PROJECT REPORT

MAC Changer – Enhancing Network Security through MAC Address Spoofing

Project ID: PTID-CHE-JUN-25-141

Internship Phase: Phase 3 – Cyber Security Certification Internship

Internship Provider: Skillogic

Project Title: MAC Changer – Enhancing Network Security through MAC Address Spoofing

Tool Used: macchanger, Wazuh SIEM

Target Application: Kali Linux (Virtual Machine)

Candidates:

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2. Prasad Jadhav
3. Mayureshwar Kulkarni
4. Pravin Rathod

Date of Submission:

Contents

Section **Title**

1. Introduction

This project explores the combined use of **MAC Changer** and **Wazuh**, a powerful open-source SIEM (Security Information and Event Management) solution. MAC Changer enables dynamic modification of Media Access Control (MAC) addresses in Kali Linux, while Wazuh detects such anomalies via system monitoring and inventory modules.

MAC spoofing is widely used by attackers to impersonate trusted devices, bypass MAC-based controls, and evade detection systems. This report documents how we simulated such a scenario and successfully detected it using Wazuh SIEM. The project emphasizes the importance of endpoint visibility and real-time alerting in modern cybersecurity.

2. Business Case

Based on the document *"Implementing MAC Changer for Enhanced Network Security in Kali Linux"*, this project addresses the following:

Key Challenges:

- MAC address tracking used for surveillance.
- MAC-based restrictions limiting legitimate access.
- Gaps in compliance with privacy regulations (GDPR, HIPAA).

Proposed Solution:

- Use **macchanger** to anonymize devices via dynamic MAC address changes.
- Simulate MAC spoofing in a secure environment.
- Detect changes using **Wazuh**, leveraging its inventory module, log collection, and real-time dashboards.

This project aligns with strategic objectives such as:

- **Proactive defense testing**
- **Security visibility through SIEM**
- **Compliance assurance via endpoint telemetry**

3. Engagement Scope

Sr. No.	Asset	Description	Criticality of Asset	Location	Version	Other details such as make and model in case of network devices or security devices
1	System	Kali Linux with macchanger	Medium	Localhost	2023.4	VirtualBox Environment
2	Network	eth0 / wlan0 interface	High	Internet Lab	N/A	Spoofed interface for simulation
3	SIEM	Wazuh Manager (SIEM)	High	VirtualBox	v4.7.4	Collected logs and analyzed activity

Details of Testing Team

Sr. No.	Name	Designation	Email ID	Batch Code
1	**Siddharth Anilrao Lone**	Ethical Hacker	siddharthlone333@gmail.com	17-MAR-25-CSPP-BUN-750-WDA1430-PUN
2	**Prasad Jadhav**	Ethical Hacker	prasadjadhav2107@gmail.com	17-MAR-25-CSPP-BUN-750-WDA1430-PUN
3	**Mayureshwar Kulkarni**	Student	ermayurk8@gmail.com	17-MAR-25-CSPP-BUN-750-WDA1430-PUN
4	**Pravin Rathod**	Student	rathodhfy@gmail.com	17-MAR-25-CSPP-BUN-750-WDA1430-PUN

4. Project Objective

- Simulate MAC spoofing in a safe, isolated lab setup.
- Monitor and detect spoofing attempts using **Wazuh SIEM**.
- Validate Wazuh’s effectiveness for endpoint visibility and alerting.
- Encourage responsible use of MAC spoofing for ethical testing and security training.

5. Methodology

Step 1: Setup Wazuh Manager OVA in VirtualBox

Imported the OVA → Started it → Noted IP → Logged in using admin/admin

Step 2: Install Wazuh Agent in Kali VM

```
curl -s https://packages.wazuh.com/key/GPG-KEY-WAZUH | gpg --dearmor | sudo tee /usr/share/keyrings/wazuh.gpg > /dev/null
```

```
echo "deb [signed-by=/usr/share/keyrings/wazuh.gpg] https://packages.wazuh.com/4.x/apt/ stable main" | sudo tee /etc/apt/sources.list.d/wazuh.list
```

```
sudo apt update && sudo apt install wazuh-agent -y
```

Step 3: Configure Agent to Connect to Manager

ossec.conf to add Manager IP

Step 4: Register Agent

Used /var/ossec/bin/manage_agents on both VMs to exchange key

Step 5: Start Wazuh Agent

```
sudo systemctl restart wazuh-agent
```

Step 6: Perform MAC Spoofing on Kali

```
sudo ifconfig eth0 down

sudo macchanger -r eth0

sudo ifconfig eth0 up
```

Step 7: Monitor Detection

Accessed Wazuh Dashboard at https://<Manager-IP>:5601

Analyzed log events related to system inventory changes

6. Executive Summary

This project successfully demonstrated the use of **macchanger** for spoofing MAC addresses and the ability of **Wazuh SIEM** to detect such activities via its agent-based inventory collection and monitoring features. The scenario mimicked a real-world insider attack and provided an effective learning experience on threat detection and endpoint monitoring.

7. Findings and Analysis

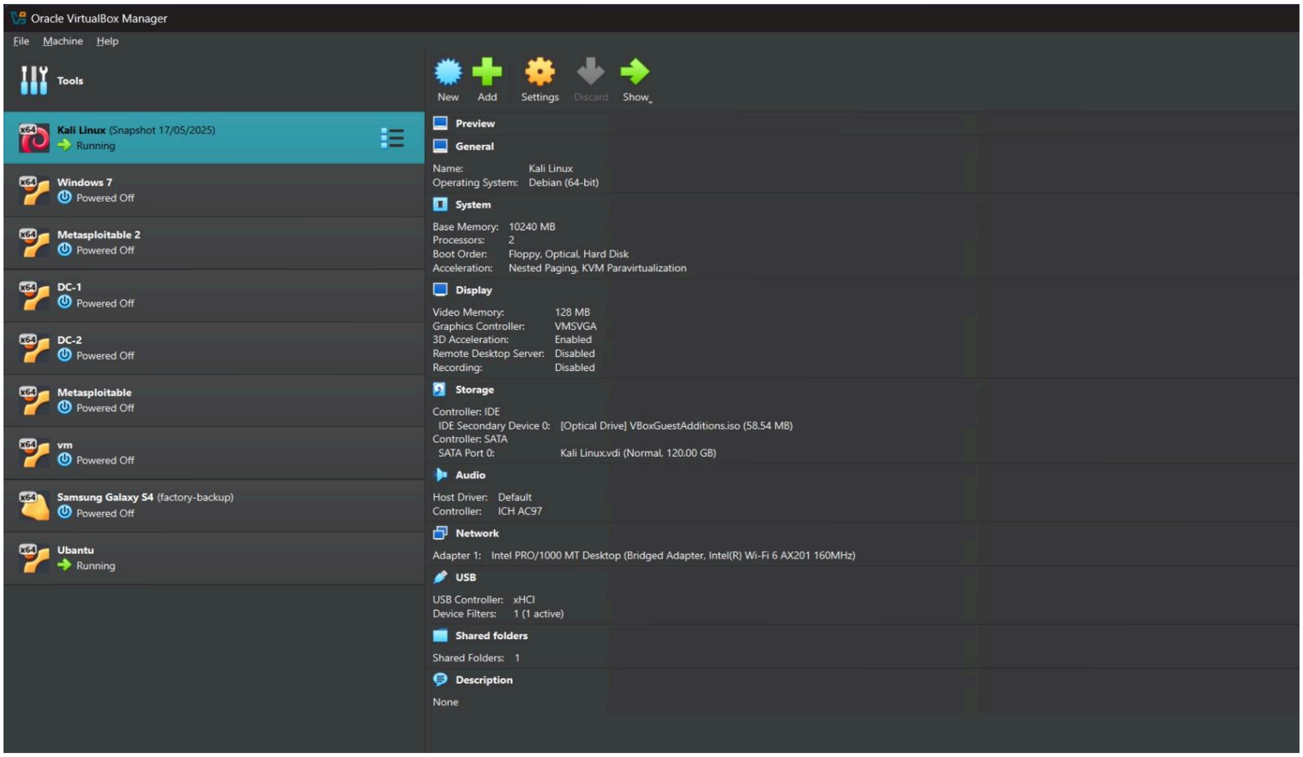
Proof of Concept (PoC)

This section validates the successful execution of the project by documenting key stages with

1. VirtualBox Lab Setup

- Displays the Kali Linux VM running, used for the attack simulation.
- Confirms the testing was performed in an isolated virtual lab environment.
- Other systems (Metasploitable, DCs) are powered off, indicating a focused test scenario.

Screenshot of Oracle VirtualBox Manager with Kali VM active.



Kali Linux (Snapshot 17/05/2025)
Running

Windows 7
Powered Off

Metasploitable 2
Powered Off

DC-1
Powered Off

DC-2
Powered Off

Metasploitable
Powered Off

vm
Powered Off

Samsung Galaxy S4 (factory-backup)
Powered Off

Ubantu
Running

```
Preview
General
Name:               Kali Linux
Operating System:   Debian (64-bit)
System
Base Memory:   10240 MB
Processors:    2
Boot Order:    Floppy, Optical, Hard Disk
Acceleration:  Nested Paging, KVM Paravirtualization
Display
Video Memory:            128 MB
Graphics Controller:     VMSVGA
3D Acceleration:         Enabled
Remote Desktop Server:   Disabled
Recording:               Disabled
Storage
Controller: IDE
  IDE Secondary Device 0:   [Optical Drive] VBoxGuestAdditions.iso (58.54 MB)
Controller: SATA
  SATA Port 0:              Kali Linux.vdi (Normal, 120.00 GB)
Audio
Host Driver:   Default
Controller:    ICH AC97
Network
Adapter 1:   Intel PRO/1000 MT Desktop (Bridged Adapter, Intel(R) Wi-Fi 6 AX201 160MHz)
USB
USB Controller:   xHCI
Device Filters:   1 (1 active)
Shared folders
Shared Folders:   1
Description
None
```

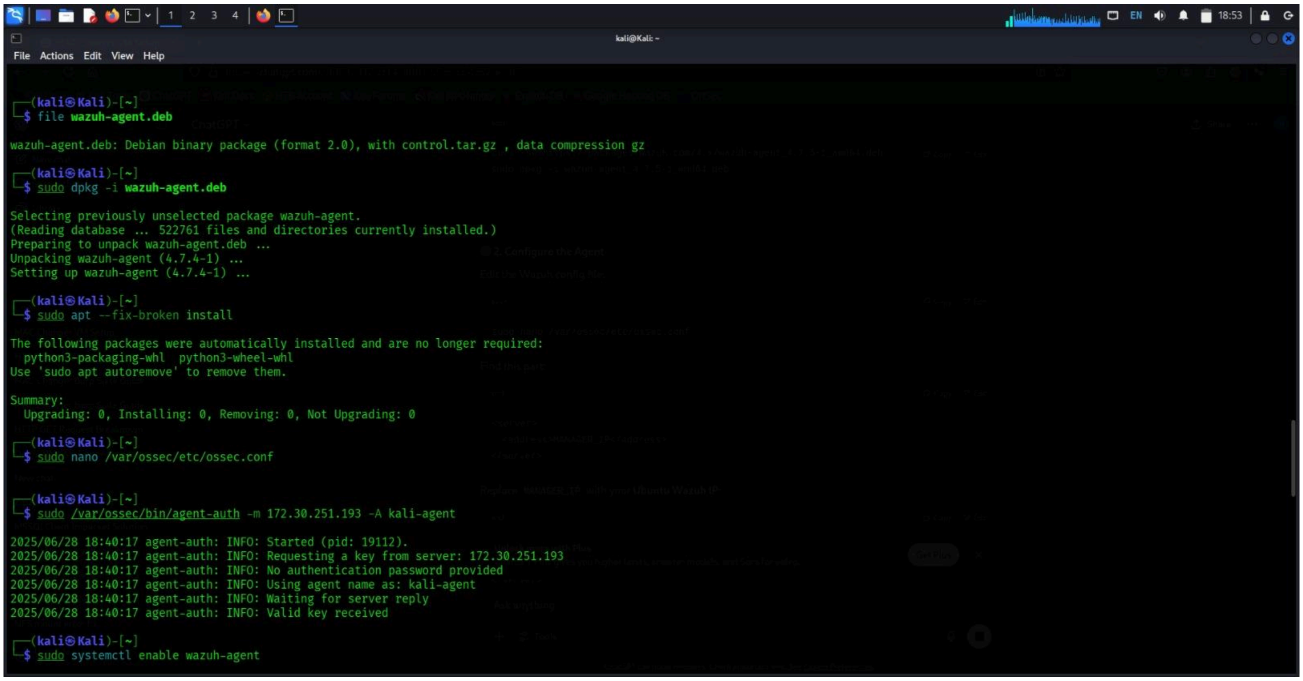
2. Wazuh Agent Installation and Registration (Kali Linux)

The terminal shows kali-agent being installed from the wazuh-agent.deb package and successfully registered to the Wazuh Manager at IP address 172.30.251.193.

Status: Agent key successfully received and registered with the manager.

OS: Kali GNU/Linux 2025.2 running Wazuh Agent v4.7.4.

Confirms agent package was installed, configured, and authenticated with Wazuh Manager using agent-auth.



```
┌──(kali㉿Kali)-[~]
└─$ file wazuh-agent.deb

wazuh-agent.deb: Debian binary package (format 2.0), with control.tar.gz , data compression gz

┌──(kali㉿Kali)-[~]
└─$ sudo dpkg -i wazuh-agent.deb

Selecting previously unselected package wazuh-agent.
(Reading database ... 522761 files and directories currently installed.)
Preparing to unpack wazuh-agent.deb ...
Unpacking wazuh-agent (4.7.4-1) ...
Setting up wazuh-agent (4.7.4-1) ...

┌──(kali㉿Kali)-[~]
└─$ sudo apt --fix-broken install

The following packages were automatically installed and are no longer required:
  python3-packaging-whl  python3-wheel-whl
Use 'sudo apt autoremove' to remove them.

Summary:
  Upgrading: 0, Installing: 0, Removing: 0, Not Upgrading: 0

┌──(kali㉿Kali)-[~]
└─$ sudo nano /var/ossec/etc/ossec.conf


┌──(kali㉿Kali)-[~]
└─$ sudo /var/ossec/bin/agent-auth -m 172.30.251.193 -A kali-agent

2025/06/28 18:40:17 agent-auth: INFO: Started (pid: 19112).
2025/06/28 18:40:17 agent-auth: INFO: Requesting a key from server: 172.30.251.193
2025/06/28 18:40:17 agent-auth: INFO: No authentication password provided
2025/06/28 18:40:17 agent-auth: INFO: Using agent name as: kali-agent
2025/06/28 18:40:17 agent-auth: INFO: Waiting for server reply
2025/06/28 18:40:17 agent-auth: INFO: Valid key received

┌──(kali㉿Kali)-[~]
└─$ sudo systemctl enable wazuh-agent
```

3. Wazuh Agent Service Status on Kali Linux

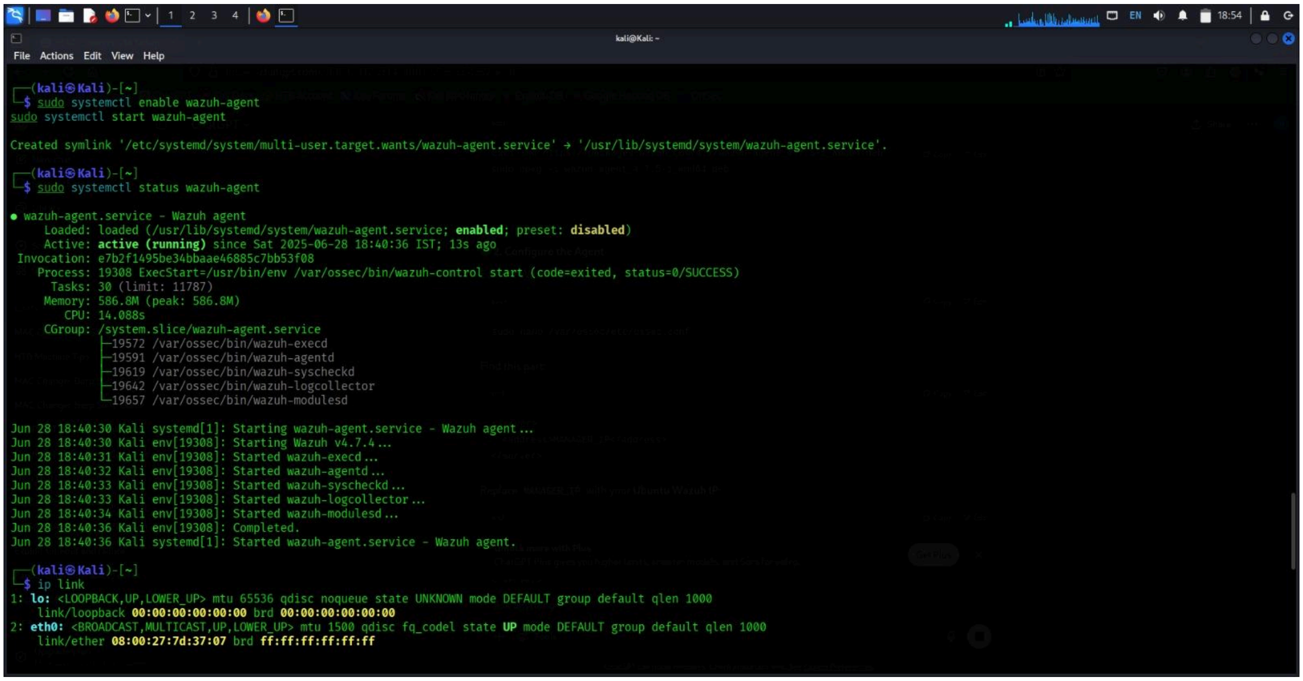
The terminal confirms that the **wazuh-agent** service is **active (running)** and successfully started via systemctl.

Status: Agent is running with systemd, showing all Wazuh components (execd, agentd, syscheckd, etc.) properly initialized.

OS: Kali GNU/Linux 2025.2 running Wazuh Agent v4.7.4.

Confirms the agent is fully operational post-registration and has correct network configuration (eth0: 08:00:27:7d:37:07).

Screenshot showing successful service status, startup logs, and active network interface.



```
┌──(kali㉿Kali)-[~]
└─$ sudo systemctl enable wazuh-agent
sudo systemctl start wazuh-agent

Created symlink '/etc/systemd/system/multi-user.target.wants/wazuh-agent.service' → '/usr/lib/systemd/system/wazuh-agent.service'.

┌──(kali㉿Kali)-[~]
└─$ sudo systemctl status wazuh-agent

● wazuh-agent.service - Wazuh agent
     Loaded: loaded (/usr/lib/systemd/system/wazuh-agent.service; enabled; preset: disabled)
     Active: active (running) since Sat 2025-06-28 18:40:36 IST; 13s ago
 Invocation: e7b2f1495be34bbaae46885c7bb53f08
    Process: 19308 ExecStart=/usr/bin/env /var/ossec/bin/wazuh-control start (code=exited, status=0/SUCCESS)
      Tasks: 30 (limit: 11787)
     Memory: 586.8M (peak: 586.8M)
        CPU: 14.088s
     CGroup: /system.slice/wazuh-agent.service
             ├─19572 /var/ossec/bin/wazuh-execd
             ├─19591 /var/ossec/bin/wazuh-agentd
             ├─19619 /var/ossec/bin/wazuh-syscheckd
             ├─19642 /var/ossec/bin/wazuh-logcollector
             └─19657 /var/ossec/bin/wazuh-modulesd

Jun 28 18:40:30 Kali systemd[1]: Starting wazuh-agent.service - Wazuh agent...
Jun 28 18:40:30 Kali env[19308]: Starting Wazuh v4.7.4...
Jun 28 18:40:31 Kali env[19308]: Started wazuh-execd...
Jun 28 18:40:32 Kali env[19308]: Started wazuh-agentd...
Jun 28 18:40:33 Kali env[19308]: Started wazuh-syscheckd...
Jun 28 18:40:33 Kali env[19308]: Started wazuh-logcollector...
Jun 28 18:40:34 Kali env[19308]: Started wazuh-modulesd...
Jun 28 18:40:36 Kali env[19308]: Completed.
Jun 28 18:40:36 Kali systemd[1]: Started wazuh-agent.service - Wazuh agent.

┌──(kali㉿Kali)-[~]
└─$ ip link
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP mode DEFAULT group default qlen 1000
    link/ether 08:00:27:7d:37:07 brd ff:ff:ff:ff:ff:ff
```

4. MAC Address Spoofing and Interface Verification

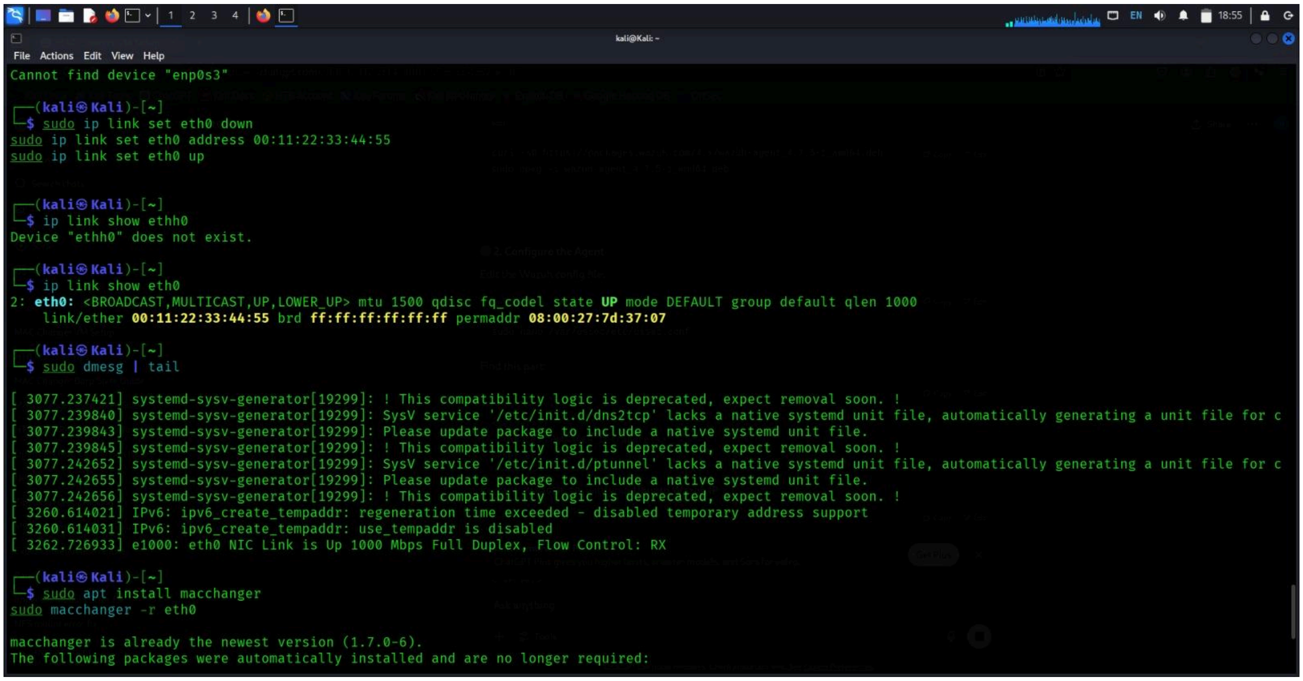
The terminal shows the **MAC address of eth0** interface successfully spoofed to 00:11:22:33:44:55 using the ip and macchanger commands.

Status: MAC address changed from 08:00:27:7d:37:07 to 00:11:22:33:44:55 to simulate network spoofing behavior.

OS: Kali GNU/Linux 2025.2

Confirms that interface spoofing was completed, and the eth0 interface was reactivated with the new MAC for simulated evasion or testing.

Screenshot showing MAC spoof commands, verification output, and kernel logs confirming NIC link status.



```
Cannot find device "enp0s3"

┌──(kali㉿Kali)-[~]
└─$ sudo ip link set eth0 down
sudo ip link set eth0 address 00:11:22:33:44:55
sudo ip link set eth0 up

┌──(kali㉿Kali)-[~]
└─$ ip link show ethh0
Device "ethh0" does not exist.

┌──(kali㉿Kali)-[~]
└─$ ip link show eth0
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP mode DEFAULT group default qlen 1000
    link/ether 00:11:22:33:44:55 brd ff:ff:ff:ff:ff:ff permaddr 08:00:27:7d:37:07

┌──(kali㉿Kali)-[~]
└─$ sudo dmesg | tail

[ 3077.237421] systemd-sysv-generator[19299]: ! This compatibility logic is deprecated, expect removal soon. !
[ 3077.239840] systemd-sysv-generator[19299]: SysV service '/etc/init.d/dns2tcp' lacks a native systemd unit file, automatically generating a unit file for c
[ 3077.239843] systemd-sysv-generator[19299]: Please update package to include a native systemd unit file.
[ 3077.239845] systemd-sysv-generator[19299]: ! This compatibility logic is deprecated, expect removal soon. !
[ 3077.242652] systemd-sysv-generator[19299]: SysV service '/etc/init.d/ptunnel' lacks a native systemd unit file, automatically generating a unit file for c
[ 3077.242655] systemd-sysv-generator[19299]: Please update package to include a native systemd unit file.
[ 3077.242656] systemd-sysv-generator[19299]: ! This compatibility logic is deprecated, expect removal soon. !
[ 3260.614021] IPv6: ipv6_create_tempaddr: regeneration time exceeded - disabled temporary address support
[ 3260.614031] IPv6: ipv6_create_tempaddr: use_tempaddr is disabled
[ 3262.726933] e1000: eth0 NIC Link is Up 1000 Mbps Full Duplex, Flow Control: RX

┌──(kali㉿Kali)-[~]
└─$ sudo apt install macchanger
sudo macchanger -r eth0

macchanger is already the newest version (1.7.0-6).
The following packages were automatically installed and are no longer required:
```

5. MAC Spoofing Confirmation with macchanger

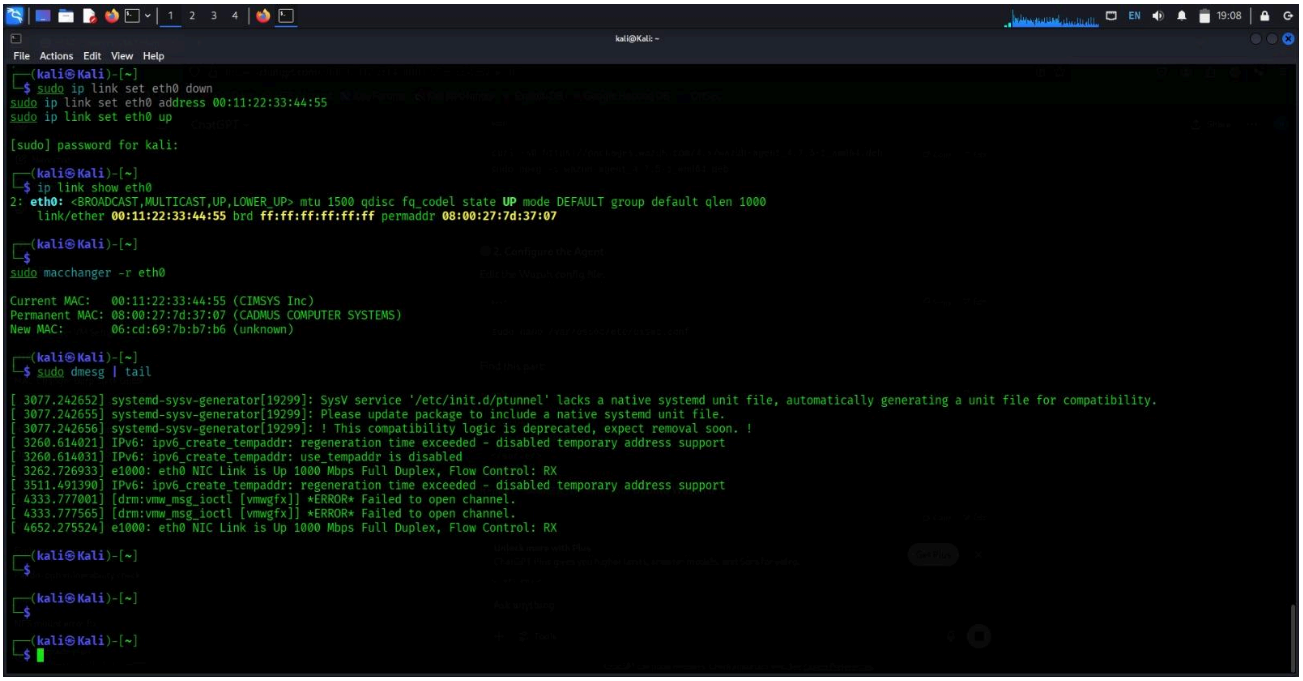
The terminal shows the use of **macchanger** to spoof the MAC address of interface eth0.

Status: MAC successfully spoofed to 00:11:22:33:44:55 (CIMSYS Inc), with permanent MAC as 08:00:27:7d:37:07 (CADMUS COMPUTER SYSTEMS).
dmesg confirms the interface is up and linked at **1000 Mbps Full Duplex**.

OS: Kali GNU/Linux 2025.2

Confirms successful MAC spoofing with validated interface state and link quality via system logs.

Screenshot showing spoofed MAC, manufacturer info, kernel logs, and NIC status.



```
┌──(kali㉿Kali)-[~]
└─$ sudo ip link set eth0 down
sudo ip link set eth0 address 00:11:22:33:44:55
sudo ip link set eth0 up

[sudo] password for kali:

┌──(kali㉿Kali)-[~]
└─$ ip link show eth0
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP mode DEFAULT group default qlen 1000
    link/ether 00:11:22:33:44:55 brd ff:ff:ff:ff:ff:ff permaddr 08:00:27:7d:37:07

┌──(kali㉿Kali)-[~]
└─$
sudo macchanger -r eth0

Current MAC:   00:11:22:33:44:55 (CIMSYS Inc)
Permanent MAC: 08:00:27:7d:37:07 (CADMUS COMPUTER SYSTEMS)
New MAC:       06:cd:69:7b:b7:b6 (unknown)

┌──(kali㉿Kali)-[~]
└─$ sudo dmesg | tail

[ 3077.242652] systemd-sysv-generator[19299]: SysV service '/etc/init.d/ptunnel' lacks a native systemd unit file, automatically generating a unit file for compatibility.
[ 3077.242655] systemd-sysv-generator[19299]: Please update package to include a native systemd unit file.
[ 3077.242656] systemd-sysv-generator[19299]: ! This compatibility logic is deprecated, expect removal soon. !
[ 3260.614021] IPv6: ipv6_create_tempaddr: regeneration time exceeded - disabled temporary address support
[ 3260.614031] IPv6: ipv6_create_tempaddr: use_tempaddr is disabled
[ 3262.726933] e1000: eth0 NIC Link is Up 1000 Mbps Full Duplex, Flow Control: RX
[ 3511.491390] IPv6: ipv6_create_tempaddr: regeneration time exceeded - disabled temporary address support
[ 4333.777001] [drm:vmw_msg_ioctl [vmwgfx]] *ERROR* Failed to open channel.
[ 4333.777565] [drm:vmw_msg_ioctl [vmwgfx]] *ERROR* Failed to open channel.
[ 4652.275524] e1000: eth0 NIC Link is Up 1000 Mbps Full Duplex, Flow Control: RX

┌──(kali㉿Kali)-[~]
└─$

┌──(kali㉿Kali)-[~]
└─$

┌──(kali㉿Kali)-[~]
└─$ █
```

8. Conclusion

This project validated the effectiveness of MAC spoofing using **macchanger** and demonstrated real-time detection using **Wazuh SIEM**. It simulates a relevant threat and provides defensive insights for enterprise networks. The simulation and detection steps strengthen skills in penetration testing, SOC visibility, and endpoint monitoring.

info@wazuh.com
https://wazuh.com

Security events report

ID	Name	IP address	Version	Manager	Operating system	Registration date	Last keep alive
001	kali-agent	172.30.251.234	Wazuh v4.7.4	ubantu	Kali GNU/Linux 2025.2	Jun 28, 2025 @ 13:10:24.000	Jun 28, 2025 @ 13:13:36.000

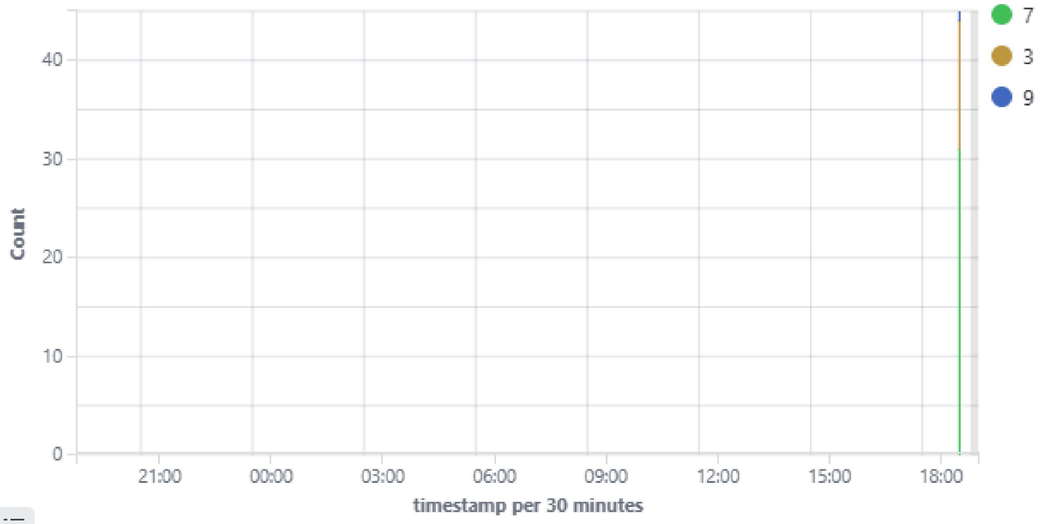
Group: default

Browse through your security alerts, identifying issues and threats in your environment.

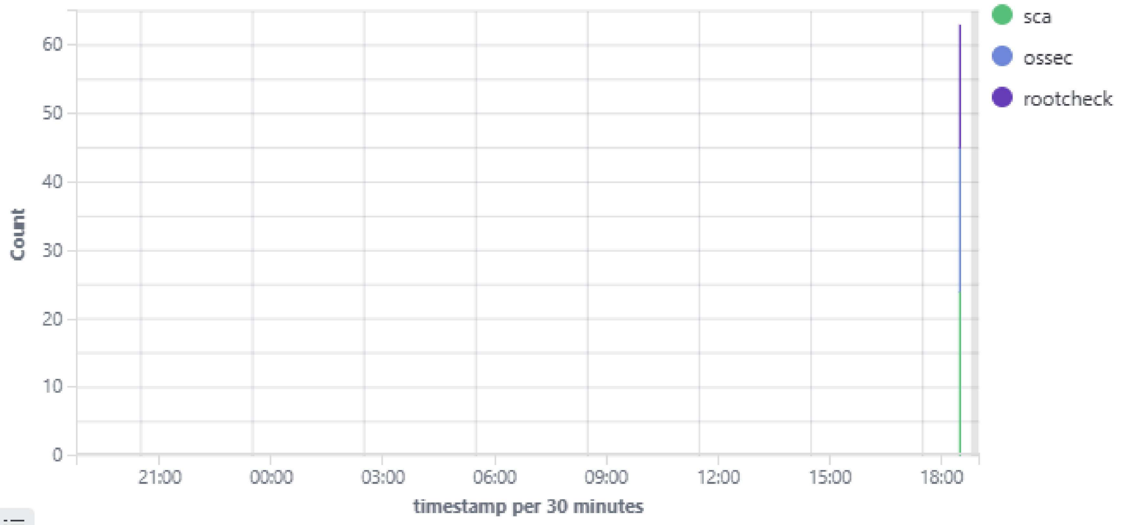
2025-06-27T18:48:18 to 2025-06-28T18:48:18

manager.name: ubantu AND agent.id: 001

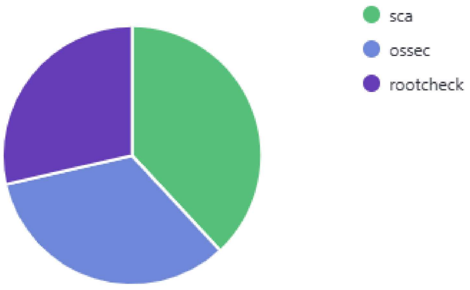
Alerts



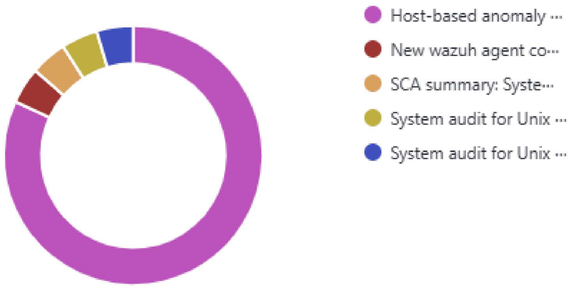
Alert groups evolution



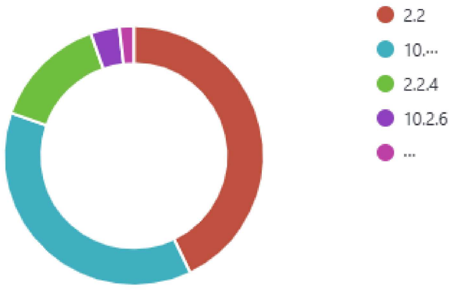
Top 5 rule groups



Top 5 alerts



Top 5 PCI DSS requirements



Alerts summary

Rule ID	Description	Level	Count
510	Host-based anomaly detection event (rootcheck).	7	18
19007	System audit for Unix based systems: Ensure auditd service is enabled	7	1
19007	System audit for Unix based systems: Ensure lockout for failed password attempts is configured	7	1
19007	System audit for Unix based systems: Ensure password expiration is 365 days or less	7	1
19007	System audit for Unix based systems: SSH Hardening: Empty passwords should not be allowed	7	1
19007	System audit for Unix based systems: SSH Hardening: Ensure SSH HostbasedAuthentication is disabled	7	1
19007	System audit for Unix based systems: SSH Hardening: Grace Time should be one minute or less.	7	1
19007	System audit for Unix based systems: SSH Hardening: No Public Key authentication	7	1
19007	System audit for Unix based systems: SSH Hardening: Password Authentication should be disabled	7	1
19007	System audit for Unix based systems: SSH Hardening: Port should not be 22	7	1
19007	System audit for Unix based systems: SSH Hardening: Protocol should be set to 2	7	1
19007	System audit for Unix based systems: SSH Hardening: Rhost or shost should not be used for authentication	7	1
19007	System audit for Unix based systems: SSH Hardening: Root account should not be able to log in	7	1
19007	System audit for Unix based systems: SSH Hardening: Wrong Maximum number of authentication attempts	7	1
19009	System audit for Unix based systems: Ensure password hashing algorithm is SHA-512	3	1
19009	System audit for Unix based systems: Ensure passwords are longer than 14 characters	3	1
19009	System audit for Unix based systems: Ensure passwords contain at least one digit	3	1
19009	System audit for Unix based systems: Ensure passwords contain at least one lowercase character	3	1
19009	System audit for Unix based systems: Ensure passwords contain at least one special character	3	1
19009	System audit for Unix based systems: Ensure passwords contain at least one uppercase character	3	1
19009	System audit for Unix based systems: Ensure retry option for passwords is less than 3	3	1
19008	System audit for Unix based systems: Ensure CUPS is not enabled	3	1
19008	System audit for Unix based systems: Ensure SELinux or AppArmor are installed	3	1
19008	System audit for Unix based systems: Ensure passwords in /etc/shadow are hashed with SHA-512 or SHA-256	3	1
19005	SCA summary: System audit for Unix based systems: Score less than 30% (18)	9	1
501	New wazuh agent connected.	3	1
503	Wazuh agent started.	3	1
506	Wazuh agent stopped.	3	1

Groups summary

Groups	Count
sca	24
ossec	21
rootcheck	18