

# OPNFV Installation instructions for the Arno release of OPNFV when using Foreman as a deployment tool

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# Abstract

This document describes how to install the Arno release of OPNFV when using Foreman/Quickstack as a deployment tool covering it's limitations, dependencies and required system resources.

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## Version history

Date	Ver.	Author	Comment
2015-05-07	0.0.1	Tim Rozet (RedHat)	First draft
2015-05-27	0.0.2	Christopher Price (Ericsson AB)	Minor changes & formatting
2015-06-02	0.0.3	Christopher Price (Ericsson AB)	Minor changes & formatting
2015-06-03	0.0.4	Ildiko Vancsa (Ericsson)	Minor changes

## Introduction

This document describes the steps to install an OPNFV Arno reference platform, as defined by the Bootstrap/Getting-Started (BGS) Project using the Foreman/QuickStack installer.

The audience is assumed to have a good background in networking and Linux administration.

## Preface

Foreman/QuickStack uses the Foreman Open Source project as a server management tool, which in turn manages and executes Genesis/QuickStack. Genesis/QuickStack consists of layers of Puppet modules that are capable of provisioning the OPNFV Target System (3 controllers, n number of compute nodes).

The Genesis repo contains the necessary tools to get install and deploy an OPNFV target system using Foreman/QuickStack. These tools consist of the Foreman/QuickStack bootable ISO (arno.2015.1.0.foreman.iso), and the automatic deployment script (deploy.sh).

An OPNFV install requires a "Jumphost" in order to operate. The bootable ISO will allow you to install a customized CentOS 7 release to the Jumphost, which then gives you the required packages needed to run deploy.sh. If you already have a Jumphost with CentOS 7 installed, you may choose to ignore the ISO step and instead move directly to running deploy.sh. In this case, deploy.sh will install the necessary packages for you in order to execute.

deploy.sh installs Foreman/QuickStack VM server using Vagrant with VirtualBox as its provider. This VM is then used to provision the OPNFV target system (3 controllers, n compute nodes). These nodes can be either virtual or bare metal. This guide contains instructions for installing both.

# Setup Requirements

## Jumphost Requirements

The Jumphost requirements are outlined below:

1. CentOS 7 (from ISO or self-installed).
2. Root access.
3. libvirt or other hypervisors disabled (no kernel modules loaded).
4. 3-4 NICs, untagged (no 802.1Q tagging), with IP addresses.
5. Internet access for downloading packages, with a default gateway configured.
6. 4 GB of RAM for a bare metal deployment, 24 GB of RAM for a VM deployment.

## Network Requirements

Network requirements include:

1. No DHCP or TFTP server running on networks used by OPNFV.
2. 3-4 separate VLANs (untagged) with connectivity between Jumphost and nodes (bare metal deployment only). These make up the admin, private, public and optional storage networks.
3. Lights out OOB network access from Jumphost with IPMI node enabled (bare metal deployment only).
4. Admin or public network has Internet access, meaning a gateway and DNS availability.

*Note: Storage network will be consolidated to the private network if only 3 networks are used.*

## Bare Metal Node Requirements

Bare metal nodes require:

1. IPMI enabled on OOB interface for power control.
2. BIOS boot priority should be PXE first then local hard disk.
3. BIOS PXE interface should include admin network mentioned above.

## Execution Requirements (Bare Metal Only)

In order to execute a deployment, one must gather the following information:

1. IPMI IP addresses for the nodes.
2. IPMI login information for the nodes (user/pass).
3. MAC address of admin interfaces on nodes.
4. MAC address of private interfaces on 3 nodes that will be controllers.

## Installation High-Level Overview - Bare Metal Deployment

The setup presumes that you have 6 bare metal servers and have already setup connectivity on at least 3 interfaces for all servers via a TOR switch or other network implementation.

The physical TOR switches are **not** automatically configured from the OPNFV reference platform. All the networks involved in the OPNFV infrastructure as well as the provider networks and the private tenant VLANs needs to be manually configured.

The Jumphost can be installed using the bootable ISO. The Jumphost should then be configured with an IP gateway on its admin or public interface and configured with a working DNS server. The Jumphost should also have routable access to the lights out network.

`deploy.sh` is then executed in order to install the Foreman/QuickStack Vagrant VM. `deploy.sh` uses a configuration file with YAML format in order to know how to install and provision the OPNFV target system. The information gathered under section [Execution Requirements \(Bare Metal Only\)](#) is put into this configuration file.

`deploy.sh` brings up a CentOS 7 Vagrant VM, provided by VirtualBox. The VM then executes an Ansible project called Khaleesi in order to install Foreman and QuickStack. Once the Foreman/QuickStack VM is up, Foreman will be configured with the nodes' information. This includes MAC address, IPMI, OpenStack type (controller, compute, OpenDaylight controller) and other information. At this point Khaleesi makes a REST API call to Foreman to instruct it to provision the hardware.

Foreman will then reboot the nodes via IPMI. The nodes should already be set to PXE boot first off the admin interface. Foreman will then allow the nodes to PXE and install CentOS 7 as well as Puppet. Foreman/QuickStack VM server runs a Puppet Master and the nodes query this master to get their appropriate OPNFV configuration. The nodes will then reboot one more time and once back up, will DHCP on their private, public and storage NICs to gain IP addresses. The nodes will now check in via Puppet and start installing OPNFV.

Khaleesi will wait until these nodes are fully provisioned and then return a success or failure based on the outcome of the Puppet application.

## Installation High-Level Overview - VM Deployment

The VM nodes deployment operates almost the same way as the bare metal deployment with a few differences. `deploy.sh` still installs Foreman/QuickStack VM the exact same way, however the part of the Khaleesi Ansible playbook which IPMI reboots/PXE boots the servers is ignored. Instead, `deploy.sh` brings up N number more Vagrant VMs (where N is 3 control nodes + n compute). These VMs already come up with CentOS 7 so instead of re-provisioning the entire VM, `deploy.sh` initiates a small Bash script that will signal to Foreman that those nodes are built and install/configure Puppet on them.

To Foreman these nodes look like they have just built and register the same way as bare metal nodes.

## Installation Guide - Bare Metal Deployment

This section goes step-by-step on how to correctly install and provision the OPNFV target system to bare metal nodes.

### Install Bare Metal Jumphost

1. If your Jumphost does not have CentOS 7 already on it, or you would like to do a fresh install, then download the Foreman/QuickStack bootable ISO [here](http://artifacts.opnfv.org/arno.2015.1.0/foreman/arno.2015.1.0.foreman.iso).
2. Boot the ISO off of a USB or other installation media and walk through installing OPNFV CentOS 7.
3. After OS is installed login to your Jumphost as root.
4. Configure IP addresses on 3-4 interfaces that you have selected as your admin, private, public, and storage (optional) networks.
5. Configure the IP gateway to the Internet either, preferably on the public interface.
6. Configure your `/etc/resolv.conf` to point to a DNS server (8.8.8.8 is provided by Google).
7. Disable selinux:
  - `setenforce 0`

```
• sed -i 's/SELINUX=.*/SELINUX=permissive/' /etc/selinux/config
```

#### 8. Disable firewalld:

```
• systemctl stop firewalld  
• systemctl disable firewalld
```

## Creating an Inventory File

You now need to take the MAC address/IPMI info gathered in section [Execution Requirements \(Bare Metal Only\)](#) and create the YAML inventory (also known as configuration) file for `deploy.sh`.

1. Copy the `opnfv_ksgen_settings.yml` file from `/root/bgs_vagrant/` to another directory and rename it to be what you want EX: `/root/my_ksgen_settings.yml`
2. Edit the file in your favorite editor. There is a lot of information in this file, but you really only need to be concerned with the "nodes:" dictionary.
3. The nodes dictionary contains each bare metal host you want to deploy. You can have 1 or more compute nodes and must have 3 controller nodes (these are already defined for you). It is optional at this point to add more compute nodes into the dictionary. You must use a different name, hostname, short\_name and dictionary keyname for each node.
4. Once you have decided on your node definitions you now need to modify the MAC address/IPMI info dependent on your hardware. Edit the following values for each node:

- `mac_address`: change to MAC address of that node's admin NIC (defaults to 1st NIC)
- `bmc_ip`: change to IP Address of BMC (out-of-band)/IPMI IP
- `bmc_mac`: same as above, but MAC address
- `bmc_user`: IPMI username
- `bmc_pass`: IPMI password

5. Also edit the following for only controller nodes:

- `private_mac` - change to MAC address of node's private NIC (default to 2nd NIC)

6. Save your changes.

## Running `deploy.sh`

You are now ready to deploy OPNFV! `deploy.sh` will use your `/tmp/` directory to store its Vagrant VMs. Your Foreman/QuickStack Vagrant VM will be running out of `/tmp/bgs_vagrant`.

It is also recommended that you power off your nodes before running `deploy.sh`. If there are DHCP servers or other network services that are on those nodes it may conflict with the installation.

Follow the steps below to execute:

1. `cd /root/bgs_vagrant`
2. `./deploy.sh -base_config </root/my_ksgen_settings.yml>`
3. It will take about 20-25 minutes to install Foreman/QuickStack VM. If something goes wrong during this part of the process, it is most likely a problem with the setup of your Jumphost. You will also notice different outputs in your shell. When you see messages that say "TASK:" or "PLAY:" this is Khalessi running and installing Foreman/QuickStack inside of your VM or deploying your nodes. Look for "PLAY [Deploy Nodes]" as a sign that Foreman/QuickStack is finished installing and now your nodes are being rebuilt.
4. Your nodes will take 40-60 minutes to re-install CentOS 7 and install/configure OPNFV. When complete you will see "Finished: SUCCESS"

## Verifying the Setup

Now that the installer has finished it is a good idea to check and make sure things are working correctly. To access your Foreman/QuickStack VM:

1. cd /tmp/bgs\_vagrant
2. vagrant ssh (password is "vagrant")
3. You are now in the VM and can check the status of Foreman service, etc. For example: `systemctl status foreman`
4. Type "exit" and leave the Vagrant VM. Now execute: `cat /tmp/bgs_vagrant/opnfv_ksgen_settings.yml | grep foreman_url`
5. This is your Foreman URL on your public interface. You can go to your web browser, `http://<foreman_ip>`, login will be "admin"/"octopus". This way you can look around in Foreman and check that your hosts are in a good state, etc.
6. In Foreman GUI, you can now go to Infrastructure -> Global Parameters. This is a list of all the variables being handed to Puppet for configuring OPNFV. Look for `horizon_public_vip`. This is your IP address to Horizon GUI.  
**Note:** You can find out more about how to use Foreman by going to <http://www.theforeman.org/> or by watching a walkthrough video here: <https://bluejeans.com/s/89gb/>
7. Now go to your web browser and insert the Horizon public VIP. The login will be "admin"/"octopus".
8. You are now able to follow the [OpenStack Verification](#) section.

## OpenStack Verification

Now that you have Horizon access, let's make sure OpenStack the OPNFV target system are working correctly:

1. In Horizon, click Project -> Compute -> Volumes, Create Volume
2. Make a volume "test\_volume" of size 1 GB
3. Now in the left pane, click Compute -> Images, click Create Image
4. Insert a name "cirros", Insert an Image Location `http://download.cirros-cloud.net/0.3.3/cirros-0.3.3-x86_64-disk.img`
5. Select format "QCOW2", select Public, then hit Create Image
6. Now click Project -> Network -> Networks, click Create Network
7. Enter a name "test\_network", click Next
8. Enter a subnet name "test\_subnet", and enter Network Address `10.0.0.0/24`, click Next
9. Enter `10.0.0.5,10.0.0.9` under Allocation Pools, then hit Create
10. Now go to Project -> Compute -> Instances, click Launch Instance
11. Enter Instance Name "cirros1", select Instance Boot Source "Boot from image", and then select Image Name "cirros"
12. Click Launch, status should show "Spawning" while it is being built
13. You can now repeat steps 11 and 12, but create a "cirros2" named instance
14. Once both instances are up you can see their IP addresses on the Instances page. Click the Instance Name of cirros1.
15. Now click the "Console" tab and login as "cirros"/"cubswin" :)

16. Verify you can ping the IP address of cirros2

Congratulations you have successfully installed OPNFV!

## Installation Guide - VM Deployment

This section goes step-by-step on how to correctly install and provision the OPNFV target system to VM nodes.

### Install Jumphost

Follow the instructions in the [Install Bare Metal Jumphost](#) section.

### Running `deploy.sh`

You are now ready to deploy OPNFV! `deploy.sh` will use your `/tmp/` directory to store its Vagrant VMs. Your Foreman/QuickStack Vagrant VM will run out of `/tmp/bgs_vagrant`. Your compute and subsequent controller nodes will run in:

- `/tmp/compute`
- `/tmp/controller1`
- `/tmp/controller2`
- `/tmp/controller3`

Each VM will be brought up and bridged to your Jumphost NICs. `deploy.sh` will first bring up your Foreman/QuickStack Vagrant VM and afterwards it will bring up each of the nodes listed above, in order.

Follow the steps below to execute:

1. `cd /root/bgs_vagrant`
2. `./deploy.sh -virtual`
3. It will take about 20-25 minutes to install Foreman/QuickStack VM. If something goes wrong during this part of the process, it is most likely a problem with the setup of your Jumphost. You will also notice different outputs in your shell. When you see messages that say "TASK:" or "PLAY:" this is Khalessi running and installing Foreman/QuickStack inside of your VM or deploying your nodes. When you see "Foreman is up!", that means `deploy` will now move on to bringing up your other nodes.
4. `deploy.sh` will now bring up your other nodes, look for logging messages like "Starting Vagrant Node <node name>", "<node name> VM is up!" These are indicators of how far along in the process you are. `deploy.sh` will start each Vagrant VM, then run provisioning scripts to inform Foreman they are built and initiate Puppet.
5. The speed at which nodes are provisioned is totally dependent on your Jumphost server specs. When complete you will see "All VMs are UP!"

### Verifying the Setup - VMs

Follow the instructions in the [Verifying the Setup](#) section.

Also, for VM deployment you are able to easily access your nodes by going to `/tmp/<node name>` and then `vagrant ssh` (password is "vagrant"). You can use this to go to a controller and check OpenStack services, OpenDaylight, etc.

### OpenStack Verification - VMs

Follow the steps in [OpenStack Verification](#) section.

# Frequently Asked Questions

## License

All Foreman/QuickStack and "common" entities are protected by the [Apache 2.0 License](#).

## References

### OPNFV

[OPNFV Home Page](#)

[OPNFV Genesis project page](#)

### OpenStack

[OpenStack Juno Release artifacts](#)

[OpenStack documentation](#)

### OpenDaylight

[OpenDaylight artifacts](#)

### Foreman

[Foreman documentation](#)

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