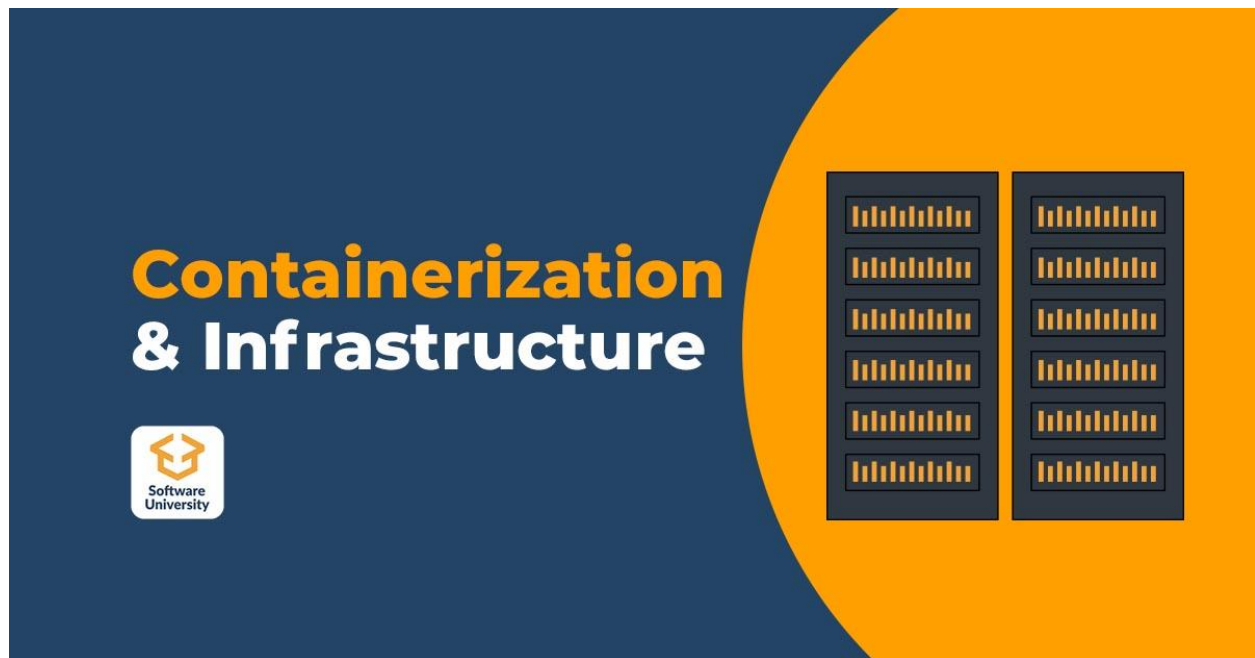


# DevOps and Cloud

March 2025



## DevOps and Containerization

Homework (M1)

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# Virtualization

## Create Vagrant Box with Debian 12

I will use debian-12.11-x64.ova downloaded from <https://zahariev.pro/go/devops-vm-templates>.

The scripts db.sh and web.sh were edited and adjusted for Debian. Check 01-virtualization folder.

### Import and setup the VM

```
VBoxManage import debian-12.11-x64.ova --vsys 0 --vmname debian12-vagrant
```

```
VBoxManage modifyvm debian12-vagrant --cpus 1
VBoxManage modifyvm debian12-vagrant --memory 2048
VBoxManage modifyvm debian12-vagrant --audio-driver none
VBoxManage modifyvm debian12-vagrant --nic1 nat
VBoxManage modifyvm debian12-vagrant --natpf1 "SSH,tcp,,2222,,22"
```

*Start the VM in headless mode and wait for it to boot before ssh.*

```
VBoxManage startvm debian12-vagrant --type=headless
```

```
PS C:\Users\v.atanasov\template-vm> VBoxManage import debian-12.11-x64.ova --vsys 0 --vmname debian12-vagrant
0%...10%...20%...30%...40%...50%...60%...70%...80%...90%...100%
Interpreting C:\Users\v.atanasov\template-vm\debian-12.11-x64.ova...
OK.
Disks:
  vmdisk1          34359738368      -1      http://www.vmware.com/interfaces/specifications/vmdk.html#streamOptimized      debian-12.11-disk001.vmdk      -1      -1
Virtual system 0:
  0: Suggested OS type: "Debian_64"
    (change with "--vsys 0 --ostype <type>"; use "list ostypes" to list all possible values)
  1: VM name specified with --vmname: "debian12-vagrant"
  2: Suggested VM group: "/"
    (change with "--vsys 0 --group <group>")
  3: Suggested VM settings file name "C:\Users\v.atanasov\VirtualBox VMs\debian-12.11 1\debian-12.11 1.vbox"
    (change with "--vsys 0 --settingsfile <filename>")
  4: Suggested VM base folder "C:\Users\v.atanasov\VirtualBox VMs"
    (change with "--vsys 0 --basefolder <path>")
  5: Number of CPUs: 1
    (change with "--vsys 0 --cpus <n>")
  6: Guest memory: 2048 MB
    (change with "--vsys 0 --memory <MB>")
  7: Sound card (appliance expects "", can change on import)
    (disable with "--vsys 0 --unit 7 --ignore")
  8: USB controller
    (disable with "--vsys 0 --unit 8 --ignore")
  9: Network adapter: orig NAT, config 3, extra slot=0;type=NAT
  10: CD-ROM
    (disable with "--vsys 0 --unit 10 --ignore")
  11: IDE controller, type PIIX4
    (disable with "--vsys 0 --unit 11 --ignore")
  12: IDE controller, type PIIX4
    (disable with "--vsys 0 --unit 12 --ignore")
  13: SATA controller, type AHCI
    (disable with "--vsys 0 --unit 13 --ignore")
  14: Hard disk image: source image=debian-12.11-disk001.vmdk, target path=debian-12.11-disk001.vmdk, controller=13;port=0
    (change target path with "--vsys 0 --unit 14 --disk path";
    change controller with "--vsys 0 --unit 14 --controller <index>";
    change controller port with "--vsys 0 --unit 14 --port <n>";
    disable with "--vsys 0 --unit 14 --ignore")
0%...10%...20%...30%...40%...50%...60%...70%...80%...90%...100%
Successfully imported the appliance.
PS C:\Users\v.atanasov\template-vm>
PS C:\Users\v.atanasov\template-vm> VBoxManage modifyvm debian12-vagrant --cpus 1
PS C:\Users\v.atanasov\template-vm> VBoxManage modifyvm debian12-vagrant --memory 2048
PS C:\Users\v.atanasov\template-vm> VBoxManage modifyvm debian12-vagrant --audio-driver none
PS C:\Users\v.atanasov\template-vm> VBoxManage modifyvm debian12-vagrant --nic1 nat
PS C:\Users\v.atanasov\template-vm> VBoxManage modifyvm debian12-vagrant --natpf1 "SSH,tcp,,2222,,22"
PS C:\Users\v.atanasov\template-vm> VBoxManage startvm debian12-vagrant
Waiting for VM "debian12-vagrant" to power on...
VM "debian12-vagrant" has been successfully started.
```

### Prepare the Debian VM

## Update and install packages

```
sudo apt update && sudo apt upgrade
sudo apt-get -qq -y install \
    vim \
    curl \
    ca-certificates \
    git \
    wget \
    openssh-server
```

## Setup OpenSSH

```
sudo sed -i '/*PasswordAuthentication.*/d' /etc/ssh/sshd_config
echo 'PasswordAuthentication yes' | sudo tee -a /etc/ssh/sshd_config

sudo sed -i '/*UseDNS.*/d' /etc/ssh/sshd_config
echo 'UseDNS no' | sudo tee -a /etc/ssh/sshd_config

sudo service sshd restart
sudo service sshd status
```

## Add vagrant user to sudoers

```
echo "vagrant ALL=(ALL) NOPASSWD:ALL" | sudo tee -a /etc/sudoers.d/vagrant
sudo chmod 0440 /etc/sudoers.d/vagrant
```

## Add Vagrant public key

```
mkdir -p /home/vagrant/.ssh
curl -fsSL https://raw.githubusercontent.com/hashicorp/vagrant/master/keys/vagrant.pub -o
/home/vagrant/.ssh/authorized_keys
chmod 600 /home/vagrant/.ssh/authorized_keys
chown -R vagrant:vagrant /home/vagrant/.ssh
```

## Install VBoxGuestAdditions.

*Install deps necessary to compile kernel module*

```
sudo apt-get update
sudo apt-get install -y build-essential dkms bzip2 tar linux-headers-"$(uname -r)"
```

*Attach the media*

```
VBoxManage storageattach debian12-vagrant --storagectl "IDE" --port 1 --device 0 --type dvddrive --
medium additions
```

*Verify attachment*

```
VBoxManage showvminfo "debian12-vagrant"
```

*Install guest additions*

```
sudo mkdir -p /tmp/vbox;
sudo mount /dev/cdrom /tmp/vbox
sudo bash /tmp/vbox/VBoxLinuxAdditions.run
```

*Add the vagrant user to the vboxsf group*

```
usermod -aG vboxsf vagrant
```

*Unmount*

```
sudo umount /mnt;  
rm -rf /tmp/vbox;  
rm -f "$HOME_DIR"/*.iso;
```

*Remove kernel dev packages and compilers we no longer need*

```
sudo apt-get remove -y build-essential gcc g++ make libc6-dev dkms linux-headers-"$(uname -r)"
```

*Reboot*

Don't forget to unmount the VBoxGuestAdditions.iso media.

```
sudo reboot
```

*Verify*

```
lsmod | grep vbox
```

**hushlogin**

```
echo -n > /home/vagrant/.hushlogin
```

**Configure GRUB**

```
sudo sed -i 's/^GRUB_TIMEOUT=.*GRUB_TIMEOUT=0/;  
s/^GRUB_TIMEOUT_STYLE=.*GRUB_TIMEOUT_STYLE=hidden/' /etc/default/grub && sudo update-grub
```

**Cleanup**

```
sudo apt-get -y autoremove;  
sudo apt-get -y clean;  
  
export HISTSIZE=0
```

**Minimize**

```
count=$(df --sync -kP / | tail -n1 | awk -F ' ' '{print $4}')  
count=$((count - 1))  
sudo dd if=/dev/zero of=/tmp/whitespace bs=1M count=$count || echo "dd exit code $? is suppressed";  
sudo rm /tmp/whitespace
```

**Switch off the VM**

```
VBoxManage controlvm debian12-vagrant poweroff
```

**Create Vagrant box**

```
vagrant package --base debian12-vagrant --output debian-base.box
```

## Add the box to the local vagrant repository

```
vagrant box add debian-base ./debian-base.box
```

```
PS C:\Users\v.atanasov\softuni\softuni-devops-and-cloud-march-2025\202506-containerization-and-infrastructure\20250617-devops-and-containerization\hw-m1> vagrant package --box=debian12-vagrant --output=debian-base.box
==> debian12-vagrant: Exporting VM...
==> debian12-vagrant: Compressing package to: C:\Users\v.atanasov\softuni\softuni-devops-and-cloud-march-2025\202506-containerization-and-infrastructure\20250617-devops-and-containerization\hw-m1\debian-base.box
PS C:\Users\v.atanasov\softuni\softuni-devops-and-cloud-march-2025\202506-containerization-and-infrastructure\20250617-devops-and-containerization\hw-m1> vagrant box add debian-base ./debian-base.box
==> box: Box file was not detected as metadata. Adding it directly...
==> box: Adding box 'debian-base' (v0) for provider:
box: Unpacking necessary files from: file:///C:/Users/v.atanasov\softuni\softuni-devops-and-cloud-march-2025\202506-containerization-and-infrastructure\20250617-devops-and-containerization\hw-m1\debian-base.box
box:
==> box: Successfully added box 'debian-base' (v0) for 'v'!
PS C:\Users\v.atanasov\softuni\softuni-devops-and-cloud-march-2025\202506-containerization-and-infrastructure\20250617-devops-and-containerization\hw-m1>
PS C:\Users\v.atanasov\softuni\softuni-devops-and-cloud-march-2025\202506-containerization-and-infrastructure\20250617-devops-and-containerization\hw-m1> |
```

## Bgapp Implementation with Custom Vagrant Box

Brows the 01-virtualization folder to explore the Vagrantfile.

```
PS C:\Users\v.atanasov\softuni\softuni-devops-and-cloud-march-2025\202506-containerization-and-infrastructure\20250617-devops-and-containerization\hw-m1> vagrant up
Bringing machine 'web' up with 'virtualbox' provider...
Bringing machine 'db' up with 'virtualbox' provider...
==> web: Importing base box 'debian-base'...
==> web: Matching MAC address for NAT networking...
==> web: Setting the name of the VM: hw-m1_web_1749716763871_27895
==> web: Clearing any previously set network interfaces...
==> web: Preparing network interfaces based on configuration...
web: Adapter 1: nat
web: Adapter 2: hostonly
==> web: Forwarding ports...
web: 80 (guest) => 8080 (host) (adapter 1)
web: 22 (guest) => 2222 (host) (adapter 1)
==> web: Booting VM...
==> web: Waiting for machine to boot. This may take a few minutes...
web: SSH address: 127.0.0.1:2222
web: SSH username: vagrant
web: SSH auth method: private key
==> web: Machine booted and ready!
==> web: Checking for guest additions in VM...
==> web: Setting hostname...
==> web: Configuring and enabling network interfaces...
==> web: Running provisioner: shell...
web: Running: C:/Users/VDB51~1.ATA/AppData/Local/Temp/vagrant-shell120250612-759520-wo88s0.sh
web: * Add hosts ...
web: 192.168.89.100 web.do1.lab web
web: 192.168.89.101 db.do1.lab db
web: * Update and install software ...

.....

web: * Enable and start Apache ...
web: Synchronizing state of apache2.service with SysV service script with /lib/systemd/systemd-sysv-install.
web: Executing: /lib/systemd/systemd-sysv-install enable apache2
web: * Cloning frontend ...
web: Cloning into 'bgapp'...
web: * Clean up /var/www/html/ ...
web: removed '/var/www/html/index.html'
web: * Copy web site files to /var/www/html/ ...
web: total 32K
web: drwxr-xr-x 2 root root 4.0K Jun 12 11:28 .
web: drwxr-xr-x 3 root root 4.0K Jun 12 11:27 ..
web: -rw-r--r-- 1 root root 13K Jun 12 11:28 bulgaria-map.png
web: -rw-r--r-- 1 root root 105 Jun 12 11:28 config.php
web: -rw-r--r-- 1 root root 1.9K Jun 12 11:28 index.php
==> db: Importing base box 'debian-base'...
```

```

==> db: Matching MAC address for NAT networking...
==> db: Setting the name of the VM: hw-m1_db_1749716902477_51810
==> db: Fixed port collision for 22 => 2222. Now on port 2200.
==> db: Clearing any previously set network interfaces...
==> db: Preparing network interfaces based on configuration...
    db: Adapter 1: nat
    db: Adapter 2: hostonly
==> db: Forwarding ports...
    db: 22 (guest) => 2200 (host) (adapter 1)
==> db: Booting VM...
==> db: Waiting for machine to boot. This may take a few minutes...
    db: SSH address: 127.0.0.1:2200
    db: SSH username: vagrant
    db: SSH auth method: private key
==> db: Machine booted and ready!
==> db: Checking for guest additions in VM...
==> db: Setting hostname...
==> db: Configuring and enabling network interfaces...
==> db: Running provisioner: shell...
    db: Running: C:/Users/VDB51~1.ATA/AppData/Local/Temp/vagrant-shell120250612-759520-c28o56.sh
    db: * Add hosts ...
    db: 192.168.89.100 web.do1.lab web
    db: 192.168.89.101 db.do1.lab db
    db: * Update and install software ...

    .....

    db: Updating mariadb configs in /etc/mysql/mariadb.conf.d/50-server.cnf
    db: Updated mariadb bind address in /etc/mysql/mariadb.conf.d/50-server.cnf to 0.0.0.0 to allow
external connections.
    db: Restarting mariadb ...
    db: * Cloning backend ...
    db: Cloning into 'bgapp'...
    db: * Create and load the database ...

```

# Факти за България



Площ 110 993.6 кв.км.

Население 6 838 937

Столица София

## Големи градове

София	1248452
Пловдив	343070
Варна	332686
Бургас	199571
Русе	137533
Стара Загора	124599
Плевен	93214
Сливен	83740
Добрич	79269
Шумен	72342

Processed by web on 2025-06-12-08-47-38

## Containerization

Brows 02-containerization folder to explore the Vagrantfile. In the folder are placed bash scripts for installing and configuring docker and docker tools.

Run a container named **homework** based on the image **shekeriev/animal-stories** interactively

```
docker run -it --name homework shekeriev/animal-stories
```

Find the file **animal-stories.txt** that is inside the container

```
find -type f -name animal-stories.txt
```

Find all the rows about **tigers**

```
find -type f -name animal-stories.txt -exec grep -i tigers {} \;
```

List all the **unique colors** sorted in reverse (descending) order

```
find -type f -name animal-stories.txt -exec sh -c 'cut -d- -f1 "{}" | sort -r | uniq' \;
```

```
root@3acdf18489a2:/# find -type f -name animal-stories.txt
./etc/cloud/animal-stories.txt
root@3acdf18489a2:/# find -type f -name animal-stories.txt -exec grep -i tigers {} \;
white-tigers-are-good-and-dream-cucumbers
purple-tigers-are-lazy-and-smell-kiwis
brown-tigers-are-clever-and-dream-apples
white-tigers-are-fast-and-like-bananas
brown-tigers-are-bad-and-smell-kiwis
root@3acdf18489a2:/# find -type f -name animal-stories.txt -exec sh -c 'cut -d- -f1 "{}" | sort -r | uniq' \;
yellow
white
purple
pink
orange
green
gray
brown
blue
black
root@3acdf18489a2:/# |
```