Cybersecurity Daily Dairy

Day 9: IP Addressing, MAC, and Subnetting Fundamentals

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Topics Covered:

- IP Address and its structure

- Types of IP addresses (Public, Private, Static, Dynamic)

- MAC Address and its significance

- Subnetting basics

- Classful addressing

- Classless addressing (CIDR)

What I Did:

Today I studied the fundamental concepts of networking, focusing on **IP addressing**, **MAC addresses**, and **subnetting**. I explored both **classful** and **classless** addressing systems to understand how networks are logically organized and how they can be divided for better performance and security. These are essential concepts for anyone working in network administration, security, or ethical hacking.

IP Address:

- An **IP address** is a unique identifier for a device on a network.

- It consists of two main parts: the **Network ID** and the **Host ID**.

- In IPv4 format, it appears as four decimal numbers separated by dots (e.g., 192.168.1.1).

Types of IP Addresses:

- **Public IP** – Assigned by Internet Service Providers; routable over the internet.

- **Private IP** – Used inside internal networks; not routable externally (e.g., 192.168.x.x, 10.x.x.x).

- **Static IP** – Manually configured and does not change.

- **Dynamic IP** – Automatically assigned by DHCP and may change over time.

MAC Address:

- **Media Access Control (MAC) Address** is a unique identifier assigned to a network interface card (NIC).

- It works at the **data link layer (Layer 2)** of the OSI model.

- Format: Six groups of hexadecimal digits separated by colons (e.g., 00:1A:2B:3C:4D:5E).

- Unlike IP addresses, MAC addresses are hardware-specific and don't change under normal conditions.

Subnetting:

- Subnetting is the practice of dividing a larger network into smaller segments, called **subnets**.

- It improves **network performance**, **security**, and **IP address management**.

- Subnetting is defined using a **subnet mask**, which specifies how many bits are allocated for the network portion (e.g., 255.255.255.0 for /24).

Classful Addressing:

Class	Starting Bits	IP Range	Default Subnet Mask
A	0	1.0.0.0 – 126.255.255.255	255.0.0.0
B	10	128.0.0.0 – 191.255.255.255	255.255.0.0
C	110	192.0.0.0 – 223.255.255.255	255.255.255.0

- Used in the early internet for IP allocation

- Lacks flexibility and leads to inefficient address use

Classless Addressing (CIDR):

- **CIDR (Classless Inter-Domain Routing)** replaces classful addressing with flexible IP allocation.

- It allows specifying subnet masks in bit format (e.g., /24 instead of 255.255.255.0).

- Example: 192.168.1.0/24 means the first 24 bits represent the network portion.

- CIDR is essential for efficient routing and address space usage on modern networks.

Key Learnings:

- IP and MAC addressing form the core of network identification and communication.

- Subnetting allows administrators to structure networks for better control and efficiency.

- Classful addressing is useful historically, but CIDR is preferred in modern systems.

- Understanding subnet masks and CIDR notations is crucial for network configuration and penetration testing.

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