



# CHAPTER 1

## Introduction

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Cisco's integration of OpenShift 1.0 (by Red Hat) and the Cisco Prime Service Catalog (PSC) creates a solution to provision, configure, and manage Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), Software-as-a-Service (SaaS), and other IT services all through a single pane-of-glass. The combined solution provides a unified portal and service catalog for XaaS (anything-as-a-Service).

The benefits of OpenShift and Cisco Prime extend far beyond the integrated portal/service catalog. All IT services can be managed through the Cisco PSC. When the user signs onto Cisco PSC, he or she can provision, configure, and manage all services in the service catalog without switching between management systems and without signing into each system individually.

The Cisco PSC abstracts the interface to the individual management domains. The user completes the provisioning, configuration, and management of services through Cisco PSC, providing the user with the same interface and the same experience for all of the IT services.

Provisioning of PaaS services through the Cisco PSC is a one-step process done through a menu-driven GUI instead of an arcane command line interface. The Cisco PSC assigns and provisions the IaaS resources when the PaaS service is provisioned. After the IaaS resource exhaustion threshold limit is reached, additional resources are seamlessly added, allowing the solution to scale out without operator intervention.

The Cisco PSC with OpenShift leverages all of the existing strengths of Cisco Prime products in managing IaaS for supporting legacy applications while providing one-touch configuration for PaaS.

For the user, Cisco PSC provides:

- A single-pane-of-glass for provisioning, configuration, and management of IaaS, PaaS, and other IT services.
- Single sign-on for IaaS, PaaS, and other IT services. No need for log on to multiple systems.
- Seamless dynamic provisioning of IaaS resources for PaaS. When the PaaS application is created, IaaS resources are configured automatically. When the resource exhaustion threshold is reached, resources are added dynamically without user intervention.
- Network QoS/Security extended for PaaS. The benefits of the Cisco VLAN technology for network QoS/security are extended for PaaS and the services developed by PaaS.
- Cisco Prime provisions, configures, and manages OpenShift PaaS, thereby reducing deployment time, eliminating configuration errors, and most importantly reducing development costs and time to deployment for new applications.
- Finally, and most importantly, Cisco PSC with OpenShift solves the biggest dilemma confronted by enterprise IT departments. By offering the best-of-breed services for IaaS and PaaS, Cisco PSC with OpenShift addresses the migration of legacy applications to the cloud, and provides the advanced tools required for rapid application development.

IaaS services from the Cisco PSC support the migration of legacy applications to the cloud, gaining control of application management, and at the same time reducing server sprawl and costs.

PaaS services from OpenShift provide the ideal set of tools for rapid application development and deployment in the cloud.

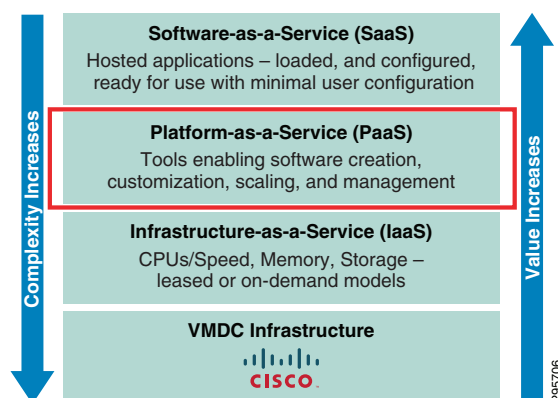
Together, the integrated solution solves the most pressing problems facing IT departments today.

## PaaS Services

IaaS has led the way for IT organizations to begin the process of migrating applications from individual servers to the cloud. IaaS has been effective in centralizing servers, reducing costs, and controlling server sprawl.

With the success of IaaS, IT departments are under great pressure with the business demand for greater access to larger amounts of information increasing geometrically. The pressure to reduce the growth in IT budgets is also increasing. Meeting the geometric increases in demands requires better tools than today's linear development environment can provide. [Figure 1-1](#) shows PaaS service layers.

**Figure 1-1 Service Layers: PaaS Perspective**



To understand the benefits of Platform-as-a-Service (PaaS) as part of a cloud infrastructure, it is necessary to understand how PaaS fits into the cloud stack. As emphasized in [Figure 1-1](#), most cloud services are delivered through IaaS, SaaS, or PaaS.

Each of these layers offers a different degree of automation, and value, in the cloud stack. For IaaS, the consumer of the service takes on all of the management above the virtualization of the hardware. The service consumer installs the operating system, the applications, and is responsible for any dependencies for the O/S or application, and any middleware required.

At the opposite end of the stack, SaaS offers the service consumer the lowest management burden, but also the least flexibility. The application is an out-of-the-box commodity, with the service consumer having little to no opportunity to customize. While this works well for standardized applications, most businesses require some level of customization.

PaaS targets the cloud consumers that need the flexibility to configure and develop applications, but removes the burden of managing the lower layer components of the stack. The platform management tasks are part of the platform, freeing developers and administrators to focus on the design and delivery of the application.

While PaaS resides between the IaaS layer and the SaaS layer, the service consumer views PaaS-developed services as just more consumable services. PaaS functions delivered through the Cisco PSC allows end users to order complete application or platform stacks from the Cisco self-service portal. The application blueprint provides end users the ability to order fully configured, multi-tiered cloud applications using standards and automation. This approach bridges the gap between developers and operations and facilitates the collaborative deployment process needed to achieve the goals of DevOps.

More than a development environment, PaaS combines the capabilities of the platform at multiple layers to enable services such as auto-scaling and load balancing, relieving the developer of recreating the platform services for each application.

The PaaS layer empowers the developer with a rich set of tools, leveraging the most important benefits cloud technology offers.

Some of the benefits PaaS provides include:

- Application-centric (vs. VM-centric) management framework.
- Developers focused on application development, not infrastructure management.
- Application as the unit of deployment and management while the infrastructure is transparent.
- Requirements of the development team for app tools and the operations team for app management are satisfied.
- Bottleneck in provisioning and deployment is eliminated
- Codifies the relationship between developers, IT, and globally-distributed clouds.

The benefits PaaS provides are rapidly driving PaaS growth. Without PaaS, many of the services enterprises require at the SaaS level will exceed the limited capacity of the IT resources and budget.

## Cisco Prime-PaaS Deployment

Cisco Prime products address the complete experience lifecycle from service design through fulfillment, assurance, analysis, and optimization. The Cisco Prime product architecture is a pre-integrated management application suite, incorporating a self-populating common inventory model, based on industry standards. The data model for Cisco Prime products abstracts network devices and services to provide powerful experience management capabilities and extends coverage from the service provider core network to the customer premises.

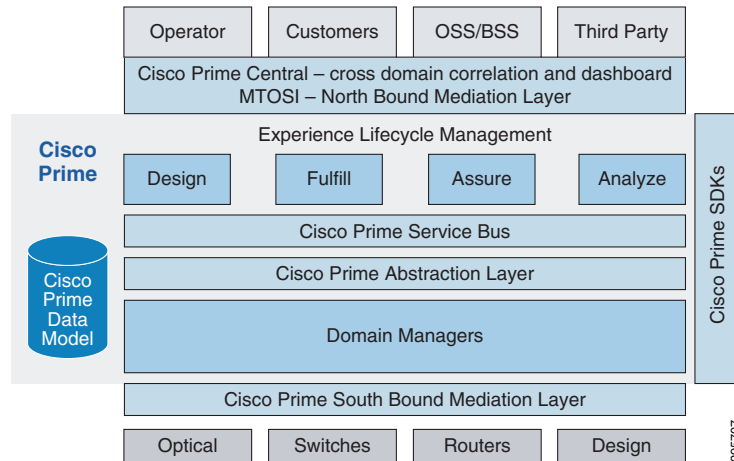
The Cisco Prime product architecture provides a comprehensive management solution to automate the design, fulfillment, assurance, and ongoing management of advanced network services such as video, mobility, and managed cloud services over IP networks. It enables repeatable, policy-driven service provisioning processes within standardized work flows and templates, allowing support personnel without specialized networking knowledge to easily provision, modify, diagnose, and repair complex services. Ultimately, it helps service providers provision services more quickly and consistently, at a lower cost.

The Cisco Prime product architecture is also designed to address complex operational challenges such as pre-population of end-to-end inventory in management systems and cross-domain fault management and troubleshooting. It provides a unified, consistent, and end-to-end view of network services, as well as cohesive work flows for common tasks that extend across multiple domains. As a result, service providers can diagnose, and correct, faults that span multiple domains more rapidly.

Finally, the Cisco Prime product architecture allows service providers to deliver the highly reliable, uninterrupted services their customers expect. Cisco Prime product solutions can be deployed to meet even the most demanding high-availability requirements. This includes both localized high-availability failover, as well as options for geographic disaster recovery and offloading.

The Cisco Prime product architecture delivers all of these benefits through a flexible, end-to-end framework of integrated Cisco Prime product suites, as shown in Figure 1-2.

**Figure 1-2 Cisco Prime Product Architecture**



## Cisco Prime Products Architecture Overview

The primary components of the Cisco Prime product architecture are described below.

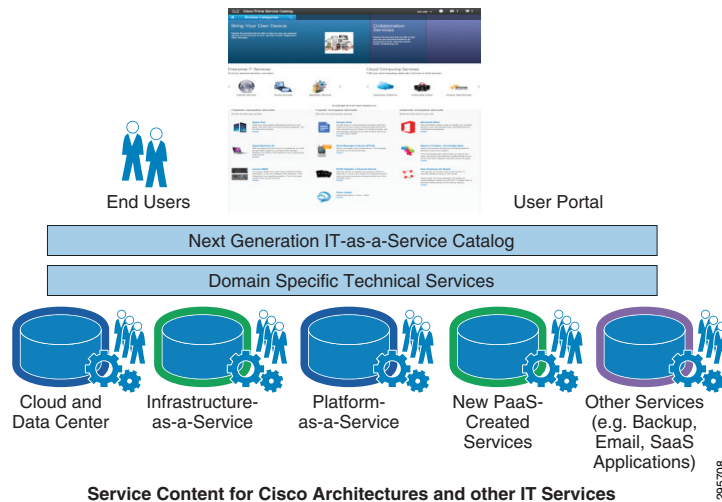
- **Cisco Prime Products Data Model**—The Cisco Prime products data model is based on the Multi-Technology Operations Systems Interface (MTOSI) 2.0 industry standard from the TeleManagement Forum (TMF) and is populated from Cisco Element (Domain) Managers.
- **Cisco Prime Products ServiceLink**—ServiceLink coordinates activity among Lifecycle Managers (i.e., among elements controlling design, fulfillment, assurance, and analysis), and between lifecycle and domain managers. It provides a redundant, highly scalable framework with the ability to mediate messages, and embedded Cisco Prime Product Framework Services such as the scheduler, locator service, and persistence.
- **Cisco Prime Products Abstraction Layer**—This component removes the complexity of managing a wide variety of interfaces by abstracting the information into the Cisco Prime products Data Model. The abstraction layer mediates information stored in the Cisco Prime products Data Model and makes it available to all Cisco Prime Suite components and interfaces.
- **Cisco Domain Managers**—Domain managers (or element managers) provide basic fault, configuration, accounting, performance, security (FCAPS) functionality for each specific technology domain. Examples include the Prime Network domain manager for IP/packet services and Prime Optical for optical transport.
- **Cisco Prime Products Southbound Mediation Interfaces (SBI)**—The Cisco Prime products SBI layer provides a common, mediated interface to communicate with any Cisco device. Each domain manager uses this element to abstract the intricacies of device communication via different protocols (e.g. SNMP, CLI, XML, CORBA) using standard interfaces. The SBI also includes a work flow engine that can be customized with graphical, drag-and-drop design tools. These tools simplify domain management in the field and help service providers customize and extend the network model without having to wait for new Cisco Prime products software releases. Additionally, since the SBI is developed in close collaboration with the Cisco hardware business unit, it is designed from the ground up to optimize the interaction between Cisco devices and Cisco Prime products.

- **Cisco Prime Products Northbound Interfaces (NBI)**—These interfaces allow for direct access to lifecycle and domain managers by both Cisco Prime Central and third-party products such as OSS systems. They are standards-based; available in a number of formats, web services, and native XML; and can be further customized in the field. The NBI is also designed for maximum security, employing transport encryption and requiring authenticated access.
- **Cisco Prime Products Software Development Kits (SDK)**—These SDKs provide service providers with maximum flexibility to customize the solution and easily integrate it into their environment. They include APIs and documentation for access to domain managers along with lifecycle managers for both northbound and southbound interfaces.
- **Cisco Prime Products Lifecycle Managers (Design, Fulfill, Assure, Analyze)**—These applications provide end-to-end experience lifecycle management services across all technology domains. The lifecycle managers coordinate with each other through the Cisco Prime Products Service Bus, and rely on the common Cisco Prime Products Data Model for shared device and service context. Examples include Cisco Prime Fulfillment and Cisco Prime Performance Manager.

## Cisco PSC with OpenShift

The Cisco Prime abstraction layer interacts with OpenShift, reducing the complexity for the administrator and the end user, as shown in [Figure 1-3](#).

**Figure 1-3** Cisco PSC Abstracts Domain Specific Controllers



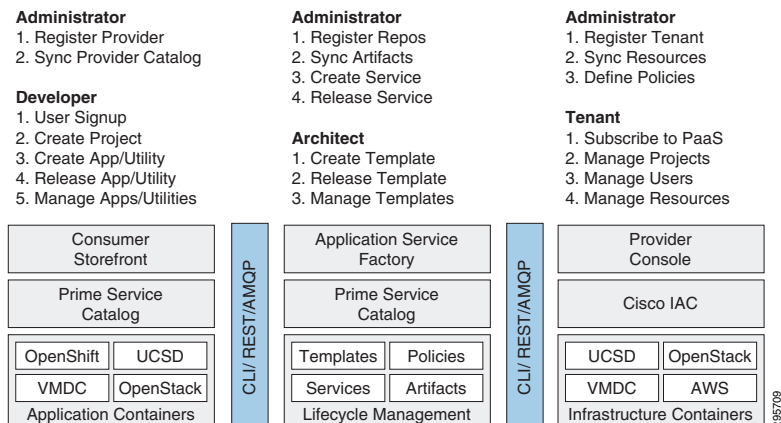
By abstracting the domain specific interactions from the user, Cisco PSC provides the same user experience for all services in the catalog. The user provisions IaaS, PaaS, and other IT services through the same pane of glass, with same graphical user interface.

The architecture of the Cisco PSC is focused on three main areas:

1. Consumer storefront
2. Service factory
3. Provider console

The integration for this document is focused primarily on the consumer storefront ([Figure 1-4](#)).

Figure 1-4 Cisco PSC Architecture



- The consumer storefront is targeted at the developer who will use the PaaS environment. It includes functions such as signing up a new PaaS user (developer), and creating, modifying, and deleting PaaS applications. Most of the work for this phase is focused on the Consumer Storefront.
- The application service factory is the work flow that creates stack templates, and publishes services that embed those templates. The work flow is managed by the Stack Designer tool. The stack designer capabilities are beyond the scope of work in this phase. Stack designs used in this phase are pre-built, and exposed through the consumer storefront. Subsequent phases will include stack designer capabilities that will further enhance OpenShift with a drop-and-drag interface.
- The Provider Console is targeted at the provider of PaaS services. While not used in this document, the provider console allows the administrator to spin-up, manage, and delete OpenShift instances in subsequent phases.

Through the Consumer Storefront, this document provides unparalleled ease-of-use to build and expose PaaS services, and to configure and manage IaaS services.

Together, OpenShift and the Cisco PSC create the market leading solution to satisfy IT departments' needs for IaaS for legacy applications, and PaaS to develop and maintain applications.