Troubleshooting OpenStack Neutron with ML2/OVN backend driver

Workshop
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Agenda

A bit of theory

- Service layout
- Differences between ML2/OVS and ML2/OVN
- Neutron - OVN resources mappings

Basic exercises on Devstack

- Network and VM
- Router, SNAT and Floating IP

Troubleshooting common issues on Devstack

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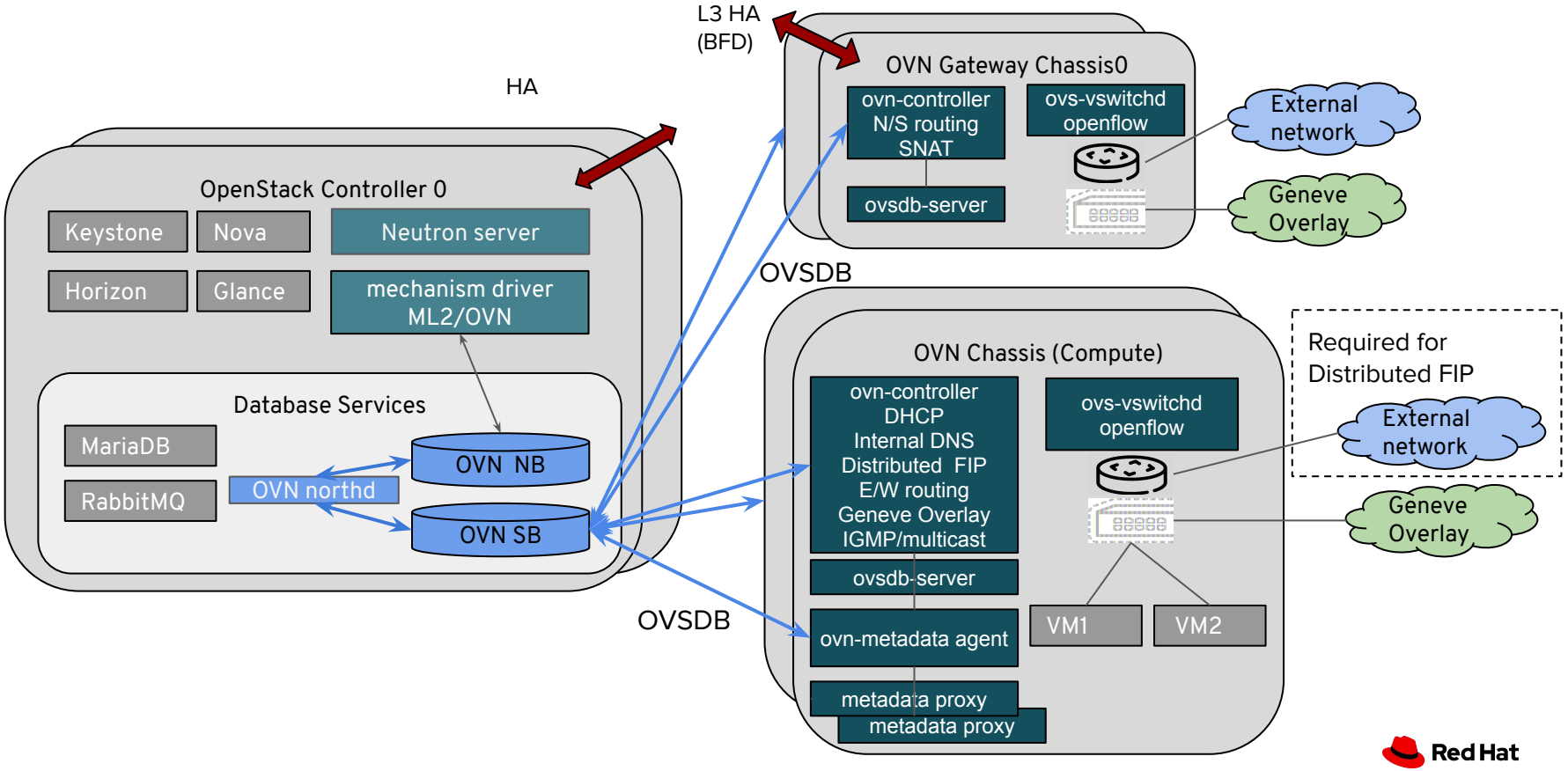
Lab preparation

Etherpad: https://etherpad.opendev.org/p/vSummit2020_TroubleshootingOpenStackNeutron

```
$ git clone https://github.com/danalsan/vagrants.git
$ # for more details, please check vagrants/devstack-workshop/README.md
$ cd vagrants/devstack-workshop
$ vagrant up
```

A bit of theory

OVN architecture: node functionality



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Differences between Neutron ML2/OVS and ML2/OVN

	ML2/OVS	**ML2/OVN**
Communication	RabbitMQ	OVSDB protocol
Metadata	agent runs together with DHCP agent or L3 agent	agent runs locally on compute nodes
L3	Agent runs on network and compute nodes (DVR)	No neutron-l3-agent needed, all is handled by OVN
DHCP	Agents runs on network nodes	No DHCP agents, DHCP service provided by OpenFlow, distributed across compute nodes

More differences at https://docs.openstack.org/neutron/latest/ovn/faq/index.html

Mapping of the Neutron resources in the OVN

Neutron	OVN Northbound
Port	Logical_Switch_Port / Logical_Router_Port
Network	Logical_Switch
Router	Logical_Router
Subnet	DHCP_Options (if -native- DHCP is enabled)
Security Group	Port_Group
Security Group Rule	ACL
Floating IP	NAT (dnat_and_snat type)

Basic exercises

Neutron Network - OVN Logical switch

```
[vagrant@central ~]$ openstack network list
+--------------------------------------+---------+--------------------------------------------------------------------------+
| ID                                   | Name    | Subnets                                                                  |
+--------------------------------------+---------+--------------------------------------------------------------------------+
| a36c5f31-7969-4498-b3bd-13f1fdcc480b | blue    | 212e0062-946b-47cd-8f18-f3e466b84ef1                                     |
| d0cab0d1-16e5-4785-b661-950d1975c468 | red     | fe642a2e-a34c-4551-a00d-207759fae7bc                                     |
+--------------------------------------+---------+--------------------------------------------------------------------------+

[root@central ~]# ovn-nbctl ls-list
baa76ad8-f475-4c56-b979-4aee458d8689 (neutron-2e50ef7f-befb-4c8a-b561-9d27b92d3b9b)
7ac80946-b4ea-4788-8bac-74c12f699659 (neutron-87027e7e-6a08-4174-b631-e2054c27f0bd)
d7d93075-e0ac-4a62-977d-98667a867af2 (neutron-a36c5f31-7969-4498-b3bd-13f1fdcc480b)
6055b3af-75ae-4e50-94d0-1188f97e38df (neutron-d0cab0d1-16e5-4785-b661-950d1975c468)
03b851c6-1690-4326-9941-6b41ef5fb2ac (neutron-d2d2929b-0c1e-4479-9953-9a4128592317)

[vagrant@central ~]$ ovn-nbctl show neutron-d0cab0d1-16e5-4785-b661-950d1975c468
switch d7d66148-9494-40e7-a468-15ad95b53d97 (neutron-d0cab0d1-16e5-4785-b661-950d1975c468) (aka red)
    port f1e08402-f77c-440a-90ec-a047cd09fc59
        type: localport
        addresses: ["fa:16:3e:e3:50:76 10.0.0.2"]
    port fd62223b-c44e-47aa-b938-ab88abdf3a87 (aka port-red-1)
        addresses: ["fa:16:3e:cc:d5:7c 10.0.0.11"]
    port 310aadd1-d373-4e18-9281-d09fb59f57c1
        type: router
        router-port: lrp-310aadd1-d373-4e18-9281-d09fb59f57c1
    port 87100123-1ee5-4740-bbab-aeba9b5444be (aka port-red-2)
        addresses: ["fa:16:3e:90:9b:a8 10.0.0.12"]
```

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Neutron Subnet – OVN DHCP Options

```
[root@central ~]# ovn-nbctl find DHCP_Options external_ids:subnet_id="fe642a2e-a34c-4551-a00d-207759fae7bc"
_uuid               : a7b90de4-cc4c-4c25-a3c4-f6c44a50dcbd
cidr                : "10.0.0.0/24"
external_ids        : {"neutron:revision_number"="0", subnet_id="fe642a2e-a34c-4551-a00d-207759fae7bc"}
options             : {classless_static_route="{169.254.169.254/32,10.0.0.2, 0.0.0.0/0,10.0.0.1}", dns_server="{8.8.8.8}",
domain_name="\"openstackgate.local\"", lease_time="43200", mtu="1442", router="10.0.0.1", server_id="10.0.0.1",
server_mac="fa:16:3e:3c:81:4b"}


All ports within a subnet:
[root@central ~]#  ovn-nbctl find Logical_Switch_Port dhcpv4_options="a7b90de4-cc4c-4c25-a3c4-f6c44a50dcbd"
```

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Neutron port – OVN Logical switch port

```
[vagrant@central ~]$ openstack port list --device-id 2d4c6bf4-0d96-4172-b274-73181466c14b
+--------------------------------------+------------+-------------------+-------------------------------------------------------------------------------+--------+
| ID                                   | Name       | MAC Address       | Fixed IP Addresses                                                            | Status |
+--------------------------------------+------------+-------------------+-------------------------------------------------------------------------------+--------+
| 8b666926-3749-4c2d-854c-e89cf0286062 | port-red-2 | fa:16:3e:4e:42:86 | ip_address='10.0.0.12', subnet_id='fe642a2e-a34c-4551-a00d-207759fae7bc' | ACTIVE |
+--------------------------------------+------------+-------------------+-------------------------------------------------------------------------------+--------+


[root@central ~]# ovn-nbctl show
...
switch 6055b3af-75ae-4e50-94d0-1188f97e38df (neutron-d0cab0d1-16e5-4785-b661-950d1975c468) (aka red)
    port 7295556f-e64b-4b52-926b-355634e13f99
        type: router
        router-port: lrp-7295556f-e64b-4b52-926b-355634e13f99
    port 8b666926-3749-4c2d-854c-e89cf0286062 (aka port-red-2)
        addresses: ["fa:16:3e:4e:42:86 10.0.0.12"]
    port d1792601-58fc-43b8-a172-b3b2eacd9b79 (aka port-red-1)
        addresses: ["fa:16:3e:d0:9a:11 10.0.0.11"]
    port 52a4e189-f92b-4330-8d12-d769d40c32f5
        type: localport
        addresses: ["fa:16:3e:08:89:05 10.0.0.2"]
...
```

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Neutron router - OVN Logical router 1/2

```
[vagrant@central ~]$ openstack router list
+--------------------------------------+-----------+--------+-------+----------------------------------+
| ID                                   | Name      | Status | State | Project                          |
+--------------------------------------+-----------+--------+-------+----------------------------------+
| 13ba46d2-fedb-4c7d-925a-66c0c8365b84 | router_rb | ACTIVE | UP    | 7f247b0583af418cbd1c3b92e90cba83 |
| 3d03ccbc-c7bc-4091-a9c3-81a4569b73bf | router1   | ACTIVE | UP    | 5a47792d50d743b48ccdefd6036bbadd |
+--------------------------------------+-----------+--------+-------+----------------------------------+
```

```
[root@central ~]# ovn-nbctl lr-list
d89823fb-2b0b-40a2-ac31-4fcd4c780c7d (neutron-13ba46d2-fedb-4c7d-925a-66c0c8365b84)
0866e033-7386-4019-a073-56cf8d286e24 (neutron-3d03ccbc-c7bc-4091-a9c3-81a4569b73bf)
```

Will command:
$ ovn-nbctl show neutron-13ba46d2-fedb-4c7d-925a-66c0c8365b84
works too?

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Neutron router - OVN Logical router 2/2 (port)

```
[vagrant@central ~]$ openstack port list --device-id 13ba46d2-fedb-4c7d-925a-66c0c8365b84
+--------------------------------------+------+-------------------+-------------------------------------------------------------------------------+--------+
| ID                                   | Name | MAC Address       | Fixed IP Addresses                                                            | Status |
+--------------------------------------+------+-------------------+-------------------------------------------------------------------------------+--------+
| 5697dae7-314d-40ef-a049-d21f2b691a91 |      | fa:16:3e:ee:0e:dd | ip_address='172.24.4.115', subnet_id='85debd16-8473-48b6-9d6f-c1fadfbb1f52'   | ACTIVE |
| 7295556f-e64b-4b52-926b-355634e13f99 |      | fa:16:3e:92:86:83 | ip_address='10.0.0.1', subnet_id='fe642a2e-a34c-4551-a00d-207759fae7bc'       | ACTIVE |
| f55cf747-e498-4563-87ab-1437a67ba039 |      | fa:16:3e:35:ce:62 | ip_address='20.0.0.1', subnet_id='212e0062-946b-47cd-8f18-f3e466b84ef1'       | ACTIVE |
+--------------------------------------+------+-------------------+-------------------------------------------------------------------------------+--------+

[root@central ~]# ovn-nbctl show
...
router d89823fb-2b0b-40a2-ac31-4fcd4c780c7d (neutron-13ba46d2-fedb-4c7d-925a-66c0c8365b84) (aka router_rb)
    port lrp-f55cf747-e498-4563-87ab-1437a67ba039
        mac: "fa:16:3e:35:ce:62"
        networks: ["20.0.0.1/24"]
    port lrp-7295556f-e64b-4b52-926b-355634e13f99
        mac: "fa:16:3e:92:86:83"
        networks: ["10.0.0.1/24"]
    port lrp-5697dae7-314d-40ef-a049-d21f2b691a91
        mac: "fa:16:3e:ee:0e:dd"
        networks: ["172.24.4.115/24"]
        gateway chassis: [88da38c3-139d-4579-a1be-76fad0485f2f]
...

[root@central ~]# ovn-nbctl lrp-get-gateway-chassis lrp-5697dae7-314d-40ef-a049-d21f2b691a91
lrp-5697dae7-314d-40ef-a049-d21f2b691a91 88da38c3-139d-4579-a1be-76fad0485f2f  1
```

```
[root@central ~]# ovn-sbctl show
Chassis "1d2795ca-b4fe-4c87-937d-d735c1734582"
    hostname: central
    Encap geneve
        ip: "192.168.121.195"
        options: {csum="true"}
    Port_Binding "319d4c29-ec7f-4b88-a389-70a77e584150"
    Port_Binding cr-lrp-1b4087bf-9070-497e-abb5-0288a24e75e8
Chassis "88da38c3-139d-4579-a1be-76fad0485f2f"
    hostname: worker1
    Encap geneve
        ip: "192.168.150.101"
        options: {csum="true"}
    Port_Binding "8b666926-3749-4c2d-854c-e89cf0286062"
    ...
    Port_Binding cr-lrp-5697dae7-314d-40ef-a049-d21f2b691a91
```

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Neutron router's gateway - OVN NAT 1/2

```
[vagrant@central ~]$ openstack port list --device-id 13ba46d2-fedb-4c7d-925a-66c0c8365b84
+--------------------------------------+------+-------------------+-------------------------------------------------------------------------------------+--------+
| ID                                   | Name | MAC Address       | Fixed IP Addresses                                                                  | Status |
+--------------------------------------+------+-------------------+-------------------------------------------------------------------------------------+--------+
| 5697dae7-314d-40ef-a049-d21f2b691a91 |      | fa:16:3e:ee:0e:dd | ip_address='172.24.4.115', subnet_id='85debd16-8473-48b6-9d6f-c1fadfbb1f52'         | ACTIVE |
| 7295556f-e64b-4b52-926b-355634e13f99 |      | fa:16:3e:92:86:83 | ip_address='10.0.0.1', subnet_id='fe642a2e-a34c-4551-a00d-207759fae7bc'             | ACTIVE |
| f55cf747-e498-4563-87ab-1437a67ba039 |      | fa:16:3e:35:ce:62 | ip_address='20.0.0.1', subnet_id='212e0062-946b-47cd-8f18-f3e466b84ef1'             | ACTIVE |
+--------------------------------------+------+-------------------+-------------------------------------------------------------------------------------+--------+


[root@central ~]# ovn-nbctl show
...

router d89823fb-2b0b-40a2-ac31-4fcd4c780c7d (neutron-13ba46d2-fedb-4c7d-925a-66c0c8365b84) (aka router_rb)
   nat 4f4b66d1-9bde-4cce-a757-e161adf240f9
       external ip: "172.24.4.115"
       logical ip: "20.0.0.0/24"
       type: "snat"
   nat 5f899cb0-521f-4877-b3f2-6a9dca7ffe81
       external ip: "172.24.4.115"
       logical ip: "10.0.0.0/24"
       type: "snat"
```

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Neutron floating IP - OVN NAT 2/2

```
[vagrant@central ~]$ openstack floating ip list -c ID -c "Floating IP Address" -c "Fixed IP Address"
+--------------------------------------+---------------------+------------------+
| ID                                   | Floating IP Address | Fixed IP Address |
+--------------------------------------+---------------------+------------------+
| da852977-4924-4978-8526-11259017fed0 | 172.24.4.132        | 20.0.0.11        |
| e0b3a3fd-e6dc-45ed-a93c-0202eecf9d66 | 172.24.4.131        | 10.0.0.11        |
+--------------------------------------+---------------------+------------------+

[root@central ~]# ovn-nbctl show
...
router d89823fb-2b0b-40a2-ac31-4fcd4c780c7d (neutron-13ba46d2-fedb-4c7d-925a-66c0c8365b84) (aka router_rb)
   nat 48537d7b-021c-484f-9968-b4ede6ceb886
       external ip: "172.24.4.131"
       logical ip: "10.0.0.11"
       type: "dnat_and_snat"
   nat aac9143e-7b8b-491e-8b0f-e38e86418cd0
       external ip: "172.24.4.132"
       logical ip: "20.0.0.11"
       type: "dnat_and_snat"
```

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Neutron floating IP - OVN NAT 3/3

```
List all Floating IPs:

ovn-nbctl find NAT type='dnat_and_snat'


uuid               : 61e12632-00d0-44df-9914-c9154995e12b
external ids        : {"neutron:fip external mac"="fa:16:3e:7c:a5:48", "neutron:fip id"="dbbea7ee-daa4-4d2f-aea2-67fcb5d440a6",
"neutron:fip port id"="f796bfb3-9dbc-4ece-98b7-f43cd1fddd3d", "neutron:revision_number"="2", "neutron:router_name"=neutron-ab1c770e-c905-431d-a37f-395dccc22bf9}
external ip         : "10.0.0.173"
external mac        : "fa:16:3e:7c:a5:48"
logical ip          : "192.168.40.220"
logical port        : "f796bfb3-9dbc-4ece-98b7-f43cd1fddd3d"
options             : {}
type                : dnat_and_snat
```

If both **'external_mac'** and **'logical_port'** fields are populated by the Neutron driver, it means that this FIP will be distributed in the compute node.

TIP: Just by clearing one of those fields, you'll force traffic to/from this FIP to be centralized on the gateway node.

Neutron Security Groups = OVN Port_Group

```
[vagrant@central ~]$ openstack security group list --project 7f247b0583af418cbd1c3b92e90cba83
+--------------------------------------+---------+-----------------------+----------------------------------+------+
| ID                                   | Name    | Description           | Project                          | Tags |
+--------------------------------------+---------+-----------------------+----------------------------------+------+
| 068bd1f0-5154-4a71-8d4e-c8b7fdec6ee6 | test    | test                  | 7f247b0583af418cbd1c3b92e90cba83 | []   |
+--------------------------------------+---------+-----------------------+----------------------------------+------+
```

```
[root@central ~]# ovn-nbctl list Port_Group
...
_uuid               : 12da2507-2a18-4718-9283-953afa323c9f
acls                : [2e4192e4-2f12-4381-bac3-2782b456c91c, a23122a8-540e-4227-b40e-33d566a98c77, aeca91e0-e7e4-49d3-a559-c8ba6a4dc183,
efa994a9-993b-4505-b144-59707e4e88e0]
external_ids        : {"neutron:security_group_id"068bd1f0-5154-4a71-8d4e-c8b7fdec6ee6"}
name                : pg_068bd1f0_5154_4a71_8d4e_c8b7fdec6ee6
ports               : [27cbf639-7044-4993-abe2-0a2d4bcdef43, abd6e791-0f18-4528-87c5-ab37eb54767a, b4bf6cff-ac65-4752-8d81-22ec154e8d4f,
bab83492-3dcb-4c4c-968b-607d8c34d486]
```

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Neutron Security Group rules = OVN ACLs

```
[vagrant@central ~]$ openstack security group rule list 068bd1f0-5154-4a71-8d4e-c8b7fdec6ee6
+--------------------------------------+-------------+-----------+-----------+------------+-----------------------+
| ID                                   | IP Protocol | Ethertype | IP Range  | Port Range | Remote Security Group |
+--------------------------------------+-------------+-----------+-----------+------------+-----------------------+
| 2e3f5b07-e70c-4be1-bb8e-5454b9f49c43 | None        | IPv6      | ::/0      |            | None                  |
| 2f15be27-23c6-4f8d-aaef-a0e71877c7be | tcp         | IPv4      | 0.0.0.0/0 | 22:22      | None                  |
| 3c6a67f8-04ab-4ceb-8e87-90561dec1ce1 | icmp        | IPv4      | 0.0.0.0/0 |            | None                  |
| eb1ad62c-7b5d-451f-9052-1e3dc49144b7 | None        | IPv4      | 0.0.0.0/0 |            | None                  |
+--------------------------------------+-------------+-----------+-----------+------------+-----------------------+
```

```
[root@central ~]# ovn-nbctl acl-list 12da2507-2a18-4718-9283-953afa323c9f
from-lport  1002 (inport == @pg_068bd1f0_5154_4a71_8d4e_c8b7fdec6ee6 && ip4) allow-related
from-lport  1002 (inport == @pg_068bd1f0_5154_4a71_8d4e_c8b7fdec6ee6 && ip6) allow-related
 to-lport  1002 (outport == @pg_068bd1f0_5154_4a71_8d4e_c8b7fdec6ee6 && ip4 && ip4.src == 0.0.0.0/0 && icmp4) allow-related
 to-lport  1002 (outport == @pg_068bd1f0_5154_4a71_8d4e_c8b7fdec6ee6 && ip4 && ip4.src == 0.0.0.0/0 && tcp && tcp.dst == 22) allow-related
```

```
# Same list of ACLs can be found by Neutron Security Group's uuid with command:

ovn-nbctl acl-list $(ovn-nbctl find Port_Group external_ids:"neutron\:security_group_id=068bd1f0-5154-4a71-8d4e-c8b7fdec6ee6" | grep ^_uuid | awk {'print $3'})
```

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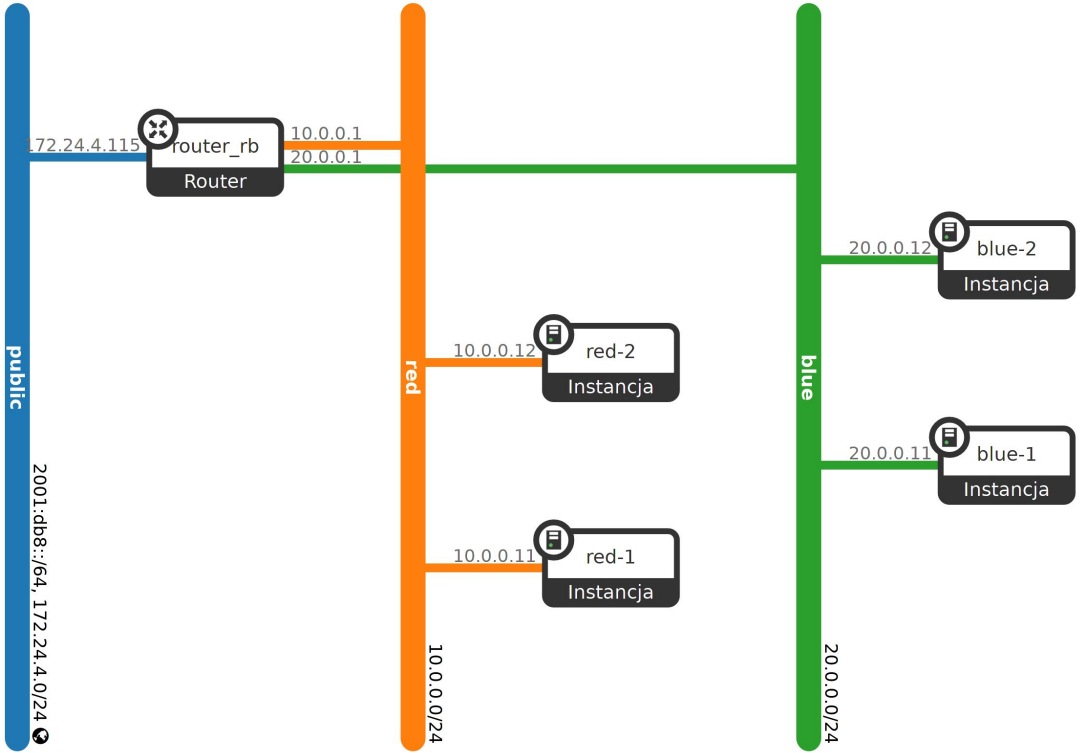
Troubleshooting

Testing topology



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