

Department of Electrical and Computer Engineering

Computer Networks (ENCS3320)

Project#2: Network Design, due 23/08/2024

Objectives:

- Learn to use packet tracer.
- Learn to do IP subnetting and address assignment.
- Learn to configure end devices like PCs and servers.
- Learn to implement routing protocols on routers.
- Learn to test and debug your network.

Topology:

The topology illustrates in **Figure 1** contains the following devices: Routers (**Router-PT**), Switches (**Switch-PT**), Server (**Server-PT**), Laptop (**Laptop-PT**), and PCs (**PC-PT**).

The number of devices in the subnetworks are as listed in Table 1. However, you need to add only the following devices in **Packet Tracer** topology:

1. **NET1**: 1 PC, 1 Laptop, and 1 Switch.
2. **NET2**: 2 Servers, 2 Switches, 2 PCs, and 2 Laptops.
3. **NET3**: 1 PC, 1 Laptop, and 1 Switch.
4. **NET4**: 3 PCs, 1 Laptop, and 2 Switches.
5. **CORE**: 4 Routers with proper interfaces.

Tasks:

Task0: IP subnetting & Assignment Part

1. You are required to assign the IP addresses of the routers and end devices with respect to **one of the student IDs** in your group as follows:
 - Assume ID is 121**3120** then the used IP is **120.31.8.0/22**.
 - Design the required IP addressing scheme and subnets using the above address space and the number of devices in Table 1 and the topology given in **Figure 1**.

Table 1: Number of hosts (Laptops, PCs, and Servers) per network excluding the router interface.

Network	Number of Hosts
NET2	60
NET1	20
NET3	30
NET4	10

2. Note that any solution without including the ID as above **will not be accepted**.
3. Include a completed table as instructed in Table 2 in your report with the following information for all subnets (edge and core).

Table 2: Subnetting details.

Subnet	Subnet Mask “/x”	Network IP	Broadcast IP	First IP	Last IP	#hosts
R0-R1 Link						
NET1						
R1-R2 Link						
:						
:						

Task1: Building Topology Part

1. Build the topology given in **Figure 1** using packet tracer based on the IP addressing you designed in **Task0**.
2. Configure the interfaces of all routers as instructed in **Figure 1**.
3. End devices (i.e. Laptops, PCs, and Servers) in the networks are getting their IPs in a static manner based on the assigned subnet IPs.

Task2: Setting-up Servers Part

1. Two servers are used in this topology: HTTP/WEB server and DNS server in NET2.
2. Configure the DNS server and WEB server with domain name www.ENCS3320Summer.com
3. Create your website by modifying the index.html file in the HTTP server. Your website should contain:
 - “ENCS3320-Summer Course Website” in the title.
 - “Welcome to [Computer Networks](#)” (part of the phrase is in [Blue](#)).
 - Group members’ names and IDs.
 - Try to make the page looks nice.

Task3: Routing Part

You need to use open shortest path protocol (OSPF) on all routers given with process id is 20 and the areas as instructed in **Figure 1**.

Task4: Testing and Troubleshooting Part

1. Test the connectivity between all PCs. You need to make **snapshots** of the results for ping and tracert commands between all PCs.
2. Access www.ENCS3320Summer.com from all PCs, take **snapshots** for all cases.
3. Show the outputs of 1 and 2 as **snapshots** and record them in your report with detailed explanations.

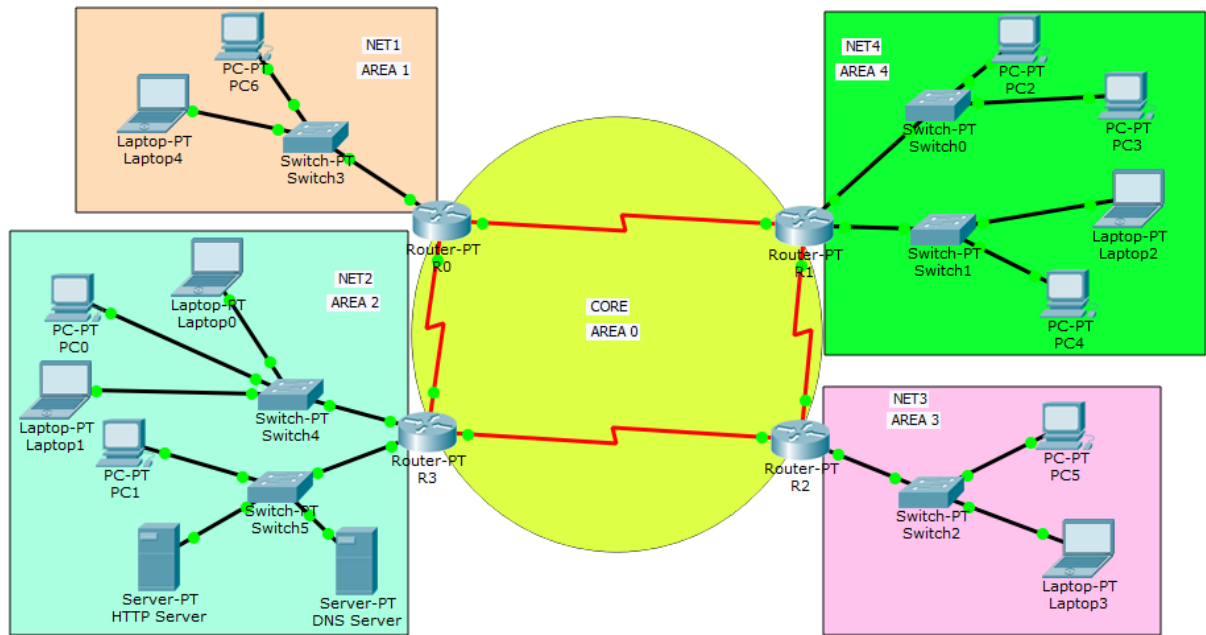


Figure 1: Network Topology

Project Report:

The report must contain parts highlighting the following points:

I. Cover Page

- Contains the university logo, department, course name and number, project title, your name (and id) for all team members and their section, and date.

II. Task0: IP subnetting Part

- Define the process on how to get the original IP address from your ID. Don't forget to briefly talk about IPv4 and specify the network and the host parts.
- Show your steps and how to define the subnets' IPs in your topology. Don't forget to complete the table and show the selected IPs on the topology.
- Provide snapshots showing the results and discuss them, **each snapshot must contain the time and the date of your machine.**

III. Task1: Building Topology Part

- Show how you add, connect, and configure the end devices. Provide some snapshots as usual.
- Show how you add, connect, and configure the routers. Provide some snapshots showing the commands used in the configuration as usual.
- Provide a snapshot of the topology with detailed labels on all links.
- Provide snapshots showing the results and discuss them, **each snapshot must contain the time and the date of your machine.**

IV. Task2: Setting-up Servers Part

- Show how you add, connect, and configure the HTTP server. Provide some snapshots showing the steps used in the configuration as usual.
- Show how you add, connect, and configure the DNS server. Provide some snapshots showing the steps used in the configuration as usual.
- Provide snapshots showing the results and discuss them, **each snapshot must contain the time and the date of your machine.**

V. Task3: Routing Part

- Describe the OSPF protocol and how to use it in your topology.
- List the required commands for defining the OSPF.

VI. Task4: Testing and Troubleshooting Part

- You need to test the connectivity of the topology between all end devices using Ping command.
- You need to test the routes of the topology between all end devices using tracert command. Also, show the routing tables for all routers.
- You need to access your web server from all devices using the browser option in the device.
- Provide snapshots for the required points showing the results and discuss them, **each snapshot must contain the time and the date of your machine.**

VII. Teamwork Part

- Three students can form a team at max, students could be from any section. Write the names of all team members on the project report cover page.
- Team members need to coordinate their work among themselves, so everyone will participate in design, implementation, simulation, testing, and report.
- Show the work done by each member in the team using a chart (i.e. bar, histogram, pie), and list the parts for each one in the team.

NOTE: Don't forget to add the appropriate numbering style, table of contents, list of figures, list of tables, references, and appendices.

Project Submissions Format and Deadlines:

- A. You need to submit the required documents through **ITC before end of Friday Aug. 23, 2024.**
- B. One submission per team is enough and the last submission will be only considered for the project.
- C. Files to be submitted through **ITC** session as follows:
 - i. A detailed report in pdf format (only **.pdf** format) for the project based on previous parts. The name of this pdf should be linked with your group number assigned in the excel sheet (e.g. **G1.pdf**). Deductions will be applied on other extensions or names.
 - ii. A packet tracer file (**.pkt**) and name it by your group number (**G1.pkt**), this file should contain the fully connected topology with detailed labels on all links about the IPs.

Grading Criteria

This is some sort of project competition. So one factor of the evaluation depends on how a project distinguishes itself. The evaluation factors that may distinguish your project:

- The more properly working features the better (i.e. a project of three well designed and implemented features is better than four poorly designed or implemented features).
- How well the parts are integrated with each other to serve the project goals.
- The level of understanding the details of design.
- How difficult it is to interface and use the parts (relatively).

The following table summarizes the grading criteria and submission deadlines of the course project.

Project Component	Percentage	Submission Deadline
Project Report & Files	75%	Friday, Aug. 23, 2024
Discussion/Question in Final Exam	25%	Final Exam

Generally, just by following the guidelines presented in this document, you should get a good score. However, failing to stick to these guidelines may result in a reduction proportional in magnitude to the deviation.

Good luck, *ENCS3320 Instructor*