

- Octavia LB** 3
- Octavia** 3
- 3
- 4
- 11
- 12
- 12
- LoadBalancer** 14
- 29
- haproxy** 31
- 31

Octavia LB

Octavia

Octavia OpenStack

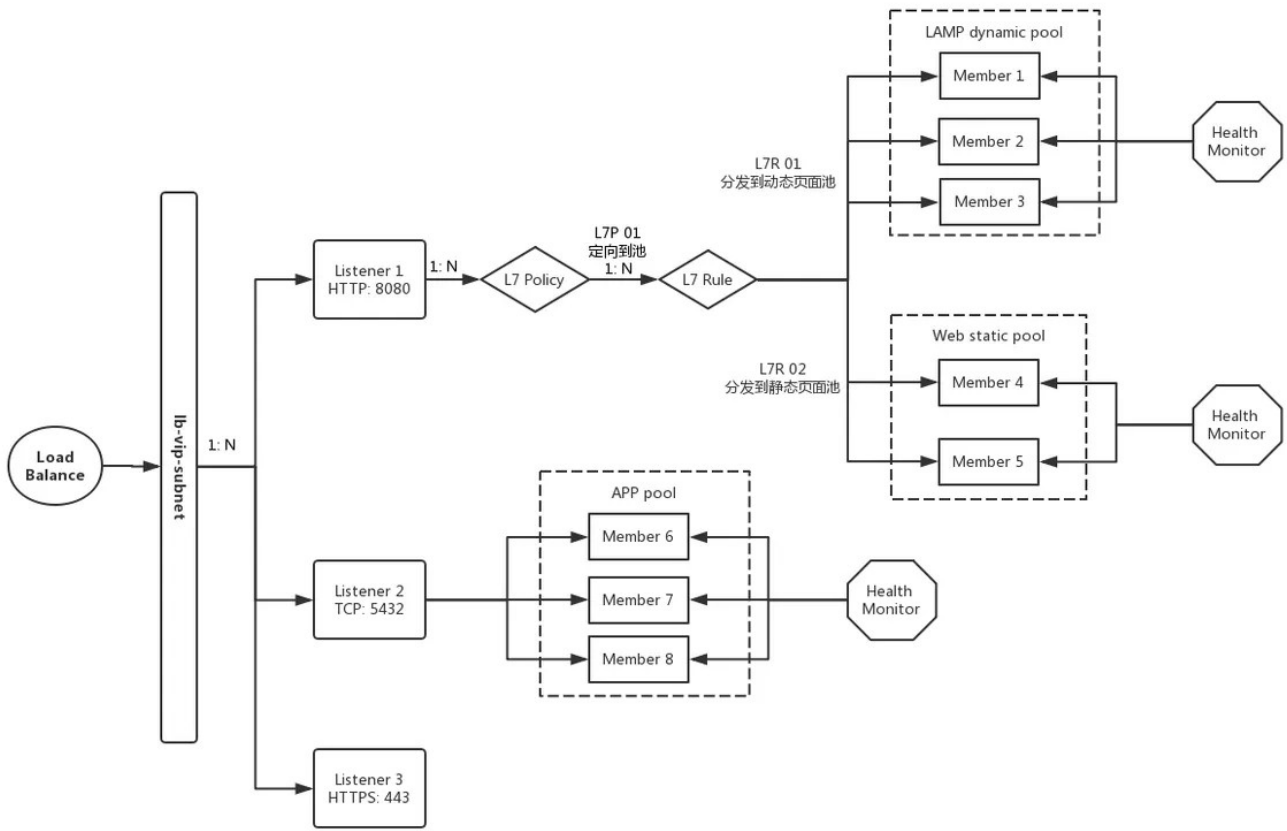
Pike OpenStack Extension Octavia Queens neutron-lbaas neutron-lbaas

. Neutron-lbaas is now deprecated.

Octavia neutron-lbaas가 API(Neutron/LBaaS/Deprecation) 가 가 neutron-lbaas가 Neutron LBaaS가

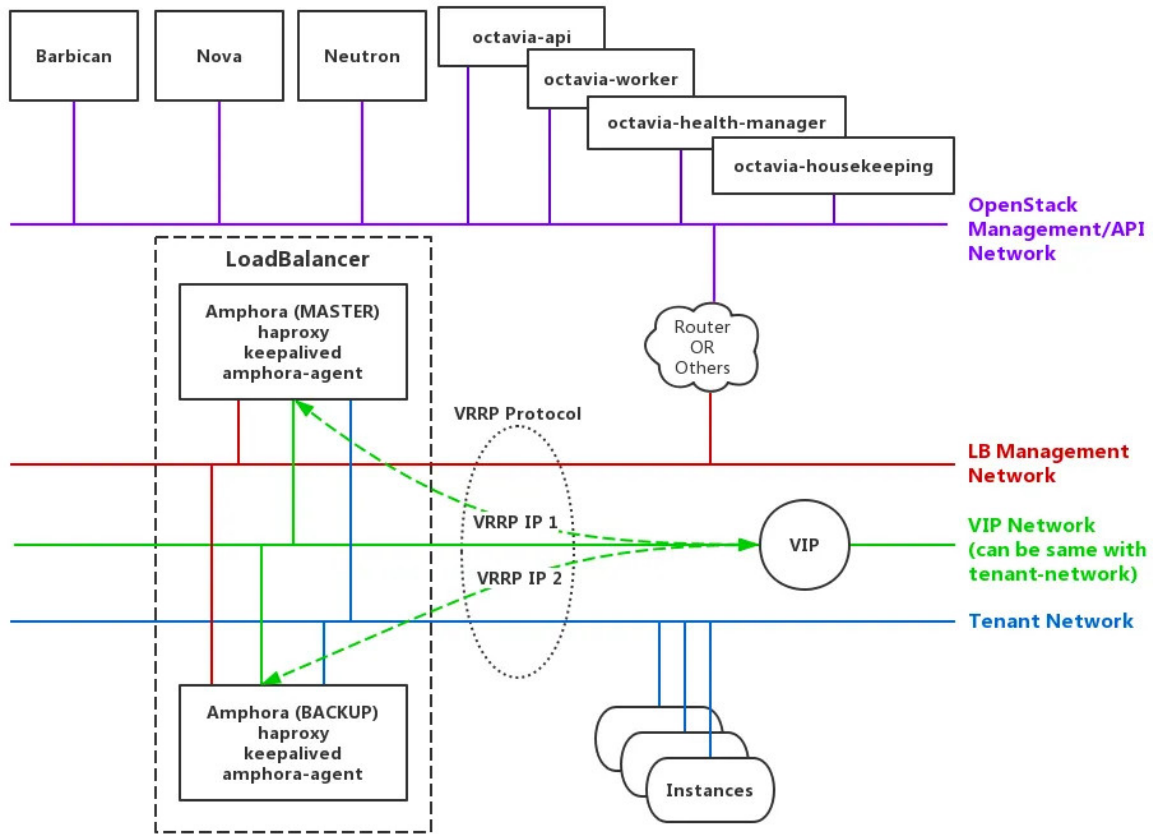
Rocky OpenStack LBaaS Octavia Octavia

- LBaaS : OpenStack LB()가 가
- loadbalancer :
- VIP : IP VIP가 , VIP (: ,)
- Pool :
- (Member) : Pool Real Server
- Health Monitor : Pool Pool Health Check
- L7 : 7 (: , URL ,)
- L7 : L7 7 (:)



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가?

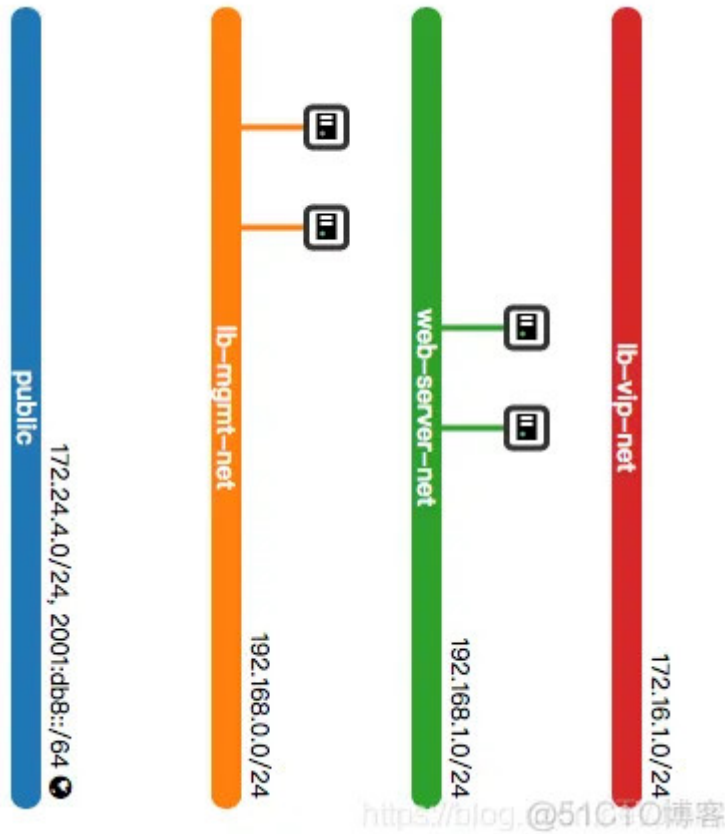


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Octavia가

Octavia

- Amphora(e) : Octavia
 - lb-mgmt-net : OpenStack Management/API Network
Amphora Octavia
 - tenant-net : 가
 - vip-net : VIP
- : vip-net -



1 . VIP . VIP . DHCP .

Create Load Balancer

Load Balancer Details

Provide the details for the load balancer.

名称

描述

IP address

Subnet*

2 . 가 .
http://<VIP>:8080/.

Create Load Balancer



Load Balancer Details

Provide the details for the listener.



Listener Details

名称

描述

Listener-1

Pool Details *

协议 *

Port *

HTTP

8080

Pool Members

Monitor Details *

取消

返回

下一步

Create Load Balancer

3

RR

Create Load Balancer



Load Balancer Details

Provide the details for the pool.



Listener Details

名称

描述

Pool-1

Pool Details

Method *

ROUND_ROBIN

Pool Members

Monitor Details *

取消

返回

下一步

Create Load Balancer

4

가

Create Load Balancer



Load Balancer Details

Listener Details

Pool Details

Pool Members

Monitor Details *

Add members to the load balancer pool.



Allocated Members 2

IP Address *	Subnet *	Port *	Weight	
192.168.1.14	web-server-subnet	80	1	移除
192.168.1.6	web-server-subnet	80	1	移除

Add external member

Available Instances

Q 筛选

名称	IP Address	
amphora-caa6ba0f-1a68-4f22-9be9-8521695ac4f4	192.168.0.13	添加
amphora-bcff6f9e-4114-4d43-a403-573f1d97d27e	192.168.0.11	添加
server-1	192.168.1.14	添加
server-2	192.168.1.6	添加

取消

< 返回

下一步 >

Create Load Balancer

5

가

PING

Create Load Balancer



Load Balancer Details

Listener Details

Pool Details

Pool Members

Monitor Details

Provide the details for the health monitor.



Monitor type *

PING

Interval (sec) *

5

Retries *

3

Timeout (sec) *

5

取消

< 返回

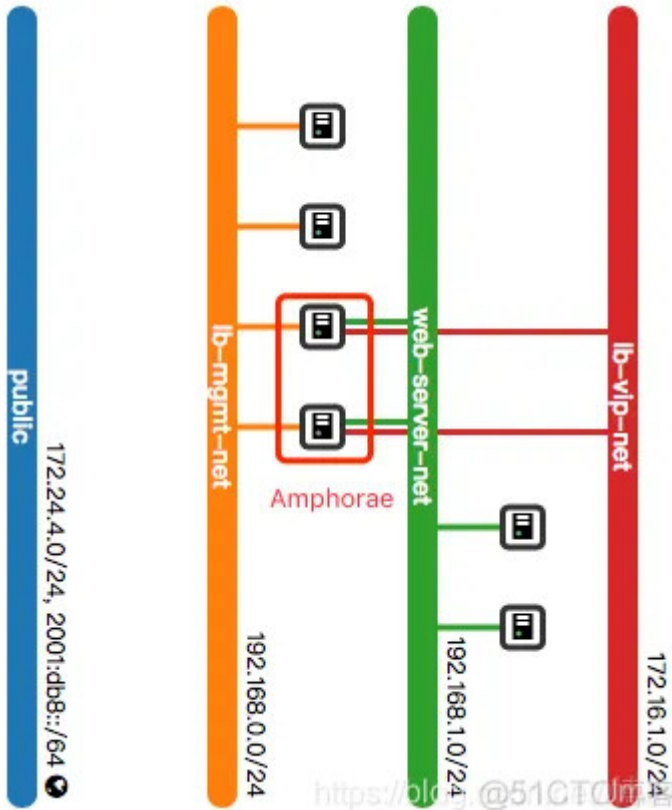
下一步 >

Create Load Balancer

VIP, Member Octava

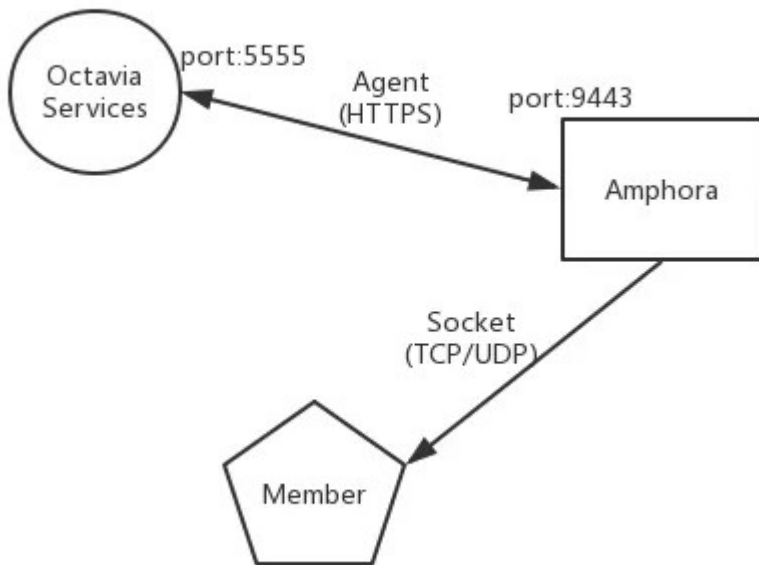
. Amphorae가

가



Octavia Amphora Provider

- Amphora (HAProxy) 가 (Keepalived) Octavia VIP
- Octavia haproxy keepalived Member가 Subnet Amphora Amphora Member Socket(IP, Port)



Octavia 가 . Amphora

. Octavia centos ubuntu

, Amphora 가 ingress (UDP/5555 egress:TCP/9443)

:

1 .

```
$ /opt/rocky/octavia/diskimage-create/diskimage-create.sh -i ubuntu  
  
$ openstack image create amphora-x64-haproxy \  
  --public \  
  --container-format=bare \  
  --disk-format qcow2 \  
  --file /opt/rocky/octavia/diskimage-create/amphora-x64-haproxy.qcow2 \  
  --tag amphora
```

2 .

[controller_worker] amp_image_owner_id, amp_image_tag

```
[controller_worker]  
amp_image_owner_id = 9e4fe13a6d7645269dc69579c027fde4  
amp_image_tag = amphora  
...
```

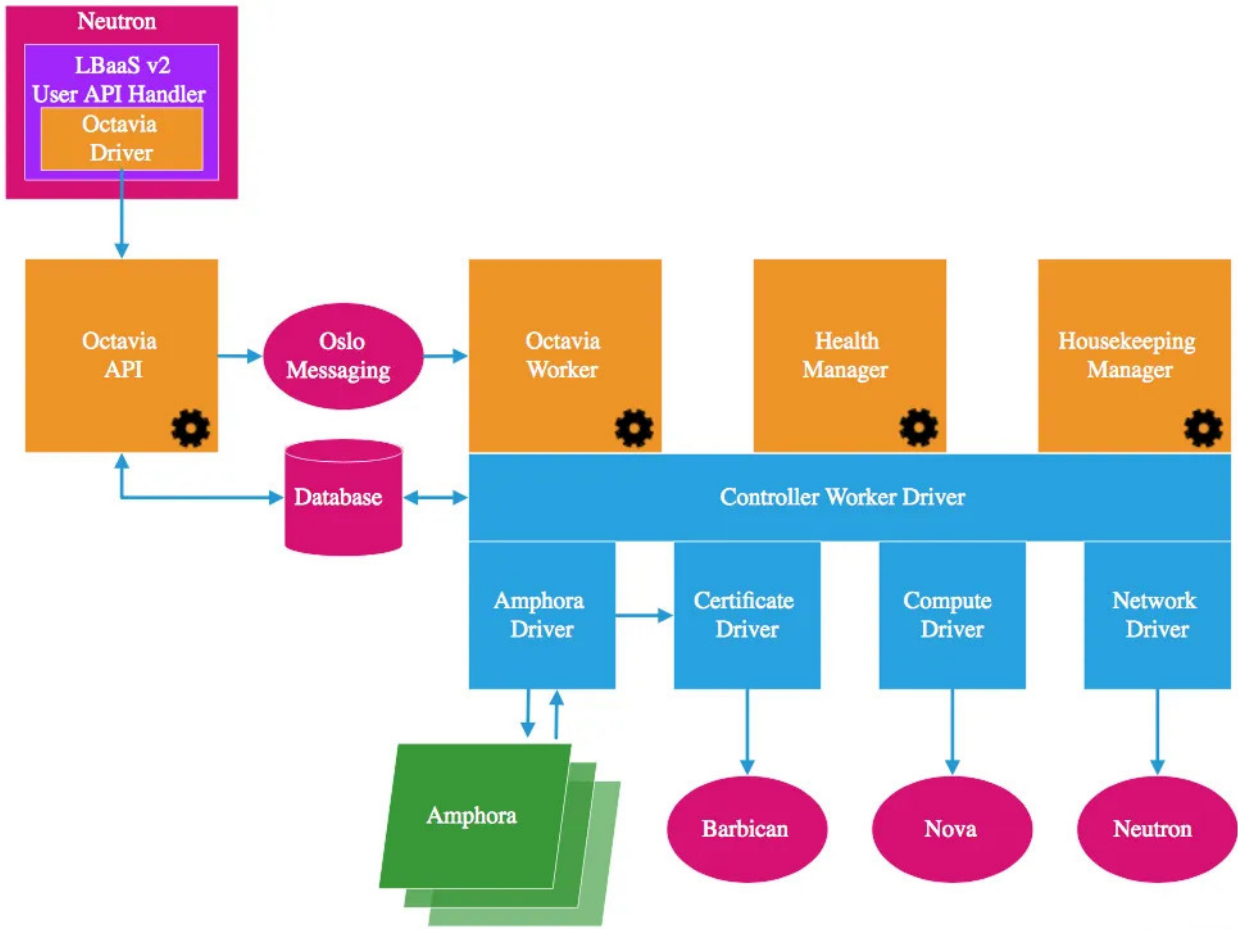
amphora :

1 . amphora

```
$ openstack security group create amphora-sec-grp --project <admin project id>  
$ openstack security group rule create --remote-ip "0.0.0.0/0" --dst-port 9443 --protocol tcp --ingress --ethertype IPv4 --project <admin project id> amphora-sec-grp  
$ openstack security group rule create --remote-ip "0.0.0.0/0" --dst-port 5555 --protocol udp --egress --ethertype IPv4 --project <admin project id> amphora-sec-grp
```

2 . amphora

```
[controller_worker]  
amp_secgroup_list = <amphora-sec-grp id>  
...
```



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(: Octavia 가 .)

Octavia “ - ” . API

MessageQueens .

- Octavia API : RESTful API, Octavia v2 API() LBaaS v2 API OS Neutron Octavia Driver .
- Octavia Controller Worker : Octavia Driver & Plugin OS 가 .
 - Octavia Worker : API Octavia .
 - Health Manager : 가 .
 - Housekeeping Manager : . SpaceAmphora, DatabaseCleanup CertRotation .

LB Amphora Octavia
 lbaas LB (: F5) . openstack/neutron-
 Octavia .

- Octavia API
- Octavia Worker
- Octavia Health Manager
- Octavia Housekeeping

```
[root@control01 octavia]# tree -L 1 -C
├── amphorae
├── api
├── certificates
├── cmd
├── common
├── compute
├── controller
├── db
├── distributor
├── hacking
├── i18n.py
├── __init__.py
├── network
├── opts.py
├── policies
├── tests
└── version.py
```

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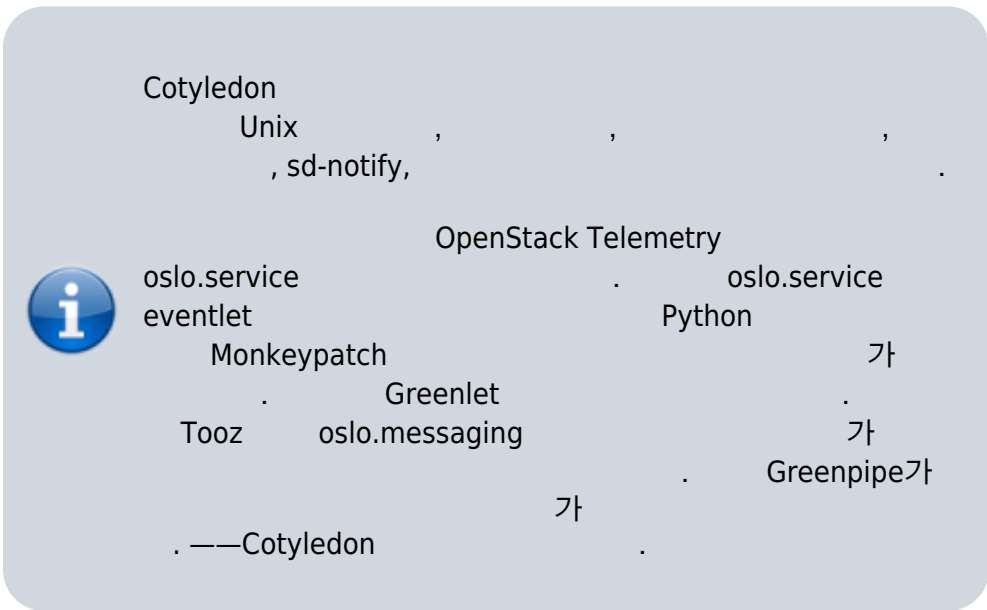
가

- amphora : amphora Rest API amphora-agent
- api : Octavia API
- certificates : CA , amphora Octavia Worker HTTPS TLS
- Compute : Compute Driver novaclient
- network : neutronclient
- db : ORM
- policies : API

```
[root@control01 octavia]# tree controller/ -L 2 -C
controller/
├── healthmanager
│   ├── health_drivers
│   ├── health_manager.py
│   ├── __init__.py
│   └── update_serializer.py
├── housekeeping
│   ├── house_keeping.py
│   └── __init__.py
├── __init__.py
├── queue
│   ├── consumer.py
│   ├── endpoint.py
│   ├── event_queue.py
│   └── __init__.py
└── worker
    ├── amphora_rate_limit.py
    ├── controller_worker.py
    ├── flows
    ├── __init__.py
    ├── tasks
    └── task_utils.py
```

<https://blog.csdn.net/Jmilk>

- healthmanager : Health Manager
 - housekeeping : HouseKeeping
 - queue : cotyledon oslo_messaging RPC
 - producer:api/handlers/queue/producer.py
 - consumer:controller/queue/consumer.py
 - worker : Octavia Worker
 - flow :
 - task :
- : cotyledon oslo.service



OpenStack Octavia
 Driver LB Provider, Certificates Driver, Compute Driver Network
 Driver Vendor
 Octavia OpenStack
 가

?

LoadBalancer

가 Octavia

UML

Octavia

CLI:

```
$ openstack loadbalancer create --vip-subnet-id lb-vip-subnet --name lb1
```

API:

```
POST /v2.0/lbaas/loadbalancers
```

:

```
{
  "loadbalancer": {
    "vip_subnet_id": "c55e7725-894c-400e-bd00-57a04ae1e676",
    "name": "lb1",
    "admin_state_up": true
  }
}
```

:

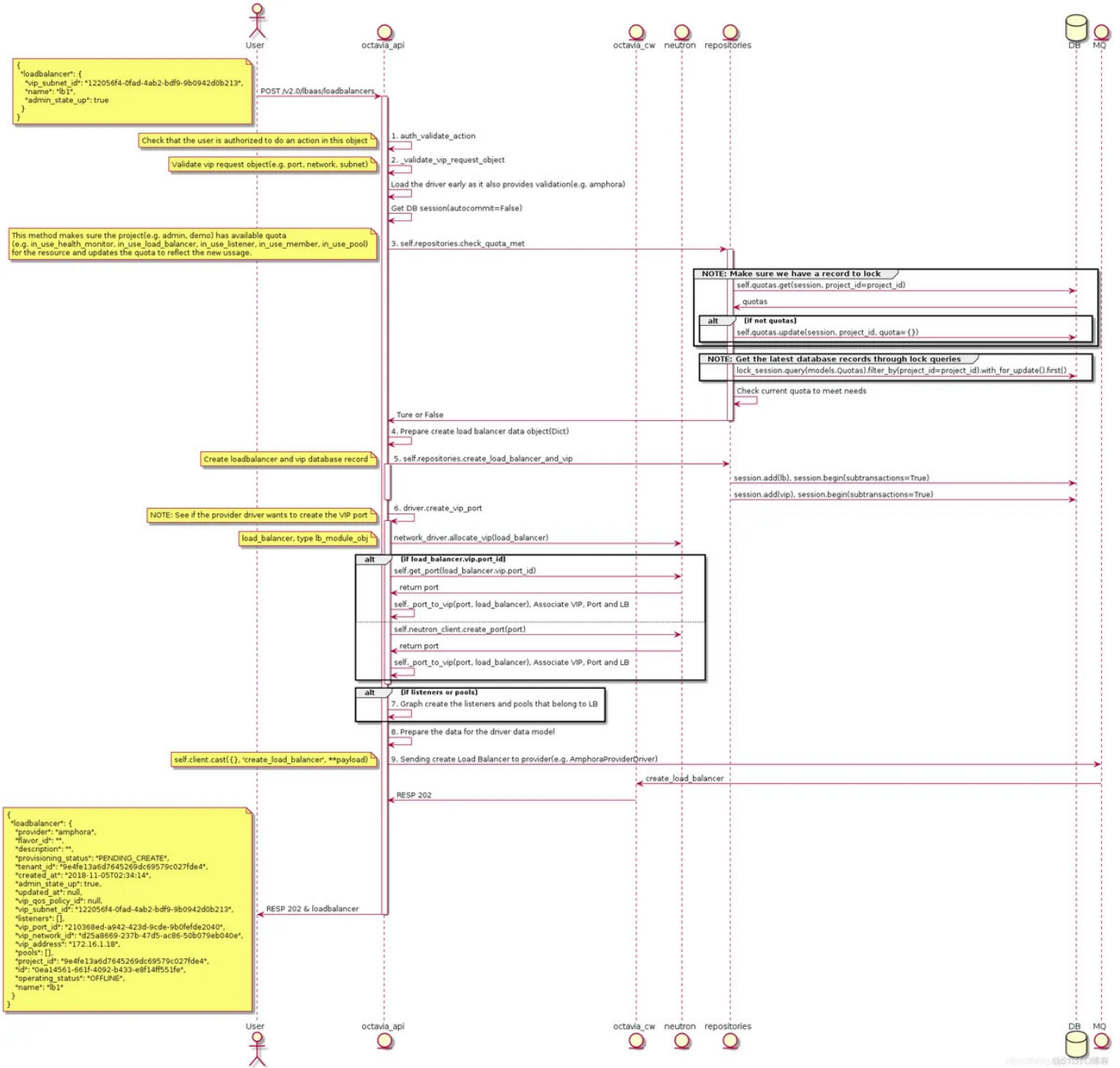
```
{
  "loadbalancer": {
    "provider": "octavia",
    "flavor_id": "",
    "description": "",
    "provisioning_status": "PENDING_CREATE",
    "created_at": "2018-10-22T02:52:04",
    "admin_state_up": true,
    "updated_at": null,
    "vip_subnet_id": "c55e7725-894c-400e-bd00-57a04ae1e676",
    "listeners": [],
    "vip_port_id": "6629fef4-fe14-4b41-9b73-8230105b2e36",
    "vip_network_id": "1078e169-61cb-49bc-a513-915305995be1",
    "vip_address": "10.0.1.7",
    "pools": [],
    "project_id": "2e560efadb704e639ee4bb3953d94afa",
  }
}
```

```

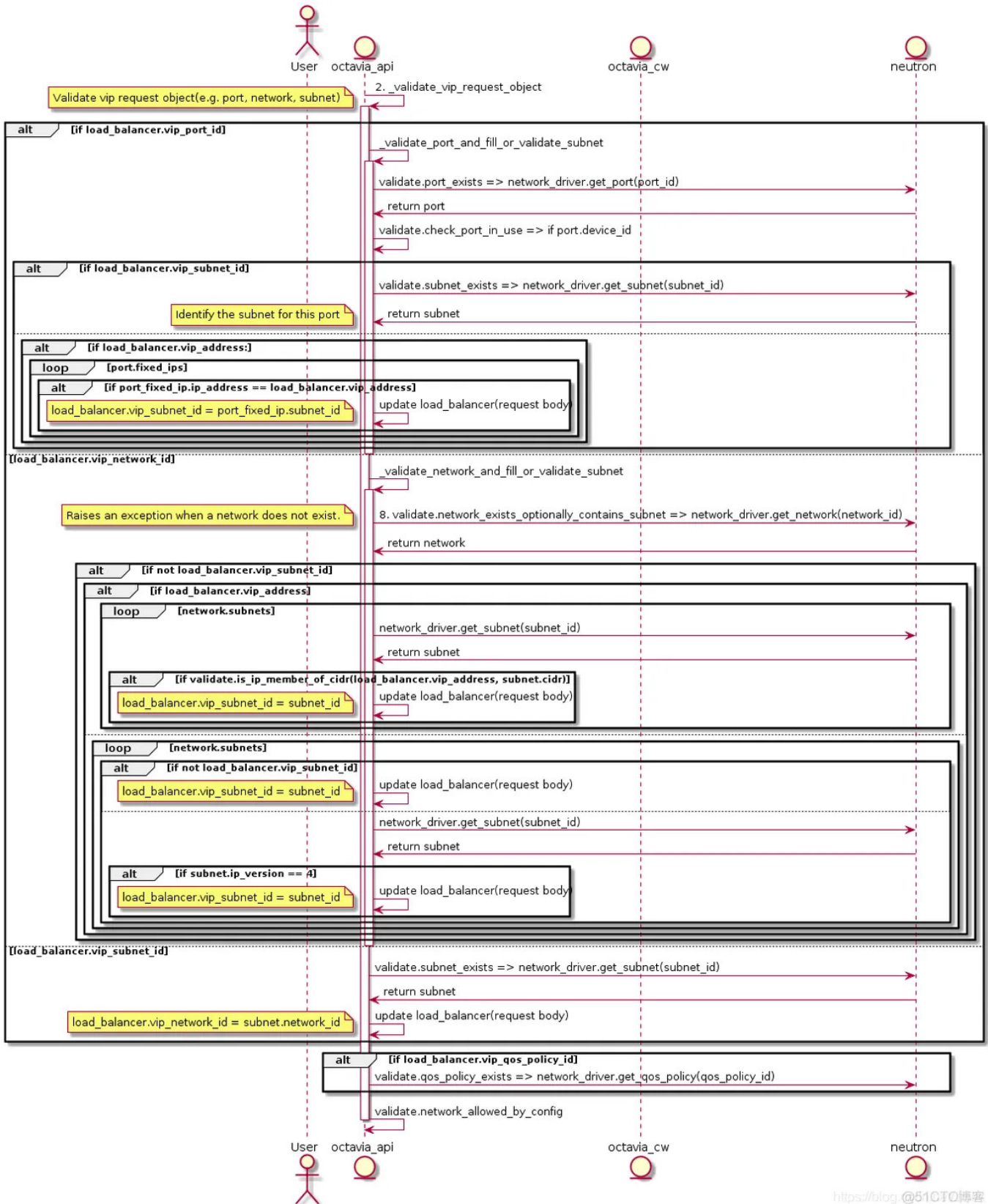
    "id": "5bcf8e3d-9e58-4545-bf80-4c0b905a49ad",
    "operating_status": "OFFLINE",
    "name": "lb1"
  }
}

```

Create LB Octavia API UML



2. _validate_vip_request_object UML



<https://blog@51CTO博客>

POST /v2.0/lbaas/loadbalancers octavia-api 가 :

- 1.
2. VIP (: , , /) . VIP config section [networking]


```

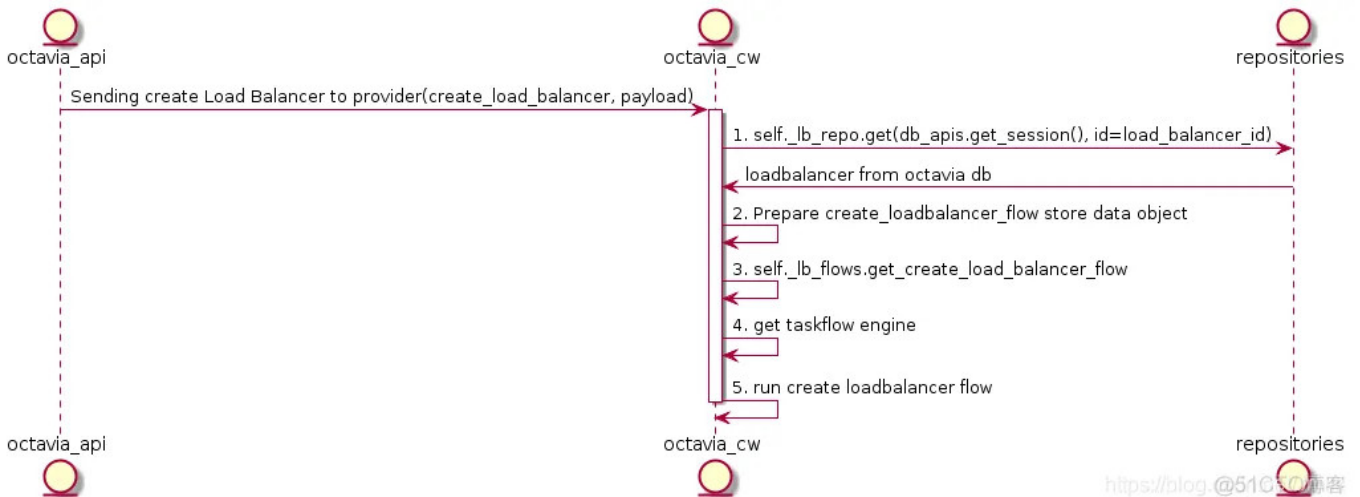
3.         LB . config section [quotas]
           ( : Project1 3 )
4.     load_balancer vip
5. Amphora ( lb ) VIP Port, VIP
   LB
6.
7. create_loadbalancer_flow
8. octavia-worker create_loadbalancer_flow

```

가

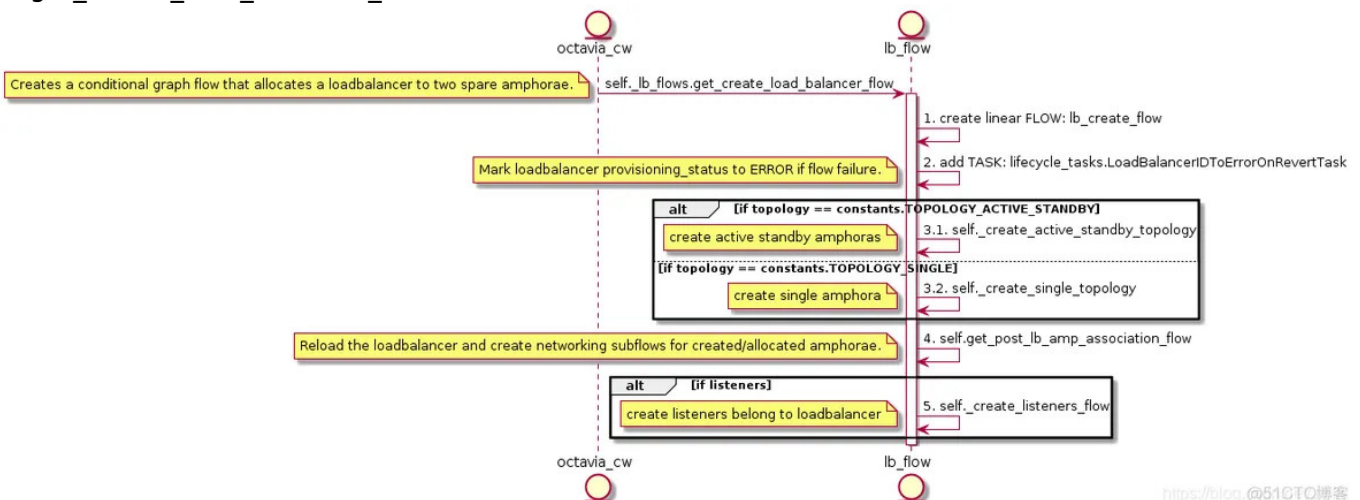
- openstack quota set.
- openstack loadbalancer create --listeners --pools , POST /v2.0/lbaas/loadbalancers UI/UX
- VIP 가 octavia-api neutronclient loadbalancer-<load_balancer_id> vip-net
- VIP , VIP QoS

Create LB Octavia Controller Worker UML



<https://blog.@51CTO博客>

3. get_create_load_balancer_flow UML



<https://blog.@51CTO博客>

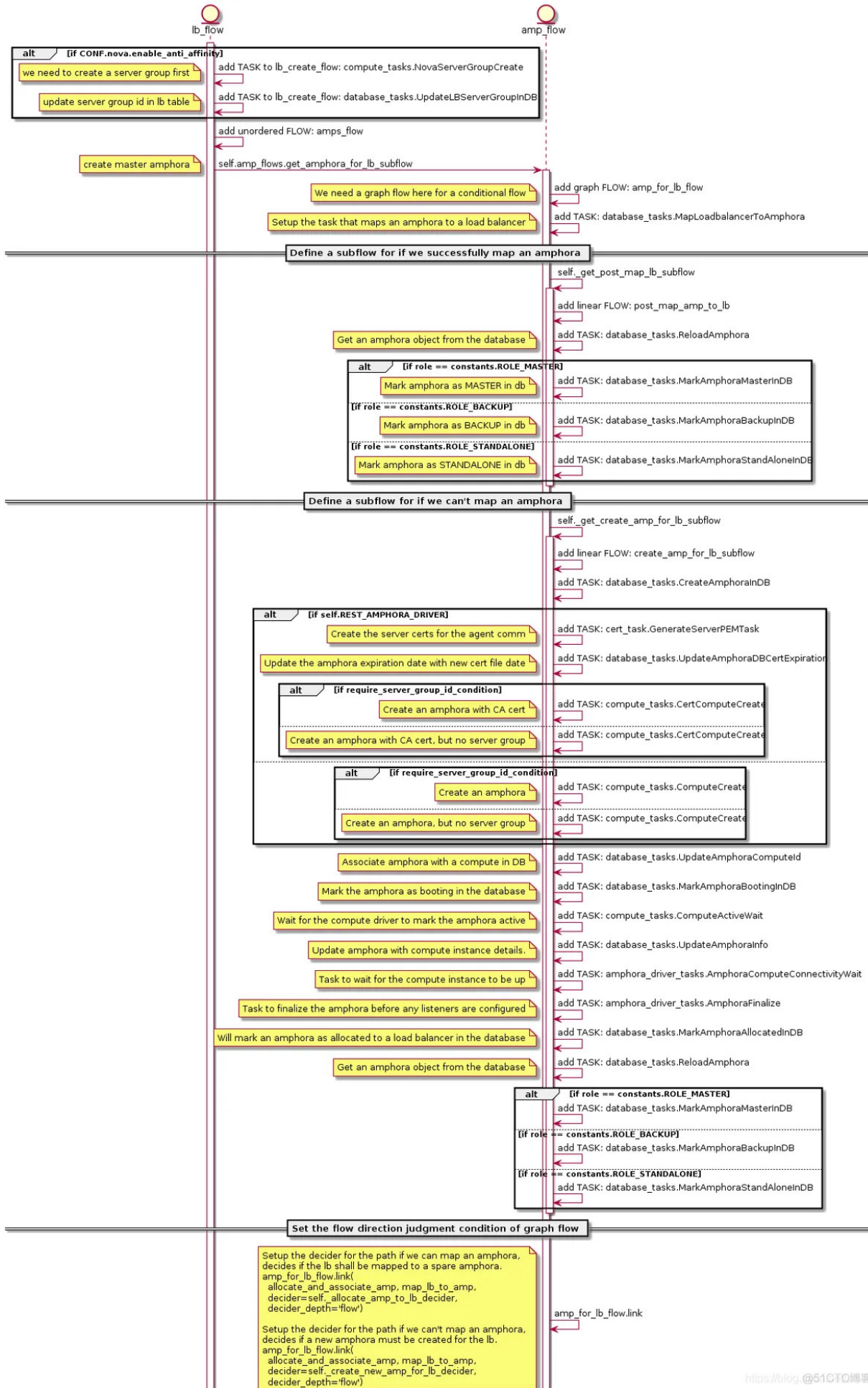
가

- amphora(e)

amphorae 가

SINGLE ACTIVE_STANDBY 가
SINGLE 가
ACTIVE_STANDBY Keepalived /
SINGLE

Amphora UML :



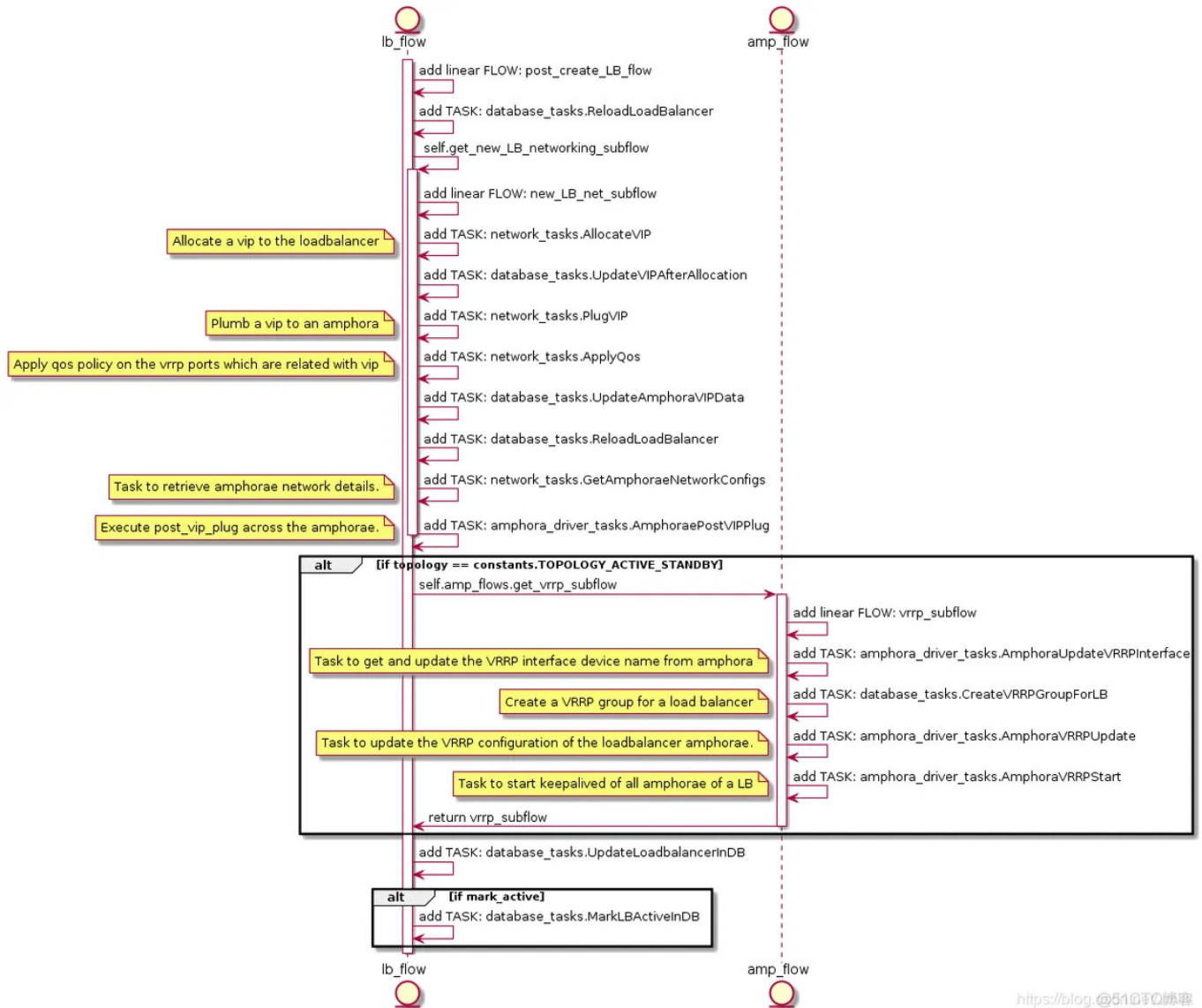
<https://blog@51CTO博客>

가

- 가 ACTIVE_STANDBY [nova] enable_anti_affinity = True
Nova 가
- space
amphora pool . amphora for lb flow space
amphora pool 가 ,
. space amphora pool Housekeeping Manager
space amphora pool Housekeeping Manager
[house_keeping] spare_amphora_pool_size=2 pool size
- amphora for lb flow
(amp_for_lb_flow.link)

```
if loadbalancer mapping Amphora instance SUCCESS:
    Upload database associations for loadbalancer and amphora
else:
    Create amphora first
    Upload database associations for loadbalancer and amphora
```

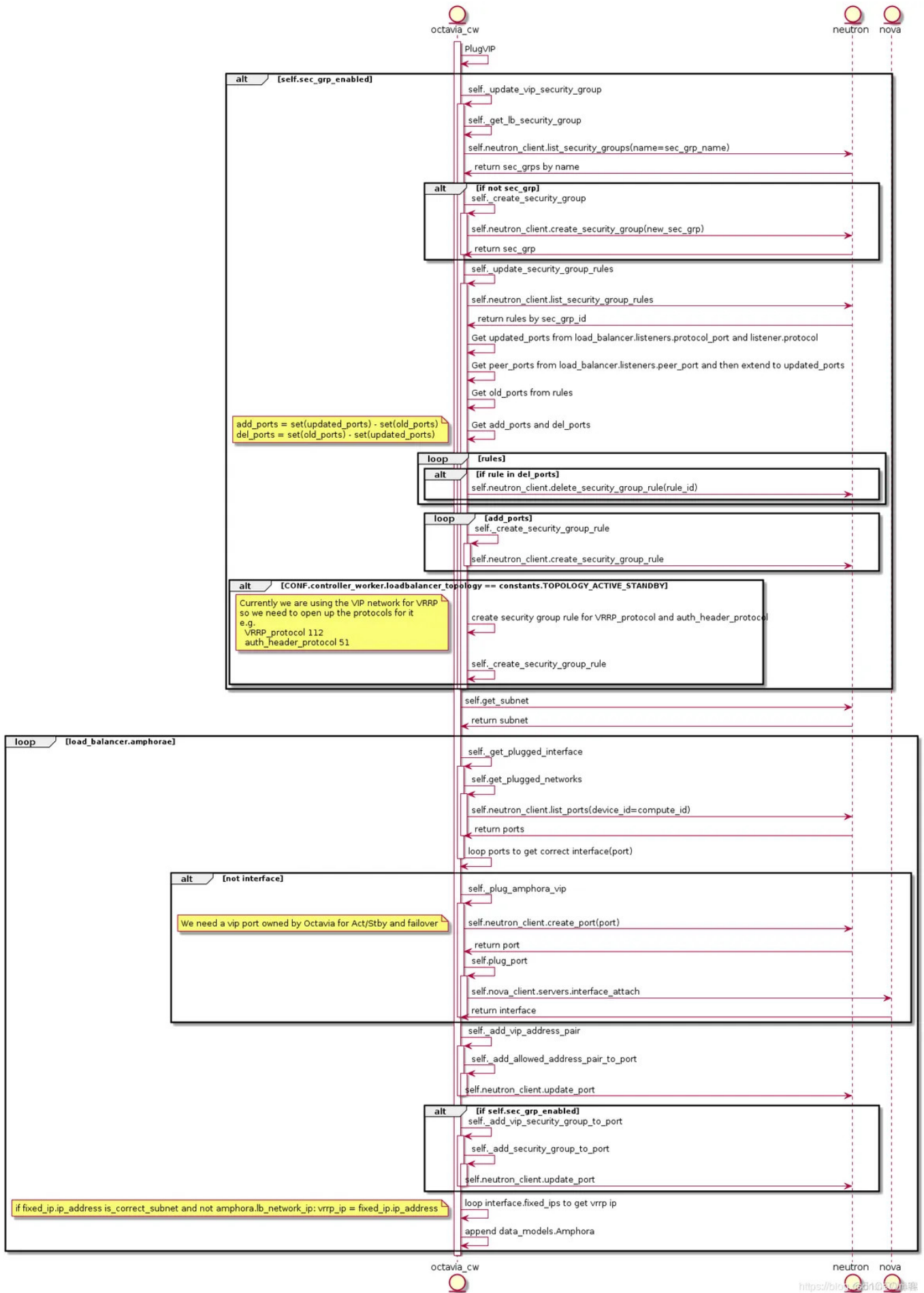
```
amphora가 lb-mgmt-net 가 loadbalancer
vip-net amphora . octavia-api vip-net
port:loadbalancer-<load_balancer_id>가
ACTIVE_STANDBY Keepalived VIP
vip-net VRRP_port (octavia-lb-vrrp-<amphora_id>)가
amphora(e) UML :
```



<https://blog.@51070의博客>

Amphora 가 . * network_tasks.AllocateVIP *
 network_tasks.PlugVIP * amphora_driver_tasks.AmphoraePostVIPPlug *
 amphora_driver_tasks.AmphoraVRRPUpdate * amphora_driver_tasks.AmphoraVRRPStart
 Octavia Networking

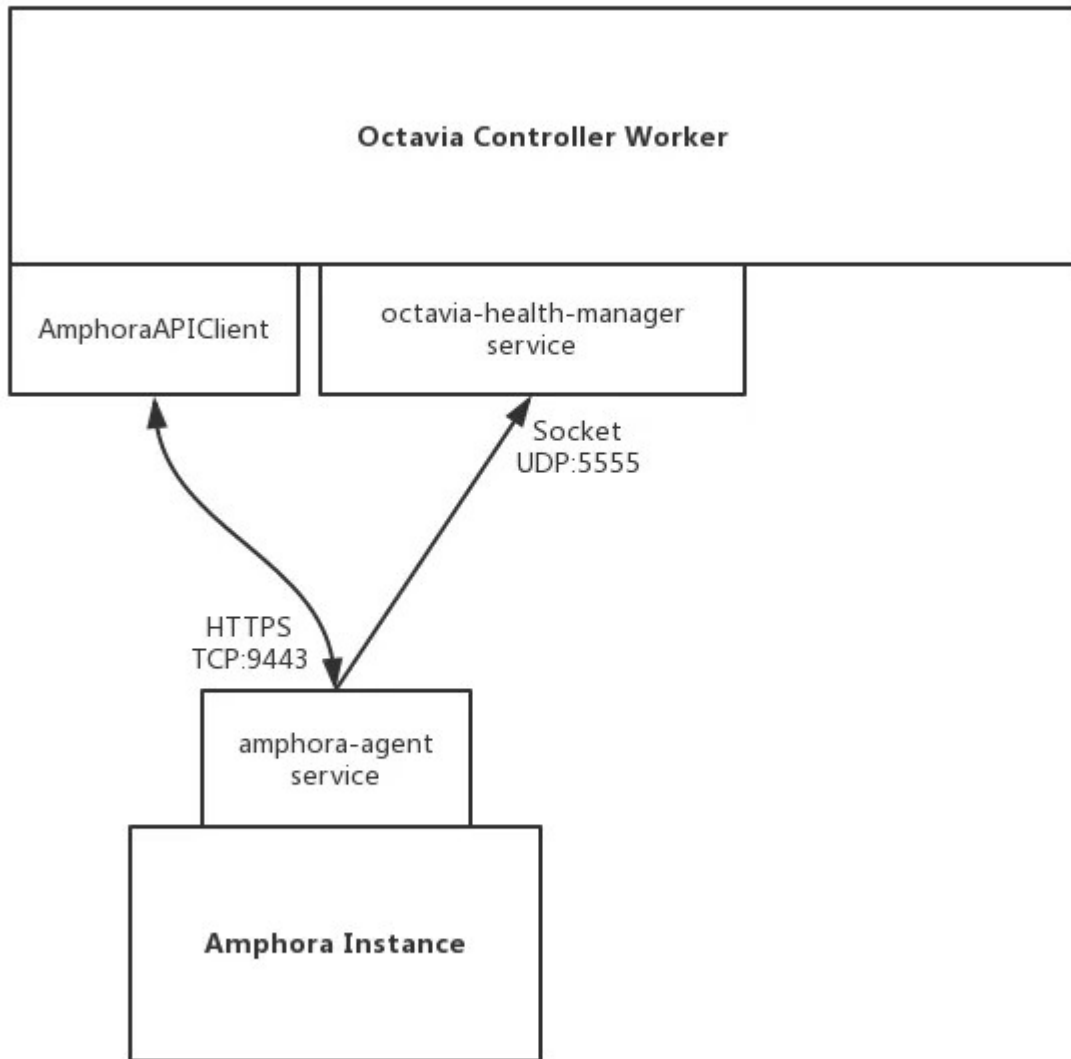
====
 network_tasks.AllocateVIP ==== AllocateVIP VIP 가 Port, VIP
 LB data_models.Vip Neutron
 AllowedAddressPairsDriver.allocate_vip . octavia-api
 octavia-worker VIP , data_models.Vip
 Task:UpdateAmphoraVIPData . ==== network_tasks.PlugVIP
 ==== AllocateVIP Neutron VIP PlugVIP Amphora VIP
 . PlugVIP UML



VIP
 VIP HTTP:8080 가
 API flow Amphora
 Worker Amphora 가
 Amphora Amphora
 Amphora Amphora
 가 ?
 Controller Worker

VIP
 HTTP:8080 가
 Neutron API
 TASK:AllocateVIP TASK:PlugVIP
 Amphora
 Amphora
 Amphora Agent AmphoraAPIClient
 가 가
 HAProxy Keepalived
 가 ?
 가 가 ! amphora-agent Octavia

Nova create lb
 Amphora
 Octavia Controller
 가
 가
 가 ?



<https://blog.@51CTO博客>

amphora-agent가 AmphoraAPIClient
 Agent ==== amphora-agent Launch Amphora
 WSGI HTTP Flask & gunicorn
 from octavia.cmd.agent import main 가

```
# file:
/opt/rocky/octavia/octavia/amphorae/backends/agent/api_server/server.py

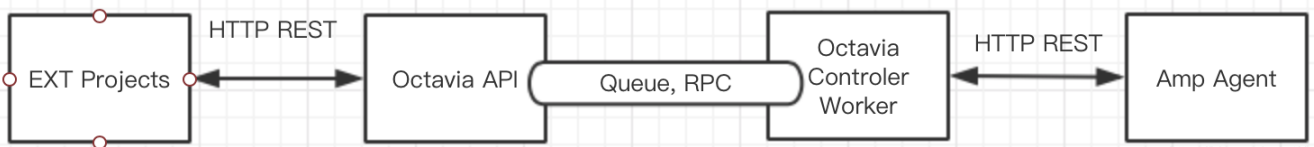
class Server(object):
    def __init__(self):
        self.app = flask.Flask(__name__)
        ...
        self.app.add_url_rule(rule=PATH_PREFIX +
            '/listeners/<amphora_id>/<listener_id>/haproxy',
                view_func=self.upload_haproxy_config,
                methods=['PUT'])
        ...
```

```
Flask
gunicorn
Octavia HAProxy Amphora API
==== AmphoraAPIClient ==== AmphoraAPIClient amphora-agent REST API
Octavia HAProxy Amphora API URL
```

```
# file:
/opt/rocky/octavia/octavia/amphorae/drivers/haproxy/rest_api_driver.py

class AmphoraAPIClient(object):
    def __init__(self):
        super(AmphoraAPIClient, self).__init__()
        self.secure = False
        ...
```

```
* Octavia API: REST API
Queue: RPC
REST API
* Amphora agent: Amphora Octavia Controller Worker
```



```
==== AmphoraePostVIPPlug ==== TASK:AmphoraePostVIPPlug 가 ,
AmphoraePostVIPPlug Amphorae AmphoraAPIClient PUT
plug/vip/{vip} amphora-agent VM NIC Amphora
가 . Amphora
AmphoraePostVIPPlug Amphora lb-mgmt-net NIC가
vip-net AmphoraPostVIPPlug VIP NIC
Amphora Plug:plug_vip
가 . Amphora lb-mgmt-net
```



```

root@amphora-cd444019-ce8f-4f89-be6b-0edf76f41b77:~# ifconfig
ens3      Link encap:Ethernet  HWaddr fa:16:3e:b6:8f:a5
          inet addr:192.168.0.9  Bcast:192.168.0.255  Mask:255.255.255.0
          inet6 addr: fe80::f816:3eff:feb6:8fa5/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1450  Metric:1
          RX packets:19462 errors:14099 dropped:0 overruns:0 frame:14099
          TX packets:70317 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:1350041 (1.3 MB)  TX bytes:15533572 (15.5 MB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

```

```

Amphora가          vrrp_port          가 가          . vrrp_port  Keepalived 가
NIC                (                eth1)                .

```

```

root@amphora-cd444019-ce8f-4f89-be6b-0edf76f41b77:~# ip netns exec amphora-
haproxy ifconfig
eth1      Link encap:Ethernet  HWaddr fa:16:3e:f4:69:4b
          inet addr:172.16.1.3  Bcast:172.16.1.255  Mask:255.255.255.0
          inet6 addr: fe80::f816:3eff:fef4:694b/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1450  Metric:1
          RX packets:12705 errors:0 dropped:0 overruns:0 frame:0
          TX packets:613211 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:762300 (762.3 KB)  TX bytes:36792968 (36.7 MB)

eth1:0    Link encap:Ethernet  HWaddr fa:16:3e:f4:69:4b
          inet addr:172.16.1.10  Bcast:172.16.1.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1450  Metric:1

```

```

VRRP IP: 172.16.1.3  VIP: 172.16.1.10          lb-vip-network  DHCP          octavia-
lb-vrrp-<amphora_uuid>  octavia-lb-<loadbalancer_uuid>          .          eth1

```

```

root@amphora-cd444019-ce8f-4f89-be6b-0edf76f41b77:~# ip netns exec amphora-
haproxy cat /etc/network/interfaces.d/eth1
auto eth1
iface eth1 inet dhcp
root@amphora-cd444019-ce8f-4f89-be6b-0edf76f41b77:~# ip netns exec amphora-
haproxy cat /etc/network/interfaces.d/eth1.cfg

```

```
# Generated by Octavia agent
auto eth1 eth1:0
iface eth1 inet static
address 172.16.1.3
broadcast 172.16.1.255
netmask 255.255.255.0
gateway 172.16.1.1
mtu 1450

iface eth1:0 inet static
address 172.16.1.10
broadcast 172.16.1.255
netmask 255.255.255.0
# Add a source routing table to allow members to access the VIP
post-up /sbin/ip route add 172.16.1.0/24 dev eth1 src 172.16.1.10 scope link
table 1
post-up /sbin/ip route add default via 172.16.1.1 dev eth1 onlink table 1
post-down /sbin/ip route del default via 172.16.1.1 dev eth1 onlink table 1
post-down /sbin/ip route del 172.16.1.0/24 dev eth1 src 172.16.1.10 scope
link table 1
post-up /sbin/ip rule add from 172.16.1.10/32 table 1 priority 100
post-down /sbin/ip rule del from 172.16.1.10/32 table 1 priority 100
post-up /sbin/iptables -t nat -A POSTROUTING -p udp -o eth1 -j MASQUERADE
post-down /sbin/iptables -t nat -D POSTROUTING -p udp -o eth1 -j MASQUERADE
```

```
==== Keepalived                                ==== 가                                loadbalancer_topology
= ACTIVE_STANDBY                                Keepalived                                가                                , TASK:AmphoraVRRPUpdate
TASK:AmphoraVRRPStart                          Keepalived                                Keepalived
. TASK:AmphoraVRRPUpdate                        , amphora topology VIP
port, VRRP_ports                                keepalived.conf                            Jinja
AmphoraAPIClient                               amphora-agent PUT vrrp/upload              Keepalived
. TASK:AmphoraVRRPStart AmphoraAPIClient    PUT vrrp/start
amphora-agent view_func:manage_service_vrrp(action=start)
```

```
# file:
/opt/rocky/octavia/octavia/amphorae/backends/agent/api_server/keepalived.py

def manager_keepalived_service(self, action):
    action = action.lower()
    if action not in [consts.AMP_ACTION_START,
                      consts.AMP_ACTION_STOP,
                      consts.AMP_ACTION_RELOAD]:
        return webob.Response(json=dict(
            message='Invalid Request',
            details="Unknown action: {0}".format(action)), status=400)

    if action == consts.AMP_ACTION_START:
        keepalived_pid_path = util.keepalived_pid_path()
```

```

    try:
        # Is there a pid file for keepalived?
        with open(keepalived_pid_path, 'r') as pid_file:
            pid = int(pid_file.readline())
            os.kill(pid, 0)

        # If we got here, it means the keepalived process is
running.
        # We should reload it instead of trying to start it again.
        action = consts.AMP_ACTION_RELOAD
    except (IOError, OSError):
        pass

    cmd = ("/usr/sbin/service octavia-keepalived {action}".format(
        action=action))

    try:
        subprocess.check_output(cmd.split(), stderr=subprocess.STDOUT)
    except subprocess.CalledProcessError as e:
        LOG.debug('Failed to %s octavia-keepalived service: %s %s',
            action, e, e.output)
        return webob.Response(json=dict(
            message="Failed to {0} octavia-keepalived service".format(
                action), details=e.output), status=500)

    return webob.Response(
        json=dict(message='OK',
            details='keepalived
{action}ed'.format(action=action)),
        status=202)

```

```

amphora-agent /usr/sbin/service octavia-keepalived start keepalived
               . octavia-keepalived.service                :

```

```

# file: /usr/lib/systemd/system/octavia-keepalived.service

[Unit]
Description=Keepalive Daemon (LVS and VRRP)
After=network-online.target .service
Wants=network-online.target
Requires=.service

[Service]
# Force context as we start keepalived under "ip netns exec"
SELinuxContext=system_u:system_r:keepalived_t:s0
Type=forking
KillMode=process

ExecStart=/sbin/ip netns exec amphora-haproxy /usr/sbin/keepalived -D -d -f

```

```
/var/lib/octavia/vrrp/octavia-keepalived.conf -p
/var/lib/octavia/vrrp/octavia-keepalived.pid
```

```
ExecReload=/bin/kill -HUP $MAINPID
PIDFile=/var/lib/octavia/vrrp/octavia-keepalived.pid
```

```
[Install]
WantedBy=multi-user.target
```

```

* keepalived namespace amphora-haproxy .
* keepalived /var/lib/octavia/vrrp/octavia-keepalived.conf .
view_func:manage_service_vrrp , keepalived
가 view_func:upload_keepalived_config . keepalived
```

```
# file: /var/lib/octavia/vrrp/octavia-keepalived.conf

vrrp_script check_script {
    script /var/lib/octavia/vrrp/check_script.sh # VRRP check
    interval 5
    fall 2
    rise 2
}

vrrp_instance 01197be798d5440da846cd70f52dc503 { # VRRP instance name is
loadbalancer UUID
    state MASTER # Master router
    interface eth1 # VRRP IP device
    virtual_router_id 1 # VRID
    priority 100
    nopreempt
    garp_master_refresh 5
    garp_master_refresh_repeat 2
    advert_int 1
    authentication {
        auth_type PASS
        auth_pass b76d77e
    }

    unicast_src_ip 172.16.1.3 # VRRP IP
    unicast_peer {
        172.16.1.7 # Backup router VRRP IP
    }

    virtual_ipaddress {
        172.16.1.10 # VIP address
    }
    track_script {
```

```

    check_script
  }
}

```

```

, keepalived eth1 VRRP IP VIP , eth1
TASK:AmphoraePostVIPPlug namespace amphora .
check_script.sh VIP Amphorae HAProxy

```

```

root@amphora-caa6ba0f-1a68-4f22-9be9-8521695ac4f4:~# cat
/var/lib/octavia/vrrp/check_scripts/haproxy_check_script.sh
haproxy-vrrp-check /var/lib/octavia/d367b5ec-24dd-44b3-b947-
e0ff72c75e66.sock; exit $?

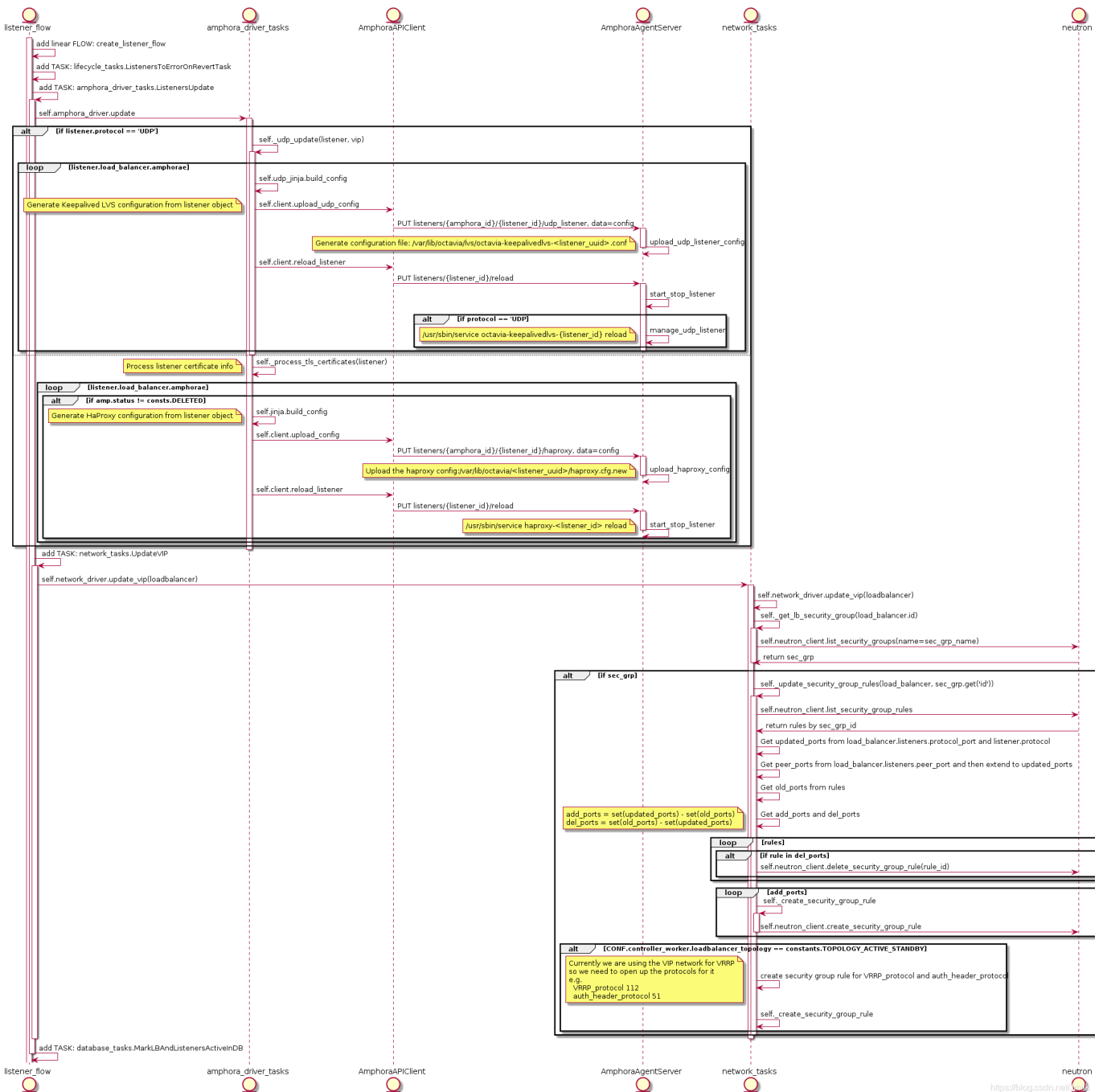
```

```

Amphora Instance amphora-agent keepalived 가
haproxy . haproxy 가
, amphorae amphorae vip-net

```

UML



, openstack loadbalancer listener create --protocol HTTP
 --protocol-port 8080 lb-1 Task:ListenersUpdate
 , AmphoraAPIClient가 :

- PUT listeners/{amphora_id}/{listener_id}/haproxy: haproxy
- PUT listeners/{listener_id}/reload: haproxy

가 haproxy 가 Listener VIP Task:UpdateVIP .

haproxy

amphora

haproxy

.

```
# file: /var/lib/octavia/1385d3c4-615e-4a92-aea1-c4fa51a75557/haproxy.cfg,
Listener UUID: 1385d3c4-615e-4a92-aea1-c4fa51a75557

# Configuration for loadbalancer 01197be7-98d5-440d-a846-cd70f52dc503
global
    daemon
    user nobody
    log /dev/log local0
    log /dev/log local1 notice
    stats socket /var/lib/octavia/1385d3c4-615e-4a92-aea1-c4fa51a75557.sock
mode 0666 level user
    maxconn 1000000

defaults
    log global
    retries 3
    option redispatch

peers 1385d3c4615e4a92aea1c4fa51a75557_peers
    peer l_Ustq0qE-h-_Q1dLXLXBAiWR8U 172.16.1.7:1025
    peer 008zAgUhIv9TEXhyYZf2iHdx0kA 172.16.1.3:1025

frontend 1385d3c4-615e-4a92-aea1-c4fa51a75557
    option httplog
    maxconn 1000000
    bind 172.16.1.10:8080
    mode http
    timeout client 50000
```

- <https://www.cnblogs.com/jmilkfan-fanguiju/p/10589749.html>
- https://blog.51cto.com/u_15301988/3126511

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