Tribhuvan University
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Lab report on:
Computer Networking Lab 3: Creating a basic LAN setup

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BCA III/V
February 24, 2024

1 Objectives

- to virtually simulate initial router setup in Cisco PacketTracer
- to physically setup a basic LAN, its ip addressing and routing using CLI

2 Theory

2.1 IP Address

Internet Protocol address is a unique logical address for identifying devices in a network. There are 2 major IP address formats:

2.1.1 ipv4

It is an older format where IP address is a number made of 32 binary bits. Every byte is converted to decimal then separated with a period. A portion of the address identifies the network while the remaining address identifies the device. It is further divided into classes based on the usecase and how many bytes represent the network.

2.1.2 ipv6

It is an improved format that uses longer 128 bit adresses. It was created to replace ipv4 once no more unique ipv4 addresses can be assigned.

2.2 Subnet

It is a technique for splitting a network into smaller sub-networks. This is done by setting ip address range for a subnet

2.2.1 Subnet mask

It is an address which defines how many IP address bits define the network address. Here, all network address bits are set to 1 and remaining to 0. For a class C ipv4 address where network address is made up of the 1st 28 bits, subnet mask will be: `255.255.255.0`. Here, `192.168.1.1` & `192.168.1.2` represent 2 different devices in the same network. Whereas, `192.168.2.1` would represent a device on a different network.

2.3 Switch

It is a central device which connects all the devices in a network. It is used for data transfer & resource sharing inside the network.

2.4 Router

One of the main components of the OSI model's Network layer is the router. It is a computer specifically designed for **routing** (forwarding data packets between different networks). It is commonly used for communicating between home LANs & the Internet. Additionally, it determines the best path for routing packets.

Since a router is just a computer, it has the basic components such as CPU & different types of memory. It also has some specialized components as shown in the figure below:

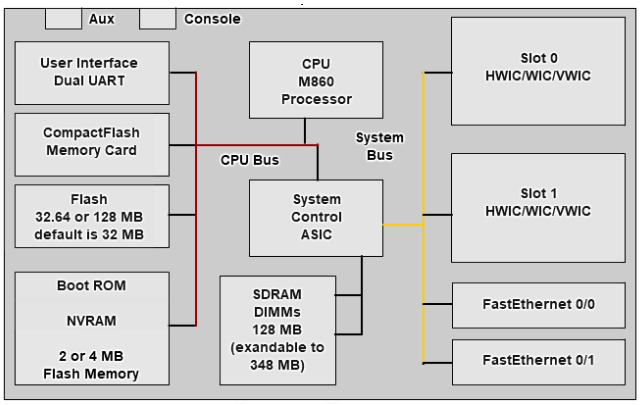

Figure 1: Hardware Components of a Router

2.4.1 ROM

It stores bootloader instructions which won't be erased even after formatting the router's data. These are loaded upon powering on the device, which then start up the operating system.

2.4.2 Flash

It is a small, non-volatile memory, generally used for storing the router's operating system. Cisco routers run IOS (Internetwork Operating System), which provides a text-based command line interface for interacting with & configuring the router.

2.4.3 NVRAM

Non-Volatile RAM is used for permanent storage of the router's startup configurations / settings in the `startup-config` file. One thing to note is that configuration changes are stored in volatile RAM in the `running-config` file. These must be manually copied into `startup-config` to save them.

2.4.4 Interfaces

A router consists of multiple interfaces / ports for connecting networks / devices through which data transfer occurs. Some basic ones are:

1. Console

   It is a management port used for configuring the router and setting it up for the first time. Using this port, router is connected to a text-based terminal or nowadays, a computer running a terminal emulater program. Text commands can then be used to configure settings.

2. FastEthernet(FE) interfaces

   These are used for physically connecting devices to one another & sending data in a network. Multiple FE ports are used for different purposes like backups, explicit input & output ports etc.

3. Slot

   Empty slots are provided to install more interfaces if needed. E.g: modules for wireless, WAN

2.4.5 Virtual Terminal

It is used for confguring the router, similar to the console. The difference is that the terminal / computer doesn't need to be physically connected, instead accessing and logging in is done remotely. This allows multiple authorized people to easily access the router regardless of physical proximity.

2.4.6 Routing

Routers maintain a routing / address table having data about the network (devices, IP addresses, subnet masks, and interfaces). This is used to map what ip address packets should be sent to, determining best path etc. IP addresses and subnet masks should be assigned to each network device as well as each enabled interface of the router accordingly.

3 Lab Work

Lab work was first done in Cisco Packet Tracer by simulating a basic router(1841) and setting it up through text commands. We then created a basic LAN setup by connecting a router, a switch, and a PC. We then learned to configure each device & its routing info to succesfully transfer data between them.

4 Conclusion

Thus, we simulated initial router setup in Cisco PacketTracer and configured its basic settings such as passwords, interfaces and ip addresses. We then used that knowledge for setting up a basic LAN physically.