

# NDS Labs Architecture



This page is out of date and does not reflect the current Labs Workbench architecture.

*Note: Also see architecture/design notes within the source code under docs*

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## Concepts and Terminology

- **Infrastructure:** The compute and storage resources in a cloud or infrastructure service (AWS, etc) that an NDS Labs cluster runs on. The NDS Labs reference architecture is OpenStack.
- **Site:** A site is an administrative organization that provides resources to and operates one or more NDS Labs clusters.
- **Cluster/NDS Labs cluster:** The NDS Labs software platform that runs on the infrastructure.
- **Project/Namespace:** An isolated, named environment within the cluster that contains a set of services that are managed and operated independently of other projects. Projects typically implement the equivalent of a "website".
- **Administrator:** An authenticated person that manages and operates a part of the system.

## NDS Labs System - Roles and Responsibilities

- **Infrastructure Administrator:**
  - Provisions infrastructure to run a NDS Labs cluster
    - On OpenStack, AWS, GCE, Rackspace, MaaS, ...
  - Deploys the NDS Labs base cluster software
  - Registers resources from infrastructure with NDS Labs cluster resource pool
  - Provides API and credential to Cluster Administrator
- **Cluster Administrator:**
  - Manages and operates the NDS Labs cluster infrastructure
  - Manages Projects in the cluster
    - Provisions Projects on the cluster
    - Manages resource assignments from the cluster pool to project pools
    - Provides API and credentials per-project to Project Administrators
- **Project Administrator:**
  - Provisions and deploys services in a project using resources granted to the project pool by the cluster administrator.
  - Manages, monitors, and administrates services within independent projects.
- **User/Project User:** A client/user of the services within a project.
- **Tool/Service Provider:** A NDSC partner that provides a tool or service in a set of containers that include NDS Labs service descriptors to enable the service to be integrated in a NDS Labs cluster.

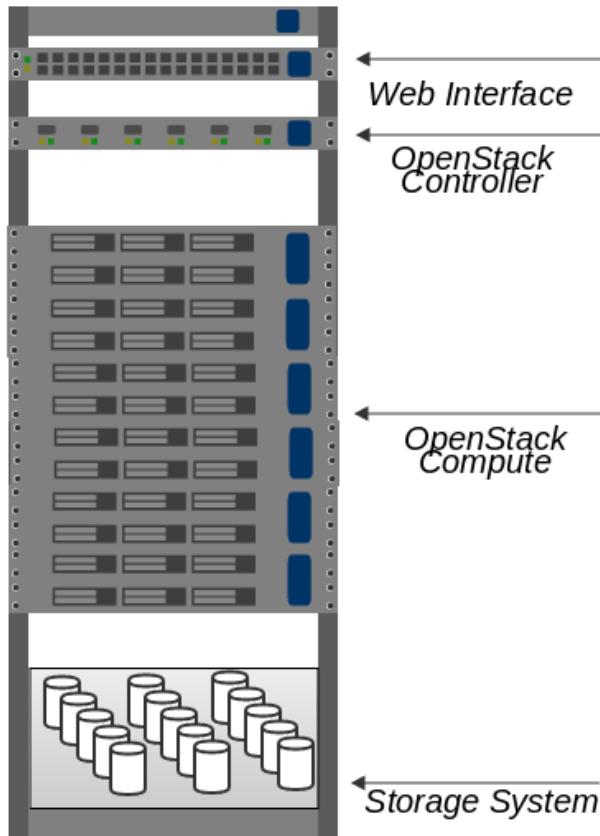
## NDS Labs Architecture

NDS Labs extends the Kubernetes base system with NDS-specific services and REST API's that support NDS Labs cluster services, project services, inter-cluster NDS Labs services. The implementations of NDS Labs services are implemented via cluster-specific Kubernetes pods and sidekick containers that are deployed in conjunction with service pods in the cluster and in project-specific services that "extend" cluster-specific and project-specific pods with integration to services such as monitoring, volume management, etc.

- **NDS Labs Cluster Services:**
  - **API Manager:** Manages cluster-wide **API naming** and **public API exposure** from the cluster public IP firewall/load-balancing system.

The NDS Labs reference infrastructure is OpenStack. A cluster begins with a cluster of 6 OpenStack VMs. The cluster admin can add additional compute nodes as-needed based on dynamic demand.

# OpenStack Cluster Hardware

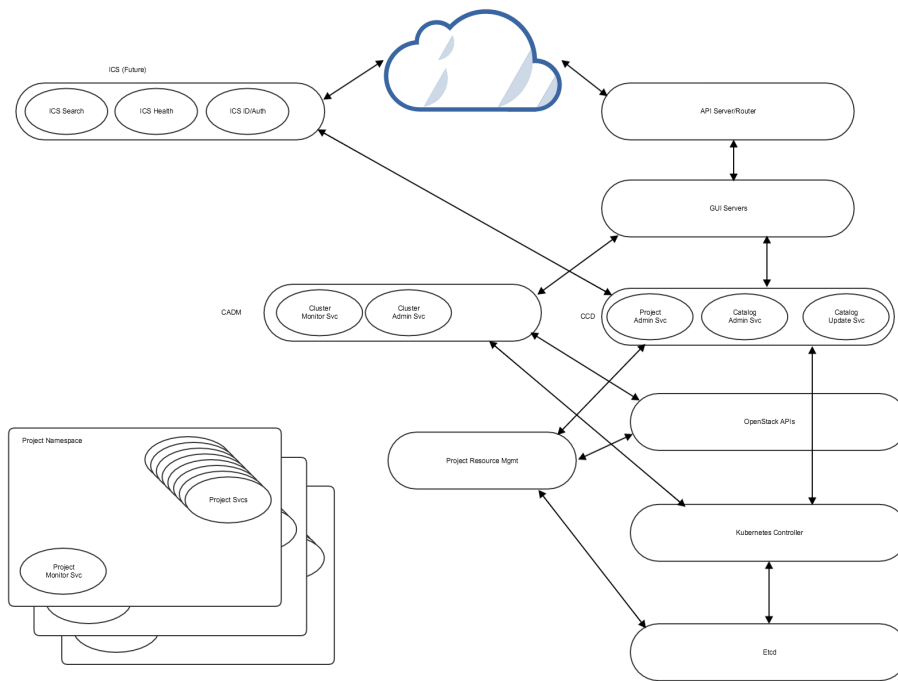


## Layer 1 - Kubernetes Container and Service Orchestration Layer

The initial 6-VM system is provisioned as a CoreOS cluster with 3 serving as etcd masters (not shown for simplicity), and 3 serving as the initial Kubernetes infrastructure, with the following architecture. additional compute resources can be added to the kubernetes cluster as demand requires.

## Layer 2 - Single-Cluster Detail - NDS Labs Services and APIs

The NDS Labs architecture layer services on top of kubernetes that implement the NDS Labs services to manage and monitor the cluster, provision and manage resources for projects in the cluster, and provide project managers the ability to manage software service stacks within their project. The NDS Labs services leverage the facilities of the underlying kubernetes cluster orchestration system and the etcd system for managing configuration and state information of the services.



## API/Service Catalog

Service	APIs	UsedBy
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## Service/Component/Role Matrix with Descriptions

Stage of Development Color Key:	Completed	In Development	In Design	Future
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Service Description	Component Description	Planning Notes	Role/Use				
			Infrastructure Admin	Cluster Admin	Project Admin	Tool Developer	System Service
Developers Environment and Tooling (DEVENV) <a href="https://github.com/nds-org/ndslabs-developer-shell">https://github.com/nds-org/ndslabs-developer-shell</a>  <a href="https://github.com/nds-org/ndslabs-system-shell">https://github.com/nds-org/ndslabs-system-shell</a>	Kubernetes Devenv Host-node network IPaddrs	<ul style="list-style-type: none"> <li>NDSC5 - Planned for managed small-scale release to handful of early adopters</li> </ul>	NA	NA	Test project deploy	Test tools	NA
	Kubernetes Devenv w/ External firewall IPaddrs	<ul style="list-style-type: none"> <li>Needs tests/design</li> <li>etcd/connfd/nginx</li> </ul>	NA	NA	Test project with proper public interface	Develop to proper external interface	NA
	Container build support Makefiles	<ul style="list-style-type: none"> <li>Needs: docs, instructions, catalog yml support, publish process integration</li> </ul>	NA	NA	NA		NA
OpenStack Platform Interface	Production Cluster Deploy	<ul style="list-style-type: none"> <li>Infrastructure provision done</li> <li>Needs production config: TLS, security, data persistence</li> </ul>	Deploy Cluster Infrastructure	NA	NA	NA	NA
	Volume Interface Service	<ul style="list-style-type: none"> <li>Needed for OpenStack deploy</li> </ul>	Provide vol resources	Allocate vol resources to projects	Implicit use of auto-named vols	NA	Register /track resources
Catalog, Configure, Deploy (CCD) <a href="https://github.com/nds-org/ndslabs">https://github.com/nds-org/ndslabs</a>	Service catalog Admin Interface (CATADM) Register catalog URLs in etcd	<ul style="list-style-type: none"> <li>NDSC5 demo component</li> </ul>	NA	Admin Catalogs - register catalog URLs	NA	Publish service Needs service format	
	Update local service		NA	NA	NA	NA	Pull catalogs

	catalog from configured catalogs (CATSVC)	<ul style="list-style-type: none"> <li>NDSC5 demo component</li> </ul>					maintain in etcd
	Project Deploy CLI Deploy service stacks in project	<ul style="list-style-type: none"> <li>NDSC5 demo</li> </ul>	NA	NA	Deploy named service stacks in project	NA	Uses kubernetes API
	Project Deploy GUI /Server Web deploy tool on CLI (CCDSRV)	<ul style="list-style-type: none"> <li>NDSC5 demo</li> <li>Needs volume management CLI</li> </ul>	NA	NA	Web configurator and deploy	Use to test newly developed tools	NA
	Project Service Monitor (PMON)	<ul style="list-style-type: none"> <li>NDSC5 demo</li> <li>Display state of stacks in project</li> </ul>	NA	NA	CCD gui	NA	NA
Cluster Administrator/Ops (CADM)	Cluster Monitor (CMON)	<ul style="list-style-type: none"> <li>NDSC5 demo component</li> <li>ELK, cadvisor/prometheus, etc.</li> <li>Graphical tools</li> <li>Needs configuration and testing</li> </ul>	NA	Monitor cluster health and performance	NA	NA	NA
Inter-Cluster Services (ICS)	Search	<ul style="list-style-type: none"> <li>Search across all NDSL clusters</li> <li>Needs research, requirements, plan</li> </ul>	NA	Registration	Register data resources	relevant for developing search interfaces /tools	External interface to cluster Distributed global service
	Registration Cluster registration /federation	Needs development	NA	Global registration	Project resource registration	??	Local and global distributed service

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