Final Engagement

Attack, Defense & Analysis of a Vulnerable Network

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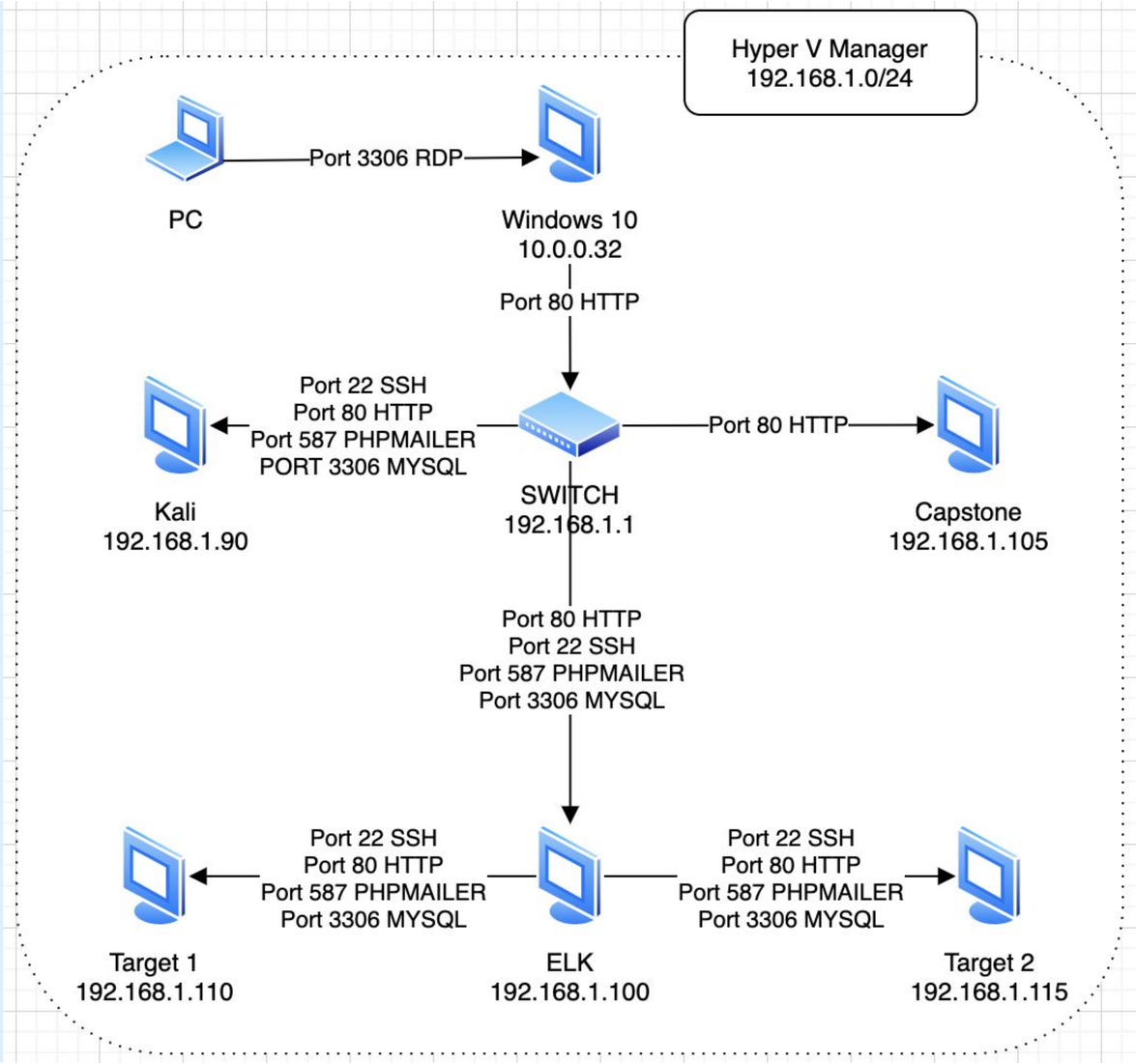
Network Topology



Network

Address Range: 192.168.1.0/24

Netmask: 255.255.255.0

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:.192.168.1.110

OS: Linux

Hostname: TARGET1

IPv4: 192.168.1.115

OS: Linux

Hostname: TARGET2

Critical Vulnerabilities: Target 1

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

Vulnerability	Description	Impact
WordPress Site Enumeration	Use of WordPress Security Scanner (wpscan) against server (192.168.1.110) reveals sensitive information	The WordPress Security Scanner reveals the usernames: “michael” and “steven”
Brute Force Attack (michael)	By using Metasploit’s ssh_login module, user michael’s password can be cracked on the target	Malicious attackers can ssh into the TARGET1 server as user michael
wp-config.php readability	wp-config.php reveals sensitive information about root password for MySQL database	Vulnerable user michael has access to viewing wp-config.php which reveals root password for MySQL
John the Ripper (steven)	Using John on a hashed password for Steven found in MySQL	User steven’s hashed password cracked and obtained
Privilege escalation with Python	Exploit steven’s sudo permissions on python to gain root access of system: sudo python -c ‘import pty;pty.spawn(“/bin/bash”)’	Steven’s sudo permissions with Python can be leveraged to gain root access of the system

Critical Vulnerabilities: Target 2

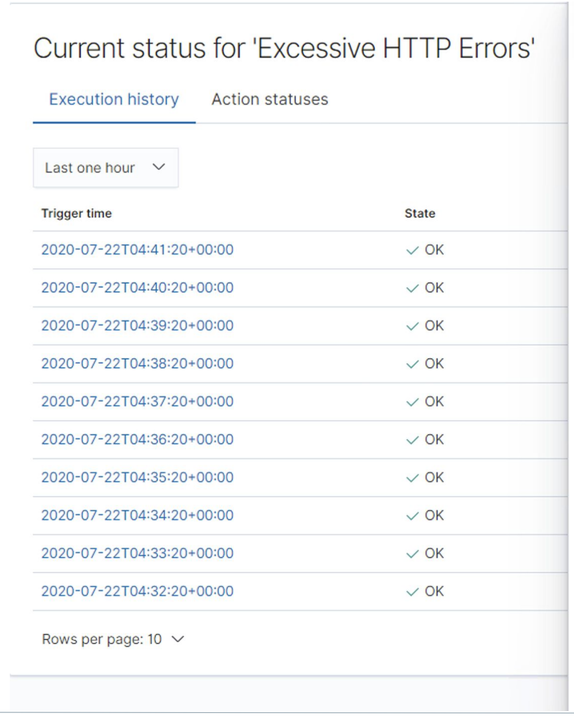
Our assessment uncovered the following critical vulnerabilities in **Target 2**.

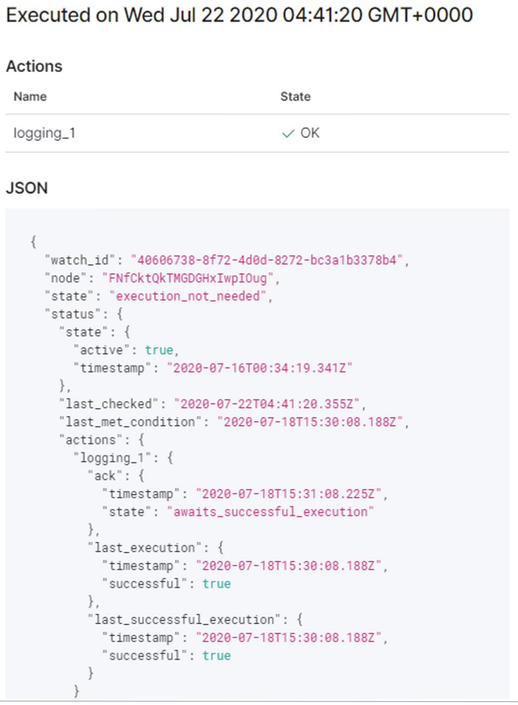
Vulnerability	Description	Impact
Wordpress Scan	• WPScan Tool to scan a server's Wordpress database for any vulnerabilities. • Can also be done using an nmap script.	• Hidden folders such as "manual" and "vendor" were revealed in the scan. • Accessing "vendor" folder and the VERSION page leads to a single flag.
PHPMailer 5.2.16	• Exploitdb search revealed an RCE vulnerability for PHPMailer versions below 5.2.18	• Uploading a unique PHP script into the server and calling on it will send a shell to the attacker machine.
MySQL Root Access	• Access to server's MySQL database as 'root' allows the attacker to administer the database.	• Attacker can create tables and functions that can allow the attacker to take control from MySQL.

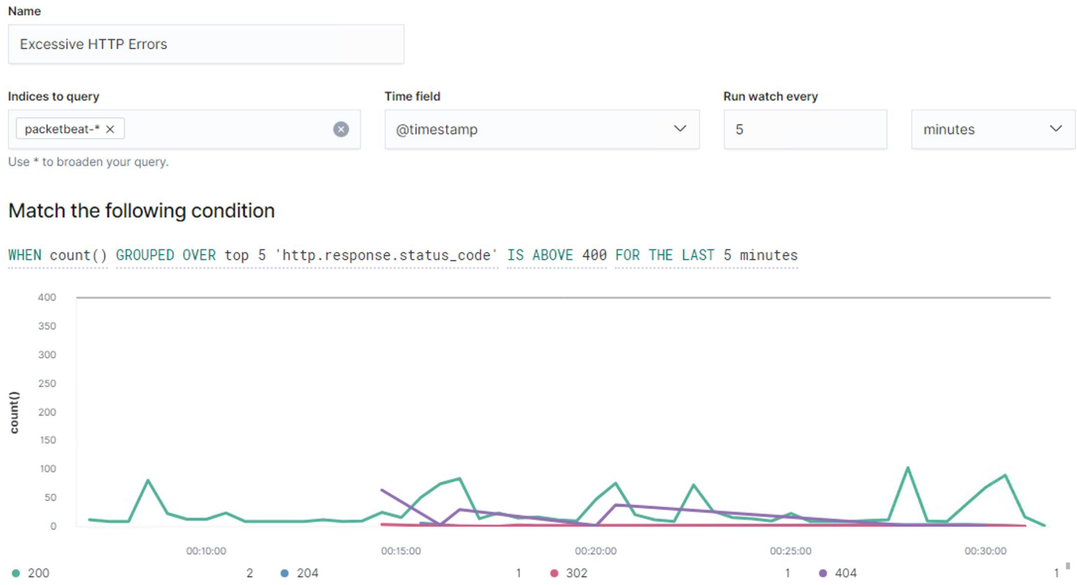
Alerts Implemented

Excessive HTTP Errors

- Description: Suspicious number of HTTP 400+ error responses
- Purpose: Identifies brute force attacks and other similar attempts which require a large number of HTTP requests
- Threshold: Fires when the top five HTTP response status codes are above 400 for the last 5 minutes

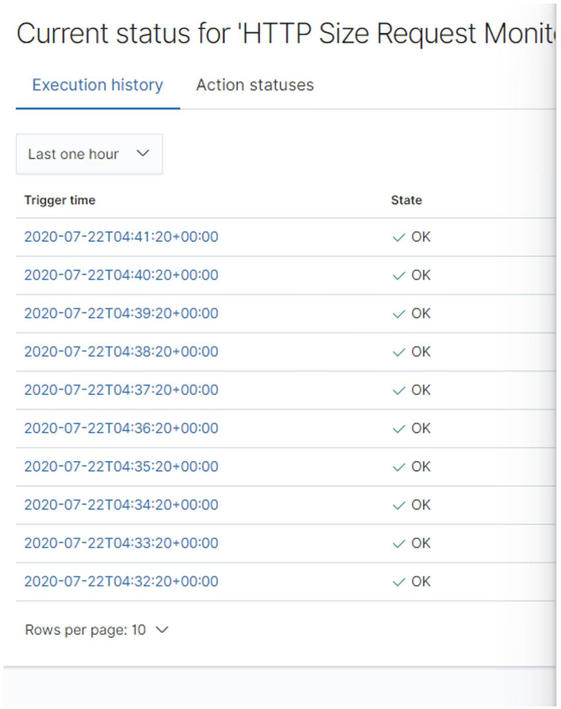


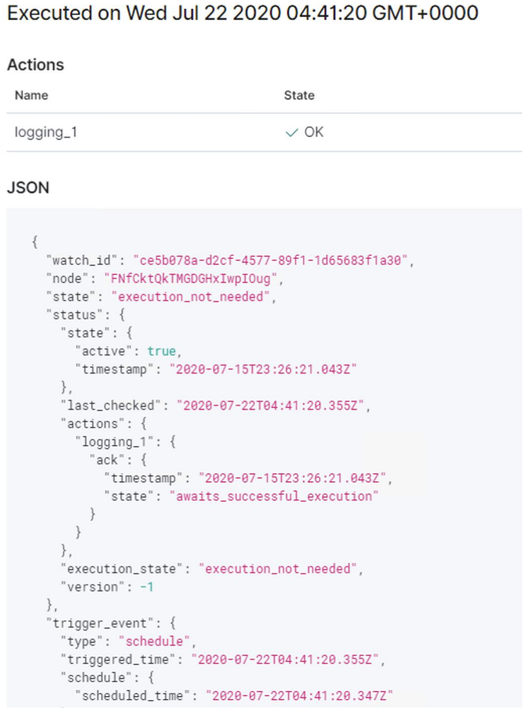


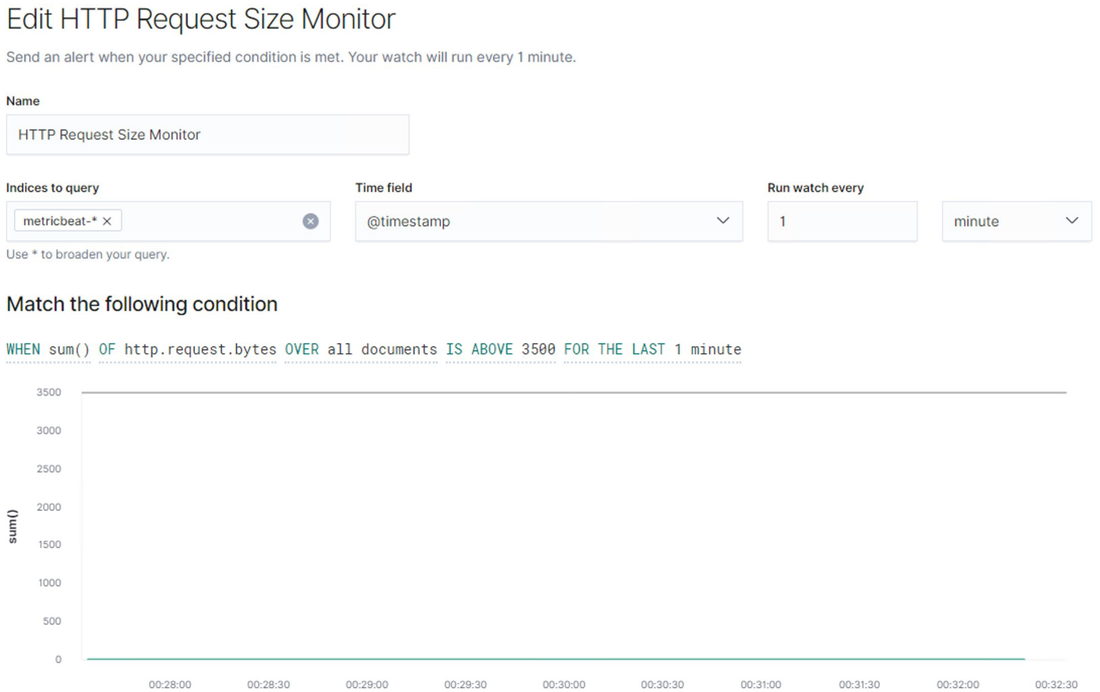


HTTP Request Size Monitor

- Description: An HTTP request contains a larger-than-average amount of data
- Purpose: Identifies malicious file transfers
- Threshold: Fires when the sum of bytes in incoming HTTP requests is above 3,500 for the last minute

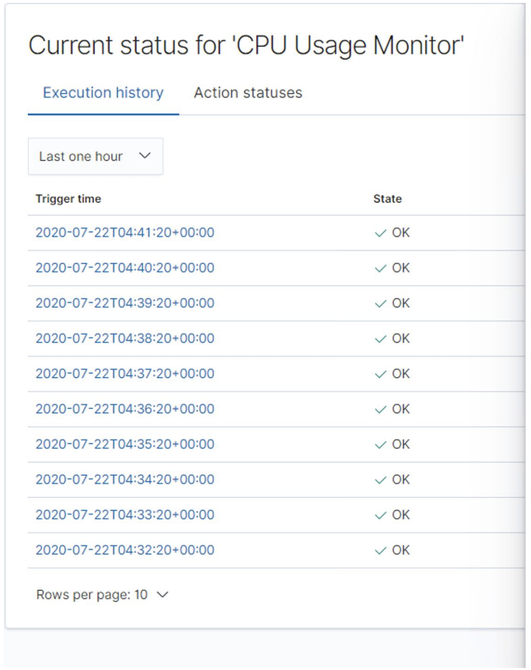


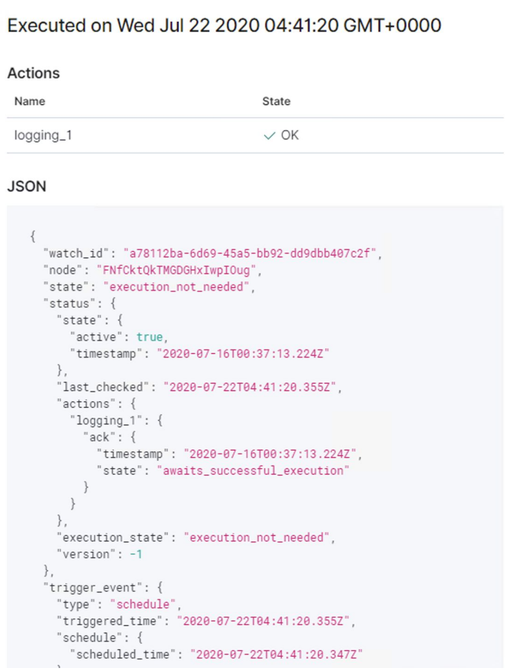


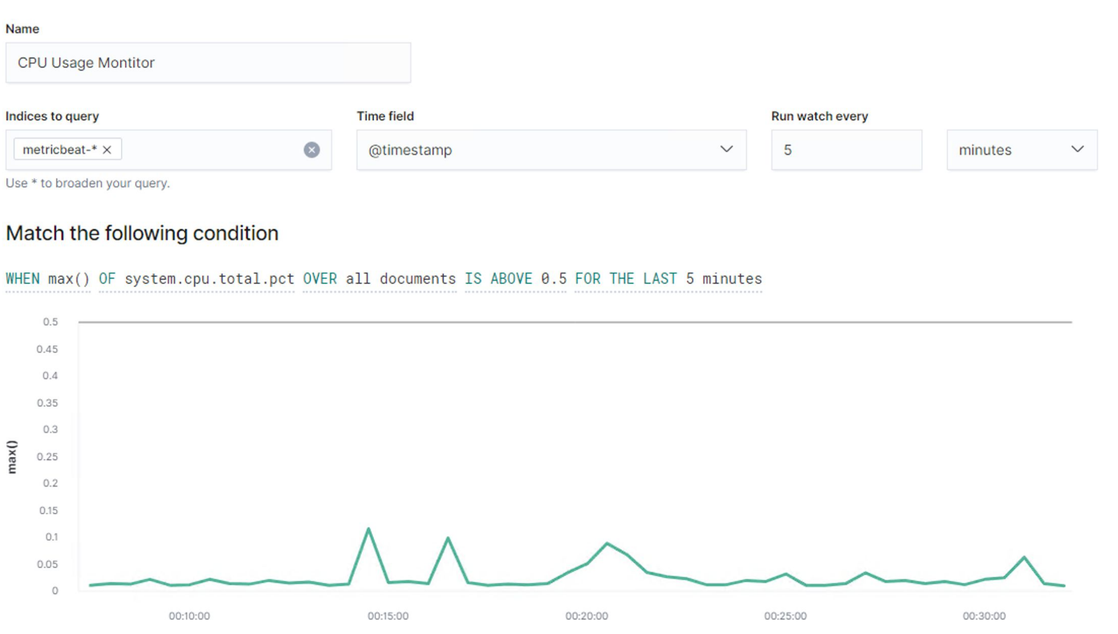


CPU Usage Monitor

- Description: Dangerously high CPU usage
- Purpose: Identifies a machine about to go offline or when the CPU is being used for nefarious purposes
- Threshold: Fires when system processes exceed 0.5 (50%) CPU total percentage for the last 5 minutes







Hardening

Hardening Against WPSCAN on Target 1

- An excellent way to mitigate potential exploits is to constantly update one’s software
- The latest version of WordPress (5.4.2) claims to patch critical security flaws and will prevent WPscan from finding vulnerabilities
- Alternatively, by installing Varnish v3 or v4 will prevent user enumeration with minor edits to its sub vcl_recv section
- To install or update WordPress:

  apt-get update

  apt-get install wordpress
- To install Varnish:

  apt-get update

  apt-get install varnish

Hardening Against Bruteforce on Target 1

- By being able to bruteforce Michael’s password, it allowed us access to the remainder of the system
- Thus by simply creating a more complex password, it would not only increase the time to bruteforce but could possibly give system administrators enough time to respond and react accordingly
- An example of a more complex password would be 10 characters in length, and contain random characters
- Alternatively limiting failed login attempts or implementing two factor authentication would also work

Hardening Against wp-config.php on Target 1

- By being able to access and view wp-config.php from Michael’s account, we were able to determine Steven’s wordpress hash
- To prevent this, one could limit Michael’s access to sensitive data or limit file permissions to sensitive data, such as hashes, to only administrator level accounts

Hardening Against John the Ripper on Target 1

- As aforementioned, creating a more complex password in terms of length and the characters it contains would mitigate John the Ripper attacks by drastically increasing the time it would take to crack

Hardening Against Python Exploit on Target 1

- The sole reason we were able to achieve root access is due to Steven’s root permissions for running Python
- Disabling Steven’s root access to Python would have prevented us from being able to gain root access

Hardening Against Enumeration on Target 2

- Using nmap we were able to view directories on the target and were able to access sensitive data
- Firewall rules or an IDS would have prevented a successful nmap scan and would have kept the directories protected against enumeration

Hardening Against PHPMailer on Target 2

- The CVE-2016-10033 vulnerability allowed us to execute arbitrary code due to the target running an outdated version of PHPMailer (5.2.16)
- To mitigate this, updating PHPMailer to its current version would remove the possibility of exploit as recent versions of PHPMailer (6.1.6) do not allow arbitrary code execution
- Alternatively, products such as Fortinet's IPS would have prevented this exploit as the malicious actor could not have used a vulnerability exploit
- To install or update PHPMailer:

  apt-get update

  apt-get install libphp-phpmailer

Hardening Against MySql UDF Exploit on Target 2

- By exploiting an outdated MySQL program (5.5.60) we were able to use UDF to escalate ourselves to root and find the final flag
- Current versions of MySQL (8.0) prevent the ability to exploit the UDF library and escalate ourselves to root
- To install or update MySQL:

  apt-get install update

  apt-get install -y wget

  wget https://dev.mysql.com/get/mysql-apt-config_0.8.15-1_all.deb

  dpkg -i mysql-apt-config_0.15-1_all.deb

  apt-get install mysql-community-server

  systemctl enable --now mysql

If there’s anything to take away from this blue team presentation, it’s to UPDATE YOUR SOFTWARE TO PREVENT EXPLOITS

[Start of Network Analysis]