

Redes de Comunicações II

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Quick guide on Virtualbox for the VoIP practical assignment

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(Note: all things highlighted in yellow should be done before the class, in order to save time)

Introduction

Using Virtualbox beyond the basic default configurations for the first time can be a daunting experience. This guide aims to provide some guidance to the students on how to prepare their setting for the VoIP assignment.

The VoIP assignment

The VoIP assignment was originally conceived assuming that there was an Ethernet network in the Lab. The Desktop computers would be connected to that network. Additionally, a Wi-Fi router would also be connected to that network. Therefore, the idea of the work would be for the Desktop computer to act as a VoIP server, and your smartphone would be connected to the same network (but via Wi-Fi) and act as a VoIP client (after installing the necessary software, such as Linphone).

As of this date, the Ethernet network is still under construction. A workaround was set in place, taking advantage of the fact that the students have Wi-Fi cards on their laptop. Therefore, the VoIP assignment has to be done with both the laptop AND the smartphone (or the second student's laptop) connected via Wi-Fi to one of the Wi-Fi networks of the lab (i.e., "Eduroam" cannot be used, as it filters ports, which is necessary for this work).

To allow this to happen, the VoIP server needs to be installed and configured (and Linux needs to be configured as well to allow it to work). This is a time-consuming task, and this is why the Desktop computer shouldn't (ideally) be used to install the software. Therefore, a Virtualbox Virtual Machine with Linux and Asterisk (i.e., the VoIP server) is provided. You just need Virtualbox (alternatively, VMWare Player can be used, and there are accounts that it is better supported for this work on Mac-based laptops).

Virtualbox configurations

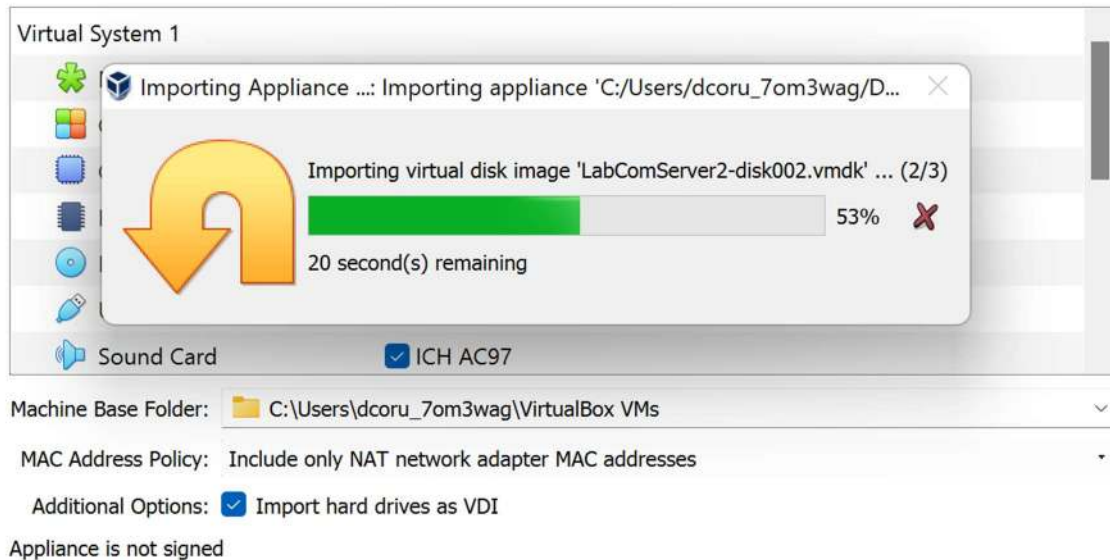
(step 1)

In order to use the virtual machine, you need to download the "Debian LXDE (VirtualBox Appliance" from e-learning. You can then extract the ZIP and then double click the OVA file, which will trigger VirtualBox and the Import wizard. Just press "Import", and you'll have yourself a virtual machine installed in a few seconds.

Import Virtual Appliance

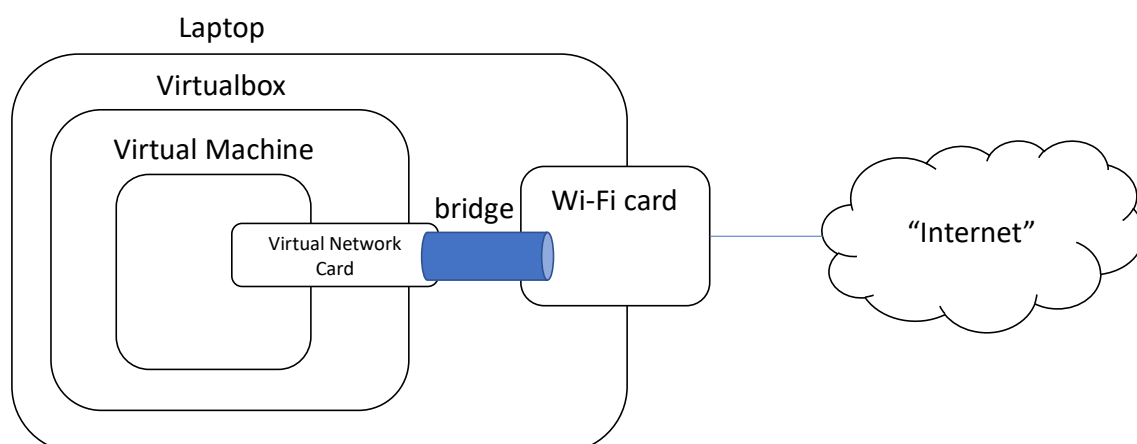
Appliance settings

These are the virtual machines contained in the appliance and the suggested settings of the imported VirtualBox machines. You can change many of the properties shown by double-clicking on the items and disable others using the check boxes below.



(step 2 – network configuration)

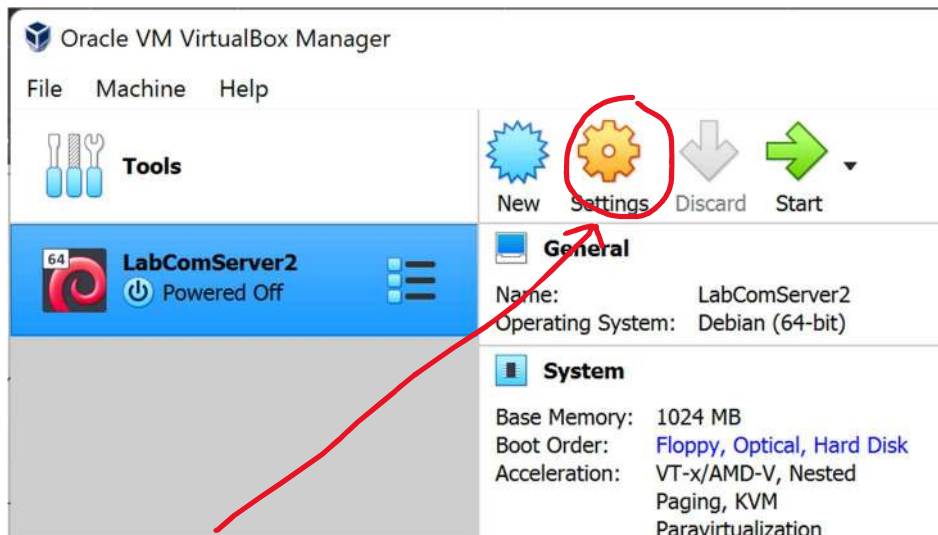
By default, your VM will have the network settings in Virtualbox configured as “NAT”. This does exactly just that: the network link of your host (i.e., physical computer, your laptop) will do a NAT to your VM, providing it with network connectivity. This is cumbersome if you need to use port-based services, such as a SIP server. Therefore, we need to bridge the Wi-Fi card adapter of your laptop with the virtual network adapter of the virtual machine. Take a look at the next figure:



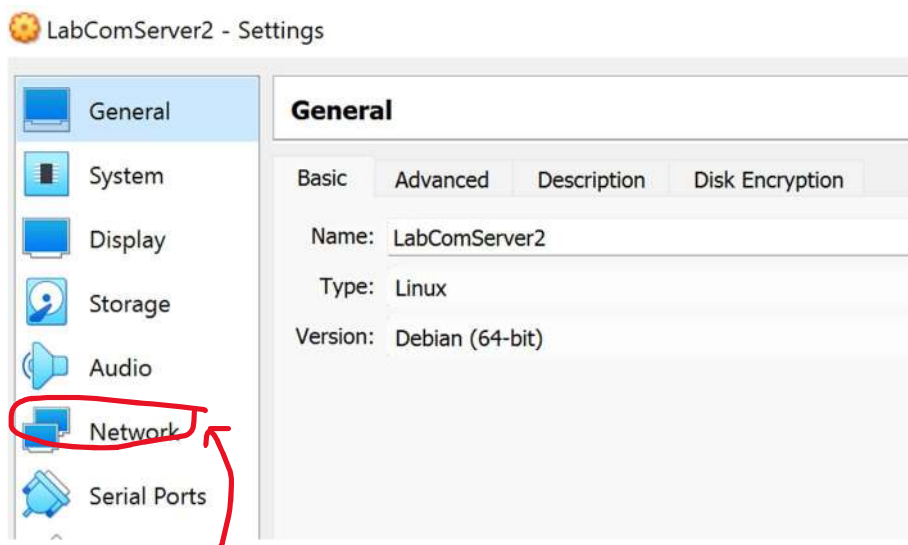
The difference between “NAT” mode and “Bridge Mode” is that in the second mode “Oracle VM VirtualBox connects to one of your installed network cards and exchanges network packets

directly, circumventing your host operating system's network stack¹." In other words, it will appear as if your VM was directly connected to the "Internet". That is: it will be able to request DHCP directly to the Wi-Fi router to which the Wi-Fi card of your laptop is connected. It will operate as if it was a physical device located somewhere else in the network.

To change the VM to bridge mode:



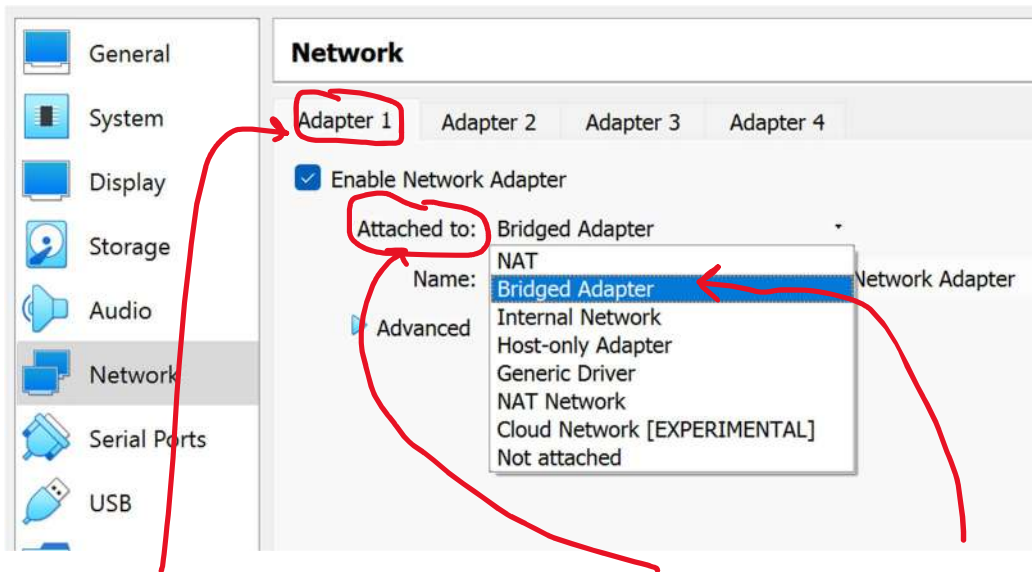
Press "Settings" .



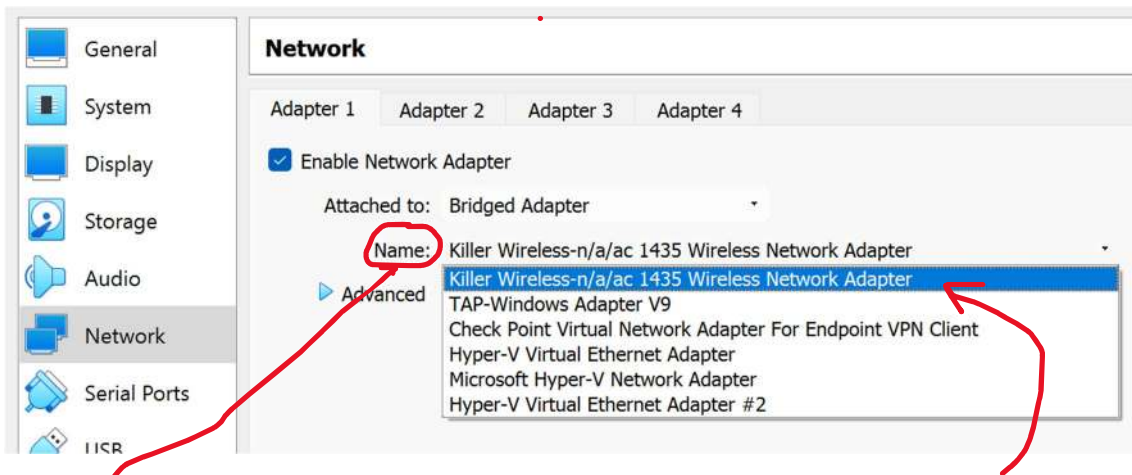
Go to "Network".

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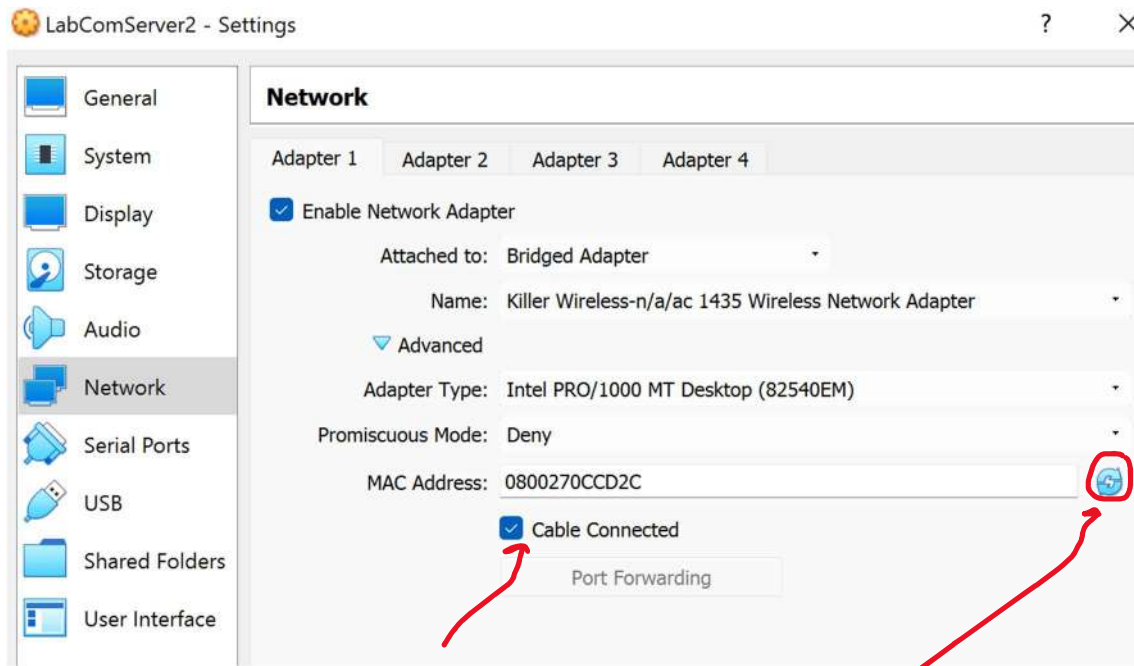
<https://www.virtualbox.org/manual/ch06.html#:~:text=To%20enable%20bridged%20networking%2C%20Open,network%20interfaces%20of%20your%20systems.>



Go to "Adapter 1", and in the drop-down menu of "Attached to:" select "Bridged Adapter"



You have several network cards in your computer, so you need to select your Wi-Fi card, in the "Name" drop-down menu. In my case, it's a "Killer Wireless-n/a/ac 1425 Wireless Network Adapter". If you can't distinguish from the options, try to exclude the obvious ones (i.e., the ones that say "Ethernet", "USB" or "Virtual"). Usually Wi-Fi cards have "Intel" or "Realtek" in them. Google is your friend.



Now, everyone will be connecting to the same network using the SAME virtual machine. This means that everyone will have the SAME MAC address. The poor Wi-Fi router will think everyone is a single machine and, therefore, will give everyone the same IP address in the DHCP process. You can avoid this by generating a random MAC address via the “recycling” button. You also have to activate the “Cable Connected” option, otherwise the bridge won’t be connected.

(step 3 – inside the virtual machine)

You can start the VM now, selecting “Start”. In principle, you won’t need to do anything, because when the machine boots up, it will request DHCP in any network card available. In this case, this will be the “virtual network card” of the VM, which will be bridged to the laptop’s Wi-Fi card. As long as you have your laptop with the Wi-Fi link connected to the Lab’s Wi-Fi network, the VM should be able to exploit this link to request by itself an IP address to the Wi-Fi router. To verify this, open a terminal in Linux and type:

```
ip addr
```

Look for the IP address in the interfaces list. Your interface should be something like ‘enp3s0’ or similar (by the way, this means that it’s an Ethernet network device, inserted in bus 3 and slot 0). The IP address should be one of the same subnet as the IP address of the Wi-Fi card of your laptop.

If you don’t have a correct IP address (i.e., addresses starting in “169” mean that the DHCP failed, any other IP means that you’re probably still in “NAT” mode), you can check some things, as follows.

In Linux, the command to trigger a DHCP request is `dhclient enp3s0`. However, most modern Linux installations have “Network Manager” running. This means that any configuration that you do in the command line will be disconfigured by “Network Manager” in some point in time (even if you do it in root mode), and thus the command will fail. You need to go into the link in the bottom right corner, right click on “Wired Ethernet Link #1”, and check the options there. You need to make sure that, in the IPv4 tab, everything is set to “auto” (i.e., ensure that you don’t have, for example, any manual IP address from some other practical work). If you can’t

see the “Network Manager” configuration for the Wired Ethernet Link #1, try to use the “disconnect” option and then “connect” again.

In VirtualBox, if you don’t activate the “Connect Cable” option, you won’t be able to connect in Linux.

Hope this helped.