Отчёт по лабораторной работе №1 "Установка ContainerLab и развертывание тестовой сети связи"

Цель: ознакомиться с инструментом ContainerLab и методами работы с ним, изучить работу VLAN, IP адресации и т.д.

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Ход работы

1. Устройства в сети:

```
Run 'containerlab version upgrade' to upgrade or go check other installation options at https://containerlab.dev/
+---+------------------------+--------------+-----------------------------+--------+---------+-----------------+
| # |          Name          | Container ID |            Image            |  Kind  |  State  |  IPv4 Address   |
+---+------------------------+--------------+-----------------------------+--------+---------+-----------------+
| 1 | clab-config-PC1        | fd2bb8aedf46 | ubuntu:latest               | linux  | running | 172.20.20.30/24 |
| 2 | clab-config-PC2        | 970a35ae7e1e | ubuntu:latest               | linux  | running | 172.20.20.31/24 |
| 3 | clab-config-RO1        | 8ed27b66c982 | vrnetlab/vr-routeros:6.47.9 | vr-ros | running | 172.20.20.20/24 |
| 4 | clab-config-SWO01.L3.01 | 42ec94192ff4 | vrnetlab/vr-routeros:6.47.9 | vr-ros | running | 172.20.20.21/24 |
| 5 | clab-config-SWO02.L3.01 | f4bc7c17838b | vrnetlab/vr-routeros:6.47.9 | vr-ros | running | 172.20.20.22/24 |
| 6 | clab-config-SWO02.L3.02 | 5c1901cd7ae3 | vrnetlab/vr-routeros:6.47.9 | vr-ros | running | 172.20.20.23/24 |
+---+------------------------+--------------+-----------------------------+--------+---------+-----------------+
```

2. Конфигурации устройств: Роутер R01

```
/system identity
set name=RO1
[admin@RO1] > interface vlan add interface=ether2 name=vlan10 vlan-id=10
[admin@RO1] > interface vlan add interface=ether2 name=vlan10 vlan-id=10
failure: already have interface with such name
[admin@RO1] > interface vlan add interface=ether2 name=vlan20 vlan-id=20
[admin@RO1] > ip address add interface=vlan10 address=192.168.100.1/24
[admin@RO1] > ip address add interface=vlan20 address=192.168.120.1/24
[admin@RO1] > export
# nov/21/2022 18:52:54 by RouterOS 6.47.9
# software id =
#
#
#
/interface vlan
add interface=ether2 name=vlan10 vlan-id=10
add interface=ether2 name=vlan20 vlan-id=20
/interface wireless security-profiles
set [ find default=yes ] supplicant-identity=MikroTik
/ip address
add address=172.31.255.30/30 interface=ether1 network=172.31.255.28
add address=192.168.100.1/24 interface=vlan10 network=192.168.100.0
add address=192.168.120.1/24 interface=vlan20 network=192.168.120.0
/ip dhcp-client
add disabled=no interface=ether1
/system identity
```

Коммутатор первого уровня SW01.L3.01

```
[admin@SWO01.L3.01] > interface vlan add interface=ether2 name=vlan10 vlan-id=10
[admin@SWO01.L3.01] > interface vlan add interface=ether2 name=vlan20 vlan-id=20
[admin@SWO01.L3.01] > interface vlan add interface=ether3 name=vlan110 vlan-id=10
[admin@SWO01.L3.01] > interface vlan add interface=ether4 name=vlan220 vlan-id=20
[admin@SWO01.L3.01] > interface bridge add name=bridge10
[admin@SWO01.L3.01] > interface bridge add name=bridge20
[admin@SWO01.L3.01] > interface bridge port add interface=vlan10 bridge=bridge10
[admin@SWO01.L3.01] > interface bridge port add interface=vlan20 bridge=bridge20
[admin@SWO01.L3.01] > interface bridge port add interface=vlan110 bridge=bridge10
[admin@SWO01.L3.01] > interface bridge port add interface=vlan220 bridge=bridge20
[admin@SWO01.L3.01] > export
# nov/21/2022 18:57:38 by RouterOS 6.47.9
# software id =
#
#
#
/interface bridge
add name=bridge10
add name=bridge20
/interface vlan
add interface=ether2 name=vlan10 vlan-id=10
add interface=ether2 name=vlan20 vlan-id=20
add interface=ether3 name=vlan110 vlan-id=10
add interface=ether4 name=vlan220 vlan-id=20
/interface wireless security-profiles
set [ find default=yes ] supplicant-identity=MikroTik
/interface bridge port
add bridge=bridge10 interface=vlan10
add bridge=bridge20 interface=vlan20
add bridge=bridge10 interface=vlan110
add bridge=bridge20 interface=vlan220
/ip address
add address=172.31.255.30/30 interface=ether1 network=172.31.255.28
/ip dhcp-client
add disabled=no interface=ether1
/system identity
set name=SWO01.L3.01
[admin@SWO01.L3.01] >
```

Коммутатор второго уровня SW02.L3.01

```
[admin@SWO02.L3.01] > interface vlan add interface=ether2 name=vlan10 vlan-id=10
[admin@SWO02.L3.01] > interface bridge add name=bridge10
[admin@SWO02.L3.01] > interface bridge port add interface=vlan10 bridge=10
input does not match any value of bridge
[admin@SWO02.L3.01] > interface bridge port add interface=vlan10 bridge=bridge10
[admin@SWO02.L3.01] > interface bridge port add interface=ether3 bridge=bridge10
[admin@SWO02.L3.01] > export
# nov/21/2022 19:01:26 by RouterOS 6.47.9
# software id =
#
#
#
/interface bridge
add name=bridge10
/interface vlan
add interface=ether2 name=vlan10 vlan-id=10
/interface wireless security-profiles
set [ find default=yes ] supplicant-identity=MikroTik
/interface bridge port
add bridge=bridge10 interface=vlan10
add bridge=bridge10 interface=ether3
/ip address
add address=172.31.255.30/30 interface=ether1 network=172.31.255.28
/ip dhcp-client
add disabled=no interface=ether2
/system identity
set name=SWO02.L3.01
[admin@SWO02.L3.01] >
```

Коммутатор второго уровня SW02.L3.02

```
[admin@SWO02.L3.02] > interface vlan add interface=ether2 name=vlan20 vlan-id=20
[admin@SWO02.L3.02] > interface bridge add name bridge20
[admin@SWO02.L3.02] > interface bridge add name=bridge20
failure: already have interface with such name
[admin@SWO02.L3.02] > interface bridge port add interface=vlan20 bridge=bridge20
[admin@SWO02.L3.02] > interface bridge port add interface=ether3 bridge=bridge20
[admin@SWO02.L3.02] > export
# nov/21/2022 19:03:42 by RouterOS 6.47.9
# software id =
#
#
#
/interface bridge
add name=bridge20
/interface vlan
add interface=ether2 name=vlan20 vlan-id=20
/interface wireless security-profiles
set [ find default=yes ] supplicant-identity=MikroTik
/interface bridge port
add bridge=bridge20 interface=vlan20
add bridge=bridge20 interface=ether3
/ip address
add address=172.31.255.30/30 interface=ether1 network=172.31.255.28
/ip dhcp-client
add disabled=no interface=ether1
/system identity
set name=SWO02.L3.02
[admin@SWO02.L3.02] >
```

Найстройка DHCP

```
dmin@RO1] > ip pool add name=pool10 ranges=192.168.100.2-192.168.100.254
dmin@RO1] > ip pool add name=pool20 ranges=192.168.120.2-192.168.120.254
dmin@RO1] > ip dhcp-server network add address=192.168.100.0/24 gateway=192.168.100.1
dmin@RO1] > ip dhcp-server network add address=192.168.120.0/24 gateway=192.168.120.1
dmin@RO1] > ip dhcp-server add address-pool=pool10 disabled=no interface=vlan10 name=server1
dmin@RO1] > ip dhcp-server add address-pool=pool20 disabled=no interface=vlan20 name=server2
dmin@RO1] > export
ov/21/2022 19:14:02 by RouterOS 6.47.9
oftware id =



nterface vlan
 interface=ether2 name=vlan10 vlan-id=10
 interface=ether2 name=vlan20 vlan-id=20
nterface wireless security-profiles
 [ find default=yes ] supplicant-identity=MikroTik
 pool
 name=pool10 ranges=192.168.100.2-192.168.100.254
 name=pool20 ranges=192.168.120.2-192.168.120.254
 dhcp-server
 address-pool=pool10 disabled=no interface=vlan10 name=server1
 address-pool=pool20 disabled=no interface=vlan20 name=server2
 address
 address=172.31.255.30/30 interface=ether1 network=172.31.255.28
 address=192.168.100.1/24 interface=vlan10 network=192.168.100.0
 address=192.168.120.1/24 interface=vlan20 network=192.168.120.0
 dhcp-client
 disabled=no interface=ether1
 dhcp-server network
 address=192.168.100.0/24 gateway=192.168.100.1
 address=192.168.120.0/24 gateway=192.168.120.1
ystem identity
 name=RO1
dmin@RO1] >
```

```
admin@SWO01.L3.01] > ip dhcp-client add disabled=no interface=bridge10
admin@SWO01.L3.01] > ip dhcp-client add disabled=no interface=bridge20
admin@SWO01.L3.01] > export
 nov/21/2022 19:15:38 by RouterOS 6.47.9
 software id =



interface bridge
 name=bridge10
 name=bridge20
interface vlan
 interface=ether2 name=vlan10 vlan-id=10
 interface=ether2 name=vlan20 vlan-id=20
 interface=ether3 name=vlan110 vlan-id=10
 interface=ether4 name=vlan220 vlan-id=20
interface wireless security-profiles
 [ find default=yes ] supplicant-identity=MikroTik
interface bridge port
 bridge=bridge10 interface=vlan10
 bridge=bridge20 interface=vlan20
 bridge=bridge10 interface=vlan110
 bridge=bridge20 interface=vlan220
ip address
 address=172.31.255.30/30 interface=ether1 network=172.31.255.28
ip dhcp-client
 disabled=no interface=ether1
```

```
dd disabled=no interface=bridge10
dd disabled=no interface=bridge20
ystem identity
et name=SWO01.L3.01
dmin@SWO01.L3.01] >
```

```
[admin@SWO02.L3.01] > ip dhcp-client add disabled=no interface=bridge10
[admin@SWO02.L3.01] > export
# nov/21/2022 19:16:47 by RouterOS 6.47.9
# software id =
#
#
#
/interface bridge
add name=bridge10
/interface vlan
add interface=ether2 name=vlan10 vlan-id=10
/interface wireless security-profiles
set [ find default=yes ] supplicant-identity=MikroTik
/interface bridge port
add bridge=bridge10 interface=vlan10
add bridge=bridge10 interface=ether3
/ip address
add address=172.31.255.30/30 interface=ether1 network=172.31.255.28
/ip dhcp-client
add disabled=no interface=ether2
add disabled=no interface=bridge10
/system identity
set name=SWO02.L3.01
[admin@SWO02.L3.01] >
```

```
[admin@SWO02.L3.02] > ip dhcp-client add disabled=no interface=bridge20
[admin@SWO02.L3.02] > export
# nov/21/2022 19:17:42 by RouterOS 6.47.9
# software id =
#
#
#
/interface bridge
add name=bridge20
/interface vlan
add interface=ether2 name=vlan20 vlan-id=20
/interface wireless security-profiles
set [ find default=yes ] supplicant-identity=MikroTik
/interface bridge port
add bridge=bridge20 interface=vlan20
add bridge=bridge20 interface=ether3
/ip address
add address=172.31.255.30/30 interface=ether1 network=172.31.255.28
/ip dhcp-client
add disabled=no interface=ether1
add disabled=no interface=bridge20
/system identity
set name=SWO02.L3.02
[admin@SWO02.L3.02] >
```

Проверка пингов

```
[admin@RO1] > ip dhcp-server lease print
Flags: X - disabled, R - radius, D - dynamic, B - blocked
 #   ADDRESS                 MAC-ADDRESS       HOST-NAME       SERVER       RATE-LIMIT
 0 D 192.168.100.254         52:54:00:E5:25:01 SWO01.L3.01     server1
 1 D 192.168.120.254         52:54:00:E5:25:01 SWO01.L3.01     server2
 2 D 192.168.100.253         52:54:00:8B:57:01 SWO02.L3.01     server1
 3 D 192.168.120.253         52:54:00:92:EA:01 SWO02.L3.02     server2
[admin@RO1] >
```

```
[admin@RO1] > ping 192.168.100.254
  SEQ HOST                                     SIZE TTL TIME  STATUS
    0 192.168.100.254                            56  64 19ms
    1 192.168.100.254                            56  64 1ms
    2 192.168.100.254                            56  64 1ms
    sent=3 received=3 packet-loss=0% min-rtt=1ms avg-rtt=7ms max-rtt=19ms

[admin@RO1] >
```

```
[admin@SWO02.L3.02] > ping 192.168.100.253
  SEQ HOST                                     SIZE TTL TIME  STATUS
    0 192.168.100.253                            56  63 14ms
    1 192.168.100.253                            56  63 5ms
    2 192.168.100.253                            56  63 5ms
    sent=3 received=3 packet-loss=0% min-rtt=5ms avg-rtt=8ms max-rtt=14ms

[admin@SWO02.L3.02] > ping 192.168.100.1
  SEQ HOST                                     SIZE TTL TIME  STATUS
    0 192.168.100.1                              56  64 4ms
    1 192.168.100.1                              56  64 2ms
    2 192.168.100.1                              56  64 2ms
    sent=3 received=3 packet-loss=0% min-rtt=2ms avg-rtt=2ms max-rtt=4ms

[admin@SWO02.L3.02] >
```

Добавление пользователя

```
[admin@RO1] > user add name=R1_main password=123 group=full
[admin@RO1] > quitConnection to 172.20.20.20 closed.
vlad@vlad-VirtualBox:~/vrnetlab/routeros$ ssh R1_main@172.20.20.20
R1_main@172.20.20.20's password:
```

```
[admin@SWO01.L3.01] > user add name=SW_1 password=123 group=full
[admin@SWO01.L3.01] > quitConnection to 172.20.20.21 closed.
```

```
[admin@SWO02.L3.01] > user add name=SW_2 password=123 group=full
[admin@SWO02.L3.01] > quitConnection to 172.20.20.22 closed.
```

```
/command        Use command at the base level

[admin@SWO02.L3.02] > user add name=SW_3 password=123 group=full
[admin@SWO02.L3.02] > quitConnection to 172.20.20.23 closed.
```

Вывод

В ходе лабораторной работы я познакомился с инструментом Containerlab. С помощью файла конфигурации сети .yaml была развернута сеть из роутера, 3-х коммутаторов и 2х ПК. В сети настроены 2 vlan и 2 dhcp-сервера для автоматической раздачи ip адресов.