Computer Network Lab #4

Announcement

- Socket Programming Project Presentation on Wed 23 Apr 2025
  - Please follow seating announcement on Discord and MCV
- Computer network lab final examination on Thu 24 Apr 2025 at 16:15 – 18:00
  - Please follow lab final exam preparation announcement on Discord and MCV
  - The announcement and example exam are now published on MCV

Schedule & Content

- 09:00 – 10:00 [60 mins] [Provided Packet Tracer]
  - Lab 8.2 - Configuring VLANs and Trunking
- 10:00 – 10:50 [50 mins] [Provided Packet Tracer]
  - Lab 9 - Configuring Basic DHCPv4 on a Router
- 10:50 – 11:50 [60 mins] [Provided Packet Tracer]
  - Lab 10 – Configuring Dynamic and Static NAT

Agreement

- All of those who late than 15 minutes is considered to be absent. (50% will be deducted)
- Lab assignments must be submitted by deadline (Any late submission 50% will be deducted)

Lab 8.2 - Configuring VLANs and Trunking
[Provided Packet Tracer]

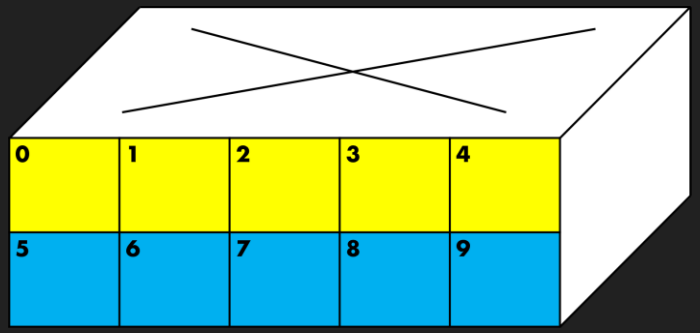
09:00 – 10:00 [60 mins]

Objectives

1. Build the Network and Configure Basic Device Settings
2. Create VLANs and Assign Switch Ports
3. Maintain VLAN Port Assignments and the VLAN Database
4. Configure an 802.1Q Trunk between the Switches

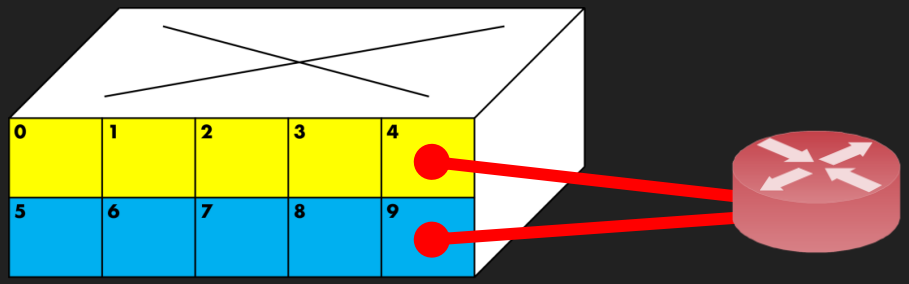
What is VLANs?

- **Virtual** Local Area Networks
  - Switch can be configured to define multiple ***virtual*** LANs over single physical LAN infrastructure.



VLAN's Features

- **Traffic Isolation**: frames to/from ports 0-4 can only reach ports 0-4
- **Dynamic membership**: ports can be dynamically assigned among VLANs
- **Forwarding between VLANS**: done via routing



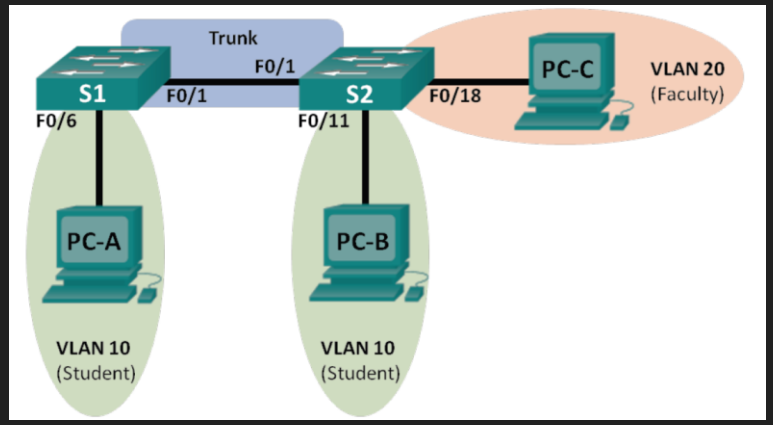
Trunk Port

- **Trunk Port**: carries frames between VLANS defined over multiple physical switches

Topology and Devices

Devices

- 3 PCs
- 2 Switches
- Console Cables
- Ethernet Cables
  - ? crossover
  - ? straight thru



Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
S1	VLAN 1	192.168.1.11	255.255.255.0	N/A
S2	VLAN 1	192.168.1.12	255.255.255.0	N/A
PC-A	NIC	192.168.10.3	255.255.255.0	192.168.10.1
PC-B	NIC	192.168.10.4	255.255.255.0	192.168.10.1
PC-C	NIC	192.168.20.3	255.255.255.0	192.168.20.1

1. Build the Network and Configure Basic Device Settings

1. Cable the network as shown in the topology
   - Attach the devices as shown in the topology diagram, and cable as necessary
2. Initialize and reload the switches
3. Configure basic settings for each switch
4. Configure PC hosts
5. Test connectivity

2. Create VLANs and Assign Switch Ports

- Create the VLANs on Switch
  - Switch(config)# vlan *[vlan no]*
- View the list of VLANs on Switch
  - Switch# show vlan
  - Switch# show vlan brief
- Assign interfaces to VLAN
  - Switch(config)# interface *[int]*
  - Switch(config-if)# switchport mode access
  - Switch(config-if)# switchport access vlan *[vlan no]*

3. Maintain VLAN Port Assignments and the VLAN Database

Range of interfaces

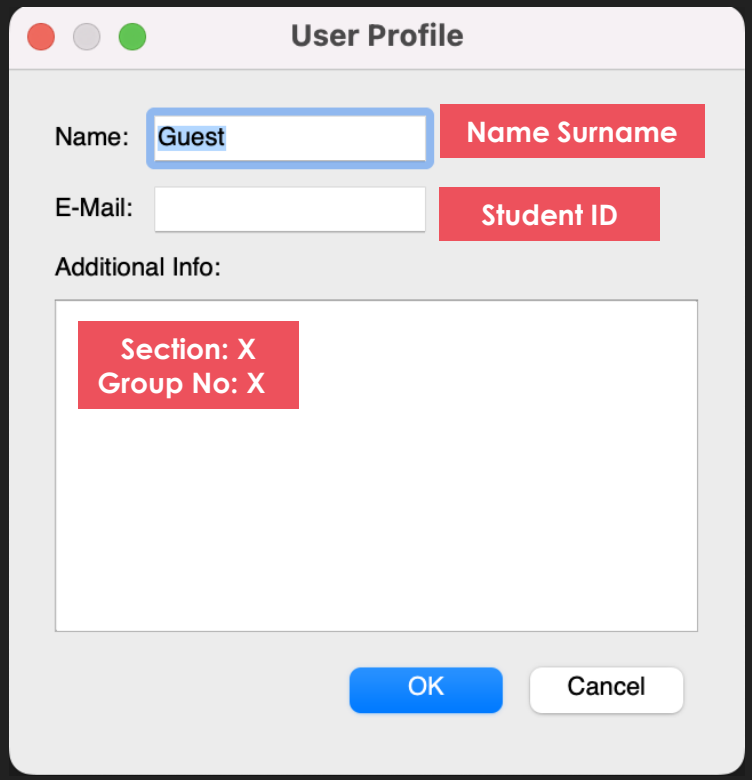
- To configure a range of interfaces
  - Switch(config)#interface range *[int - int]*
    - i.e., Switch(config)#interface range f0/1 - 24

4. Configure an 802.1Q Trunk Between the Switches

- Config switch port mode
  - Switch(config)# interface f0/1
  - Switch(config-if)# switchport mode *[mode]*
    - Mode = dynamic desirable, auto, trunk
- View trunked interfaces
  - Switch# show interfaces trunk

(1/3) User Profile Setting

Press Ctrl(Cmd)+Shift+U to Open User Profile Dialog



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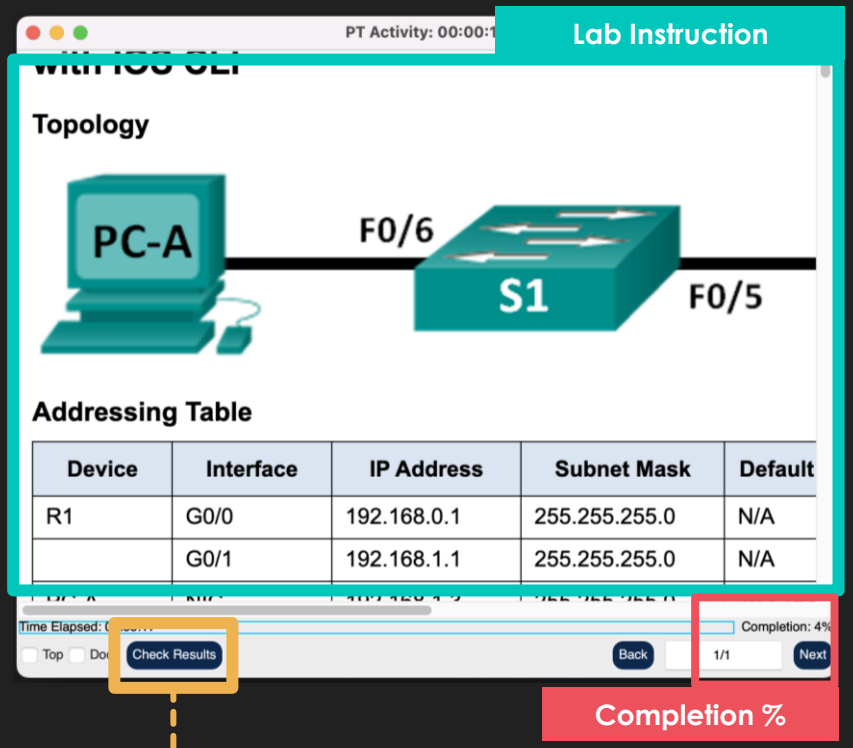
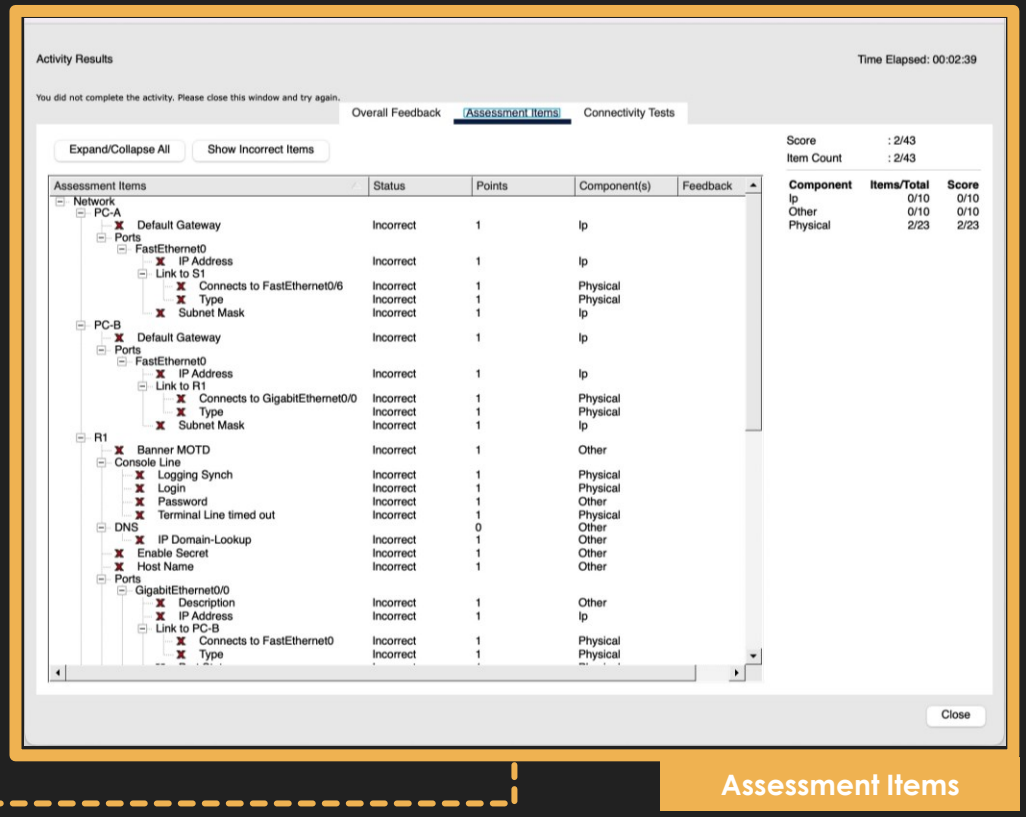
(2/3) Assessment





(3/3) How to use Packet Tracer file

- Devices used in each lab assignment (e.g. switch, router and PC) have been already provided
  - **DO NOT** add or remove any devices

1. Set the user profile
   - Cannot be changed later, otherwise all the activities **will be reset**
2. Select the appropriate cable type and connect it to each device
   - Corresponding to the network topology and the addressing table
3. Complete device configuration according to the lab instruction
   - Review: "***Lab1. Packet Tracer Tutorial & Build a Simple Network***"
4. Check the completion percentage and assessment items
5. Save and submit file

Lab 8.2 - Configuring VLANs and Trunking

- Video Clip
  - Lab8.Configuring VLANs and Trunking
- Materials
  - Slide ([#4] Lab #4 Slide)
  - Lab sheet ([#4] Lab 8.2 Configuring VLANs and Trunking)
  - Packet Tracer File ([#4] Lab 8.2 [Packet Tracer] Configuring VLANs and Trunking)
- Submission
  - Individual Assignment ([#4] Lab 8.2: Answer Sheet)
    - **Answer** the question set on mCV
    - **Upload** your Packet Tracer File

Please practice using the Packet Tracer file *individually*,
as *the final test* will require you to complete tasks on your own.

Lab 9 - Configuring Basic DHCPv4 on a Router

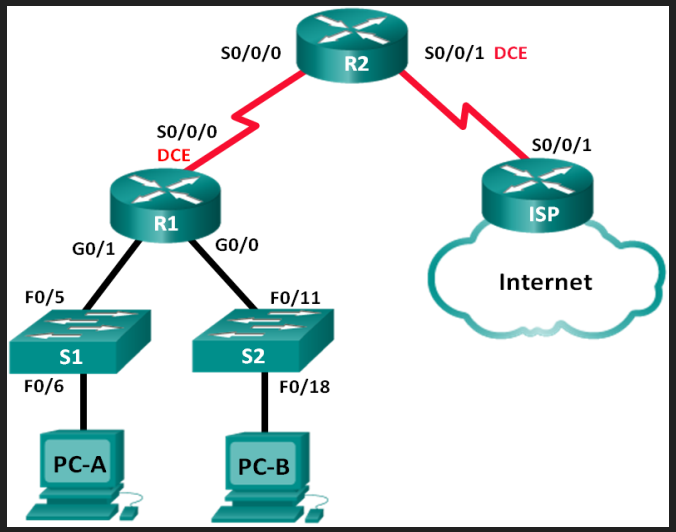
[Provided Packet Tracer]

10:00 – 10:50 [50 mins]

Objectives

- Build the Network and Configure Basic Device Settings
- Configure a DHCPv4 Server and a DHCP Relay Agent

Network topology



Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	G0/0	192.168.0.1	255.255.255.0	N/A
	G0/1	192.168.1.1	255.255.255.0	N/A
	S0/0/0 (DCE)	a)	255.255.255.252	N/A
R2	S0/0/0	192.168.2.254	b)	N/A
	S0/0/1 (DCE)	209.165.200.226	255.255.255.224	N/A
ISP	S0/0/1	209.165.200.225	255.255.255.224	N/A
PC-A	NIC	DHCP	DHCP	DHCP
PC-B	NIC	DHCP	DHCP	DHCP

Equipment

- **Devices**
  - 3 Routers – Cisco 1941
  - 2 Switches – Cisco 2960
  - 2 PCs
  - 2 Serial DCE Cables
  - 4 Straight-through cables

DHCP

- A protocol that automatically provide IP address and configurations, for example, subnet mask and default gateway to hosts in network
- Without DHCP, network administrators must manually assign IP to hosts which isn't scalable

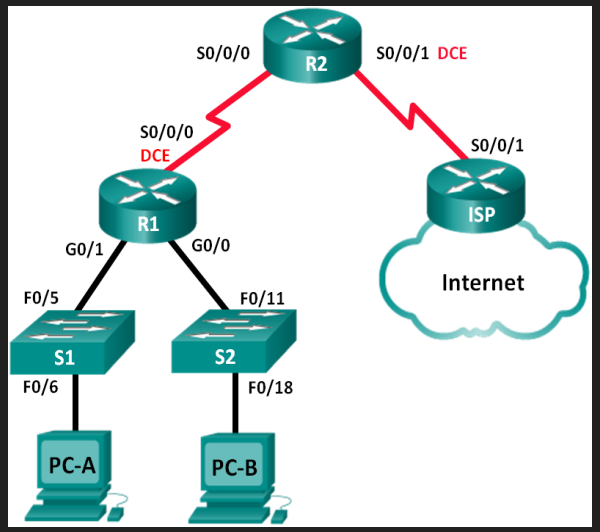
4 Steps in DHCP

DHCP overview:

- host broadcasts DHCP discover msg [optional]
- DHCP server responds with DHCP offer msg [optional]
- host requests IP address: DHCP request msg
- DHCP server sends address: DHCP ack msg

DHCP

- In this lab, we want to set up the R2 router to allocate IPv4 addresses across two distinct subnets, each connecting with R1 and the ISP, respectively.
- R2 is a DHCPv4 server
- R1 is a DHCP relay agent.



Configuration Guide

- R1> **enable**
- R1# **configure terminal**
- R1(config)# **?**
- R1(config-if)# **?**
- R1(dhcp-config)# **?**

Note:

You can type **?** to show command manual

Example:

```
Router(config)#ip dhcp ?
  excluded-address  Prevent DHCP from assigning certain addresses
  pool              Configure DHCP address pools
  relay             DHCP relay agent parameters
```

Packet Trace for this Lab

- Download Packet Tracer File from MyCourseVille

(1/3) User Profile Setting

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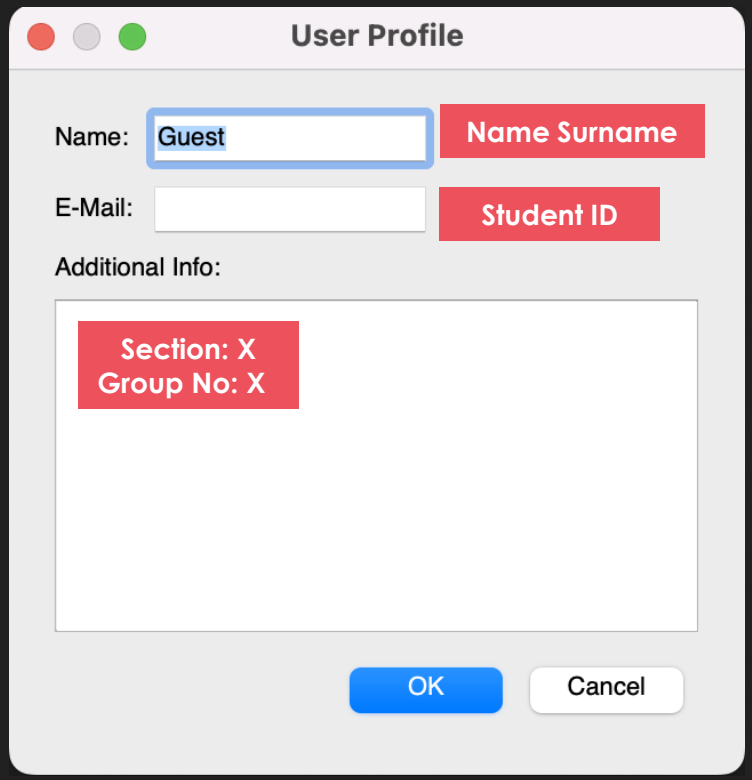

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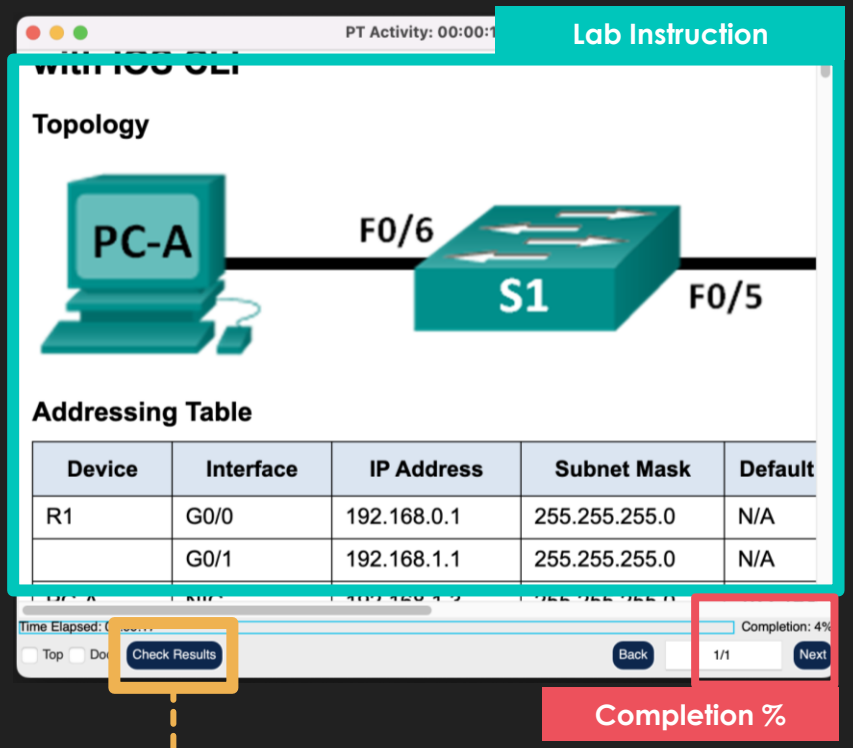

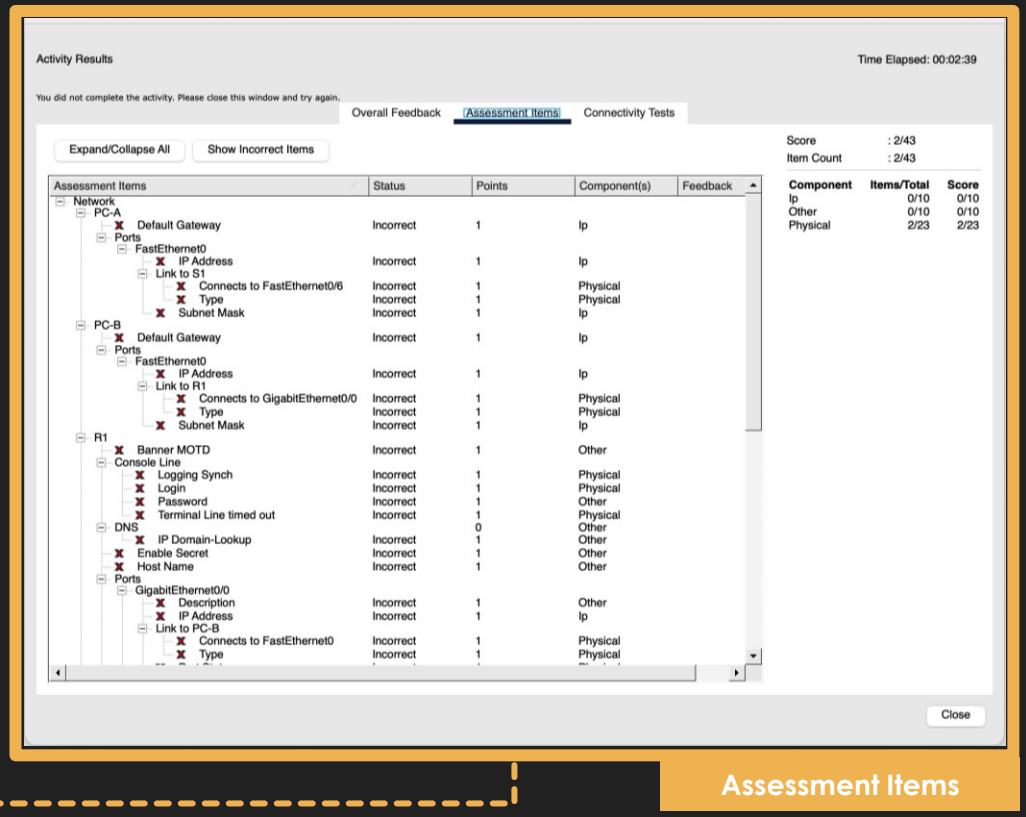

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Lab 9 - Configuring Basic DHCPv4 on a Router

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- Submission
  - Individual Assignment ([#4] Lab 9: Answer Sheet)
    - **Answer** the question set on mCV
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Please practice using the Packet Tracer file *individually*,
as *the final test* will require you to complete tasks on your own.

Lab 10 – Configuring Dynamic and Static NAT

[Provided Packet Tracer]

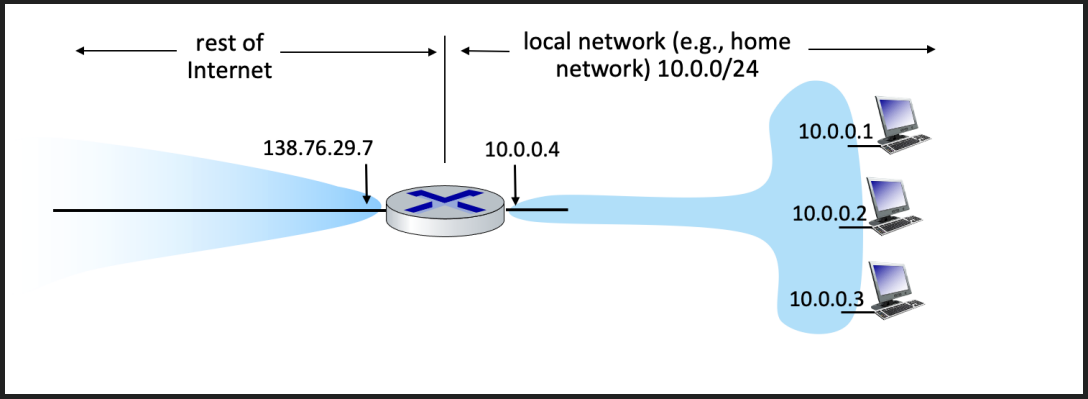
10:50 – 11:50 [60 mins]

Objectives

- Build the Network and Verify Connectivity
  - Configure basic settings for each router
  - Configure static routing
- Configure and Verify Static NAT
- Configure and Verify Dynamic NAT

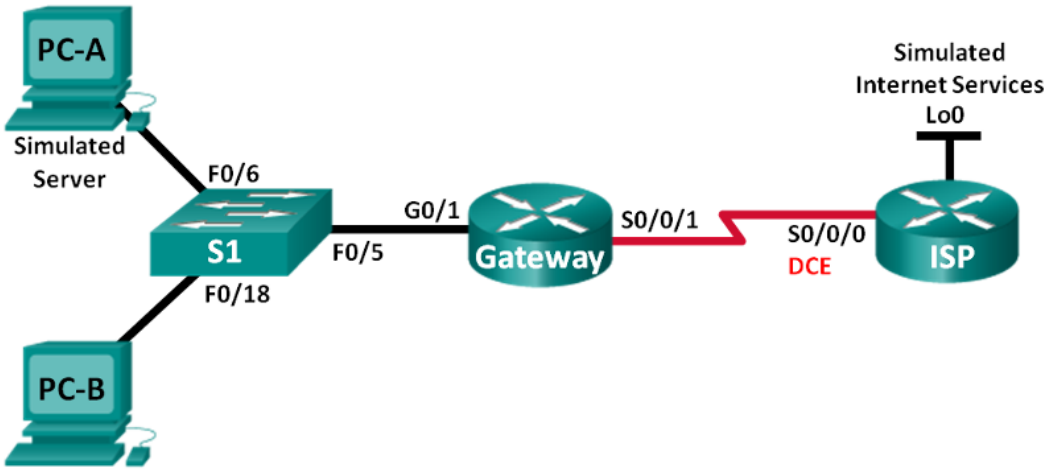
NAT

- Network Address Translation
- To mitigate an allocation of IPV4
- All devices in a private network share the same public IP address



Network Topology

Topology



Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
Gateway	G0/1	192.168.1.1	a) _____	N/A
	S0/0/1	209.165.201.18	b) _____	N/A
ISP	S0/0/0 (DCE)	c) _____	255.255.255.252	N/A
	Lo0	192.31.7.1	255.255.255.255	N/A
PC-A (Simulated Server)	NIC	192.168.1.20	255.255.255.0	d) _____
PC-B	NIC	192.168.1.21	e) _____	f) _____

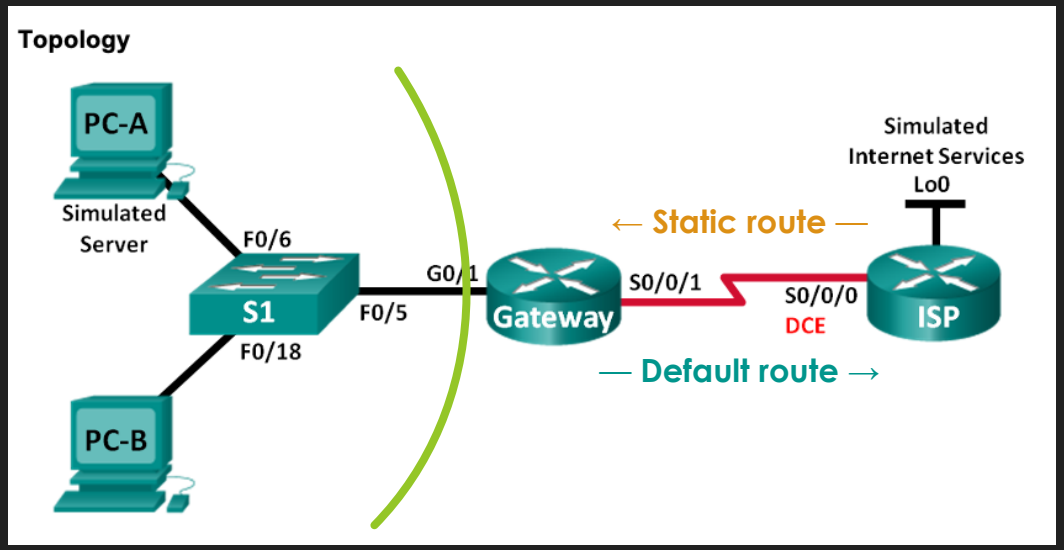
- 2 Routers – Cisco 1941
- 1 Switch – Cisco 2960
- 2 PCs
- 1 Serial DCE Cable
- 3 Straight-through cables

ISP: IP Address Allocation (209.165.200.224/27)

- Static allocation
  - 209.165.200.225 - 241
- Dynamic allocation
  - 209.165.200.242 - 255

Configure static routing

- Create a static route from the ISP router to the Gateway router (Review: Lab 4 – "Summarization")
- Create a default route from Gateway to ISP router
- Routers don't know each other's networks if we don't config route

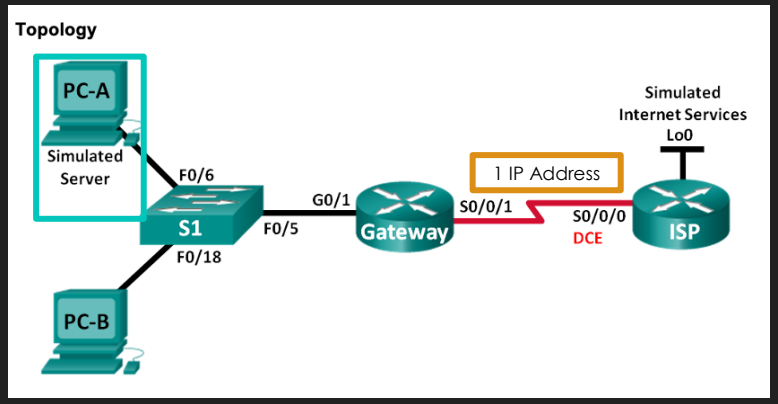


Static NAT

- It is a one-to-one mapping of local and global addresses
- Every internal IP address is mapped to a unique external IP address.

Configuration

- Configure a static mapping
- Specify the interfaces

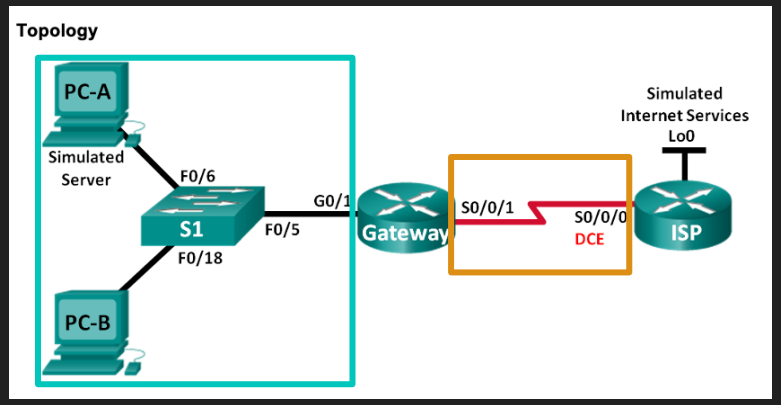


Dynamic NAT

- A pool of IP addresses are assigned to each device on first-come, first serve basis.
- There are many-to-many address mapping between local and global addresses

Configuration

- Define an access control list (ACL) that matches the LAN private IP address range
- Define the pool of usable public IP addresses
- Define the NAT from the inside source list to the outside pool
- Specify the interfaces



Verify Command

- R1# show ip route
- R1# show ip interface brief
- R1# show ip nat translations
- R1# show ip nat statistics

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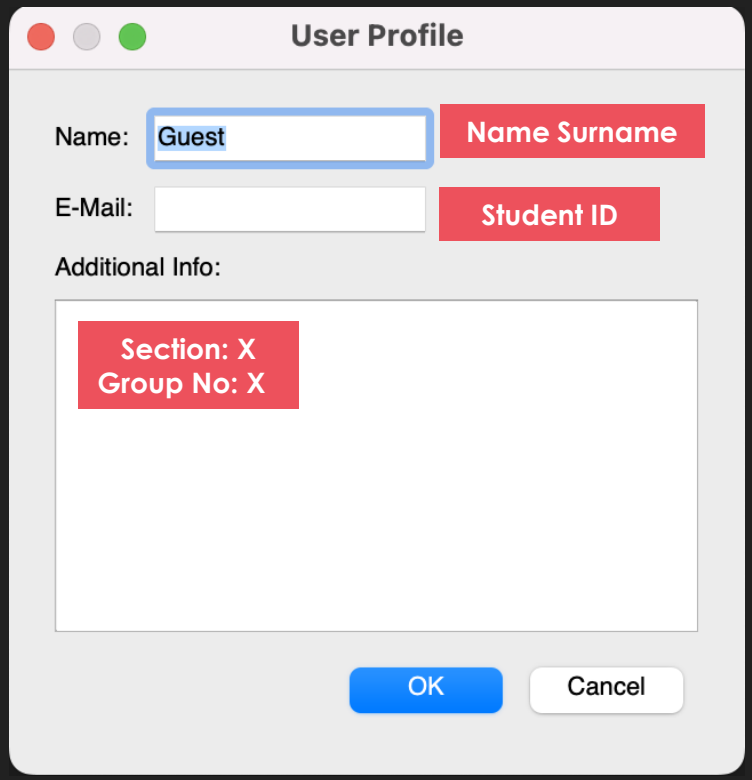

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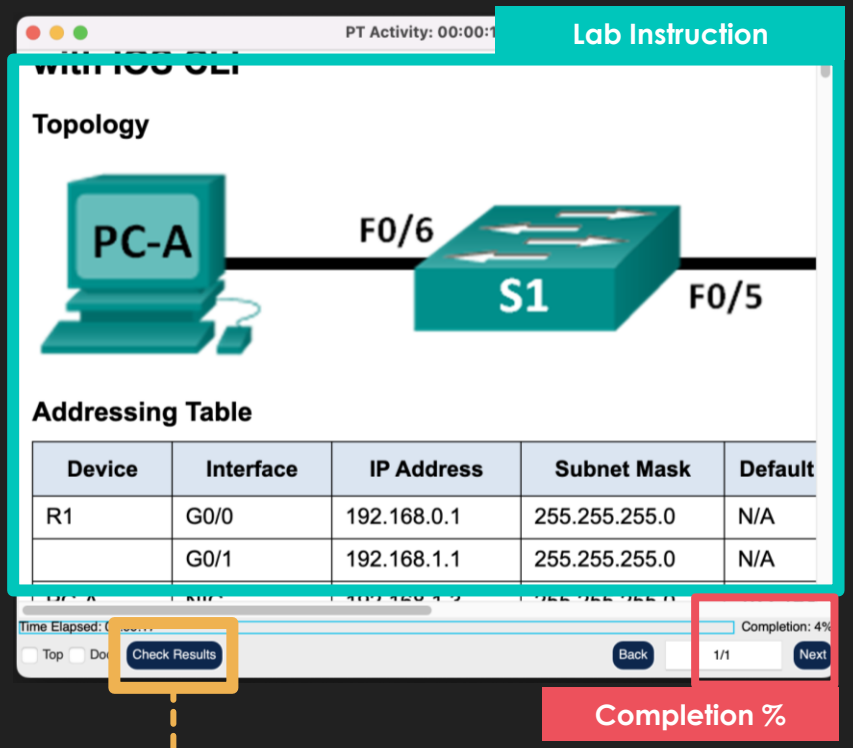

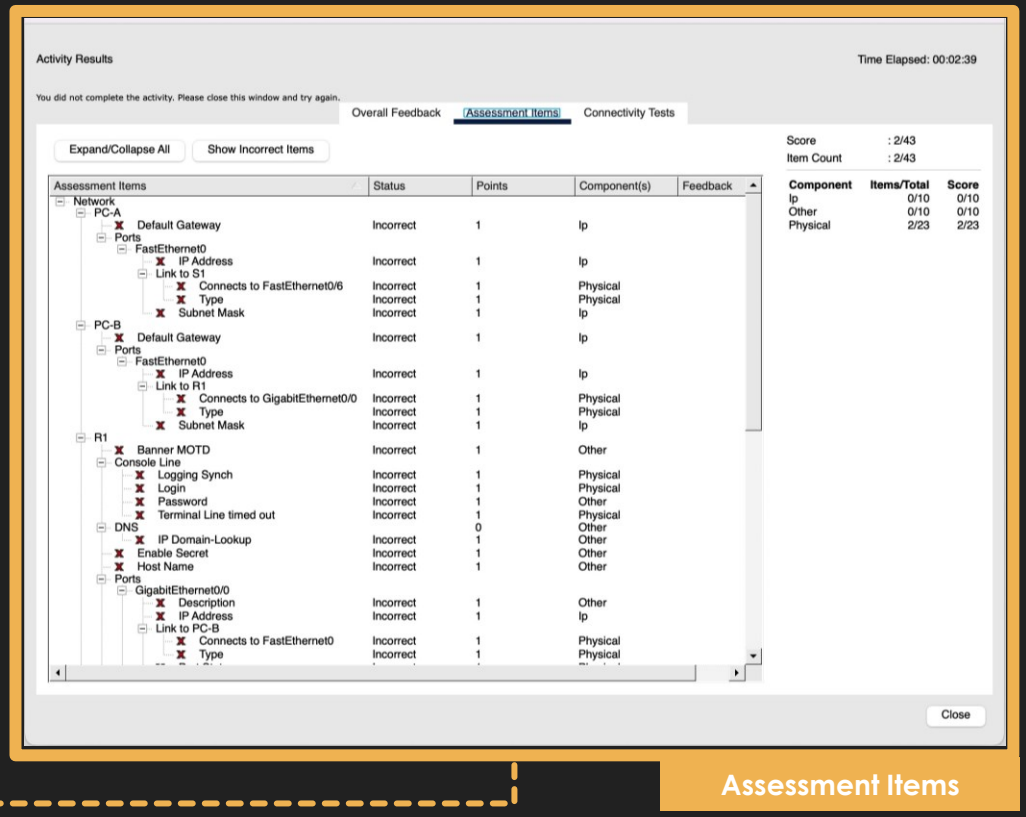

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