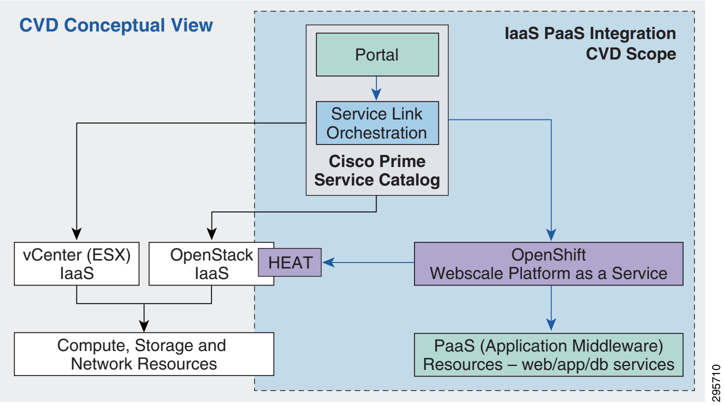
CHAPTER 2

System Overview

The Cisco IaaS/PaaS/SaaS Integration Release 1.0 architecture specifies the data flow, the API interactions and the integration points between Cisco PSC, related orchestration engines, and specific resource managers for the relevant IaaS, PaaS, and SaaS layers. This specific document focuses on the architecture, design, implementation and validation of the Cisco Prime Service Catalog OpenShift Integration 1.0 release. Figure 2-1 depicts the goal of this release—to enable Cisco Prime Catalog integration with OpenShift Enterprise 2.0 (OSE 2.0).

Figure 2-1 Cisco Prime Catalog Integration with OpenShift Enterprise 2.0


CVD Conceptual View
IaaS PaaS Integration CVD Scope
Portal
Service Link Orchestration
Cisco Prime Service Catalog
vCenter (ESX) IaaS
OpenStack IaaS
HEAT
OpenShift Webscale Platform as a Service
Compute, Storage and Network Resources
PaaS (Application Middleware) Resources – web/app/db services
295710

System Description and Scope

The solution focuses on the integration aspects rather than the implementation of IaaS or PaaS systems. As such, the scope of the document is limited to implementing, testing and validation of specific use cases outlined in the "Use Cases" section on page 2-2.

To enable the implementation and testing of the integration points between Cisco Prime Catalog and OpenShift Enterprise Broker, the underlying IaaS infrastructure is assumed to be pre-built/built out.

Use Cases

IaaS-level solutions available in today's market are fairly mature, but an integrated experience in ordering and managing PaaS services and IaaS services through the same management portal and using the same orchestration tool sets is lacking. Customers are looking to Cisco for an integrated IaaS, PaaS, and SaaS ordering and orchestration solution that allows them to expose the power and functionality of their data center infrastructure and value-added platform and software services to their end-users.

The following user cases satisfy a majority of concerns outlined and pave the way for future iterations, providing greater integration between the Service Catalog and the PaaS system (OpenShift).

Use Case 1: Integrate Provisioning for IaaS and PaaS

End users logging into the PSC can currently order IaaS services (VMs, networks, storage) for underlying IaaS implementations (VSphere or OpenStack based) using packaged Cisco Prime solutions. The same set of users must be able to order PaaS application stacks easily from the same set of Prime Catalog portal pages.

This guide enables the following:

- Single pane provisioning of IaaS and PaaS components.
- Unified authentication store for Portal and PaaS components.
- Delegate proxy from OpenShift to Portal to allow portal to provision components on behalf of Portal users.

Use Case 2: Application Stack Creation

OpenShift introduces the concept of cartridges for specific web application stack capabilities. PSC must allow portal users to provision and instantiate those cartridges into an OpenShift installation.

This guide enables the following:

- Project / Application name creation.
- Web Application Stack creation (e.g. Python, Java web-app containers).
- Value-add (Add-on) capability creation (e.g. MySQL database).

Use Case 3: Single Pane Management of Application Stack

Similar to the current PSC capabilities for listing all end user-owned IaaS resources and the ability to take actions against them (start, stop, etc.), the PSC must provide a PaaS component / application-level view of the resources ordered and allows the user to take actions against them.

This guide enables the following capabilities:

- Single pane listing of all end user-owned PaaS applications.
- Ability to stop a particular PaaS application.
- Ability to start a particular PaaS application.
- Provide a view into a scaled PaaS application.
- Ability to delete a PaaS application.

- Listing of relevant information about a PaaS application (URLs, SSH, and GIT access endpoints, application name).

Use Case 4: Dynamic Scaling of Application (PaaS) Stack Components

OpenShift allows application web stacks to be created that use the inbuilt scaling features, including auto scaling and manual scaling.

This guide enables the following:

- While provisioning via the PSC catalog, expose the ability for the end-user to provision a scaled application.

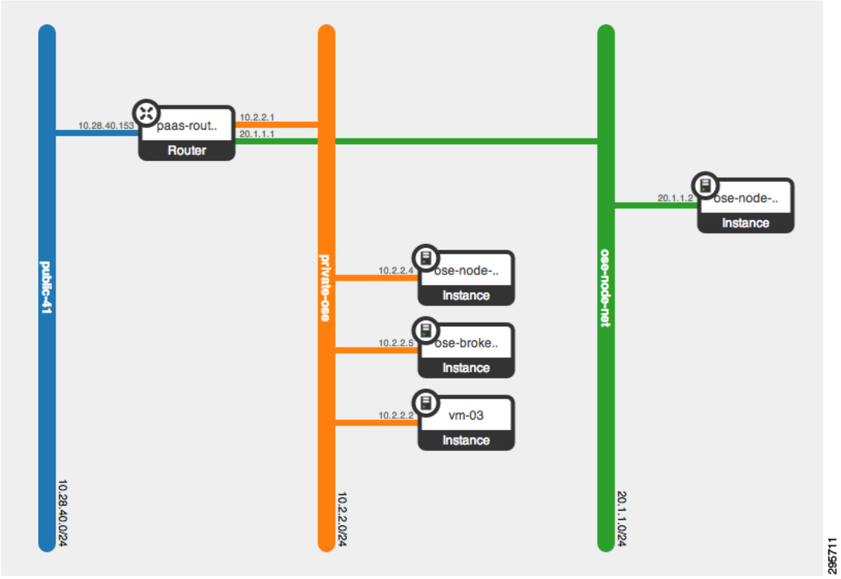
Use Case 5: Network-based Segmentation of PaaS Districts for Security

By default, OpenShift runs all applications in a shared set of IaaS resources (VMs, hosts, network segments) using Linux container primitives (CGroups, SElinux, etc.) to ensure secure multi-tenancy within the VMS. End users/customers may have a requirement to host a specific set of applications / application stacks in a separate set of IaaS resources from the primary shared pool of VMs.

This guide enables the following:

- Set up OpenShift (using OpenShift districts) to create OpenShift nodes in a different network and expose application stack creation on those VMs as an order attribute. See Figure 2-2.

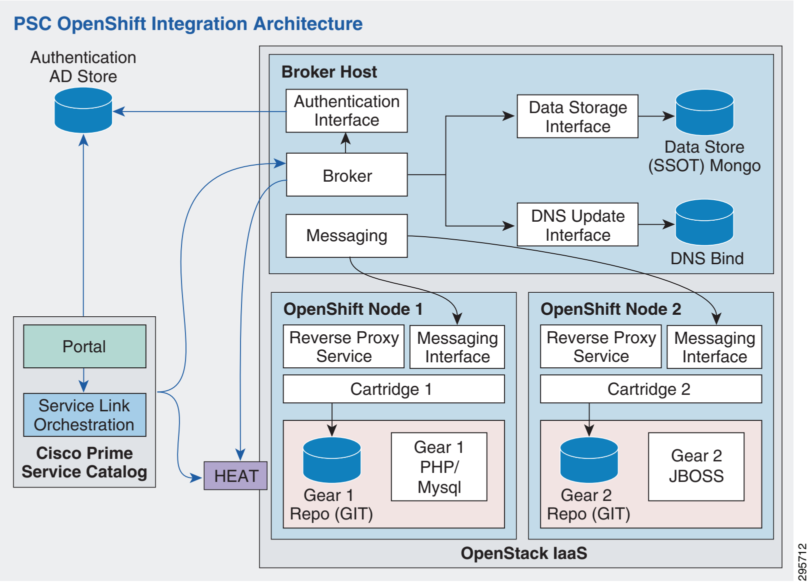
Figure 2-2 OpenShift Nodes in Public and Private Districts



System Architecture

Figure 2-3 shows the products chosen for this solution based on functional availability within the necessary time frame.

Figure 2-3 Cisco PSC—OpenShift Integration Architecture



The system architecture follows the current industry best practices for integration:

- API-based integration where possible.
- Use the single source of truth directly via APIs (with no data replication), in order to have real-time data available.
- No proliferation of user identity systems.

As such, the integration in this document uses existing adapters available in the PSC ServiceLink component to talk to the OpenShift Broker via APIs.

If an existing component in the PSC does not meet the integration requirements, this document lists out custom components and scripts developed to aid in the integration.

All calls to the OpenShift broker REST APIs are synchronous in nature. The PSC does not store OpenShift Broker-managed artifact and metadata in the Service Catalog database. Instead, all displays and display updates in the PSC portal are done in real-time via API calls.

System Components

The following system components are detailed:

- PSC, page 2-5
- OpenStack, page 2-6
- OpenShift, page 2-5
- Supporting Components, page 2-6
  - VMWare ESX Server, page 2-6
  - Microsoft Active Directory, page 2-7
- Cisco Components, page 2-7
- Third-Party Components, page 2-7

PSC

PSC provides the necessary functionality for the end user and administrative portals and the end user-facing service catalog. PSC is a highly customizable product and, if required, an extensive Advanced Services team specializing in IAC is available to assist the customer with more complex work flows.

In brief, end user requests for compute, network, and/or storage and platform/application resources are received in PSC. The ServiceLink component then instructs the required domain orchestrator's to execute the appropriate tasks in order to fulfill the end user request.

The following sections describe the features and functionalities of IAC that are relevant to meeting the requirements for managing and configuring OpenShift through Cisco Prime Services Catalog.

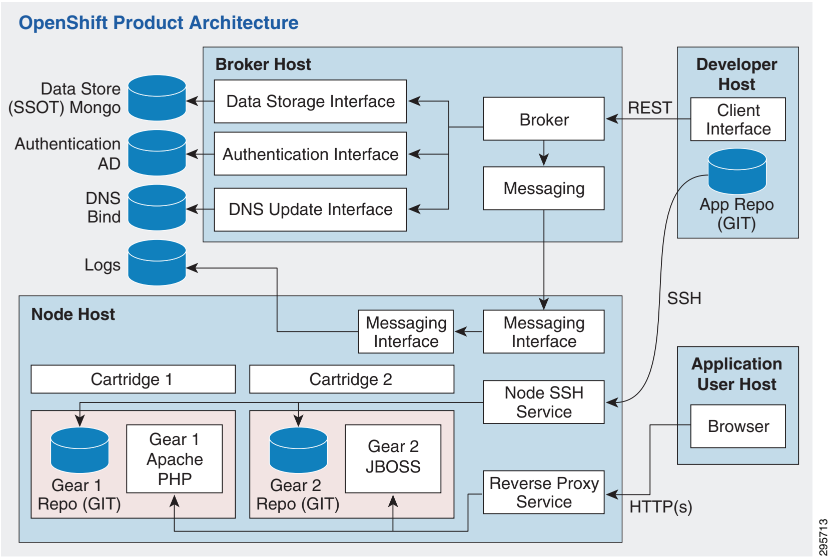
The Cisco PSC with additional IAC portal content is provided as a virtual appliance for ease of deployment. One of the components of SC is the Service Designer, which allows the Cloud Provider to design and package services as products and to catalog these services for end users to browse through and order. The look and feel of the portal is fully customizable, allowing the Cloud Provider to brand the portal as appropriate. Refer to Cisco Service Portal Designer Guide for details.

OpenShift

OpenShift Enterprise consists of several components. This section defines primary components, and various configurations within the document.

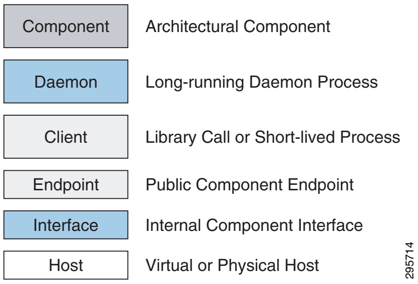
Figure 2-4 shows the Open/Shift product architecture.

Figure 2-4 OpenShift Product Architecture



The diagrams in subsequent sections show elements based on the legend in Figure 2-5.

Figure 2-5 Legend for Elements in this Document


Component
Architectural Component
Daemon
Long-running Daemon Process
Client
Library Call or Short-lived Process
Endpoint
Public Component Endpoint
Interface
Internal Component Interface
Host
Virtual or Physical Host
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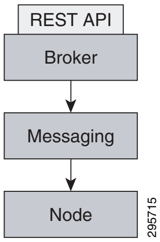
An OpenShift Enterprise deployment consists of two logical types of hosts: a broker and one or more nodes. The broker handles the creation and management of user applications, the user authentication service, and manages communication with the appropriate nodes. The nodes run the user applications in contained environments called gears. The broker queries and controls nodes using a messaging service. Figure 2-6 provides a simplified version of the interaction between these two types of hosts.

Figure 2-6 Broker Interaction with Node Hosting Gears/Applications



OpenStack

In this document OpenStack IaaS is used to:

- Demonstrate the dynamic scaling of VMs as required by OpenShift.
- Create networking resources (Subnets/VLANs) where different OpenShift Nodes can be placed to allow for network segmentation requirements of OpenShift clients.
- Allow the IaaS work flows to kick off OpenStack HEAT Orchestration templates in general for creation of OpenStack native resources (e.g. networks, VLANs, VMs, and separate OpenShift installations).

Supporting Components

Supporting components are those that are not part of the scope of this document, but are required to provide support for the components above(e.g. VMWare ESX for hosting PSC VM image).

VMWare ESX Server

The packaged PSC component used in this validation is packaged as a VMware VM Image (OVF) file. An ESX server is utilized to stand up the packaged PSC appliance.

Future iterations of this document will use an IaaS-agnostic version of the PSC appliance.

Microsoft Active Directory

The packaged PSC appliance comes with its own Active Directory installation. The same active directory is leveraged in this document to act as an authentication store for both PSC and the OpenShift Broker.

Cisco Components

Table 2-1 shows Cisco components.

Table 2-1 Cisco Components

Component Positioning	Product	HW Configuration	Software Version(s)
Data Center	Cisco UCS System		
Cloud	Cisco PSC		1.00.04 Jan 9 2008

Third-Party Components

Table 2-2 shows third party components

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Table 2-2 Third Party Components

Component	Vendor/Partner	Hardware/Software
IaaS Software	Red Hat	Red Hat OpenStack (HAVANA)
PaaS Software	Red Hat	OpenShift Enterprise 2.01