Software Requirements Specification

Justin Anderson
John Nagel
Cesar Ramirez
John Rensberger

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1. Project Overview

1.1 Vision

The purpose of this project is to provide the Computer Science department at North Dakota State University with a open source cloud using OpenStack. The cloud will provide the department with many new possibilities by offering resources as required and as a service. This will allow better utilization of resources as specific courses will be able to create purpose-built images that are easy to modify and scale while also offering many other solutions to faculty and staff for research needs. Throughout the duration of the semester, it is our goal to deliver a working cloud to the department that is not only fully operational, but is actively being utilized and is hopefully incorporated into future educational use cases.

1.2 Overall Description

OpenStack creates an Infrastructure as a Service (IaaS) that provisions computing resources to provide various cloud-based services. IBM approached North Dakota State University last year to create a private cloud running on four nodes as a proof-of-concept that such an application could be achieved using open source products. Being able to implement OpenStack also presents many possibilities to the university, the primary being cost savings on software. The capstone group that worked on this project last year delivered a working prototype and developed a few use cases to demonstrate its abilities.

Based on last year's success, IBM would like to continue to pursue the possibilities that OpenStack can offer the CS department at NDSU. Throughout the duration of the semester, the group is expected to deliver a fully-functional production instance of the cloud to the department. In addition to delivering this instance, the group will need to reach out to the faculty and staff in the department to develop several use cases for the cloud. It is then their responsibility to deliver as many of these use cases as possible. The true success of this project will be measured by how heavily utilized the cloud is within the department.

To complete these goals, the group will need to spend significant time researching OpenStack to streamline processes in order to allow further development. All work will need to be thoroughly documented and packages/scripts should be provided to allow future builds of the cloud, modules, and configurations.

2. Software Requirements

2.1 High-Level Requirements

ID	Added	Description	Status
1100	Onset	Provide visual interface for System Administrator and other users of OpenStack	C
1200	Onset	OpenStack will provide VLANs for different tenants to provide more isolation between VMs	C
1300	Onset	LDAP and AD integration with OpenStack	C
1400	Onset	Quantum (network) component working	C
1500	Onset	Cinder (block storage) component working	C
1600	Onset	Swift (Object Storage) component working	C
1700	Onset	Nova (Compute) component working	C
1800	Onset	Documentation for beginning users	C
2100	Onset	Integration from OpenStack with Hadoop	T
2200	Onset	Script for automatic deployment of OpenStack	T
2300	Onset	Integration GRASS-GIS and OpenStack over a distributed file system	T
2400	Onset	Chef/Puppet integration for orchestration	T
2500	Onset	Post deployment script for VMs	T
3100	Onset	Integration with Jenkins/CI systems for large scale testing	NC

2.2 Low-Level Requirements

ID	Description
1101	Main controller node and 2+ compute nodes
1102	Reporting and monitoring of VMs that allows a system administrator to confirm the correct functioning of the entire system.
1103	System should be able to deploy a new VM in less than 10 minutes.
1104	System should be capable of deploying a new cluster of 100 small VMs in less than an hour.
1105	All passwords for all components and services of OpenStack should be stored hashed and inaccessible by external users.
1106	Updates should be able to be installed without stopping the entire system.
1201	Networks should be isolated in a per-tenant basis using VLANs.
1301	LDAP and AD for user authentication
1401	VLAN for network management
1402	All internal networks should have a connection speed of at least 1GB/S.
1501	Redundancy of data storage
1601	Object and Block storage be only accessible by the tenant owner and the system administrator.
1602	Redundancy for Object and Block storage.
1603	Both high-speed(SSD) and high-capacity drives should be available for the users.
1801	Documentation will provide step-by-step tutorials to users and administrators
1802	With basic training, a user should be able to create, stop and manage their own VMs.
2501	Scripts should exist to allow the quick deployment of the system.

3. Dependencies and Constraints

ID	Dependencies and Constraints
D1	System Administrator physical hardware/availability
D2	Folsom release having all features implemented for the project
C1	Conflicting schedules between all group members
C2	Relaying requirements and development progress between
C3	Make sure mentor has access to servers, Dashboard interface and other tools

4. Definitions and Acronyms

Term	Definition
Backend	A term that refers to a computer that stores data.
Cinder	The OpenStack component that provides block storage for guest VM's.
Flavor	An available hardware configuration for a server.
Glance	The OpenStack component that provides catalog and repository for virtual disk images.
Horizon	The OpenStack component that provides a web UI for easy administration.
Keystone	The OpenStack component that provides authorization and authentication for the services.
NFS	An acronym that stands for Network File System. A network file system, is a system that allows access of files and folders over a network.
Nova	The OpenStack component that provides creation of virtual servers on demand.
Quantum	The OpenStack component that provides a "network as a service".
SAN	An acronym that stands for Storage Area Network. A storage area network is a network of systems that are dedicated to file access and storage.
Swift	The OpenStack component that provides storage or objects (files and folders).
VM	An acronym that stands for Virtual Machine. A virtual machine is software that allows an multiple occurrences of operating systems to run on the same system.

5. Requirements Review

Project Manager

Name:	John Rensberger
Date:	
Signature:	

Mentor

Name:	Michael Fork, Lance Bragstad, Mathew Odden, Adam Reznechek
Date:	
Signature:	