

OpenStack: How can I install OpenStack Magnum from source on BCM 8.1?

This KB describes how to install and configure the Container Infrastructure Management service, code-named Magnum, on the OpenStack controller.

The procedures were tested on a BCM 8.1 cluster configured on CentOS 7.5, and running with Bright OpenStack's cluster extension installed. The cluster has a single head node and a single OpenStack controller node.

NOTE: These are guidelines only. Magnum configuration does not fall under support cover. The scope of support cover is described at:

<https://www.brightcomputing.com/support/>

Terminology:

Magnum

Magnum is an OpenStack project which offers container orchestration engines for deploying and managing containers as first class resources in OpenStack.

Cluster

A cluster is the construct in which Magnum launches container orchestration engines. After a cluster has been created, a user can add containers to it. Containers can be added either directly, or, in the case of the Kubernetes container orchestration engine, within pods - a logical construct specific to that implementation. A cluster is created based on a ClusterTemplate.

ClusterTemplate

A ClusterTemplate in Magnum is roughly equivalent to a flavor in Nova. A given template defines options such as the container orchestration engine, keypair, and image for use when Magnum is creating clusters.

Container Orchestration Engine (COE)

A container orchestration engine manages the lifecycle of one or more containers, logically represented in Magnum as a cluster. Magnum supports a number of container orchestration engines, each with their own pros and cons, including Docker Swarm, Kubernetes, and Mesos.

Magnum API service

This service accepts API requests from users. It authenticates, authorizes, and communicates with magnum-conductor.

Magnum conductor

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This communicates with the COE (Container Orchestration Engine). It does the actual work of creating cluster templates, clusters, services, and containers.

Install and configure:

Note: Magnum creates clusters of compute instances on the Compute service (Nova). These instances must have basic Internet connectivity and must be able to reach Magnum's API server. Make sure that the Compute and Network services are configured accordingly.

Prerequisites

Before you install and configure the Container Infrastructure Management service, you must create a database, service credentials, and API endpoints.

1. To create the database, complete these steps:

- Use the database access client to connect to the database server on the controller node as the root user:

```
[root@node006 ~]# mysql -u root -p
```

- Create the magnum database:
CREATE DATABASE magnum;
- Grant proper access to the magnum database:
GRANT ALL PRIVILEGES ON magnum.* TO 'magnum'@master\
IDENTIFIED BY 'MAGNUM_DBPASS';
GRANT ALL PRIVILEGES ON magnum.* TO 'magnum'@'%\
IDENTIFIED BY 'MAGNUM_DBPASS';
GRANT ALL PRIVILEGES ON magnum.* TO 'magnum'@'localhost\
IDENTIFIED BY 'MAGNUM_DBPASS';
- Replace MAGNUM_DBPASS with a suitable password.
- Exit the database access client.

2. On the head node Source the admin password:

```
[root@maa-test4 ~]# . .openstackrc_password
```

3. To create the service credentials, complete these steps:

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- Create the magnum user:
openstack user create --domain default \
--password PASSWORD magnum
- Add the admin role to the magnum user:
openstack role add --project service --user magnum admin
- Create the magnum service entity:
openstack service create --name magnum \
--description "OpenStack Container Infrastructure Management Service" \
Container-infra

4. Create the Container Infrastructure Management service API endpoints:

```
[root@maa-test4 ~]# openstack endpoint create --region openstack container-infra  
admin \  
http://oshaproxy:9511/v1  
[root@maa-test4 ~]# openstack endpoint create --region openstack container-infra  
internal \  
http://oshaproxy:9511/v1  
[root@maa-test4 ~]# openstack endpoint create --region openstack container-infra  
public \  
http://10.2.62.16:9511/v1
```

The IP address in the preceding text must be replaced with the IP address of the head node that HAproxy listens on.

5. Magnum uses the AWS CloudFormation template format; so we will need to install Heat's compatible CloudFormation API and configure it:

- Install the packages in the software image:
yum install openstack-heat-api-cfn.noarch
- On the head node, create the service:
[root@maa-test4 ~]# openstack service create --name heat-cfn --description
"Orchestration" \
cloudformation
- On the head node, create the endpoints:
[root@maa-test4 ~]# openstack endpoint create --region openstack
cloudformation admin \

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```
http://oshaproxy:8000/v1
```

```
[root@maa-test4 ~]# openstack endpoint create --region openstack  
cloudformation internal \
```

```
http://oshaproxy:8000/v1
```

```
[root@maa-test4 ~]# openstack endpoint create --region openstack  
cloudformation public \
```

```
http://10.2.62.16::8000/v1
```

Replace the preceding IP address with the IP address of the head node that HAproxy listens on.

- Add the following line in “**/etc/heat/heat.conf**”, under section “[heat_api_cfn]”:
workers = 4
- Append the below lines to “**/etc/haproxy/haproxy.cfg**” on the head node:
listen orchestrationAPI-heat-cfn
bind 0.0.0.0:8000
server auto-node006::10.141.0.6:8000 10.141.0.6:8000 check

6. Magnum requires additional information in the Identity service to manage clusters. To add this information, complete these steps:

- Create the magnum domain that contains projects and users:
openstack domain create --description "Owns users and projects \ created by magnum" magnum
- Create the magnum_domain_admin user to manage projects and users in the magnum domain:
openstack user create --domain magnum --password PASSWORD \ magnum_domain_admin
- Add the admin role to the magnum_domain_admin user in the magnum domain to enable administrative management privileges by the magnum_domain_admin user:
openstack role add --domain magnum --user-domain magnum \ --user magnum_domain_admin admin

Install and configure components:

The following procedures will be done inside the software image used by OpenStack:

1. # chroot /cm/images/<image-name>

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2. Install the OS-specific prerequisites:

```
# yum install python-devel openssl-devel mysql-devel \
  libxml2-devel libxslt-devel postgresql-devel git \
  libffi-devel gettext gcc
```

3. Create the magnum user and the necessary directories:

- Create user with corresponding group:

```
# groupadd --system magnum
# useradd --home-dir "/var/lib/magnum" \
  --create-home \
  --system \
  --shell /bin/false \
  -g magnum \
  magnum
```

- Create these other Magnum directories:

```
# mkdir -p /var/log/magnum
# mkdir -p /etc/magnum
```

- Set the ownership of the directories:

```
# chown magnum:magnum /var/log/magnum
# chown magnum:magnum /var/lib/magnum
# chown magnum:magnum /etc/magnum
```

4. Install virtualenv and python prerequisites:

- Install virtualenv and create one for magnum's installation:

```
# easy_install -U virtualenv
# su -s /bin/sh -c "virtualenv /var/lib/magnum/env" magnum
```

- Install python prerequisites:

```
# su -s /bin/sh -c "/var/lib/magnum/env/bin/pip install tox pymysql \
  python-memcached" magnum
```

5. Clone the stable/Pike branch, and install magnum:

```
# cd /var/lib/magnum
# git clone --single-branch -b stable/pike https://git.openstack.org/openstack/magnum.git
# chown -R magnum:magnum magnum
# cd magnum
# su -s /bin/sh -c "/var/lib/magnum/env/bin/pip install -r requirements.txt" magnum
```

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```
# su -s /bin/sh -c "/var/lib/magnum/env/bin/python setup.py install" magnum
```

6. Copy policy.json and api-paste.ini:

```
# su -s /bin/sh -c "cp etc/magnum/policy.json /etc/magnum" magnum  
# su -s /bin/sh -c "cp etc/magnum/api-paste.ini /etc/magnum" magnum
```

7. Generate a sample configuration file:

```
# su -s /bin/sh -c "/var/lib/magnum/env/bin/tox -e genconfig" magnum  
# su -s /bin/sh -c "cp etc/magnum/magnum.conf.sample \  
/etc/magnum/magnum.conf" magnum
```

8. Edit the **"/etc/magnum/magnum.conf"** file so that it looks like the following, while adjusting the appropriate values to match your own environment:

1. If you can't remember the RabbitMQ password that you set for the openstack account, then you can grep for it in `/etc/nova/nova.conf` on the controller node. For example:

```
[root@node006 ~]# grep ^transport_url /etc/nova/nova.conf  
transport_url =  
rabbit://openstack:8y4LCe4sBL1y2ipiGpbtRsjGgmeq7i@node006:5672/
```

The text `RABBITMQPASSWORD` in the following `magnum.conf` file is thus replaced by `8y4LCe4sBL1y2ipiGpbtRsjGgmeq7i`:

```
[DEFAULT]  
host = node006  
log_file = magnum.log  
log_dir = /var/log/magnum  
transport_url = rabbit://openstack:RABBITMQPASSWORD@node006:5672/  
[api]  
host = 10.141.0.6  
[barbican_client]  
[certificates]  
cert_manager_type = local  
storage_path = /var/lib/magnum/certificates/  
[cinder]  
[cinder_client]  
region_name = openstack  
[cluster]  
[cluster_heat]  
[cluster_template]  
[conductor]  
[cors]
```

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```
[database]
connection = mysql+pymysql://magnum:PASSWORD@node006:3307/magnum
[docker]
[docker_registry]
[drivers]
#disable certificate authority validation
verify_ca = false
[glance_client]
[heat_client]
[keystone_auth]
[keystone_auth_token]
memcached_servers = node006:11211
auth_version = v3
auth_uri = http://oshaproxy:5000/v3
project_domain_name = default
project_name = service
user_domain_name = default
password = PASSWORD
username = magnum
auth_url = http://oshaproxy:35357
#do not change auth_type = password
auth_type = password
admin_user = magnum
admin_password = PASSWORD
admin_tenant_name = service
[magnum_client]
[matchmaker_redis]
[neutron_client]
[nova_client]
[oslo_concurrency]
lock_path = /var/lib/magnum/tmp
[oslo_messaging_amqp]
[oslo_messaging_kafka]
[oslo_messaging_notifications]
driver = messaging
[oslo_messaging_rabbit]
[oslo_messaging_zmq]
[oslo_policy]
[profiler]
[quotas]
[trust]
trustee_domain_name = magnum
trustee_domain_admin_name = magnum_domain_admin
trustee_domain_admin_password = PASSWORD
[x509]
```

9. Populate the Magnum database:

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URL: <http://kb.brightcomputing.com/faq/index.php?action=artikel&cat=24&id=435&artlang=en>

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```
# su -s /bin/sh -c "/var/lib/magnum/env/bin/magnum-db-manage upgrade" magnum
```

10. Set up Magnum log rotation:

```
#cd /var/lib/magnum/magnum
```

```
# cp doc/examples/etc/logrotate.d/magnum.logrotate /etc/logrotate.d/magnum
```

Finalize installation

1. Create init scripts and services:

- ```
#cd /var/lib/magnum/magnum
cp doc/examples/etc/systemd/system/magnum-api.service \
/etc/systemd/system/magnum-api.service
cp doc/examples/etc/systemd/system/magnum-conductor.service \
/etc/systemd/system/magnum-conductor.service
```

2. Using `cmsh`, 3 new services can be added to the controller node. The services are `openstack-heat-api-cfn`, `magnum-api` and `magnum-conductor`, and they can be set to `autostart` and to be `monitored`. For example, for the `openstack-heat-api-cfn`, and if the controller node is `node006`:

- ```
[root@maa-test4 ~]# cmsh
[maa-test4]% device use node006
[maa-test4->device[node006]]% services
[maa-test4->device[node006]->services]% add openstack-heat-api-cfn
[maa-test4->device[node006]->services]% set autostart yes
[maa-test4->device[node006]->services]% set monitored yes
[maa-test4->device[node006]->services]% commit
```
- Repeat the same steps to add `magnum-api` and `magnum-conductor`.

3. Exit the Chrooted environment and reboot your OpenStack environment/nodes

4. Append the following to `/etc/haproxy/haproxy.cfg` on the head node:

- `listen magnum`

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```
bind 0.0.0.0:9511
```

```
server auto-node006::10.141.0.6:9511 10.141.0.6:9511 check
```

5. Restart HAproxy on the head node:

- # systemctl restart haproxy.service

6. If you will be using named on the head node for recursive queries from the clusters that you will be building via Magnum; then you can tell named to accept recursive queries from any source IP:

- Modify “/cm/local/apps/cmd/etc/cmd.conf”
- Set PublicDNS from false to true
PublicDNS = true
- Restart cmd on the head node
[root@maa-test4 ~]# systemctl restart cmd

7. Verify that openstack-heat-api-cfn, magnum-api and magnum-conductor services are running on the controller node:

- # systemctl status magnum-api
systemctl status magnum-conductor
systemctl status openstack-heat-api-cfn

Install the command-line client

The package “python2-magnumclient.noarch” provides the magnum command-line client that can be used to interact with magnum. It is installed on the head node and on the OpenStack software image as part of Bright’s OpenStack deployment. If for some reason the package is not available then you can install it on the head node and in the OS software image, for example as follows:

```
[root@maa-test4 ~]# yum install python2-magnumclient.noarch  
[root@maa-test4 ~]# yum install python2-magnumclient.noarch
```

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```
--installroot=/cm/images/<SOFTWARE_IMAGE>
```

Verify operation

Perform these operations on the head node to verify that magnum-conductor is up:

```
[root@maa-test4 ~]# . .openstackrc_password
```

```
[root@maa-test4 ~]# magnum service-list
```

```
+-----+-----+-----+-----+-----+-----+
| id | host | binary      | state | created_at          | updated_at          |
+-----+-----+-----+-----+-----+-----+
| 1  | node006 | magnum-conductor | up   | 2018-09-28T10:19:00+00:00 | 2018-09-28T15:55:46+00:00 |
+-----+-----+-----+-----+-----+-----+

```

Launch a test cluster

1. We will create a test Docker Swarm cluster using a Fedora Atomic image.

- [root@maa-test4 ~]# wget <https://fedorapeople.org/groups/magnum/fedora-atomic-ocata.qcow2>
- [root@maa-test4 ~]# openstack image create --disk-format=qcow2 --container-format=bare --file=fedora-atomic-ocata.qcow2 --property os_distro='fedora-atomic' fedora-atomic-ocata

2. Before creating the cluster, a template must be created and the cluster will be based on this template.

- [root@maa-test4 ~]# openstack coe cluster template create --name dockertemp2 --image 604f9bfc-2cd7-4895-9617-a68d98bfa77c --docker-volume-size 5 --external-network c541029e-eb65-4771-a747-a76088162cec --dns-nameserver 10.141.255.25 --master-flavor 9fcd9c68-9a85-4b90-bab7-3fdf285c1d19 --flavor 9fcd9c68-9a85-4b90-bab7-3fdf285c1d19 --coe swarm --tls-disabled
- Note: we are using IDs instead of component names above, as there is an issue with Magnum resolving the names to IDs while building the cluster

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- You should replace the above IDs with the ones corresponding to your environment

3. Create the cluster:

- `[root@maa-test4 ~]# openstack coe cluster create --name dockercluster --cluster-template dockertemp2 --node-count 1 --keypair keypair`
- `[root@maa-test4 ~]# openstack coe cluster show dockercluster`

```
+-----+-----+
| Field      | Value                                     |
+-----+-----+
| status     | CREATE_COMPLETE                         |
| cluster_template_id | b143ea59-bee9-4701-b9f1-95a986e0e7af |
| node_addresses | [u'10.141.152.12']                       |
| uuid       | 9440f792-8894-4749-a176-eba10203aea8    |
| stack_id   | 0e93f875-a0cd-4b61-9a06-dd9024a35e80    |
| status_reason | Stack CREATE completed successfully      |
| created_at | 2018-10-02T13:29:16+00:00               |
| updated_at | 2018-10-02T13:36:28+00:00               |
| coe_version | 1.2.5                                    |
| faults     |                                           |
| keypair    | keypair                                  |
| api_address | tcp://10.141.152.3:2376                  |
| master_addresses | [u'10.141.152.3']                       |
| create_timeout | 60                                       |
| node_count | 1                                        |
| discovery_url | https://discovery.etcd.io/638e7384c59885070a35675fcdba6cc3 |
```

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```
| master_count    | 1 |
| container_version | 1.12.6 |
| name            | dockercluster |
```

-----+

- Create a container in the swarm cluster. This container will ping the address 8.8.8.8 four times:

```
[root@dockercluster-ravfonb644f7-master-0 ~]# docker run --rm -it cirros:latest ping -c 4 8.8.8.8
```

```
Unable to find image 'cirros:latest' locally
Trying to pull repository docker.io/library/cirros ...
```

```
sha256:38e8f9e7bc8a340c54a5139823dc726d67dd7408ed7db9e3be41cb1517847f56: Pulling
from docker.io/library/cirros
```

```
3d6427f49fe3: Pull complete
```

```
7f41e3d981b9: Pull complete
```

```
56f8ef4ed3d7: Pull complete
```

```
Digest: sha256:38e8f9e7bc8a340c54a5139823dc726d67dd7408ed7db9e3be41cb1517847f56
```

```
Status: Downloaded newer image for docker.io/cirros:latest
```

```
PING 8.8.8.8 (8.8.8.8): 56 data bytes
```

```
64 bytes from 8.8.8.8: seq=0 ttl=116 time=10.667 ms
```

```
64 bytes from 8.8.8.8: seq=1 ttl=116 time=10.805 ms
```

```
64 bytes from 8.8.8.8: seq=2 ttl=116 time=9.778 ms
```

```
64 bytes from 8.8.8.8: seq=3 ttl=116 time=11.061 ms
```

```
--- 8.8.8.8 ping statistics ---
```

```
4 packets transmitted, 4 packets received, 0% packet loss
```

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round-trip min/avg/max = 9.778/10.577/11.061 ms

Troubleshooting

Refer to the upstream troubleshooting guide:

<https://docs.openstack.org/magnum/latest/admin/troubleshooting-guide.html>

Unique solution ID: #1435

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