# PRACTICAL FILE

# COMPUTER NETWORKS


**SESSION: 2024-2025**

**B. TECH-CSE-B**

**SEMESTER-6th**

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# Practical – 01

## AIM: Introduction to Networking

Networking in computer networks refers to the process of connecting multiple computing devices, such as computers, servers, and mobile devices, to share resources, exchange data, and communicate efficiently. These connections can be wired or wireless and operate through various networking protocols to ensure smooth data transmission. Computer networks form the foundation of modern communication, enabling internet access, cloud computing, and real-time data sharing.

### Types of Computer Networks

Computer networks can be classified based on their size, coverage area, and purpose:

1. **Local Area Network (LAN):** A LAN connects devices within a limited area, such as an office, home, or school. It provides high-speed communication and is commonly used for file sharing and resource management.

2. **Metropolitan Area Network (MAN):** A MAN extends over a city or campus, connecting multiple LANs within a specific geographical region. It is often used by businesses and educational institutions.

3. **Wide Area Network (WAN):** A WAN covers a vast geographical area, connecting multiple networks across cities or even countries. The Internet is the largest example of a WAN.

### Components of a Computer Network

A computer network consists of various hardware and software components that enable communication:

- **Routers:** Direct data between different networks and manage traffic efficiently.
- **Switches:** Connect multiple devices within a LAN and enable data transfer.
- **Modems:** Convert digital signals to analog for Internet access.
- **Network Interface Cards (NICs):** Enable devices to connect to a network.
- **Cables and Wireless Technologies:** Establish physical and wireless connections between devices.

### Networking Models and Protocols

Networking follows specific models and protocols to ensure reliable communication:

- **OSI Model:** The Open Systems Interconnection (OSI) model consists of seven layers, including Physical, Data Link, Network, Transport, Session, Presentation, and Application layers. It provides a structured approach to networking.

- **TCP/IP Model:** The Transmission Control Protocol/Internet Protocol (TCP/IP) model is a four-layer model widely used for Internet communication. It includes the Network Interface, Internet, Transport, and Application layers.
- **Common Networking Protocols:** Protocols such as HTTP (Hypertext Transfer Protocol) for web browsing, FTP (File Transfer Protocol) for file sharing, and DNS (Domain Name System) for translating domain names into IP addresses play essential roles in networking.

**Applications of Networking**

Networking has numerous real-world applications, including:

- Internet communication (emails, web browsing, social media)
- Cloud computing and remote data storage
- Online banking and e-commerce
- Smart home automation and IoT (Internet of Things)
- Video conferencing and remote work solutions

# Practical – 02

## AIM: Understanding IP Address

### Introduction

An IP (Internet Protocol) address is a unique identifier for devices on a network, enabling communication over the Internet or within private networks. It acts as a digital address, ensuring data reaches the correct destination. Every website, computer, and IoT device requires an IP address for data exchange.

### Types of IP Addresses

There are two main versions of IP addresses:

**IPv4 (Internet Protocol Version 4)**

IPv4 is the most widely used Internet Protocol. It uses a 32-bit address format, divided into four numerical values separated by dots. An example of an IPv4 address is 192.168.1.1. IPv4 provides around 4.3 billion unique addresses, but due to the rapid expansion of the Internet, this number is no longer sufficient.

**IPv6 (Internet Protocol Version 6)**

IPv6 was introduced to overcome the limitations of IPv4. It uses a 128-bit address format, written in hexadecimal and separated by colons, such as 2001:db8::8a2e:370:7334. IPv6 can support an almost unlimited number of addresses, making it future-proof for the growing demand for Internet-connected devices.

### Public and Private IP Addresses

IP addresses can be classified based on their accessibility:

- **Public IP Addresses** are assigned by Internet Service Providers (ISPs) and are used for communication over the Internet. These addresses are unique worldwide and allow devices to connect externally.
- **Private IP Addresses** are used within a local network (such as homes, offices, and institutions). They are not accessible from the Internet and help in internal communication between devices. An example of a private IP is 192.168.1.1.

### IP Address Classification

IPv4 addresses are divided into different classes based on their range and intended use. Class A addresses are used for large organizations, Class B for medium-sized networks like universities, and Class C for small businesses and home networks. Class D is reserved for multicast communication, while Class E is experimental and not commonly used.

### How IP Addresses Work in Networking

When a user visits a website, the **Domain Name System (DNS)** translates the domain name (e.g., **www.google.com**) into its corresponding IP address. This enables the browser to connect to the correct web server and retrieve the requested information. Without DNS, users would have to remember numerical IP addresses instead of human-friendly domain names.

# Practical – 03

## AIM: Write about Networking devices.

**Networking devices** are hardware components used to connect computers, servers, printers, and other devices within a network. These devices enable communication, data transfer, and resource sharing between connected systems in both local (LAN) and wide area networks (WAN).

In simple terms, networking devices help build and manage a network by allowing devices to send and receive data efficiently and securely.

Networking devices play a vital role in both small and large-scale networks by ensuring reliable and efficient communication between devices. They help manage traffic, reduce congestion, enhance security, and improve network performance. In modern networks, advanced networking devices also support features like data encryption, network monitoring, and remote management. Whether in homes, schools, offices, or data centers, these devices are essential for building a stable and secure communication infrastructure that supports internet access, file sharing, and the functioning of cloud-based services.

Here are few networking devices:

1. **Router**:
A router connects multiple networks together. It directs data packets between devices and chooses the best path for data transmission. It's commonly used to connect a home or office network to the internet.
2. **Switch**:
A switch connects devices within a single network (like computers in a LAN). It uses MAC addresses to forward data only to the specific device intended, improving speed and security.
3. **Hub**:
A hub is a basic device that connects multiple computers in a network. It broadcasts data to all connected devices, regardless of the destination, making it less efficient than a switch.
4. **Modem**:
A modem (modulator- demodulator) connects a network to the internet by converting digital data from a computer into analog signals for transmission over telephone lines, and vice versa.
5. **Access Point (AP)**:
An access point provides wireless connectivity to devices within a network. It connects to a wired router or switch and allows wireless devices to connect via Wi-Fi.

# Practical-04

## AIM: Write about networking cables.

**Networking cables** are essential for establishing wired connections between devices within a network. Each type of cable has its own characteristics, suited for different purposes. Here are some common types of networking cables:

1. **Ethernet (Twisted Pair) Cables**: These are the most commonly used cables in networking today. They consist of pairs of twisted wires that reduce interference and crosstalk. There are two main categories:

- **Cat5e (Category 5e)**: Supports speeds up to 1 Gbps and is used for most home and office networks.
- **Cat6/Cat6a (Category 6/6a)**: Provides faster speeds up to 10 Gbps and is better suited for data-intensive applications like servers or video streaming.

2. **Fiber Optic Cables**: Fiber optic cables transmit data using light, making them faster and capable of carrying data over longer distances compared to copper-based cables. They are commonly used for high-speed internet connections, especially in wide area networks (WANs). There are two types:

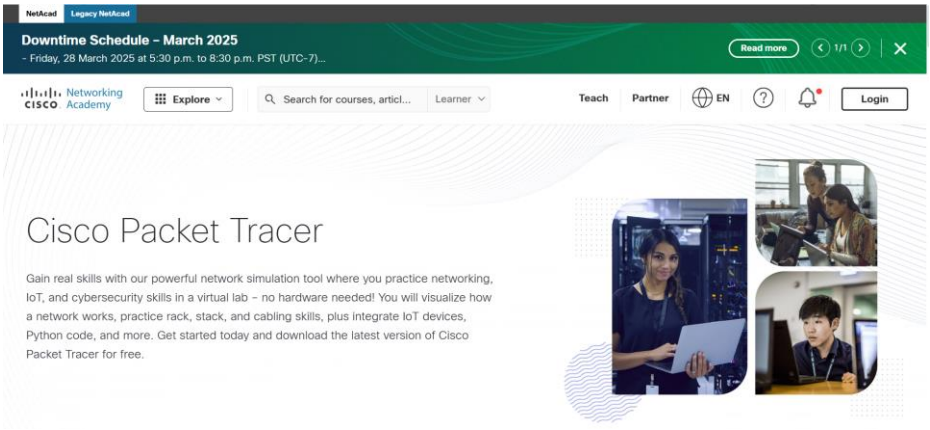
- **Single-mode Fiber**: Used for long-distance communication, it can carry signals over miles without losing signal quality.
- **Multi-mode Fiber**: Used for shorter distances (e.g., within buildings), it allows multiple light signals to be transmitted simultaneously.

3. **Coaxial Cables**: Coaxial cables are commonly used for cable television and broadband internet. They consist of a central conductor, surrounded by insulation, shielding, and an outer jacket. They are less common in modern networking but still used in some areas.
4. **USB Cables**: Though primarily used to connect peripheral devices (like printers or external storage), USB cables can also be used for networking in specific situations (like creating a temporary connection between two computers).
5. **Crossover Cables**: Crossover cables are used to directly connect two network devices (such as two computers) without the need for a switch or hub. This type of Ethernet cable swaps the transmit and receive wires to facilitate communication.

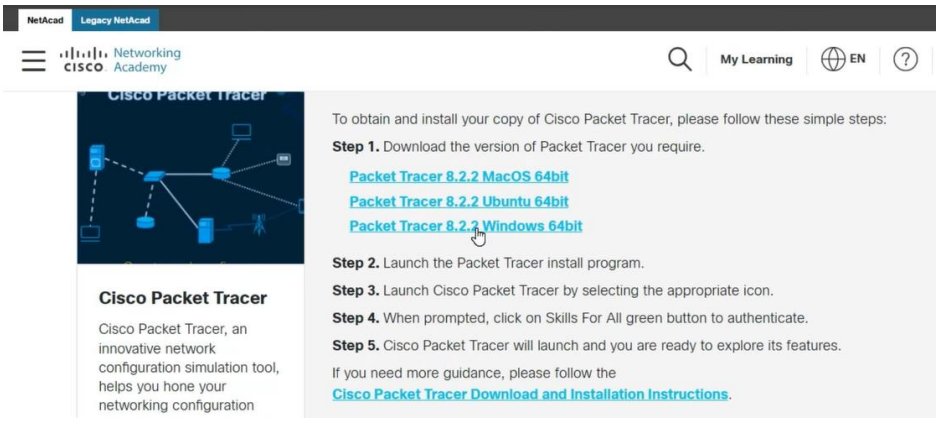
# Practical-05

## Installation of Cisco Packet Tracer

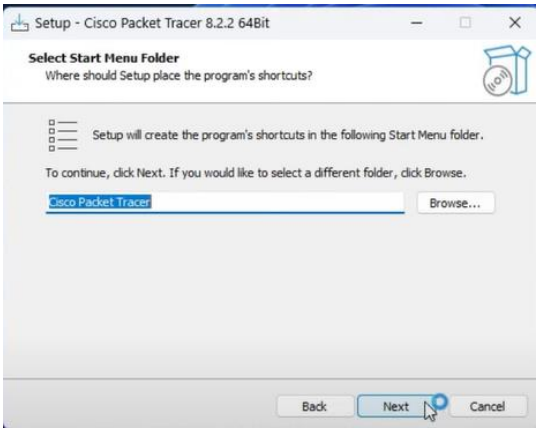
a. Go to https://www.netacad.com/ and log in or sign up.



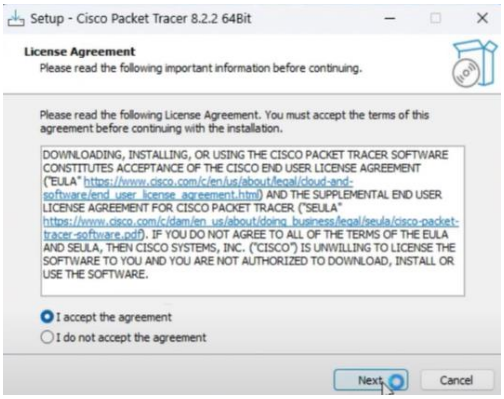

b. Download Cisco Packet Tracer for your OS (Windows/Linux).



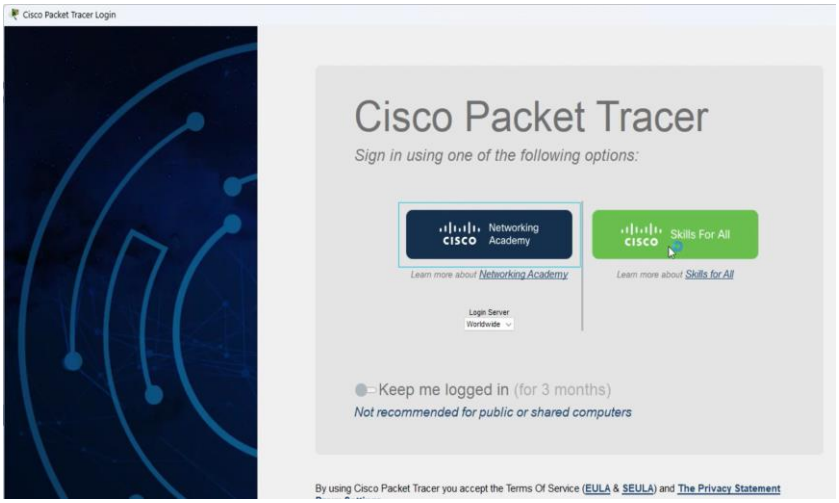

c. Run the downloaded installer (.exe for Windows).



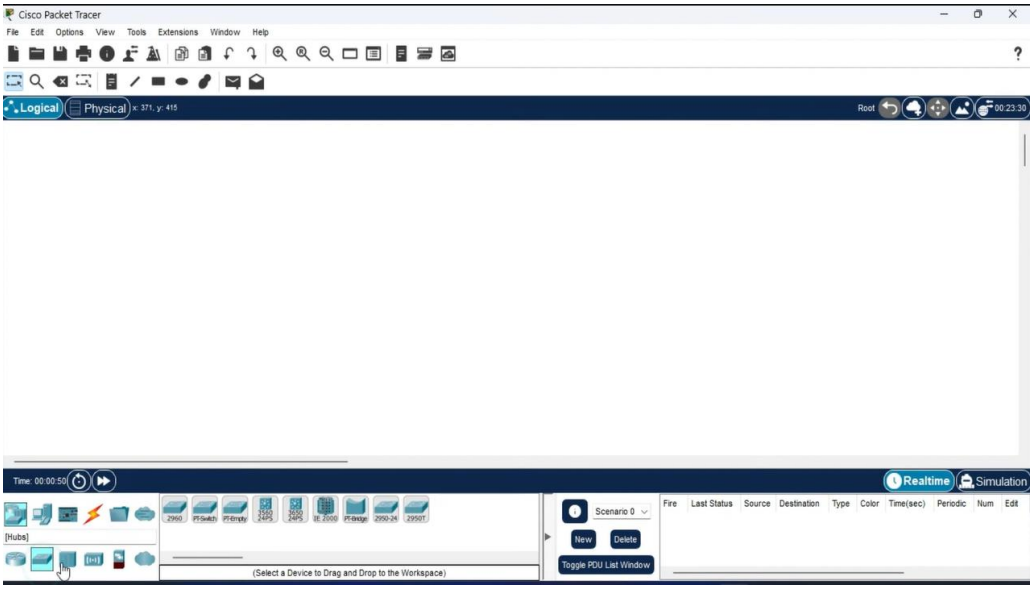
d. Accept the license agreement and complete the installation.




e. Open Cisco Packet Tracer and log in with your NetAcad credentials.




f. Start creating network simulations.



# Practical - 06

## AIM: Configuration of LAN Network

### Introduction

A Local Area Network (LAN) is a network that connects computers and devices within a limited area such as an office, school, or home. Configuring a LAN involves setting up hardware and software components to ensure seamless communication between devices.

### 1. Planning the LAN Network

Before setting up a LAN, it is crucial to plan the network based on the number of devices, type of devices (PCs, printers, servers, routers, switches), network topology (star, bus, ring, or mesh), and the required bandwidth.

### 2. Required Components

- Network Devices: Switches, Routers, Modems
- Computers and Peripherals: PCs, Laptops, Printers
- Cables and Connectors: Ethernet cables (Cat5e, Cat6), RJ45 connectors
- Network Interface Cards (NICs)
- IP Addressing Scheme

### 3. Physical Setup

1. Connect all computers and network devices using Ethernet cables or a wireless access point.
2. Ensure the network switch is properly connected to the router/modem.
3. Use structured cabling to ensure minimal signal interference.
4. Power on all devices and check the physical connectivity status.

### 4. Configuring Network Devices

**Switch Configuration:**

1. Connect the switch to a computer or access it via network management software.
2. Assign an IP address to the switch for management purposes.
3. Configure Virtual LANs (VLANs) if network segmentation is required.
4. Save and verify the configuration to ensure proper functionality.

**Router Configuration:**

1. Assign an IP address to the router and configure the necessary network settings.
2. Set up Dynamic Host Configuration Protocol (DHCP) for automatic IP allocation.
3. Establish security measures such as firewalls and access control policies.
4. Ensure the router is properly connected to the ISP modem for internet access.

### 5. Configuring Clients

1. Ensure all computers have functioning Network Interface Cards (NICs).
2. Assign IP addresses manually or enable DHCP for automatic assignment.

3. Configure the default gateway as the router’s IP address.
4. Set the DNS server to a public or local DNS for name resolution.
5. Test network connectivity to verify proper configuration.

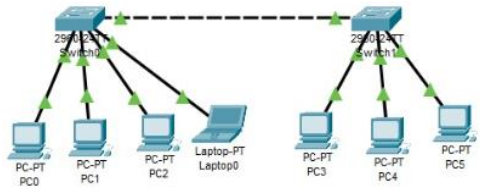
**6. Testing and Troubleshooting**

1. Check connectivity using basic network diagnostic tools.
2. Verify IP configurations to ensure correct addressing.
3. Inspect physical connections for any loose or faulty cables.
4. Examine switch and router logs to detect possible errors.
5. Use network monitoring tools to analyze traffic and performance.

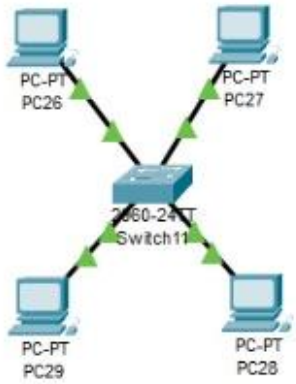
# Practical – 07

## AIM:Creating different topologies in Cisco packet tracer

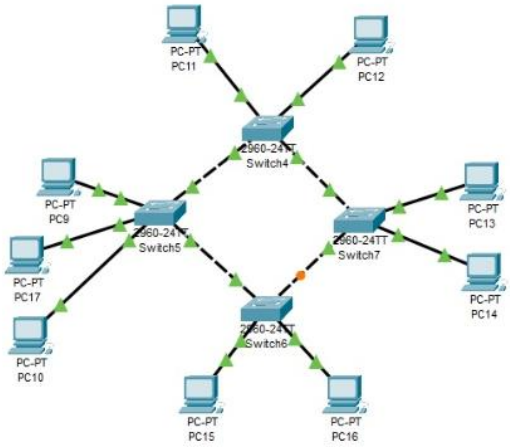
## Bus Topology:



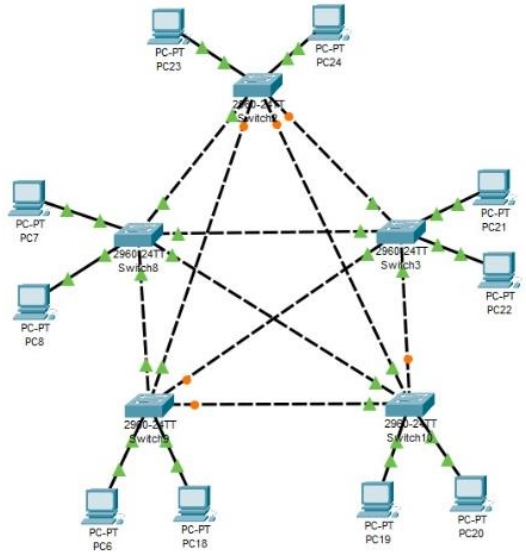

## Star Topology:



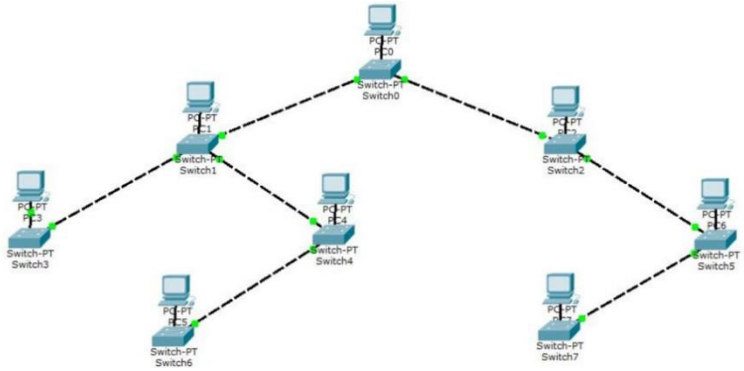

## Ring Topology:



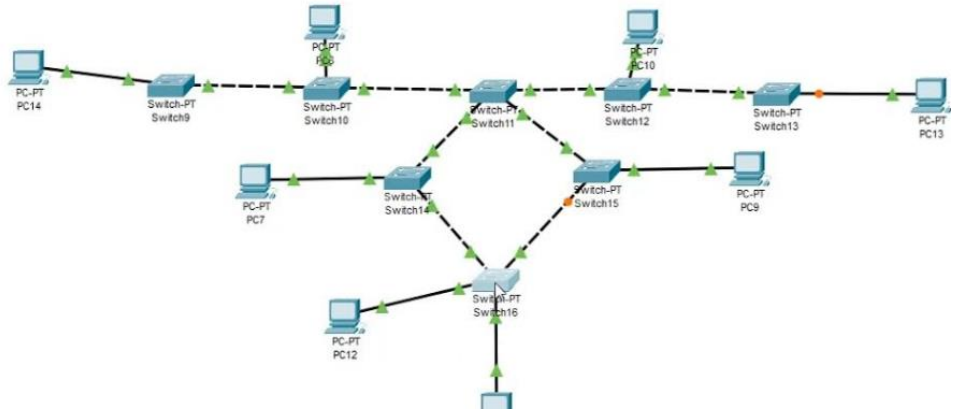
## Mesh Topology:




## Tree Topology:




## Hybrid Topology:



# Practical – 08

## AIM: Basic commands of router.

## 1. Show running configuration

```
Router>enable
Router#show running-config
Building configuration...

Current configuration : 602 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Router
!
!
!
!
!
!
!
ip cef
no ipv6 cef
!
!
!
license udi pid CISCO2811/K9 sn FTX1017L2WH-
!
!
!
!
!
!
!
!
!
spanning-tree mode pvst
!
!
!
!
!
interface FastEthernet0/0
 no ip address
 duplex auto
 speed auto
 shutdown
!
interface FastEthernet0/1
 no ip address
 duplex auto
 speed auto
 shutdown
!
interface Vlan1
```

## 2. Check start-up running configuration

```
Router#show startup-config
startup-config is not present
Router#
```

## 3. Save configuration

```
Router#write
Building configuration...
[OK]
```

## 4. Show start-up configuration

```
Router#show startup-config
Using 602 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Router
!
!
!
!
!
!
!
!
ip cef
no ipv6 cef
!
!
!
!
 --More--
```

## 5. Enter global configuration mode

```
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
```

## 6. Show Flash Memory Details

```
Router(config)#do show flash

System flash directory:
File  Length   Name/status
  3   33591768 2800nm-advipservicesk9-mz.151-4.M4.bin
  2   28282    sigdef-category.xml
  1   227537   sigdef-default.xml
[33847587 bytes used, 221896413 available, 255744000 total]
249856K bytes of processor board System flash (Read/Write)
```

## 7. Show interface details

```
Router(config)#do show flash

System flash directory:
File  Length   Name/status
  3   33591768 2800nm-advipservicesk9-mz.151-4.M4.bin
  2   28282    sigdef-category.xml
  1   227537   sigdef-default.xml
[33847587 bytes used, 221896413 available, 255744000 total]
249856K bytes of processor board System flash (Read/Write)


Router(config)#do show interface
FastEthernet0/0 is administratively down, line protocol is down (disabled)
  Hardware is Lance, address is 000c.cf8d.4001 (bia 000c.cf8d.4001)
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Full-duplex, 100Mb/s, media type is RJ45
  ARP type: ARPA, ARP Timeout 04:00:00,
  Last input 00:00:08, output 00:00:05, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: fifo
  Output queue :0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     0 input packets with dribble condition detected
     0 packets output, 0 bytes, 0 underruns
     0 output errors, 0 collisions, 1 interface resets
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier
 --More--
```

## 8. Viewing configuration commands

```
Router(config)#?
Configure commands:
  aaa                 Authentication, Authorization and Accounting.
  access-list         Add an access list entry
  banner              Define a login banner
  bba-group           Configure BBA Group
  boot                Modify system boot parameters
  cdp                 Global CDP configuration subcommands
  class-map           Configure Class Map
  clock               Configure time-of-day clock
  config-register     Define the configuration register
  crypto              Encryption module
  default             Set a command to its defaults
  dial-peer           Dial Map (Peer) configuration commands
  do                  To run exec commands in config mode
  dot11               IEEE 802.11 config commands
  enable              Modify enable password parameters
  end                 Exit from configure mode
  ephone              define ethernet phone
  ephone-dn           Configure ephone phone lines (Directory Numbers)
  exit                Exit from configure mode
  flow                Global Flow configuration subcommands
  hostname            Set system's network name
 --More--
```

## 9. Testing connectivity with ping

```
Router(config)#do ping 10.0.0.30

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.30, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

## 10. To check commands history

```
Router(config)#do show history
  show flash
  do show flash
  do show interface
  ping 10.0.0.30
  do ping 10.0.0.30
  do show history
```

## 11. Saving router configuration

```
Router(config)#do write
Building configuration...
[OK]
```

## 12. Router reload process and system boot details

```
Router(config)#do reload
Proceed with reload? [confirm]
System Bootstrap, Version 12.4(1r) [hqluong 1r], RELEASE SOFTWARE (fc1)
Copyright (c) 2005 by cisco Systems, Inc.

Initializing memory for ECC
..
C2800 processor with 524288 Kbytes of main memory
Main memory is configured to 64 bit mode with ECC enabled

Readonly ROMMON initialized

program load complete, entry point: 0x8000f000, size: 0xc940
program load complete, entry point: 0x8000f000, size: 0xc940

program load complete, entry point: 0x8000f000, size: 0x3ed1338
Self decompressing the image :
################################################################################ [OK]
Smart Init is enabled
smart init is sizing iomem
ID              TYPE       MEMORY_REQ
0003E7          0X00474800 C2811 Mainboard
                0X0014B430 Onboard PVDM2 SIMM
                0X00264050 Onboard VPN
                0X000021B8 Onboard USB
00038E          0X0008BE00 Service Engine AIM
                0X002C29F0 public buffer pools
                0X00211000 public particle pools
-------------------------------------------------
TOTAL:          0X00D85628

If any of the above Memory Requirements are
"UNKNOWN", you may be using an unsupported
configuration or there is a software problem and
system operation may be compromised.
Rounded IOMEM up to: 14Mb.
Using 2 percent iomem. [14Mb/512Mb]

             Restricted Rights Legend

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(c) of the Commercial Computer Software - Restricted
Rights clause at FAR sec. 52.227-19 and subparagraph
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Software clause at DFARS sec. 252.227-7013.

           cisco Systems, Inc.
           170 West Tasman Drive
           San Jose, California 95134-1706

Cisco IOS Software, 2800 Software (C2800NM-ADVIPSERVICESK9-M), Version 15.1(4)M4
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2012 by Cisco Systems, Inc.
Compiled Thurs 5-Jan-12 15:41 by pt_team
Image text-base: 0x2100F918, data-base: 0x24729040

This product contains cryptographic features and is subject to United
States and local country laws governing import, export, transfer and
use. Delivery of Cisco cryptographic products does not imply
```

## 13. To enter the third mode

```
Router>enable
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
```

## 14. Setting up password

```
Router(config)#enable password 1234
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#exit



Router con0 is now available



Press RETURN to get started.
```

## 15. Entering the configuration mode with password.

```
Router>enable
Password:
Password:
Router#
```

## 16. No secure password

```
Router#show running-config
Building configuration...

Current configuration : 625 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Router
!
!
!
enable password 1234
!
!
!
!
!
!
ip cef
no ipv6 cef
 --More-- |
```

## 17. Setting up secret(secure) password

```
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#enable secret 123456
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
exit
```

```
Router con0 is now available
```

```
Press RETURN to get started.
```

## 18. Checking the secure password

```
Router>en
Password:
Router#show running-config
Building configuration...

Current configuration : 672 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Router
!
!
!
enable secret 5 $1$mERr$H7PDxl7VYMqaD3id4jJVK/
enable password 1234
!
!
!
!
!
!
ip cef
 --More-- |
```

## 19. Setting up a hostname

```
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname amity
```

## 20. Setting up banner for router

```
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname amity
amity(config)#banner
% Incomplete command.
amity(config)#banner ?
  login  Set login banner
  motd   Set Message of the Day banner
amity(config)#banner motd # welcome to amity
Enter TEXT message.  End with the character '#'.



#

amity(config)#do write
Building configuration...
[OK]
amity(config)#do reload
```

```
welcome to amity



amity>s
```

## 21. Updating the time

```
amity#show version
Cisco IOS Software, 2800 Software (C2800NM-ADVIPSERVICESK9-M), Version 15.1(4)M4, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2012 by Cisco Systems, Inc.
Compiled Thurs 5-Jan-12 15:41 15:41 by pt_team

ROM: System Bootstrap, Version 15.1(4)M4, RELEASE SOFTWARE (fc1)
cisco2811 uptime is 1 minutes, 27 seconds
System returned to ROM by power-on
System image file is "flash0:c2800nm-advipservicesk9-mz.151-4.M4.bin"
Last reload type: Normal Reload

This product contains cryptographic features and is subject to United
States and local country laws governing import, export, transfer and
use. Delivery of Cisco cryptographic products does not imply
third-party authority to import, export, distribute or use encryption.
Importers, exporters, distributors and users are responsible for
compliance with U.S. and local country laws. By using this product you
agree to comply with applicable laws and regulations. If you are unable
to comply with U.S. and local laws, return this product immediately.

A summary of U.S. laws governing Cisco cryptographic products may be found at:
http://www.cisco.com/wwl/export/crypto/tool/stqrg.html
 --More--
```

## 22. To show clock(time)

```
amity#clock set 16:00:00 3 march 2025
amity#show clock
16:0:5.204 UTC Mon Mar 3 2025
amity#
```