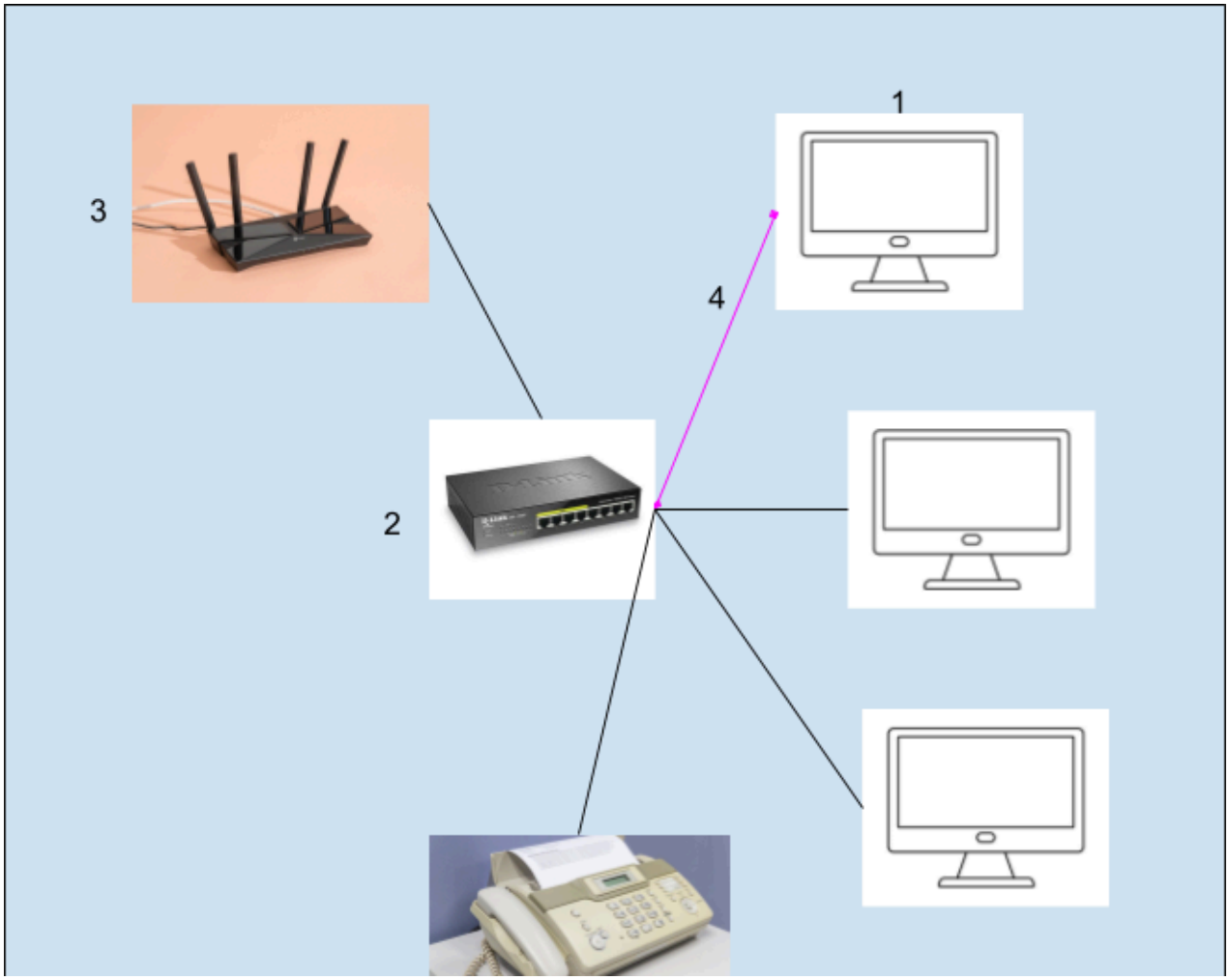
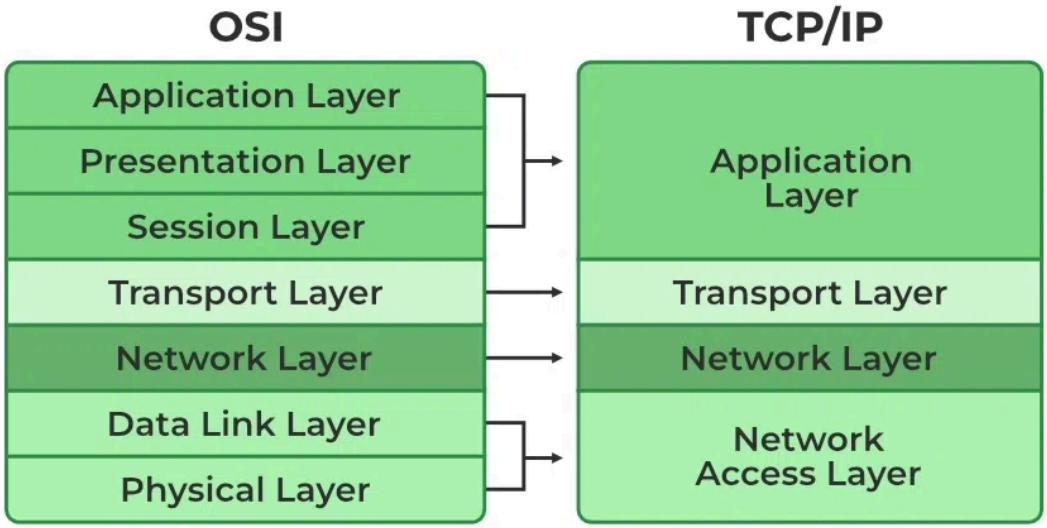


LAN Web Network -

This type of typology restricts operations to the Local Area Network though a centralized hub, in this case, its a network switch. Throught this network switch, an administrator the ability to enforce strict authentication and authorization of any network traffic that might come through the switch. It also allows the network to easily accommodate additional devices with minimal disruption since the devices cannot access each other directly. This also serves as a safety measure as any communication from devices within and outside of the network would have to go throught the network switch and its subsequent network rules.



Design Network Protocols and Architectures -
TCI/IP Has 4 layers - Application, transport, and network, and network access layer. Number one is the network switch and is incharge of the lowest layer, which is responsible for the physical transmission of data over the network. It handles how devices connect to the physical network and defines protocols like Ethernet or Wi-Fi. Number two is the router, which is responsible of the transport layer that does the logical addressing and routing data between devices on different networks.This includes IP address asisgnment to devices, packet fragmentation and reassembly, and defines protocols like IPv4, IPv6, and ICMP. Number three is the computer, which handles the network layer as it ensures the reliable or unreliable delivery of data between applications on devices. Lastly, number 4 is the actual network wires connecting the devices to the network itself. THis counds as the Network access layer that is in charge of handling communication between applications,and providing protocols and interfaces for data exchange.

Implement Network Security Fundamentals-

Firewall Rule Implementation

Objective:

To block unauthorized access to a specific port (Port 22 - SSH) from external sources while allowing internal communication.

Configuration:

- **Firewall Used**: pfSense
- **Rule Description**: Block all inbound traffic on port 22 from external IP addresses to prevent unauthorized SSH access.
- **Source**: `ANY (0.0.0.0/0)`
- **Destination**: `192.168.1.10` (Internal server IP)

- **Protocol**: TCP
- **Port**: 22
- **Action**: Block

Steps:

1. Accessed the pfSense web interface.
2. Navigated to **Firewall Rules** > **WAN**.
3. Created a new rule with the following:
    - **Action**: Block.
    - **Source**: Any.
    - **Destination**: Internal server (192.168.1.10).
    - **Protocol**: TCP.
    - **Port Range**: 22.
4. Saved and applied the rule.

Intrusion Detection System (IDS) Configuration

Objective:

To detect port scanning attempts from external attackers using Snort.

Configuration:

- **IDS Tool**: Snort
- **Rule Description**: Detect and log TCP SYN packets from a single IP to multiple ports within a short timeframe.
- **Rule**: `alert tcp any any -> any any (msg:"Port scan detected"; flags:S; threshold:type both, track by_src, count 10, seconds 10; sid:1000001; rev:1;)`

Steps:

1. Installed and configured Snort on a server running Ubuntu.
2. Created a custom rule in Snort to detect port scanning.
3. Enabled the rule and restarted Snort for the configuration to take effect.

Evidence:

Below is an example log entry generated by Snort:

yaml
CopyEdit

```
[**] [1:1000001:1] Port scan detected [**]
[Priority: 3]
```

```
Timestamp: 2025-01-27 10:15:30
Source IP: 203.0.113.45
Destination IP: 192.168.1.10
Ports Scanned: 22, 80, 443, 8080
```

Impact:

- Successfully detected and logged a port scanning event.

Intrusion Prevention System (IPS) Configuration

Objective:

To prevent brute force login attempts targeting an internal web server using Suricata.

Configuration:

- **IPS Tool**: Suricata
- **Rule Description**: Block IP addresses with more than 5 failed login attempts within 1 minute.
- **Rule**: `drop tcp any any -> 192.168.1.10 80 (msg:"Brute force login attempt detected"; flow:to_server,established; content:"POST"; http_client_body; content:"login"; threshold:type both, track by_src, count 5, seconds 60; sid:2000001; rev:1;)`

Steps:

1. Installed Suricata on the same server as Snort.
2. Configured the rule to block traffic after repeated failed login attempts.
3. Verified the functionality by simulating failed login attempts using a testing tool.

Evidence:

Below is a log entry showing the blocked event:

yaml
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```
[**] [1:2000001:1] Brute force login attempt detected [**]
[Priority: 2]
Timestamp: 2025-01-27 10:30:15
Source IP: 203.0.113.55
Destination IP: 192.168.1.10
Blocked: Yes
```

Impact:

- Successfully blocked the IP address after detecting malicious activity.
- Prevented further brute force attempts.

Example of Detected Event
Event Description:
A port scan followed by a brute force attack was detected and mitigated.

Details:
Detected by IDS:

Snort detected a port scan originating from 203.0.113.45 at 10:15:30.
Logged the event with details on ports scanned.
Blocked by IPS:

Suricata detected multiple failed login attempts from the same source IP (203.0.113.55) at 10:30:15.
Automatically blocked the IP address, preventing further attempts.

Implement Access Control Measures-

Access Control List (ACL) Configuration

- **Objective**: Restrict web server access to the `192.168.1.0/24` subnet on Port 80.

Rule:
arduino
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```
access-list ACL_WEBSERVER permit tcp 192.168.1.0 255.255.255.0 any eq 80
access-list ACL_WEBSERVER deny ip any any
```

-
- **Impact**: Ensures only trusted IPs can access the web server.

Access Control Model (DAC)

- **Objective**: Apply user-defined permissions to a shared folder (`\\Server01\SharedDocs`).
- **Permissions**:
  - **User1**: Read-only.
  - **User2**: Full control.
  - **Group1**: Modify access.

Impact: Restricts access based on user needs, minimizing risk.

User Access Levels

- **System**: CRM application.
- **Roles**:
  - **Admin**: Full control.
  - **Manager**: Edit and view records.
  - **Staff**: View records only.
- admin@example.com - Admin Full control
- manager@example.com Manager Edit & View Records
- staff@example.com Staff View Records Only

I. Introduction

This report documents the usage of various network security tools to assess the security posture of the 10.0.2.0/24 and 10.138.16.0/24 subnets. The tools used include Wireshark for packet capture and analysis, Nmap for network scanning and vulnerability assessment.

II. Wireshark Capture and Analysis (10.138.16.0/24)

- **Capture Details:**
  - A Wireshark capture was performed on the 10.138.16.0/24 subnet.
  - The capture aimed to analyze the network traffic patterns, protocol usage, and potential security concerns.
  - The capture revealed a wide range of network activity from host 10.138.16.39.
- **Analysis Highlights:**
  - **DNS Queries:** Frequent DNS queries to `mydae.schoology.com`, `safebrowsing.googleapis.com`, `lh3.googleusercontent.com`, and `addons-pa.clients6.google.com` were observed, indicating web browsing and service utilization.
  - **TLS Communication:** Extensive TLSv1.2 and TLSv1.3 traffic on port 443, suggesting secure web browsing and API communication with various external servers.
  - **QUIC Protocol:** Usage of the QUIC protocol for efficient and secure communication with Google services.
  - **SSDP Activity:** Multiple SSDP M-SEARCH requests, indicating device discovery on the local network.
  - **UDP Traffic:** A high volume of UDP traffic on port 443, primarily to Google-owned IP addresses.
  - **NBNS Queries:** NetBIOS name service queries for name resolution on the local network.
  - **Browser Protocol:** "Get Backup List Request" traffic to the broadcast address.

    - **ARP Traffic:** ARP request and response traffic showing 10.138.16.39's MAC address (20:c1:9b:fe:0f:01).
    - **DHCP Traffic:** DHCP request traffic.
    - **NTP Traffic:** Network Time Protocol traffic.
    - **Dropbox LAN sync Discovery Protocol:** Dropbox LAN sync discovery protocol traffic.
    - **Encrypted Alerts:** TCP encrypted alert traffic indicating connection closures.
- **Key Findings:**
    - Host 10.138.16.39 exhibits active web browsing and cloud service utilization.
    - The network shows typical behavior for a modern network with diverse protocol usage.
    - The encrypted alerts, show that some connections were closed by the server.

III. Network Vulnerability Scanner Report (Nmap --script vuln) (10.0.2.2)

- **Scan Details:**
    - Nmap was used with the `--script vuln` option to perform a vulnerability scan on host 10.0.2.2.
    - The scan aimed to identify potential vulnerabilities in the services running on the host.
- **Scan Results:**
    - Host 10.0.2.2 is identified as a Microsoft Windows system.
    - Open ports:
        - 135/tcp (msrpc - Microsoft Windows RPC)
        - 445/tcp (microsoft-ds)
    - Vulnerability scan results:
        - `smb-vuln-ms10-054`: false (indicating the host is likely not vulnerable to MS10-054).
        - `smb-vuln-ms10-061` and `samba-vuln-cve-2012-1182` returned errors related to SMB connection negotiation.
        - Not shown: 998 filtered tcp ports (no-response)
- **Analysis:**
    - The open SMB ports (135 and 445) present potential security risks.
    - The SMB errors during the vulnerability scan require further investigation to determine the root cause. This could be firewalls blocking the connection, or misconfiguration.
    - Microsoft RPC is running on the host.
    - The filtered ports show that a firewall is likely in place.

IV. Network Penetration Testing Tool Output (Nmap -sn) (10.0.2.0/24)

- **Scan Details:**
    - Nmap was used with the `-sn` option to perform a ping scan on the 10.0.2.0/24 subnet.

    - The scan aimed to identify active hosts on the network.
- **Scan Results:**
    - The scan identified three active hosts: 10.0.2.2, 10.0.2.3, and 10.0.2.15.
    - MAC addresses were identified for 10.0.2.2 (52:55:04:00:02:02) and 10.0.2.3 (52:55:04:00:02:03), both labeled as "Unknown".
    - Nmap done: 256 IP addresses (3 hosts up) scanned in 2.08 seconds
- **Analysis:**
    - The ping scan successfully identified active hosts on the network.
    - The unknown MAC addresses could indicate virtual machines or specialized network devices.

V. Recommendations

- **10.0.2.2 Hardening:**
    - Review and harden the SMB configuration on 10.0.2.2.
    - Investigate the SMB errors from the vulnerability scan to ensure no misconfigurations or vulnerabilities are present.
    - Ensure that the windows host is fully patched.
    - If not needed, disable the Microsoft RPC service.
    - Review the firewall rules.
- **10.138.16.39 Monitoring:**
    - Monitor the host's network activity for any unusual behavior.
    - Ensure the host's software is up to date to mitigate potential vulnerabilities.
- **Network Security:**
    - Implement network intrusion detection/prevention systems (IDS/IPS) to monitor for malicious activity.
    - Regularly review and update firewall rules.
    - Monitor for unusual broadcast traffic.
    - Investigate the unknown MAC addresses.

VI. Conclusion

This report demonstrates the effectiveness of Wireshark and Nmap in network security assessments. The findings highlight potential security concerns and provide actionable recommendations for improving the security posture of the analyzed networks. Regular security assessments and continuous monitoring are essential for maintaining a secure network environment.

Event Detection

- **Event**: Unauthorized IP (`10.0.0.55`) attempted to access the web server.
- **Log Entry**:
  csharp

CopyEdit

```
Deny tcp src 10.0.0.55/52000 dst 192.168.1.10/80 by ACL_WEBSERVER
```

Secure Wireless Networks -

Network Details:

- **SSID**: SecureNet-Office
- **Authentication Protocol**: WPA3-Personal
- **Encryption Method**: AES-GCMP
- **Pre-shared Key (PSK)**: `Secure@2025!`

Configuration Steps:

1. Logged into the wireless router interface at `192.168.1.1`.
2. Navigated to **Wireless Settings → Security Options**.
3. Selected **WPA3-Personal** for the SSID `SecureNet-Office`.
4. Set the encryption to **AES-GCMP** and created a strong PSK: `Secure@2025!`.
5. Saved the configuration and tested the connection.

WIPS Configuration:

- **WIPS Tool**: Cisco Prime Infrastructure
- **Monitoring Scope**: All devices within the range of `SecureNet-Office`.
- **Policies**:
  - Detect and block rogue APs.
  - Alert and log MAC address spoofing attempts.
  - Disable devices attempting deauthentication attacks.

Steps:

1. Configured WIPS to monitor the SSID `SecureNet-Office` and log unauthorized device activity.
2. Set up automatic blocking of rogue access points and devices with spoofed MAC addresses.
3. Enabled email alerts for critical events.

Tools Used:

- **SIEM Tool**: Splunk
- **IDS/IPS**: Snort
- **Firewall**: Cisco ASA

Monitor and Respond to Network Security Events -

Monitoring Scope:

- Monitored traffic on the internal network (`192.168.1.0/24`) for unusual patterns, unauthorized access attempts, and potential breaches.