Introduction to Communication Networks

TE 156

Network Simulation - Cisco Packet Tracer

Justice Owusu Agyemang, Department of Telecommunications Engineering, KNUST

Cisco Packet Tracer

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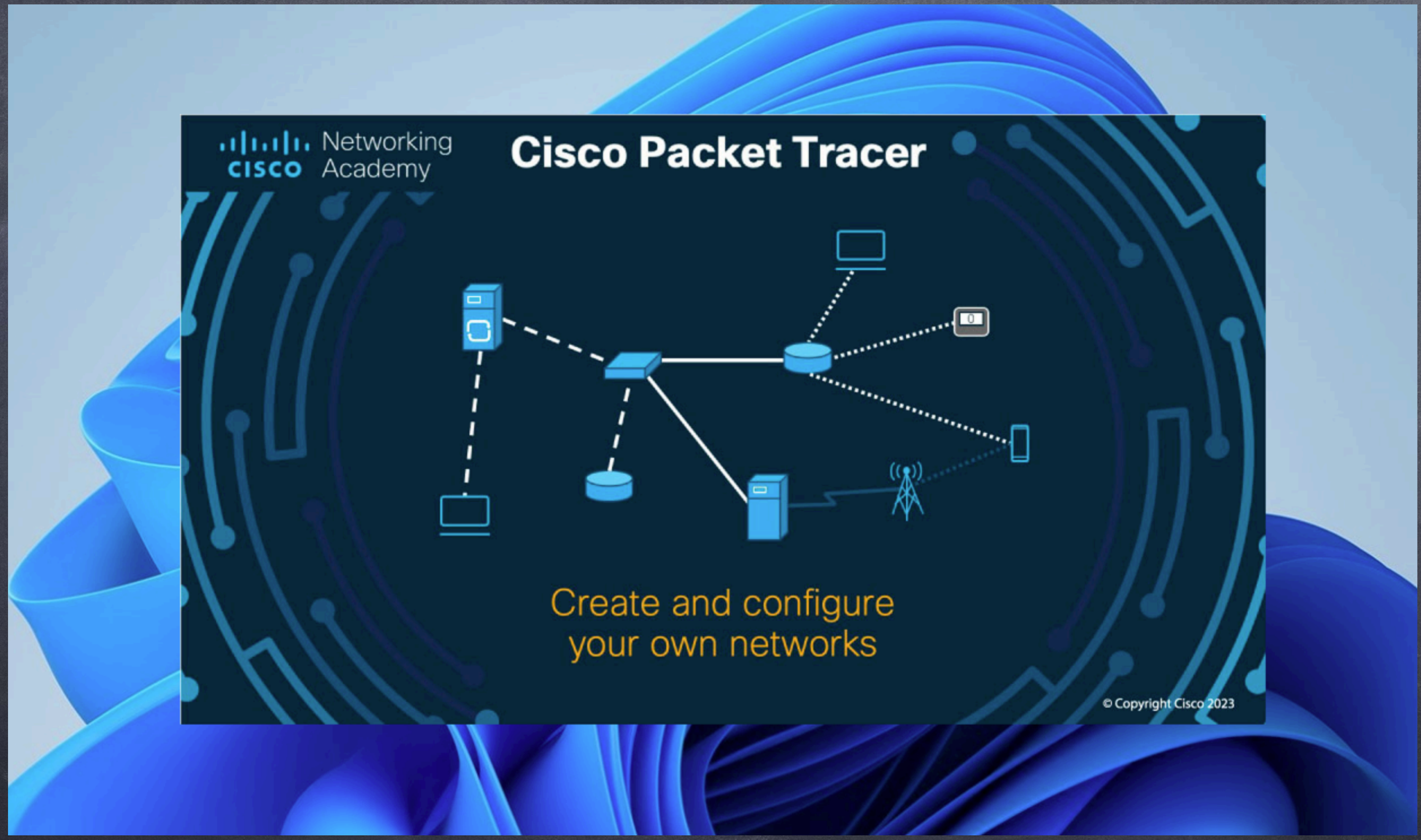
Cisco Packet Tracer

- **Network Simulation**: It allows users to design, configure, and simulate network topologies, helping to test and troubleshoot networking setups without the need for physical equipment.
- **Prototyping and Planning**: Network administrators and engineers can use Packet Tracer to prototype and plan real-world network deployments, ensuring smooth implementation.
- **Troubleshooting**: The tool enables users to simulate network issues and practice troubleshooting scenarios, improving problem-solving skills in a risk-free environment.
- **Protocol Understanding**: It facilitates the exploration and understanding of various networking protocols and their interactions.
- **Visualizing Network Traffic**: Users can analyze network traffic flow and understand how data packets move within the network.
- **IoT Simulation**: Packet Tracer supports Internet of Things (IoT) simulations, aiding in understanding and designing IoT networks.

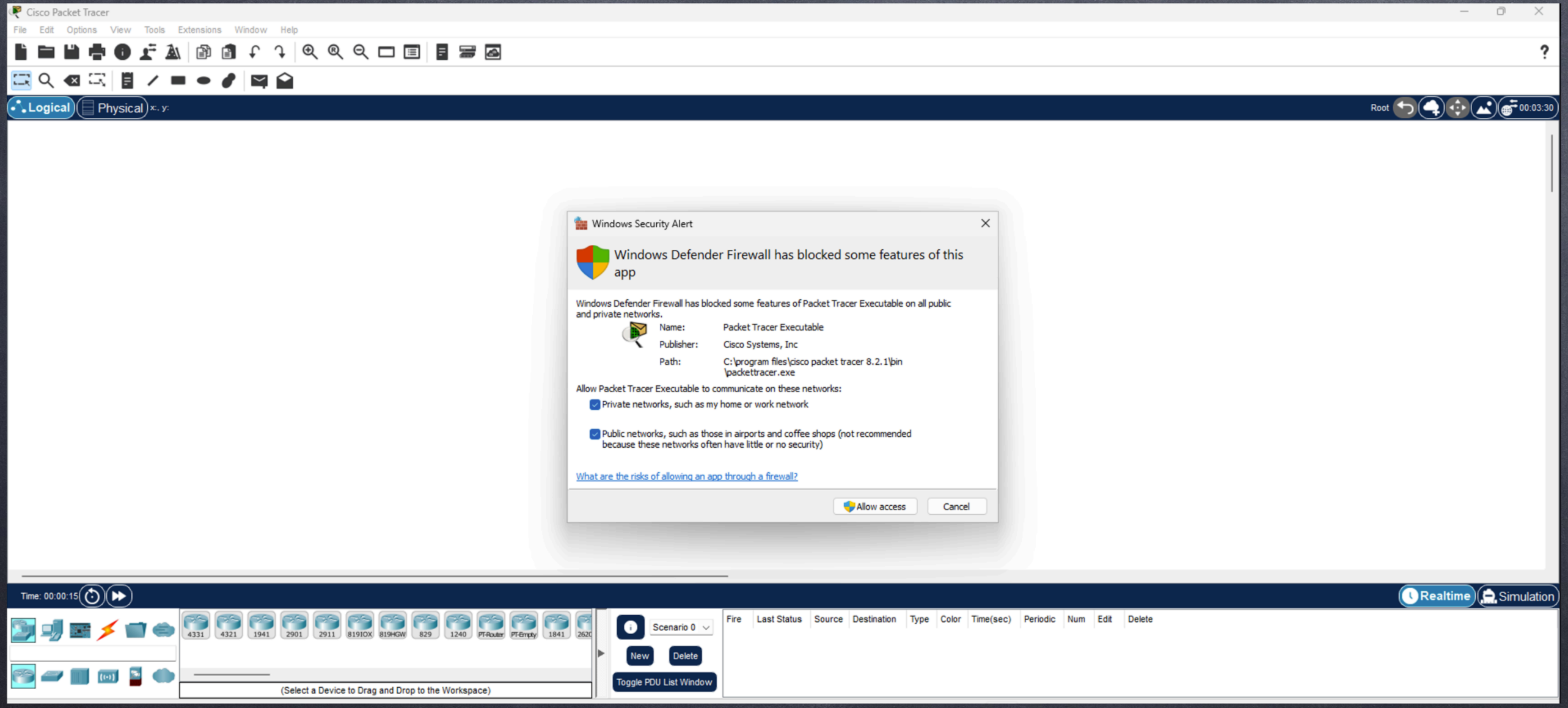
Installing Cisco Packet Tracer

- Cisco Packet Tracer runs on
  - Windows
  - Linux
  - MacOS

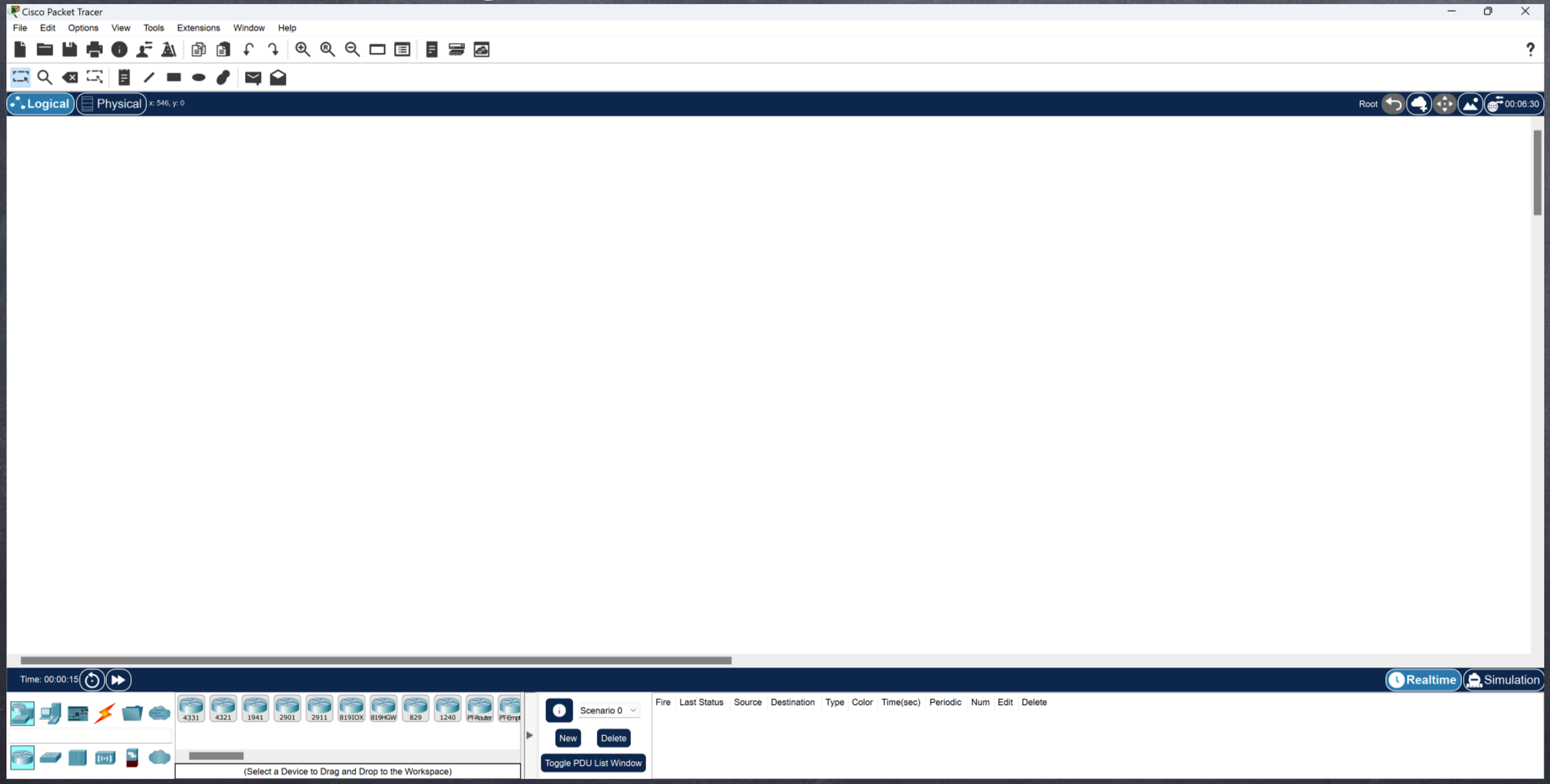
Installing Cisco Packet Tracer



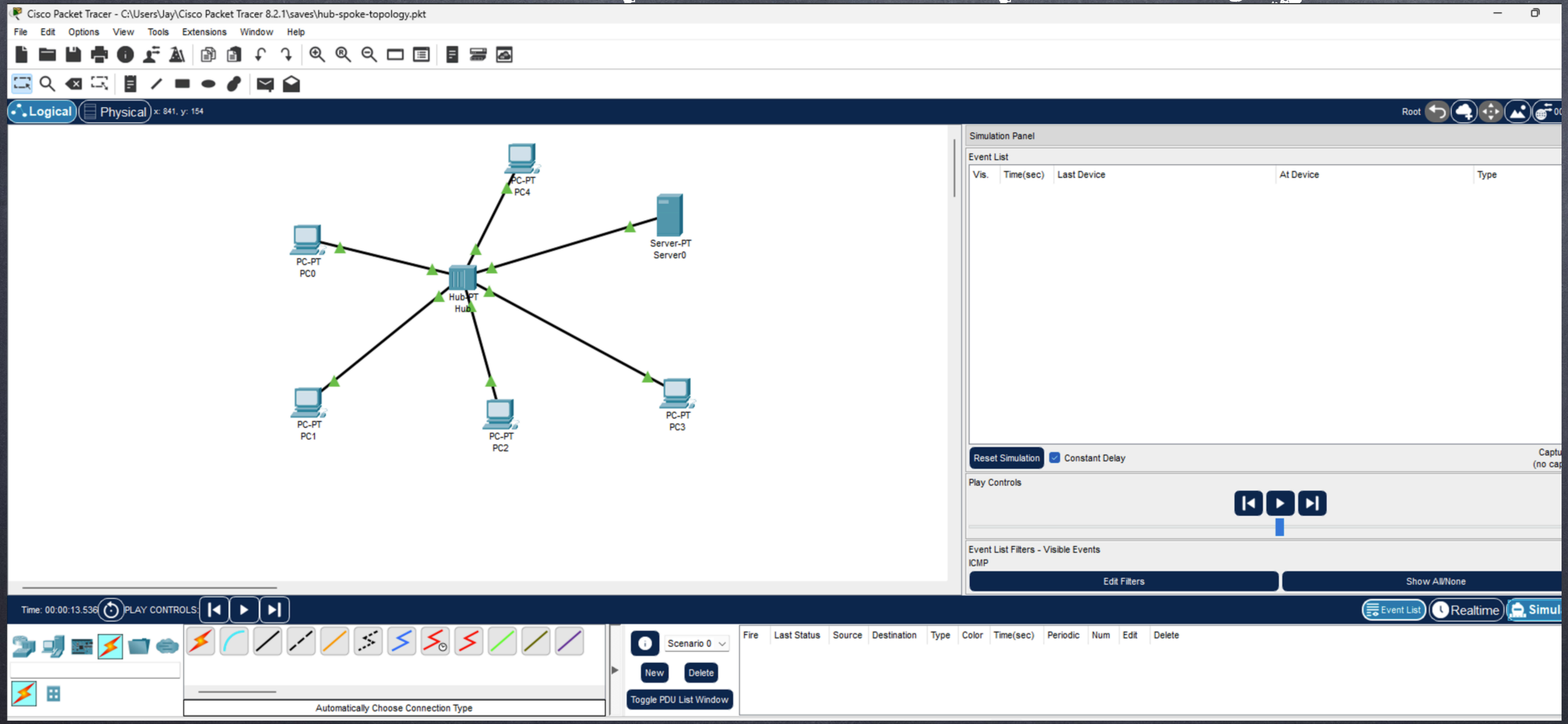
Installing Cisco Packet Tracer



Installing Cisco Packet Tracer



Hub & Spoke Topology



Subnetting a Network

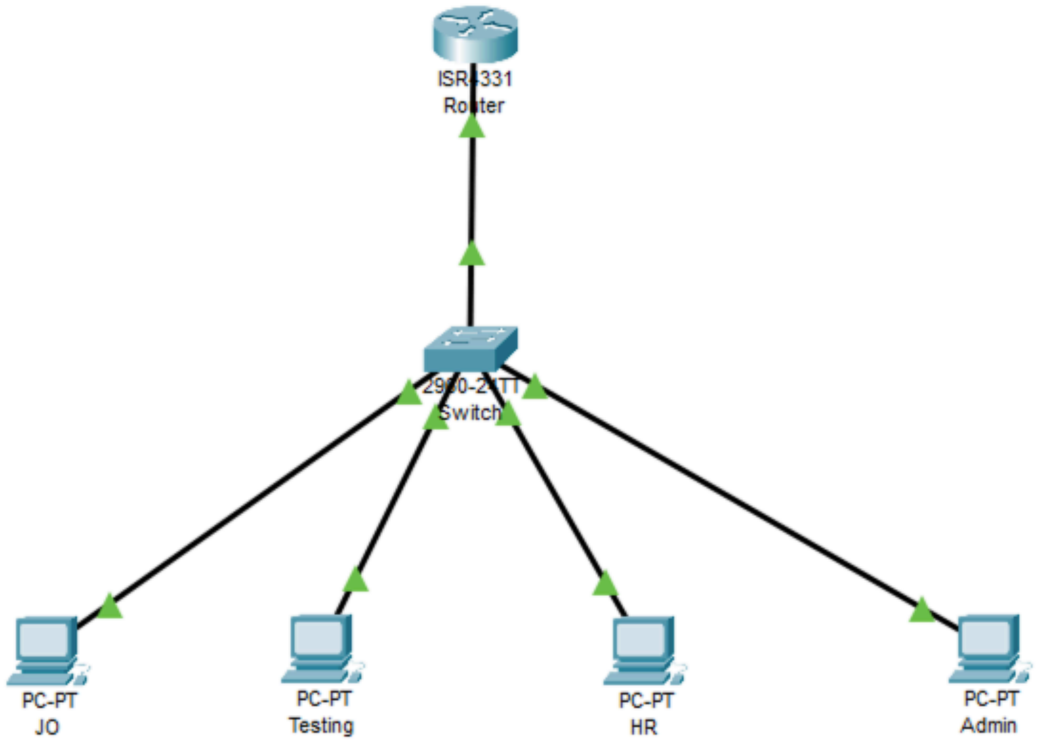
A sub network or subnet is a logical subdivision of an IP network. The practice of dividing a network into two or more network is called sub netting.

It offers the following advantages:

1. It provides security to the network.
2. Speeds up the network thus improving the performance of the network.
3. It allows for better organization of the resources.

Subnetting a Network

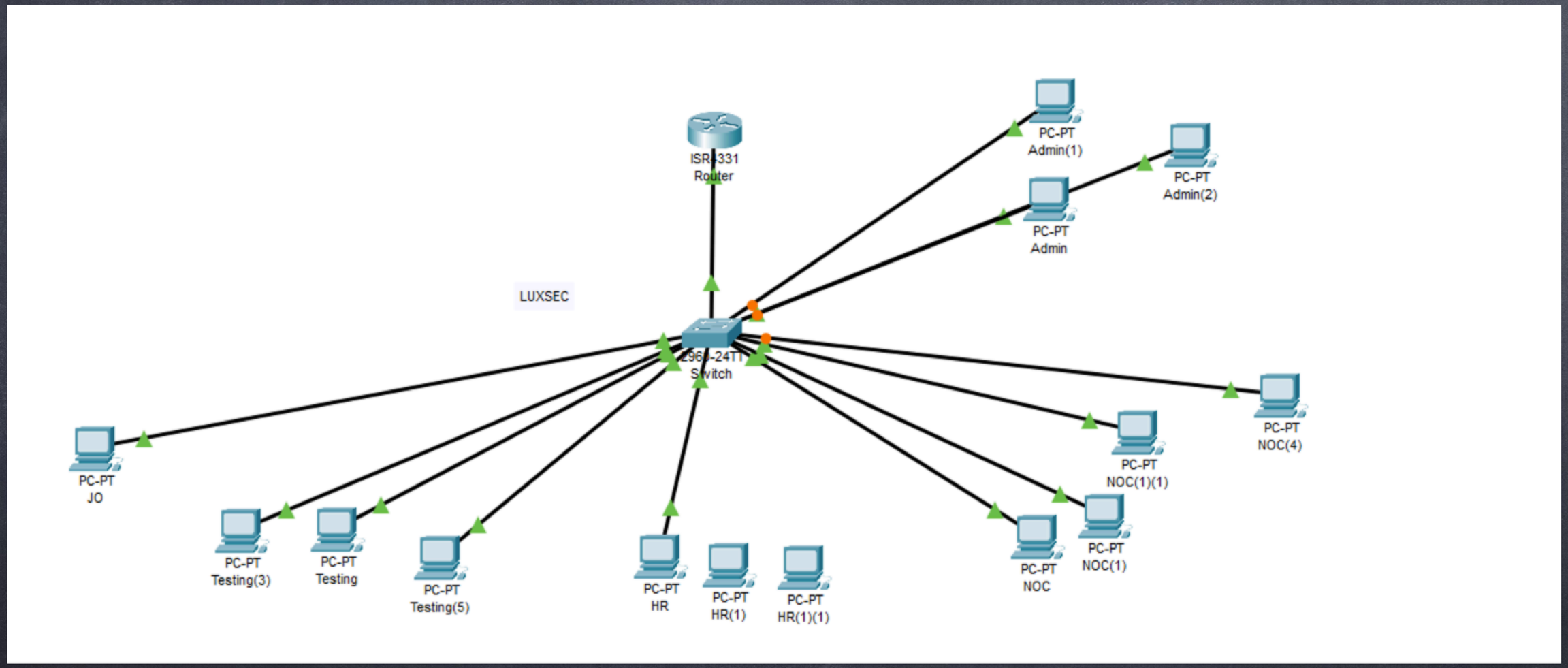
Consider this network topology of a Company




```
enable
conf t
interface g0/0/0
ip address 192.168.10.1 255.255.255.0
 ip dhcp pool net
network 192.168.10.0 255.255.255.0
dns-server 192.168.10.1
exit
interface g0/0/0
no shut
```

Subnetting a Network

The company now grows to have this topology.



Command Line Modes on Cisco Routers and Switches

Cisco IOS is the Internetwork Operating System of both Cisco routers and switches.

It has two interfaces,

- Command Line Interface (CLI), and
- Graphical User Interface (GUI)

When a switch or router boots up, the IOS loads the start configuration from NVRAM and displays the IOS prompt waiting for commands.

Command Line Modes on Cisco Routers and Switches

The Cisco IOS has five (5) command line modes.

1. Setup mode
2. User EXEC mode
3. Privileged EXEC mode
4. Global configuration mode
5. Specific configuration mode

Command Line Modes on Cisco Routers and Switches

Setup Mode

1. It is the initial setup configuration mode of Cisco switches and routers.
2. The device start in setup mode when no startup configuration exists in NVRAM.
3. After completion of the setup mode, the Cisco IOS transitions to user EXEC mode.

Command Line Modes on Cisco Routers and Switches

User EXEC Mode

1. It is the normal operation mode on Cisco switches and routers.
2. The Cisco IOS user EXEC prompt is the switch or router name followed by the 'greater than' character >.

Privileged EXEC Mode

1. It is the advanced operation mode of Cisco IOS. It has been designed to restrict access to IOS commands that can have adverse effects on the Cisco device and its configuration.
2. It is comprised of the switch or router name followed by the # character.

Command Line Modes on Cisco Routers and Switches

Global Configuration Mode

1. It comprises of commands pertaining to the entire Cisco device.
2. It can only be enabled from privileged EXEC mode by typing "config t" or "conf t" commands.
3. The prompt in this mode is comprised of the device name followed by "(config)#".

Command Line Modes on Cisco Routers and Switches

Specific Configuration Mode

1. It is used for commands that affect the configuration of either just one part or range of components of the Cisco device.
2. The prompt in this mode is comprised of the router or switch host name followed by "(config-<component>)#".

Basic Configuration of a Cisco Router or Switch

Naming the switch/router

A switch/router can be named using "hostname" command.

Configure Management IP Address

Configuring management IP address allows us to connect to the switch or router from remote locations using either Telnet or HTTP.

- Configuring Console Password
- Configuring Telnet Password

Basic Configuration of a Cisco Router or Switch

Configuring Banners

Banners can be used to display a brief message about the with when someone logs in.

It helps identity the switch we log into and its configuration and usage guidelines.

The "banner motd -" command (note that there's a space between motd and -) is used to configure the message of the day banner on the switch.

Configuration Password on Cisco Routers and Switches

Cisco devices have four types of passwords:

1. Console password: Used to set password for the console access.
2. Auxiliary password: It is used to set password to auxiliary port (if the switch has one).
3. VTY lines password: Used to set password for telnet and ssh access.
4. Privileged password: Used to set password for privileged access to the switch.

Configuration Password on Cisco Routers and Switches

Encrypting Passwords on Cisco Routers and Switches

1. Encrypting password can further enhance the security of the device.
2. Privileged password can be encrypted by using the command "enable secret" instead of "enable password". This command should be set from the privileged global configuration mode.

NB: The console, auxiliary and vty lines passwords cannot be encrypted even if we used "enable secret" command. To encrypt those passwords, we have to use another command "service password-encryption"

Enabling SSH on Cisco Routers and Switches

1. Remote configuration of a switch/router can be done using telnet or SSH protocols. Telnet is insecure; login credentials can be sniffed.
2. To address the security issue, SSH protocol is used for remote configuration of the switch or router.
3. SSH protocol is as same as telnet but it uses encryption during the communication.

Configuring EtherChannel on a Cisco Switch

1. Etherchannel is also known as port link aggregation.
2. It allows us to group several physical ethernet links on a Cisco switch into one logical link.

Configuring Static VLAN on a Cisco Switch

1. A single layer-2 network may be partitioned to create multiple distinct broadcast domains, which are mutually isolated so that packets can only pass between them via one or more routers; such a domain is referred to as a Virtual Local Area Network, Virtual LAN or VLAN.
2. VLANs are of two types:
    1. Static VLAN: Specific ports are assigned to specific VLAN
    2. Dynamic VLAN: MAC addresses are assigned to specific VLAN.