it will reduce the number of false positives and alert when a high number of HTTP Errors are present after 5 minutes



WHEN count() GROUPED OVER top 5 'http.response.status_code' IS ABOVE 400 FOR THE LAST 5 minutes

HTTP Request Size Monitor

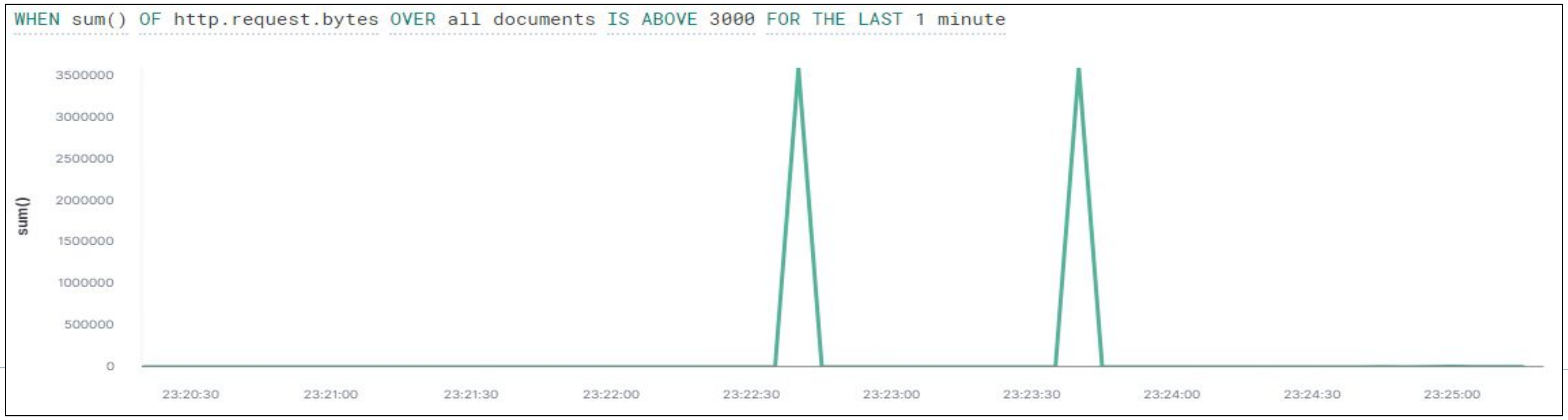
<u>Alert 2 is implemented as follows:</u>

- **Metric:** Packetbeat (http.request.bytes)

  - **Threshold**: WHEN sum() of http.request.bytes OVER all documents IS ABOVE 3500 FOR THE LAST 1 minute

  - **Vulnerability Mitigated**: Code Injection attacks (XSS or CRLF)

  - **Reliability**: This is Medium Reliability because some it may generate false positives. There is the possibility that a large, non-malicious HTTP request may trigger the alarm.



WHEN sum() OF http.request.bytes OVER all documents IS ABOVE 3000 FOR THE LAST 1 minute

CPU Usage Monitor

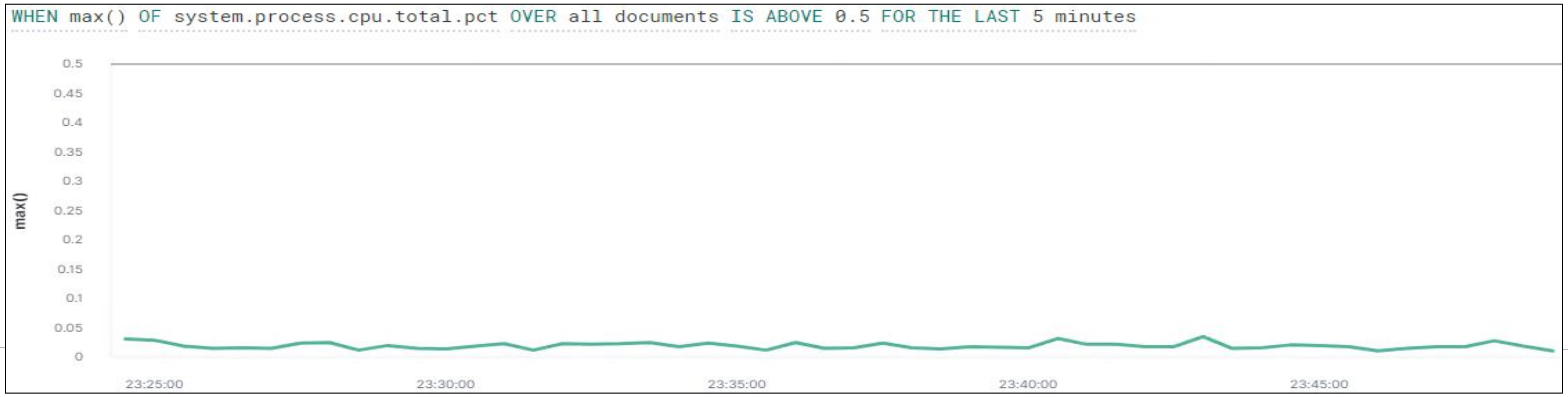
Alert 3 is implemented as follows:

- **Metric**: Metricbeat (system.process.cpu.total.pct)

  - **Threshold**: WHEN max() OF system.process.cpu.total.pct OVER all documents IS ABOVE 0.5 FOR THE LAST 5 minutes

  - **Vulnerability Mitigated**: Virus or Malware

  - **Reliability**: This is Low Reliability because this alert will generate a lot of false positives. CPU can spike for several different reasons.


WHEN max() OF system.process.cpu.total.pct OVER all documents IS ABOVE 0.5 FOR THE LAST 5 minutes

Hardening

Hardening Against **BRUTE FORCE Vulnerability** on Target 1

Vulnerability 1: Brute Force Attacks

Patch: WordPress Hardening

- Update WordPress and other software: apt-get upgrade weekly
- Popular WordPress Plugins: Loginizer, WP Limit Login Attempts, Brute Force Login Protection: These plugins help protect websites from malicious attacks
- Implement a strong password policy: 12 characters/2 special characters and password reset every 60 days
- Create alerts when when a user has met the "failed login" threshold and lock out the user
- Implement a Multi-Factor Authentication password reset policy
- Establish rule to block all known VPN Traffic
- Disable unused features such as WordPress REST API

Why It Works:

- Updating software weekly typically will automatically fix errors and update patches
- Plugins help secure the website based on their intended purpose.
- Strong password policies help reduce BruteForce Attacks
- Alerts help notify Cyber Professionals when there is unusual activity like a large amount of HTTP Requests
- Multi-Factor Authentication is a useful tool to ensure attackers can not gain access to another user's account
- Blocking VPN Traffic is one way monitor and identify traffic
- Disabling REST API prevents enumeration of users

Hardening Against <u>**Code Injection Attacks**</u> on Target 1

Vulnerability 2: Code Injection attacks (XSS or CRLF)

Patch: Code Injection/DDOS Hardening

- Update software: apt-get upgrade weekly
- Create Ansible Playbook to include Code Injection Plugins:
  - XXXtrike
  - BruteXSS Terminal
  - Brute XSS GUI
  - XSS Scanner Online
  - XSSer
  - xsscrapy
- Restrict PHP and EXE
- Establish HTTP Request Limit Rules
  - Max URL Length
  - Max length of a query string
  - Max size of a request

Why It Works:

- Updating software weekly typically will automatically fix errors and update patches
- Creating Ansible Playbook with Industry Standard plugins improve automation/efficiency and improve security for Code Injection Attacks
- Restricting PHP and EXE helps reduce Injection Attacks on the front end
- Establishing HTTP Request Limit Rules automatically drops traffic when threshold has been met

Hardening Against **Virus or Malware** Vulnerability on Target 1

Vulnerability 3: Virus or Malware

Patch: Virus and Malware Hardening

- Update software: apt-get upgrade weekly
- Update and install industry standard Anti-Virus Software
- Implement and Monitor Network using Intrusion Detection System (IDS)
    - SNORT
    - Kibana
    - Wireshark
    - Nessus

Why It Works:

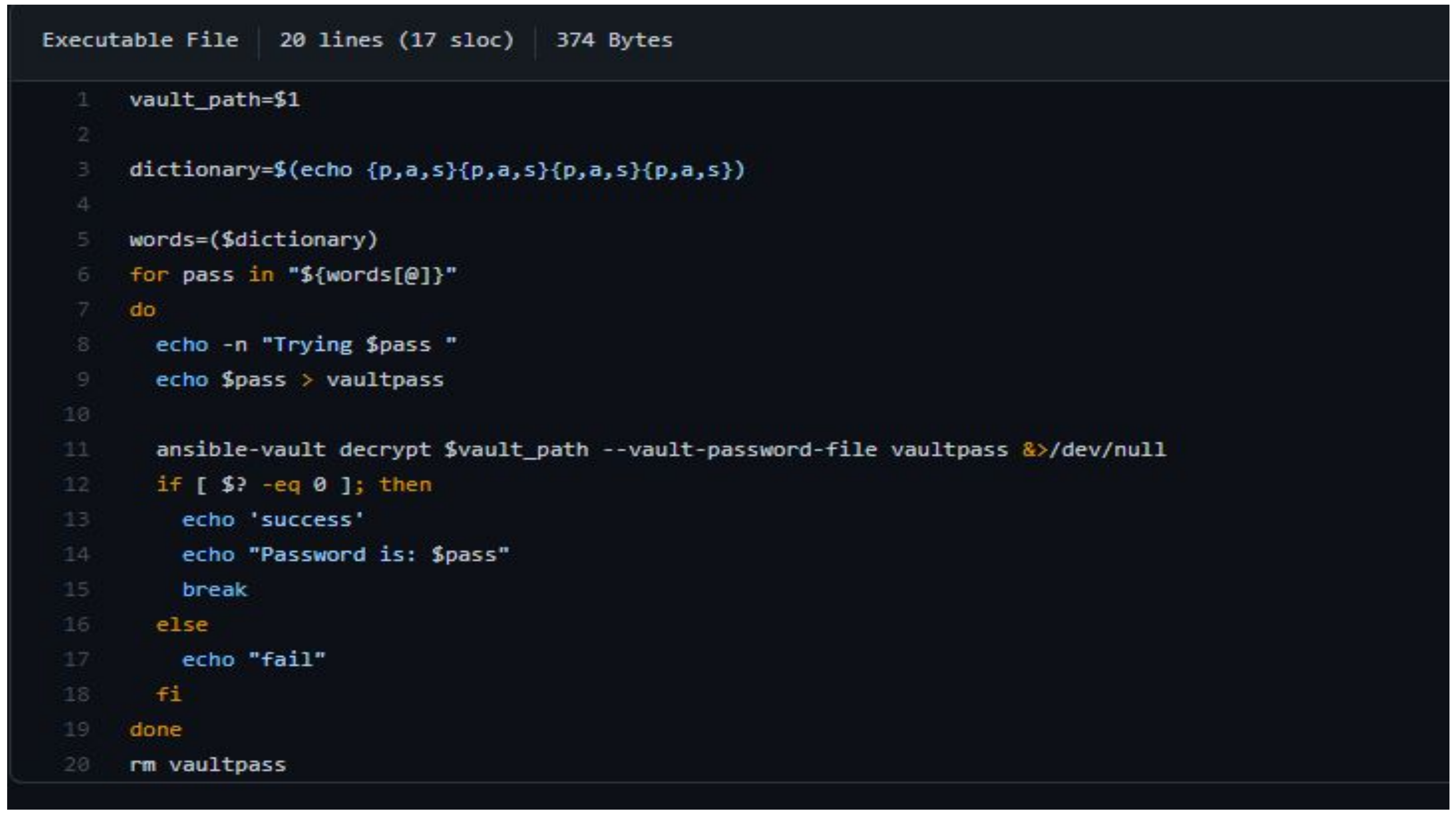
- Updating software weekly typically will automatically fix errors and update patches
- Installing Anti-Virus Software is critical to any Network Security. Installing Anti-Virus Software is an Industry Standard Practice.
- Create Ansible Playbook to automate and update Virus Protection
- IDS is critical for network security because it enables you to detect and respond to malicious traffic

Implementing Patches

Implementing Patches with Ansible

Playbook Overview: Brute Force

Playbook Name: ansible-vault-brute-force.sh



Executable File | 20 lines (17 sloc) | 374 Bytes

```
vault_path=$1

dictionary=$(echo {p,a,s}{p,a,s}{p,a,s}{p,a,s})

words=($dictionary)
for pass in "${words[@]}"
do
  echo -n "Trying $pass "
  echo $pass > vaultpass

  ansible-vault decrypt $vault_path --vault-password-file vaultpass &>/dev/null
  if [ $? -eq 0 ]; then
    echo 'success'
    echo "Password is: $pass"
    break
  else
    echo "fail"
  fi
done
rm vaultpass
```

Implementing Patches with Ansible

Playbook Overview: Code Injection Attacks (XSS or CRLF)

Cross-Site Scripting (XSS) attacks are a type of injection, in which malicious scripts are injected into otherwise benign and trusted web sites. XSS attacks occur when an attacker uses a web application to send malicious code, generally in the form of a browser side script, to a different end user. Flaws that allow these attacks to succeed are quite widespread and occur anywhere a web application uses input from a user within the output it generates without validating or encoding it.

An attacker can use XSS to send a malicious script to an unsuspecting user. The end user's browser has no way to know that the script should not be trusted and will execute the script. Because it thinks the script came from a trusted source, the malicious script can access any cookies, session tokens, or other sensitive information retained by the browser and used with that site. These scripts can even rewrite the content of the HTML page.

XSS Vulnerability Scanner Tool's are simple tools to help mitigate Code Injection Attacks:

- XSStrike
- BruteXSS Terminal
- BruteXSS GUI
- XSS Scanner Online
- XSSer
- xsscrapy

Implementing Patches with Ansible

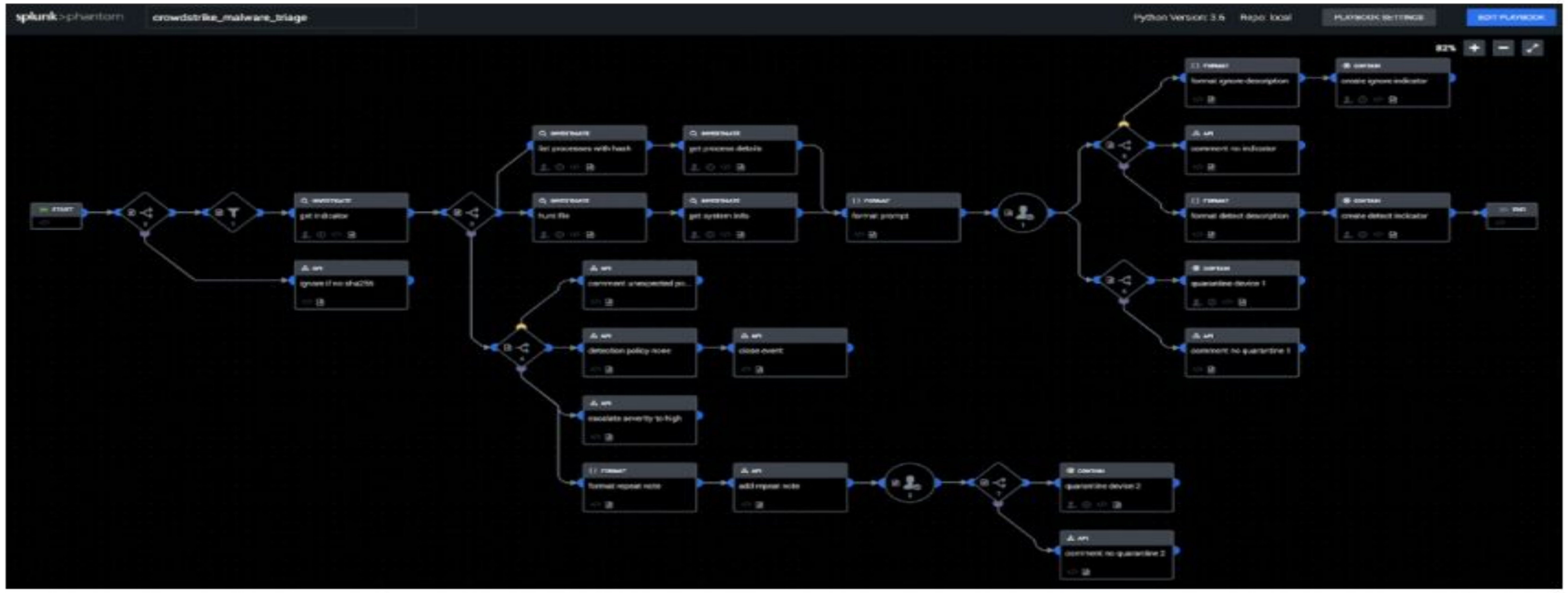
Playbook Overview: Virus or Malware

There are several trusted Industry Standard Playbooks that can be used to automate and secure the network against Viruses and Malware.

For example this is a picture of Splunk SOAR Playbook: Crowdstrike Malware Triage

The Playbook

This playbook walks through the steps that are performed automatically by Phantom to triage file hashes ingested from Crowdstrike.


splunk>phantom
crowdstrike_malware_triage
Python Version: 3.6
Repo: local
PLAYBOOK SETTINGS
EDIT PLAYBOOK
82%
START
get indicator
ignore if no sha256
list processes with hash
get process details
hunt file
get system info
comment unexpected po...
detection policy none
close event
escalate severity to high
format repeat note
add repeat note
format prompt
format ignore description
create ignore indicator
comment no indicator
format detect description
create detect indicator
END
quarantine device 1
comment no quarantine 1
quarantine device 2
comment no quarantine 2