Red Hat OpenStack Platform 14

Use Skydive for OpenStack network analysis

Use Skydive to view, troubleshoot, and audit your OpenStack network

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Abstract

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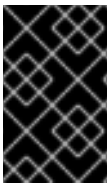
CHAPTER 1. SKYDIVE OVERVIEW

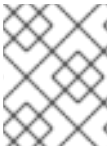


IMPORTANT

Skydive is included with this release as a Technology Preview. For more information on the support scope for features marked as technology previews, see https://access.redhat.com/solutions/21101.

A typical software-defined networking (SDN) deployment can grow to significant complexity, as the layers of abstraction and virtualization make network analysis and troubleshooting seem more difficult. This complexity can be apparent in a cloud product such as OpenStack, where it can be a challenge to track the flow of traffic, or distinguish between the various types of bridged and tunneled networks that connect instances.

To help with these challenges, Skydive is a lightweight distributed service that allows you view and debug your SDN deployment, allowing for easier network analysis and troubleshooting. Skydive includes a web UI that displays a live view of your network topology, dependencies, and flows. The Skydive CLI allows you to generate reports and perform configuration audits. Skydive also includes a REST API; for more information, see http://skydive.network/documentation/api.



NOTE

Skydive is intended for use by cloud administrators only, and is not intended as a service for end-users or individual tenants.

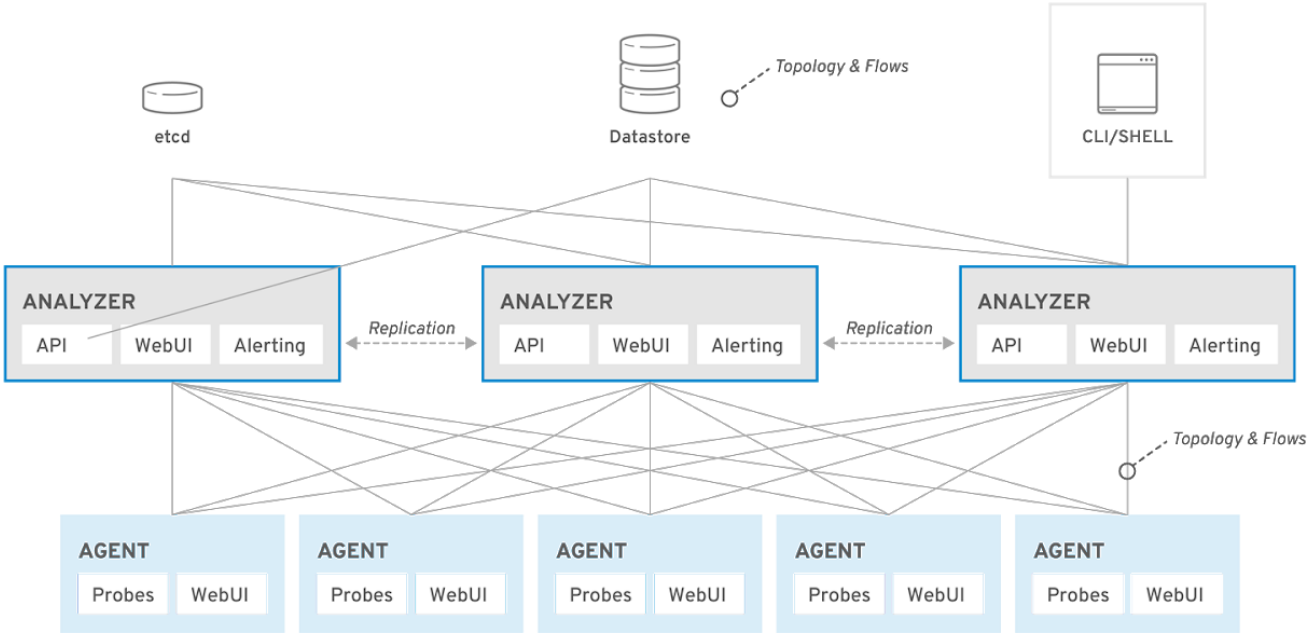
1.1. USE CASES FOR OPENSTACK DEPLOYMENTS

Use the data presented by Skydive for a number of use cases:

- Troubleshooting
  - Packet loss
  - Performance issues
  - Review ingress and egress flows
- Validate services and configuration
  - Check that your deployment is working correctly.
  - Review whether the expected MTU settings are correctly applied.
- Network Monitoring
  - Generate traffic reports for a particular tenant.
  - Capture network traffic between virtual interfaces.
  - Alarming - for example: when an interface drops, or if a flow reaches a certain percentage of utilization.
- Capacity Planning
  - Identify low-latency nodes to host certain services.

1.2. SKYDIVE ARCHITECTURE

Skydive is a distributed service that relies on agents installed on each node. As demonstrated in the following diagram, these agents send data back to the analyzer services. The analyzer service reviews the data, generates reports, and present the results using an API. These reports can then be viewed using the web UI or through the command line reporting tool.



Skydive is installed using Red Hat OpenStack Platform director, and is available as two composable services. For more information, see Chapter 2, *Install Skydive*.

1.3. DATA SOURCES

To generate its reports, Skydive analyzes the following components:

- **`OVSDB`** - Open vSwitch (OVS) components. This information includes the OVSDB, bridges, ports, and interfaces.
- **`Netlink`** - A node's network objects. This information includes the host's interfaces, network namespaces, bridges, MTU, among others.
- **`neutron`** - The OpenStack networking service.
- Container services.
- Custom objects - You can add your own static network components, such as a top-of-rack (ToR) switch.

CHAPTER 2. INSTALL SKYDIVE

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Skydive's two components, the analyzer and the agent, are available as composable services:

```
OS::TripleO::Services::SkydiveAgent
OS::TripleO::Services::SkydiveAnalyzer
```

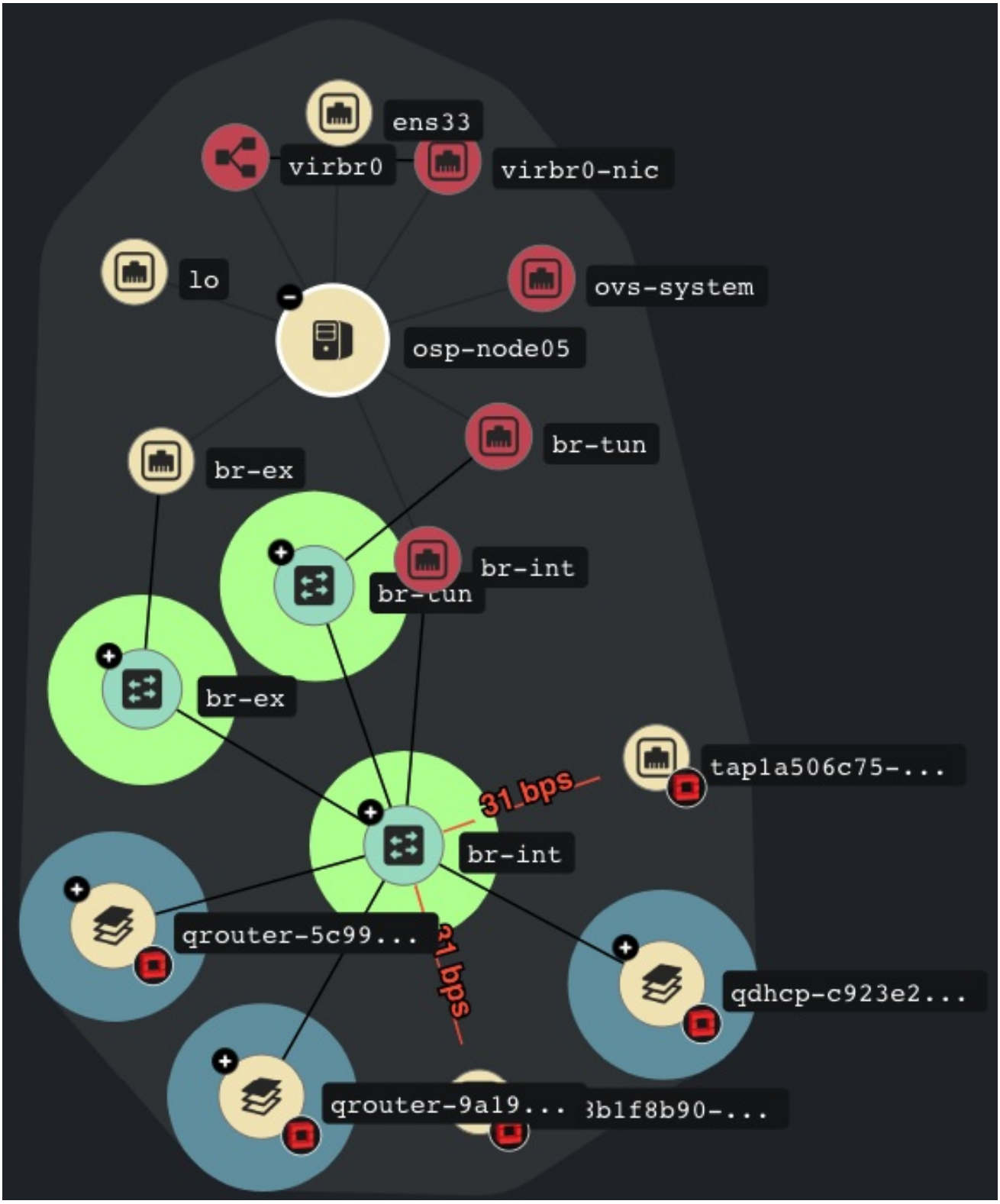
Install Skydive by adding **`skydive-environment.yaml`** to your **`openstack overcloud deploy`** command. The director installs **`SkydiveAgent`** on each Controller and Compute node by default. These agents report the network analytics back to **`SkydiveAnalyzer`**, running on the Controller node.

CHAPTER 3. USING THE SKYDIVE UI

Use the Skydive UI to perform a number of tasks, such as viewing your network topology. By default, you access the UI through a web browser on port **8082**. For example: **https://192.168.123.141:8082**.

The default view shows all your physical nodes. Click the **Expand** button to see the full view for a node:

The expanded node displays the virtual networking topology:

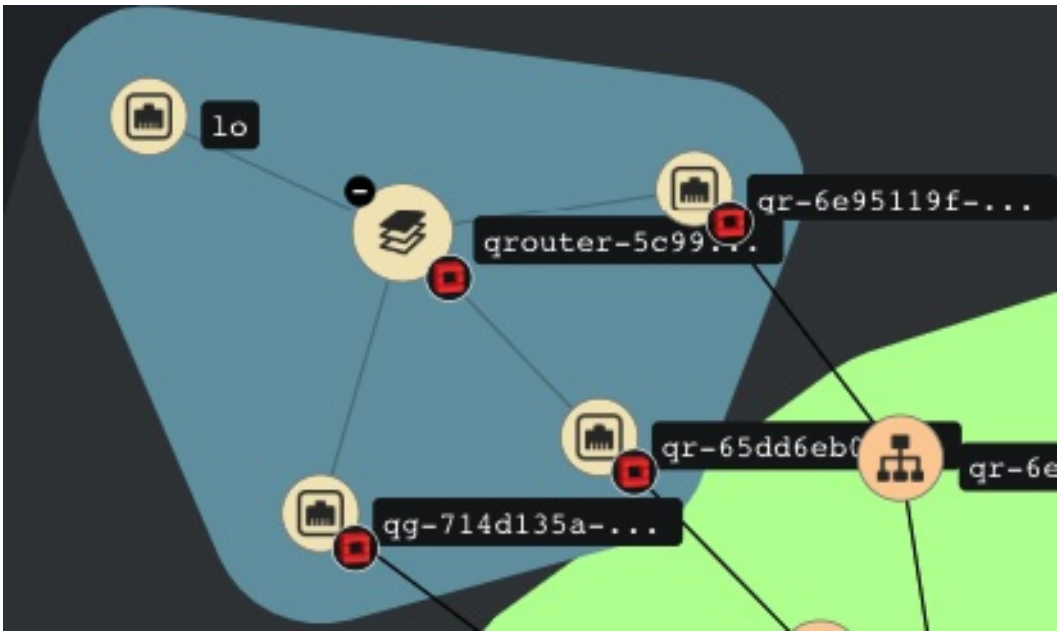


In this example, the physical node **osp-node05** contains various connection types; these are presented in different colors to distinguish their functions:

- **Beige:** The physical NICs and the OVS interface **br-ex**
- **Blue:** The network namespaces created for the OpenStack projects.
- **Red:** Indicates that the network interface is down.

To see additional details, click the same **Expand** button again:

This view reveals further details of the network topology, such as the instance interfaces within a Project's namespace:



CHAPTER 4. USING THE SKYDIVE COMMAND LINE

The Skydive CLI allows you to perform the same functions as the GUI. For example:

- Review your topology
- Capture traffic
- Perform packet injection

4.1. CHECK SKYDIVE STATUS

You can use **`skydive client status`** to check the state of your Skydive services. For example:

```
$ skydive client status
{
  "Agents": {
    "node01.lab.local": {
      "ServiceType": "agent",
      "ClientProtocol": "protobuf",
      "Addr": "10.0.0.20",
      "Port": 49454,
      "IsConnected": true,
      "ConnectTime": "2018-11-16T09:19:12.652607Z",
      "RemoteHost": "node01.lab.local"
    },
    "node02.lab.local": {
      "ServiceType": "agent",
      "ClientProtocol": "protobuf",
      "Addr": "10.0.0.9",
      "Port": 43916,
      "IsConnected": true,
      "ConnectTime": "2018-11-16T09:19:12.770824379Z",
      "RemoteHost": "node02.lab.local"
    },
    "node1": {
      "ServiceType": "agent",
      "ClientProtocol": "protobuf",
      "Addr": "192.168.42.132",
      "Port": 54582,
      "IsConnected": true,
      "ConnectTime": "2018-11-16T09:19:12.803125487Z",
      "RemoteHost": "node1"
    }
  },
  "Peers": {
    "Incomers": {},
    "Outgoers": {}
  },
  "Publishers": {},
  "Subscribers": {},
  "Alerts": {
    "IsMaster": true
  },
  "Captures": {
```

```
    "IsMaster": true
  },
  "Probes": [
    "fabric",
    "peering"
  ]
}
```

Skydive includes a command line reporting tool that uses the Gremlin syntax. Gremlin searches the Skydive database to help review your system configuration. For example, this query returns a list of IP addresses that do not use a MTU size of exactly **1500**:

```
$ /opt/stack/go/bin/skydive client query "G.V().Has('MTU',
NE(1500)).Values('IPV4')"
[
 [
  "127.0.0.1/8"
 ],
 [
  "127.0.0.1/8"
 ],
 [
  "10.0.0.9/24"
 ],
 [
  "10.233.64.1/24"
 ],
 [
  "127.0.0.1/8"
 ],
 [
  "127.0.0.1/8"
 ],
 [
  "10.233.64.4/24"
 ],
 [
  "10.0.0.3/26"
 ],
 [
  "127.0.0.1/8"
 ],
 [
  "10.0.0.1/26"
 ],
 [
  "127.0.0.1/8"
 ],
 [
  "127.0.0.1/8"
 ],
 [
  "10.233.64.0/32"
 ],
 [
  "10.0.0.2/26"
```

```
 ],
 [
  "10.0.0.20/24",
  "192.168.0.1/24"
 ],
 [
  "10.233.64.2/24"
 ]
]
```

To see which IP addresses use a MTU of exactly **1500**:

```
$ /opt/stack/go/bin/skydive client query
"G.V().Has('MTU',1500).Values('IPV4")"
[
 [
  "192.168.122.1/24"
 ],
 [
  "192.168.42.129/25"
 ],
 [
  "172.17.0.1/16"
 ],
 [
  "172.17.0.1/16"
 ],
 [
  "192.168.42.132/25"
 ],
 [
  "192.168.122.1/24"
 ]
]
```

For more information on:

- Gremlin queries, see http://skydive.network/documentation/api-gremlin.
- Skydive CLI, see http://skydive.network/documentation/cli.
- Skydive Rest API, see http://skydive.network/documentation/api-rest.

CHAPTER 5. CAPTURE TRAFFIC STATISTICS

Use Skydive to capture the network statistics of an instance's interface. This is useful for troubleshooting and diagnostics, or determining whether the network works as expected. To do this, first create a capture between the two interfaces, then use the **Flows** tool to query the captured traffic.

This example shows an ICMP ping between **instance-1** and **instance-2**. The intention is to observe these ICMP packets in a monitoring session:

1. Review the IP addresses assigned to the instances:

```
$ openstack server list
+--------------------------------------+------------+--------+---
-------------------+-------+---------+
| ID                                   | Name       | Status |
Networks              | Image | Flavor  |
+--------------------------------------+------------+--------+---
-------------------+-------+---------+
| 24a20f49-a23a-4f30-b1c3-d67a8277e42f | instance-2 | ACTIVE |
web=192.168.201.19    |       | m1.nano |
| eea0a3cc-9338-4f01-bc72-df3252a5c689 | instance-1 | ACTIVE |
private=192.168.200.3 |       | m1.nano |
+--------------------------------------+------------+--------+---
-------------------+-------+---------+
```

2. In the Skydive UI, click **Capture** in the right-hand pane and click **Create**.

3. Click **Gremlin Expression** to create a query to capture traffic based on custom criteria. For example, you could enter one of the following into the **Query** field:

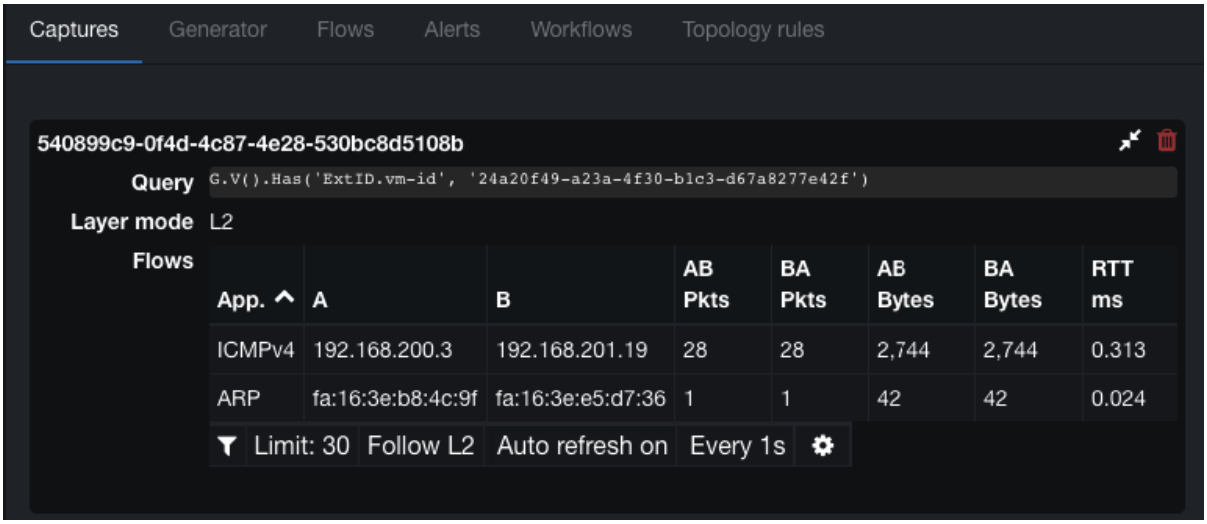
   - If you know vm-id of the instance: **G.V().Has('ExtID.vm-id', '24a20f49-a23a-4f30-b1c3-d67a8277e42f')**
   - If you know the IP address of the instance: **G.V().Has('Neutron.IPV4', IPRange('10.0.0.3/32'))**
   - If you know the IP address of the interface: **G.V().Has('IPV4', '10.0.0.20/24')**
   - If you know the IP address but not the mask: **G.V().Has('IPV4', IPRANGE('10.0.0.20/32'))**

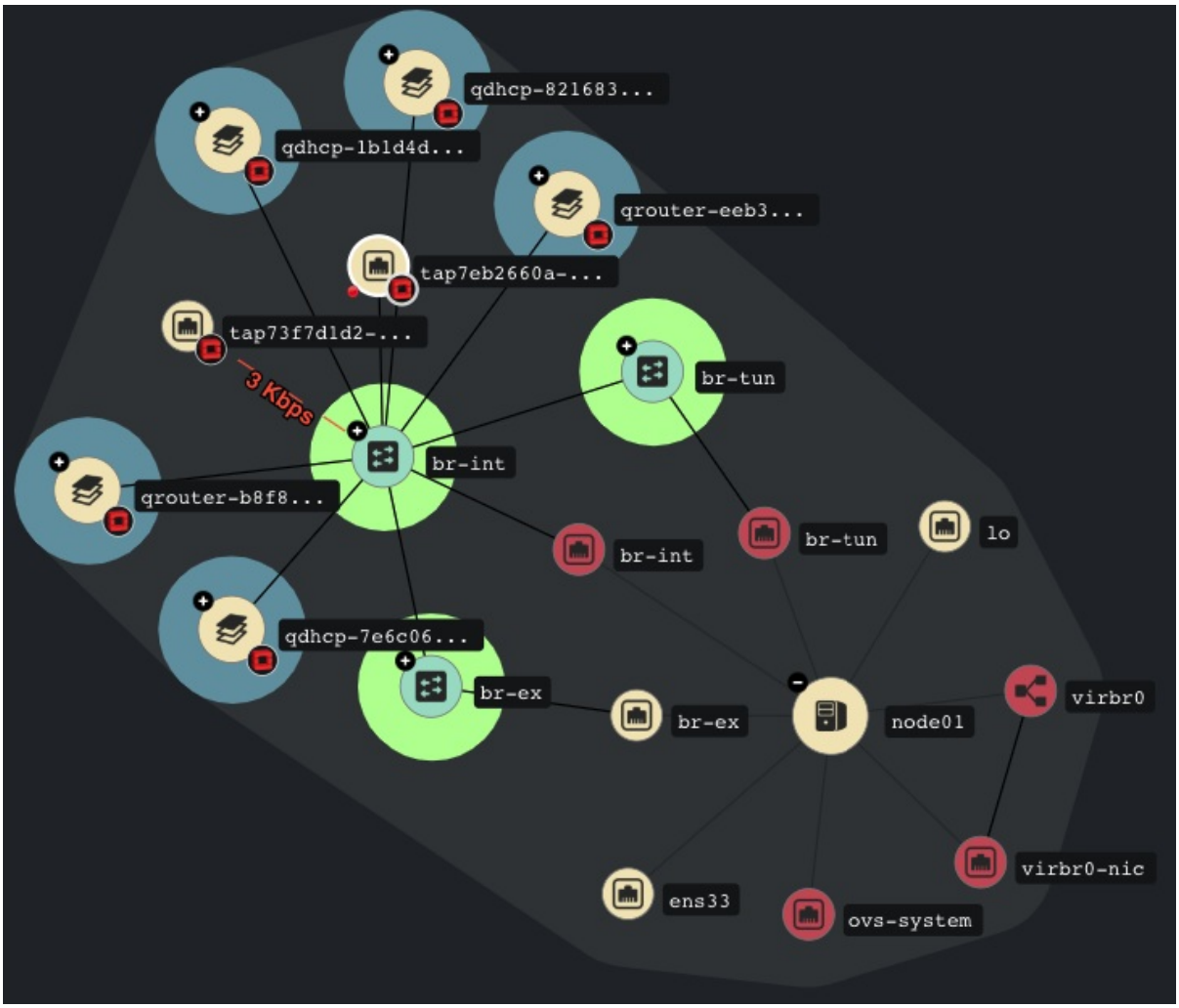
   NOTE

   Edit the IP address or instance ID to suit your deployment.

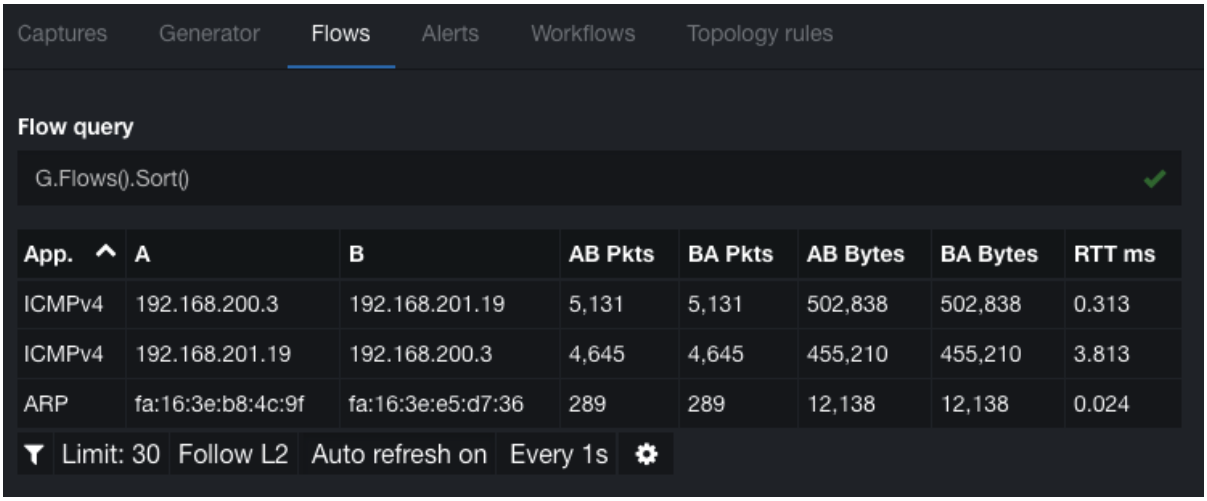
4. Click **Start** to begin the capture.
   For example, adding the ID of **instance-2** to the query: **G.V().Has('ExtID.vm-id', '24a20f49-a23a-4f30-b1c3-d67a8277e42f')**, the **Flows** table shows all network traffic for that instance:



Skydive automatically selects the topology in the diagram. The instance interfaces are indicated by the OpenStack logo:



5. To view the packet statistics, click on **`Flows`** at the bottom of the right-hand pane. Consider enabling **`Auto refresh`** for an updated view. This example shows the network traffic moving between **`instance-1`** and **`instance-2`**:



6. By default, the *Flows* UI uses the Gremlin query **`G.Flows().Sort()`**, which returns all the captured traffic. Enter your own query into the field to refine this view. For example:

   - Return only ICMPv4 traffic: **`G.Flows().Has('Application', 'ICMPv4').Limit(10)`**