Installation Runbook for

Application Version	F5 BIG-IP 11.5.2+, 11.6.x, 12.0.x, 12.1.x
	F5-LBaaS v9.1.0 (LBaaSv2 API)
	F5-Heat Plugin v8.0.3
MOS Version	9.0
Openstack Version	Openstack Mitaka
Application Type	Validation of LBaaSv2 and Heat plugins for BIG-IP

Document History

Version	Revision Date	Description
0.1	5/10/2016	Initial Version
0.2	6/10/2016	Modified the reference architecture section
0.3	7/10/2016	Some minor rewrites
0.4	14/10/2016	- Explicitly indicate that the "F5 LBaaSv2 packages installation" have to be installed in all the controllers - Added mkdir -p before un-tar the provider package. - Replaced curl by wget due to web site problems in the redirection with curl.
1.0	17/10/2016	- Updated the guide for the 9.1.0 software package - Scale-N is supported in this version. - Corrected reference to L2 Adjacent Mode notes - Some minor rewrites - Added section on agent start at boot time
1.1	20/10/2016	- Clarified in section 4.1 where deployment and configuration of packages is done.
1.2	17/11/2016	- Added F5 Heat plugin
1.3	17/11/2016	- Fixed version number for F5 Heat plugin package from 9.0.1 to 8.0.3

1   Introduction

This document is to serve as a Deployment Guide for:

- F5 Networks' OpenStack LBaaSv2 plug-in.

  F5 offers an LBaaS plug-in compatible with the OpenStack Neutron LBaaS v2.0 service. This document describes the reference architecture and installation steps for this F5 OpenStack LBaaSv2 plug-in. We will also highlight any limitations in the current implementation.

- F5 Network's Openstack HEAT plugin.

  This HEAT plugin provides HEAT resource types to implement additional functionalities that are not possible with the LBaaSv2 HEAT resource types. This document lists the additional resource types provided and the installation of the plugin.

1.1   Target Audience

This guide is aimed at Mirantis Fuel Openstack Architects and System Administrators who wish to use the F5 OpenStack LBaaSv2 and/or HEAT plugins to manage BIG-IP hardware or Virtual Editions in their cloud environments. This guide assumes that the reader is familiar with BIG-IP Hardware and Virtual Editions as well as basic layer 2-3 networking. For additional information on the F5 product line please visit www.f5.com.

2   F5 LBaaSv2 overview

The F5 OpenStack LBaaSv2 Plug-in allows OpenStack operators to utilize BIG-IP hardware or Virtual Edition in MOS. LBaaSv2 plug-in supports a wide range of features. The following table summarizes the support status of these:

LBaaSv2 feature	Supported in MOS 9.0	Supported by F5	Tested in the development of this guide
LB methods ROUND_ROBIN, LEAST_CONNECTIONS, SOURCE_IP	ALL	Yes	Yes If using SOURCE_IP check this link
Health monitors (PING, TCP, HTTP)	Yes	Yes	Yes
Health monitors (HTTPS)	No	Yes	NA
Certificate Manager / SSL Offloading	No	Yes	NA
Session persistence (SOURCE_IP, HTTP_COOKIE, APP_COOKIE)	Yes	Yes	Yes If using APP_COOKIE check this link
L7 routing	Yes	No	NA
Unattached Pools	Yes	No	NA
Load balancer statistics	Yes	No	NA

LBaaSv2 dictates an API for a Load Balancer feature set. How these LBaaSv2 features are implemented is left to the Load Balancer provider. F5 implementation transparently provides a set of features such as LBaaSv2 agent high availability that makes F5 a great solution. The next table shows these implementation features and which of these have been tested during the development of this guide. ***Note that although not all features have been tested in this guide they are expected to be fully operational and are fully supported by F5 with Mirantis.***

F5 implementation feature	Tested in the development of this guide
L2 Adjacent Mode (f5_global_routed_mode = False)	Yes
Global Routed Mode	Yes
BIG-IP High Availability & Device Clusters	Yes – Active/Standby and Active/Active with Scale-N load distribution
Hierarchical Port Binding	No

A description of these features are described in http://f5-openstack-lbaasv2-driver.readthedocs.io/en/latest/map_lbaasv2-features.html

The F5 BIG-IP has the possibility of connecting to the network using the following technologies. ***Note that although not all features have been tested in this guide they are expected to be fully operational and are fully supported by F5 with Mirantis.***

Network connectivity technology	Tested in the development of this guide
VLAN	Yes
VxLAN	Yes
GRE tunneling	No

3   F5 LBaaSv2 reference architecture

There are two main components for using F5 with LBaaSv2:

- F5 LBaaS driver: receives the LBaaSv2 requests from Neutron and binds the requests to the appropriate agent.
- F5 LBaaS agent: implements the LBaaSv2 by using the F5 iControlRest API.

A sample view of the architecture is shown next.
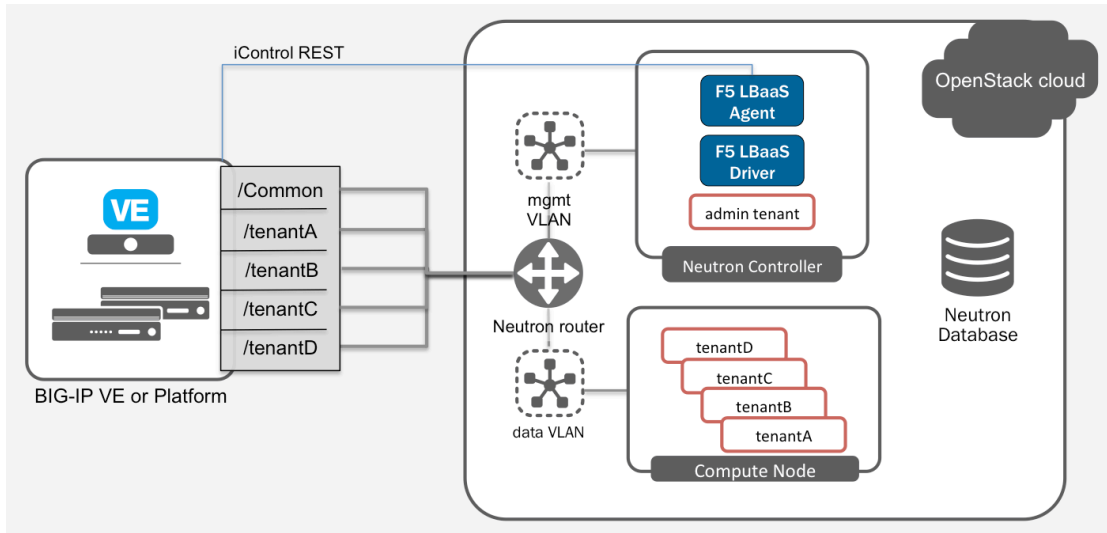
More precisely when Neutron LBaaSv2 API calls are issued to your Neutron controller, the LBaaSv2 plugin will attempt provision LBaaSv2 resources using the configured F5 OpenStack LBaaSv2 service provider drivers. These run within the Neutron controller process(es) and utilize Neutron RPC messaging queues to issue provisioning tasks to specific F5 OpenStack LBaaSv2 agent processes. Upon starting and successfully communicating with configured TMOS device API endpoints, each agent process registers its own specific named queue to receive tasks from one or more Neutron controllers.

The F5 OpenStack LBaaSv2 agents also make callbacks to the Openstack service provider drivers to query additional Neutron network, port, and subnet information; allocate Neutron objects like fixed IP address for SelfIP and SNAT translation addresses; and report provisioning and pool status.

This detail of API workflow described above can be seen in the next picture
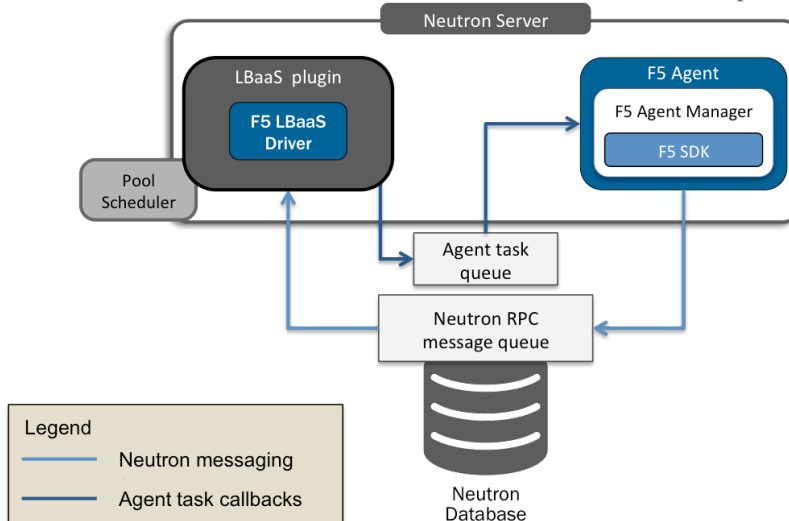
3.1   BIG-IP topologies

The F5 LBaaSv2 supports the following BIG-IP configurations:
- Standalone – A single BIG-IP without redundancy.
- HA-Pair – Traditional Active-Standby high availability mode.

- Scale-N – Active-Active high availability mode with 2 or more BIG-IPs. The F5 LBaaSv2 plugin transparently distributes the workloads of the different tenants between the available BIG-IPs. *Note that at time of this writing up to 4 Active devices are supported in F5 LBaaSv2.*

These configurations are supported for Virtual Editions, BIG-IP appliances or BIG-IP chassis platforms. For additional information on high availability modes please check

http://f5-openstack-lbaasv2-driver.readthedocs.io/en/v9.1.0/includes/topic_ha-modes.html

http://f5-openstack-lbaasv2-driver.readthedocs.io/en/v9.1.0/includes/topic_clustering.html

Connection and persistence mirroring is supported normally. Please see *SOL3478: Overview of connection and persistence mirroring (11.x - 12.x)* for further information.

4   Heat resource types provided by F5 Heat Plugin

In this version the following resources are available to implement additional functionalities not possible by means of the LBaaS API/LBaaS Heat resource types:

```
F5::BigIP::Device
F5::Cm::Cluster
F5::Cm::Sync
F5::LTM::Pool
F5::LTM::VirtualServer
F5::Sys::Partition
F5::Sys::Save
F5::Sys::iAppCompositeTemplate
F5::Sys::iAppFullTemplate
F5::Sys::iAppService
```

For additional information in these HEAET resource types please visit `https://f5-openstack-heat.readthedocs.io`

5   Installation & Configuration

5.1   Environment preparation

The installation of F5 LBaaSv2 or the F5 Heat plugin don't impose any requirements on the Mirantis installation. No additional steps are required during installation.

After the Openstack installation has been completed additional F5 packages will be deployed and configured in the controllers. This will be detailed in the next sections alongside verification steps.

5.2   F5 Heat plugin Installation

The installation has to be performed in all the Openstack nodes which contain the Heat engine. To perform the installation the python-pip installer will be used instead of using deb packages.

- Install the F5 Heat Plugins pip package

```
$ sudo pip install f5-openstack-heat-plugins==8.0.3
```

- Re-install F5-Heat Plugin's installed version of the `f5-sdk` package

By default the `f5-openstack-heat-plugins` package automatically installs it's own version of `f5-sdk` whilst F5 LBaaS plugin specifically requires `f5-sdk` version 1.5.0. Because of this we will uninstall the automatically installed version of `f5-sdk` and we will install LBaaS required version. This will provide a consistent installation no matter if we install LBaaS and in which order.

```
$ sudo pip uninstall f5-sdk
```

Download and install `f5-sdk` version 1.5.0

```
$ wget https://github.com/F5Networks/f5-common-python/releases/download/v1.5.0/f5-sdk-
1.5.0-1.el7.noarch.rpm

$ sudo dpkg -i python-f5-sdk_1.5.0-1_1404_all.deb
```

- Run the following tail command in the background:

```
$ tail -f /var/log/heat/heat-engine.log | grep F5:: &
```

- Restart the Heat service

```
$ sude service heat-engine stop
$ sude service heat-engine start
```

- Verify the installation

Shortly after restarting the service the following output is expected to be shown by the tail command running in background:

```
016-11-15 03:40:06.951 23041 INFO heat.engine.environment [-]  Registered: [Plugin](User:False) F5::Sys::iAppService -> <class
'heat.engine.plugins.f5_heat.resources.f5_sys_iappservice.F5SysiAppService'>
2016-11-15 03:40:06.954 23041 INFO heat.engine.environment [-]  Registered: [Plugin](User:False) F5::Sys::Partition -> <class
'heat.engine.plugins.f5_heat.resources.f5_sys_partition.F5SysPartition'>
2016-11-15 03:40:06.967 23041 INFO heat.engine.environment [-]  Registered: [Plugin](User:False) F5::Sys::Save -> <class
'heat.engine.plugins.f5_heat.resources.f5_sys_save.F5SysSave'>
2016-11-15 03:40:06.969 23041 INFO heat.engine.environment [-]  Registered: [Plugin](User:False) F5::LTM::VirtualServer ->
<class 'heat.engine.plugins.f5_heat.resources.f5_ltm_virtualserver.F5LTMVirtualServer'>
2016-11-15 03:40:06.971 23041 INFO heat.engine.environment [-]  Registered: [Plugin](User:False) F5::BigIP::Device -> <class
'heat.engine.plugins.f5_heat.resources.f5_bigip_device.F5BigIPDevice'>
2016-11-15 03:40:06.973 23041 INFO heat.engine.environment [-]  Registered: [Plugin](User:False) F5::Cm::Sync -> <class
'heat.engine.plugins.f5_heat.resources.f5_cm_sync.F5CmSync'>
2016-11-15 03:40:06.983 23041 INFO heat.engine.environment [-]  Registered: [Plugin](User:False) F5::LTM::Pool -> <class
'heat.engine.plugins.f5_heat.resources.f5_ltm_pool.F5LTMPool'>
2016-11-15 03:40:06.984 23041 INFO heat.engine.environment [-]  Registered: [Plugin](User:False) F5::Sys::iAppFullTemplate ->
<class 'heat.engine.plugins.f5_heat.resources.f5_sys_iappfulltemplate.F5SysiAppFullTemplate'>
2016-11-15 03:40:06.986 23041 INFO heat.engine.environment [-]  Registered: [Plugin](User:False)
F5::Sys::iAppCompositeTemplate -> <class
'heat.engine.plugins.f5_heat.resources.f5_sys_iappcompositetemplate.F5SysiAppCompositeTemplate'>
2016-11-15 03:40:06.990 23041 INFO heat.engine.environment [-]  Registered: [Plugin](User:False) F5::Cm::Cluster -> <class
'heat.engine.plugins.f5_heat.resources.f5_cm_cluster.F5CmCluster'>
```

where it can be seen that the F5 Heat resources (which start with the F5:: prefix) appear as Registered in the output above. This is required to verify the installation.

5.3 F5 LBaaSv2 packages installation

These packages need to be installed in all the Openstack controllers

- Download and install the F5 LBaaSv2 service provider package

```
$ wget https://github.com/F5Networks/neutron-lbaas/releases/download/v8.0.1/f5.tgz

$ sudo mkdir -p /usr/lib/python2.7/dist-packages/neutron_lbaas/drivers/

$ sudo tar xvf f5.tgz -C /usr/lib/python2.7/dist-packages/neutron_lbaas/drivers/
```

- Install Openstack supporting packages

```
# apt-get install neutron-lbaas-common python-barbicanclient python-neutron-lbaas
```

Note that the `neutron-lbaas-common` package will install haproxy unconditionally and it cannot be removed. If it is not going to be installed it is suggested to disable the service to startup at boot.

- Download and install F5 supporting packages

Note: If the F5 Heat plugin has been installed previously the f5-sdk package is not required to be installed again.

```
$ wget https://github.com/F5Networks/f5-common-python/releases/download/v1.5.0/python-f5-
sdk_1.5.0-1_1404_all.deb

$ wget https://github.com/F5Networks/f5-icontrol-rest-
python/releases/download/v1.0.9/python-f5-icontrol-rest_1.0.9-1_1404_all.deb


$ sudo dpkg -i python-f5-icontrol-rest_1.0.9-1_1404_all.deb

$ sudo dpkg -i python-f5-sdk_1.5.0-1_1404_all.deb
```

- Download and install the F5 agent

```
$ wget https://github.com/F5Networks/f5-openstack-agent/releases/download/v9.1.0/python-
f5-openstack-agent_9.1.0-1_1404_all.deb

$ sudo dpkg -i python-f5-openstack-agent_9.1.0-1_1404_all.deb
```

- Download and install the F5 driver

```
$ wget https://github.com/F5Networks/f5-openstack-lbaasv2-
driver/releases/download/v9.1.0/python-f5-openstack-lbaasv2-driver_9.1.0-1_1404_all.deb

$ sudo dpkg -i python-f5-openstack-lbaasv2-driver_9.1.0-1_1404_all.deb
```

5.4   F5 LBaaSv2 configuration

The configuration happens entirely in the Openstack controllers. Please execute the following instructions in each controller.

5.4.1   Initial agent configuration – for verification purposes

In this step we will setup a minimal configuration for the purpose of agent verification only. A single BIG-IP will be used which can be VE or hardware version. Please make sure that the BIG-IP is Licensed.

In the file `/etc/neutron/services/f5/f5-openstack-agent.ini` modify the following parameters:

```
icontrol_hostname
icontrol_username
icontrol_password
```

```
        f5_ha_type
        f5_global_routed_mode
```

These variables are described in the `f5-openstack-agent.ini` file itself. Set `icontrol_hostname` to the IP address the BIG-IP that will be used to connect via iControlRest. This is typically the management port. Set `icontrol_username` and `icontrol_password` to match the credentials of a user with Administrator rights (ie: admin and its password). To simplify the verification `f5_ha_type` setting should be set to `standalone` and `f5_global_routed_mode` should be set to `True`.

At this point verify the connectivity between the controller(s) and the IP address specified above. Verify that TCP port 443 is be reachable from the controller(s).

5.4.2   Set 'F5Networks' as the LBaaSv2 Service Provider

Edit the service_providers section of `/etc/neutron/neutron_lbaas.conf` as shown below to set 'F5Networks' as the LBaaSv2 service provider.

```
[service_providers]
service_provider =
LOADBALANCERV2:F5Networks:neutron_lbaas.drivers.f5.driver_v2.F5LBaaSV2Driver:default
```

5.4.3   Add the Neutron LBaaSv2 Service Plugin

Edit the `[DEFAULT]` section of the Neutron config file – `/etc/neutron/neutron.conf`

Add the LBaaSv2 service plugin as shown below.

```
[DEFAULT]
service_plugins = [already defined plugins],neutron_lbaas.services.loadbalancer.plugin.LoadBalancerPluginv2
```

Notes about this setting:

-   Several LBaaSv2 providers might be configured.
-   LBaaSv1 has been deprecated and it is not compatible with LBaaSv2.

5.4.4   Run neutron-db-manage upgrade for neutron-lbaas:

```
neutron-db-manage --service lbaas --config-file /etc/neutron/neutron.conf --config-
file /etc/neutron/plugins/ml2/ml2_conf.ini upgrade head
```

5.4.5   Restart Neutron

Use the command appropriate for your OS to restart the neutron-server:

```
$ sudo service neutron-server restart
```

To verify that neutron-server is restarted properly running the following command after few seconds allowing for initialization. The alive column should show the smiley face.

```
root@node-1:~$ neutron agent-list
+--------------------------------------+--------------------+---------------+-------------------+-------+----------------+--------------------------+
| id                                   | agent_type         | host          | availability_zone | alive | admin_state_up | binary                   |
+--------------------------------------+--------------------+---------------+-------------------+-------+----------------+--------------------------+
| 12ad3c94-6f2a-44e2-9e43-2a625640b396 | Metadata agent     | node-2.domain.tld |               | :-)   | True           | neutron-metadata-agent   |
| a60a54a0-7648-4b85-8e2c-d0f1feacb304 | Open vSwitch agent | node-2.domain.tld |               | :-)   | True           | neutron-openvswitch-agent |
| a6b34875-f5e6-498c-ad6f-ccec467f5a9e | Open vSwitch agent | node-1.domain.tld |               | :-)   | True           | neutron-openvswitch-agent |
| c49a7ac4-2815-4c07-9f5f-87ac7b55d39d | DHCP agent         | node-2.domain.tld | nova          | :-)   | True           | neutron-dhcp-agent       |
| f00f52ee-4031-4402-8b6e-0c3025d5e22a | L3 agent           | node-2.domain.tld | nova          | :-)   | True           | neutron-l3-agent         |
+--------------------------------------+--------------------+---------------+-------------------+-------+----------------+--------------------------+
```

5.4.6   Start the F5 OpenStack Agent

Ps –ef Start the service

```
$ sudo service f5-oslbaasv2-agent start
```

Verify that the agent has started properly, first verify the agent has successfully registered in neutron by checking the smiley face of the f5-oslbaasv2-agent in the alive column

```
# neutron agent-list -c alive -c binary -c agent_type | egrep "alive|f5-oslbaasv2-agent|----"
+-------+---------------------------+---------------------+
| alive | binary                    | agent_type          |
+-------+---------------------------+---------------------+
| :-)   | f5-oslbaasv2-agent        | Loadbalancerv2 agent |
+-------+---------------------------+---------------------+
```

If the agent started successfully it should be able to connect to the iControlRest endpoint defined earlier. This can be checked in the `/var/log/neutron/f5-oslbaasv2-agent.log` file by looking in the line showing `iControlDriver dynamic agent configurations` which shows the configuration of the BIG-IP that the agent has connected to (highlighted below). The next output is an example of a typical log when agent startup is successful.

```
2016-10-07 06:07:06.004 6372 INFO neutron.common.config [-] Logging enabled!
2016-10-07 06:07:06.005 6372 INFO neutron.common.config [-] /usr/bin/f5-oslbaasv2-agent version 8.1.1
2016-10-07 06:07:06.037 6372 INFO f5_openstack_agent.lbaasv2.drivers.bigip.icontrol_driver [req-9c57efd1-4133-4e3d-9d09-2751f4b3fe1a - - -
- -] WARNING - f5_global_routed_mode enabled. There will be no L2 or L3 orchestration or tenant isolation provisioned. All vips and pool
members must be routable through pre-provisioned SelfIPs.
2016-10-07 06:07:06.039 6372 INFO f5_openstack_agent.lbaasv2.drivers.bigip.icontrol_driver [req-9c57efd1-4133-4e3d-9d09-2751f4b3fe1a - - -
- -] Opening iControl connection to admin @ 10.128.5.119
2016-10-07 06:07:06.285 6372 INFO f5_openstack_agent.lbaasv2.drivers.bigip.icontrol_driver [req-9c57efd1-4133-4e3d-9d09-2751f4b3fe1a - - -
- -] iControlDriver initialized to 1 bigips with username:admin
2016-10-07 06:07:06.285 6372 INFO f5_openstack_agent.lbaasv2.drivers.bigip.icontrol_driver [req-9c57efd1-4133-4e3d-9d09-2751f4b3fe1a - - -
- -] iControlDriver dynamic agent configurations:{'tunnel_types': [], 'device_drivers': ['f5-lbaasv2-icontrol'], 'bridge_mappings': {},
'tunneling_ips': [], 'icontrol_endpoints': {'10.128.5.119': {'platform': '', 'version': u'12.1.0', 'serial_number': u'd781c52b-b887-f64b-
4907876dc778', 'device_name': u'bigip1.local.net'}}}
```

5.4.7   Complete the agent configuration.

After the initial configuration of agent used to validate the setup a complete setup with all the relevant options will need to be done.

Follow the instructions from http://f5-openstack-lbaasv2-driver.readthedocs.io/en/v9.1.0/map_quick-start-guide.html to fully setup the agent. Once configured restart the agent and make sure the agent status is alive.

5.4.8   Set the agent to start at boot

The current startup script is not ideal because it will abort if it is unable to connect to the BIG-IP devices on boot. This could be caused because:
-    Openstack startup is asynchronous and takes long time or
-    Because the BIG-IPs are not available on agent startup.

At time of this writing a convenient way to achieve an acceptable behavior is to start the service from cron.

```
$ sudo echo '* * * * * root /etc/init.d/f5-oslbaasv2-agent status | egrep -q "not running|not
started" && /etc/init.d/f5-oslbaasv2-agent start' > /etc/cron.d/f5-oslbaasv2-agent

$ sudo chmod +x /etc/cron.d/f5-oslbaasv2-agent
```

This will be enhanced in future versions of this document and is being tracked in https://github.com/F5Networks/f5-openstack-agent/issues/395.