

Computer Networks with Filius

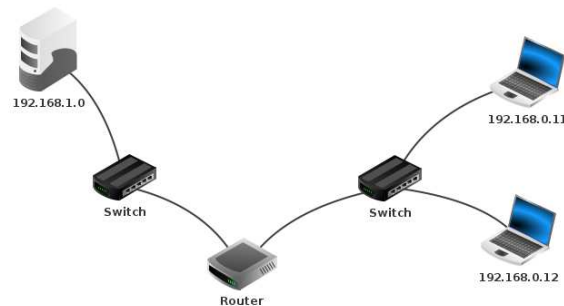
We are going to use the software tool Filius to create some small network computers, and to simulate some simple activities on the network.

Installing Filius

Filius can be freely downloaded and installed on your local machine. To get it, simply make a Google search with the keyword “filius”. If located in France, the first option given by Google will probably be the French page that the *Académie de Bordeaux* devotes to this software tool: just follow the link for the download (you’ll be redirected to a German webpage). The executable files of Filius can be directly installed under Windows and Ubuntu; otherwise, the source code is also available for compilation on your computer architecture.

A simple example

Let’s start by constructing the example given in the picture. We will manually define the IP addresses, including the addresses associated to the router, as well as the gateways for the computers. Once the network has been configured, open a terminal in each computer and try to *ping* the other ones (via their IP addresses).



Automatic configuration of a local network

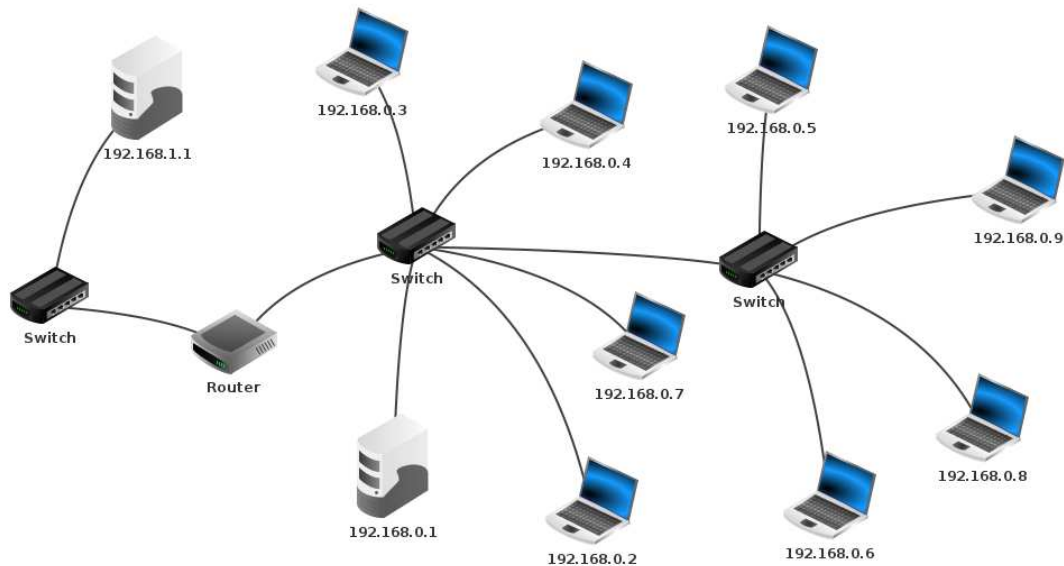
We consider now a larger network (see picture on next page), comprising two servers, and a certain number of laptops (client computers). We will suppose that the two servers have two fundamental roles in the network: one server (192.168.1.0) will play the role of DNS server (the main reference for the external connection to the Internet), while the other server (192.168.0.1) will play the role of DHCP server.

What is a *Dynamic Host Configuration Protocol* (DHCP) ? One of the first issues with large networks is that their manual configuration can be very time consuming, and humans are very likely to make mistakes when performing this kind of tasks (for example, by giving the same IP address to two computers). With the DHCP, the automatic configuration of all computers (our laptops) can be performed, once, of course, the DHCP server has manually been set up.

The DHCP server has IP address 192.168.0.1. In the computer’s settings, we need therefore to specify, among the others (see previous exercise on the small network), the DHCP settings. In practice, we will have to provide the allowed range of IP addresses to be considered when automatically assigning addresses, the gateway to the DNS server, as well as the IP address of the DNS server (the computer 192.168.1.0 will be our DNS server).

Once the DHCP server has correctly been set up, we only need to pre-configure all laptops by clicking on the option “Use DHCP for configuration”. If we’ll also click on “Use IP address as Name”, then we’ll be able to see the IP addresses that will automatically be assigned.

Your computer network is supposed to look like the one below. After activating the network, you’ll have an animation showing you the flux of information among the computers that allows the DHCP to assign the various addresses. There is no way to predict the chosen IP addresses, so it’s likely the addresses given below (for the laptops) will not correspond to yours.



In order to verify that the overall configuration of the network is correct, every computer needs to be able to communicate with all the others. Since we opted for an automatic configuration, it is not necessary to verify the connection (via *ping*) between any pair of computers: we can restrict our verification to some ad-hoc chosen computer pairs.

Echo server

Let’s try now to make a laptop send messages to the DHCP server, where an echo software tool will be running, which basically sends back as is every received message. To this aim, we will install the “Echo server” on the server, and the “Generic client” on the laptop. Run both applications at the same time, and follow the graphical interface to establish the connection and to exchange some short text messages.

DNS server

For our computer 192.168.1.0 to play the role of a DNS server, it is simply necessary to install on it the corresponding software (all other computers should already know, at this stage, the address of the DNS server). The *Domain Name System* allows us to use a human-friendly name for the websites, instead of making direct use of their IP addresses.

Install the “Webserver” on the DNS server, and the “Webbrowser” on one of the laptops. From the laptop, try to visit the default webpage already present on the DNS server. Since

the DNS was not configured yet, we'll need to use, in this initial attempt, directly the IP address. Install now the tool "DNS server" on the server, and configure it so that the name `www.filius.istic.rennes1.fr` is associated to the IP address of our DNS server. Try to visit again the webpage now by writing the new name associated to the webpage. Finally, add a "Websserver" on our second server, modify the default webpage and configure the DNS server so that it can be reached not only with the IP address, but also with the name `www.other.istic.rennes1.fr`.

What else?

It is your time now to propose an additional exercise, with the corresponding correction, to the other students of the class. Explore the other various functionalities provided Filius, and choose the one that inspires you the most. Write down the text of the exercise by taking inspiration by the text of the exercises above. Please also prepare a correction of your exercise in written form, and submit it to your teacher together with the computer network project realized with Filius (please use the standard Filius file format).