Лабораторная работа №1

Введение в Mininet

Ким Реачна[1]

14 ноября, 2023, Москва, Россия

[1]Российский Университет Дружбы Народов

Цели и задачи

Цель лабораторной работы

Основной целью работы является развёртывание в системе виртуализации mininet, знакомство с основными командами для работы с Mininet через командную строку и через графический интерфейс.

Процесс выполнения лабораторной работы

Настройка образа VirtualBox

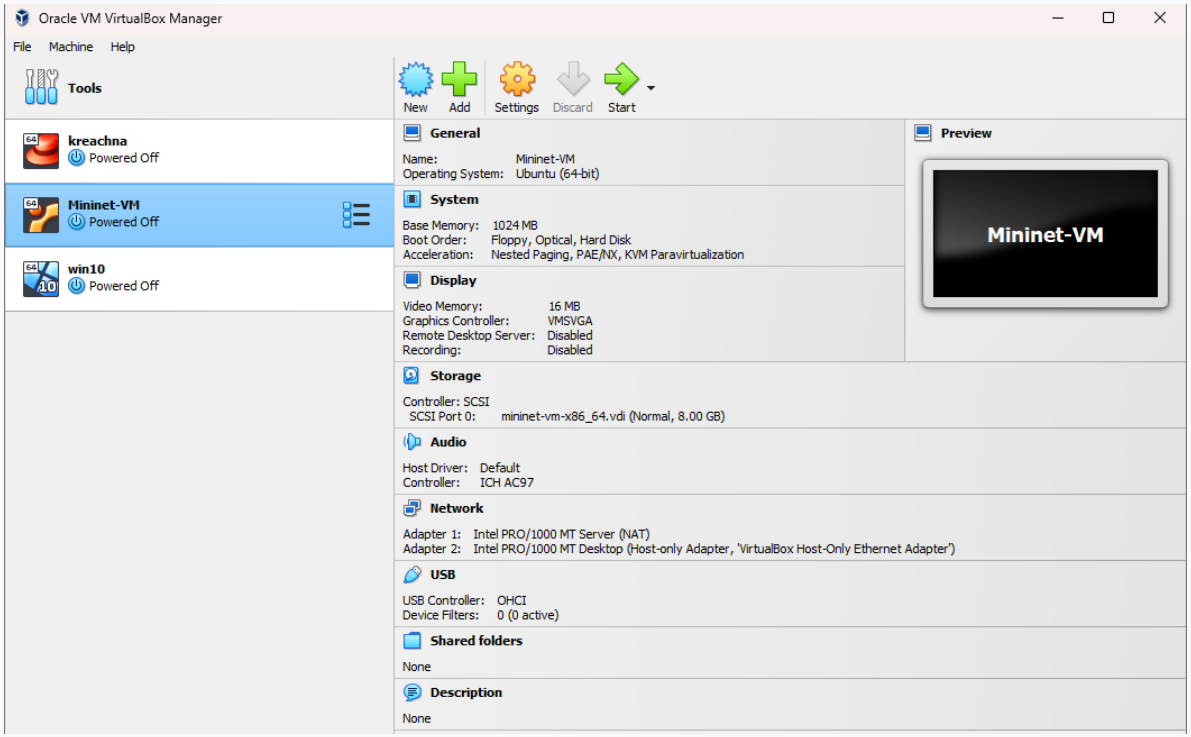

Рис. 1: Настройка образа mininet

Подключение к машине

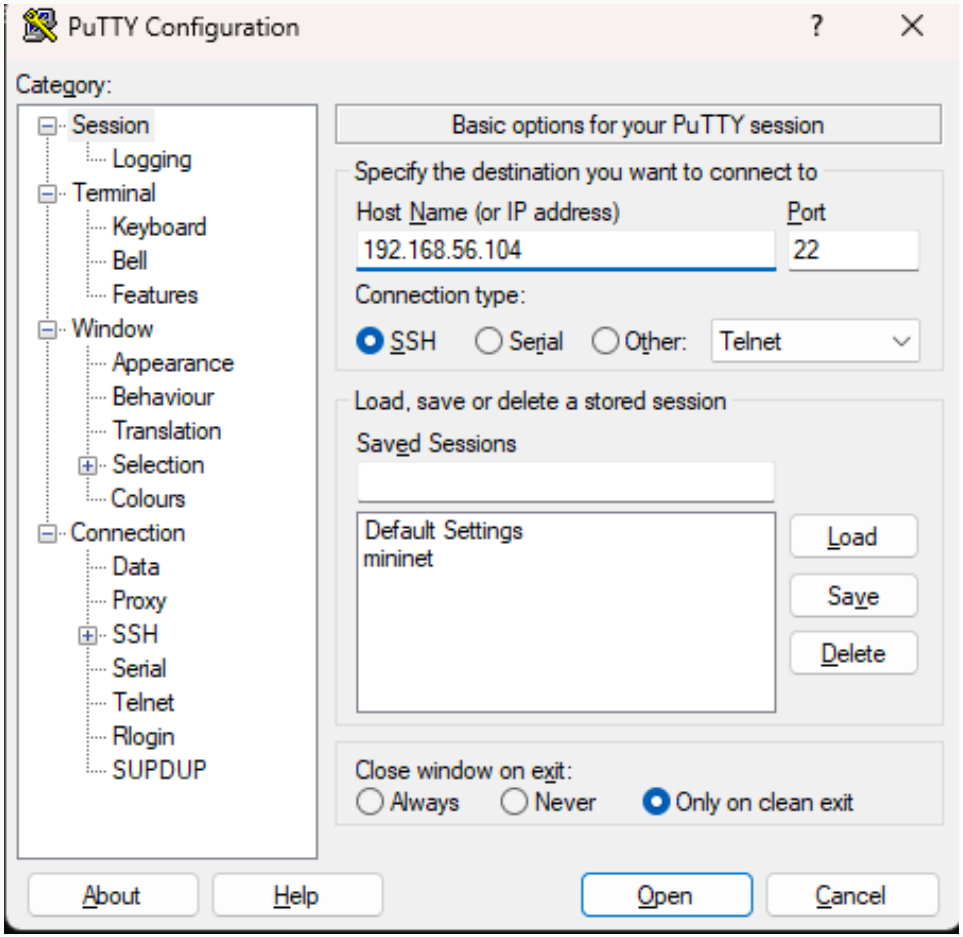

Рис. 2: Подключение к машине

Настройка доступа к Интернет

```
mininet@mininet-vm:~$ sudo dhclient eth1
mininet@mininet-vm:~$ ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.56.104  netmask 255.255.255.0  broadcast 192.168.56.255
        ether 08:00:27:fd:6d:ca  txqueuelen 1000  (Ethernet)
        RX packets 166  bytes 21711 (21.7 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 112  bytes 18719 (18.7 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 10.0.2.15  netmask 255.255.255.0  broadcast 10.0.2.255
        ether 08:00:27:86:d6:24  txqueuelen 1000  (Ethernet)
        RX packets 65  bytes 7261 (7.2 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 67  bytes 6528 (6.5 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 343  bytes 26858 (26.8 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 343  bytes 26858 (26.8 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

Рис. 3: Настройка доступа к Интернет

Обновление версии Mininet

```
mininet@mininet-vm:~$ mv ~/mininet ~/mininet.orig
mininet@mininet-vm:~$ cd ~
mininet@mininet-vm:~$ mn --version
2.3.0
mininet@mininet-vm:~$ cd ~
mininet@mininet-vm:~$ git clone https://github.com/mininet/mininet.git
Cloning into 'mininet'...
remote: Enumerating objects: 10388, done.
remote: Counting objects: 100% (234/234), done.
remote: Compressing objects: 100% (140/140), done.
remote: Total 10388 (delta 129), reused 175 (delta 92), pack-reused 10154
Receiving objects: 100% (10388/10388), 3.36 MiB | 4.30 MiB/s, done.
Resolving deltas: 100% (6910/6910), done.
mininet@mininet-vm:~$ cd ~/mininet
mininet@mininet-vm:~/mininet$ sudo make install
cc -Wall -Wextra  \
-DVERSION=\"`PYTHONPATH=. python -B bin/mn --version 2>&1`\" mnexec.c -o mnexec
install -D mnexec /usr/bin/mnexec
PYTHONPATH=. help2man -N -n "create a Mininet network." \
--no-discard-stderr "python -B bin/mn" -o mn.1
help2man -N -n "execution utility for Mininet." \
-h "-h" -v "-v" --no-discard-stderr ./mnexec -o mnexec.1
install -D -t /usr/share/man/man1 mn.1 mnexec.1
python -m pip uninstall -y mininet || true
Found existing installation: mininet 2.3.0
Uninstalling mininet-2.3.0:
  Successfully uninstalled mininet-2.3.0
python -m pip install .
Processing /home/mininet/mininet
Requirement already satisfied: setuptools in /usr/lib/python3/dist-packages (from mininet==2.3.
1b4) (45.2.0)
Building wheels for collected packages: mininet
  Building wheel for mininet (setup.py) ... done
  Created wheel for mininet: filename=mininet-2.3.1b4-py3-none-any.whl size=160942 sha256=0ef19
e48b7467443838bfed790fbadbf1fd706ed4d063e588ac186c36f2981ce
  Stored in directory: /tmp/pip-ephem-wheel-cache-i94m7kjb/wheels/cd/7d/a7/aafe1b3eaff31efd6ba4
e2ea6c9690a717bdf739db6cfe8d45
Successfully built mininet
Installing collected packages: mininet
Successfully installed mininet-2.3.1b4
mininet@mininet-vm:~/mininet$ mn --version
2.3.1b4
```

Рис. 4: Обновление версии Mininet

Настройка соединения X11 для суперпользователя

```
mininet@mininet-vm:~$ xauth list $DISPLAY
mininet-vm/unix:10  MIT-MAGIC-COOKIE-1  4f04e38fa64e0dd23b1a77dcf3d90ed0
mininet@mininet-vm:~$ sudo -i
root@mininet-vm:~# xauth list
xauth:  file /root/.Xauthority does not exist
root@mininet-vm:~# xauth add mininet-vm/unix:10  MIT-MAGIC-COOKIE-1  4f04e38fa64e0dd23b1a77dcf3
d90ed0
xauth:  file /root/.Xauthority does not exist
root@mininet-vm:~# xauth list $DISPLAY
mininet-vm/unix:10  MIT-MAGIC-COOKIE-1  4f04e38fa64e0dd23b1a77dcf3d90ed0
root@mininet-vm:~# logout
```

Рис. 5: MIT magic cookie

Работа с Mininet с помощью командной строки

```
mininet@mininet-vm:~$ sudo mn
*** Creating network
*** Adding controller
*** Adding hosts:
h1 h2
*** Adding switches:
s1
*** Adding links:
(h1, s1) (h2, s1)
*** Configuring hosts
h1 h2
*** Starting controller
c0
*** Starting 1 switches
s1 ...
*** Starting CLI:
```

Рис. 6: Создание топологии в терминале

Работа с Mininet с помощью командной строки

```
mininet> h1 ping 10.0.0.2
PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data.
64 bytes from 10.0.0.2: icmp_seq=1 ttl=64 time=2.44 ms
64 bytes from 10.0.0.2: icmp_seq=2 ttl=64 time=0.209 ms
64 bytes from 10.0.0.2: icmp_seq=3 ttl=64 time=0.041 ms
64 bytes from 10.0.0.2: icmp_seq=4 ttl=64 time=0.045 ms
64 bytes from 10.0.0.2: icmp_seq=5 ttl=64 time=0.037 ms
64 bytes from 10.0.0.2: icmp_seq=6 ttl=64 time=0.032 ms
64 bytes from 10.0.0.2: icmp_seq=7 ttl=64 time=0.069 ms
64 bytes from 10.0.0.2: icmp_seq=8 ttl=64 time=0.033 ms
64 bytes from 10.0.0.2: icmp_seq=9 ttl=64 time=0.031 ms
64 bytes from 10.0.0.2: icmp_seq=10 ttl=64 time=0.047 ms
64 bytes from 10.0.0.2: icmp_seq=11 ttl=64 time=0.032 ms
64 bytes from 10.0.0.2: icmp_seq=12 ttl=64 time=0.036 ms
^C
--- 10.0.0.2 ping statistics ---
12 packets transmitted, 12 received, 0% packet loss, time 11238ms
rtt min/avg/max/mdev = 0.031/0.254/2.439/0.660 ms
```

Рис. 7: Проверка связности

Построение и эмуляция сети в Mininet с использованием графического интерфейса

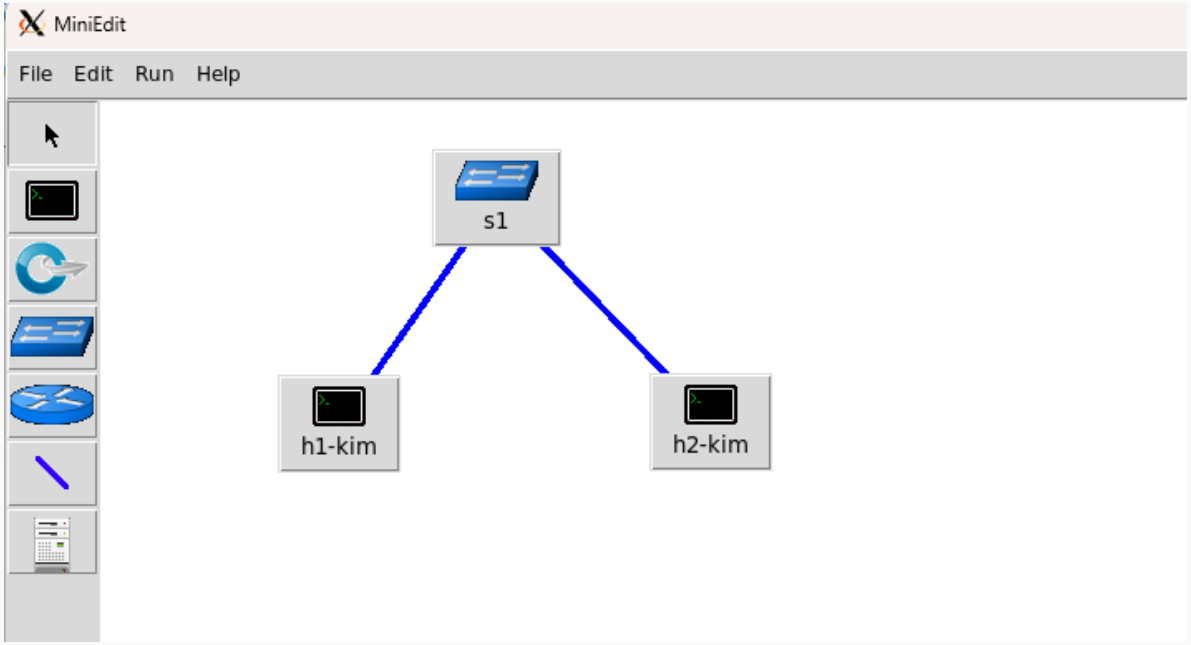

Рис. 8: Построение топологии в графическом интерфейсе

Построение и эмуляция сети в Mininet с использованием графического интерфейса

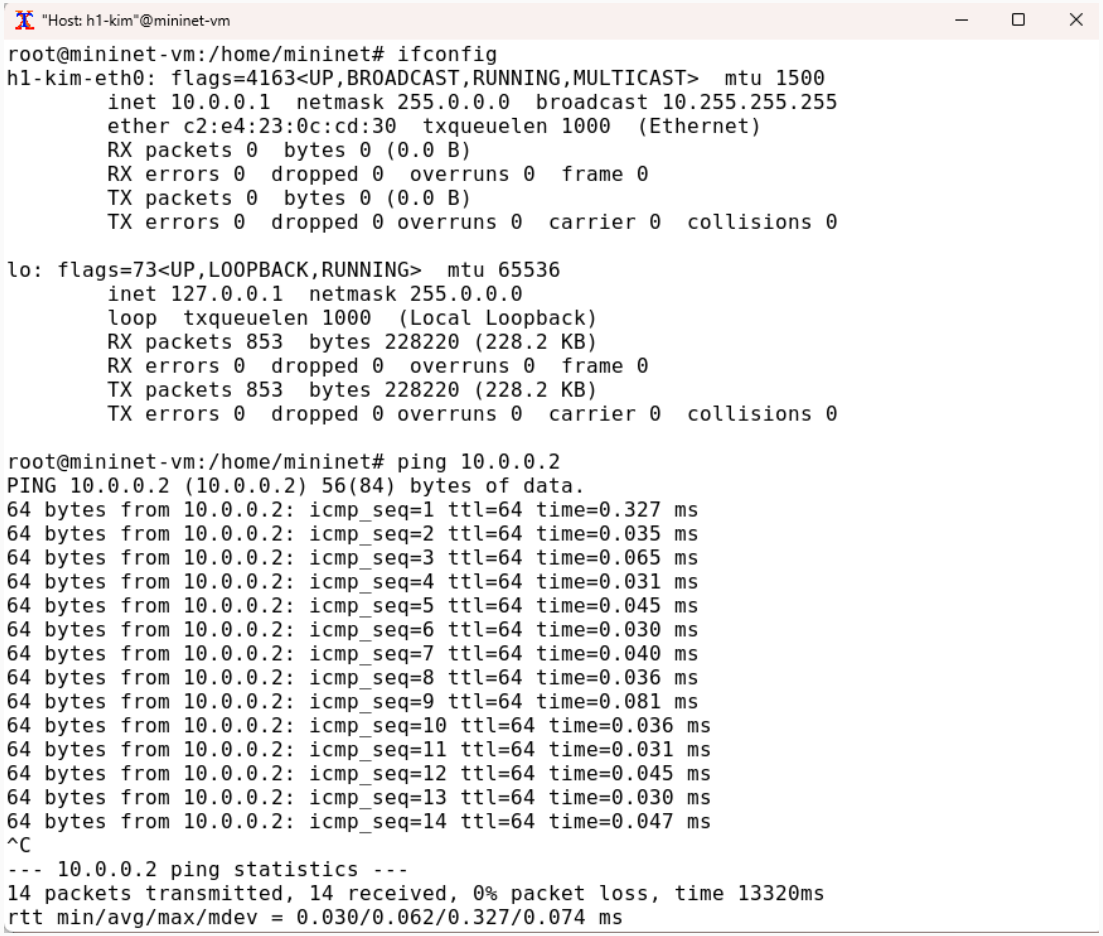

Рис. 9: Проверка связности

Выводы по проделанной работе

Вывод

Я развернула в системе виртуализации mininet, знакомство с основными командами для работы с Mininet через командную строку и через графический интерфейс.