

# **OpenStack Cluster Proposal**

## *Information Technology Club, OSU*

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# 1 Purpose

The purpose of this document is to outline the use of resources and division of work to build and maintain an OpenStack cluster using hardware provided to the Information Technology Club, OSU by the Server Infrastructure Group, Information Services, OSU. This document outlines the intended use for each piece of hardware to be donated and how each piece will be delegated within the club.

In order for a project to succeed in the long term it is necessary for multiple parties to be involved in the setup and maintenance of the project. This proposal will outline where the boundaries should exist between parts of the project so that multiple parties will be responsible or involved in keeping up the project. If this plan is followed it should allow for easier passing of knowledge between generations of club members and keep the project running smoothly.

## 2 The Hardware

The hardware in question is three Dell R610 1U servers. Each system has 12x4GB of RAM and dual 6 core hyperthreaded processors for 24 total cores of computing power. Each server is equipped with a host buss adapter and 6x1TB SAS hard drives. Each chassis has 4 onboard 1Gb NICs and dual redundant power supplies as well as remote access management.

In total this cluster will have 144GB of RAM, 72 computing cores, and 18TB of storage capacity. This will be replacing a cluster of only 80GB of RAM, 32 computing cores, and 2TB of storage capacity which will help relieve the strain on the current openstack cluster for the IT Club.

## 3 Software

The ultimate goal for the hardware is to implement openstack as a general purpose computing platform for the IT Club. The IT Club already has an openstack cluster, however there are several problems that drastically limit performance and scalability for the current setup. A new approach will be used with the new hardware to improve usability and scalability.

A bare metal hypervisor will be used on each node to allow for easier deployment of base operating systems and management of total system resources. A bare metal hypervisor will also allow for easier movement of running systems for maintenance and upgrades. All the required subsystems of openstack will be run on virtual machines on top of these hypervisors. A distributed file system will be run along side the openstack subsystems in virtual machines as a storage system for openstack.

### 3.1 VMWare ESXi

The bare metal hypervisor of choice for this project is ESXi from VMWare. It is available as a free platform with some restrictions or as a yearly subscription with no restrictions. The restrictions that most hinder the free version is a limit to the number of virtual processors

a virtual machine can have. This is limited to 8 virtual processors per vm which should not be a problem for this project. Instead of one large vm for openstack several smaller vms will provide computing resources for openstack and allow for resources to be evenly spread across the three systems.

## **3.2 Ceph**

Ceph is the distributed file system of choice for this project. Ceph allows for pooling of storage resources across a network as well as redundancy and storage system balancing on distributed storage nodes. Ceph is free and open source.

## **3.3 Other storage options**

There are other distributed file system options that are candidates as well. A list of those options follows:

1. GlusterFS

## **3.4 OpenStack**

OpenStack will be used to provide end users with access to virtual machines and software defined networking. OpenStack is an open source software suite capable of providing many different IT solutions. The focus of this cluster is on virtual machines and virtual networking with the possibility of adding software defined storage as well. Openstack is made up of multiple pieces of software interacting together to provide an end user with service. Generally it is broken into nodes where each node provides a specific piece of the openstack puzzle. The basic pieces of openstack are as follows:

1. Controller
2. Networking
3. Storage
4. Compute

For this implementation of openstack the different functions will be divided into multiple virtual machines. Each virtual machine will provide a specific function for openstack and be distributed as follows:

1. Control Node: Control plane, networking, and storage
2. Compute Node: Compute services, edge networking

## 4 Hardware Setup

Each server will run 3 virtual machines each. Each virtual machine will consist of 8 virtual cores and 16GB of virtual memory. This will equally distribute the resources and work around the 8 core limit for each VM.

### 4.1 System 1 - Cluster1.fw-it-club.eecs.oregonstate.edu

System 1 will run 3 virtual machines as follows: controller.fw-it-club.eecs.oregonstate.edu, ceph1.fw-it-club.eecs.oregonstate.edu, compute1.fw-it-club.eecs.oregonstate.edu.

Controller.fw-it-club.eecs.oregonstate.edu will be responsible for the control plane for the openstack deployment. It will run openstack services for Keystone, Nova, Neutron, and Glance. Nova, and Neutron will be the control plane versions of each service with the remote ends running on the compute nodes.

Ceph1.fw-it-club.eecs.oregonstate.edu will run the master node for a 3 node Ceph cluster. It will be given 4 of the 6 total disks on Cluster1 for network storage.

Compute1.fw-it-club.eecs.oregonstate.edu will be one of 5 compute nodes for the cluster. It will run the remote ends for Nova and Neutron. It will run KVM for end user virtual machines.

### 4.2 System 2 - Cluster2.fw-it-club.eecs.oregonstate.edu

System 2 will run 3 virtual machines as follows: ceph2.fw-it-club.eecs.oregonstate.edu, compute2.fw-it-club.eecs.oregonstate.edu, compute3.fw-it-club.eecs.oregonstate.edu.

Ceph2.fw-it-club.eecs.oregonstate.edu will run a slave node for the 3 node Ceph cluster. It will also consume 4 of the 6 total disks on Cluster2.

compute2 and compute3 will be mirrored from compute1.fw-it-club.eecs.oregonstate.edu and will provide more computing resources.

### 4.3 System 3 - Cluster3.fw-it-club.eecs.oregonstate.edu

System 3 will be a mirror of System 2 providing the same resources. It will run the following virtual machines: ceph3.fw-it-club.eecs.oregonstate.edu, compute4.fw-it-club.eecs.oregonstate.edu, compute5.fw-it-club.eecs.oregonstate.edu.

## 5 Project Division

This project will fall under the IT Club Datacenter group. The group will be further divided into sub groups for each part of the project.

### 5.1 Infrastructure

The Infrastructure group will be responsible for maintaining the physical hardware and physical networking for the project. This will likely include physical installation of the servers and engineering of the base network to support the system.

## **5.2 Bare Metal**

The Bare Metal group will be responsible for installing and maintaining the bare metal hypervisor on each system. This will likely include installing the hypervisor on each system, setup, and tweaking for best performance. It will also likely include provisioning of the virtual machines for each service that is required.

## **5.3 Ceph**

The Ceph group will be responsible for installing and maintaining the Ceph nodes for the cluster. This will likely include installation and tweaking for best performance on the drives and across the network. It may include later expansion of the system.

## **5.4 Control**

The Control group will be responsible for installation and maintenance of the openstack controller(s). This will likely include installation and performance tweaking as well as provisioning new compute nodes that are added to the cluster.

## **5.5 SDN Network**

The SDN Network group will be responsible for installation and maintenance of the virtual networking for openstack. This will likely include building Neutron configs to work with both the controller and the compute nodes. This group will also be responsible for working with the Infrastructure group to coordinate between virtual networks and physical networks.

## **5.6 SDN Compute**

The SDN Compute group will be responsible for the installation and maintenance of the compute nodes. This will likely include installation and performance tweaking for each compute node added to the cluster.

## **5.7 Administration**

The Administration group will be responsible for administering user accounts and user projects within openstack. This will likely include user account creation, user project creation and user association, and user resource management.