

Лабораторная работа №1

Подготовка лабораторного стенда

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1 Цель работы

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

2 Выполнение лабораторной работы

В данной лабораторной работе устанавливается версия Rocky Linux 10, поэтому в ходе её выполнения был использован пример кода.



Рисунок 2.1: Конфигурация папок Vagrant и Packer

```

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

Vagrant.configure("2") do |config|
  config.vagrant.plugins = "vagrant-libvirt"
  config.vagrant.plugins = "vagrant-vbguest"

  config.vm.provider :virtualbox do |virtualbox|
    virtualbox.linked_clone = true
    # Customize the amount of memory on the VM
    virtualbox.memory = 2048
    virtualbox.cpus = 2
    ## Display the VirtualBox GUI when booting the machine
    virtualbox.gui = false
    ## Set the video memory to 12MB
    virtualbox.customize ["modifyvm", :id, "--vram", "32"]
    virtualbox.customize ["modifyvm", :id, "--nestedhwiotraveler1", "on"]
    virtualbox.customize ["modifyvm", :id, "--clipboard", "bidirectional"]
    virtualbox.customize ["modifyvm", :id, "--draganddrop", "bidirectional"]
    virtualbox.customize ["modifyvm", :id, "--graphicscontroller", "vmsvga"]
    virtualbox.customize ["modifyvm", :id, "--accelerate3d", "on"]
    virtualbox.customize ["modifyvm", :id, "--nested-hw-virt", "on"]
  end

  config.vm.provider :libvirt do |libvirt|
    libvirt.driver = "kvm"
    libvirt.memory = 2048
    libvirt.cpus =
    libvirt.video_type = "virtio"
    libvirt.disk_bus = "virtio"
    libvirt.nic_model_type = "virtio"
    libvirt.management_network_name = "vagrant-libvirt"
    libvirt.management_network_address = "192.168.121.0/24"
    libvirt.storage_pool_name = "vagrant"
    # libvirt.storage_pool_name = "default"
  end

  ## Common configuration
  config.vm.provision "common dummy",
    type: "shell",
    preserve_order: true,
    path: "provision/default/01-dummy.sh"
end

```

Рисунок 2.2: Конфигурационный файл Vagrantfile

```

# System bootloader configuration
bootloader --append="no_timer_check console=tty0 console=ttyS0,115200n8 net.ifnames=0 biosdevname=0 elevator=noop" --location=mbr --timeout=1
# Clear the Master Boot Record
zerombr
# Partition clearing information
clearpart --all
  --reboot
# Use text mode install
text
# Keyboard layouts
keyboard --vkeymap=us,ru --xlayouts='us,ru'
# System language
lang en_US.UTF-8

# Network information
network --bootproto=dhcp --device=link --activate

# System authorization information
authselect select ssd with-sudo with-mkhomedir --force
authselect apply-changes
# Root password
rootpw vagrant
user --name=vagrant --password=vagrant
  --full
  --disabled
  --no-configure
# Do not configure the X Window System
#skipx
# System services
services --enabled="NetworkManager,sshd,chrony"
# System timezone
timezone UTC --utc
user --name=vagrant --password=vagrant
# Disk partitioning information
# parted --script --mklabel=gpt --size=10239
bootloader --location=mbr
clearpart --all --initlabel
autopart --type=lvm

$post
# configure swap to a file
# falllocate -1 2G /swapfile
# chmod 600 /swapfile
# mkswap /swapfile
# echo "none none swap defaults 0 0" >> /etc/fstab

```

Рисунок 2.3: Конфигурационный файл ks.cfg

```

Packer {
  required_plugins {
    vagrant = {
      source = "github.com/hashicorp/vagrant"
      version = ">= 1"
    }
    virtualbox = {
      version = ">= 1"
      source = "github.com/hashicorp/virtualbox"
    }
    qemu = {
      version = ">= 1"
      source = "github.com/hashicorp/qemu"
    }
  }
}

variable "artifact_description" {
  type = string
  default = "Rocky 10.0"
}

variable "artifact_version" {
  type = string
  default = "10.0"
}

variable "disk_size" {
  type = string
  default = "61440"
}

variable "iso_checksum" {
  type = string
  default = "de75c2f7cc566ea964017a1e94883913f066c4ebef1d356964e390ed76cadd12"
}

variable "iso_checksum_type" {
  type = string
  default = "sha256"
}

variable "iso_url" {
  type = string
}

file

```

length: 5519 lines: 189 Ln:23 Col:8 Pos:402 Unix (LF) UTF-8 INS

Рисунок 2.4: Конфигурационный файл vagrant-rocky.pkr.hcl

```

#!/bin/bash

echo "Provisioning script $0"

echo "Enable forwarding"
echo "net.ipv4.ip_forward = 1" > /etc/sysctl.d/90-forward.conf
sysctl -w net.ipv4.ip_forward=1

echo "Configure masquerading"
firewall-cmd --add-masquerade --permanent
firewall-cmd --reload

restorecon -vR /etc

```

file length: 280 lines: 14 Ln:1 Col:1 Pos:1 Unix (LF) UTF-8 INS

Рисунок 2.5: Скрипт виртуальной машины server 02-forward.sh

```

#!/bin/bash
echo "Provisioning script $0"
nmcli connection modify "System eth1" ipv4.gateway "192.168.1.1"
nmcli connection up "System eth1"
nmcli connection modify eth0 ipv4.never-default true
nmcli connection modify eth0 ipv6.never-default true
nmcli connection down eth0
nmcli connection up eth0
# systemctl restart NetworkManager

```

file length: 339 lines: 15 Ln: 3 Col: 30 Pos: 43 Unix (LF) UTF-8 INS

Рисунок 2.6: Скрипт виртуальной машины client 01-routing.sh

Теперь приступим к основной части работы. Для начала нам нужно сформировать box-файл виртуальной машины - для этого используем программу packer. Он работает с конфигурационным файлом vagrant-rocky.pkr.hcl, в котором содержатся настройки и команды, которые выполняются во время создания базовой виртуальной машины. (рис. 2.7, рис. 2.8)

```

C:\Work\aaqurihlev\packer>packer.exe init vagrant-rocky.pkr.hcl
C:\Work\aaqurihlev\packer>packer.exe build vagrant-rocky.pkr.hcl
virtualbox-iso.rockylinux: output will be in this color.
qemu.rockylinux: output will be in this color.

Build 'qemu.rockylinux' errored after 11 milliseconds 111 microseconds: Failed creating Qemu driver: exec: "qemu-system-x86_64": executable file not found in %PATH%
=> virtualbox-iso.rockylinux: Retrieving Guest additions
=> virtualbox-iso.rockylinux: Trying C:\Program Files\Oracle\VirtualBox\VBoxGuestAdditions.iso
=> virtualbox-iso.rockylinux: Trying file:///C:/Program%20Files/Oracle/VirtualBox/VBoxGuestAdditions.iso
=> virtualbox-iso.rockylinux: file:///C:/Program%20Files/Oracle/VirtualBox/VBoxGuestAdditions.iso => C:/Program Files/Oracle/VirtualBox/VBoxGuestAdditions.iso
=> virtualbox-iso.rockylinux: Retrieving ISO
=> virtualbox-iso.rockylinux: Trying Rocky-10.0-x86_64-minimal.iso
=> virtualbox-iso.rockylinux: Trying Rocky-10.0-x86_64-minimal.iso?checksum=sha256%3Ade75c2f7cc566ea964017a1e94883913f066c4ebcb1d356964e398ed76cadd12
=> virtualbox-iso.rockylinux: Rocky-10.0-x86_64-minimal.iso?checksum=sha256%3Ade75c2f7cc566ea964017a1e94883913f066c4ebcb1d356964e398ed76cadd12 => C:/Work/aagurihlev/packer/Rocky-10.0-x86_64-minimal.iso
=> virtualbox-iso.rockylinux: Starting HTTP server on port 8468
=> virtualbox-iso.rockylinux: Creating virtual machine...
=> virtualbox-iso.rockylinux: Creating hard drive output-rockylinux10-virtualbox.rockylinux10-virtualbox.vdi with size 61440 MiB...
=> virtualbox-iso.rockylinux: Mounting ISO...
=> virtualbox-iso.rockylinux: Mounting boot ISO...
=> virtualbox-iso.rockylinux: Creating forwarded port mapping for communicator (SSH, WinRM, etc) (host port 2278)
=> virtualbox-iso.rockylinux: Executing custom VBoxManage commands...
=> virtualbox-iso.rockylinux: Executing: modifyvm rockylinux10-virtualbox --memory 2048
=> virtualbox-iso.rockylinux: Executing: modifyvm rockylinux10-virtualbox --cpus 2
=> virtualbox-iso.rockylinux: Executing: modifyvm rockylinux10-virtualbox --nat-localhostreachable1 on
=> virtualbox-iso.rockylinux: Executing: modifyvm rockylinux10-virtualbox --firmware EFI
=> virtualbox-iso.rockylinux: Executing: modifyvm rockylinux10-virtualbox --vnde on
=> virtualbox-iso.rockylinux: Executing: modifyvm rockylinux10-virtualbox --vrdeport 3390
=> virtualbox-iso.rockylinux: Starting the virtual machine...
=> virtualbox-iso.rockylinux: The VM will be run headless, without a GUI. If you want to
=> virtualbox-iso.rockylinux: view the screen of the VM, connect via VRDP without a password to
=> virtualbox-iso.rockylinux: rdp://127.0.0.1:5952
=> virtualbox-iso.rockylinux: Waiting 10s for boot...
=> virtualbox-iso.rockylinux: Typing the boot command...
=> virtualbox-iso.rockylinux: Using SSH communicator to connect: 127.0.0.1
=> virtualbox-iso.rockylinux: Waiting for SSH to become available...

```

Рисунок 2.7: Результат работы packer

```

=> virtualbox-iso.rockylinux: Gracefully halting virtual machine...
=> virtualbox-iso.rockylinux: Broadcast message from root@localhost on pts/2 (Sun 2025-11-09 23:46:02 UTC):
=> virtualbox-iso.rockylinux: The system will power off now!
=> virtualbox-iso.rockylinux: Preparing to export machine...
=> virtualbox-iso.rockylinux: Deleting forwarded port mapping for the communicator (SSH, WinRM, etc) (host port 2278)
=> virtualbox-iso.rockylinux: Exporting virtual machine...
=> virtualbox-iso.rockylinux: Executing: export rockylinux10-virtualbox --output output-rockylinux10-virtualbox/rockylinux10-virtualbox.ovf --manifest --vsys
0 -description Rocky 10.0 -version 10.0
=> virtualbox-iso.rockylinux: Cleaning up floppy disk...
=> virtualbox-iso.rockylinux: Deregistering and deleting VM...
=> virtualbox-iso.rockylinux: Running post-processor: (type vagrant)
=> virtualbox-iso.rockylinux (vagrant): Creating a dummy Vagrant box to ensure the host system can create one correctly
=> virtualbox-iso.rockylinux (vagrant): Creating Vagrant box for 'virtualbox' provider
=> virtualbox-iso.rockylinux (vagrant): Copying from artifact: output-rockylinux10-virtualbox\rockylinux10-virtualbox-disk001.vmdk
=> virtualbox-iso.rockylinux (vagrant): Copying from artifact: output-rockylinux10-virtualbox\rockylinux10-virtualbox.mf
=> virtualbox-iso.rockylinux (vagrant): Copying from artifact: output-rockylinux10-virtualbox\rockylinux10-virtualbox.nvram
=> virtualbox-iso.rockylinux (vagrant): Copying from artifact: output-rockylinux10-virtualbox\rockylinux10-virtualbox.ovf
=> virtualbox-iso.rockylinux (vagrant): Renaming the OVF to box.ovf...
=> virtualbox-iso.rockylinux (vagrant): Compressing: Vagrantfile
=> virtualbox-iso.rockylinux (vagrant): Compressing: box.ovf
=> virtualbox-iso.rockylinux (vagrant): Compressing: metadata.json
=> virtualbox-iso.rockylinux (vagrant): Compressing: rockylinux10-virtualbox-disk001.vmdk
=> virtualbox-iso.rockylinux (vagrant): Compressing: rockylinux10-virtualbox.mf
=> virtualbox-iso.rockylinux (vagrant): Compressing: rockylinux10-virtualbox.nvram
Build 'virtualbox-iso.rockylinux' finished after 42 minutes 22 seconds.

=> Wait completed after 42 minutes 22 seconds

=> Some builds didn't complete successfully and had errors:
--> qemu.rockylinux: Failed creating Qemu driver: exec: "qemu-system-x86_64": executable file not found in %PATH%

=> Builds finished. The artifacts of successful builds are:
--> virtualbox-iso.rockylinux: 'virtualbox' provider box: vagrant-virtualbox-rockylinux10-x86_64.box

```

Рисунок 2.8: Результат работы packer

Далее необходимо зарегистрировать созданный box-файл в программе Vagrant.
(рис. 2.9)

```

C:\Work\aaagurihlev\packer>vagrant box add rockylinux10 vagrant-virtualbox-rockylinux10-x86_64.box
=> box: Box file was not detected as metadata. Adding it directly...
=> box: Adding box 'rockylinux10' (v0) for provider: (amd64)
  box: Unpacking necessary files from: file:///C:/Work/aaagurihlev/packer/vagrant-virtualbox-rockylinux10-x86_64.box
  box:
=> box: Successfully added box 'rockylinux10' (v0) for '(amd64)'


```

Рисунок 2.9: Регистрация box-файла в Vagrant

Теперь запустим виртуальные машины server и клиент - они основаны на box-файле, который мы создали с помощью packer. Начнем с сервера, выполнив команду vagrant up server. (рис. 2.10, рис. 2.11)

```
C:\Work\aaugurihlev\vagrant>vagrant up server
Bringing machine 'server' up with 'virtualbox' provider...
=> server: You assigned a static IP ending in ".1" or ":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 'rockylinux10'...
=> server: Cloning VM...
=> server: Matching MAC address for NAT networking...
=> server: You assigned a static IP ending in ".1" or ":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: Setting the name of the VM: vagrant_server_1762732829550_39604
=> 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!
```

Рисунок 2.10: Запуск виртуальной машины server

```
=> server: Checking for guest additions in VM...
=> server: Setting hostname...
=> server: Configuring and enabling network interfaces...
=> server: Mounting shared folders...
    server: C:/Work/aaugurihlev/vagrant => /vagrant
=> server: Running provisioner: common dummy (shell)...
    server: Running: C:/Users/Work/AppData/Local/Temp/vagrant-shell20251110-1584-7sb7m0.sh
    server: Provisioning script /tmp/vagrant-shell
=> server: Running provisioner: common hostname (shell)...
    server: Running: C:/Users/Work/AppData/Local/Temp/vagrant-shell20251110-1584-suh8gr.sh
=> server: Running provisioner: common user (shell)...
    server: Running: C:/Users/Work/AppData/Local/Temp/vagrant-shell20251110-1584-bvb52v.sh
    server: Provisioning script /tmp/vagrant-shell
    server: id: 'aaugurihlev': no such user
=> server: Running provisioner: server dummy (shell)...
    server: Running: C:/Users/Work/AppData/Local/Temp/vagrant-shell20251110-1584-xz46su.sh
    server: Provisioning script /tmp/vagrant-shell
```

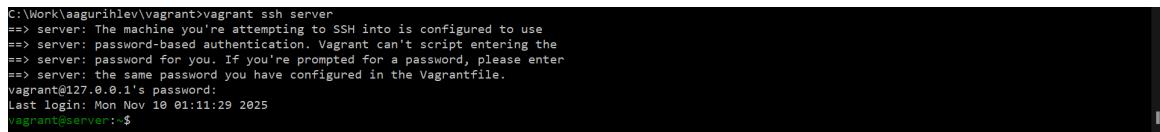
Рисунок 2.11: Запуск виртуальной машины server

После запуска и проверки server запустим виртуальную машину client командой
vagrant up client. (рис. 2.12)

```
=> client: Booting VM...
=> client: Waiting for machine to boot. This may take a few minutes...
=> client: Machine booted and ready!
=> client: Checking for guest additions in VM...
=> client: Setting hostname...
=> client: Configuring and enabling network interfaces...
=> client: Mounting shared folders...
    client: C:/Work/aaugurihlev/vagrant => /vagrant
=> client: Running provisioner: common dummy (shell)...
    client: Running: C:/Users/Work/AppData/Local/Temp/vagrant-shell20251110-20820-2pju08.sh
    client: Provisioning script /tmp/vagrant-shell
=> client: Running provisioner: common hostname (shell)...
    client: Running: C:/Users/Work/AppData/Local/Temp/vagrant-shell20251110-20820-oq76yr.sh
=> client: Running provisioner: common user (shell)...
    client: Running: C:/Users/Work/AppData/Local/Temp/vagrant-shell20251110-20820-n54dk8.sh
    client: Provisioning script /tmp/vagrant-shell
    client: id: 'aaugurihlev': no such user
=> client: Running provisioner: client dummy (shell)...
    client: Running: C:/Users/Work/AppData/Local/Temp/vagrant-shell20251110-20820-17t70j.sh
    client: Provisioning script /tmp/vagrant-shell
=> client: Running provisioner: client routing (shell)...
    client: Running: C:/Users/Work/AppData/Local/Temp/vagrant-shell20251110-20820-14krvm.sh
    client: Provisioning script /tmp/vagrant-shell
    client: Error: unknown connection 'System eth1'.
    client: Error: unknown connection 'System eth1'.
    client: Connection 'eth0' successfully deactivated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveConnection/2)
    client: Connection successfully activated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveConnection/5)
```

Рисунок 2.12: Запуск виртуальной машины client

Запустив обе виртуальные машины, зайдем в пользователя vagrant в обеих системах, а затем проверим ssh-соединение с ними. Вписав в консоли команду vagrant ssh server, подключимся к серверу и залогинимся в собственного пользователя, затем выйдем. (рис. 2.13, рис. 2.14)



```
C:\Work\aaagurihlev\vagrant>vagrant ssh server
=> server: The machine you're attempting to SSH into is configured to use
=> server: password-based authentication. Vagrant can't script entering the
=> server: password for you. If you're prompted for a password, please enter
=> server: the same password you have configured in the Vagrantfile.
vagrant@127.0.0.1's password:
Last login: Mon Nov 10 01:11:29 2025
vagrant@server: ~$
```

Рисунок 2.13: Логин под пользователем vagrant виртуальной машины server



```
aaagurihlev@server: ~$ su - aaagurihlev
Password:
Last failed login: Mon Nov 10 01:13:44 UTC 2025 on pts/0
There were 4 failed login attempts since the last successful login.
[aaagurihlev@server.aaagurihlev.net ~]$
```

Рисунок 2.14: Логин под собственным пользователем виртуальной машины server

Тоже самое проделаем и с клиентом - посредством команды vagrant ssh client. (рис. 2.15)



```
C:\Work\aaagurihlev\vagrant>vagrant ssh client
=> client: The machine you're attempting to SSH into is configured to use
=> client: password-based authentication. Vagrant can't script entering the
=> client: password for you. If you're prompted for a password, please enter
=> client: the same password you have configured in the Vagrantfile.
vagrant@127.0.0.1's password:
Last login: Mon Nov 10 01:15:24 2025
vagrant@client: ~$ su - aaagurihlev
Password:
[aaagurihlev@client.aaagurihlev.net ~]$
```

Рисунок 2.15: Логин под пользователем vagrant и под собственным пользователем виртуальной машины client

Выключим обе виртуальные машины командами vagrant halt server и vagrant halt client.

3 Выводы

В результате выполнения лабораторной работы была настроена система виртуальных машин Linux server и client, в которых будут выполняться следующие лабораторные работы, а также получены навыки работы с программой vagrant.