Lab Assignment 8	**L8**
Corresponding to Topic 11, "Network Fundamentals"	

Main goals

- To understand some basic concepts concerning TCP/IP.
- To become familiar with the basic elements of network administration: network interface, static routing tables and client configuration.
- To learn how to configure the network host to be part of a computer network.

Previous configuration

For this lab, we will use two VMs (*guests*). Besides `core_si`, we will create a new VM which we will call `si_server`. Almost all exercises in this lab will be done on this `si_server`.

1) **Create a clone of** `core_si`**:**
   a) Name: `si_server`.
   b) Set the checkbox of the MAC address restart.
   c) Type of clone: *Linked*.

2) Go to the global VirtualBox preferences and define two types of NAT networks:

    a) Network1 name: nat_1:

        I) IP routing (CIDR network): 10.0.**2**.0/24.

        II) Enable DHCP support.

    b) Network 2: name: nat_2:

        I) IP routing (CIDR network): 10.0.**3**.0/24.

        II) Enable DHCP support.

3) Adjust the network configuration of your two virtual machines:

    a) `core_si`:

        I) Adapter 1: connect to the nat_1 NAT network.

    b) `si_server`:

        I) Adapter 1: connect to the nat_1 NAT network.

        II) Adapter 2: connect to the nat_2 NAT network.

    (*Make sure that the cable is connected: tick in "Cable connected").

Once the whole environment is set, create an initial SnapShot and start the lab.

Network Administration

1) **Configuration:**

   a) Turn on your clone machine (`si-server`) and login as 'root' user.

   b) Modify the VM host name from `si` to `si-server`.

   c) Check the network interfaces available in the virtual machine.

   d) Use the `ifconfig` command to disable the first non-local network interface available (loopback).

   e) Enable it again.

   f) Modify manually the configuration of the second interface (the one not used) so that it is configured in dynamic mode by the DHCP server offered by VirtualBox. Do it so that this change is permanent.

   g) Restart the network configuration service (or using ifdown/ifup commands). Check the IP assigned by the DHCP server.

   h) Now, knowing your IP, configure this second interface in static mode (fixed IP) and in a permanent way. Indicate the netmask parameters, the network address, the broadcast address and the gateway[1].

2) **Routing:**

   a) Force all the traffic from the VM to go through this second network interface.

   b) Add a new network route to route all the traffic whose destination is the public network of our Science Faculty (193.144.198.0) by using the *eth0* interface.

   c) Check that it is working correctly with a `ping` (`-I`) to the IP 193.144.198.222 (for example).

   d) Is it possible to find out the Ethernet address (MAC) of www.ce.unican.es from the virtual machine? Why/Why not?

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[1] Gateway address is always (for VirtualBox) xxx.xxx.xxx.**1.**

3) Domain Name Service (DNS) and Dynamic Host Configuration Protocol (DHCP):

a) Configure the system so that www.elpais.es is really "*localhost*". In other words, the system will resolve the name www.elpais.es with the IP 127.0.0.1. Check that it works.

b) Configure the `/etc/hosts` file so that both virtual machines can solve other hostnames. Check that it works.

c) Include the *atc.unican.es* domain in the automatic search. Check if a ping to calderon hostname is autocompleted correctly.

4) IPv4 network reconfiguration:

a) Configure `si-server` to act as a Gateway/Proxy (default) for `si`. You must enable ip-forwarding in the kernel configuration of the `si-server` and delete all its routes related to eth1. Then, in both machines `si` and in `si-server` configure a **static** and permanent, eth0 interface. In `si-server` (ip:10.0.2.5, gw:10.0.2.1) and in `si` (ip:10.0.2.6, gw:10.0.2.5).

b) Check that network traffic from `si` to "internet" pass through `si-server`. Make use of the command `traceroute`.