TD3 - Networks and protocols

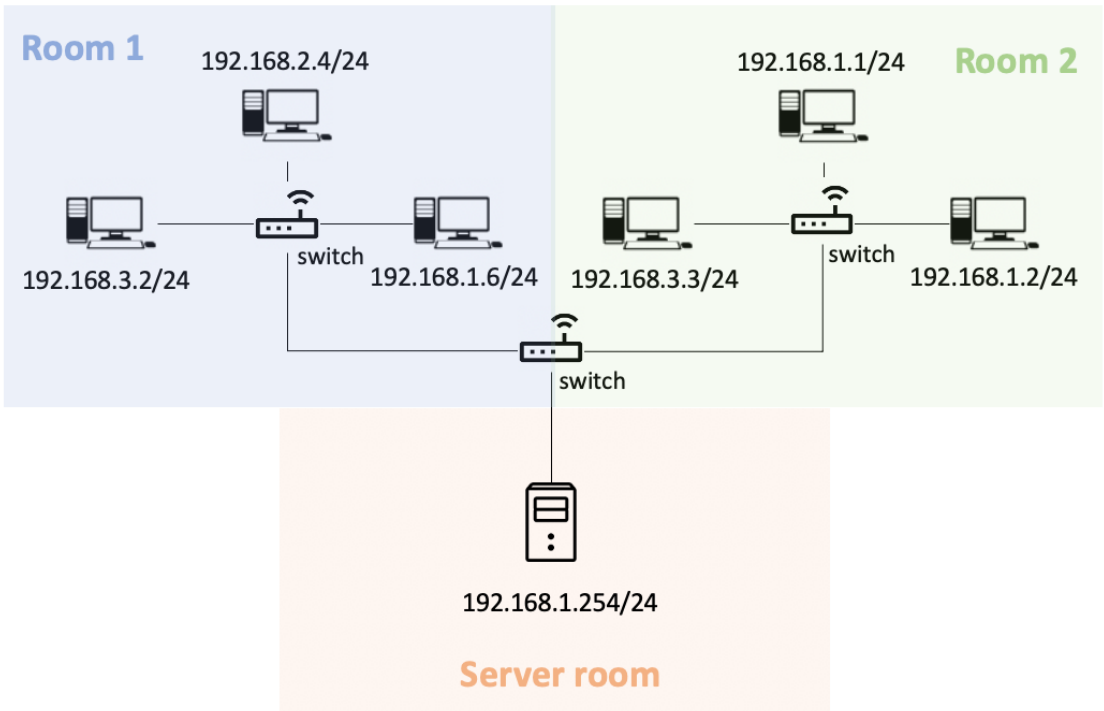
TI602

In this tutorial, we are interested in IP addressing and subnetting techniques.

Case study

We are interested in an online shooter video game platform where players control characters and compete in 3D space. Characters can interact with the environment and with other characters by attacking each other. This platform runs on a local network infrastructure, each player accesses the game on a machine on which his client application is running. A central server manages the synchronization of the game's views and actions: a client application sends data to the servers at a fairly high frequency on the position of the player's character, movements and the actions executed by the latter (in particular on the other players characters). The server after receiving this information, made a computation based on the actions and movements done (received) and distributes the updates to the other machines so that everyone can see everyone's state almost in real time locally on their machine. In this kind of games, the speed of the messages as well as the optimization of resources is very important in order to guarantee an optimal gaming experience (maximum data transmitted correctly and low latency for a view close to real time).

Part 1



In order to organize a gaming competition, we needed to configure a network of two playing rooms to allow two player teams to access the platform and compete. This project was initially entrusted to an agent who barely has basic knowledge on network. After installation and configuration, some players were not able to connect to the servers. So, we - network specialist L3 students - responded to solve this problem.

Before configuring anything, we need first to locate the problem:

1. Which machines cannot communicate with the server and why?
2. Keeping the same topology, propose a solution.

Even if IP configuration is hidden from players, some malicious players and bad losers had fun sending broadcast messages using the Broadcast IP address on the current network (255.255.255.255) as soon as they felt they were losing, to congest the network. To deal with this problem we decided to divide the network into three subnets (room 1 - subnet 1, room 2 - subnet 2, server room – subnet 3) by putting a router in the middle that connects the three rooms/subnets.

3. Why does adding a router solve this broadcast problem?
4. Put this router (router 1) in the topology and propose an IP configuration for the three networks using the address range 192.168.1.0/24:
    a. machines, router and server IP addresses
    b. subnetworks addresses/masks
    c. broadcast addresses
5. Build the router 1 routing table (no next hop in this case, only port/interface number)
6. Compute the size of the routing table based on the machine number
7. Propose a solution to optimize the size of the network

Part 2

After a few weeks, other requests for larger organizations were received and we must respond to this need, we have to extend our site. We can reserve two new adjacent rooms (room 3 and room 4) to create two new subnets (subnet 3 and subnet 4) and extend the two existing rooms (room 1 and room 2) to 10 and 20 machines. Subnet 3 and subnet 4 are connected by a new router (router 2) that is connected to router 1.

1. Is the mask used previously for our subnets enough to add the two new subnets? if so, what will be the subnets addresses? If no, give a new mask and new subnets addresses (for the 5 subnets)

2. Can we assign IP addresses to the new machines in the extended rooms 1 and 2 (10 and 20 machines) using the same subnets defined previously?

3. We now want to equip the two new rooms 3 and 4 with 50 machines each. Is this possible with our current subnets? Why?

4. Propose a solution.

5. Build routers 1 and 2 routing table.