Laboratory Work №1.
Installing Linux Ubuntu on a virtual machine VirtualBox.

Oracle VM VirtualBox - this is a set of applications, system services and drivers that emulate new computer equipment in the operating system environment where VirtualBox is installed. On a virtual machine (virtual machine), you can install almost any operating system (guest OS) and use it in parallel with the primary. For example, on a real Windows computer, you can install a virtual machine (VM - Virtual Machine) with the operating system of the Linux family and use both operating systems simultaneously. In addition, you can configure the interaction between these systems over the local network, data exchange through removable media, shared folders, etc. Also, the current state of the virtual machine (and the state of the operating system installed on it) can be fixed, and if necessary, in any Moment of time - perform a full rollback to this state. In other words, a virtual machine is a very convenient tool for learning new operating systems, debugging software, performing experiments without disturbing the main OS, examining viruses, diagnostics and recovery, and just for running multiple operating systems on the same computer.

Installing Oracle VM Virtualbox

The current version of Oracle VM VirtualBox can be downloaded from the https://www.virtualbox.org/wiki/Downloads project, which contains links to downloading installation packages for Windows x86/x64, Linux, Solaris and OS X.

The installation in Windows environment should be performed under User account with administrator rights.

In the process of further installation of VirtualBox a warning will be issued:

This means that when installing the VirtualBox network drivers, the current network connections will be reset and a temporary disconnection from the network will occur. If, for example, parallel with the installation, the data is transferred to the network drive, it will fail. If the network is not running, then short-term disabling of the adapters will not have any effect, and you need to allow the installation to continue with the Yes button. Otherwise, you must first complete the work with network resources. After the installation is completed, the main VirtualBox user program module will be launched - Oracle VM VirtualBox Manager (Oracle manager VM VirtualBox):

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All actions on creating virtual machines, changing their settings, importing and exporting configurations, etc. can be performed using the **Oracle VM VirtualBox Manager** (in the Russian-language software - **Oracle VM VirtualBox Manager**) or using the command line utility **VboxManage.exe.** The last one has several great possibilities for configuring virtual machines, but it is more difficult to use.

Installing a guest OS on a virtual machine can be divided into 2 stages:

Create the required virtual machine using VirtualBox;

- Boot into the environment of the created virtual machine from the installation disk.

The source of the download (media with Linux distribution) is determined by the settings of the virtual machine. They can be a real or virtual CD / DVD drive, a floppy disk, a HDD, a bootable disk image or a local network. By default, the boot order is the following: floppy disk, CD-ROM, hard disk, Network. This order can be changed in the virtual machine settings.

The first time VirtualBox is launched, the main program window with the welcome message is displayed and the New button is activated to create a new VM:
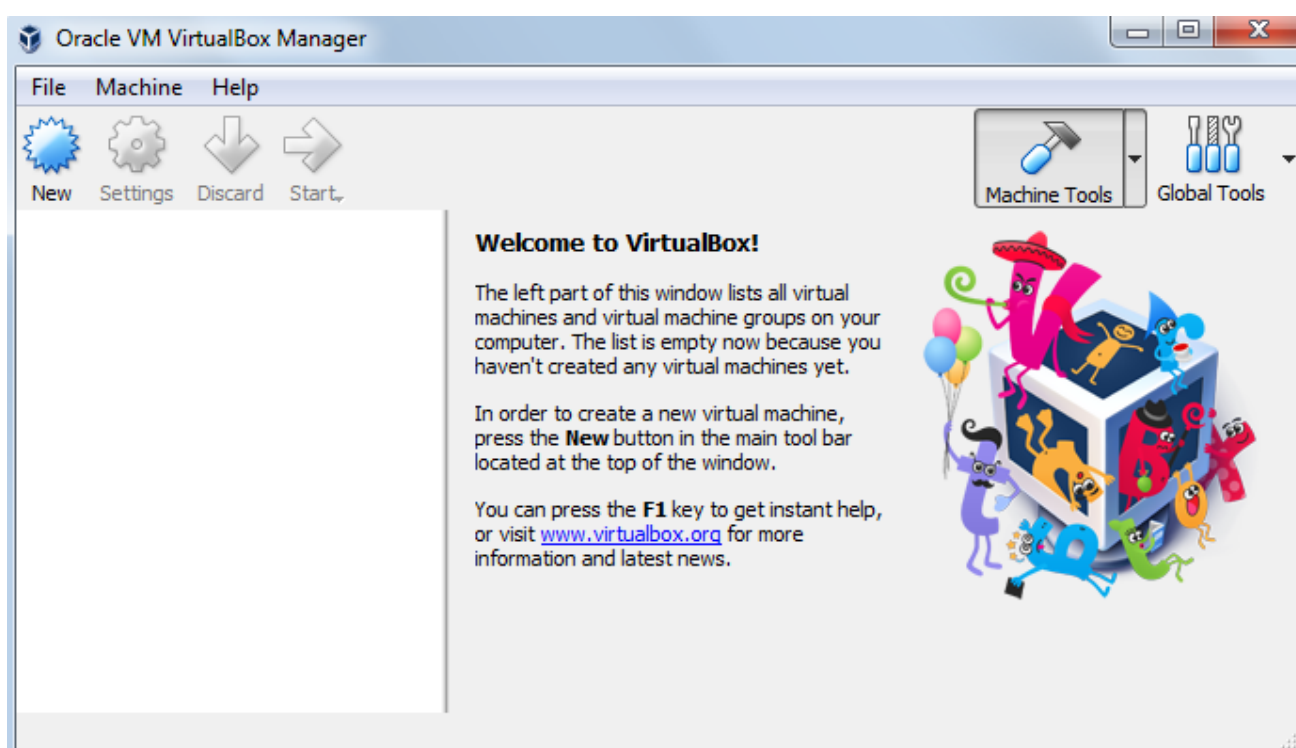

When creating a new virtual machine, the following parameters are defined:

- name of the virtual machine. In accordance with it, a directory with virtual machine files will be created. By default, this is a subdirectory in **C:\Documents and Settings\Имя пользователя\VirtualBox VMs** in the Windows XP environment **C:\Users\Пользователь\VirtualBox VMs** for Windows 7 and later.

- the type of operating system that will be installed on the virtual machine. In this case, Linux - OS version. In this case, Ubuntu.

Other parameters can be left by default, because they are already selected based on the configuration of the equipment of the real machine and

according to the type and version of the operating system installed on the virtual machine.
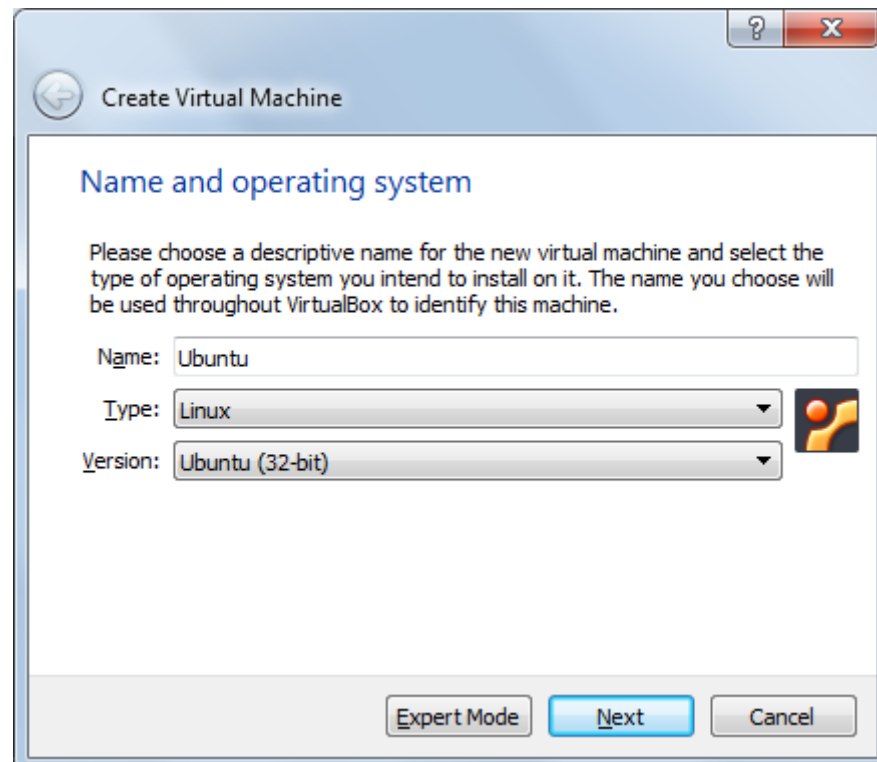
If necessary, the parameters can be determined based on your own preferences, for example, increase the amount of RAM allocated to the virtual machine.
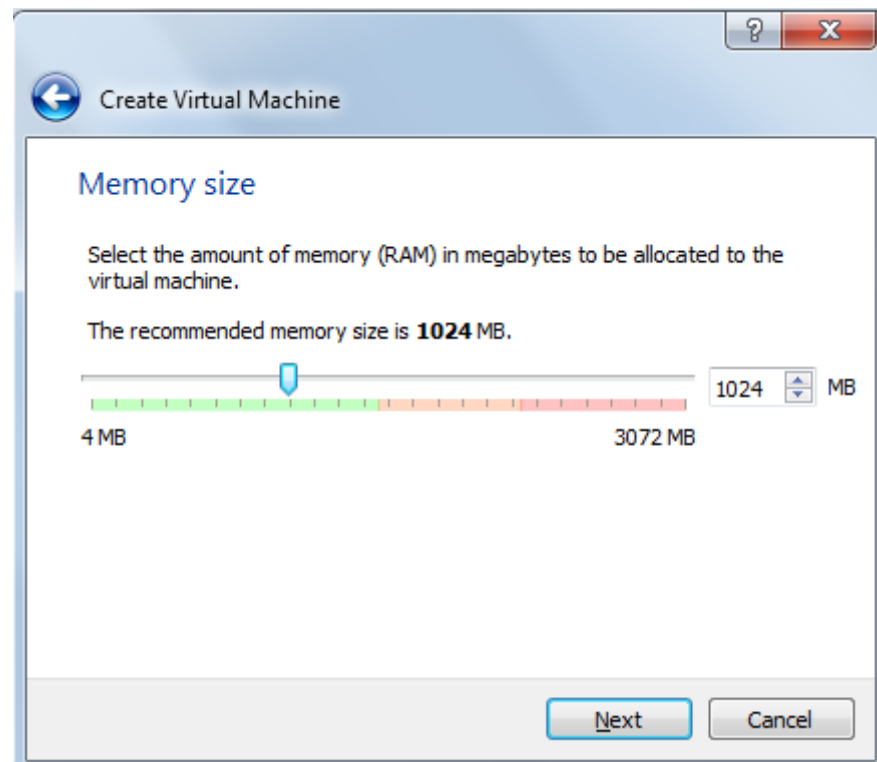
Here is an example of allocating 1024 MB of RAM to a virtual machine, instead of the recommended 512 MB. When allocating memory, you need to take into account its actual size and minimum requirements for the guest OS. If there are difficulties in selecting this item, use the values recommended by the program. Incorrect memory allocation between real and virtual machines can lead to a decrease in performance of both.
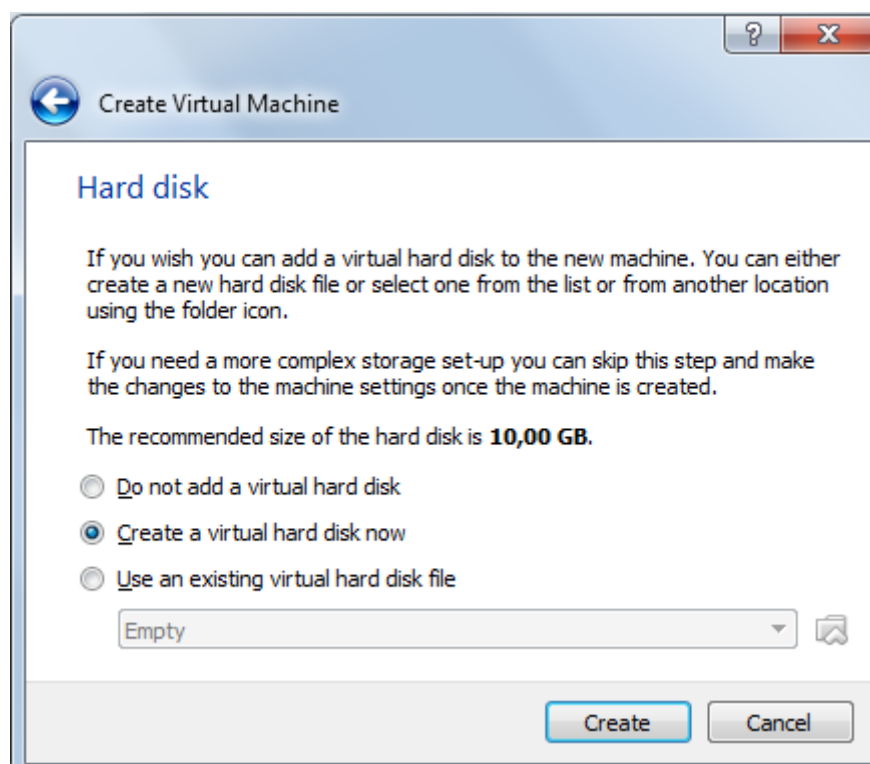
The virtual machine's hard disk (virtual hard disk) is a special format file in the Windows file system. A virtual disk can be created either dynamically or fixedly. A dynamic disk is created not by the entire volume specified by the setting, but by its part, and increases as needed during the virtual machine's operation. To obtain the maximum speed of the guest operating system, it is better to select a fixed virtual hard disk, and to save disk space - dynamic.

VirtualBox allows you to use several different data formats for virtual disks:
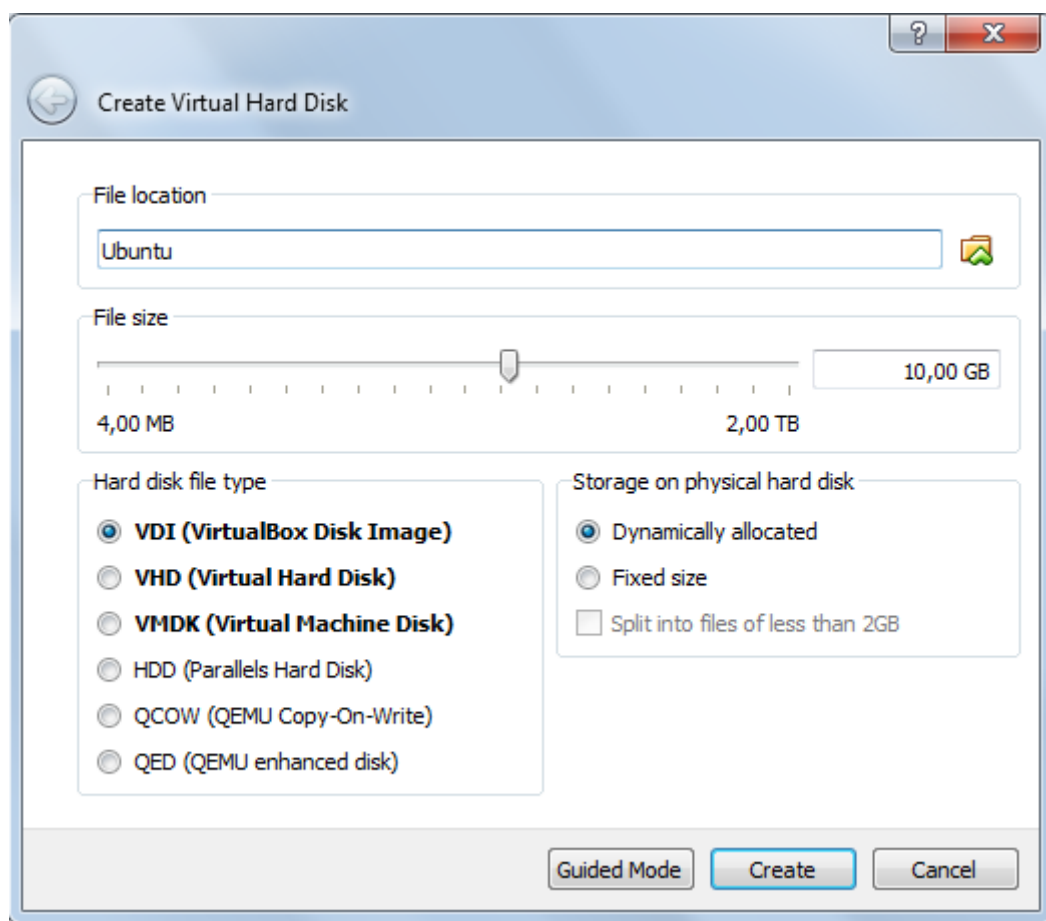
Selecting a format, which differs from the recommended one, makes sense if It is planned to use a virtual machine, created by VirtualBox in the environment of other virtualization software products (VMWare, MS Virtual PC, QEMU).
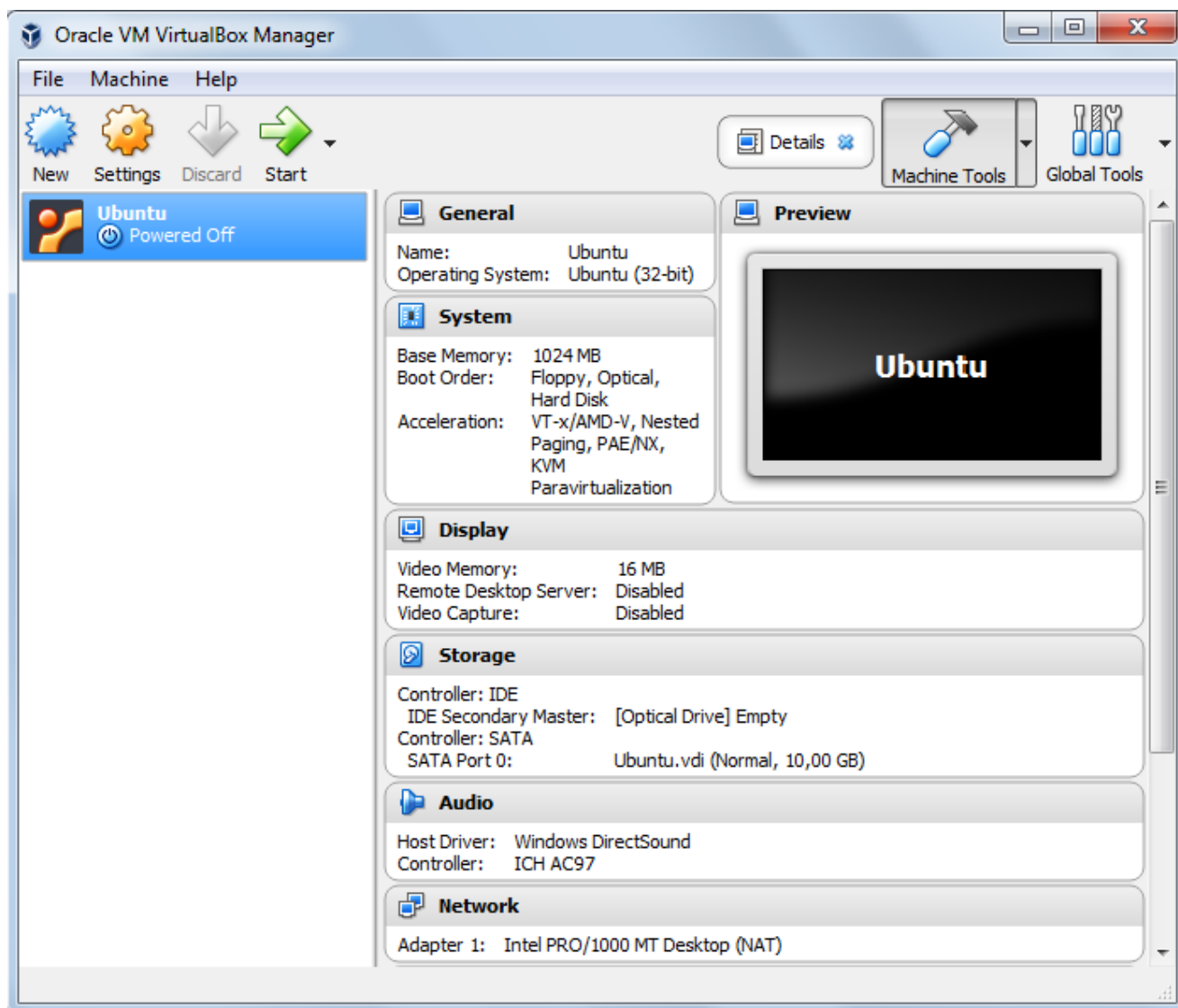
Most of the parameters defined during the process of creating a new virtual machine, can be changed, if necessary, at each point of time.

Then click to Create Button.

Details Button allows you to observe virtual machine characteristics.

For the created virtual machine, the **Configure** button becomes active, which allows you to change some of its settings, add or remove virtual devices, change their operating modes, and manage the distribution of resources of the real operating system. To get acquainted with the guest OS Ubuntu Linux is quite enough initial settings made when creating a virtual machine. Therefore, you can immediately start the VM launch by clicking the **Start** button. After the VM starts, a message appears on the screen about using the Keyboard Capture.
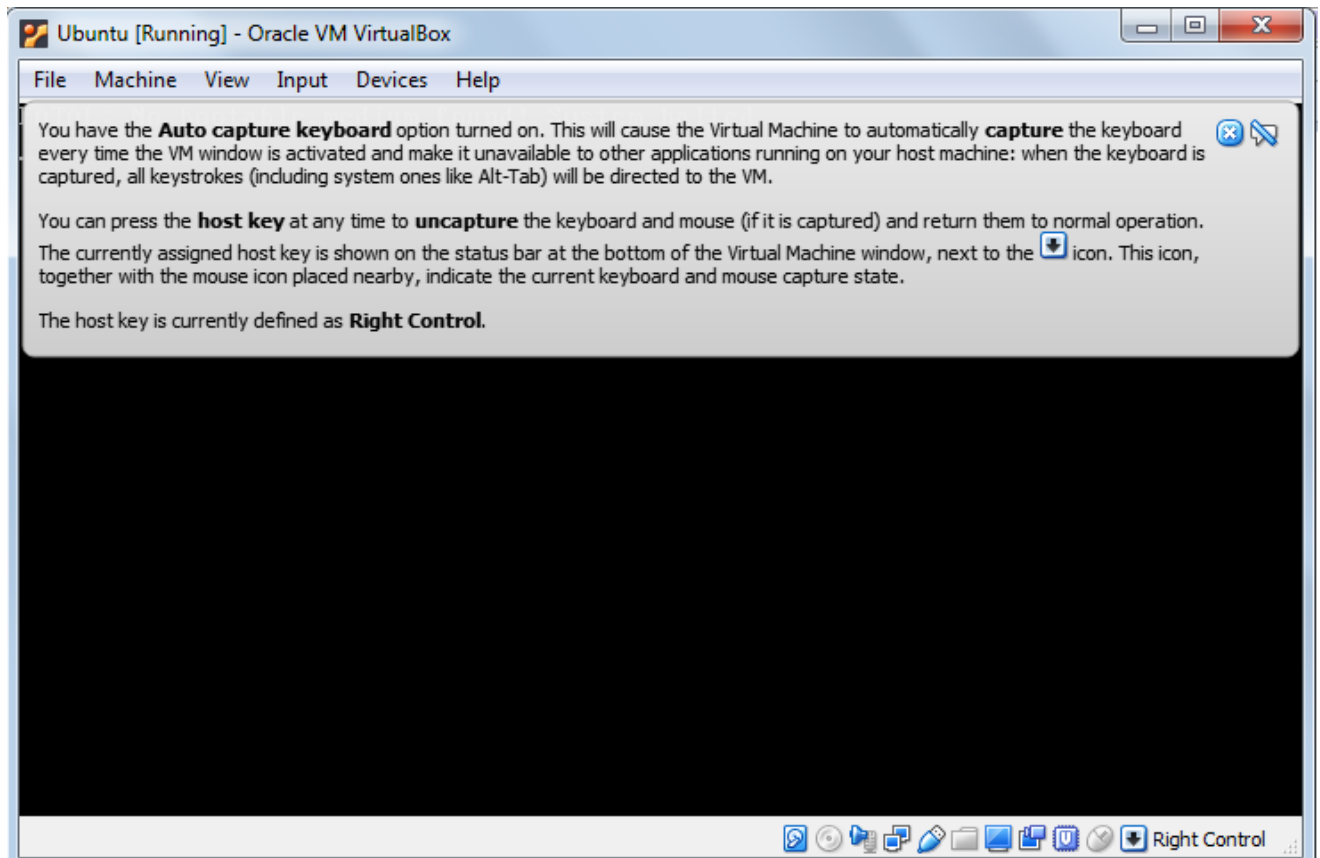
This means that when the cursor is located within the VM window, keyboard input will be performed for the virtual machine. By default, to switch input from the keyboard between the windows of the real and virtual machines, the **right Ctrl** is used. The current status of the input is displayed in the status bar at the bottom of the virtual machine window.


The green color of the arrow in means that keyboard input will be executed for the virtual machine, gray for the real one.

To install the operating system on a virtual machine, you need to boot from the installation disc. In the VirtualBox environment, you can download not only from standard devices (CD/DVD drive, USB flash drive, network ...) but also using a virtual drive created on the basis of the image of the boot disk. Typically, Linux distributions are distributed as image files in the ISO-9660 format (files with the iso extension) and VirtualBox allows you to do without burning the image to a CD-ROM, but simply connect such a file directly to the virtual machine as a virtual drive with the media installed on the basis of the contents of iso Image. When you first start the virtual machine, when there is no installed guest operating system, VirtualBox will prompt you to select the boot device.
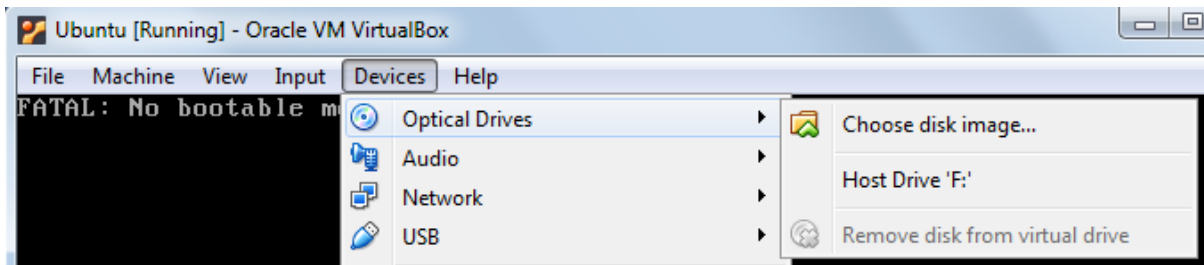
Instead of a physical drive, you can select an image file, for example, **ubuntu-18.04-desktop-amd64.iso.** You can download this file from https://www.ubuntu.com/download

This file will be connected as a virtual device with the installation CD/DVD disc Ubuntu 18.04. When you click the Continue button, you will be booted from the virtual drive and the guest operating system (Ubuntu) will be started to install.
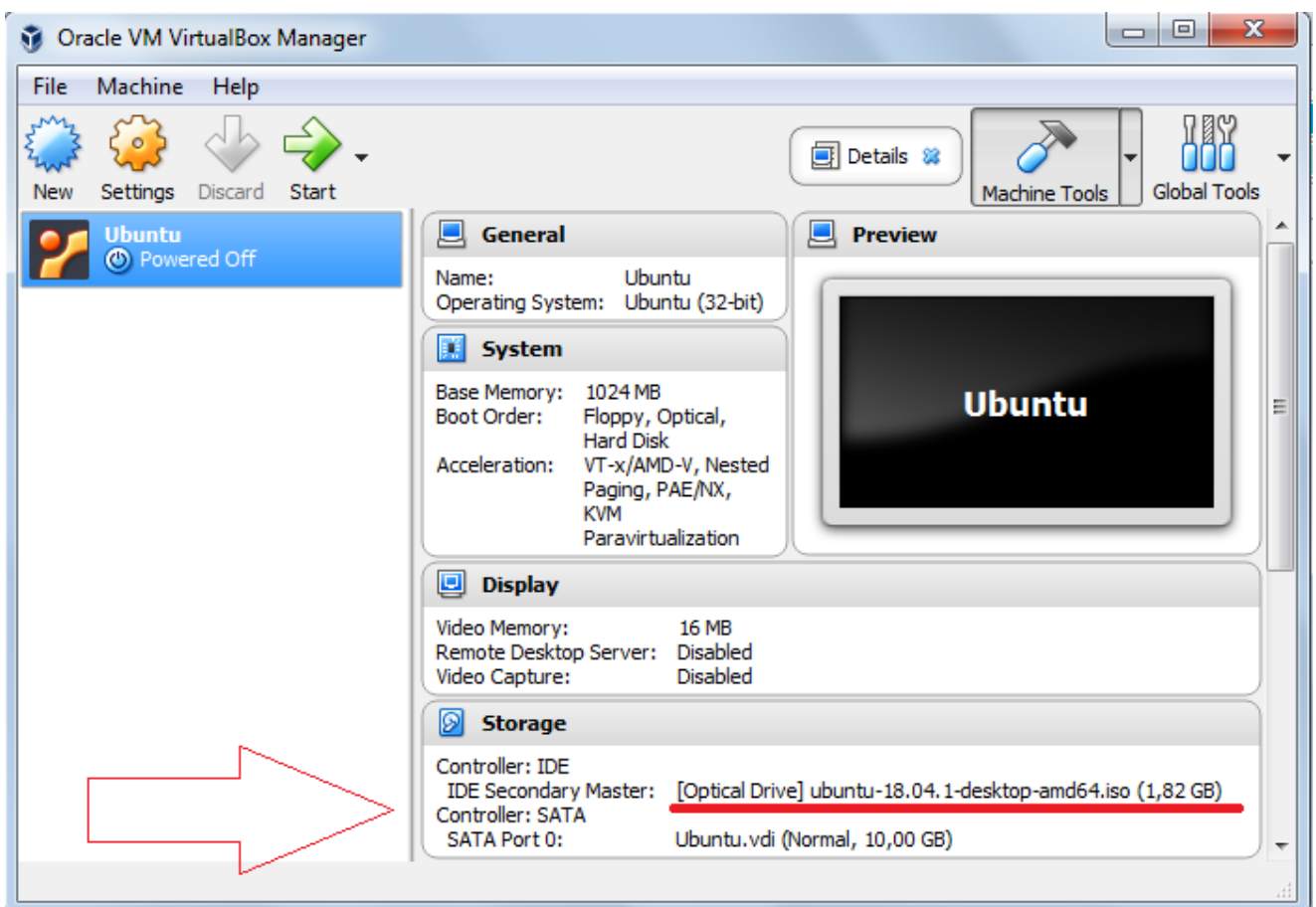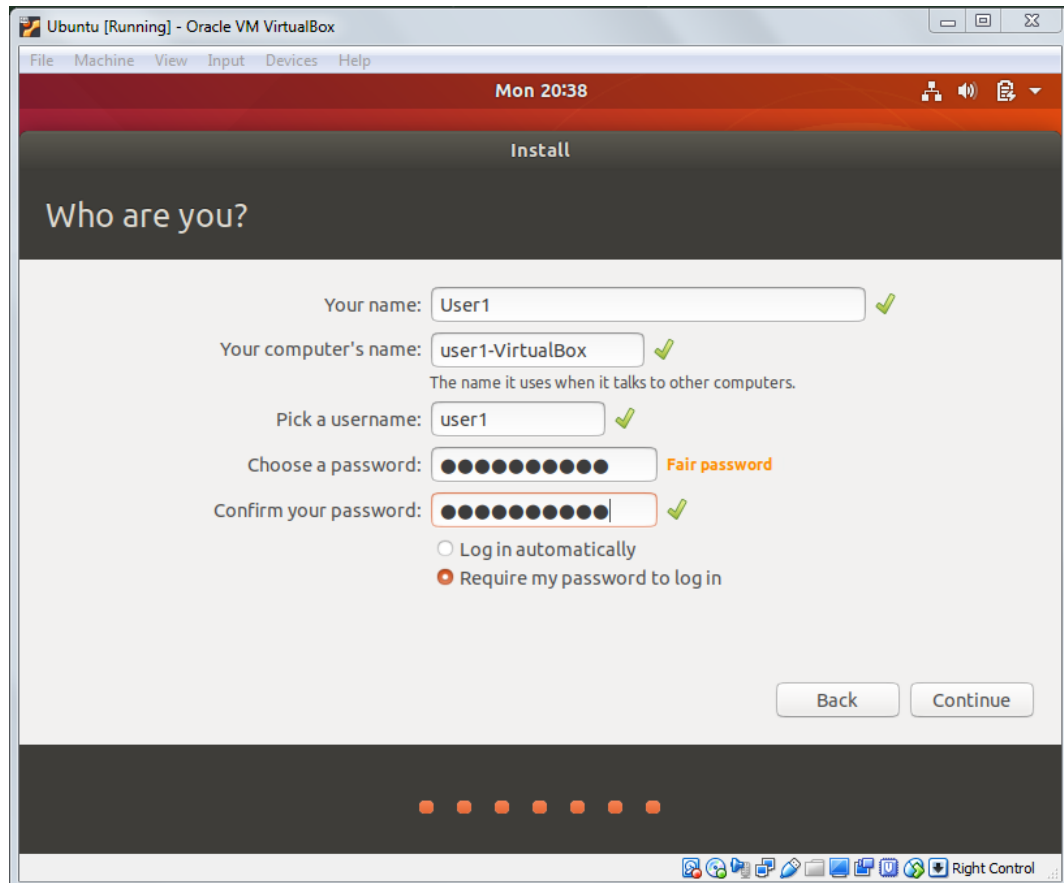

The process of installing a guest OS is no different from installing on a real machine.
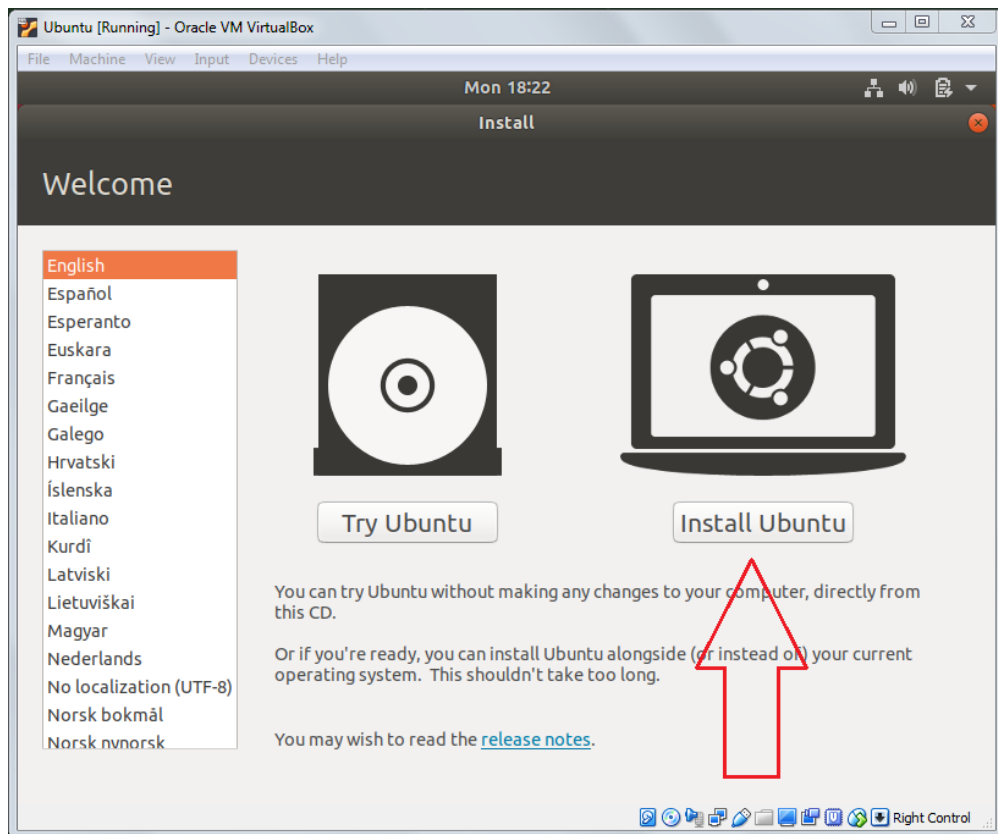
You can select the language for the installed system (usually Russian), time zone, keyboard layout, etc. Most parameters can be left by default, including the Type of installation.
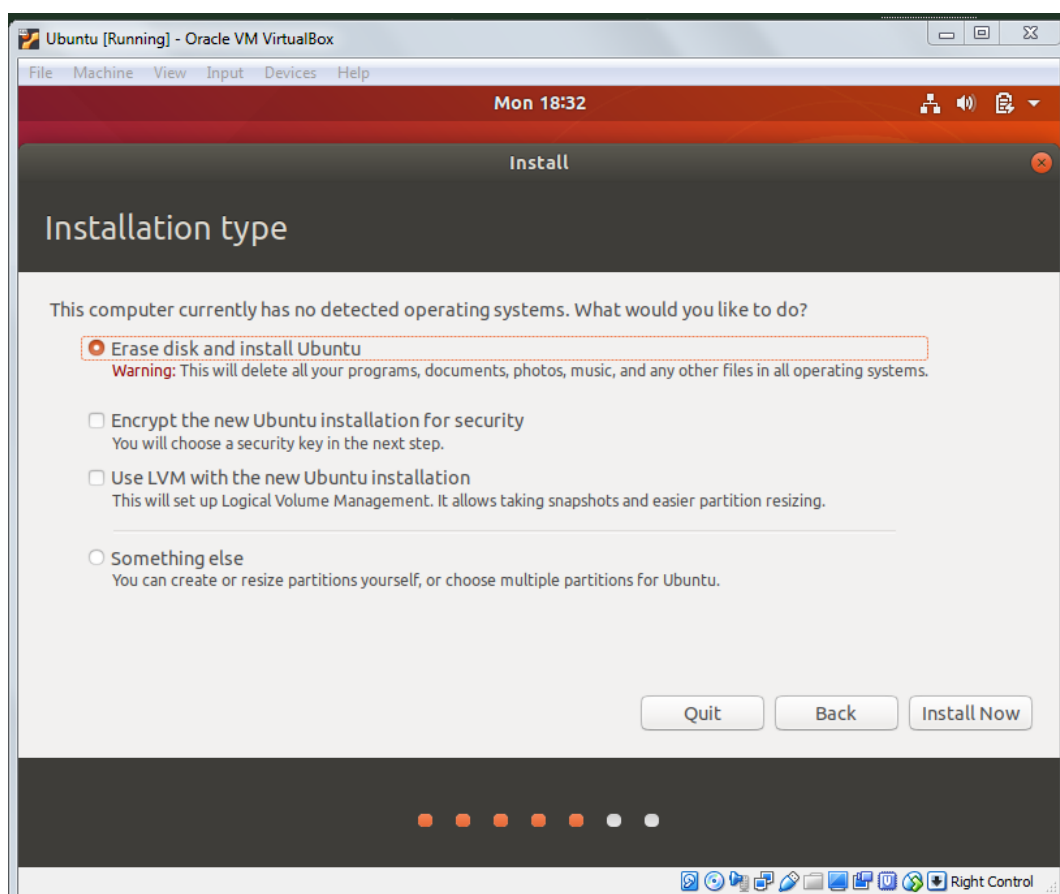
During the installation, you must specify the name of the computer, user, password and login mode:


Further installation of Ubuntu is performed without any user intervention and ends with suggestions to restart the computer. Compared with installing the system on real computer equipment, installation on a virtual machine is slower, which is quite expected. The degree of performance degradation is mainly dependent on the speed of the hardware of the real computer.

When the newly installed operating system is booted for the first time, the VirtualBox manager automatically disconnects the virtual drive based on the disk image with the Ubuntu distribution, the boot will be performed from the virtual hard disk and upon its completion, the screen displays the login prompt.

<u>Changing the settings of the virtual machine Oracle VM VirtualBox</u>

In some cases, such as when you include a virtual machine in a real local network as a peer with external connectivity to its network services, you will need to change some of the default settings when creating the VM.

In the VirtualBox environment, you can use 4 virtual network Ethernet adapters that are configured in the virtual machine properties window on the **Network** tab.
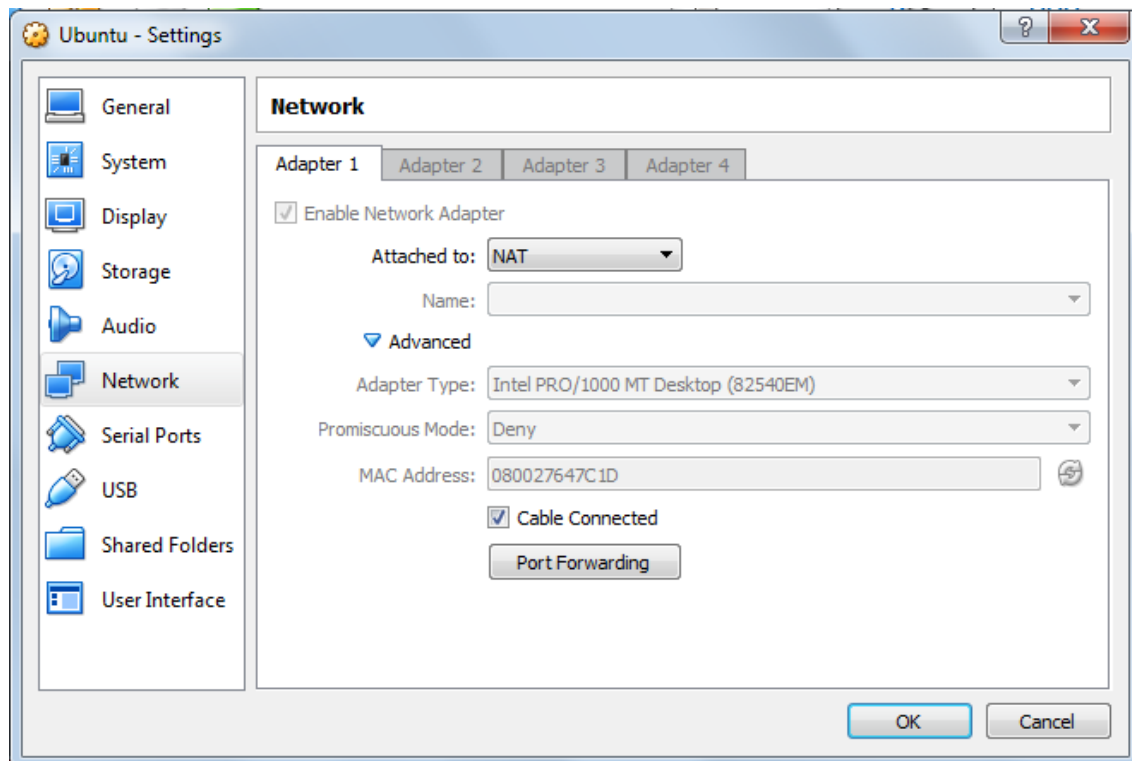
Clicking the Advanced button will expand the values of the additional parameters of the virtual network adapters, allowing you to select the type of adapter that the virtual machine driver will use, illegible mode, when the virtual adapter will receive all Ethernet frames regardless of the MAC address of the receiver, the MAC address value that is assigned Virtual network card.

For each network adapter, you can specify in which of the following modes they will function (the **Connection Type** field):

Not connected - In this mode, VirtualBox informs the guest OS that the network adapter is present in the hardware configuration, but it is not connected - as if the Ethernet cable were not connected to the card.

NAT (Network Address Translation) is the default connection mode that is installed by default when creating a virtual machine. It allows the most simple implementation of network access using client software (mail, Web, Skype, etc.)

A **network bridge** is a bridge mode between a virtual and a real network adapter, when data is exchanged directly between them without any change in the guest OS environment. This mode allows you to access the network services of the guest OS in the same way as for normal real sites on the local network. Using this mode, you can easily simulate a local network from real and (or) virtual machines.

Internal network - used to create a virtual network accessible from a virtual machine, but inaccessible from real applications.

Virtual host adapter - used to create a local network from virtual machines and a real machine where VirtualBox (host machines) is running. This

mode does not use data exchange via a physical network adapter, like exchange through a loopback interface.

Generic network interface - allows you to include in VirtualBox a user-selectable driver with additional extensions for combining virtual machines running on different hosts.

To enable the virtual machine in an existing local network with the ability to access its network services, use the **Network Bridge** mode and configure the virtual network adapter so that its IP address is within the range of the local network addresses. For example, for a local network 192.168.0.0/255.255.255.0, you need to assign a free address from the range 192.168.0.1- 192.168.0.254 to the virtual adapter (manually or automatically by DHCP).

The first step, in the settings of the newly created virtual machine, in the **Network** section of the VirtualBox Manager for the network adapter, is to change the **NAT** connection type to the **Network Bridge**. Then, with the means of the guest OS (in this case using Ubuntu) set the new IP address. You can do this using System **Settings - Network - Select** a connection and click the **Settings** button.
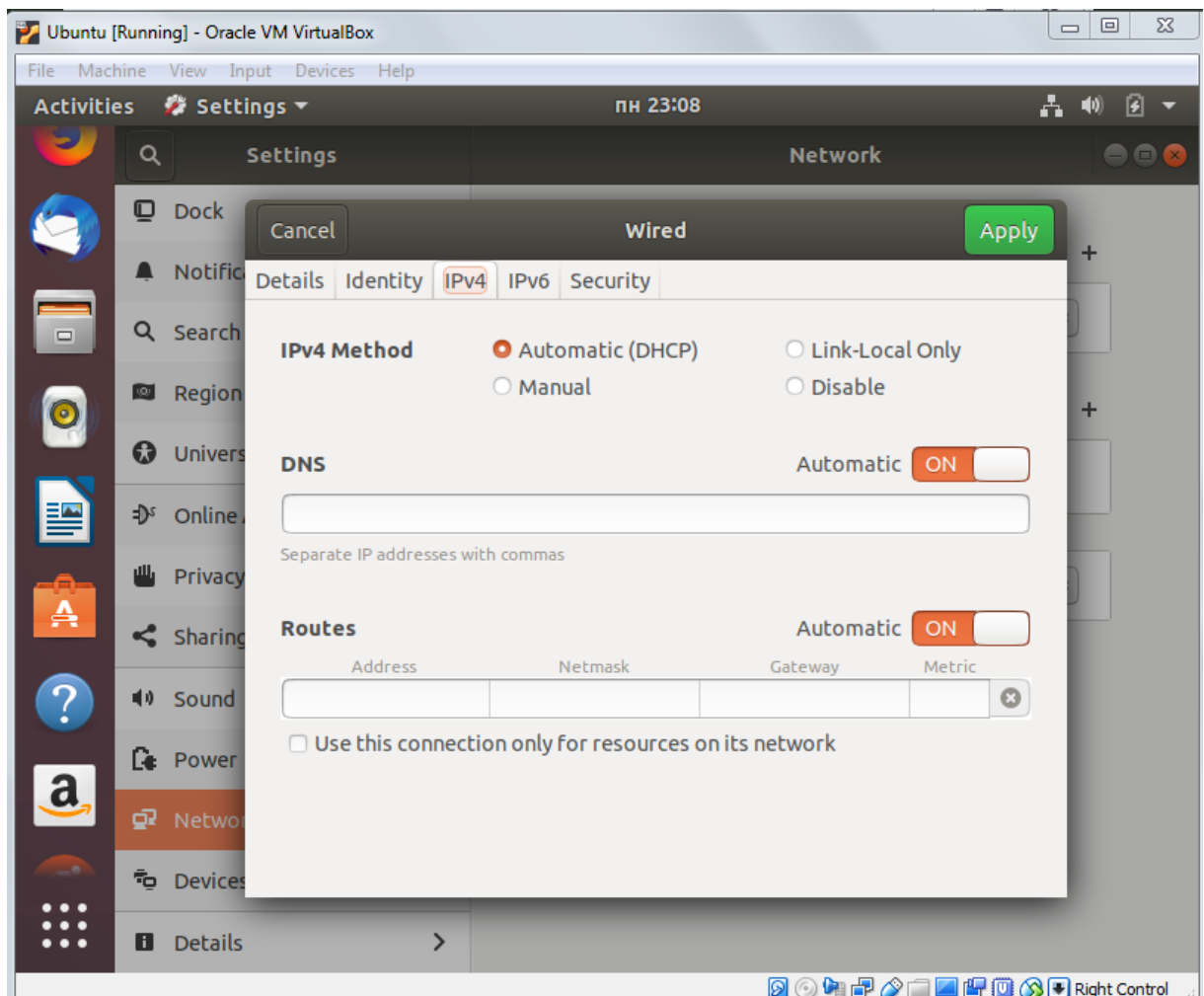
To change the IP address, you must select the "Manual"

In the VirtualBox environment, as well as on a real computer with the Linux operating system, you can use several virtual terminals, to switch between them you use the CTRL-ALT + F1 ... F6 key combination (from the first terminal to the 6th terminal).

Thus, if necessary, you can simultaneously open multiple user sessions on different terminals and use them simultaneously. To switch to the graphical shell, use CTRL-ALT + F7. On different distributions, the key combination for switching may be different. When you change or view system settings that require the execution of commands as root, you can, for example, use the first terminal, with registration in the context of the superuser account. The second terminal (as well as the graphical one) can be used as an ordinary user account.

To switch to the root account context, you must run the su command on behalf of the superuser.

sudo su - go to the console as root su allows you to run the command on behalf of another user. If the user name is not specified, then root is assumed. It is not recommended to work under the root account, because erroneous actions can lead to serious damage or even system crash.

To view the current network settings in the console, use the **ifconfig** command. When executed without parameters, the current settings for all network interfaces are displayed:

```
eth0 Link encap:Ethernet HWaddr A8:00:97:6E:e9:65
      inet addr:192.168.50.8 Bcast:192.168.0.255 Mask:255.255.255.0
      inet6 addr: fe80::a00:27ff:fe6b:e965/64 Scope:Link
      UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
      RX packets:124 errors:0 dropped:0 overruns:0 frame:0
      TX packets:166 errors:0 dropped:0 overruns:0 carrier:0
      collisions:0 txqueuelen:1000
      RX bytes:28340 (28.3 KB) TX bytes:19383 (19.3 KB)

lo Link encap:Локальная петля (Loopback)
      inet addr:127.0.0.1 Mask:255.0.0.0
      inet6 addr: ::1/128 Scope:Host
      UP LOOPBACK RUNNING MTU:65536 Metric:1
      RX packets:144 errors:0 dropped:0 overruns:0 frame:0
      TX packets:144 errors:0 dropped:0 overruns:0 carrier:0
      collisions:0 txqueuelen:0
      RX bytes:12445 (12.4 KB) TX bytes:12445 (12.4 KB)
```

In this case, information about 2 network interfaces, eth0 and lo is displayed. The first with the name eth0 is the interface of the local Ethernet network and is created on the network card with the MAC address A8:00:97:6E:e9:65 and IP address 192.168.50.8. The second - lo is a loopback

interface with the IP address 127.0.0.1, usually used to emulate data transfer within this system.

Typically, the bootable virtual machine image reflects its state at the time of the completion of the Ubuntu installation using standard settings. The user name and password for logging in are listed on the download page.

QUIZ

1. What is Ubuntu?
2. Main tasks of OS Ubuntu.
3. Advantages and disadvantages of Ubuntu.
4. What is a repository?
5. Possibilities of installation on the computer.
6. What is the target of Ubuntu?
7. Describe the process of installing Ubuntu on a virtual machine.