

Лабораторная работа №1

Подготовка лабораторного стенда

Демидова Екатерина Алексеевна

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1 Цель работы

Целью данной работы является приобретение практических навыков установки Rocky Linux на виртуальную машину с помощью инструмента Vagrant.

2 Задание

1. Сформируйте box-файл с дистрибутивом Rocky Linux для VirtualBox
2. Запустите виртуальные машины сервера и клиента и убедитесь в их работоспособности.
3. Внесите изменения в настройки загрузки образов виртуальных машин server и client, добавив пользователя с правами администратора и изменив названия хостов
4. Скопируйте необходимые для работы с Vagrant файлы и box-файлы виртуальных машин на внешний носитель. Используя эти файлы, вы можете попробовать развернуть виртуальные машины на другом компьютере.

3 Выполнение лабораторной работы

Перед началом работы с Vagrant создадим каталог в /var/tmp с помощью команд:

```
mkdir -p /var/tmp/user_name/packer
```

```
mkdir -p /var/tmp/user_name/vagran
```

В созданном рабочем каталоге разместим образ варианта операционной системы Rocky Linux и в этом же каталоге разместим подготовленные заранее для работы с Vagrant файлы: vagrant-rocky.pkr.hc, ks.cfg, Vagrantfile, Makefile.

В этом же каталоге создадим каталог provision с подкаталогами default, server и client, в которых будут размещаться скрипты, изменяющие настройки внутреннего окружения базового (общего) образа виртуальной машины, сервера или клиента соответственно. В каталогах default, server и client разместим заранее подготовленный скриптзаглушку 01-dummy.sh следующего содержания:

```
#!/bin/bash
```

```
echo "Provisioning script $0"
```

В каталоге default разместим заранее подготовленный скрипт 01-user.sh по изменению названия виртуальной машины следующего содержания(рис. 3.1):

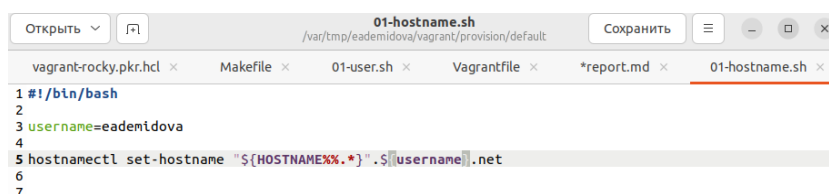


Рис. 3.1: Скрипт 01-user.sh

В каталоге default разместим заранее подготовленный скрипт 01-hostname.sh по изменению названия виртуальной машины следующего содержания(рис. 3.2):



```
1 #!/bin/bash
2
3 echo "Provisioning script $0"
4
5 username=eademidova
6 userpassword=123456
7
8 encpassword=`openssl passwd -1 ${userpassword}`
9
10 id -u $username
11 if [[ $? ]]
12 then
13     adduser -G wheel -p ${encpassword} ${username}
14     homedir=`getent passwd ${username} | cut -d: -f6`
15     echo "export PS1='\u@\H \W]\\$ '" >> ${homedir}/.bashrc
16 fi
17
```

Рис. 3.2: Скрипт 01-hostname.sh

Перейдем в каталог с проектом:

```
cd /var/tmp/user_name/packer
```

В терминале наберем

```
make help
```

Посмотрим перечень указанных в Makefile целей и краткое описание их действий.

Для формирования box-файла с дистрибутивом Rocky Linux для VirtualBox в терминале наберем make(рис. 3.3):

```
edemidova@edemidova-ThinkBook-14s-Yoga-ITL: /var/tmp/edemidova/packer$ make
Inspect      see components of a template
Validate     check that a template is valid
Version      Prints the Packer version

make: *** [makefile:17: lint] Ошибка 127

edemidova@edemidova-ThinkBook-14s-Yoga-ITL: /var/tmp/edemidova/packer$ make
Installed plugin github.com/hashicorp/vagrant v1.1.1 in "/var/tmp/edemidova/packer/.config/packer/plugins/github.com/hashicorp/vagrant/packer-plugin-vagrant_v1.1.1_x86_64_linux_amd64"
Warning: Bundled Plugins used

This template relies on the use of plugins bundled into the Packer binary.
The practice of bundling external plugins into Packer will be removed in an
upcoming version.

To remove this warning, add the following section to your template:

packer {
  required_plugins {
    vagrant = [
      source = "github.com/hashicorp/vagrant"
      version = "~> 1"
    ]
  }
}

Then run "packer init" to manage installation of the plugins

virtualbox-iso:virtualbox: output will be in this color:
== virtualbox-iso.virtualbox: Retrieving Guest additions
== virtualbox-iso.virtualbox: Trying /usr/share/virtualbox/WindowsAdditions.iso
== virtualbox-iso.virtualbox: Trying /usr/share/virtualbox/WindowsAdditions.iso
== virtualbox-iso.virtualbox: Trying /usr/share/virtualbox/WindowsAdditions.iso
== virtualbox-iso.virtualbox: Retrieving ISO
== virtualbox-iso.virtualbox: Trying rocky-9.2-x86_64-miscel.iso
== virtualbox-iso.virtualbox: Trying rocky-9.2-x86_64-miscel.iso
== virtualbox-iso.virtualbox: Starting HTTP server on port 8112
== virtualbox-iso.virtualbox: Creating virtual machine...
== virtualbox-iso.virtualbox: Creating hard drive build/packer-rocky-virtualbox-ovf.vdi with size 40960 MB...
== virtualbox-iso.virtualbox: Mounting ISO
== virtualbox-iso.virtualbox: Creating Forwarded port mapping for communicator (SSH, WinRM, etc) (host port 3000)
== virtualbox-iso.virtualbox: Executing custom VMChange Commands...
== virtualbox-iso.virtualbox: Executing: maltpm packer-rocky-virtualbox-ovf --memory 2048
== virtualbox-iso.virtualbox: Executing: maltpm packer-rocky-virtualbox-ovf --cpus 1
== virtualbox-iso.virtualbox: Executing: maltpm packer-rocky-virtualbox-ovf --nat-lsashosts=chubel on
== virtualbox-iso.virtualbox: Starting the virtual machine...
== virtualbox-iso.virtualbox: Waiting for boot...
== virtualbox-iso.virtualbox: Typing the boot command...
== virtualbox-iso.virtualbox: Using SSH communicator to connect: 127.0.0.1
== virtualbox-iso.virtualbox: Waiting for SSH to become available...
```

Рис. 3.3: Формирование box-файла

Начался процесс скачивания, распаковки и установки драйверов VirtualBox и дистрибутива ОС на виртуальную машину.

После завершения процесса автоматического развёртывания образа виртуальной машины в каталоге `/var/tmp/user_name/vagrant` временно появился каталог `builds` с промежуточными файлами `.vdi`, `.vmdk` и `.ovf`, которые затем автоматически будут преобразованы в box-файл сформированного образа: `vagrant-virtualbox-rocky-9-x86_64.box`.

Для регистрации образа виртуальной машины в Vagrant в терминале в каталоге `/var/tmp/user_name/vagrant` наберем `make addbox`(рис. 3.4):


```
eademidova@eademidova-ThinkBook-14s-Yoga-ITL: /var/tmp/eademidova/vagrant$ cd ..
eademidova@eademidova-ThinkBook-14s-Yoga-ITL: /var/tmp/eademidova$ cd vagrant/
eademidova@eademidova-ThinkBook-14s-Yoga-ITL: /var/tmp/eademidova/vagrant$ make help
Usage:
make <target>

Targets:
addbox          Add the built box to Vagrant
client-destroy  Destroy client
client-provision Up and provision client
client-up       Up client
plugins         Install plugins
server-destroy  Destroy server
server-provision Up and provision server
server-up       Up server
up              Up boxies

eademidova@eademidova-ThinkBook-14s-Yoga-ITL: /var/tmp/eademidova/vagrant$ make addbox
==> box: Box file was not detected as metadata. Adding it directly...
==> box: Adding box 'rocky9' (v0) for provider:
box: Unpacking necessary files from: file:///var/tmp/eademidova/vagrant/vagrant-virtualbox-rocky-9-x86_
64.box
==> box: Successfully added box 'rocky9' (v0) for ''!
eademidova@eademidova-ThinkBook-14s-Yoga-ITL: /var/tmp/eademidova/vagrant$
```

Рис. 3.4: Регистрация образа

Это позволит на основе конфигурации, прописанной в файле Vagrantfile, сформировать box-файлы образов двух виртуальных машин — сервера и клиента с возможностью их параллельной или индивидуальной работы.

Запустим виртуальную машину Server, введя `make server-up`(рис. 3.5, 3.6):

```
eademidova@eademidova-ThinkBook-14s-Yoga-ITL: /var/tmp/eademidova/vagrant$ make addbox
==> box: Box file was not detected as metadata. Adding it directly...
==> box: Adding box 'rocky9' (v0) for provider:
box: Unpacking necessary files from: file:///var/tmp/eademidova/vagrant/vagrant-virtualbox-rocky-9-x86_
64.box
==> box: Successfully added box 'rocky9' (v0) for ''!
eademidova@eademidova-ThinkBook-14s-Yoga-ITL: /var/tmp/eademidova/vagrant$ make server-up
Installing the 'vagrant-vbguest' plugin. This can take a few minutes...
Fetching micromachine-3.0.0.gem
Fetching vagrant-vbguest-0.31.0.gem
Installed the plugin 'vagrant-vbguest (0.31.0)'!
touch plugins
Bringing machine 'server' up with 'virtualbox' provider...
==> server: You assigned a static IP ending in ".1" to this machine.
==> server: This is very often used by the router and can cause the
==> server: network to not work properly. If the network doesn't work
==> server: properly, try changing this IP.
==> server: Preparing master VM for linked clones...
server: This is a one time operation. Once the master VM is prepared,
server: it will be used as a base for linked clones, making the creation
server: of new VMs take milliseconds on a modern system.
==> server: Importing base box 'rocky9'...
```

Рис. 3.5: Команда `make server-up`

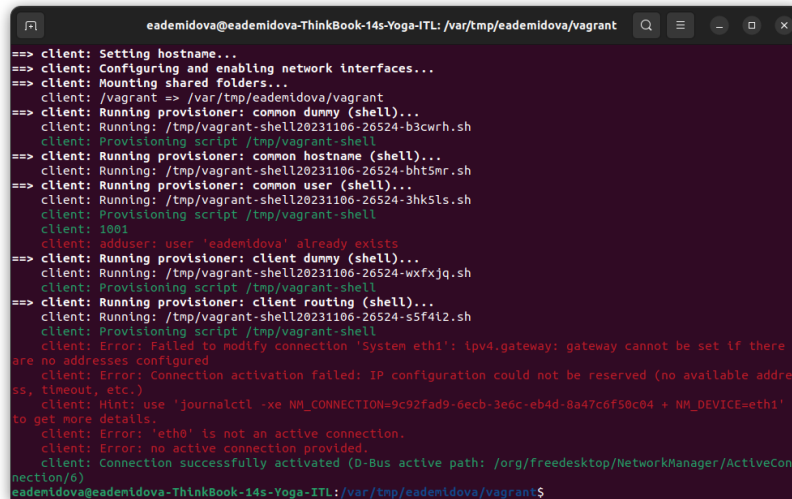
```
eademidova@eademidova-ThinkBook-14s-Yoga-ITL: /var/tmp/eademidova/vagrant
server: SSH auth method: password
==> server: Machine booted and ready!
Got different reports about installed GuestAdditions version:
Virtualbox on your host claims:
VBoxService inside the vm claims: 7.0.12
Going on, assuming VBoxService is correct...
[server] GuestAdditions seems to be installed (7.0.12) correctly, but not running.
Got different reports about installed GuestAdditions version:
Virtualbox on your host claims:
VBoxService inside the vm claims: 7.0.12
Going on, assuming VBoxService is correct...
Redirecting to /bin/systemctl start vboxadd.service
Redirecting to /bin/systemctl start vboxadd-service.service
==> server: Checking for guest additions in VM...
==> server: Setting hostname...
==> server: Configuring and enabling network interfaces...
==> server: Mounting shared folders...
server: /vagrant => /var/tmp/eademidova/vagrant
==> server: Running provisioner: common dummy (shell)...
server: Running: /tmp/vagrant-shell20231106-17060-5lx2w3.sh
server: Provisioning script /tmp/vagrant-shell
==> server: Running provisioner: common hostname (shell)...
server: Running: /tmp/vagrant-shell20231106-17060-1mwmac.sh
==> server: Running provisioner: common user (shell)...
server: Running: /tmp/vagrant-shell20231106-17060-ofej7n.sh
server: Provisioning script /tmp/vagrant-shell
server: id: 'eademidova': no such user
==> server: Running provisioner: server dummy (shell)...
server: Running: /tmp/vagrant-shell20231106-17060-115k42.sh
server: Provisioning script /tmp/vagrant-shell
eademidova@eademidova-ThinkBook-14s-Yoga-ITL: /var/tmp/eademidova/vagrant$
```

Рис. 3.6: Успешный запуск виртуальной машины Server

Запустим виртуальную машину Client, введя make client-up(рис. 3.7, 3.8):

```
eademidova@eademidova-ThinkBook-14s-Yoga-ITL: /var/tmp/eademidova/vagrant
==> server: Running provisioner: common dummy (shell)...
server: Running: /tmp/vagrant-shell20231106-19608-98kg2b.sh
server: Provisioning script /tmp/vagrant-shell
==> server: Running provisioner: common hostname (shell)...
server: Running: /tmp/vagrant-shell20231106-19608-tkzgex.sh
==> server: Running provisioner: common user (shell)...
server: Running: /tmp/vagrant-shell20231106-19608-venfgo.sh
server: Provisioning script /tmp/vagrant-shell
server: id: 'eademidova': no such user
==> server: Running provisioner: server dummy (shell)...
server: Running: /tmp/vagrant-shell20231106-19608-o5jvfe.sh
server: Provisioning script /tmp/vagrant-shell
eademidova@eademidova-ThinkBook-14s-Yoga-ITL: /var/tmp/eademidova/vagrant$ make client-up
Bringing machine 'client' up with 'virtualbox' provider...
==> client: Cloning VM...
==> client: Matching MAC address for NAT networking...
==> client: Setting the name of the VM: client
==> client: Fixed port collision for 22 => 2222. Now on port 2200.
==> client: Clearing any previously set network interfaces...
==> client: Preparing network interfaces based on configuration...
client: Adapter 1: nat
client: Adapter 2: intnet
==> client: Forwarding ports...
client: 22 (guest) => 2200 (host) (adapter 1)
==> client: Running 'pre-boot' VM customizations...
==> client: Booting VM...
==> client: Waiting for machine to boot. This may take a few minutes...
client: SSH address: 127.0.0.1:2200
client: SSH username: vagrant
client: SSH auth method: password
```

Рис. 3.7: Команда make client-up

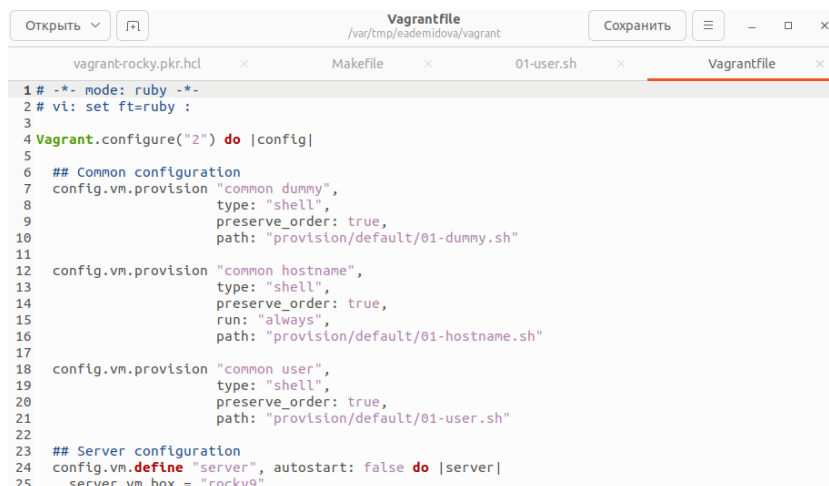


```
eademidova@eademidova-ThinkBook-14s-Yoga-ITL: /var/tmp/eademidova/vagrant
==> client: Setting hostname...
==> client: Configuring and enabling network interfaces...
==> client: Mounting shared folders...
client: /vagrant => /var/tmp/eademidova/vagrant
==> client: Running provisioner: common dummy (shell)...
client: Running: /tmp/vagrant-shell20231106-26524-b3cwrh.sh
client: Provisioning script /tmp/vagrant-shell
==> client: Running provisioner: common hostname (shell)...
client: Running: /tmp/vagrant-shell20231106-26524-bht5nr.sh
==> client: Running provisioner: common user (shell)...
client: Running: /tmp/vagrant-shell20231106-26524-3hk5ls.sh
client: Provisioning script /tmp/vagrant-shell
client: 1001
client: adduser: user 'eademidova' already exists
==> client: Running provisioner: client dummy (shell)...
client: Running: /tmp/vagrant-shell20231106-26524-wxfxjq.sh
client: Provisioning script /tmp/vagrant-shell
==> client: Running provisioner: client routing (shell)...
client: Running: /tmp/vagrant-shell20231106-26524-s5f4t2.sh
client: Provisioning script /tmp/vagrant-shell
client: Error: failed to modify connection 'system eth1': ipv4.gateway: gateway cannot be set if there
are no addresses configured
client: Error: Connection activation failed: IP configuration could not be reserved (no available addre
ss, timeout, etc.)
client: Hint: use 'journalctl -xe NM_CONNECTION=9c92fad9-6ecb-3e6c-eb4d-8a47c6f50c04 + NM_DEVICE=eth1'
to get more details.
client: Error: 'eth0' is not an active connection.
client: Error: no active connection provided.
client: Connection successfully activated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveCon
nection/6)
eademidova@eademidova-ThinkBook-14s-Yoga-ITL: /var/tmp/eademidova/vagrant$
```

Рис. 3.8: Успешный запуск виртуальной машины Client

Затем выключим обе виртуальные машины и внесем изменения в настройки внутреннего окружения виртуальной машины.

Для отработки созданных скриптов во время загрузки виртуальных машин убедимся, что в конфигурационном файле Vagrantfile до строк с конфигурацией сервера имеется следующая запись(рис. 3.9):

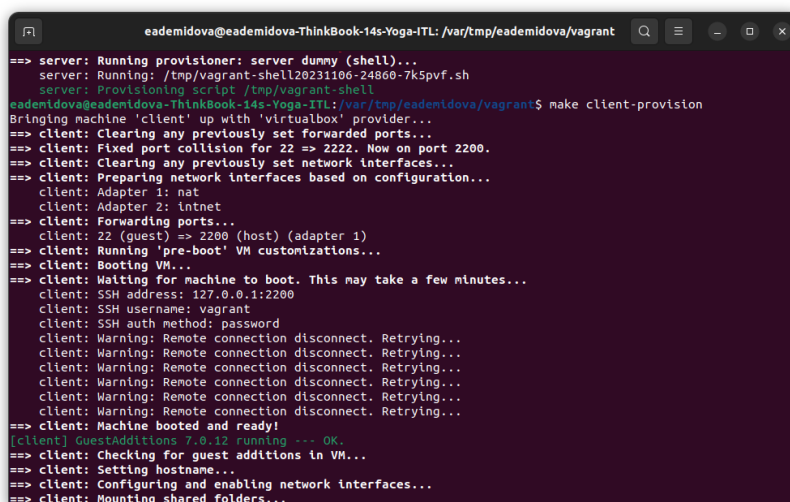


```
Открыть  Vagrantfile  /var/tmp/eademidova/vagrant  Сохранить
vagrant-rocky.pkr.hcl  Makefile  01-user.sh  Vagrantfile
1 # -*- mode: ruby -*-
2 # vi: set ft=ruby :
3
4 Vagrant.configure("2") do |config|
5
6   ## Common configuration
7   config.vm.provision "common dummy",
8     type: "shell",
9     preserve_order: true,
10    path: "provision/default/01-dummy.sh"
11
12   config.vm.provision "common hostname",
13     type: "shell",
14     preserve_order: true,
15     run: "always",
16     path: "provision/default/01-hostname.sh"
17
18   config.vm.provision "common user",
19     type: "shell",
20     preserve_order: true,
21     path: "provision/default/01-user.sh"
22
23   ## Server configuration
24   config.vm.define "server", autostart: false do |server|
25     server.vm.box = "rocky9"
```

Рис. 3.9: Проверка конфигурационного файла Vagrant

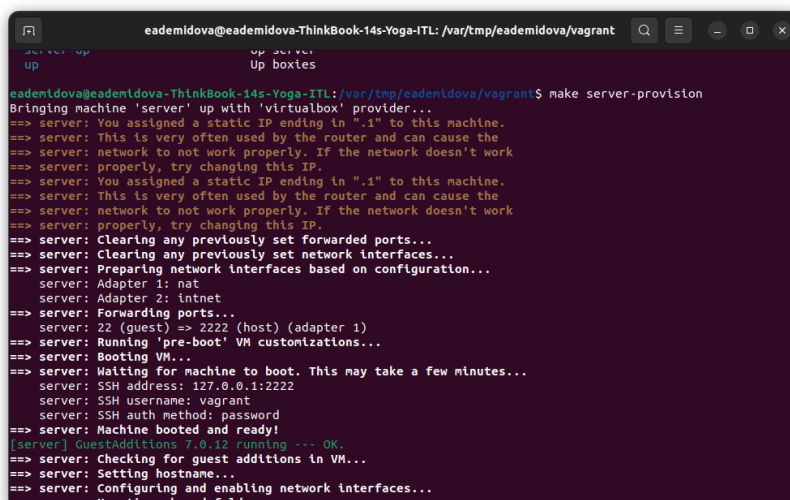
Зафиксируем внесённые изменения для внутренних настроек виртуальных

машин, введя в терминале `make server-provision`, а затем `make client-provision`(рис. 3.10, 3.11):



```
eademidova@eademidova-ThinkBook-14s-Yoga-ITL: /var/tmp/eademidova/vagrant$ make client-provision
server: Running provisioner: server dummy (shell)...
server: Provisioning script /tmp/vagrant-shell
eademidova@eademidova-ThinkBook-14s-Yoga-ITL: /var/tmp/eademidova/vagrant$ make client-provision
Bringing machine 'client' up with 'virtualbox' provider...
==> client: Clearing any previously set forwarded ports...
==> client: Fixed port collision for 22 => 2222. Now on port 2200.
==> client: Clearing any previously set network interfaces...
==> client: Preparing network interfaces based on configuration...
client: Adapter 1: nat
client: Adapter 2: intnet
==> client: Forwarding ports...
client: 22 (guest) => 2200 (host) (adapter 1)
==> client: Running 'pre-boot' VM customizations...
==> client: Booting VM...
==> client: Waiting for machine to boot. This may take a few minutes...
client: SSH address: 127.0.0.1:2200
client: SSH username: vagrant
client: SSH auth method: password
client: Warning: Remote connection disconnect. Retrying...
client: Warning: Remote connection disconnect. Retrying...
client: Warning: Remote connection disconnect. Retrying...
client: Warning: Remote connection disconnect. Retrying...
client: Warning: Remote connection disconnect. Retrying...
==> client: Machine booted and ready!
[client] GuestAdditions 7.0.12 running --- OK.
==> client: Checking for guest additions in VM...
==> client: Setting hostname...
==> client: Configuring and enabling network interfaces...
==> client: Mounting shared folders...
```

Рис. 3.10: Команда `make server-provision`



```
eademidova@eademidova-ThinkBook-14s-Yoga-ITL: /var/tmp/eademidova/vagrant$ make server-provision
Bringing machine 'server' up with 'virtualbox' provider...
==> server: You assigned a static IP ending in ".1" to this machine.
==> server: This is very often used by the router and can cause the
==> server: network to not work properly. If the network doesn't work
==> server: properly, try changing this IP.
==> server: You assigned a static IP ending in ".1" to this machine.
==> server: This is very often used by the router and can cause the
==> server: network to not work properly. If the network doesn't work
==> server: properly, try changing this IP.
==> server: Clearing any previously set forwarded ports...
==> server: Clearing any previously set network interfaces...
==> server: Preparing network interfaces based on configuration...
server: Adapter 1: nat
server: Adapter 2: intnet
==> server: Forwarding ports...
server: 22 (guest) => 2222 (host) (adapter 1)
==> server: Running 'pre-boot' VM customizations...
==> server: Booting VM...
==> server: Waiting for machine to boot. This may take a few minutes...
server: SSH address: 127.0.0.1:2222
server: SSH username: vagrant
server: SSH auth method: password
==> server: Machine booted and ready!
[server] GuestAdditions 7.0.12 running --- OK.
==> server: Checking for guest additions in VM...
==> server: Setting hostname...
==> server: Configuring and enabling network interfaces...
==> server: Mounting shared folders...
```

Рис. 3.11: Команда `make client-provision`

Залогинемся на сервере и клиенте под созданным пользователем. Убедимся, что в терминале приглашение отображается в виде `eademidova@server.eademidova.net`

на сервере и в виде eademidova@client.eademidova.net на клиенте(рис. 3.12, 3.13):

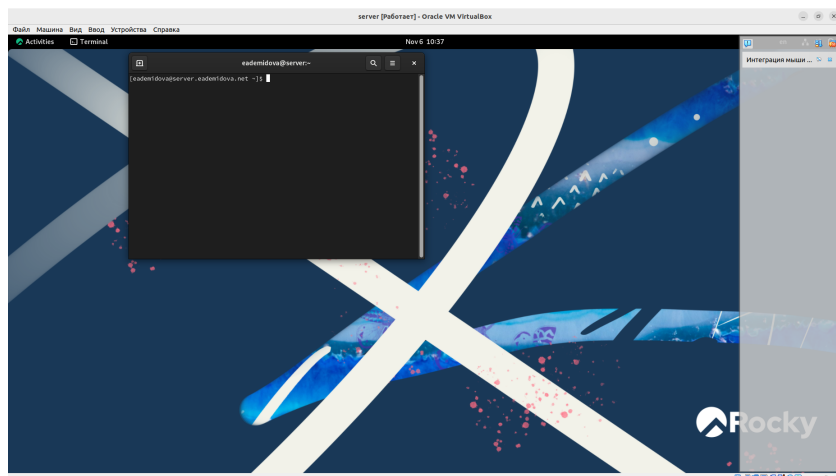


Рис. 3.12: Проверка работы сервера

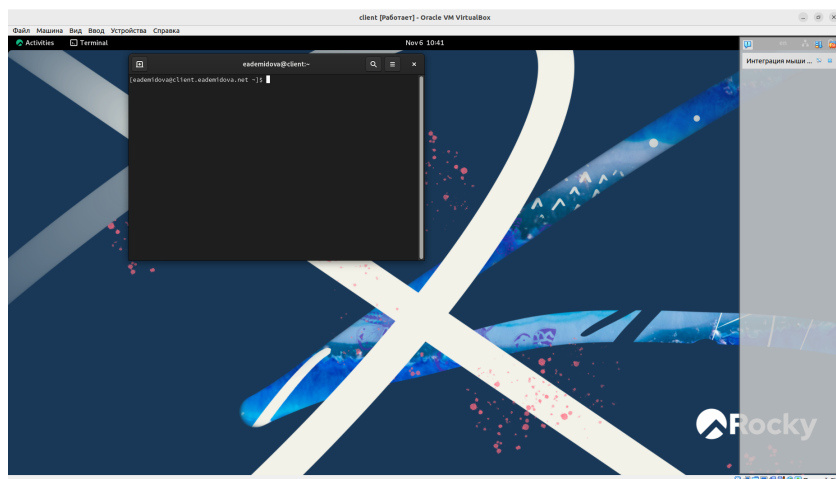


Рис. 3.13: Проверка работы клиента

4 Выводы

В результате выполнения данной работы были приобретены практические навыки установки Rocky Linux на виртуальную машину с помощью инструмента Vagrant.