

# Using the IBM DS8870 in an OpenStack Cloud Environment

## IBM Redbooks Solution Guide

OpenStack is being developed as an industry standard cloud-computing project. It was started by Rackspace Cloud and NASA in 2010. Currently, more than 150 companies have joined the project, including IBM®.

With the availability of the IBM Storage Driver for OpenStack, the IBM DS8870 storage system can offer a range of capabilities that enable more effective storage automation deployments in to private or public clouds. Enabling OpenStack with DS8870 allows for storage to be made available whenever it is needed without the traditional associated cost of highly skilled administrators and infrastructure.

The IBM Storage Driver for OpenStack enables OpenStack clouds to access the DS8870 storage system. The driver integrates with the OpenStack environment and enables OpenStack applications to take advantage of the DS8870 enterprise-class storage.

Figure 1 shows the solution for integrating the DS8870 in an OpenStack infrastructure.

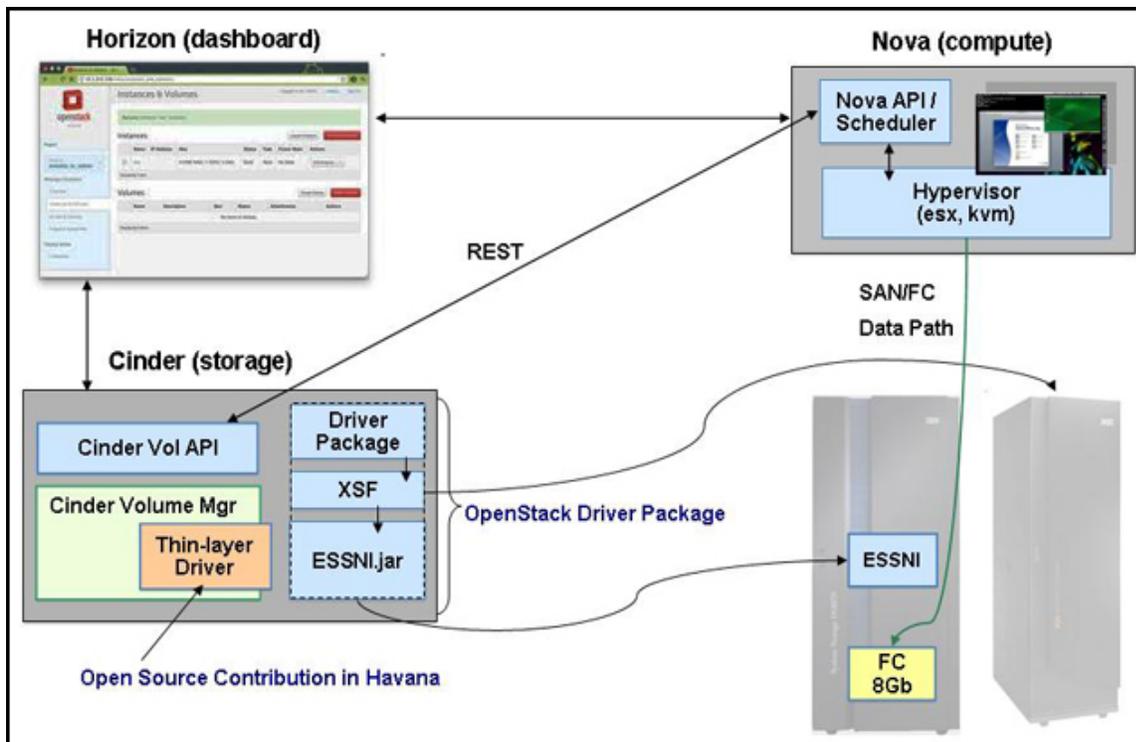


Figure 1. DS8870 and OpenStack infrastructure

## Did you know?

- Open Stack is a rapidly growing open cloud infrastructure platform.
- OpenStack allows companies to build massively scalable clouds either for internal (private) usage or to become Infrastructure as a Service (IaaS) providers.
- OpenStack is a no-charge, open source software that is released under the terms of the Apache License.
- The IBM Storage Driver for OpenStack enables OpenStack clouds to access the DS8870 storage system.
- The OpenStack Havana release with the OpenStack driver package can support IBM DS8700 and IBM DS8800 at R6.3x code levels, and the DS8870 at any code level.

## Business value

OpenStack simplifies deployment and makes DS8870 capabilities available for cloud environments:

- OpenStack automates the provisioning of high-end storage to a cloud environment.
- The storage in OpenStack cloud environments can be provisioned by using a self-service model that provides storage on an as-needed basis. Using this model, users get and pay only for what they really need, and the cloud provider does not have a situation where cloud storage space is wasted because of overprovisioning.
- Connection is just the first step in using the new OpenStack platform. OpenStack can potentially exploit advanced features, such as automated tiering with IBM Easy Tier or enablement of differentiated type of capabilities through quality of service (QoS) .

## Solution overview

OpenStack is a modular architecture for virtualization of various resources to build a cloud computing platform, as shown in Figure 2. The core OpenStack projects (Nova, Swift, and Glance) were developed in Python and are all available under the Apache License.

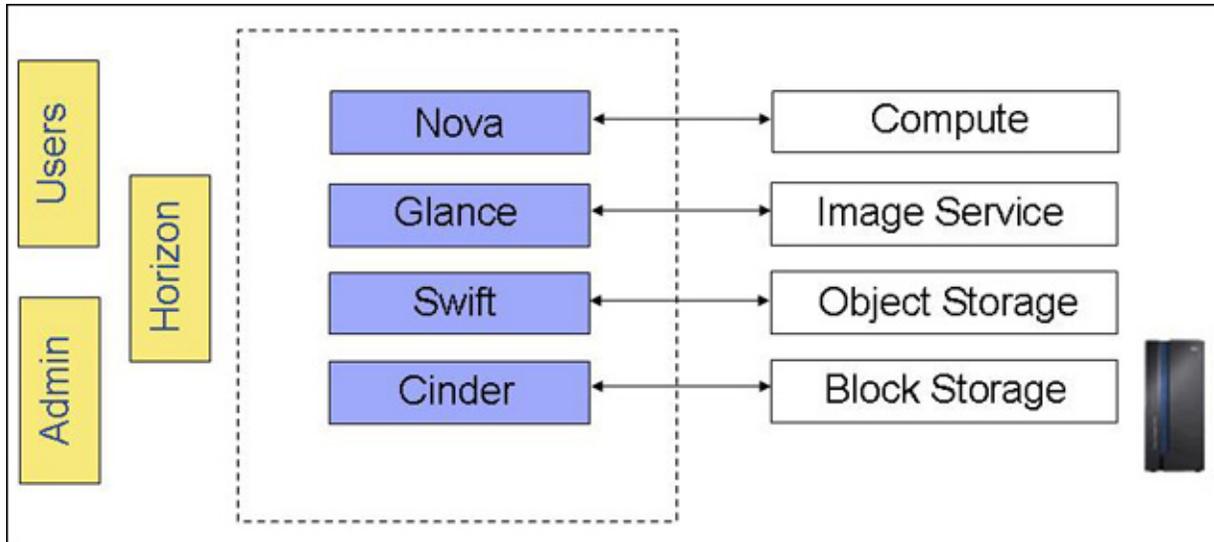


Figure 2. OpenStack solution overview

OpenStack includes the following major components:

- Glance (Image) provides a catalog and repository for disk images that are mostly used in OpenStack Compute.
- Nova (Compute) provides virtual machines (VM) or instances. Nova interacts with several OpenStack services, such as Keystone, Horizon, or Glance. The API process can upload and query Glance while the nova-compute service downloads images for use in starting images. Nova is the most complex and distributed component of OpenStack. Many processes are involved to handle user API requests and start virtual machines.
- Horizon (Dashboard) provides a modular web-based user interface for all the OpenStack services. With this web GUI, you can perform most operations on your cloud. You can create volumes, start an instance, assign IP addresses, and set access controls.
- Cinder (Block Storage) provides persistent block storage to guest VMs. This project was created from code that was originally in Nova (the nova-volume service). The IBM Storage Driver for OpenStack is fully supported by Cinder 2012.11 and provides “block storage as a service” through iSCSI and Fibre Channel to VMs.

OpenStack Cinder was split from the Nova project to increase the focus on storage. Cinder’s role is to take requests from the system through API calls and provision persistent storage to specific compute resources:

- Granularity is a LUN that is sized based on request.
- The LUN is persistent until it is deleted.
- Cinder is attached (mapped) to a single VM, and is not shared to multiple hosts.
- Cinder is control path only; I/O is run directly from the compute resources.

For more information about Cinder and the IBM Storage Driver for OpenStack, go to the following website:

<http://wiki.openstack.org/Cinder>

## Solution architecture

Figure 1 shows the OpenStack architecture for DS8870. The OpenStack Cinder driver provides an infrastructure for managing volumes and is the interface to the DS8870. Because Cinder uses XSF, a gateway into the DS8870 ESSNI service, it can work with multiple IBM System Storage DS8000® storage systems.

The Horizon dashboard provides a web-based user interface for managing OpenStack services for both users and administrators. The OpenStack Cinder driver attaches or uses extent pools only, so other workloads and data can also be on the same DS8870 in other pools (including CKD and other distributed data).

### Infrastructure setup

An OpenStack solution with a DS8870 storage system consists of the following components:

- One or more DS8870 storage systems to host the entire data set. Arrays, Ranks, and Extent Pools must be created.
- A storage area network (SAN) that is used to provide connectivity across application servers and storage systems.
- Network connectivity from OpenStack nodes to HMC.
- One or more fixed block extent pools to be used for OpenStack.

Because many OpenStack environments are pre-production or just proof-of-concept, the advantage here is that portions of older hardware can be used for this purpose without requiring a new DS8870 storage system.

The OpenStack driver attaches or uses extent pools only, so other workloads and data can also be on the same DS8870 in other pools (including CKD and other distributed data).

The IBM Storage Driver for OpenStack package is available for download at the IBM Fix Central website:

<http://www-933.ibm.com/support/fixcentral/>

### Configuration example

To illustrate the usage of OpenStack with the DS8870, here is a configuration example. Assume that the DS8870 and an OpenStack environment are in place and that there is network connectivity between OpenStack nodes and the DS8870 HMC.

For this example, we have defined two Fixed Blocks extent pools with ID P1 and P2 for use with OpenStack. We create a stanza (shown in Figure 3) called `ibm_ds8k_1` in the `cinder.conf` configuration file to configure access to the P1 and P2 pools in OpenStack. The parameters in the stanza help configure the driver, and are used to initialize control the XSF and ESSNI communication to the DS8870.

```
1  [ibm_ds8k_1]
2  san_password = none
3  san_clustername = none
4  san_login = none
5  san_ip = none
6  xiv_ds8k_connection_type = fibre_channel
7  xiv_ds8k_proxy = xiv_ds8k_openstack.ds8k_nova_proxy.DS8KNovaProxy
8  san_is_local = False
9  debug = true
10 verbose = true
11 volume_backend_name = ibm_ds8k_1
12 xiv_ds8k_array_jar_lib_path = /home/user/xsf/jars
13 xiv_ds8k_array_java_path = /usr/bin/java
14 xiv_ds8k_array_storage_unit = IBM.2107-xxx
15 xiv_ds8k_vol_pool = P1,P2
16 xiv_ds8k_pass = test
17 xiv_ds8k_user = test
18 xiv_ds8k_address = 9.10.11.12
19 volume_driver = cinder.volume.drivers.xiv_ds8k.XIVDS8KDriver
20
```

Figure 3. Configuration example

The driver needs to know the following information:

- The IP address of the HMC (`xiv_ds8k_address`)
- The HMC login and password (`xiv_ds8k_user` and `xiv_ds8k_pass`)
- The storage system ID of the storage facility image that the HMC should control (`xiv_ds8k_storage_unit`)
- Various paths to the Java environment (`xiv_ds8k_array_jar_lib_path` and `xiv_ds8k_array_java_path`)
- The name of the OpenStack driver (`volume_driver`)
- DS8870 pools to use for creating the volume (`volume_backend_name`) with OpenStack (`xiv_ds8k_vol_pool`)

## Usage scenarios

The OpenStack cloud connects to the DS8870 storage system over an iSCSI or Fibre Channel connection. Remote cloud users can issue requests for storage volumes from the OpenStack cloud. These requests are transparently handled by the IBM Storage Driver. The IBM Storage Driver communicates with the DS8870 storage system and controls the storage volumes on it.

In addition to traditional enterprise-class storage technology, many organizations now have various storage needs with varying performance and price requirements. OpenStack has support for both Object Storage and Block Storage, with many deployment options for each depending on the use case:

- Cinder can migrate volumes between back ends.
- The user can initiate full backups of detached volumes to the OpenStack Swift Object store.
- The user can initiate incremental/differential backups of detached volumes.

## Integration

The IBM Storage Driver for OpenStack is a software component that integrates with the OpenStack cloud environment and enables the usage of storage resources that are provided by the following IBM storage systems:

- DS8870
- IBM XIV®
- IBM SAN Volume Controller
- IBM Storwize® V7000

## Related publications and links

For more information, see the following resources:

- *IBM System Storage DS8870: Architecture and Implementation*, SG24-8886  
<http://www.redbooks.ibm.com/abstracts/SG248886.html>
- OpenStack home page  
[https://wiki.openstack.org/wiki/Main\\_Page](https://wiki.openstack.org/wiki/Main_Page)
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<https://github.com/openstack/cinder/tree/stable/havana/cinder/volume/drivers>
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<http://pic.dhe.ibm.com/infocenter/strhosts/ic/index.jsp>

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