

Домашняя работа № 1

Выполнил: Груданов Николай Алексеевич

Я использую Manjaro Linux на личном ПК, поэтому все задания будут выполнены на нем и скриншоты на нем. У меня нет личного устройства с ОС Windows.

VirtualBox

Включить аппаратную виртуализацию на компьютере/ноутбуке (если отключена).

На linux дистрибутивах за аппаратную виртуализацию отвечает KVM ([Kernel-based Virtual Machine](#)).

Для проверки выполним команду:

```
lsmod | grep kvm
```

И посмотрим на ее вывод



```
~ via ● v23.7.0 took 3s
> lsmod | grep kvm
kvm_amd           237568  0
kvm                1388544  1 kvm_amd
ccp                 184320  1 kvm_amd

~ via ● v23.7.0
> [REDACTED]
```

Данный вывод показывает состояние загруженных модулей ядра, связанных с аппаратной виртуализацией:

1. **kvm_amd (237568)**

- Драйвер для поддержки аппаратной виртуализации на процессорах AMD (SVM — Secure Virtual Machine).
- Размер модуля: 237568 байт.
- Используется 0 раз (последний ноль: нет активных зависимостей).

2. **kvm (1388544)**

- Основной модуль KVM (Kernel-based Virtual Machine).
- Размер: 1.38 МБ.
- Зависит от `kvm_amd` (цифра 1 в последнем столбце).

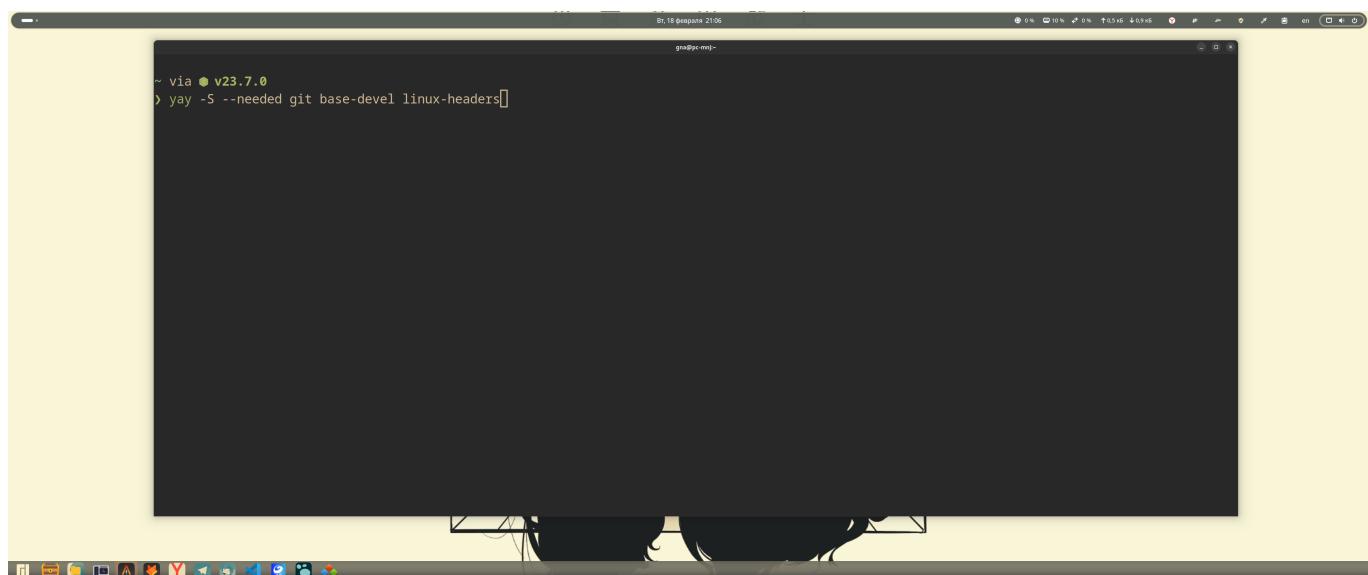
3. `ccp` (184320)

- Модуль **Crypto Co-Processor** — отвечает за работу с криптографическим сопроцессором AMD.
- Связан с `kvm_amd` (цифра 1 в последнем столбце).

Таким образом мы убедились, что загружены модули `kvm_amd` и `kvm`, что указывает на корректную работу KVM для моего процессора AMD. Значит аппаратная виртуализация активна.

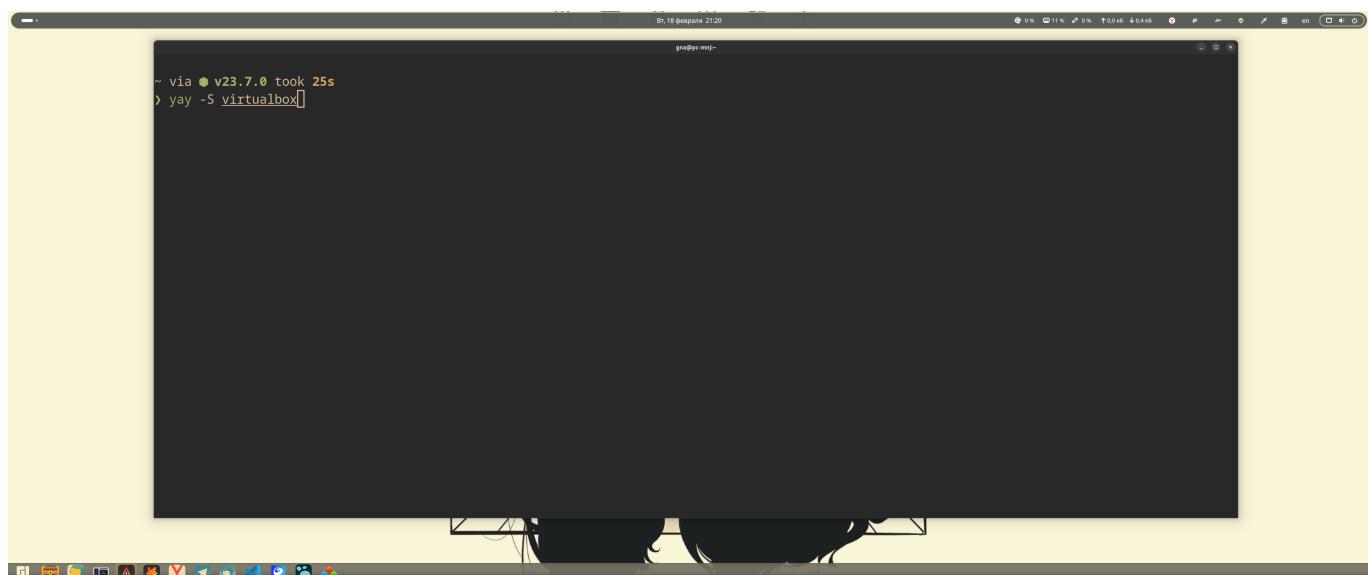
Скачать и установить VirtualBox версии 6.1 и выше

Для начала установим нужные зависимости. Я использую менеджер пакетов `yay`. Поэтому команда будет выглядеть следующим образом.



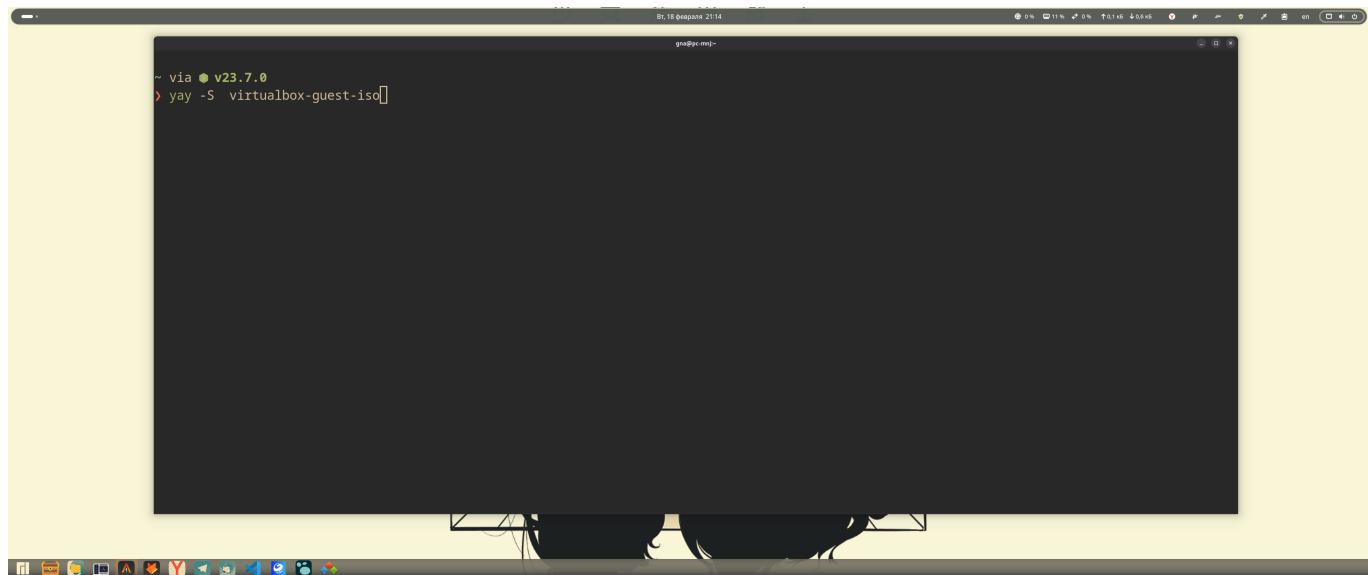
```
Br. 18 февраля 21:06 gna@pc-mmj:~  
~ via ● v23.7.0  
> yay -S --needed git base-devel linux-headers[]
```

После установим сам VirtualBox.



```
Br. 18 февраля 21:20 gna@pc-mmj:~  
~ via ● v23.7.0 took 25s  
> yay -S virtualbox[]
```

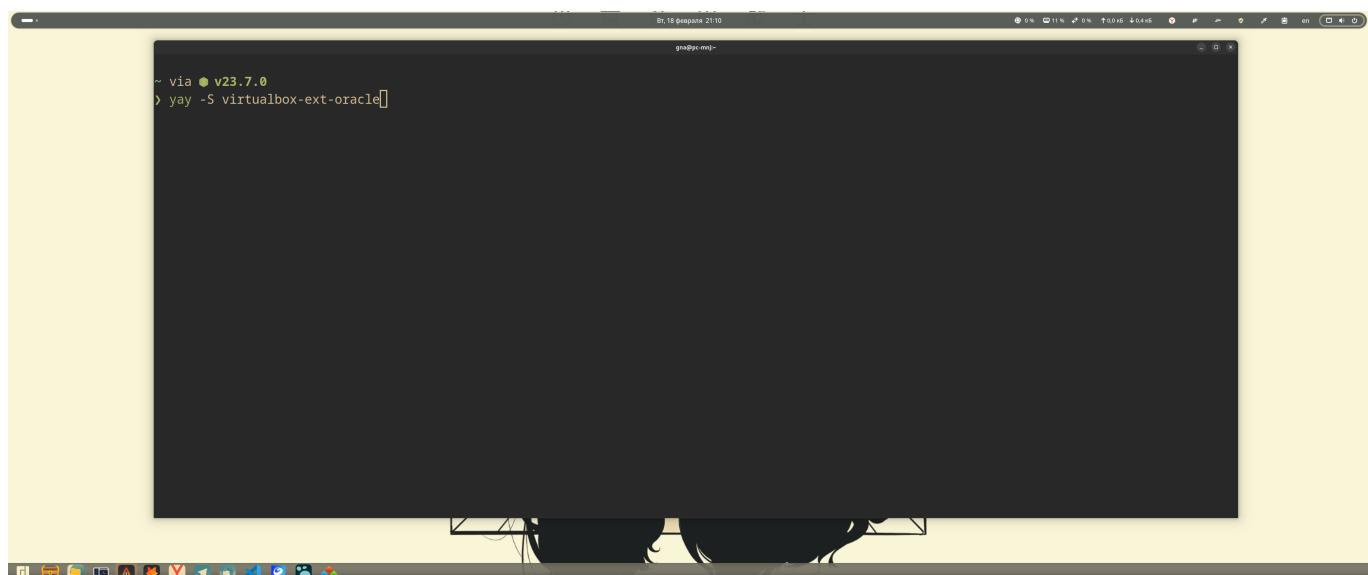
Также установим дополнительный пакет для гостевых ОС



```
~ via ● v23.7.0
> yay -S virtualbox-guest-iso
```

Скачать и установить плагин VirtualBox Extension Pack: в отчете отобразить список функций, которые предоставляет Extension Pack.

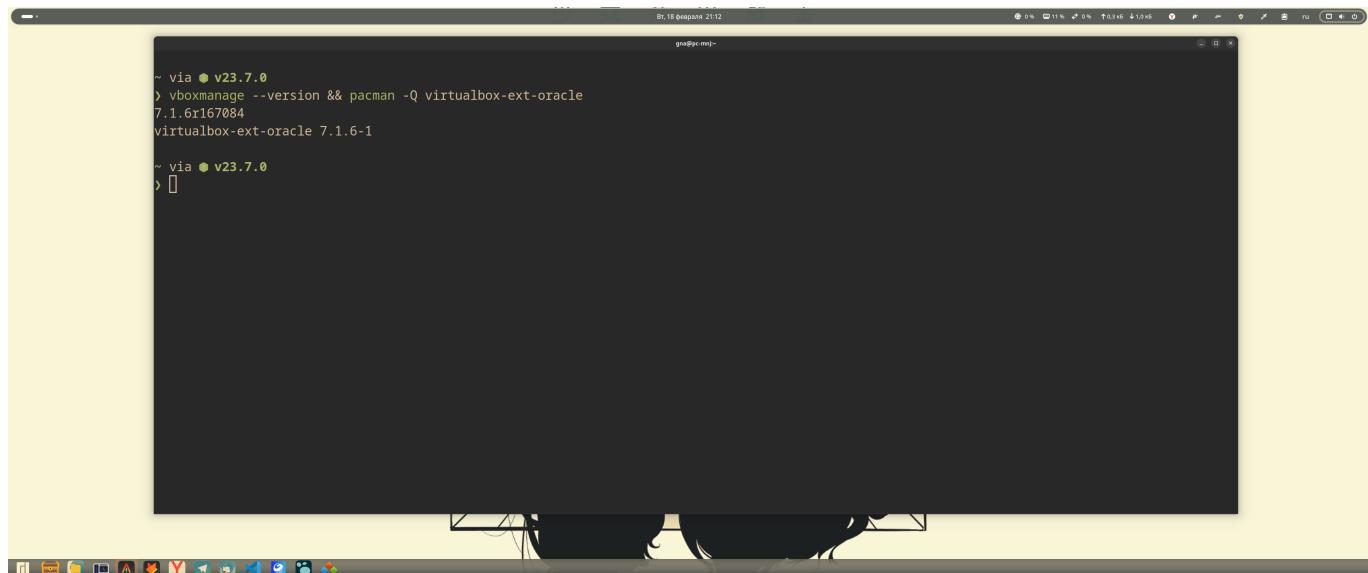
Для установки выполним следующую команду:



```
~ via ● v23.7.0
> yay -S virtualbox-ext-oracle
```

После согласимся с установкой и укажем пароль для sudo.

После установки проверим что версии VirtualBox и VirtualBox Extension Pack совпадают. Это важно для корректной работы.



```
~ via ● v23.7.0
> vboxmanage --version && pacman -Q virtualbox-ext-oracle
7.1.6r167084
virtualbox-ext-oracle 7.1.6-1

~ via ● v23.7.0
> [REDACTED]
```

Видим, что версии сопадают. У обоих 7.1.6.

Список функций, которые предоставляет Extension Pack

1. Поддержка USB 2.0/3.0

Позволяет подключать физические USB-устройства (флешки, принтеры) внутри виртуальных машин.

2. VirtualBox RDP (Remote Desktop Protocol)

Удалённое управление виртуальными машинами через протокол RDP.

3. Шифрование дисков

Защита данных виртуальных HDD с помощью AES-256. Пример использования:

4. PXE Boot для Intel

Сетевая загрузка виртуальных машин через эмуляцию PXE ROM.

5. Общий доступ к веб-камере хоста

Использование камеры физического устройства в гостевой ОС без драйверов.

Дополнительные возможности

- NVMe-хранилище**

Эмуляция современных SSD для повышения производительности.

- Виртуальное USB-устройство xHCI**

Поддержка USB 3.0 в гостевых ОС.

- Cloud Integration**

Автоматическая интеграция с облачными сервисами через VRDE.

- Шифрование VMCI**

Защита межмашинного взаимодействия.

Источники:

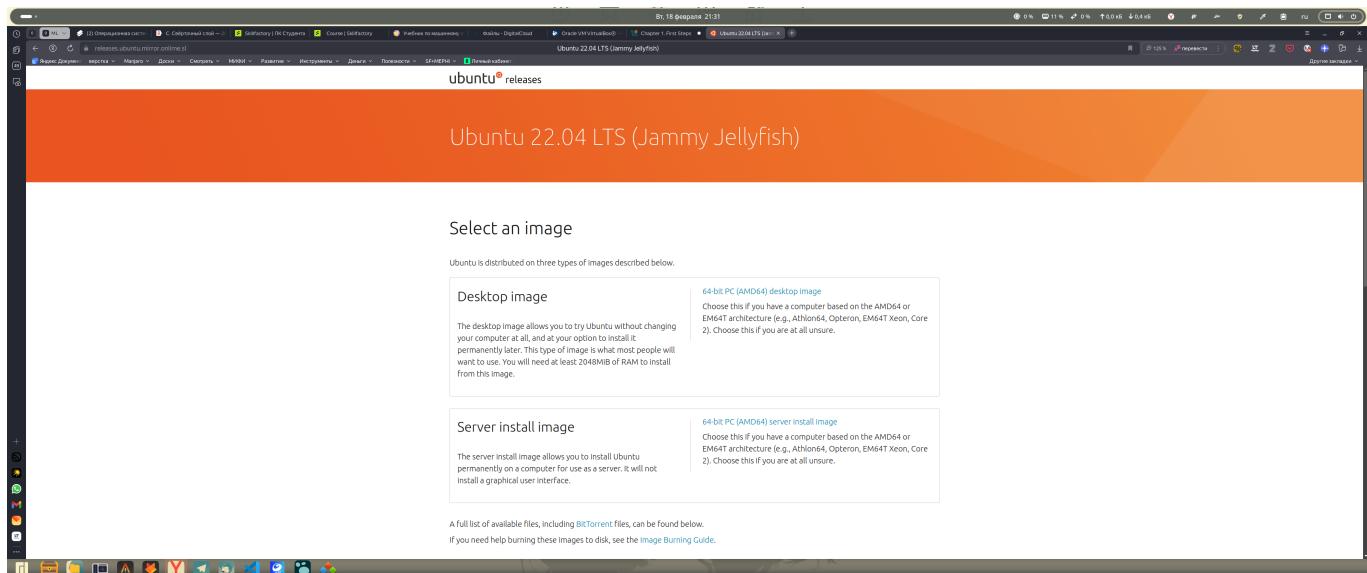
- [Официальная документация](#)
- [Oracle VM VirtualBox Documentation](#)

Скачать десктопную версию Ubuntu 22.04 LTS (Jammy Jellyfish)

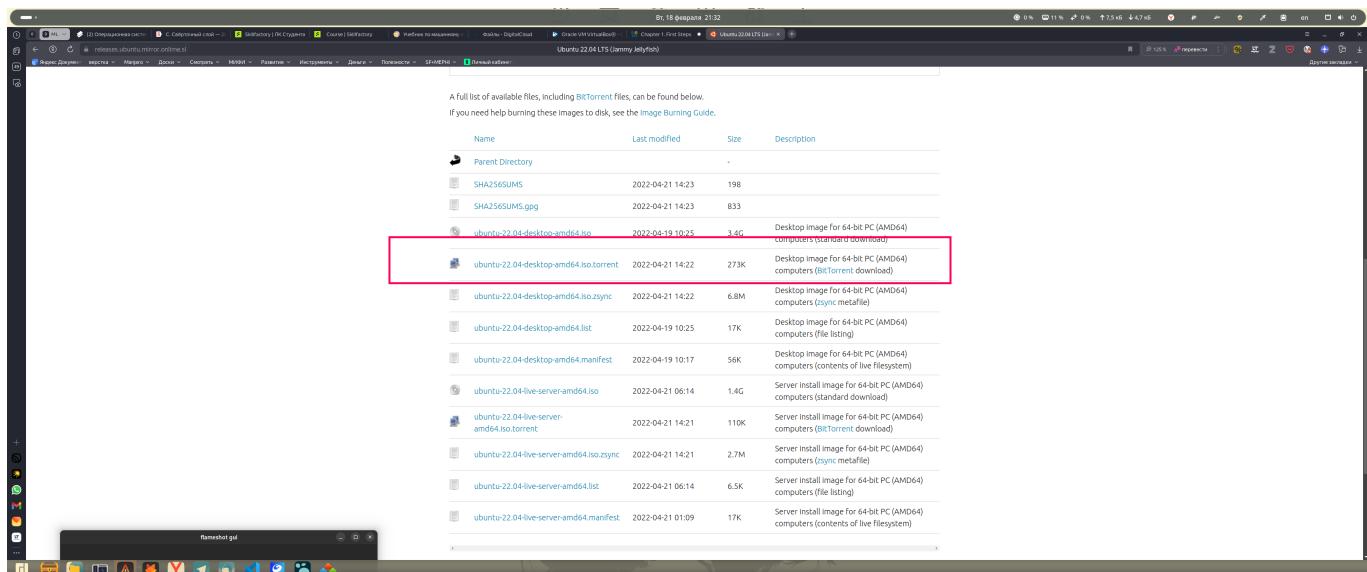
Скачать десктопную версию Ubuntu 22.04 LTS (Jammy Jellyfish), создать виртуальную машину со следующими параметрами:

- 2 CPU.
- 2048 RAM.
- 128 МБ видеопамяти.
- 40 GB постоянной памяти (динамический VDI)
- Сетевой адаптер установить в режим NAT

Для скачивания переходим на официальный сайт [ubuntu](https://releases.ubuntu.com/22.04/)



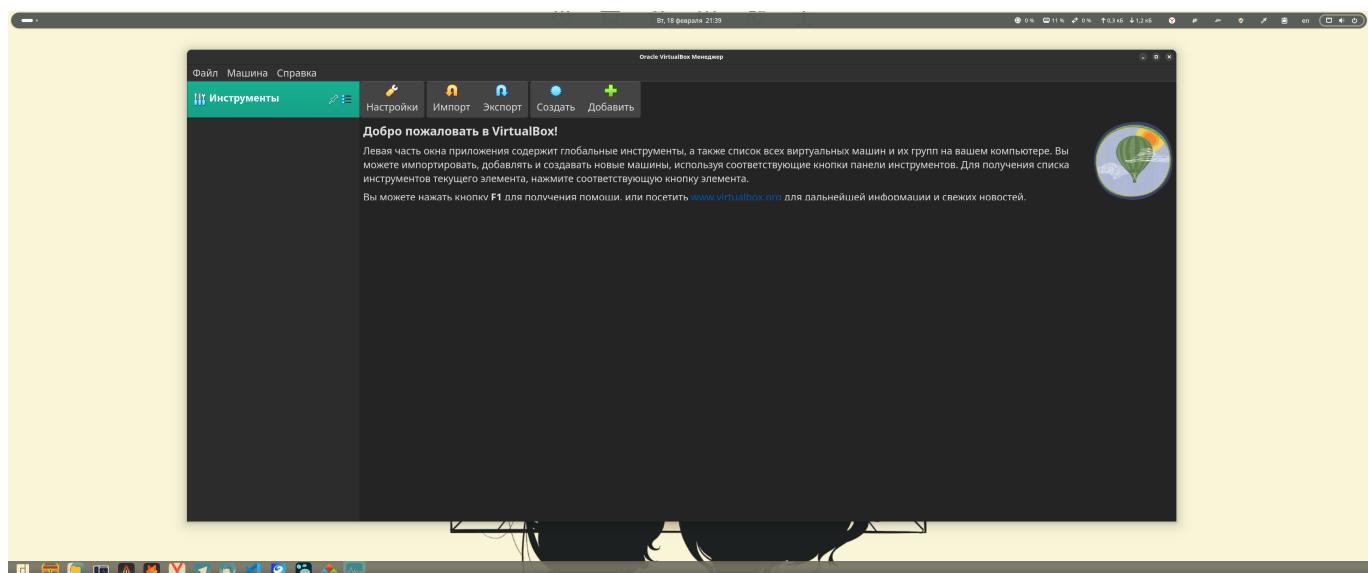
Я выбрас залузку через торрент для большей скорости



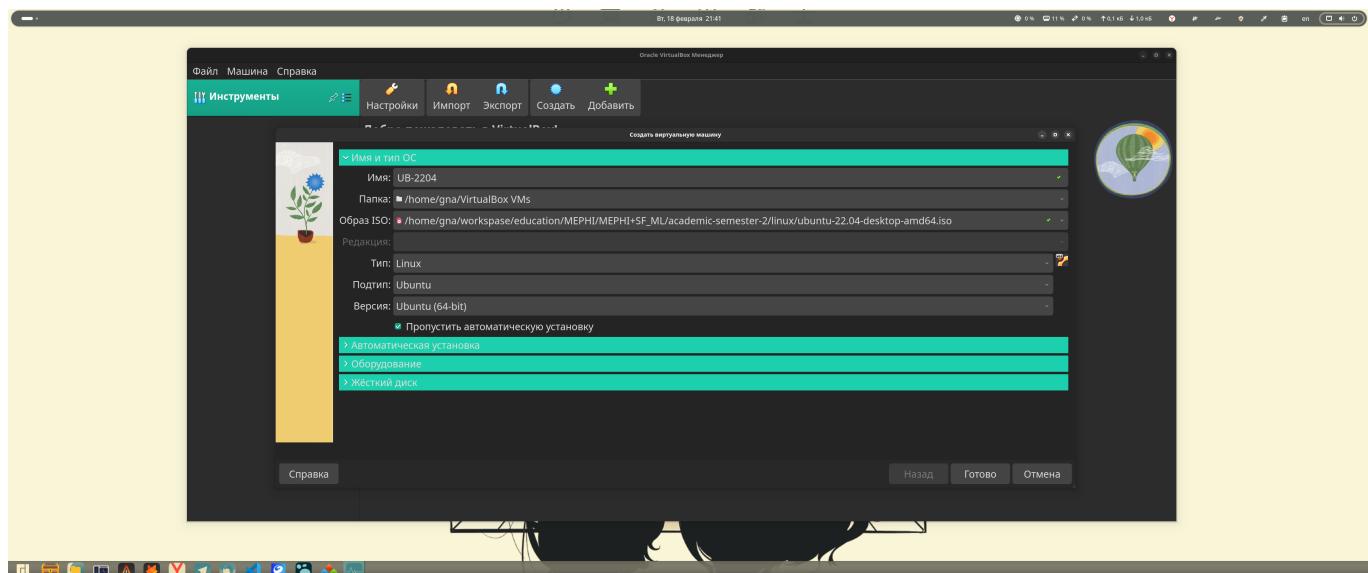
Полсле ждем загружки



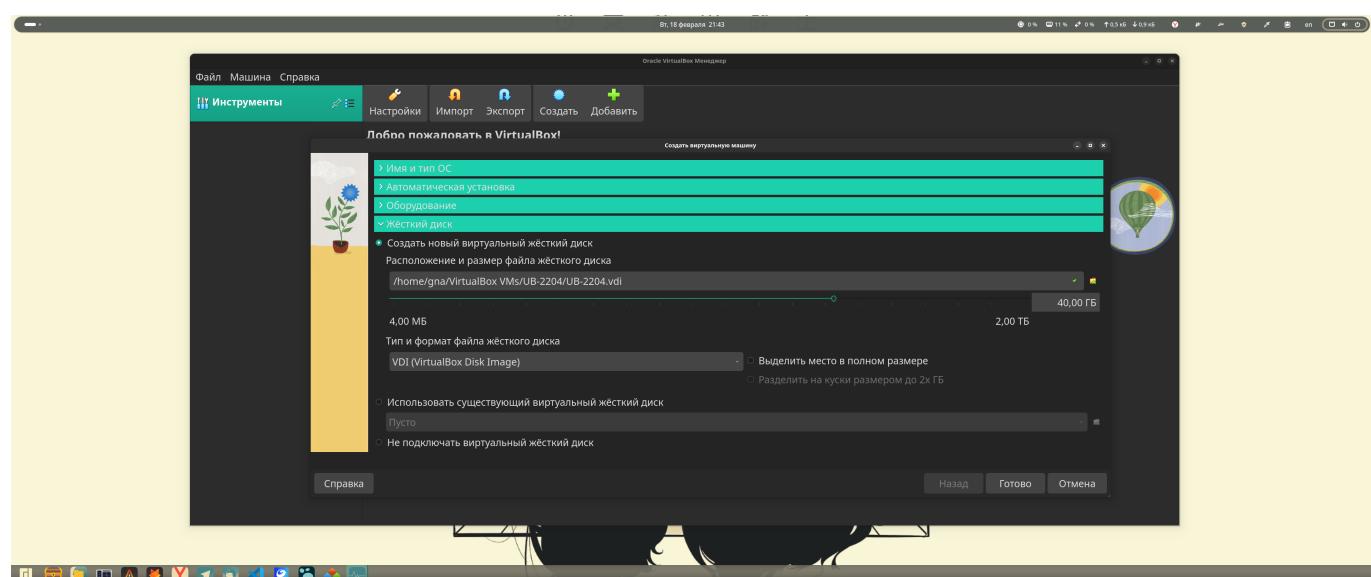
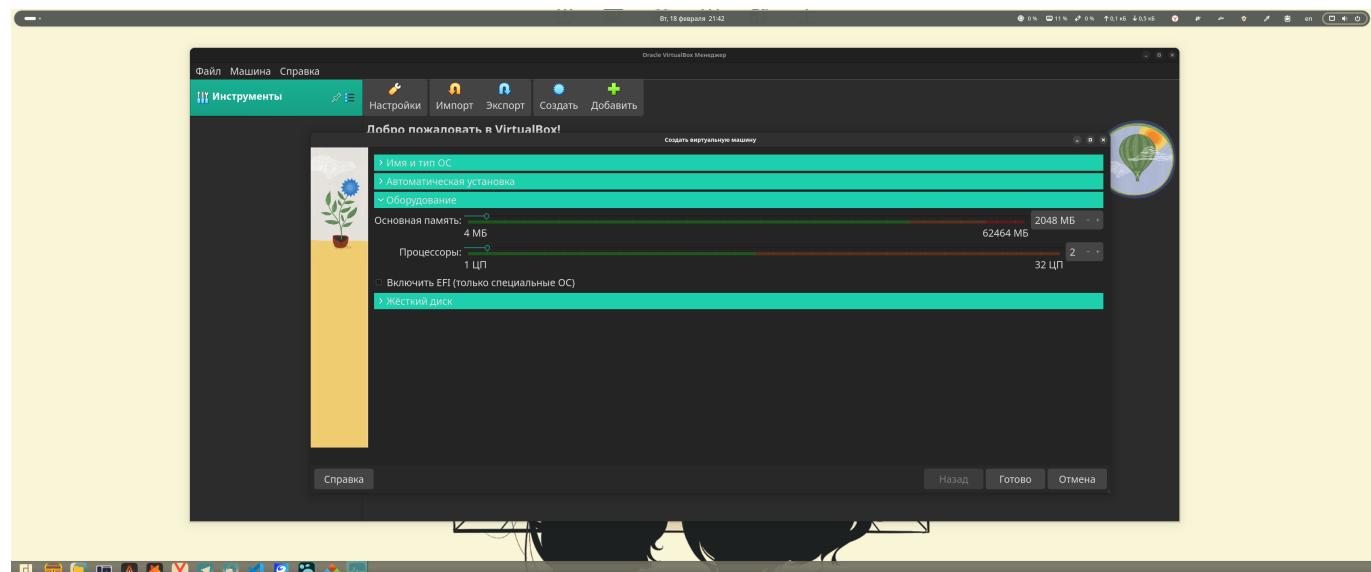
Теперь можно приступать к созданию витруальной машины в VirtualBox.



Нажимаем кнопку создать и даем название нашей машине и указываем путь до ISO образа. Прожимаем "Пропустить автоматическую установку" чтобы самим следовать по шагам установщика.

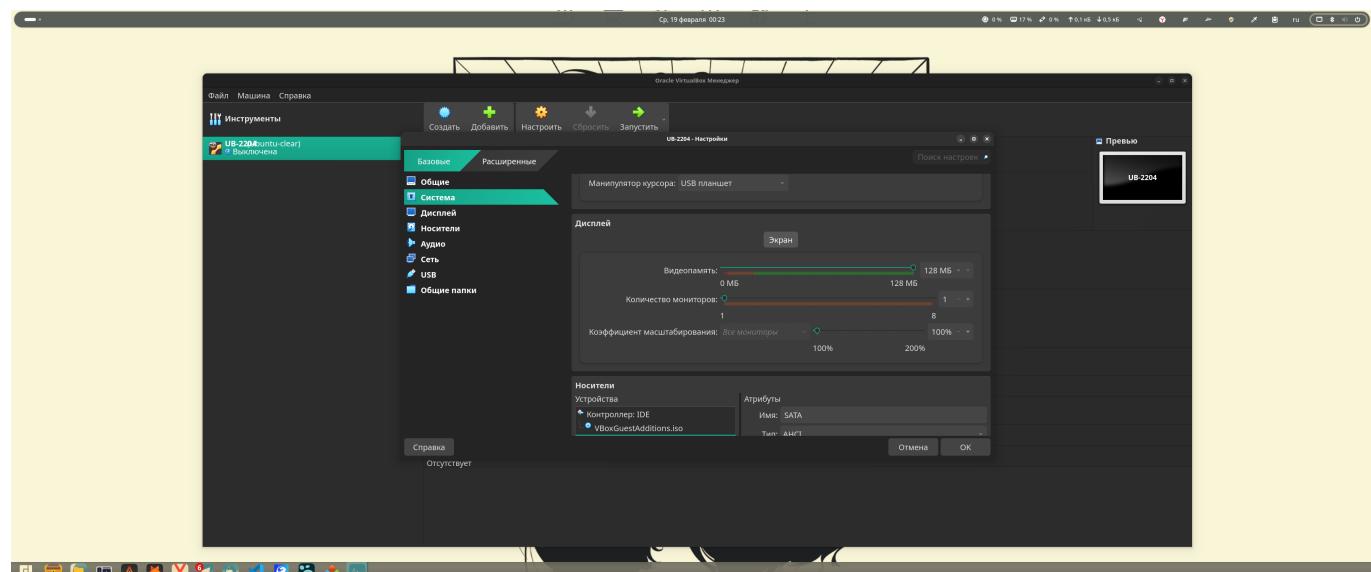


Далее указываем ресурсы для нашей виртуальной машине, согласно зданию

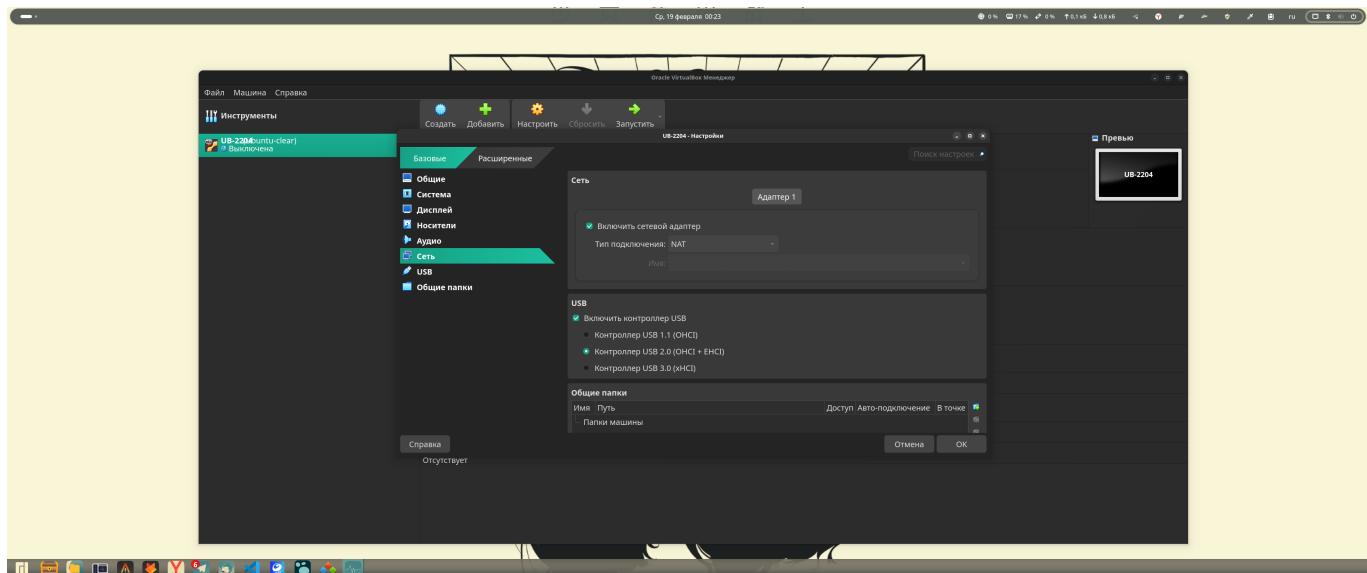


Наша виртуальная машина создалась.

При создании не было возможности указать количество видео памяти, поэтому зададим ее сейчас.

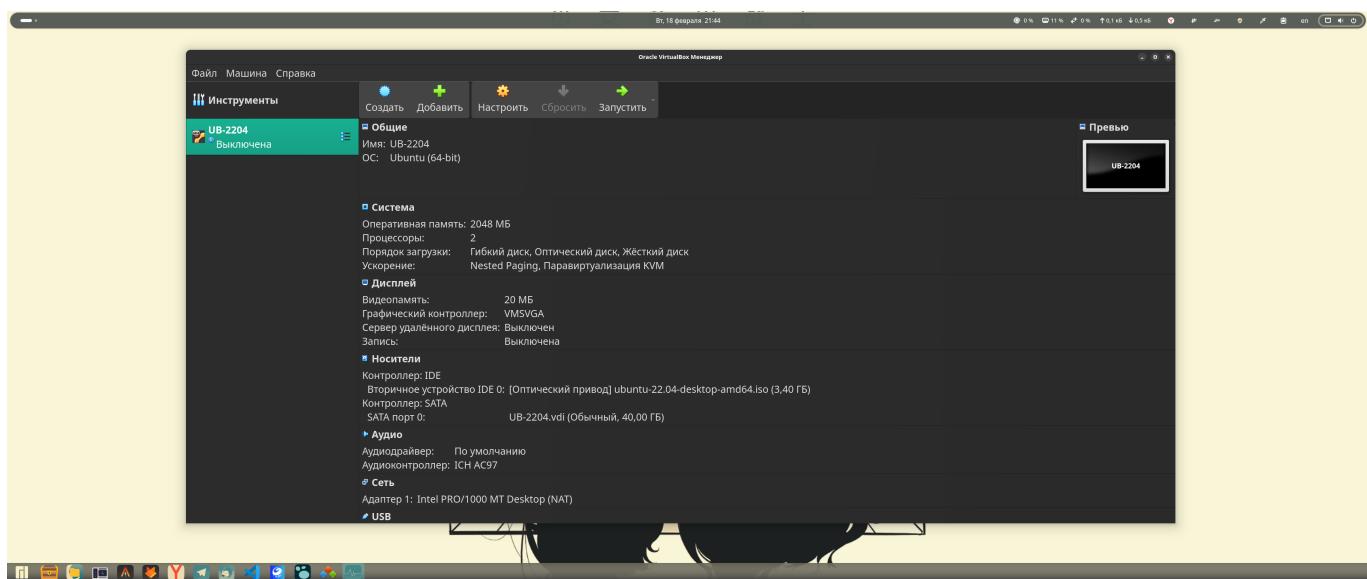


И NAT

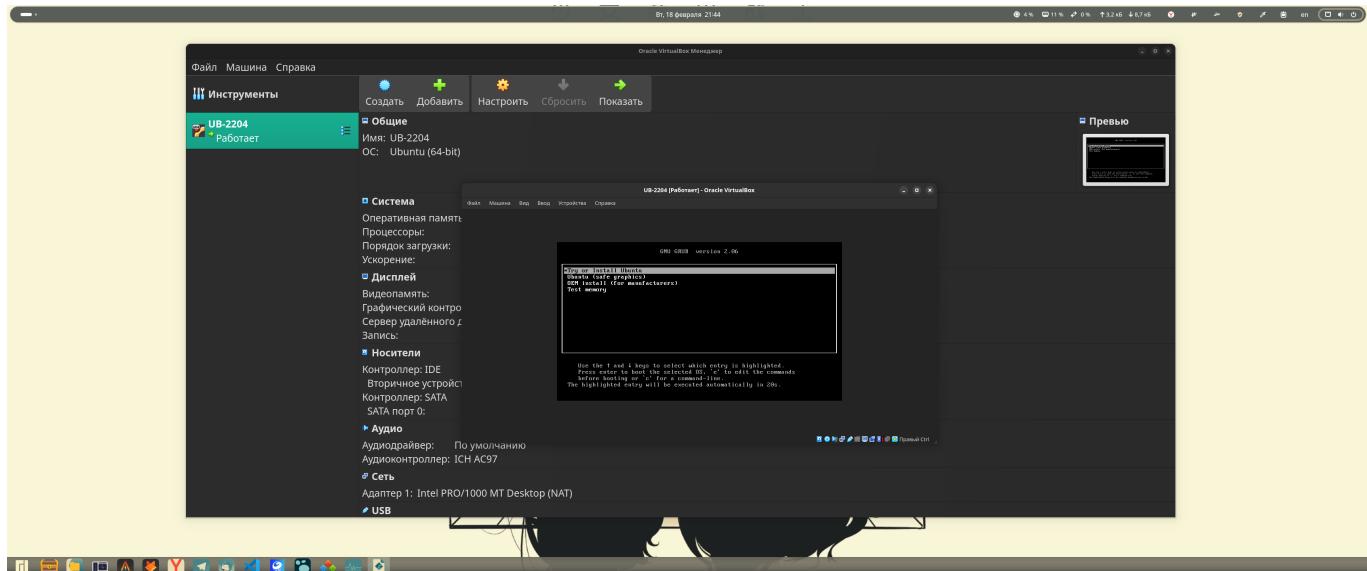


Произвести установку ОС Ubuntu 22.04 LTS на виртуальную машину, следя указаниям установщика

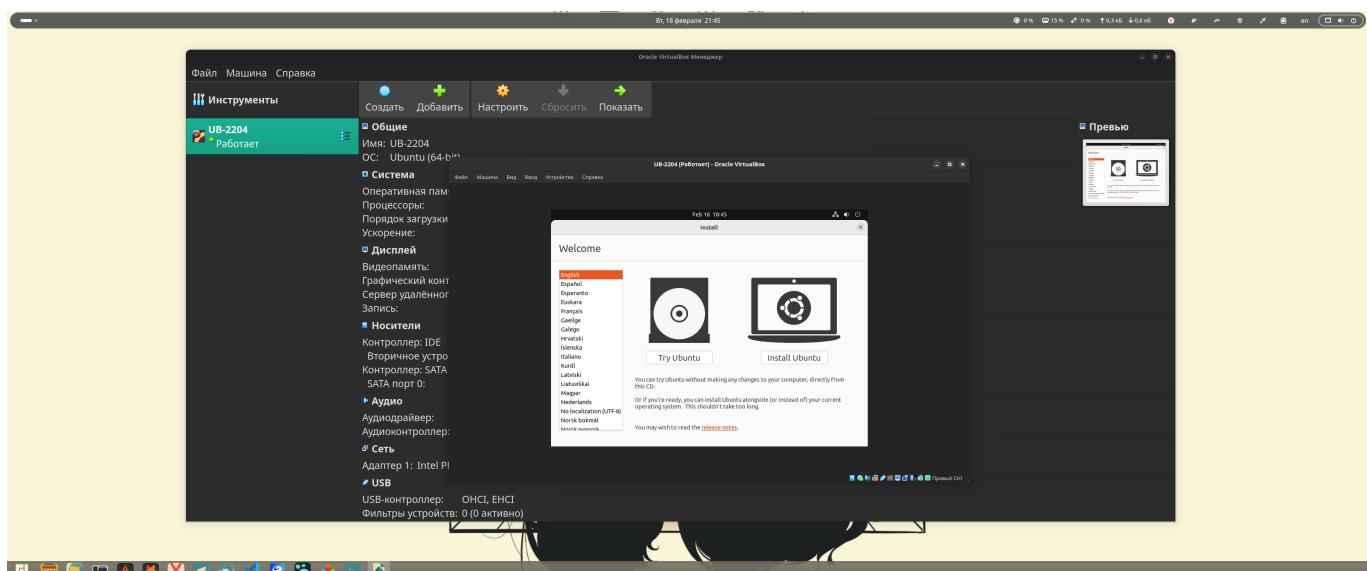
Для установки надо запустить виртуальную машину.



После запуска видим варианты запуска. Для установки выбираем первый пункт.

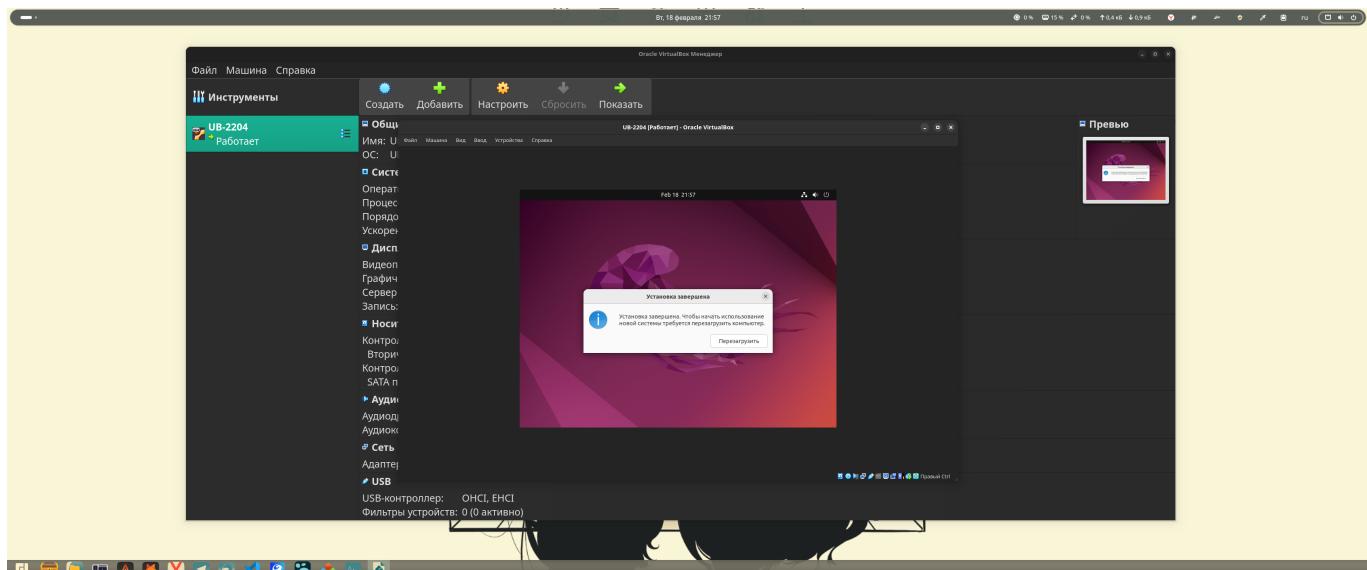


Видим графический установщик.

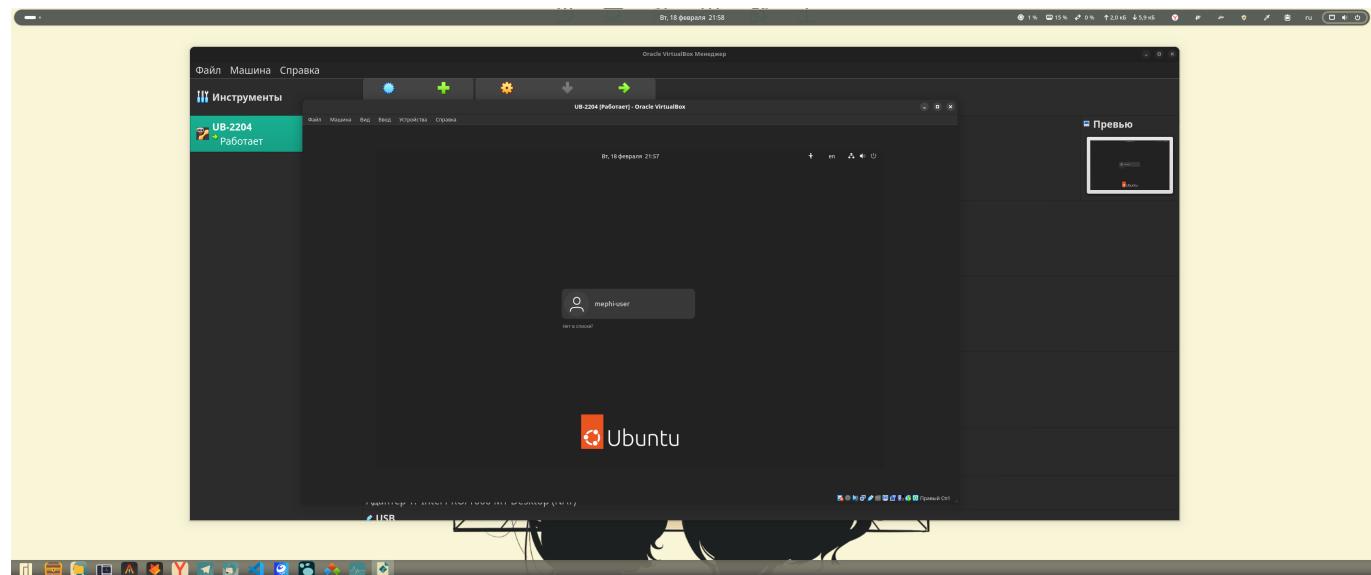


Далее идет по шагам которые предлагает графический установщик Ubuntu.

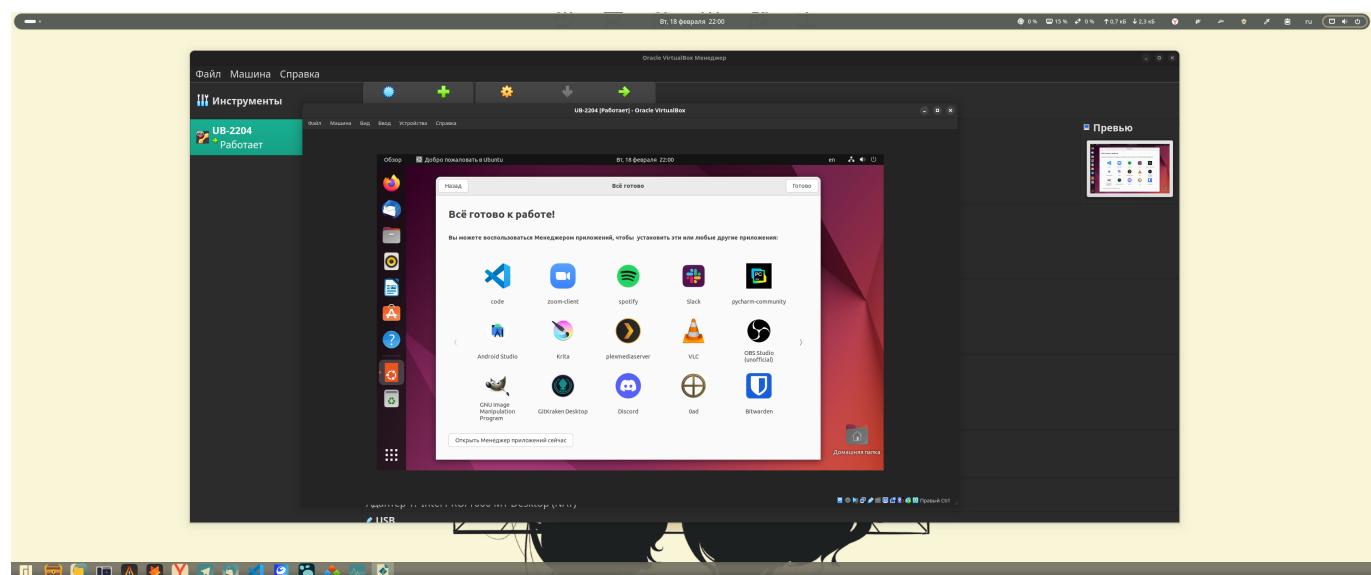
После всех шагов видим окно с информацией о завершении установки.



Перезагружаем систему. После видим выбор пользователя для входы. Выбираем нашего пользователя и вводим пароль.

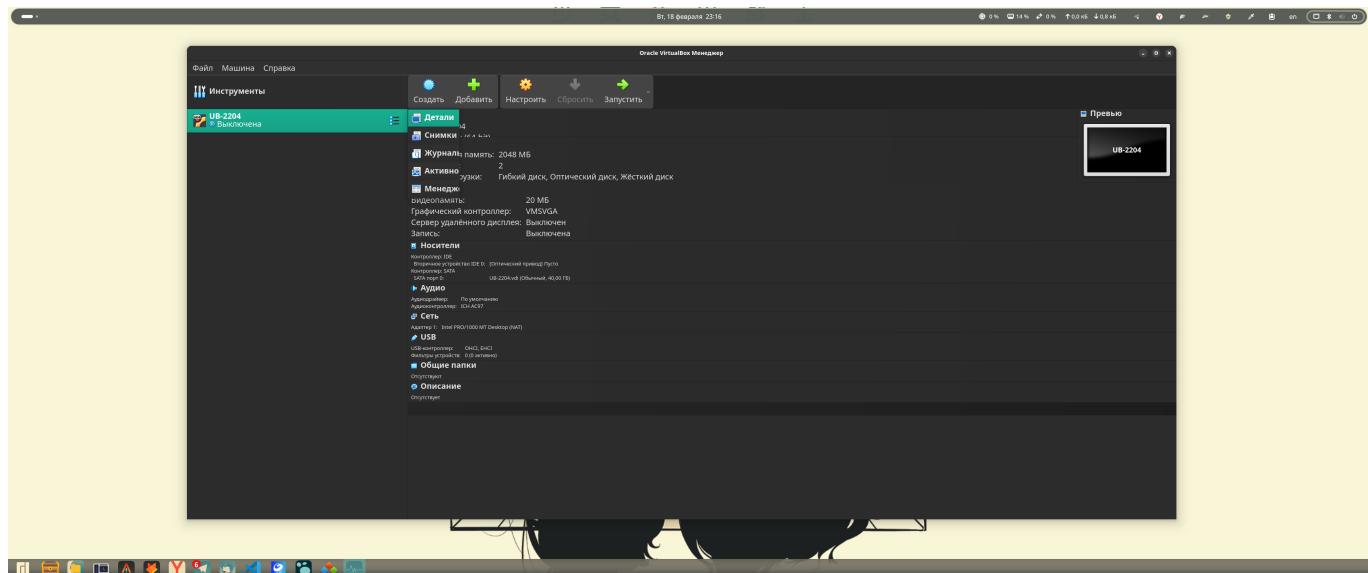


Пропускаем все приветственные окна и видим, что все готово к работе.

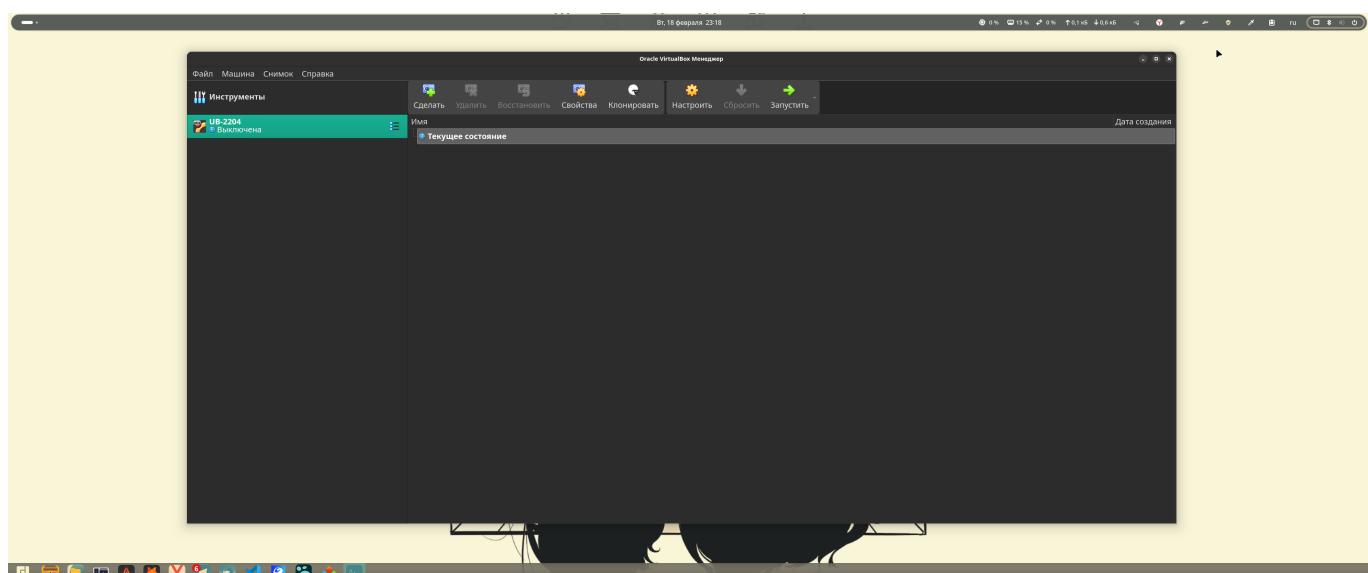


Создать снимок виртуальной машины, назвать снимок именем «Ubuntu-clear»

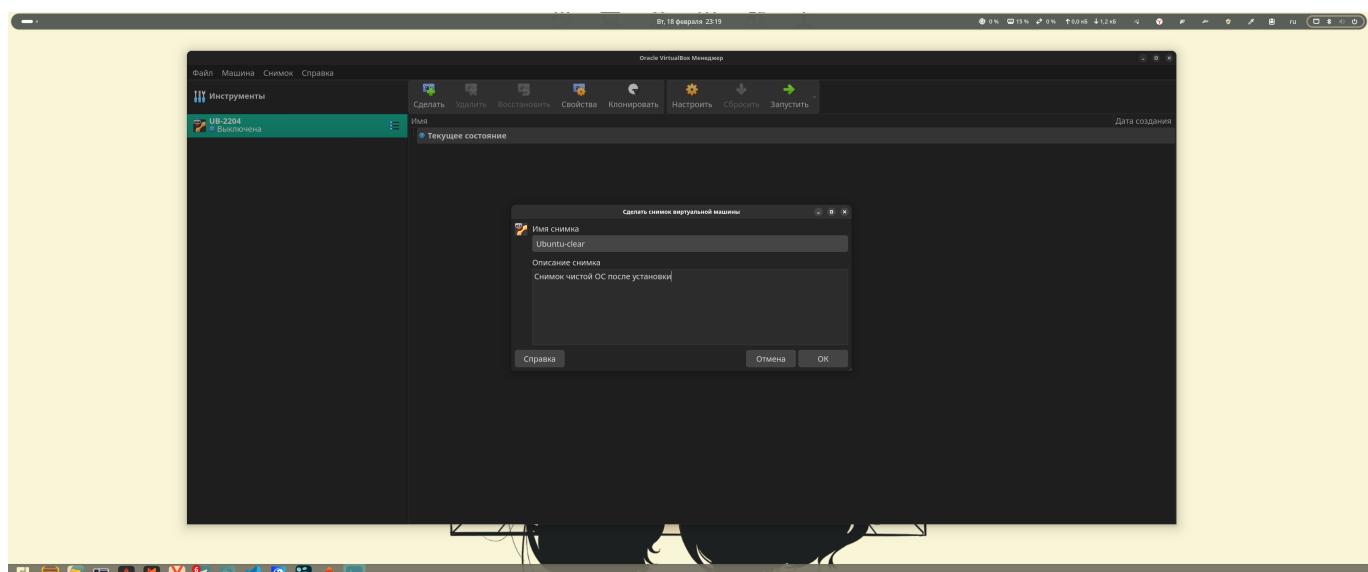
Выключаем виртуальную машину. Полосе нажимаем на 3 черточки и выбираем раздел для создания снимков.



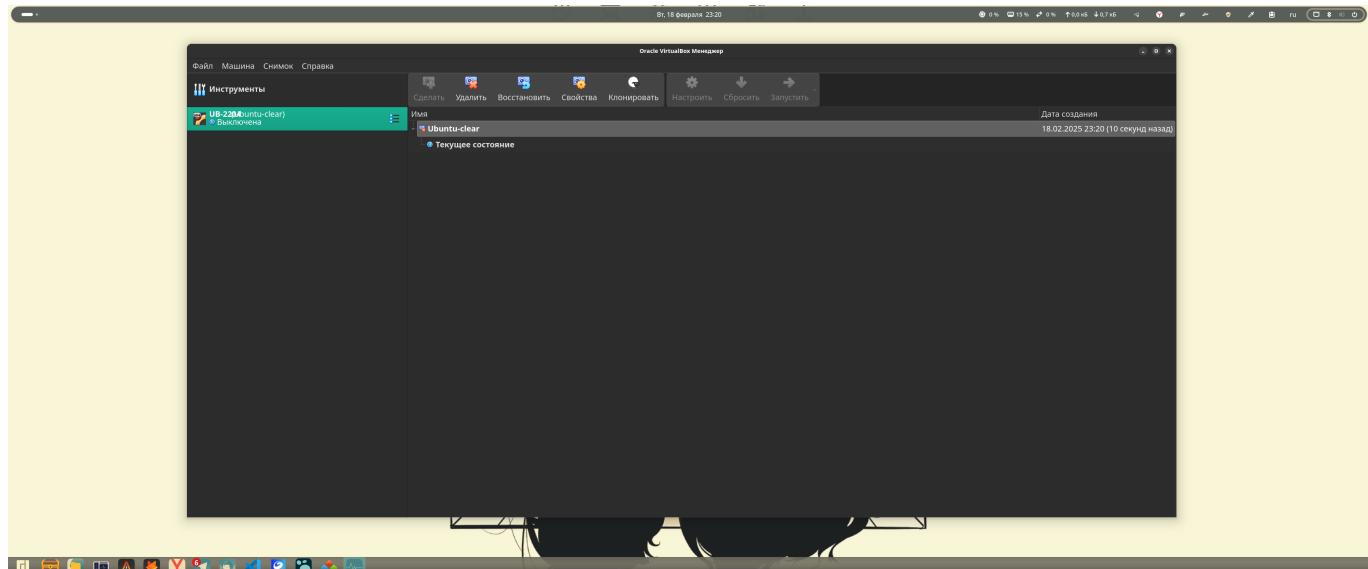
Открывается следующее меню



Нажимаем кнопку "Сделать". Указываем имя и описание снимка.

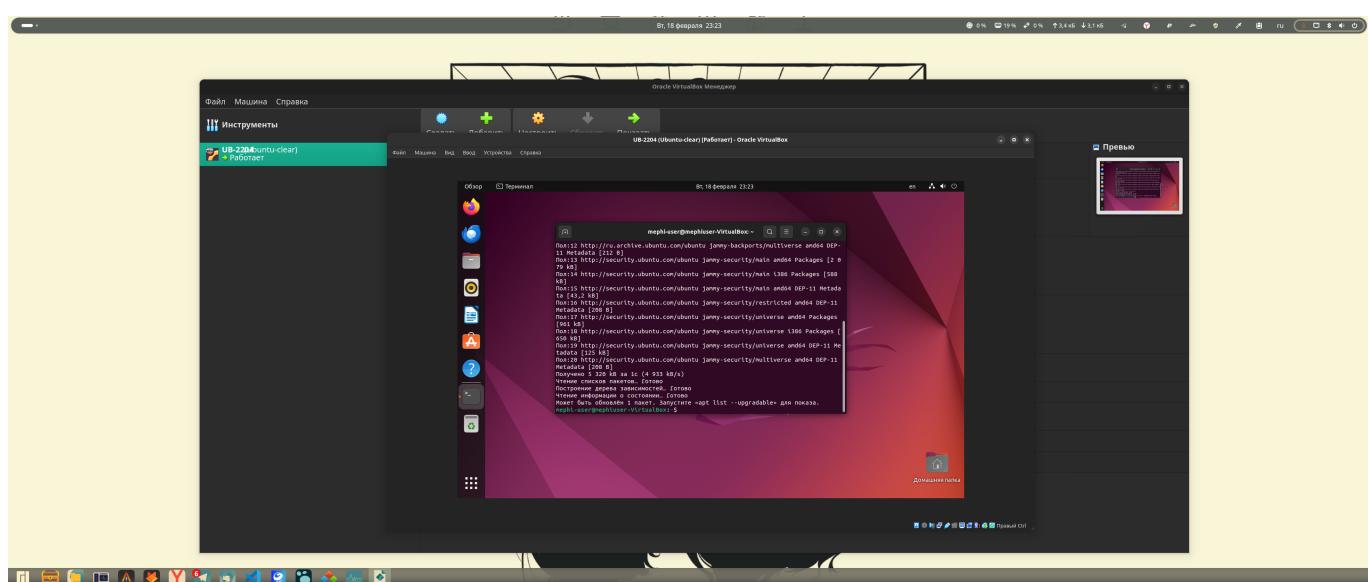
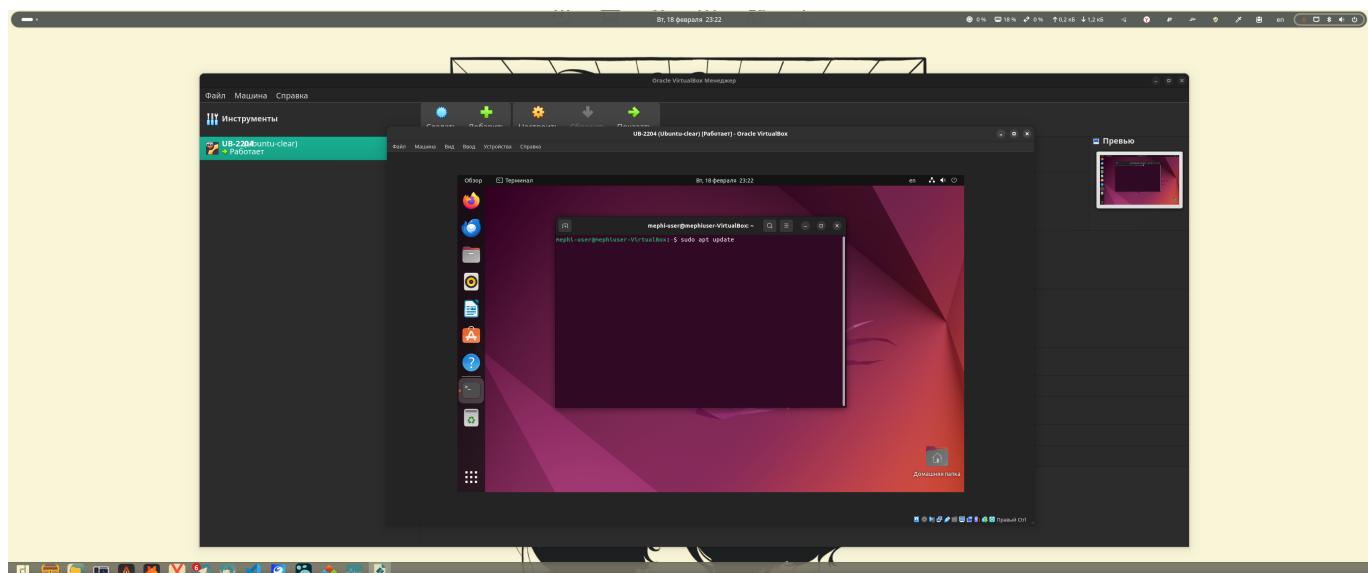


Видим созданный снимок.

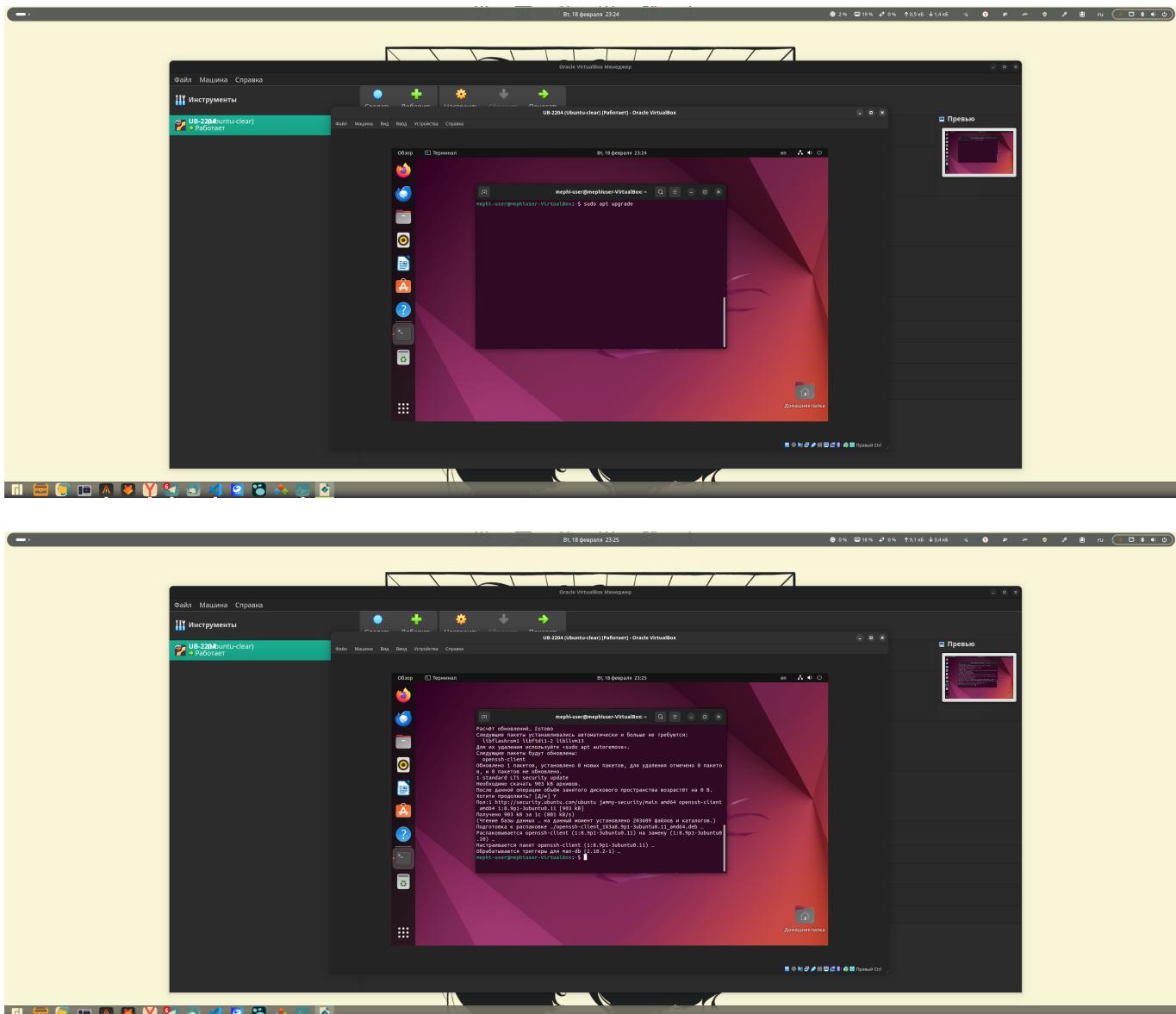


Произвести установку гостевых дополнений и перезагрузить виртуальную машину

Первым делом обновим все пакеты.



Обновим систему.



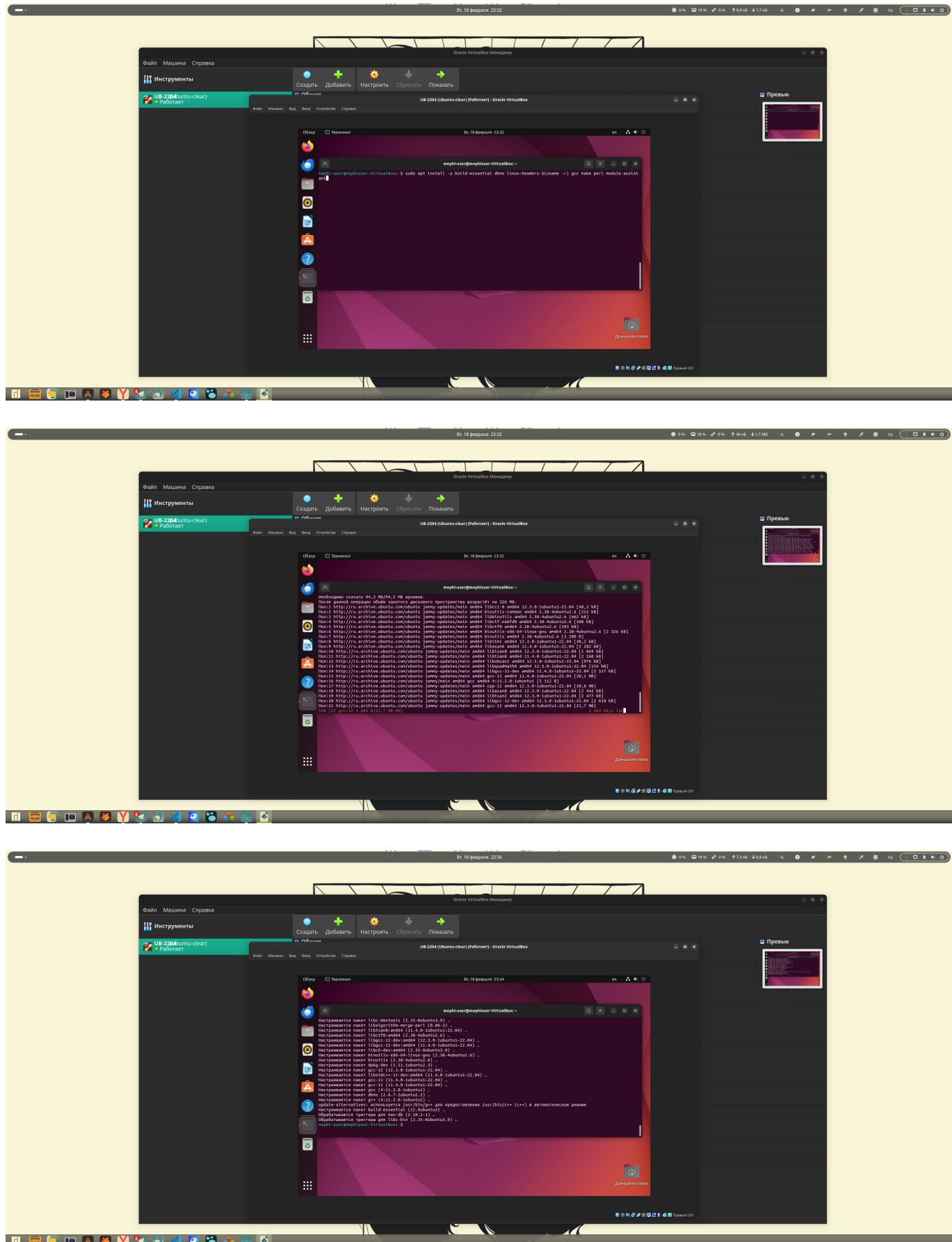
Теперь установим зависимости.

Для установки зависимостей гостевых дополнений VirtualBox в Ubuntu выполним

```
sudo apt update && sudo apt install -y build-essential dkms linux-headers-$(uname -r) gcc make perl module-assistant
```

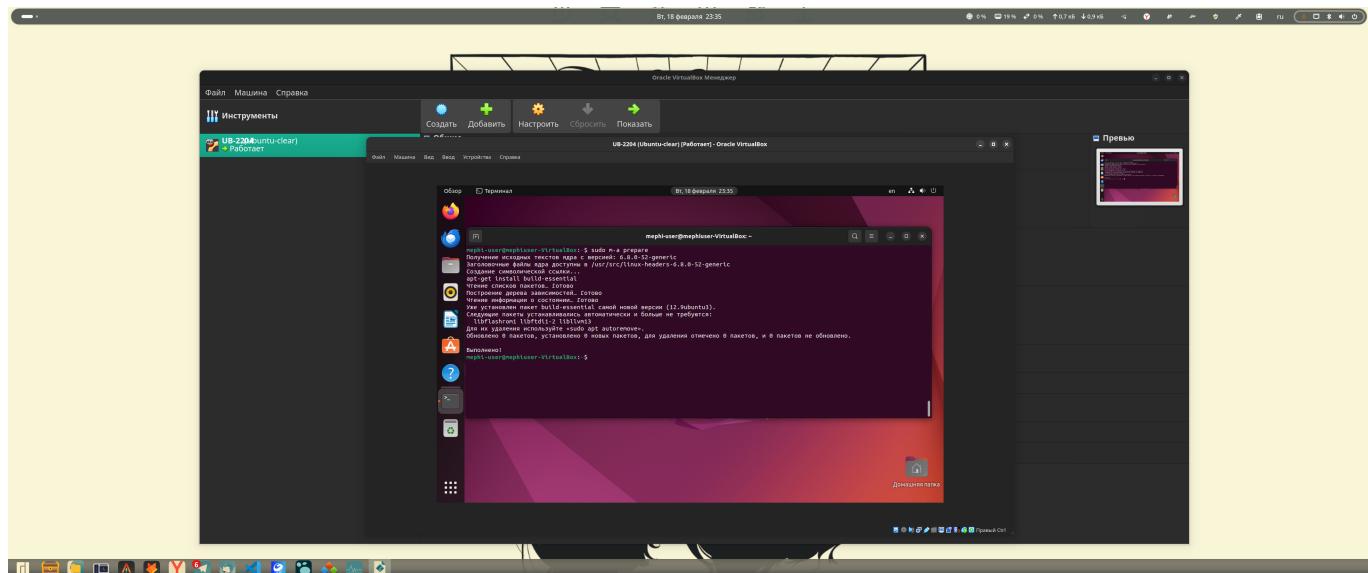
Пояснение пакетов:

- **build-essential** — компиляторы и инструменты сборки
- **dkms** — динамическое обновление модулей ядра
- **linux-headers-\$(uname -r)** — заголовки текущей версии ядра
- **gcc, make, perl** — базовые инструменты компиляции
- **module-assistant** — упрощает сборку сторонних модулей

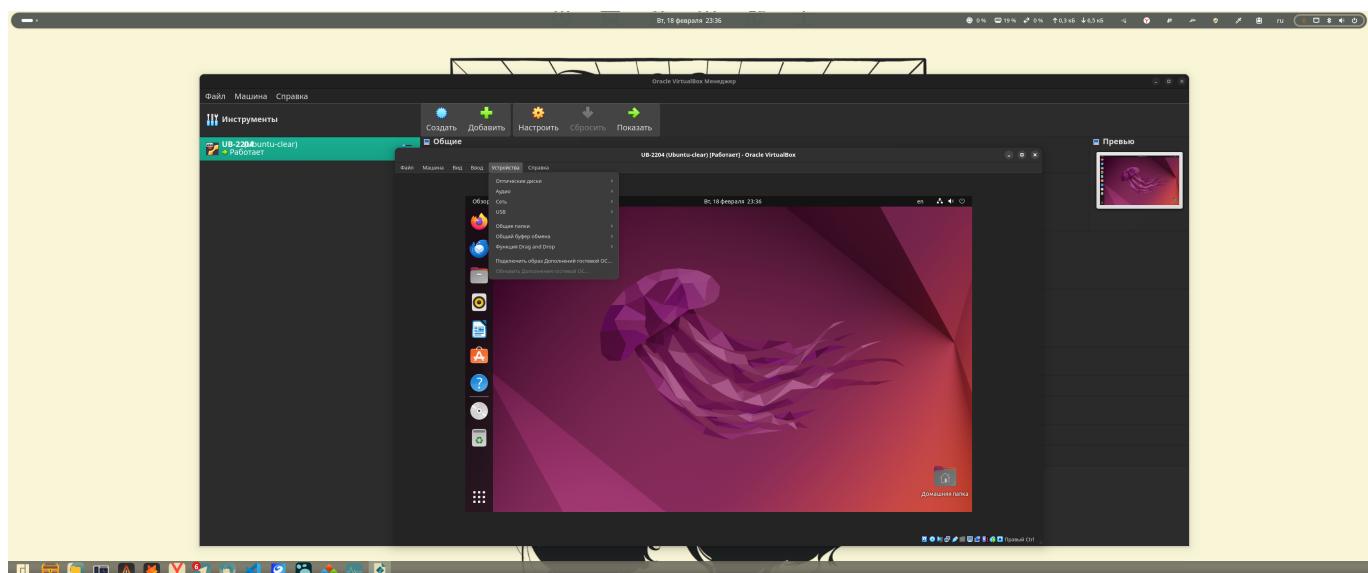


После нужна подготовка окружения (для Ubuntu 22.04+)

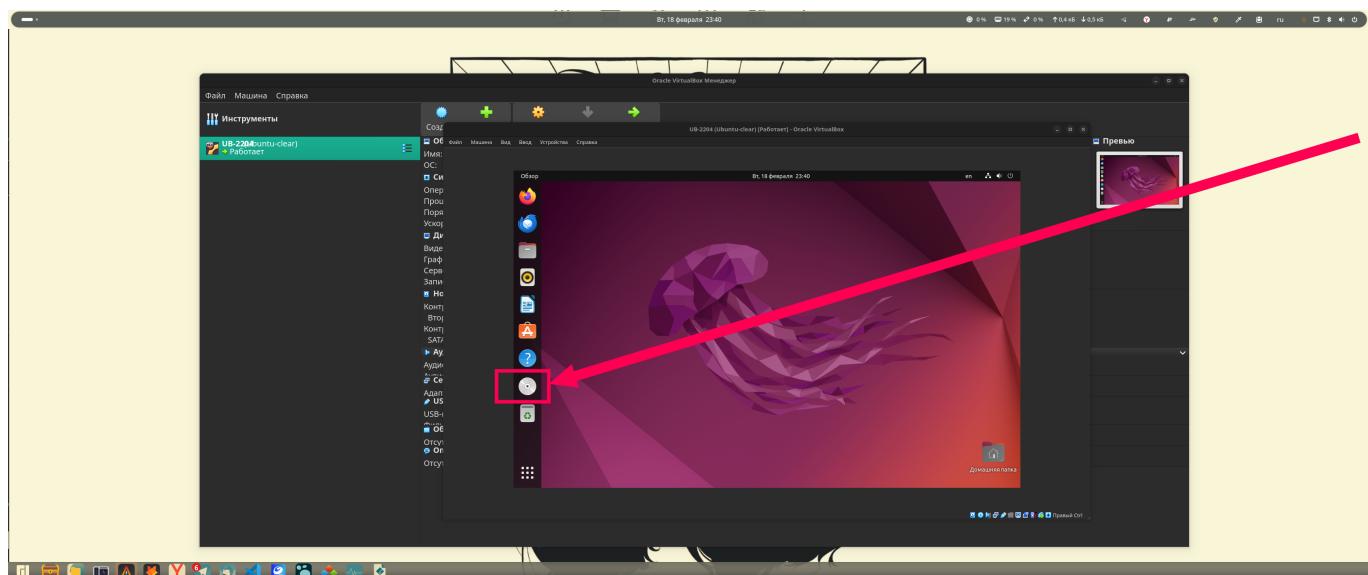
```
sudo m-a prepare
```



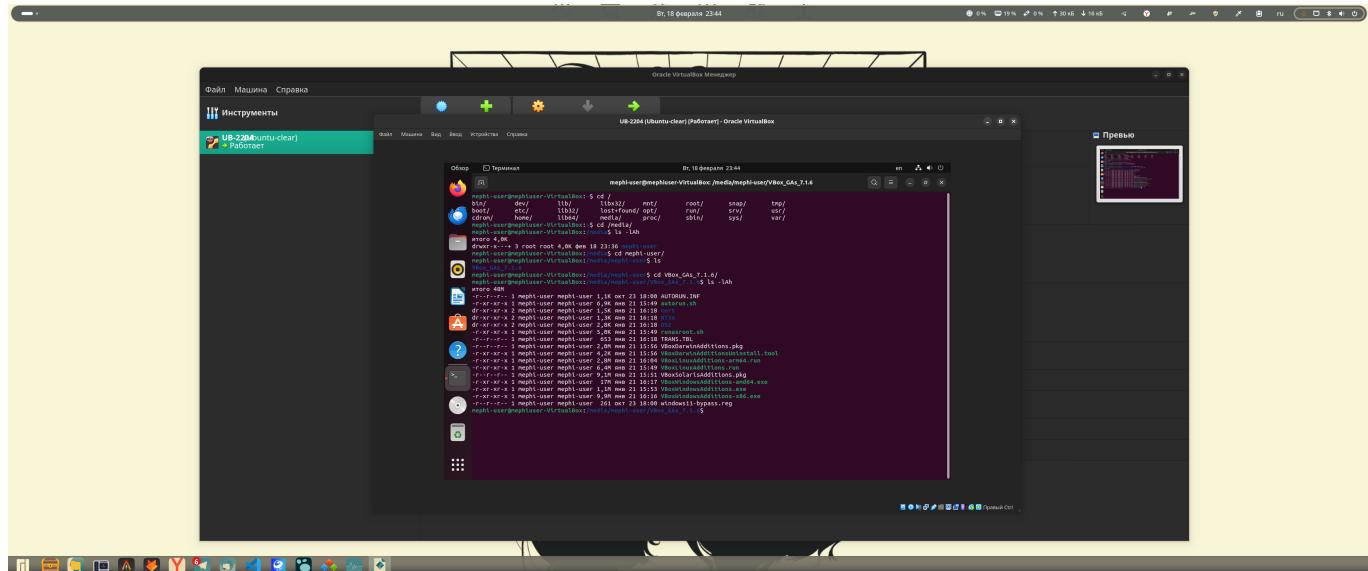
После нажимаем "Устройства" -> "Подключить образ Дополнительной гостевой ОС"



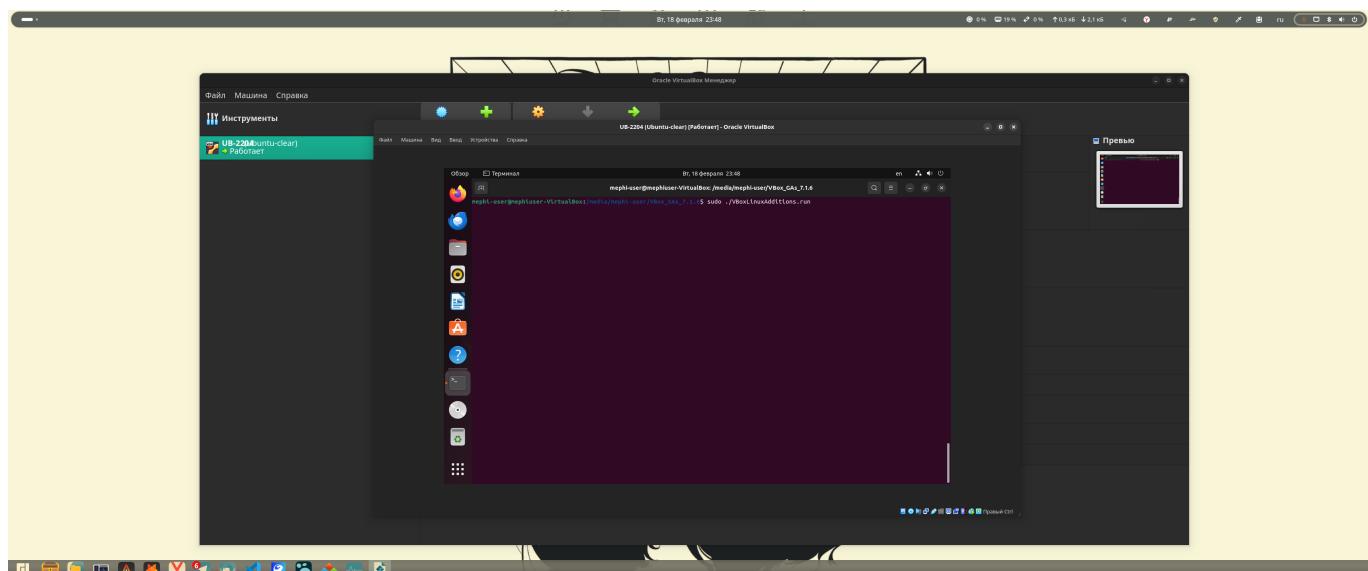
Видим что появился значек диска, то есть примонтировался диск с гостевыми дополнениями



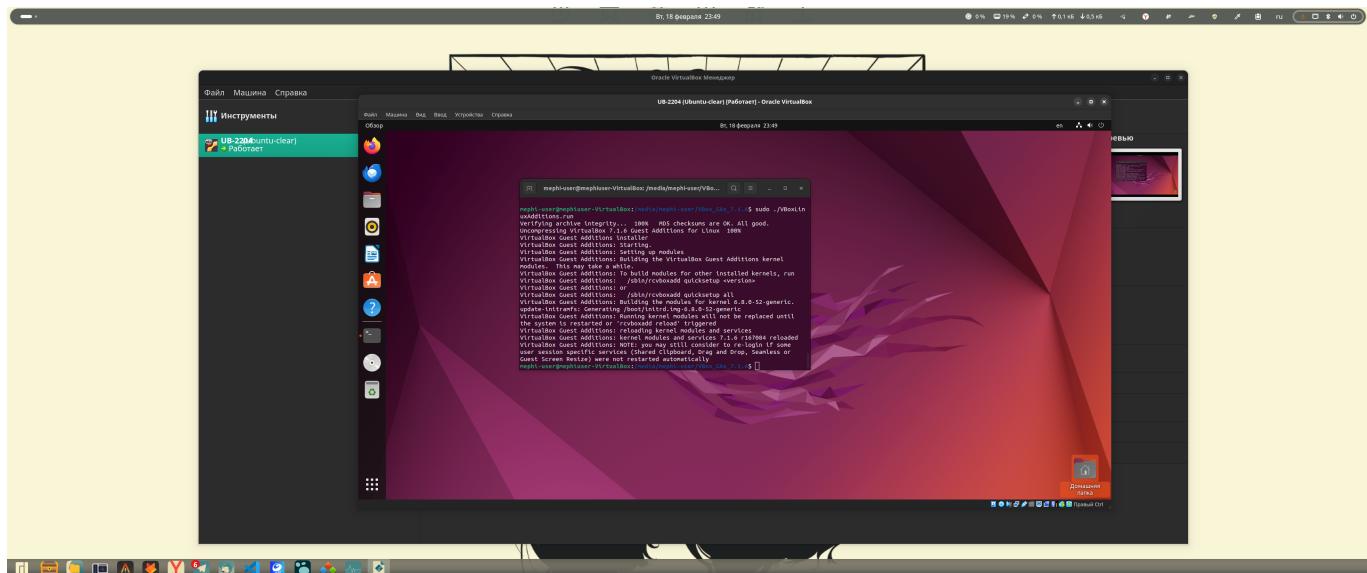
Автоматическая установка не произошла, поэтому надо запустить установку вручную. Для этого надо перейти в смонтированный диск и найти скрипт для запуска установки.



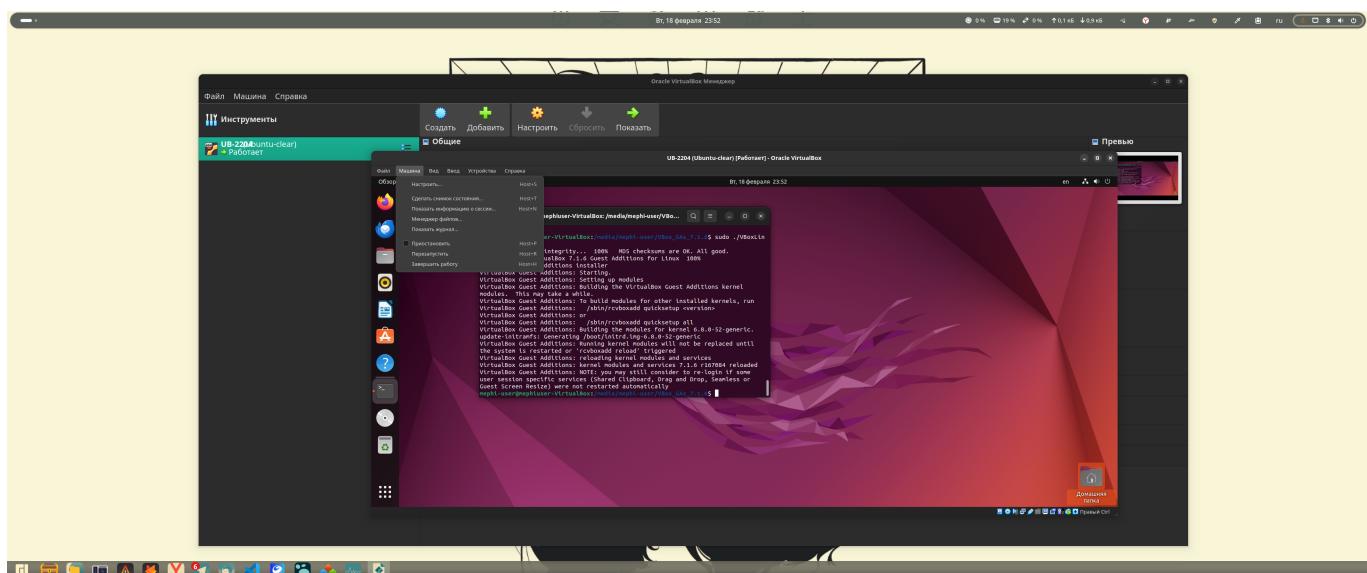
Запускаем нужный скрипт



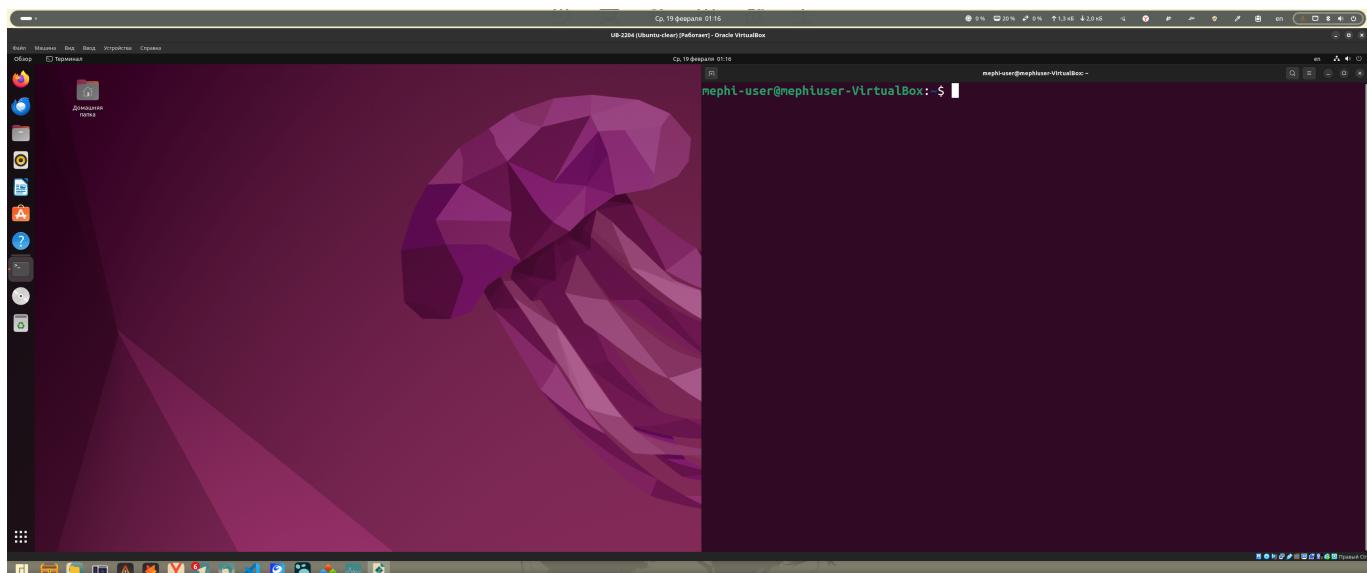
После запуска видим сообще о успешной установке.



Перезагружаем виртуальную машину



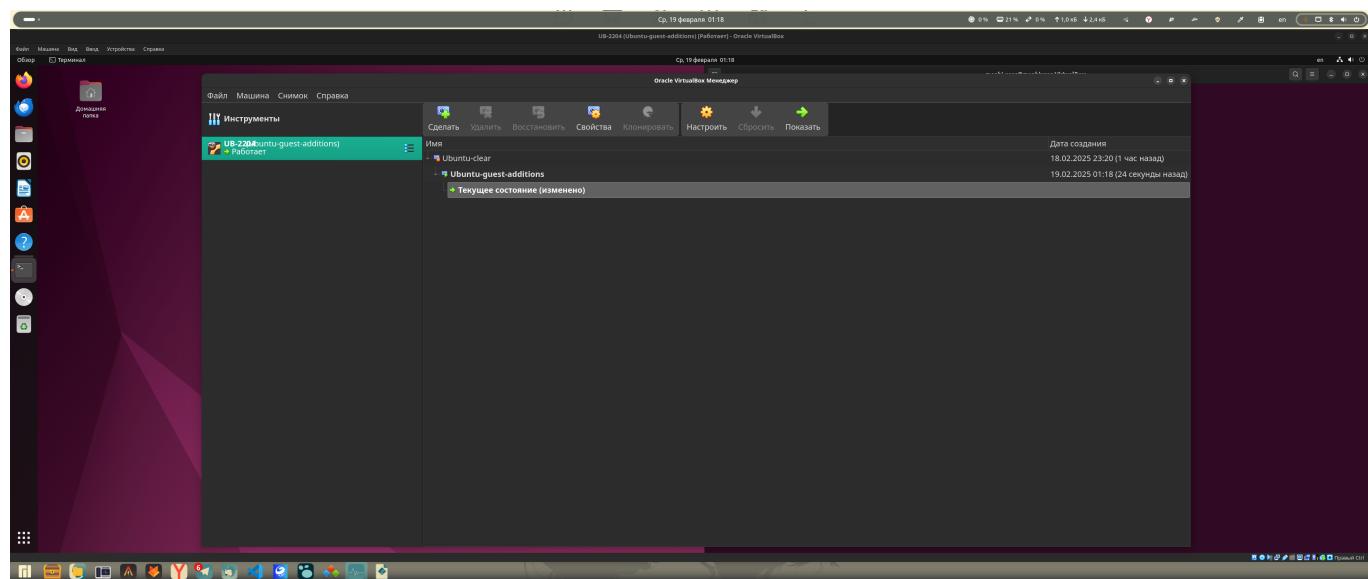
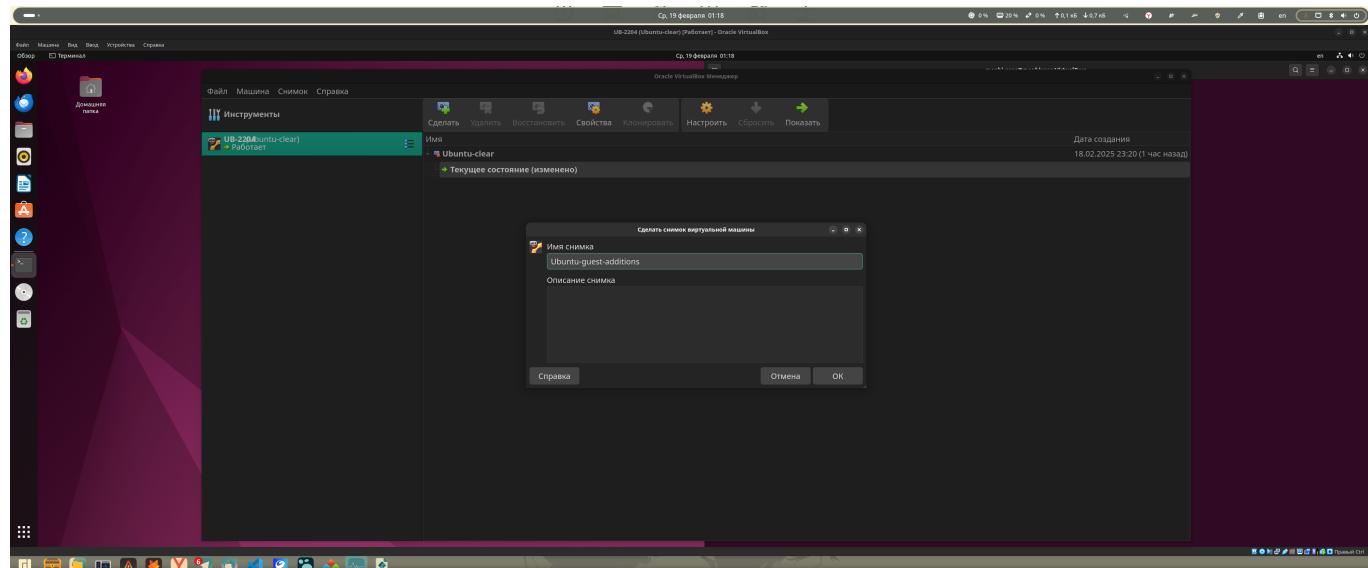
После перезапуска получается растянуть виртуальную машину на весь экран, что говорит об успешной установке и корректной работе.



Источники:

- <https://bafista.ru/virtualbox-install-guest-addition-linux-ubuntu/>
- <https://blog.programs74.ru/how-to-install-virtualbox-guest-additions-on-ubuntu-2204/>
- <https://losst.pro/ustanovka-dopolnenij-gostevoj-os-ubuntu>

Создать снимок виртуальной машины, назвать снимок именем «Ubuntu-guest-additions»

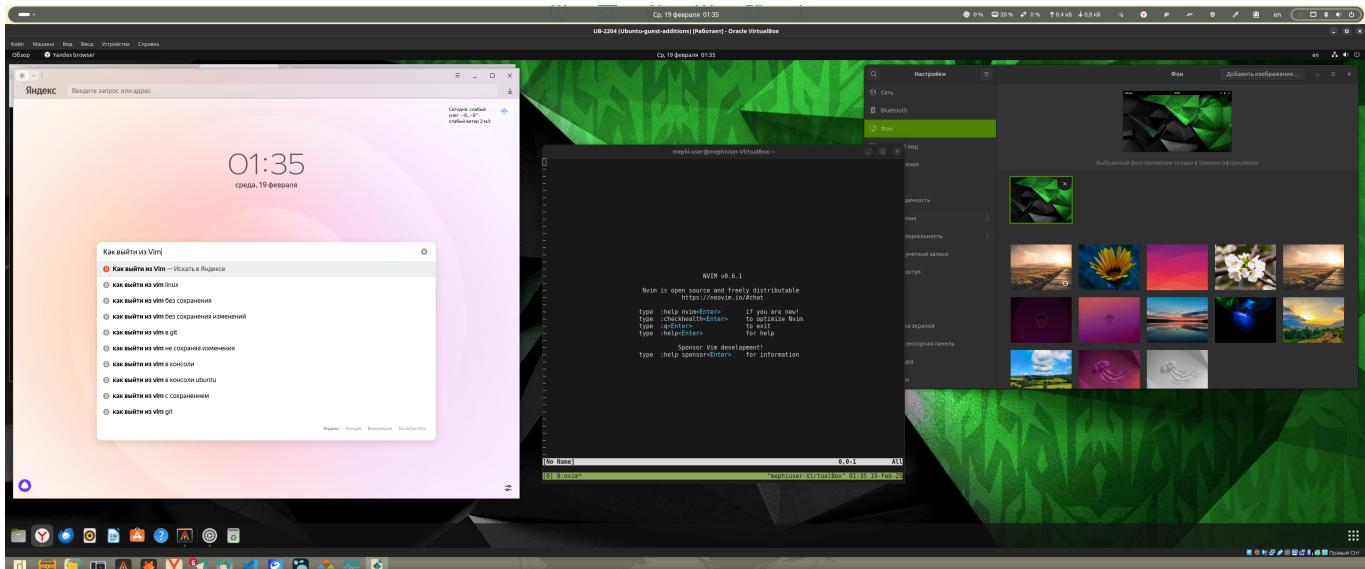


Произвести настройку операционной системы в соответствии с личными предпочтениями (сменить обои, установить браузер и т.д)

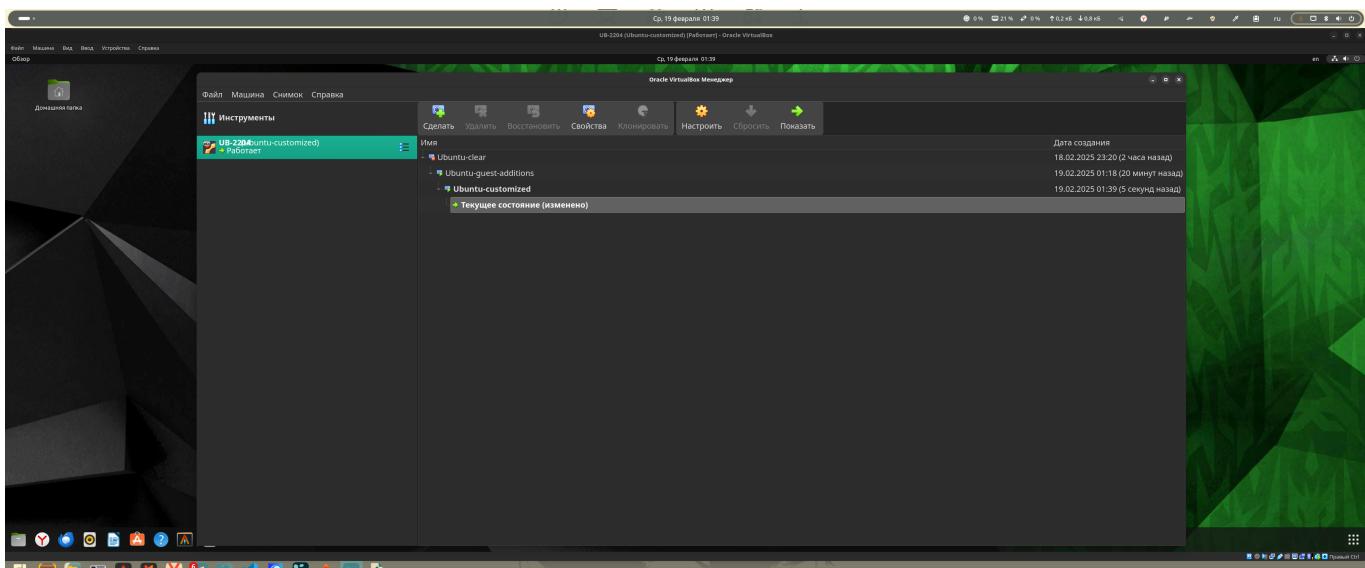
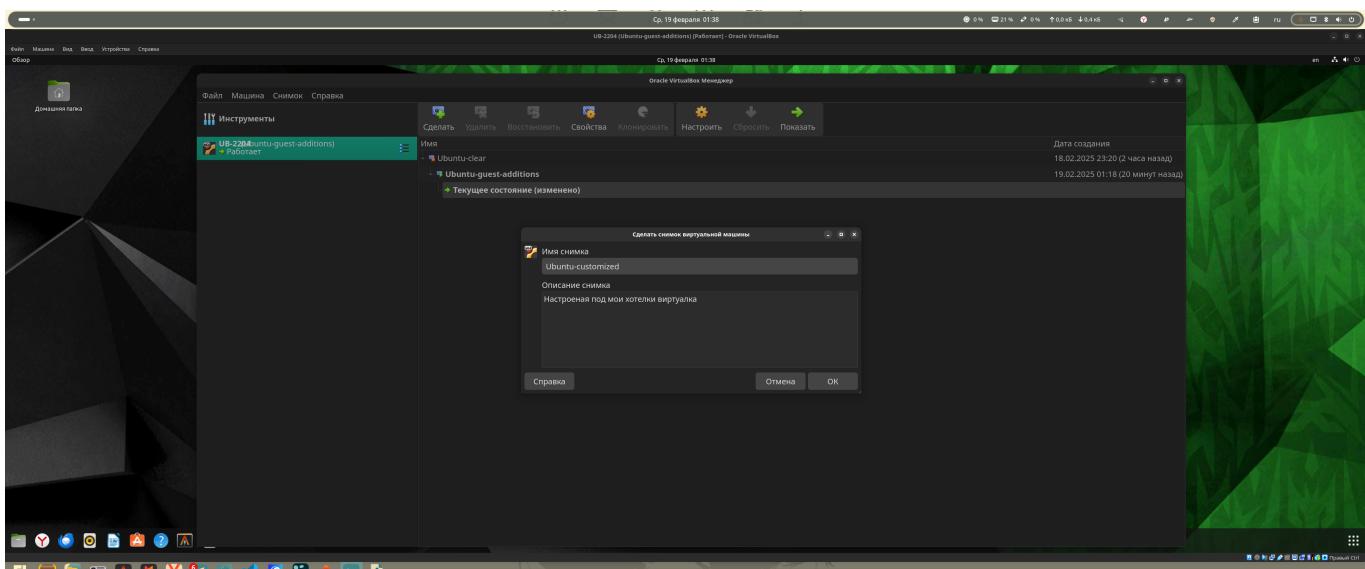
Произвел кастомизацию. Установил:

- tmux
- neovim
- alacritty
- Яндекс браузер

Поменял фон и тему оформления

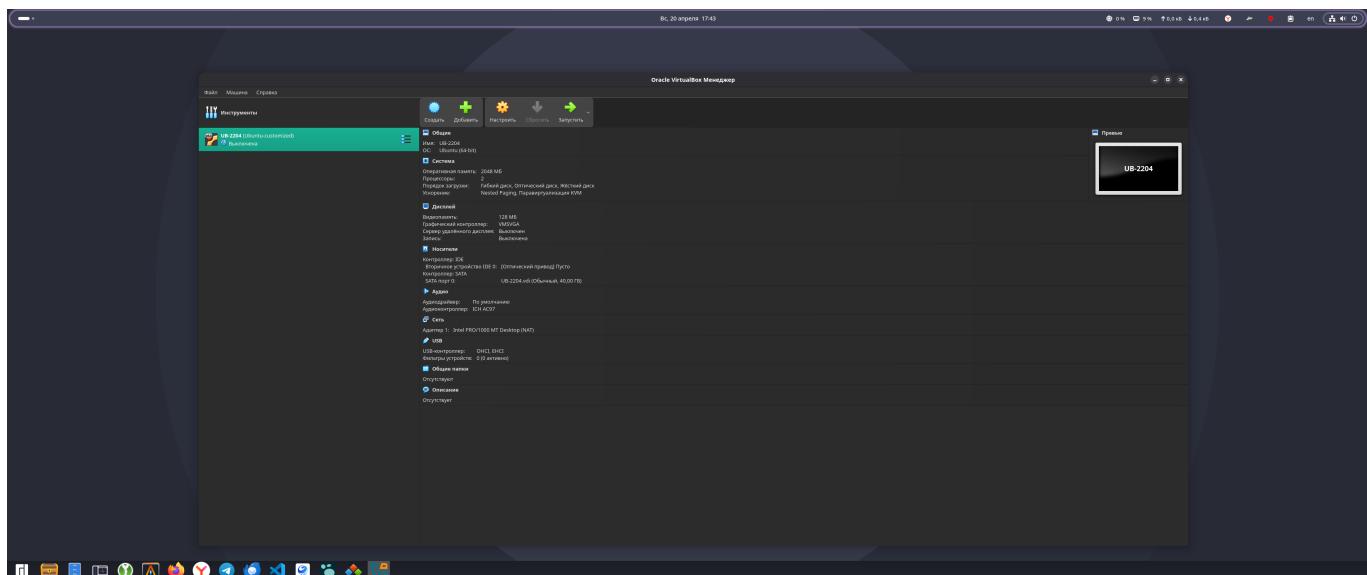


Создать снимок виртуальной машины, назвать снимок именем «Ubuntu-customized»

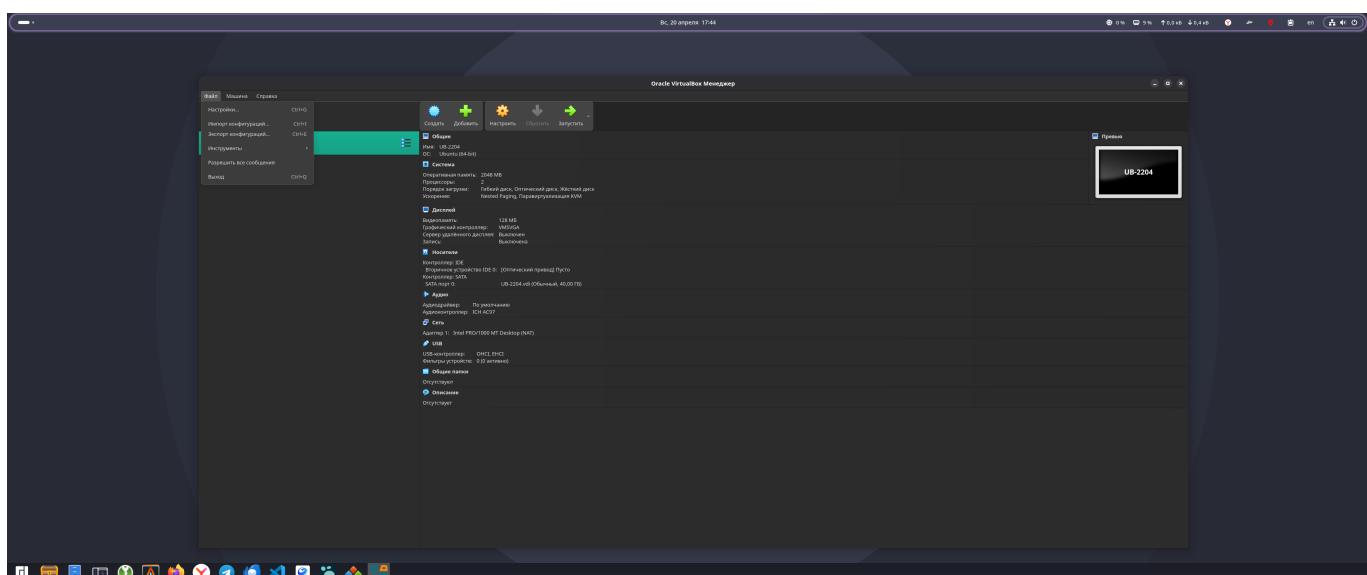


Произвести экспорт виртуальной машины в формате OVA.

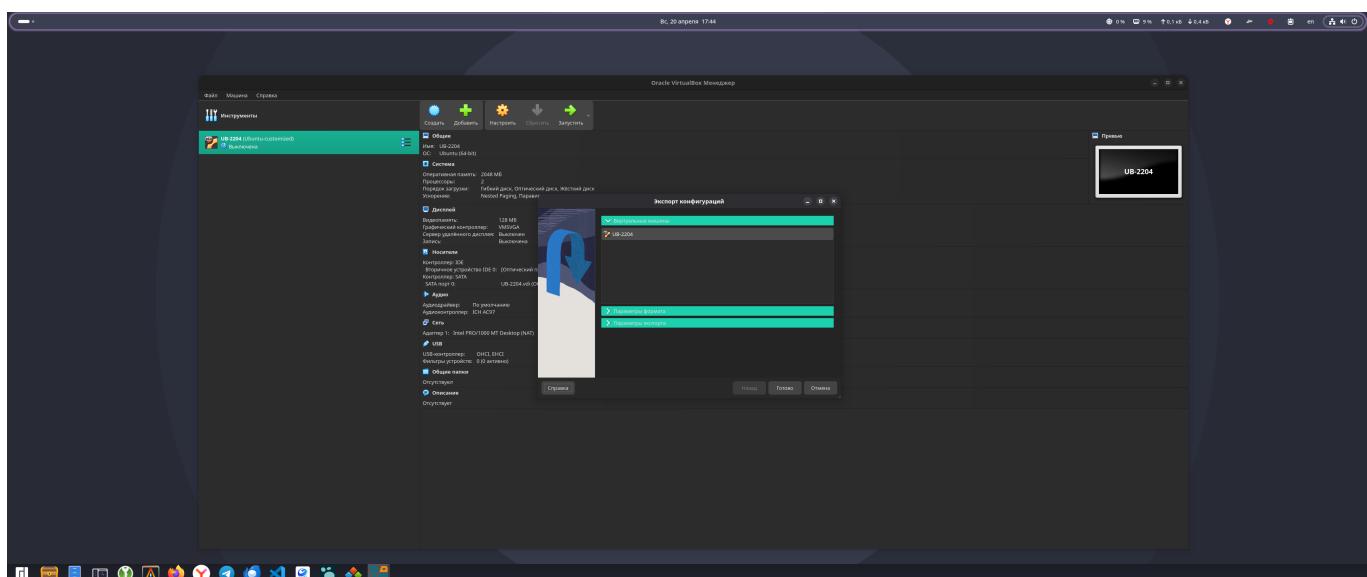
В главном меню VirtualBox выбираем Файл



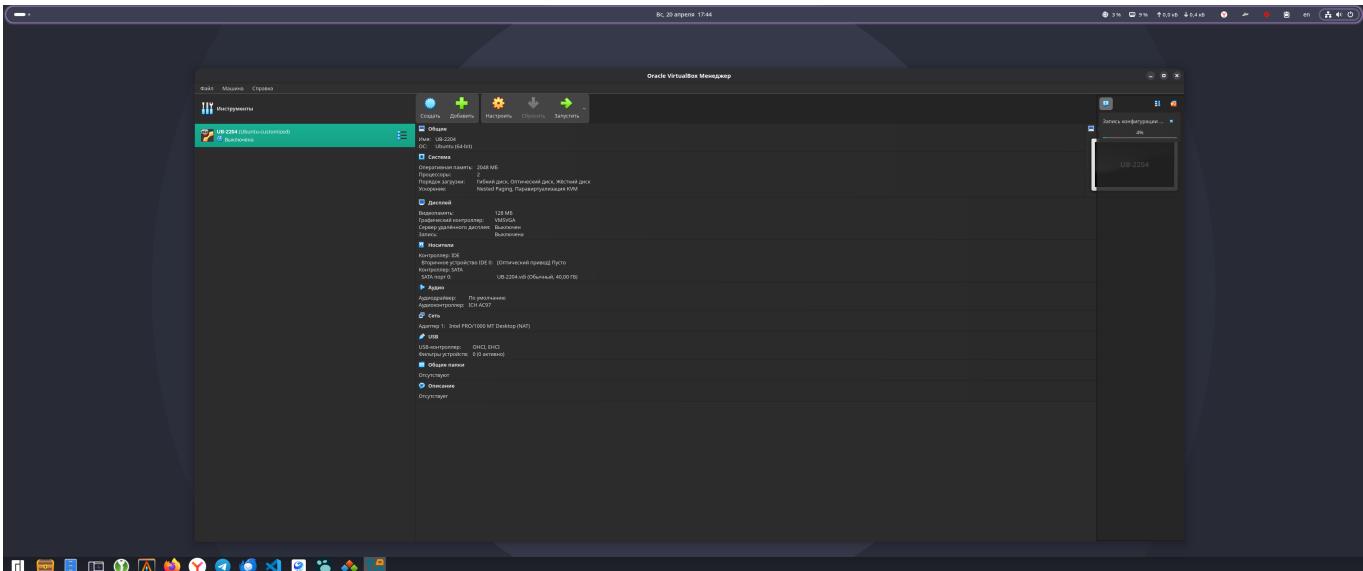
Далее Экспорт конфигураций



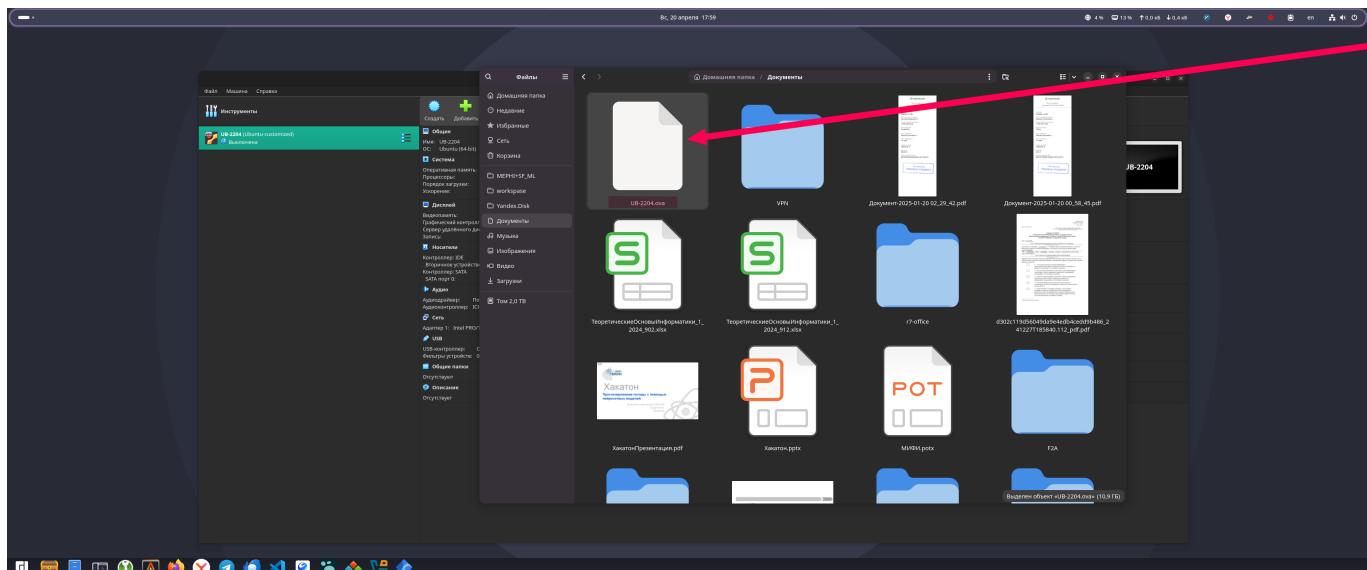
Выбираем нашу виртуальную машину



Видим процесс экспорта

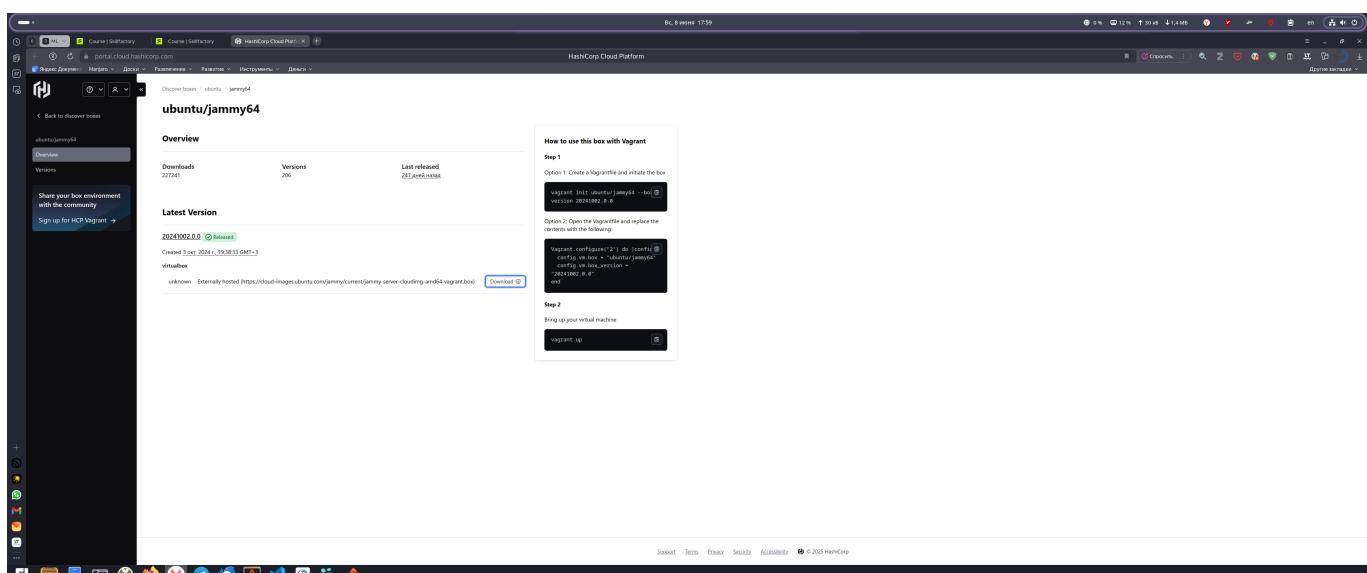


После выполнения можем найти файл в директории



Vagrant

Скачиваем образ по ссылке из задания



Приоздовим инициализацию образа ubuntu/jammy64

```

Bc: 8 янв 18:10
gna@pc-mru:~/workspace/education/MEPHI/MEPHI+SF_ML/academic-semester-2/linux

~ via ● v20.19.2
> cd workspace/education/MEPHI/MEPHI+SF_ML/academic-semester-2/linux

MEPHI+SF_ML/academic-semester-2/linux on ℰ main [x!?]
> ls
Hn-1  jammy-server-cloudimg-amd64-vagrant.box  lectures  ubuntu-22.04-desktop-amd64.iso  ubuntu-22.04-desktop-amd64.iso.torrent

MEPHI+SF_ML/academic-semester-2/linux on ℰ main [x!?] via v2.4.6
> []

Bc: 8 янв 18:10
gna@pc-mru:~/workspace/education/MEPHI/MEPHI+SF_ML/academic-semester-2/linux

~ via ● v20.19.2
> cd workspace/education/MEPHI/MEPHI+SF_ML/academic-semester-2/linux

MEPHI+SF_ML/academic-semester-2/linux on ℰ main [x!?]
> vagrant init jammy-server-cloudimg-amd64-vagrant.box
A 'Vagrantfile' has been placed in this directory. You are now
ready to 'vagrant up' your first virtual environment! Please read
the comments in the Vagrantfile as well as documentation on
'vagrantup.com' for more information on using Vagrant.

MEPHI+SF_ML/academic-semester-2/linux on ℰ main [x!?] via v2.4.6
> []

```

Запустить виртуальную машину

```

Bc: 8 янв 18:13
vagrant up

MEPHI+SF_ML/academic-semester-2/linux on ℰ main [x!?] via v2.4.6
> vagrant up
Bringing machine 'default' up with 'virtualbox' provider...
==> default: Box 'jammy-server-cloudimg-amd64-vagrant.box' could not be found. Attempting to find and install...
    default: Box Provider: virtualbox
    default: Box Version: >= 0
==> default: Box was not detected as metadata. Adding it directly...
==> default: Adding box 'jammy-server-cloudimg-amd64-vagrant.box' (v0) for provider: virtualbox
    default: Unpacking necessary files from: file:///home/gna/workspace/education/MEPHI/MEPHI+SF_ML/academic-semester-2/linux/jammy-server-cloudimg-amd64-vagrant.box
==> default: Successfully added box 'jammy-server-cloudimg-amd64-vagrant.box' (v0) for 'virtualbox'
==> default: Importing base box 'jammy-server-cloudimg-amd64-vagrant.box'...
==> default: Matching MAC address for NAT networking...
==> default: Setting the name of the VM: linux_default_174939577833_68045
Vagrant is currently configured to create VirtualBox synced folders with
the `SharedFoldersEnableSymlinksCreate` option enabled. If the Vagrant
guest is not trusted, you may want to disable this option. For more
information on this option, please refer to the VirtualBox manual.

  https://www.virtualbox.org/manual/ch04.html#sharedfolders

This option can be disabled globally with an environment variable:

  VAGRANT_DISABLE_VBOXSYMLINKCREATE=1

or on a per folder basis within the Vagrantfile:

  config.vm.synced_folder '/host/path', '/guest/path', SharedFoldersEnableSymlinksCreate: false
==> default: Clearing any previously set network interfaces...
==> default: Preparing network interfaces based on configuration...
    default: Adapter 1: nat
==> default: Forwarding ports...
    default: 22 (guest) => 2222 (host) (adapter 1)
==> default: Running 'pre-boot' VM customizations...

```

```

Bc: 8 янв 18:15
gna@pc-mru:~/workspace/education/MEPHI/MEPHI+SF_ML/academic-semester-2/linux

==> default: Preparing network interfaces based on configuration...
    default: Adapter 1: nat
==> default: Forwarding ports...
    default: 22 (guest) => 2222 (host) (adapter 1)
==> default: Running 'pre-boot' VM customizations...
==> default: Booting VM...
==> default: Waiting for machine to boot. This may take a few minutes...
    default: SSH address: 127.0.0.1:2222
    default: SSH username: vagrant
    default: SSH auth method: private key
    default:
    default: Vagrant insecure key detected. Vagrant will automatically replace
    default: this with a newly generated keypair for better security.
    default:
    default: Inserting generated public key within guest...
    default: Removing insecure key from the guest if it's present...
    default: Key inserted! Disconnecting and reconnecting using new SSH key...
==> default: Machine booted and ready!
==> default: Checking for guest additions in VM...
    default: The guest additions on this VM do not match the installed version of
    default: VirtualBox! In most cases this is fine, but in rare cases it can
    default: prevent things such as shared folders from working properly. If you see
    default: shared folder errors, please make sure the guest additions within the
    default: virtual machine match the version of VirtualBox you have installed on
    default: your host and reload your VM.
    default:
    default: Guest Additions Version: 6.0.0 r127566
    default: VirtualBox Version: 7.1
==> default: Mounting shared folders...
    default: /home/gna/workspace/education/MEPHI/MEPHI+SF_ML/academic-semester-2/linux => /vagrant

MEPHI+SF_ML/academic-semester-2/linux on ℰ main [x!?] via v2.4.6 took 24s
> []

```

Удаляем машину

```
MEPHI+SF_ML/academic-semester-2/linux on 12 main [x!?] via v2.4.6 took 48s
> vagrant destroy
  default: Are you sure you want to destroy the 'default' VM? [y/N] y
==> default: Forcing shutdown of VM...
==> default: Destroying VM and associated drives...
```

С помощью текстового редактора vim внесём изменения в VagrantFile

```
MEPHI+SF_ML/academic-semester-2/linux on 12 main [x!?] via v2.4.6 took 48s
> vagrant destroy
  default: Are you sure you want to destroy the 'default' VM? [y/N] y
==> default: Forcing shutdown of VM...
==> default: Destroying VM and associated drives...
```

> nvim Vagrantfile

```
# -*- mode: ruby -*-
# vi: set ft=ruby :

# All Vagrant configuration is done below. The "2" in Vagrant.configure
# configures the configuration version (we support older styles for
# backwards compatibility). Please don't change it unless you know what
# you're doing.
Vagrant.configure("2") do |config|
  config.vm.box = "jammy-server-cloudimg-amd64-vagrant.box"
  # Example for VirtualBox:
  config.vm.provider "virtualbox" do |vb|
    # Устанавливаем имя хоста.
    config.vm.hostname = "ubuntu"
    #   # Display the VirtualBox GUI when booting the machine
    vb.gui = true
    #
    #   # Customize the amount of memory on the VM:
    vb.memory = "2048"
    vb.cpus = "2"
    vb.name = "ubuntu"
  end
  #
  # View the documentation for the provider you are using for more
  # information on available options.

  # Enable provisioning with a shell script. Additional provisioners such as
Vagrantfile [+]
```

Производим запуск машины

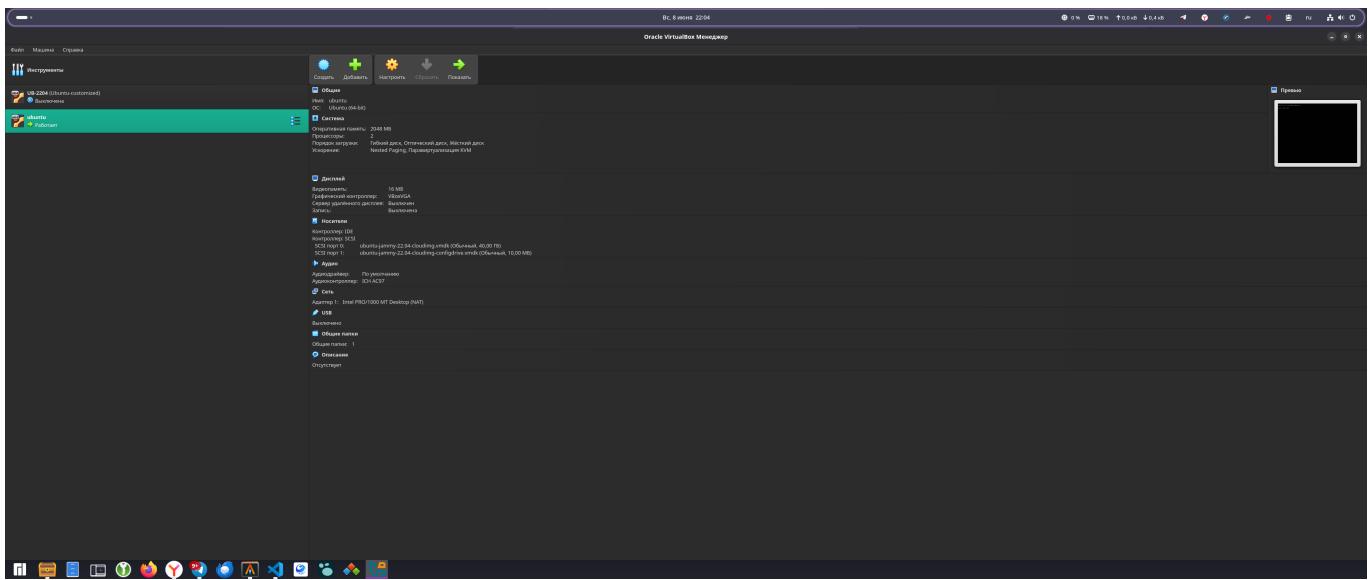
```
MEPHI+SF_ML/academic-semester-2/linux on 192.168.1.10 main [x!?] via v2.4.6
> lsd -lah
drwxr-xr-x gna gna 4.0 KB Sun Jun 8 18:12:52 2025 .vagrant
drwxr-xr-x gna gna 4.0 KB Sun Jun 8 21:14:40 2025 HW-1
.rw-r--r-- gna gna 610 MB Sun Jun 8 18:01:22 2025 jammy-server-cloudimg-amd64-vagrant.box
drwxr-xr-x gna gna 4.0 KB Sun Jun 8 17:59:07 2025 lectures
.rw-r--r-- gna gna 3.4 GB Thu Feb 13 19:25:00 2025 ubuntu-22.04-desktop-amd64.iso
.rw-r--r-- gna gna 273 KB Thu Feb 13 19:11:50 2025 ubuntu-22.04-desktop-amd64.iso.torrent
.rw-r--r-- gna gna 1.2 KB Sun Jun 8 21:44:58 2025 Vagrantfile

MEPHI+SF_ML/academic-semester-2/linux on 192.168.1.10 main [x!?] via v2.4.6
> vagrant up
```

```
==> default: Waiting for machine to boot. This may take a few minutes...
default: SSH address: 127.0.0.1:2222
default: SSH username: vagrant
default: SSH auth method: private key
default:
default: Vagrant insecure key detected. Vagrant will automatically replace
default: this with a newly generated keypair for better security.
default:
default: Inserting generated public key within guest...
default: Removing insecure key from the guest if it's present...
default: Key inserted! Disconnecting and reconnecting using new SSH key...
==> default: Machine booted and ready!
==> default: Checking for guest additions in VM...
default: The guest additions on this VM do not match the installed version of
default: VirtualBox! In most cases this is fine, but in rare cases it can
default: prevent things such as shared folders from working properly. If you see
default: shared folder errors, please make sure the guest additions within the
default: virtual machine match the version of VirtualBox you have installed on
default: your host and reload your VM.
default:
default: Guest Additions Version: 6.0.0 r127566
default: VirtualBox Version: 7.1
==> default: Setting hostname...
==> default: Mounting shared folders...
default: /home/gna/workspace/education/MEPHI/MEPHI+SF_ML/academic-semester-2/linux => /vagrant

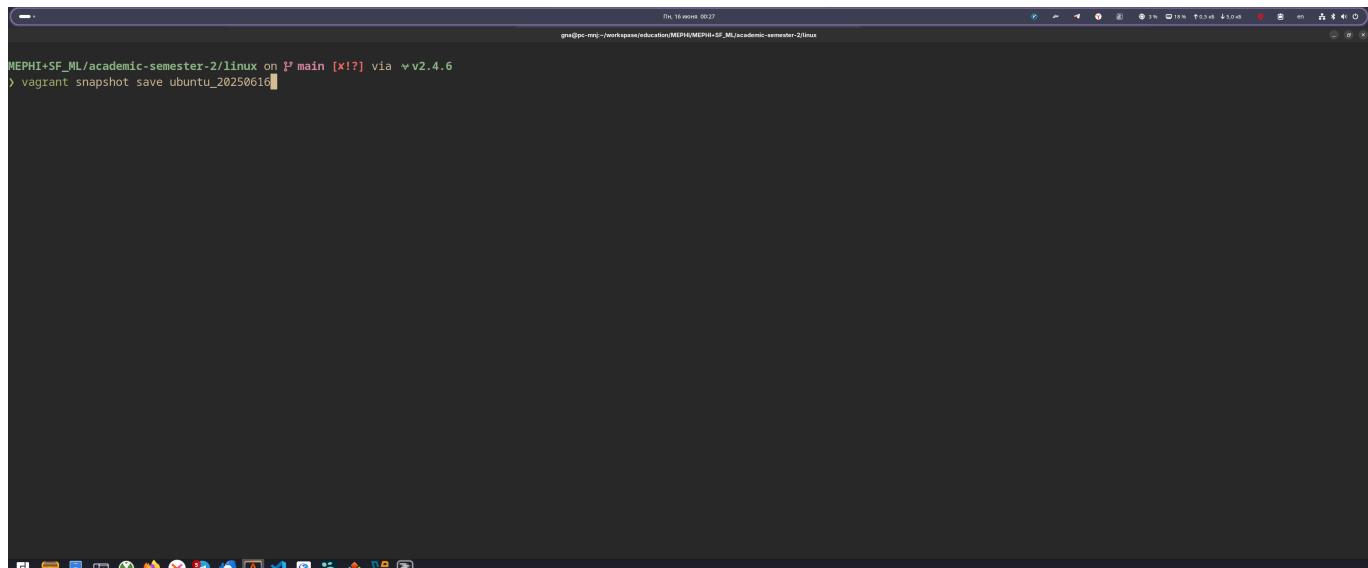
MEPHI+SF_ML/academic-semester-2/linux on 192.168.1.10 main [x!?] via v2.4.6 took 25s
>
```

Проверяем что машина создалась коректно с нужными параметрами

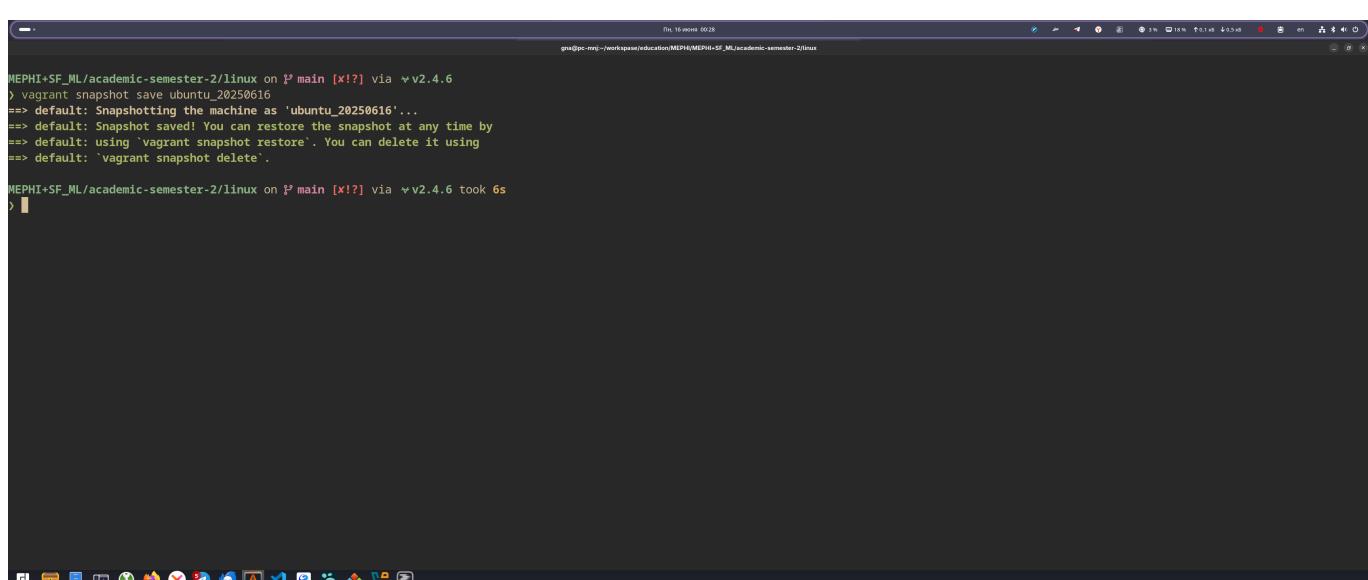


Видим новую виртуальную машину с 048 МБ ОЗУ и 2 VPCU и именем ubuntu.

Произведем создание снимка виртуальной машины

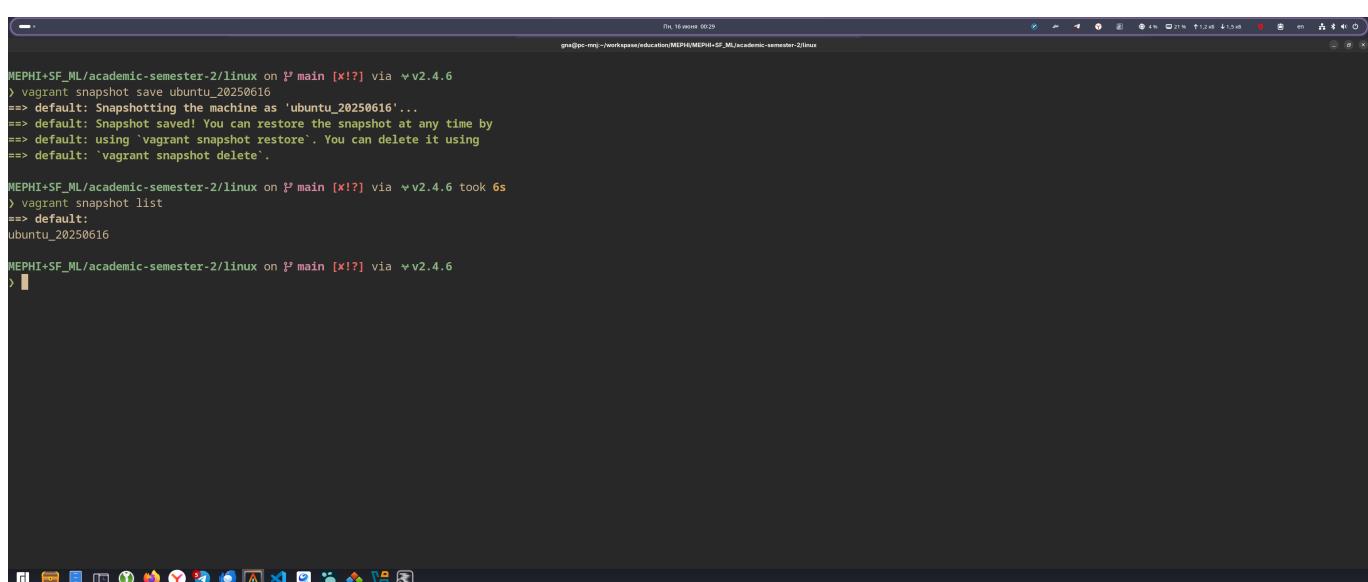


```
MEPHI+SF_ML/academic-semester-2/linux on 12 main [x!?] via v2.4.6
> vagrant snapshot save ubuntu_20250616
```



```
MEPHI+SF_ML/academic-semester-2/linux on 12 main [x!?] via v2.4.6
> vagrant snapshot save ubuntu_20250616
=> default: Snapshotting the machine as 'ubuntu_20250616'...
=> default: Snapshot saved! You can restore the snapshot at any time by
=> default: using `vagrant snapshot restore`. You can delete it using
=> default: `vagrant snapshot delete`.

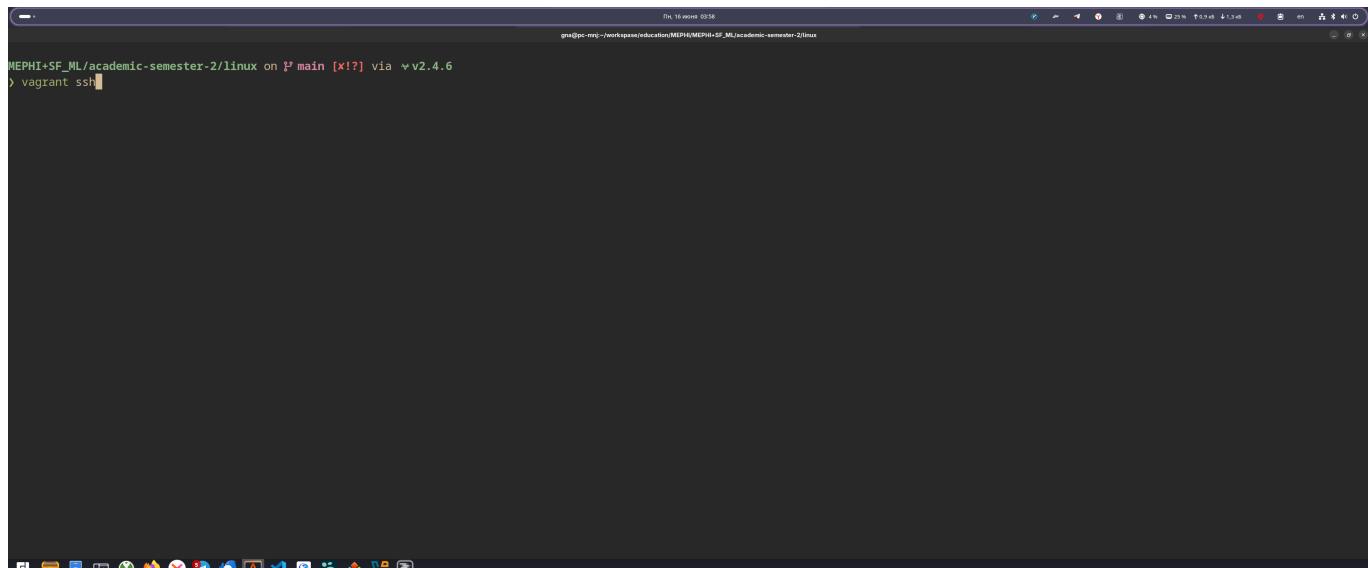
MEPHI+SF_ML/academic-semester-2/linux on 12 main [x!?] via v2.4.6 took 6s
>
```



```
MEPHI+SF_ML/academic-semester-2/linux on 12 main [x!?] via v2.4.6
> vagrant snapshot list
=> default: ubuntu_20250616

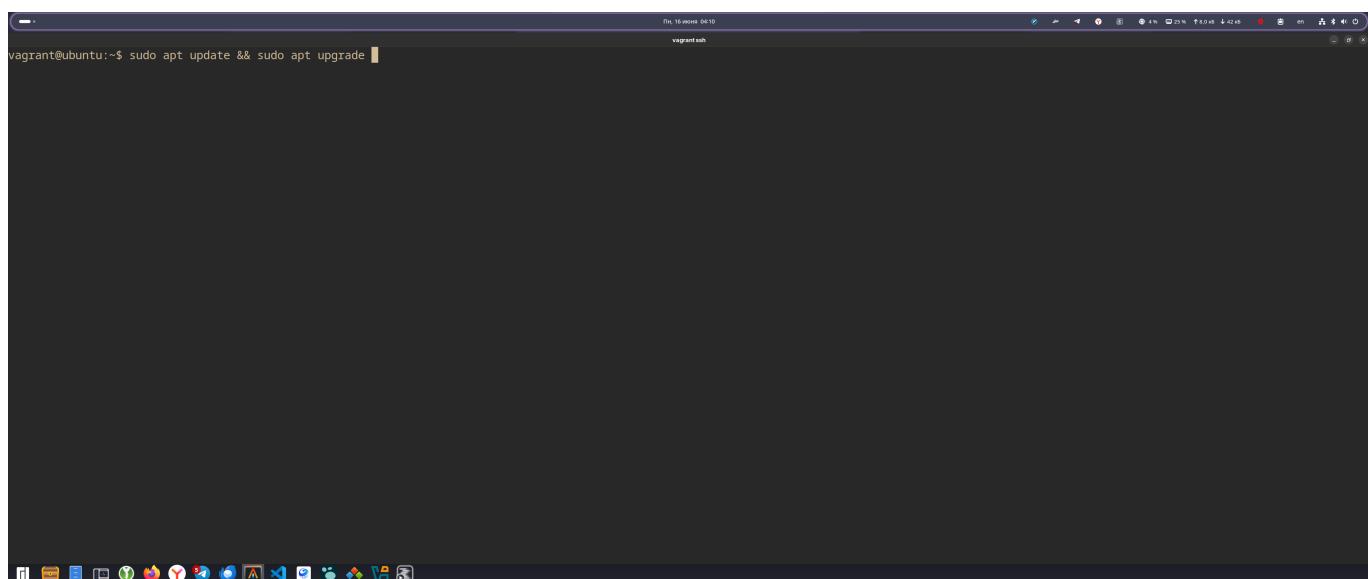
MEPHI+SF_ML/academic-semester-2/linux on 12 main [x!?] via v2.4.6
>
```

Подключимся к машине по ssh



```
File: 16.jun.vim 00:56  
MEPHI+SF_ML/academic-semester-2/linux on 12 main [x!?] via v2.4.6  
> vagrant ssh  
  
Welcome to Ubuntu 22.04.5 LTS (GNU/Linux 5.15.0-140-generic x86_64)  
  
 * Documentation: https://help.ubuntu.com  
 * Management: https://landscape.canonical.com  
 * Support: https://ubuntu.com/pro  
  
System information as of Mon Jun 16 00:58:56 UTC 2025  
  
 System load: 0.02  
 Usage of /: 5.5% of 38.70GB  
 Memory usage: 15%  
 Swap usage: 0%  
 Processes: 102  
 Users logged in: 0  
 IPv4 address for enp0s3: 10.0.2.15  
 IPv6 address for enp0s3: fd17:625c:f037:2:41:72ff:fed:616c  
  
Expanded Security Maintenance for Applications is not enabled.  
7 updates can be applied immediately.  
To see these additional updates run: apt list --upgradable  
  
Enable ESM Apps to receive additional future security updates.  
See https://ubuntu.com/esm or run: sudo pro status  
  
New release '24.04.2 LTS' available.  
Run 'do-release-upgrade' to upgrade to it.  
  
*** System restart required ***  
vagrant@ubuntu:~$
```

Обновим пакеты



Запустился процесс обновления

```

Preparing to unpack .../8-initramfs-tools-bin_0.140ubuntu13.5_amd64.deb ...
Unpacking initramfs-tools-bin (0.140ubuntu13.5) over (0.140ubuntu13.4) ...
Preparing to unpack .../9-cloud-init_25.1.2-0ubuntu0~22.04.2_all.deb ...
Unpacking cloud-init (25.1.2-0ubuntu0~22.04.2) over (24.4.1-0ubuntu0~22.04.2) ...
Setting up cloud-init (25.1.2-0ubuntu0~22.04.2) ...
Installing new version of config file /etc/cloud/templates/sources.list.debian.deb822.tmpl ...
Installing new version of config file /etc/cloud/templates/sources.list.ubuntu.deb822.tmpl ...
Setting up apt-utils (2.4.14) ...
Setting up python3-problem-report (2.20.11-0ubuntu82.8) ...
Setting up systemd (249.11-0ubuntu3.16) ...
Setting up python3-apport (2.20.11-0ubuntu82.8) ...
Setting up systemd-timesyncd (249.11-0ubuntu3.16) ...
Setting up udev (249.11-0ubuntu3.16) ...
Setting up python3-update-manager (1:22.04.22) ...
Setting up libpam-systemd:amd64 (249.11-0ubuntu3.16) ...
Setting up initramfs-tools-core (0.140ubuntu13.5) ...
Setting up initramfs-tools (0.140ubuntu13.5) ...
update-initramfs: deferring update (trigger activated)
Processing triggers for rsyslog (8.21.2.0-2ubuntu2.2) ...
Processing triggers for man-db (2.10.2-1) ...
Processing triggers for dbus (1.12.20-2ubuntu1) ...
Processing triggers for libc-bin (2.35-0ubuntu3.10) ...
Processing triggers for initramfs-tools (0.140ubuntu13.5) ...
update-initramfs: Generating /boot/initrd.img-5.15.0-141-generic
apport-autoreport.service is a disabled or a static unit, not starting it.
Setting up update-manager-core (1:22.04.22) ...
Setting up libpam-systemd:amd64 (249.11-0ubuntu3.16) ...
Setting up initramfs-tools-core (0.140ubuntu13.5) ...
Setting up initramfs-tools (0.140ubuntu13.5) ...
update-initramfs: deferring update (trigger activated)
Processing triggers for rsyslog (8.21.2.0-2ubuntu2.2) ...
Processing triggers for man-db (2.10.2-1) ...
Processing triggers for dbus (1.12.20-2ubuntu4.1) ...
Processing triggers for libc-bin (2.35-0ubuntu3.10) ...
Processing triggers for initramfs-tools (0.140ubuntu13.5) ...
update-initramfs: Generating /boot/initrd.img-5.15.0-141-generic
Scanning processes...
Scanning candidates...
Scanning linux images...

Progress: [ 99%] #####

```

Видим что все успешно обновилось

```

apport-autoreport.service is a disabled or a static unit, not starting it.
Setting up update-manager-core (1:22.04.22) ...
Setting up libpam-systemd:amd64 (249.11-0ubuntu3.16) ...
Setting up initramfs-tools-core (0.140ubuntu13.5) ...
Setting up initramfs-tools (0.140ubuntu13.5) ...
update-initramfs: deferring update (trigger activated)
Processing triggers for rsyslog (8.21.2.0-2ubuntu2.2) ...
Processing triggers for man-db (2.10.2-1) ...
Processing triggers for dbus (1.12.20-2ubuntu4.1) ...
Processing triggers for libc-bin (2.35-0ubuntu3.10) ...
Processing triggers for initramfs-tools (0.140ubuntu13.5) ...
update-initramfs: Generating /boot/initrd.img-5.15.0-141-generic
Scanning processes...
Scanning candidates...
Scanning linux images...

Restarting services...
systemctl restart cron.service irqbalance.service multipathd.service packagekit.service polkit.service serial-getty@ttyS0.service ssh.service
Service restarts being deferred:
/etc/needrestart/restart.d/dbus.service
systemctl restart getty@tty1.service
systemctl restart networkd-dispatcher.service
systemctl restart systemd-logind.service
systemctl restart unattended-upgrades.service
systemctl restart user@1000.service

No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
vagrant@ubuntu:~$ 

```

Выйдем с помощью команды `exit`

```

Setting up initramfs-tools (0.140ubuntu13.5) ...
update-initramfs: deferring update (trigger activated)
Processing triggers for rsyslog (8.21.2.0-2ubuntu2.2) ...
Processing triggers for man-db (2.10.2-1) ...
Processing triggers for dbus (1.12.20-2ubuntu4.1) ...
Processing triggers for libc-bin (2.35-0ubuntu3.10) ...
Processing triggers for initramfs-tools (0.140ubuntu13.5) ...
update-initramfs: Generating /boot/initrd.img-5.15.0-141-generic
Scanning processes...
Scanning candidates...
Scanning linux images...

Restarting services...
systemctl restart cron.service irqbalance.service multipathd.service packagekit.service polkit.service serial-getty@ttyS0.service ssh.service
Service restarts being deferred:
/etc/needrestart/restart.d/dbus.service
systemctl restart getty@tty1.service
systemctl restart networkd-dispatcher.service
systemctl restart systemd-logind.service
systemctl restart unattended-upgrades.service
systemctl restart user@1000.service

No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
vagrant@ubuntu:~$ exit
logout

```

Остановим виртуальную машину

```

Setting up initramfs-tools (0.140ubuntu13.5) ...
update-initramfs: deferring update (trigger activated)
Processing triggers for syslog (8.2112.0-2ubuntu2.2) ...
Processing triggers for man-db (2.10.2-1) ...
Processing triggers for dbus (1.12.20-2ubuntu4.1) ...
Processing triggers for libc-bin (2.35-0ubuntu3.10) ...
Processing triggers for initramfs-tools (0.140ubuntu13.5) ...
update-initramfs: Generating /boot/initrd.img-5.15.0-141-generic
Scanning processes...
Scanning candidates...
Scanning linux images...

Restarting services...
systemctl restart cron.service irqbalance.service multipathd.service packagekit.service polkit.service serial-getty@ttyS0.service ssh.service
Service restarts being deferred:
/etc/needrestart/restart.d/dbus.service
systemctl restart getty@tty1.service
systemctl restart networkd-dispatcher.service
systemctl restart systemd-logind.service
systemctl restart unattended-upgrades.service
systemctl restart user@1000.service

No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.

vagrant@ubuntu:~$ exit
logout

MEPHI+SF_ML/academic-semester-2/linux on   main [x!?] via   v2.4.6 took 5m10s
  vagrant halt

```

```

Processing triggers for dbus (1.12.20-2ubuntu4.1) ...
Processing triggers for libc-bin (2.35-0ubuntu3.10) ...
Processing triggers for initramfs-tools (0.140ubuntu13.5) ...
update-initramfs: Generating /boot/initrd.img-5.15.0-141-generic
Scanning processes...
Scanning candidates...
Scanning linux images...

Restarting services...
systemctl restart cron.service irqbalance.service multipathd.service packagekit.service polkit.service serial-getty@ttyS0.service ssh.service
Service restarts being deferred:
/etc/needrestart/restart.d/dbus.service
systemctl restart getty@tty1.service
systemctl restart networkd-dispatcher.service
systemctl restart systemd-logind.service
systemctl restart unattended-upgrades.service
systemctl restart user@1000.service

No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.

vagrant@ubuntu:~$ exit
logout

MEPHI+SF_ML/academic-semester-2/linux on   main [x!?] via   v2.4.6 took 5m10s
  vagrant halt
=> default: Attempting graceful shutdown of VM...

```

Процесс упаковки виртуальной машины в образ с именем "ubuntu2204.box"

```

MEPHI+SF_ML/academic-semester-2/linux on   main [x!?] via   v2.4.6
  vagrant package --output ubuntu2204.box

```

```
MEPHI+SF_ML/academic-semester-2/linux on 1 main [x!?] via v2.4.6
> vagrant package --output ubuntu2204.box
==> default: Exporting VM...
==> default: Compressing package to: /home/gna/workspace/education/MEPHI/MEPHI+SF_ML/academic-semester-2/linux/ubuntu2204.box
MEPHI+SF_ML/academic-semester-2/linux on 1 main [x!?] via v2.4.6 took 1m27s
>
```

Проверим что наш образ есть в списке доступных образов

```
MEPHI+SF_ML/academic-semester-2/linux on 1 main [x!?] via v2.4.6
> vagrant package --output ubuntu2204.box
==> default: Exporting VM...
==> default: Compressing package to: /home/gna/workspace/education/MEPHI/MEPHI+SF_ML/academic-semester-2/linux/ubuntu2204.box

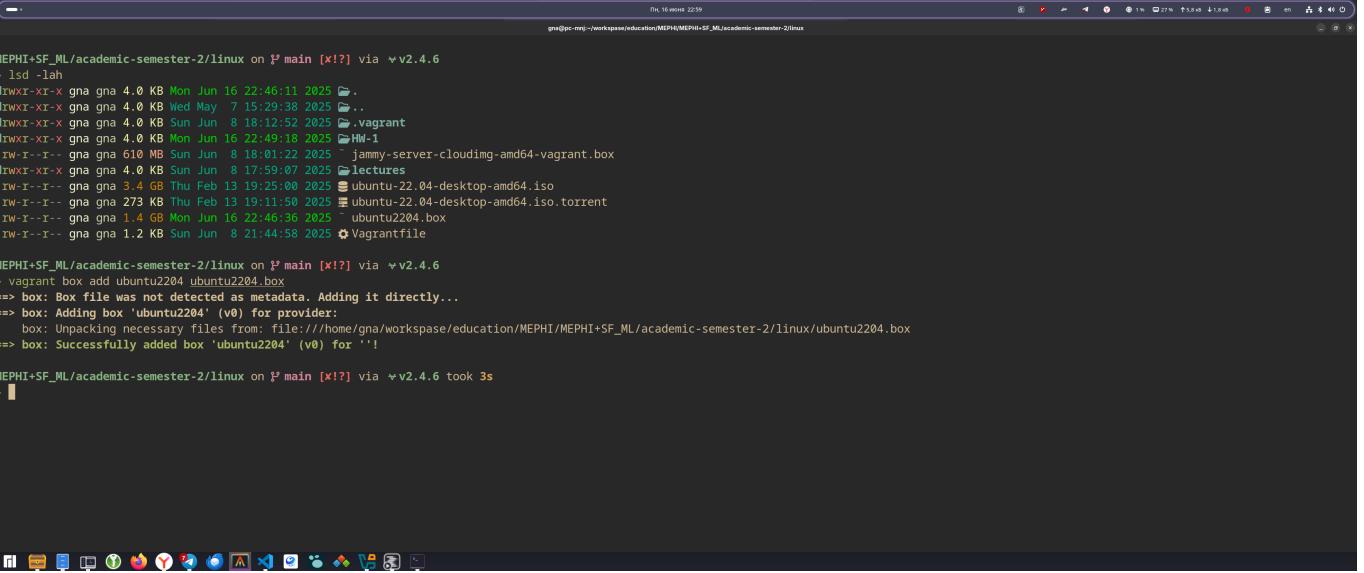
MEPHI+SF_ML/academic-semester-2/linux on 1 main [x!?] via v2.4.6 took 1m27s
> vagrant box list
jammy-server-cloudimg-amd64-vagrant.box (virtualbox, 0)

MEPHI+SF_ML/academic-semester-2/linux on 1 main [x!?] via v2.4.6
>
```

Он есть, перейдем к следующему шагу, загрузим образ в локальный репозиторий

```
MEPHI+SF_ML/academic-semester-2/linux on 1 main [x!?] via v2.4.6
> lsd -lah
drwxr-xr-x gna gna 4.0 KB Mon Jun 16 22:46:11 2025 .
drwxr-xr-x gna gna 4.0 KB Wed May 7 15:29:38 2025 ..
drwxr-xr-x gna gna 4.0 KB Sun Jun 8 18:12:52 2025 .vagrant
drwxr-xr-x gna gna 4.0 KB Mon Jun 16 22:49:18 2025 .Hwi-1
.rw-r--r-- gna gna 610 MB Sun Jun 8 18:01:22 2025 jammy-server-cloudimg-amd64-vagrant.box
drwxr-xr-x gna gna 4.0 KB Sun Jun 8 17:59:07 2025 .lectures
.rw-r--r-- gna gna 3.4 GB Thu Feb 13 19:25:00 2025 ubuntu-22.04-desktop-amd64.iso
.rw-r--r-- gna gna 273 KB Thu Feb 13 19:11:50 2025 ubuntu-22.04-desktop-amd64.iso.torrent
.rw-r--r-- gna gna 1.4 GB Mon Jun 16 22:46:36 2025 ubuntu2204.box
.rw-r--r-- gna gna 1.2 KB Sun Jun 8 21:44:58 2025 Vagrantfile

MEPHI+SF_ML/academic-semester-2/linux on 1 main [x!?] via v2.4.6
> vagrant box add ubuntu2204 ubuntu2204.box
```



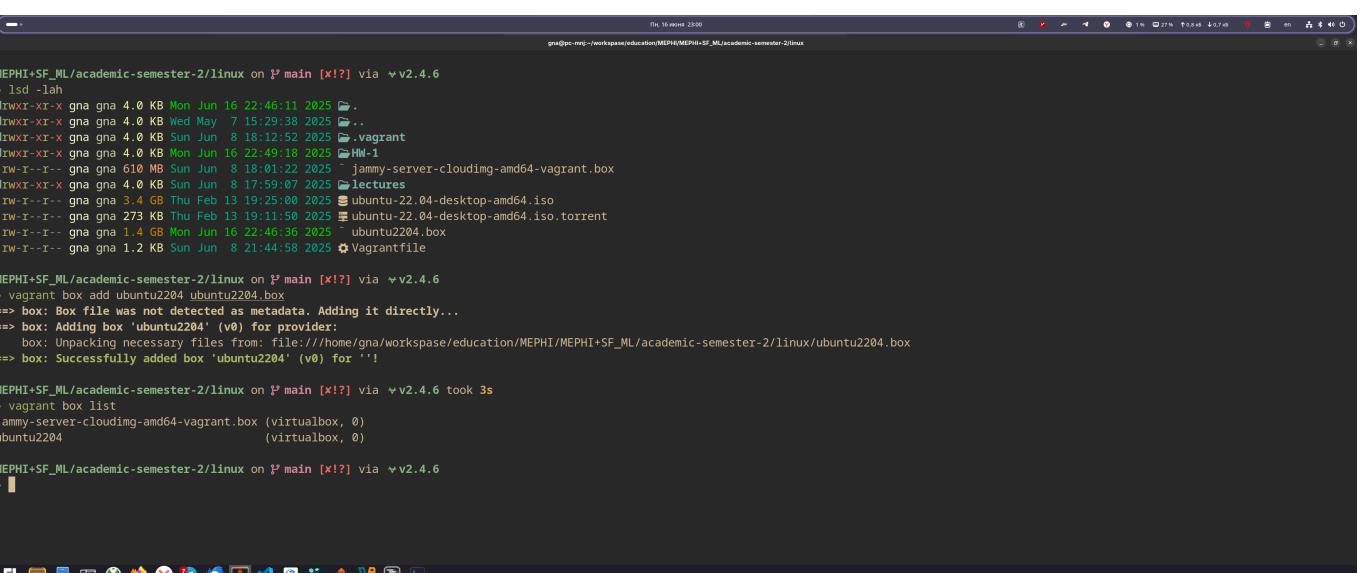
```

MEPHI+SF_ML/academic-semester-2/linux on 12 main [x!?] via v2.4.6
> lsd -lah
drwxr-xr-x gna gna 4.0 KB Mon Jun 16 22:46:11 2025 .
drwxr-xr-x gna gna 4.0 KB Wed May 7 15:29:38 2025 ..
drwxr-xr-x gna gna 4.0 KB Sun Jun 8 18:12:52 2025 .vagrant
drwxr-xr-x gna gna 4.0 KB Mon Jun 16 22:49:18 2025 .Hd-1
.rw-r--r-- gna gna 610 MB Sun Jun 8 18:01:22 2025 jammy-server-cloudimg-amd64-vagrant.box
drwxr-xr-x gna gna 4.0 KB Sun Jun 8 17:59:07 2025 .lectures
.rw-r--r-- gna gna 3.4 GB Thu Feb 13 19:25:00 2025 ubuntu-22.04-desktop-amd64.iso
.rw-r--r-- gna gna 273 KB Thu Feb 13 19:11:50 2025 ubuntu-22.04-desktop-amd64.iso.torrent
.rw-r--r-- gna gna 1.4 GB Mon Jun 16 22:46:36 2025 ubuntu2204.box
.rw-r--r-- gna gna 1.2 KB Sun Jun 8 21:44:58 2025 Vagrantfile

MEPHI+SF_ML/academic-semester-2/linux on 12 main [x!?] via v2.4.6
> vagrant box add ubuntu2204 ubuntu2204.box
=> box: Box file was not detected as metadata. Adding it directly...
=> box: Adding box 'ubuntu2204' (v0) for provider:
  box: Unpacking necessary files from: file:///home/gna/workspace/education/MEPHI/MEPHI+SF_ML/academic-semester-2/linux/ubuntu2204.box
=> box: Successfully added box 'ubuntu2204' (v0) for ''

MEPHI+SF_ML/academic-semester-2/linux on 12 main [x!?] via v2.4.6 took 3s
>

```

```

MEPHI+SF_ML/academic-semester-2/linux on 12 main [x!?] via v2.4.6
> lsd -lah
drwxr-xr-x gna gna 4.0 KB Mon Jun 16 22:46:11 2025 .
drwxr-xr-x gna gna 4.0 KB Wed May 7 15:29:38 2025 ..
drwxr-xr-x gna gna 4.0 KB Sun Jun 8 18:12:52 2025 .vagrant
drwxr-xr-x gna gna 4.0 KB Mon Jun 16 22:49:18 2025 .Hd-1
.rw-r--r-- gna gna 610 MB Sun Jun 8 18:01:22 2025 jammy-server-cloudimg-amd64-vagrant.box
drwxr-xr-x gna gna 4.0 KB Sun Jun 8 17:59:07 2025 .lectures
.rw-r--r-- gna gna 3.4 GB Thu Feb 13 19:25:00 2025 ubuntu-22.04-desktop-amd64.iso
.rw-r--r-- gna gna 273 KB Thu Feb 13 19:11:50 2025 ubuntu-22.04-desktop-amd64.iso.torrent
.rw-r--r-- gna gna 1.4 GB Mon Jun 16 22:46:36 2025 ubuntu2204.box
.rw-r--r-- gna gna 1.2 KB Sun Jun 8 21:44:58 2025 Vagrantfile

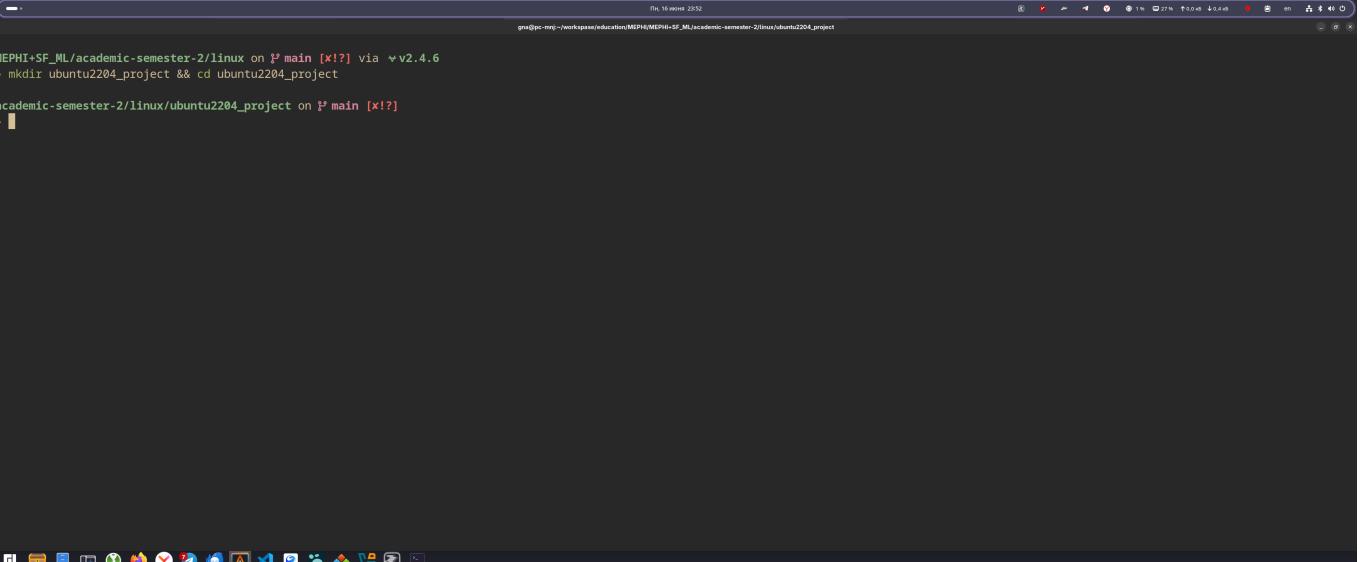
MEPHI+SF_ML/academic-semester-2/linux on 12 main [x!?] via v2.4.6
> vagrant box add ubuntu2204 ubuntu2204.box
=> box: Box file was not detected as metadata. Adding it directly...
=> box: Adding box 'ubuntu2204' (v0) for provider:
  box: Unpacking necessary files from: file:///home/gna/workspace/education/MEPHI/MEPHI+SF_ML/academic-semester-2/linux/ubuntu2204.box
=> box: Successfully added box 'ubuntu2204' (v0) for ''

MEPHI+SF_ML/academic-semester-2/linux on 12 main [x!?] via v2.4.6 took 3s
> vagrant box list
jammy-server-cloudimg-amd64-vagrant.box (virtualbox, 0)
ubuntu2204 (virtualbox, 0)

MEPHI+SF_ML/academic-semester-2/linux on 12 main [x!?] via v2.4.6
>

```

Инициализация и запуск новой машины, для этого создадим новую папку



```

MEPHI+SF_ML/academic-semester-2/linux on 12 main [x!?] via v2.4.6
> mkdir ubuntu2204_project && cd ubuntu2204_project
academic-semester-2/linux/ubuntu2204_project on 12 main [x!?]
>

```

Инициализируем Vagrantfile в новой папке с помощью команды `vagrant init ubuntu2204`

```

MEPHI+SF_ML/academic-semester-2/linux on 12 main [x!?] via v2.4.6
> mkdir ubuntu2204_project && cd ubuntu2204_project
academic-semester-2/linux/ubuntu2204_project on 12 main [x!?] via v2.4.6
> vagrant init ubuntu2204
A 'Vagrantfile' has been placed in this directory. You are now
ready to `vagrant up` your first virtual environment! Please read
the comments in the Vagrantfile as well as documentation on
`vagrantup.com` for more information on using Vagrant.

academic-semester-2/linux/ubuntu2204_project on 12 main [x!?] via v2.4.6
>

```

Запустим машину

```

MEPHI+SF_ML/academic-semester-2/linux on 12 main [x!?] via v2.4.6
> mkdir ubuntu2204_project && cd ubuntu2204_project
academic-semester-2/linux/ubuntu2204_project on 12 main [x!?]
> vagrant init ubuntu2204
A 'Vagrantfile' has been placed in this directory. You are now
ready to `vagrant up` your first virtual environment! Please read
the comments in the Vagrantfile as well as documentation on
`vagrantup.com` for more information on using Vagrant.

academic-semester-2/linux/ubuntu2204_project on 12 main [x!?] via v2.4.6
> vagrant up

```

```

academic-semester-2/linux/ubuntu2204_project on 12 main [x!?] via v2.4.6
> vagrant up
Bringing machine 'default' up with 'virtualbox' provider...
==> default: Importing base box 'ubuntu2204'...
==> default: Matching MAC address for NAT networking...
==> default: Setting the name of the VM: ubuntu2204_project_default_1750107304201_45577
==> default: Clearing any previously set network interfaces...
==> default: Preparing network interfaces based on configuration...
    default: Adapter 1: nat
==> default: Forwarding ports...
    default: 22 (guest) => 2222 (host) (adapter 1)
==> default: Booting VM...
==> default: Waiting for machine to boot. This may take a few minutes...
    default: SSH address: 127.0.0.1:2222
    default: SSH username: vagrant
    default: SSH auth method: private key
==> default: Machine booted and ready!
==> default: Checking for guest additions in VM...
    default: The guest additions on this VM do not match the installed version of
    default: VirtualBox! In most cases this is fine, but in rare cases it can
    default: prevent things such as shared folders from working properly. If you see
    default: shared folder errors, please make sure the guest additions within the
    default: virtual machine match the version of VirtualBox you have installed on
    default: your host and reload your VM.
    default:
    default: Guest Additions Version: 6.0.0 r127566
    default: VirtualBox Version: 7.1
==> default: Mounting shared folders...
    default: /home/gna/workspace/education/MEPHI/MEPHI+SF_ML/academic-semester-2/linux/ubuntu2204_project => /vagrant

academic-semester-2/linux/ubuntu2204_project on 12 main [x!?] via v2.4.6 took 27s
>

```

Создание снимка

```

    gna@pc-mj:~/workspace/education/MEPHI/MEPHI+SF_ML/academic-semester-2/linux/ubuntu2204_project
    ==> default: Forwarding ports...
    default: 22 (guest) => 2222 (host) (adapter 1)
    ==> default: Booting VM...
    ==> default: Waiting for machine to boot. This may take a few minutes...
    default: SSH address: 127.0.0.1:2222
    default: SSH username: vagrant
    default: SSH auth method: private key
    ==> default: Machine booted and ready!
    ==> default: Checking for guest additions in VM...
    default: The guest additions on this VM do not match the installed version of
    default: VirtualBox! In most cases this is fine, but in rare cases it can
    default: prevent things such as shared folders from working properly. If you see
    default: shared folder errors, please make sure the guest additions within the
    default: virtual machine match the version of VirtualBox you have installed on
    default: your host and reload your VM.
    default:
    default: Guest Additions Version: 6.0.0 r127566
    default: VirtualBox Version: 7.1
    ==> default: Mounting shared folders...
    default: /home/gna/workspace/education/MEPHI/MEPHI+SF_ML/academic-semester-2/linux/ubuntu2204_project => /vagrant

  academic-semester-2/linux/ubuntu2204_project on [+] main [x!?] via v2.4.6 took 27s
  > vagrant snapshot save default

    ==> default: Snapshotting the machine as 'default'...
    ==> default: Snapshot saved! You can restore the snapshot at any time by
    ==> default: using 'vagrant snapshot restore'. You can delete it using
    ==> default: 'vagrant snapshot delete'.

  academic-semester-2/linux/ubuntu2204_project on [+] main [x!?] via v2.4.6 took 4s
  >

```

Внесем изменения в ВМ

```

    gna@pc-mj:~/workspace/education/MEPHI/MEPHI+SF_ML/academic-semester-2/linux/ubuntu2204_project
    ==> default: Forwarding ports...
    default: 22 (guest) => 2222 (host) (adapter 1)
    ==> default: Booting VM...
    ==> default: Waiting for machine to boot. This may take a few minutes...
    default: SSH address: 127.0.0.1:2222
    default: SSH username: vagrant
    default: SSH auth method: private key
    ==> default: Machine booted and ready!
    ==> default: Checking for guest additions in VM...
    default: The guest additions on this VM do not match the installed version of
    default: VirtualBox! In most cases this is fine, but in rare cases it can
    default: prevent things such as shared folders from working properly. If you see
    default: shared folder errors, please make sure the guest additions within the
    default: virtual machine match the version of VirtualBox you have installed on
    default: your host and reload your VM.
    default:
    default: Guest Additions Version: 6.0.0 r127566
    default: VirtualBox Version: 7.1
    ==> default: Mounting shared folders...
    default: /home/gna/workspace/education/MEPHI/MEPHI+SF_ML/academic-semester-2/linux/ubuntu2204_project => /vagrant

  academic-semester-2/linux/ubuntu2204_project on [+] main [x!?] via v2.4.6 took 27s
  > vagrant snapshot save default

    ==> default: Snapshotting the machine as 'default'...
    ==> default: Snapshot saved! You can restore the snapshot at any time by
    ==> default: using 'vagrant snapshot restore'. You can delete it using
    ==> default: 'vagrant snapshot delete'.

  academic-semester-2/linux/ubuntu2204_project on [+] main [x!?] via v2.4.6 took 4s
  > vagrant ssh

```

```

    vagrant ssh
    System information as of Mon Jun 16 20:58:06 UTC 2025
    System load:          0.0
    Usage of /:           5.4% of 38.70GB
    Memory usage:         10%
    Swap usage:          0%
    Processes:            107
    Users logged in:     0
    IPv4 address for emp0s3: 10.0.2.15
    IPv6 address for emp0s3: fd17:625c:f037:2:41:72ff:fedf:616c
    * Strictly confined Kubernetes makes edge and IoT secure. Learn how MicroK8s
      just raised the bar for easy, resilient and secure K8s cluster deployment.
      https://ubuntu.com/engage/secure-kubernetes-at-the-edge
    Expanded Security Maintenance for Applications is not enabled.
    1 update can be applied immediately.
    1 of these updates is a standard security update.
    To see these additional updates run: apt list --upgradable
    Enable ESM Apps to receive additional future security updates.
    See https://ubuntu.com/esm or run: sudo pro status
    New release '24.04.2 LTS' available.
    Run 'do-release-upgrade' to upgrade to it.

    Last login: Mon Jun 16 01:08:32 2025 from 10.0.2.2
    vagrant@ubuntu:~$ 

```

```

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

New release '24.04.2 LTS' available.
Run 'do-release-upgrade' to upgrade to it.

Last login: Mon Jun 16 01:08:32 2025 from 10.0.2.2
vagrant@ubuntu:~$ ls -lah
total 32K
drwxr-x--- 4 vagrant vagrant 4.0K Jun 16 01:04 .
drwxr-xr-x 4 root root 4.0K Jun 8 18:47 ..
-rw----- 1 vagrant vagrant 106 Jun 16 01:13 .bash_history
-rw-r--r-- 1 vagrant vagrant 220 May 23 11:06 .bash_logout
-rw-r--r-- 1 vagrant vagrant 3.7K May 23 11:06 .bashrc
drwx----- 2 vagrant vagrant 4.0K Jun 8 18:47 .cache
-rw-r--r-- 1 vagrant vagrant 807 May 23 11:06 .profile
drwx----- 2 vagrant vagrant 4.0K Jun 8 18:47 .ssh
vagrant@ubuntu:~$ touch test_file.txt
vagrant@ubuntu:~$ ls -lah
total 32K
drwxr-x--- 4 vagrant vagrant 4.0K Jun 16 21:00 .
drwxr-xr-x 4 root root 4.0K Jun 8 18:47 ..
-rw----- 1 vagrant vagrant 106 Jun 16 01:13 .bash_history
-rw-r--r-- 1 vagrant vagrant 220 May 23 11:06 .bash_logout
-rw-r--r-- 1 vagrant vagrant 3.7K May 23 11:06 .bashrc
drwx----- 2 vagrant vagrant 4.0K Jun 8 18:47 .cache
-rw-r--r-- 1 vagrant vagrant 807 May 23 11:06 .profile
drwx----- 2 vagrant vagrant 4.0K Jun 8 18:47 .ssh
-rw-rw-r-- 1 vagrant vagrant 0 Jun 16 21:00 test_file.txt
vagrant@ubuntu:~$ 

```

Добавили файл test_file.txt

Теперь восстановим машину из снепшота и проверим, что нет ранее созданного файла

```

Last login: Mon Jun 16 01:08:32 2025 from 10.0.2.2
vagrant@ubuntu:~$ ls -lah
total 32K
drwxr-x--- 4 vagrant vagrant 4.0K Jun 16 01:04 .
drwxr-xr-x 4 root root 4.0K Jun 8 18:47 ..
-rw----- 1 vagrant vagrant 106 Jun 16 01:13 .bash_history
-rw-r--r-- 1 vagrant vagrant 220 May 23 11:06 .bash_logout
-rw-r--r-- 1 vagrant vagrant 3.7K May 23 11:06 .bashrc
drwx----- 2 vagrant vagrant 4.0K Jun 8 18:47 .cache
-rw-r--r-- 1 vagrant vagrant 807 May 23 11:06 .profile
drwx----- 2 vagrant vagrant 4.0K Jun 8 18:47 .ssh
vagrant@ubuntu:~$ touch test_file.txt
vagrant@ubuntu:~$ ls -lah
total 32K
drwxr-x--- 4 vagrant vagrant 4.0K Jun 16 21:00 .
drwxr-xr-x 4 root root 4.0K Jun 8 18:47 ..
-rw----- 1 vagrant vagrant 106 Jun 16 01:13 .bash_history
-rw-r--r-- 1 vagrant vagrant 220 May 23 11:06 .bash_logout
-rw-r--r-- 1 vagrant vagrant 3.7K May 23 11:06 .bashrc
drwx----- 2 vagrant vagrant 4.0K Jun 8 18:47 .cache
-rw-r--r-- 1 vagrant vagrant 807 May 23 11:06 .profile
drwx----- 2 vagrant vagrant 4.0K Jun 8 18:47 .ssh
-rw-rw-r-- 1 vagrant vagrant 0 Jun 16 21:00 test_file.txt
vagrant@ubuntu:~$ exit
logout

academic-semester-2/linux/ubuntu2204_project on ✘ main [x!?] via ↵ v2.4.6 took 3m56s
> 

```

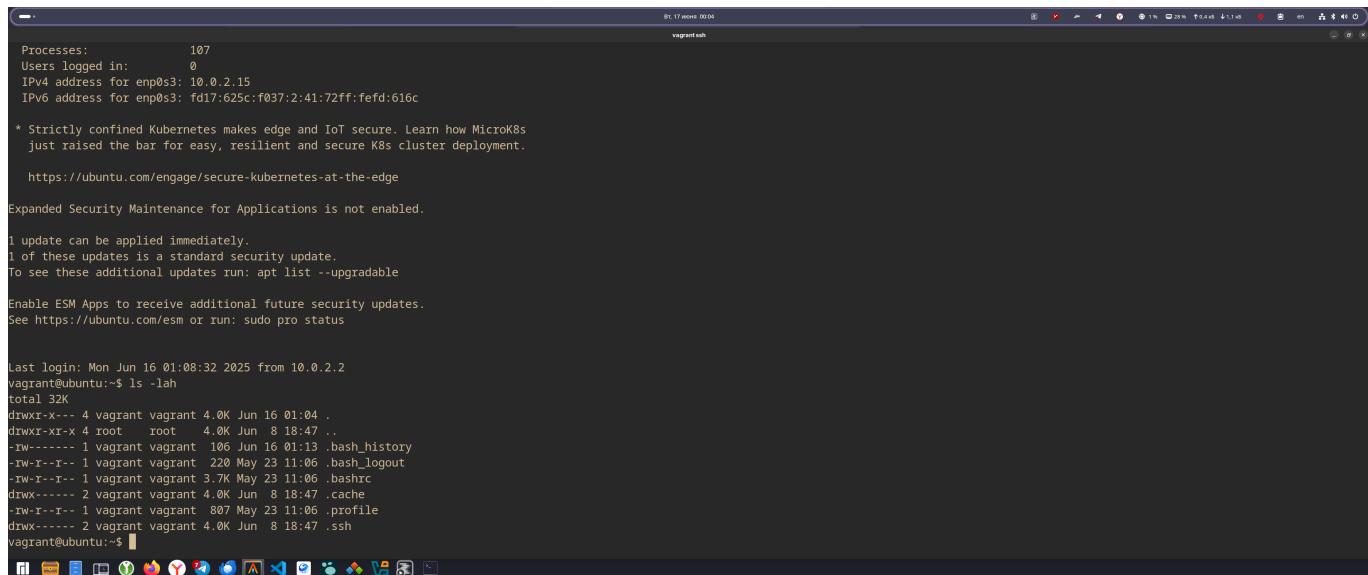
```

drwx----- 2 vagrant vagrant 4.0K Jun 8 18:47 .ssh
vagrant@ubuntu:~$ touch test_file.txt
vagrant@ubuntu:~$ ls -lah
total 32K
drwxr-x--- 4 vagrant vagrant 4.0K Jun 16 21:00 .
drwxr-xr-x 4 root root 4.0K Jun 8 18:47 ..
-rw----- 1 vagrant vagrant 106 Jun 16 01:13 .bash_history
-rw-r--r-- 1 vagrant vagrant 220 May 23 11:06 .bash_logout
-rw-r--r-- 1 vagrant vagrant 3.7K May 23 11:06 .bashrc
drwx----- 2 vagrant vagrant 4.0K Jun 8 18:47 .cache
-rw-r--r-- 1 vagrant vagrant 807 May 23 11:06 .profile
drwx----- 2 vagrant vagrant 4.0K Jun 8 18:47 .ssh
-rw-rw-r-- 1 vagrant vagrant 0 Jun 16 21:00 test_file.txt
vagrant@ubuntu:~$ exit
logout

academic-semester-2/linux/ubuntu2204_project on ✘ main [x!?] via ↵ v2.4.6 took 3m56s
> vagrant snapshot restore default
=> default: Forcing shutdown of VM...
=> default: Restoring the snapshot 'default'...
=> default: Resuming suspended VM...
=> default: Booting VM...
=> default: Waiting for machine to boot. This may take a few minutes...
  default: SSH address: 127.0.0.1:2222
  default: SSH username: vagrant
  default: SSH auth method: private key
=> default: Machine booted and ready!
=> default: Machine already provisioned. Run 'vagrant provision' or use the '--provision'
=> default: flag to force provisioning. Provisioners marked to run always will still run.

academic-semester-2/linux/ubuntu2204_project on ✘ main [x!?] via ↵ v2.4.6 took 19s
> 

```



Processes: 107
Users logged in: 0
IPv4 address for enp0s3: 10.0.2.15
IPv6 address for enp0s3: fd17:625c:f037:2:41:72ff:fe:fd:616c

* Strictly confined Kubernetes makes edge and IoT secure. Learn how MicroK8s just raised the bar for easy, resilient and secure K8s cluster deployment.
<https://ubuntu.com/engage/secure-kubernetes-at-the-edge>

Expanded Security Maintenance for Applications is not enabled.
1 update can be applied immediately.
1 of these updates is a standard security update.
To see these additional updates run: apt list --upgradable

Enable ESM Apps to receive additional future security updates.
See <https://ubuntu.com/esm> or run: sudo pro status

Last login: Mon Jun 16 01:08:32 2025 from 10.0.2.2
vagrant@ubuntu:~\$ ls -lah
total 32K
drwxr-x--- 4 vagrant vagrant 4.0K Jun 16 01:04 .
drwxr-xr-x 4 root root 4.0K Jun 8 18:47 ..
-rw----- 1 vagrant vagrant 106 Jun 16 01:13 .bash_history
-rw-r--r-- 1 vagrant vagrant 220 May 23 11:06 .bash_logout
-rw-r--r-- 1 vagrant vagrant 3.7K May 23 11:06 .bashrc
drwx----- 2 vagrant vagrant 4.0K Jun 8 18:47 .cache
-rw-r--r-- 1 vagrant vagrant 807 May 23 11:06 .profile
drwx----- 2 vagrant vagrant 4.0K Jun 8 18:47 .ssh
vagrant@ubuntu:~\$