Universidad Carlos III de Madrid

Departamento de Ingeniería Telemática

Computer Networks

IP Address Assignment Exercise

Computer Science

1. Goal

The main objective of this exercise is to get used to the problem of designing and assigning IP addresses in a given networking scenario, with room for customization.

It is **NECESSARY TO PROVIDE A DESIGN SOLUTION BEFORE THE CLASS WHERE THE EXERCISE IS SOLVED** (using Aula Global). It is important to realize that **NO routing plan will be provided** in this assignment; hence you must create one **based on the design choices you make during this exercise**

This exercise may be done alone or in couples. It is important to read through the entire document before starting the IP addressing process, to take all the requirements into account for your design.

Once the network design is ready, you will proceed to **1) fill an online form with the results (see Aula Global)** and **2) upload a network design picture and routing tables to Aula Global**.

2. Problem description

You are in charge of interconnecting the equipment of a large company. The company has several branches, all connected to each other. Each branch has a given number of devices (computers, printers, routers, etc.) to be connected through the network. Branches communicate with each other through a backbone network that connects to the router of each branch.

2.1. Global requirements

The enterprise "owns" the **10.0.0.0/16** address range, which is divided between the branches as follows.

- All the branches are connected to a backbone network that must be addressed within the **10.0.0.0/24** range.
- Each branch has **10.0.X.0/24** range, where '**X**' indicates the number of the branch. For example, the branch 1 has 10.0.1.0/24 range, the branch 2, 10.0.2.0/24 range, and so on.
- Every group must ONLY DESIGN ONE BRANCH and will use the **last two digits of the NIA** of any of the group components as the **value for 'X'**.

2.2. Requirements for the design of the branch networks

- Routers can be configured with a maximum of 5 LAN interfaces. It is not necessary to use them all (some of them will remain unused).
- The branch to be designed has three units, namely, the **Office 1, Office 2** and the room that hosts the various **servers** used by the branch. Due to the nature of the various tasks performed in each unit, it has been decided to have one **separate network** for each one.
- The network for **Office 1** must be able to accommodate up to **120 terminal devices** (PCs, printers, etc.).
- The network for **Office 2** must be able to accommodate up to **27 terminal devices** (PCs, printers, etc.).
- The network dedicated to the **servers** must be able to accommodate up to **12 terminal devices**.
- The routers of the three branch networks must be interconnected together with a dedicated **point-to-point link** between them.
- Each one of the routers of the office networks' is connected through a dedicated point-to-point link with the router of the network that hosts the servers.
- The connection of the branch to the central backbone is done through a separate router, which connects via a dedicated line to the router that serves the network hosting the servers. It is not necessary for this practice to configure a default route for this router (but it IS necessary for the rest of the routers).
- The topology design should provide **redundancy** against faults / broken links. Please note that redundancy must also be taken into account when configuring the routing tables (redundant routes are required in the forwarding table).
- It is necessary to also assign addresses (and the corresponding routes) to the networks that are "only" used to interconnect the different routers.
- It is mandatory to perform the addressing from the largest range (i.e. starting with the networks that require a larger number of end systems) to the lowest. That is, SUCCESIVELY assigning addresses starting with the 10.0.X.0 using the corresponding prefixes in the following order: /24, /25, /26,… depending on the design. This way, the unused addresses with remain at the end of the range.

2.3. Design methodology

The steps for the realization of this project are the following:

1. Design the network topology, defining the **number of subnets** needed.
2. Define the **number of addresses** required for each subnet.
3. Assign the **minimal required range** of addresses for each subnet.
4. Define the **routing tables** of all devices. Routers must be configured to take advantage of the existing **physical redundancy**, protecting services against link failures.

3. Delivery

You must deliver to things:

1) Fill in the form available in Aula Global with the results of the lab (assigned addresses, etc.). If the lab was done in pairs, this must be indicated in the field provided on the form.

2) A .pdf file with two pages: the first page will contain the topology drawing (including the assigned network addresses) and the second page will contain the routing tables. It will be delivered through the activity enabled for this purpose in Aula Global. The name of the file must follow the following format:

   RO-Ld-*[Group]-[NIA].pdf]*

   where NIA is the NIA used to configure the branch.

   Valid example: **RO-PdC2-L81-100055221.zip**

   NOTE: the exercise will **only** be delivered by one student (the one whose NIA is included in the name of the file that is the same used to configure the branch). In case it has been done in pairs the other NIA would be included in the online form commented in step 1.