Signed in successfully.

From Device IDs to Routing

Introduction:

In the vast digital landscape, understanding how devices communicate and how networks are managed is crucial. This guide will take you on a journey through the fundamental aspects of network communication, from the unique identifiers that allow devices to interact, to the intricacies of network management. We'll demystify MAC and IP addresses, delve into the world of CIDR, subnet classes, and routing, and even explore the art of network diagrams.

Device Identification:

Every device connected to a network has unique identifiers that allow it to communicate effectively with other devices. Two of the most important identifiers are the Media Access Control (MAC) address and the Internet Protocol (IP) address.

• MAC Address

A MAC address is a unique identifier assigned to network interfaces for communications on the physical network segment. It's like a fingerprint for your device, hardcoded by the manufacturer, and it remains constant. This address is used within the network for sending and receiving data at the data link layer of the OSI model (/rltoken/yqJBwt1PzUJUu2sc2aAXmQ).

Example:

```
MAC Address: 00:0a:95:9d:68:16
```

- Each MAC address is a set of six 2-digit hexadecimal numbers.
- They are unique to each network interface card (NIC).

• IP Address

An IP address, on the other hand, is a unique identifier for a device on a network. It's used at the network layer of the OSI model (/rltoken/yqJBwt1PzUJUu2sc2aAXmQ). There are two versions of IP addresses in use: IPv4 and IPv6.

Example:

```
IPv4 Address: 192.168.1.1
IPv6 Address: 2001:0db8:85a3:0000:0000:8a2e:0370:7334
```

- IPv4 addresses are most commonly used; they are 32-bit addresses that are typically displayed in dotted decimal format.
- IPv6 was developed due to the exhaustion of IPv4 addresses, and it uses a 128-bit address, allowing for a larger number of unique addresses.

CIDR

Classless Inter-Domain Routing (CIDR) is a method for allocating IP addresses and routing Internet Protocol packets. It replaced the previous system based on classes A, B, and C.

Example: `CIDR notation: 192.0.2.0/24`

- The “/24” indicates the number of bits used for the network prefix.
- The rest of the bits (32 total for IPv4 - 24 in this case) are used for host addresses within the network.

• Subnet Classes

In the past, IP addresses were divided into five classes (A, B, C, D, and E). Each class had a range of IP addresses.

Example:

```
Class A:    1.0.0.1     to  126.255.255.254
Class B:    128.1.0.1   to  191.255.255.254
Class C:    192.0.1.1   to  223.255.254.254


Top 3 bits          Network prefix bits     Host identifier bits    Class       Example
000 through 011     8                       24                      Class A     44.0.0.1
100 through 101     16                      16                      Class B     128.32.0.1
110                 24                      8                       Class C     192.12.33.3
```

- Class A was for large networks with many devices, while Class C was for smaller networks.
- Class D was reserved for multicast groups, and Class E was reserved for future or experimental purposes.

Routing

Routing is the process of selecting a path for traffic in a network or between multiple networks.

Example:

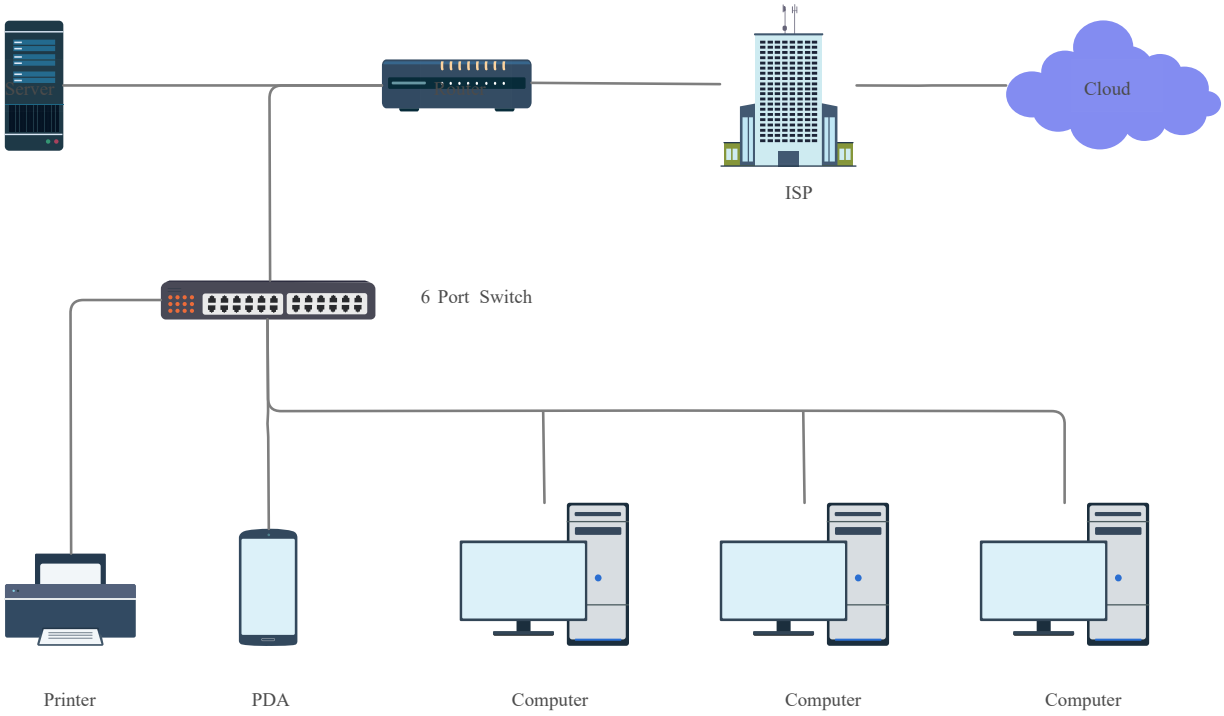
```
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
default         192.168.1.1     0.0.0.0         UG    600    0        0 wlp4s0
192.168.1.0     0.0.0.0         255.255.255.0   U     600    0        0 wlp4s0
```

- This is a simple routing table showing the destination IP addresses, the gateway to reach them, the subnet mask (genmask), and other information.

Network Diagrams

A network diagram is a visual representation of a computer or telecommunications network.

Example:



- It shows the components that make up a network and how they interact, including routers, devices, hubs, firewalls, etc.
- Network diagrams can be used to represent everything from simple home networks to complex enterprise networks.