Task:

***"Configuring Firewalls and Intrusion Detection Systems".***

Provided by:

***"Digital Empowerment Networks".***

Done by:

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## Objective:

Protect the network by setting up firewalls and IDS.

## Description:

Implement firewalls and intrusion detection systems to monitor and control incoming and outgoing network traffic. Detect and prevent unauthorized access and attacks.

## Selecting appropriate firewall and IDS solutions.

**Firewall:** ufw (Uncomplicated Firewall).

**IDS:** suricata.

### Configuring firewall rules and policies.

### Firewall Rules:

- Only accept necessary traffic and deny other traffic that is not necessary.
- Allow and Deny Traffic on specific port depending on your needs i.e. HTTP/HTTPS outgoing traffic on Port 80 and 443 if you had set up your webserver or if you wanted to access you must accept incoming HTTP/HTTPS traffic. Also, you can set up rules to accept or deny traffic from specific sources or destination ports.
- Allow and Deny Traffic from specific IP addresses. You can also set rules to accept only traffic from specific IP on specific port.
- Limit incoming connection requests to save yourself for DOS Attack or to limit number of SSH login attempts.
- Allow or Deny traffic for VPN connections to allow remote access securely.
- Allow or Deny traffic from specific services like FTP, SSH, IMAP.
- Enable logging to monitor and analyze blocked or allowed traffic.
- You can make more rules on your specific needs.

### Firewall Policies:

**Allow Established and Related Connections:**

- **Policy**: Deny all traffic by default unless explicitly allowed.

- **Purpose**: Minimizes exposure by ensuring that only specified traffic is permitted.
- **Implementation**: Set the default incoming policy to deny.

**Allow Established and Related Connections:**

- **Policy**: Allow traffic related to established connections.
- **Purpose**: Ensures that ongoing sessions can continue without interruption.
- **Implementation**: Typically managed automatically by many firewalls but can be explicitly configured if needed.

**Least Privilege Access:**

- **Policy**: Allow only the minimum required access for services and users.
- **Purpose**: Reduces the attack surface by limiting exposure to only necessary services.
- **Implementation**: Define rules for specific services and restrict access to known, trusted IP addresses.

**IP Whitelisting:**

- **Policy**: Allow traffic only from specific, trusted IP addresses.
- **Purpose**: Restricts access to services from known sources.
- **Implementation**: Configure rules to allow traffic from specified IP addresses only.

**Network Segmentation:**

- **Policy**: Create different network segments and control traffic between them.
- **Purpose**: Limits the impact of a security breach by isolating different parts of the network.
- **Implementation**: Define rules to control traffic between network segments.

**Rate Limiting:**

- **Policy**: Limit the rate of incoming connections to prevent abuse.

- **Purpose**: Mitigates denial-of-service (DoS) attacks and reduces load on services.
- **Implementation**: Use rate-limiting features to restrict connection attempts.

**Logging and Monitoring:**

- **Policy**: Enable logging of firewall activity and monitor logs regularly.
- **Purpose**: Provides visibility into traffic patterns and helps detect unauthorized access.
- **Implementation**: Enable and review firewall logs.

**Application-Level Rules:**

- **Policy**: Create rules based on specific applications rather than just ports.
- **Purpose**: Allows more granular control over traffic based on application requirements.
- **Implementation**: Define rules for services by name or application

**Secure Management Access:**

- **Policy**: Restrict access to firewall management interfaces.
- **Purpose**: Protects the firewall from unauthorized changes and access.
- **Implementation**: Limit management access to specific IP addresses and use strong authentication.

**Policy for External and Internal Traffic:**

- **Policy**: Differentiate rules for internal (within the organization) and external (internet) traffic.
- **Purpose**: Ensures appropriate controls for different types of network traffic.
- **Implementation**: Set specific rules for traffic based on its origin.

**Regular Rule Reviews and Updates:**

- **Policy**: Regularly review and update firewall rules and policies.
- **Purpose**: Adapts to changing network environments and emerging threats.

- **Implementation**: Schedule periodic reviews and adjust rules as necessary.

**Backup and Recovery:**

- **Policy**: Regularly back up firewall configurations and have a recovery plan in place.
- **Purpose**: Ensures quick restoration of configurations in case of failure or misconfiguration.
- **Implementation**: Save backup copies of firewall configurations and test recovery procedures.

**Practices:**

- Review and update Firewall rules daily.
- Regularly Backup your firewall configuration to avoid data loss and Facilite recovery. Document firewall rules and policies.
- Integrate it with IDS to detect and remove malicious files or traffic that bypass firewall rules.

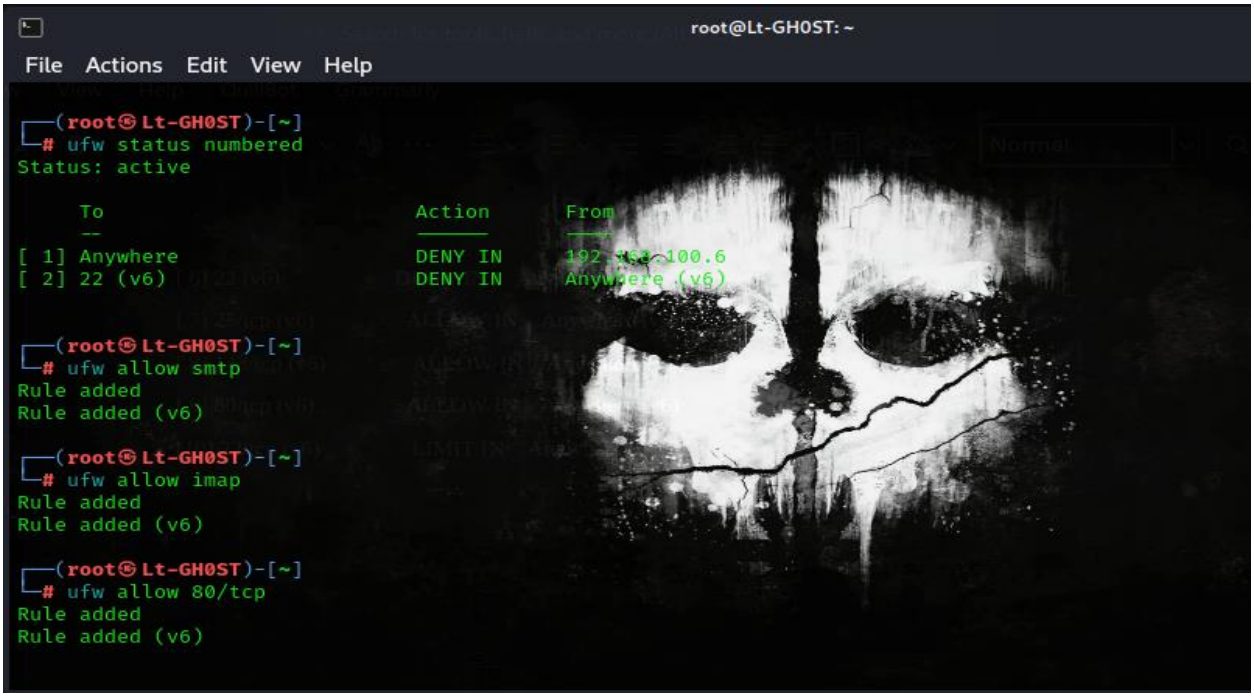
**Linux commands that I run in my terminal for setting up Rules of Firewall:**

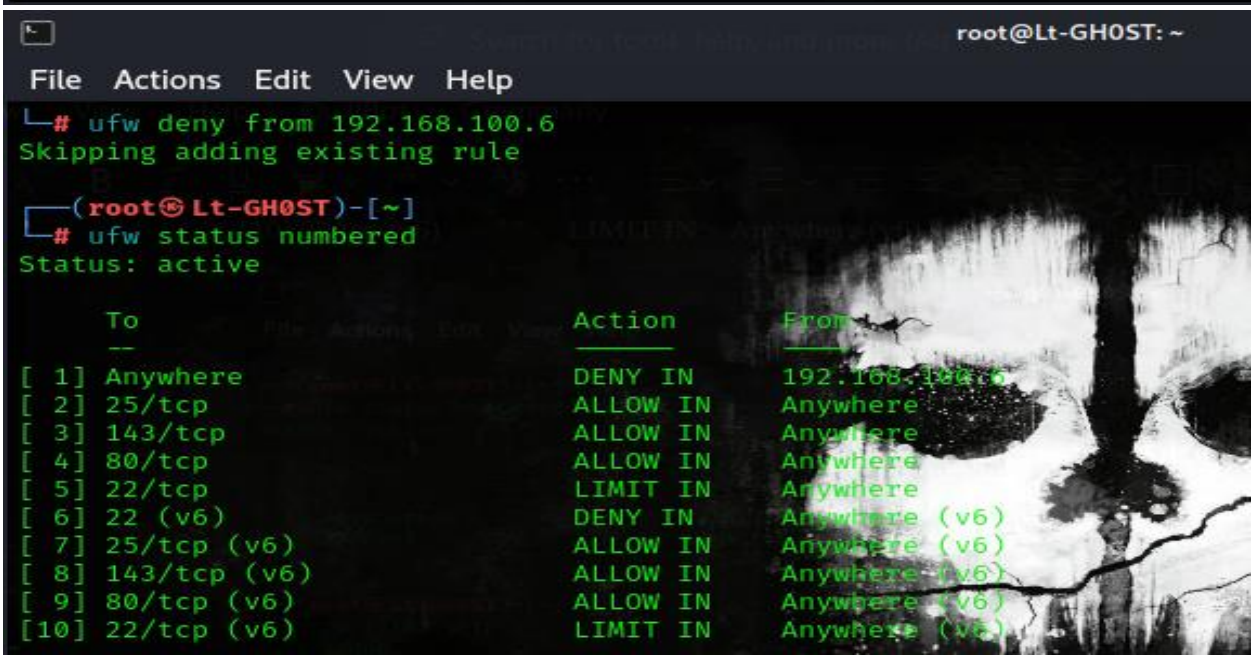
```
┌──(root㉿Lt-GH0ST)-[~]
└─# ufw status numbered
Status: active
     To                         Action      From
     --                         ------      ----
[ 1] Anywhere                   DENY IN     192.168.100.6
[ 2] 22 (v6)                    DENY IN     Anywhere (v6)


┌──(root㉿Lt-GH0ST)-[~]
└─# ufw allow smtp
Rule added
Rule added (v6)
```

```
┌──(root㉿Lt-GH0ST)-[~]
└─# ufw allow imap
Rule added
Rule added (v6)
┌──(root㉿Lt-GH0ST)-[~]
└─# ufw allow 80/tcp
Rule added
Rule added (v6)
┌──(root㉿Lt-GH0ST)-[~]
└─# ufw limit 22/tcp
Rule added
Rule added (v6)
┌──(root㉿Lt-GH0ST)-[~]
└─# ufw deny from 192.168.100.6
Skipping adding existing rule
┌──(root㉿Lt-GH0ST)-[~]
└─# ufw status numbered
Status: active
     To                         Action      From
     --                         ------      ----
[ 1] Anywhere                   DENY IN     192.168.100.6
[ 2] 25/tcp                     ALLOW IN    Anywhere
[ 3] 143/tcp                    ALLOW IN    Anywhere
[ 4] 80/tcp                     ALLOW IN    Anywhere
[ 5] 22/tcp                     LIMIT IN    Anywhere
[ 6] 22 (v6)                    DENY IN     Anywhere (v6)
[ 7] 25/tcp (v6)                ALLOW IN    Anywhere (v6)
[ 8] 143/tcp (v6)               ALLOW IN    Anywhere (v6)
[ 9] 80/tcp (v6)                ALLOW IN    Anywhere (v6)
```

[10] 22/tcp (v6)  LIMIT IN  Anywhere (v6)



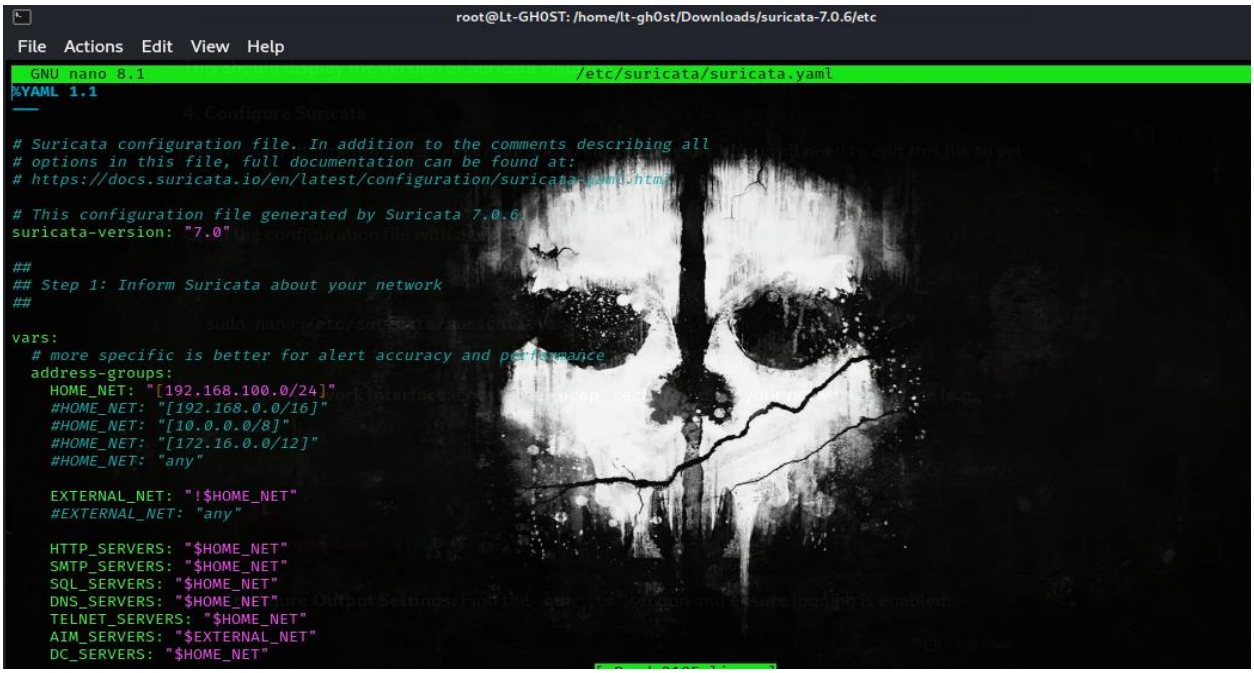




## Setting up IDS to monitor network traffic:

I Successfully Downloaded suricata.

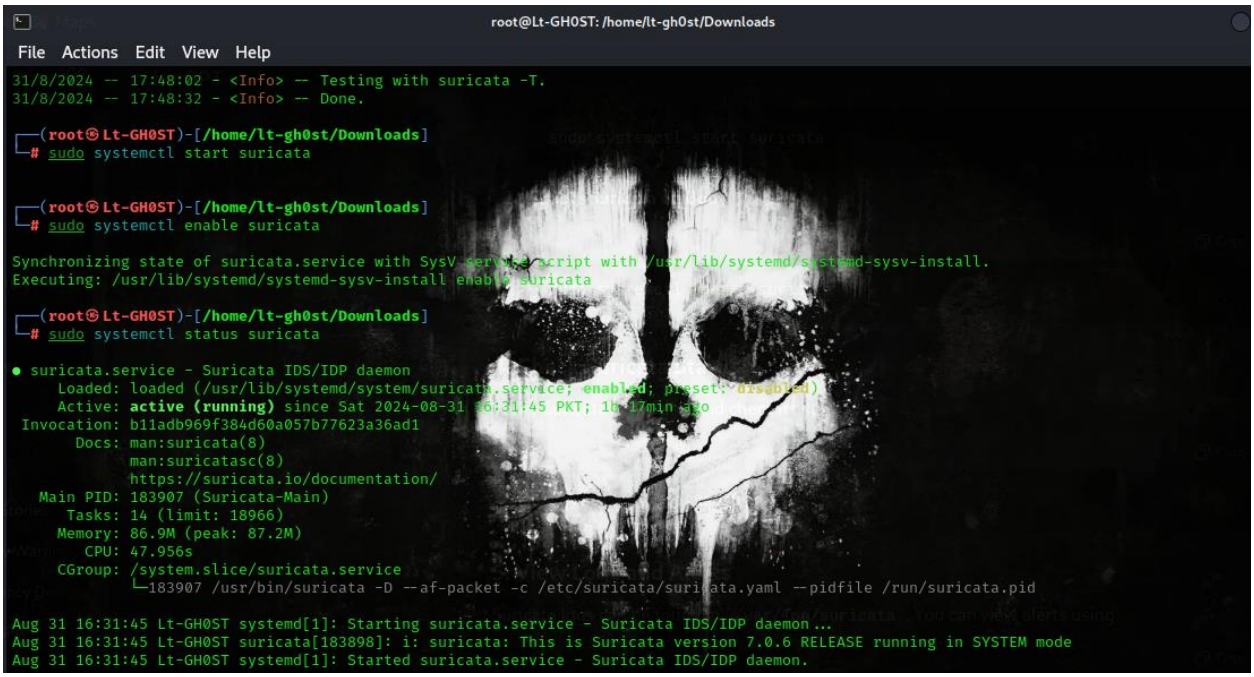
Using: sudo apt install suricata.

Let's configure it.





Suricata is running and enabled as we can see in the screenshot below.



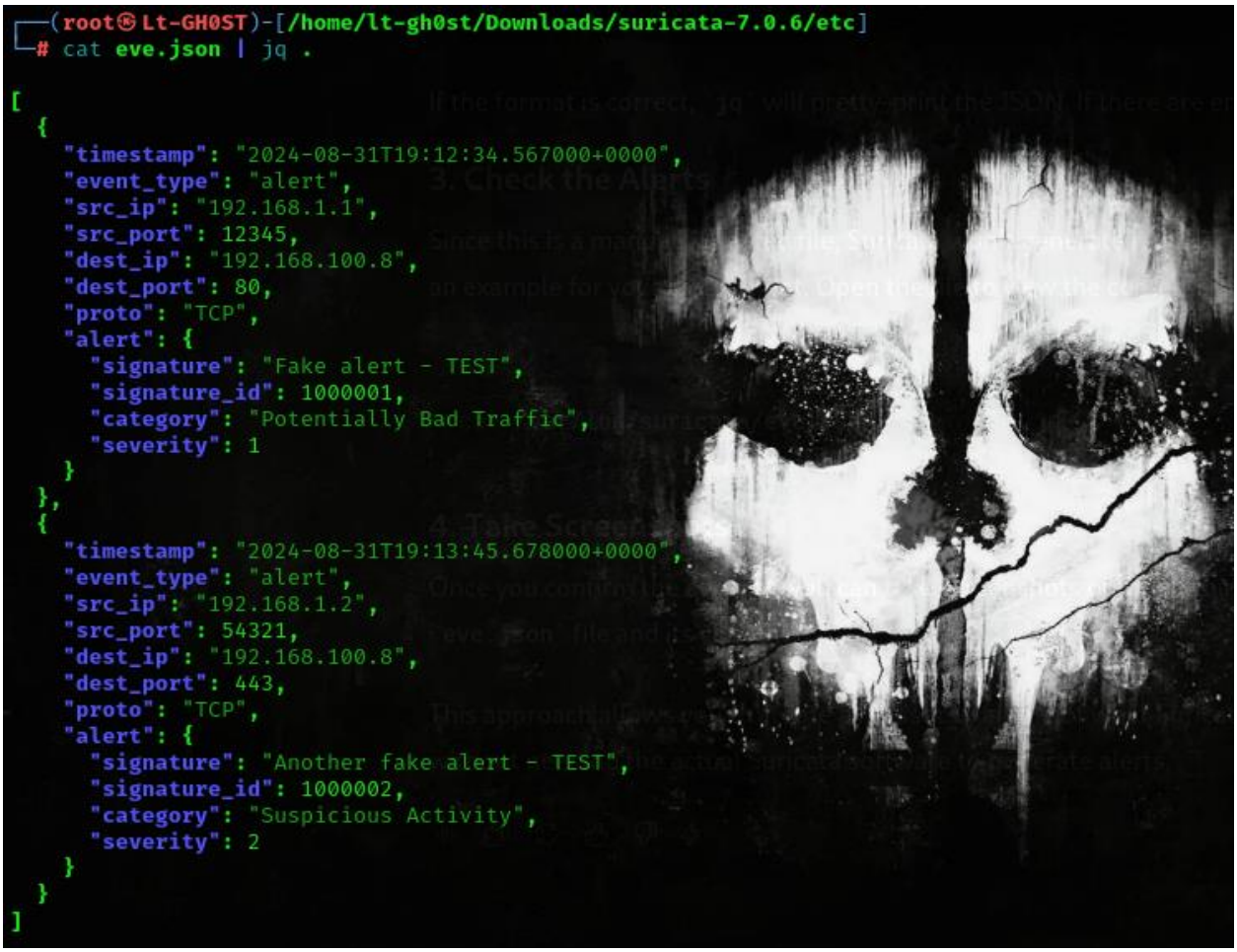

**To See alerts in Suricata:**

Use this command to open Suricata configuration and set up alert's methods.


My file type is eve.json .

Use tail, less or cat command to see its content like

sudo tail -f /var/log/suricata/eve.json




**Best practices for IDs:**

## Choose the Right IDS Type:

- **Network-Based IDS (NIDS):** Monitors network traffic for suspicious activity.
- **Host-Based IDS (HIDS):** Monitors and analyzes the internals of a computing system.

## Proper Installation and Configuration:

- **Placement:** Install IDS at strategic points in your network, such as the perimeter or key segments.
- **Configuration:** Tailor the IDS rules and settings to match your network environment and security policies.

### Regular Updates:

- **Signature Updates:** Ensure that IDS signature databases are regularly updated to recognize the latest threats.
- **Software Updates:** Keep the IDS software itself up-to-date to benefit from new features, improvements, and security patches.

### Fine-Tune Rules and Signatures:

- **Custom Rules:** Create and refine custom rules to minimize false positives and enhance detection capabilities.
- **Baseline Normal Activity:** Understand normal network and system behavior to adjust IDS rules and thresholds accordingly.

### Integration with Other Security Tools:

- **SIEM Integration:** Integrate IDS with Security Information and Event Management (SIEM) systems for centralized logging, analysis, and correlation of security events.
- **Firewall and IPS:** Coordinate IDS with firewalls and Intrusion Prevention Systems (IPS) for a layered security approach.

### Monitoring and Analysis:

- **Real-Time Monitoring:** Continuously monitor alerts and logs to quickly detect and respond to potential threats.
- **Incident Analysis:** Regularly review and analyze detected incidents to improve detection rules and response strategies.

## Performance Considerations:

- **Resource Management:** Ensure the IDS has adequate resources (CPU, memory) to handle the volume of traffic and data it needs to process.
- **Network Impact:** Configure the IDS to minimize its impact on network performance.

## Documentation and Reporting:

- **Alert Documentation:** Document all alerts, incidents, and responses for future reference and analysis.
- **Regular Reports:** Generate and review regular reports on IDS activity, trends, and incident statistics.

## Training and Awareness:

- **Staff Training:** Train IT and security staff on how to use the IDS effectively, interpret alerts, and respond to incidents.
- **Awareness Programs:** Educate users and stakeholders about security best practices and the role of the IDS.

## Testing and Validation:

- **Regular Testing:** Periodically test and validate the IDS configuration and rules to ensure they are effective and not causing unintended issues.
- **Simulation Exercises:** Conduct simulation exercises to evaluate the IDS's response to different attack scenarios.

## Scalability and Flexibility:

- **Future Growth:** Ensure the IDS can scale with network growth and adapt to new types of threats.
- **Flexible Configuration:** Use a modular approach to easily update and adjust IDS configurations as needed.