HP Continuous Delivery Automation

Software Version 1.10

Concepts Guide

Legal Notices

Warranty

The only warranties for HP products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. HP shall not be liable for technical or editorial errors or omissions contained herein. The information contained herein is subject to change without notice.

Restricted Rights Legend

Confidential computer software. Valid license from HP required for possession, use or copying. Consistent with FAR 12.211 and 12.212, Commercial Computer Software, Computer Software Documentation, and Technical Data for Commercial Items are licensed to the U.S. Government under vendor's standard commercial license.

Copyright Notice

© Copyright 2012 Hewlett-Packard Development Company, L.P.

Trademark Notices

Adobe® is a trademark of Adobe Systems Incorporated.

Microsoft® and Windows® are U.S. registered trademarks of Microsoft Corporation.

Oracle and Java are registered trademarks of Oracle and/or its affiliates.

UNIX® is a registered trademark of The Open Group.

RED HAT READY™ Logo and RED HAT CERTIFIED PARTNER™ Logo are trademarks of Red Hat, Inc.

Documentation Updates

The title page of this document contains the following identifying information:

- Software Version number, which indicates the software version.
- Document Release Date, which changes each time the document is updated.
- Software Release Date, which indicates the release date of this version of the software.

To check for recent updates or to verify that you are using the most recent edition of a document, go to:

http://h20230.www2.hp.com/selfsolve/manuals

This site requires that you register for an HP Passport and sign in. To register for an HP Passport ID, go to:
http://h20229.www2.hp.com/passport-registration.html

Or click the **New users - please register** link on the HP Passport login page. You will also receive updated or new editions if you subscribe to the appropriate product support service. Contact your HP sales representative for details.

Support

Visit the HP Software Support Online web site at: *www.hp.com/go/hpsoftwaresupport* This web site provides contact information and details about the products, services, and support that HP Software offers.

HP Software online support provides customer self-solve capabilities. It provides a fast and efficient way to access interactive technical support tools needed to manage your business. As a valued support customer, you can benefit by using the support web site to:

- Search for knowledge documents of interest

- Submit and track support cases and enhancement requests

- Download software patches

- Manage support contracts

- Look up HP support contacts

- Review information about available services

- Enter into discussions with other software customers

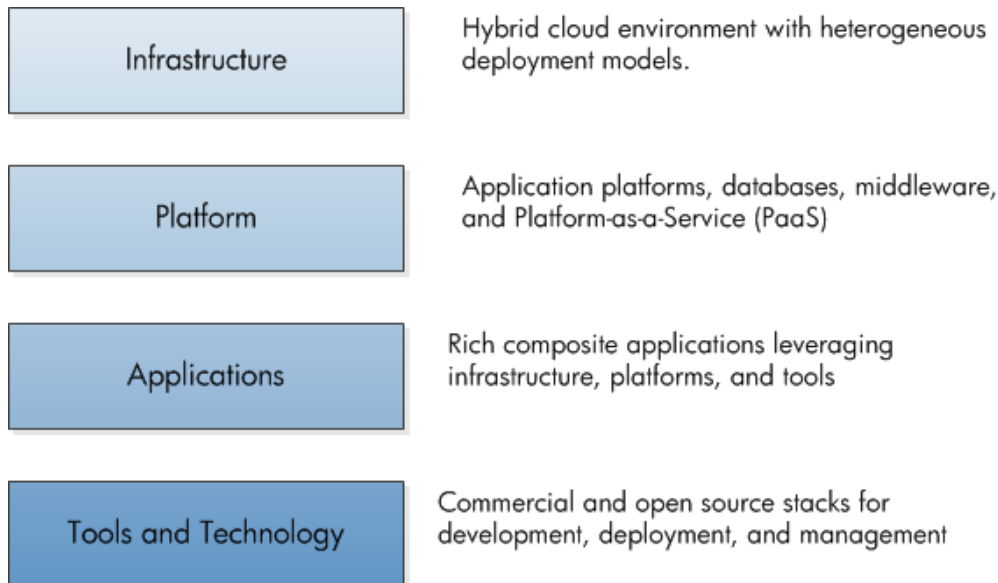- Research and register for software training

Most of the support areas require that you register as an HP Passport user and sign in. Many also require a support contract. To register for an HP Passport user ID, go to: **http://h20229.www2.hp.com/passport-registration.html** To find more information about access levels, go to: **http://h20230.www2.hp.com/new_access_levels.jsp**

Contents

Application Lifecycle Challenges and Opportunities

In the end-to-end delivery lifecycle, processes such as agile development and continuous integration, have matured and evolved through generations of tools and techniques. Organizations, however, face new challenges when extending continuous integration into continuous delivery. Challenges include consistently deploying composite applications through development to production environments, while considering the differences in the environments (infrastructure as well as tools used) and negotiating the gaps across organizational silos. The diagram below shows the different ecosystem tiers of the application lifecycle.

Infrastructure	Hybrid cloud environment with heterogeneous deployment models.
Platform	Application platforms, databases, middleware, and Platform-as-a-Service (PaaS)
Applications	Rich composite applications leveraging infrastructure, platforms, and tools
Tools and Technology	Commercial and open source stacks for development, deployment, and management

Software Development Lifecycle (SDLC)

Following the current Software Development Lifecycle (SDLC) model, segments of businesses across markets continue to manage the development of applications and processes to deliver and support their products and services. In the SDLC model, the following key factors drive planning, development, release, and operations toward faster time-to-value:

- Agile development
- Continuous integration and delivery
- Agile operations

Along with state-of-the-art technologies, such as cloud computing and virtualization, and new IT business practices, organizations are now required to manage the end-to-end lifecycle of modern composite hybrid applications. These applications leverage the following entities to set up and manage the composite application ecosystem:

- Heterogeneous infrastructure (physical, virtual, cloud)
- Diverse platforms (databases, middleware, application servers, message buses, etc.)
- Application software that uses commercial and open source fulfillment and assurance tools

DevOps Overview

Development and Operations (DevOps) provides a framework to bridge the gaps between development (dev) and operations (ops) environments by using a set of principles, methods, and practices around collaboration, automation and governance. The goal is to extend continuous build/assembly integration into repeatable and consistent application deployment across heterogeneous environments. The diagram shows below the continuous integration and continuous delivery cycle in a DevOps environment.
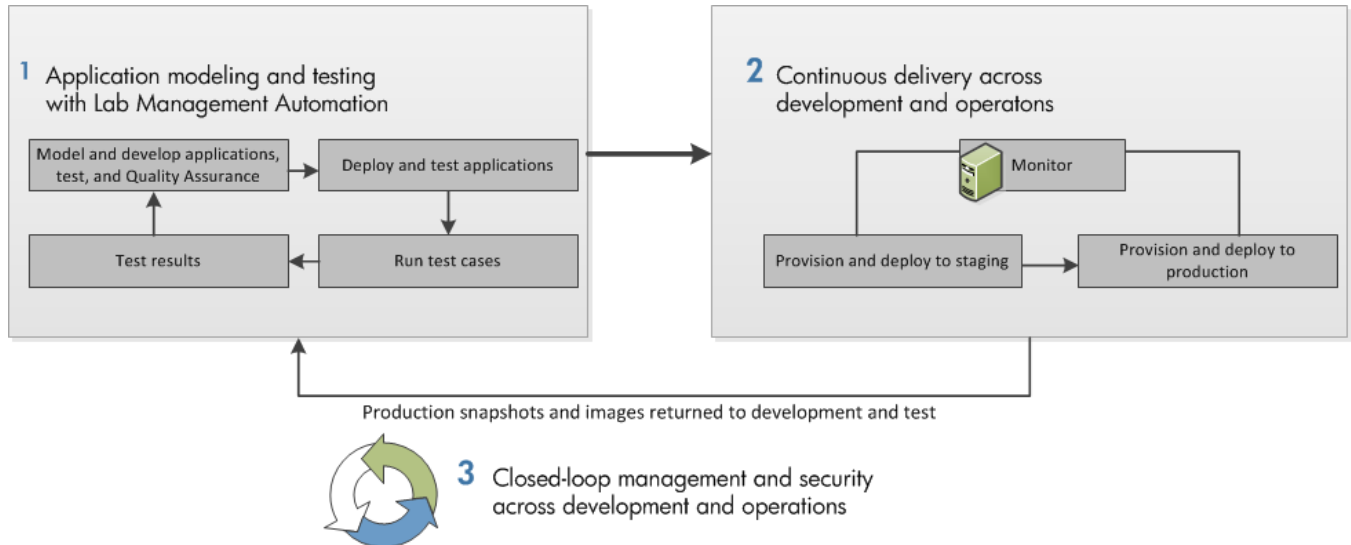
DevOps provides key values to organizations such as:

- Enabling application developers to use IT resources directly, according to centralized policy
- Standardizing application and release versions, as well as lifecycle promotion
- Modeled artifacts that normalize release into production, including performance monitoring, workload management, and security binding

HP CDA: Driving the DevOps Environment

HP Continuous Delivery Automation (HP CDA) provides a model-driven approach to DevOps collaboration, automation of application deployment, and monitoring. HP CDA enables customers to focus on their core applications and to drive business values while reducing costs, risks, and time to perform provisioning and deployment tasks. Core HP CDA features include:

- Modeling the application and infrastructure configuration to deliver infrastructure-as-code for deployment and provisioning
- Full artifact version control, role-based access, application lifecycle management, and Definitive Software Library (DSL)
- Application deployment management using configurable tool options
- Infrastructure provisioning management across hybrid environments
- Embedded monitoring deployment in conjunction with application deployment

The diagram below shows where HP CDA is positioned in a DevOps environment.
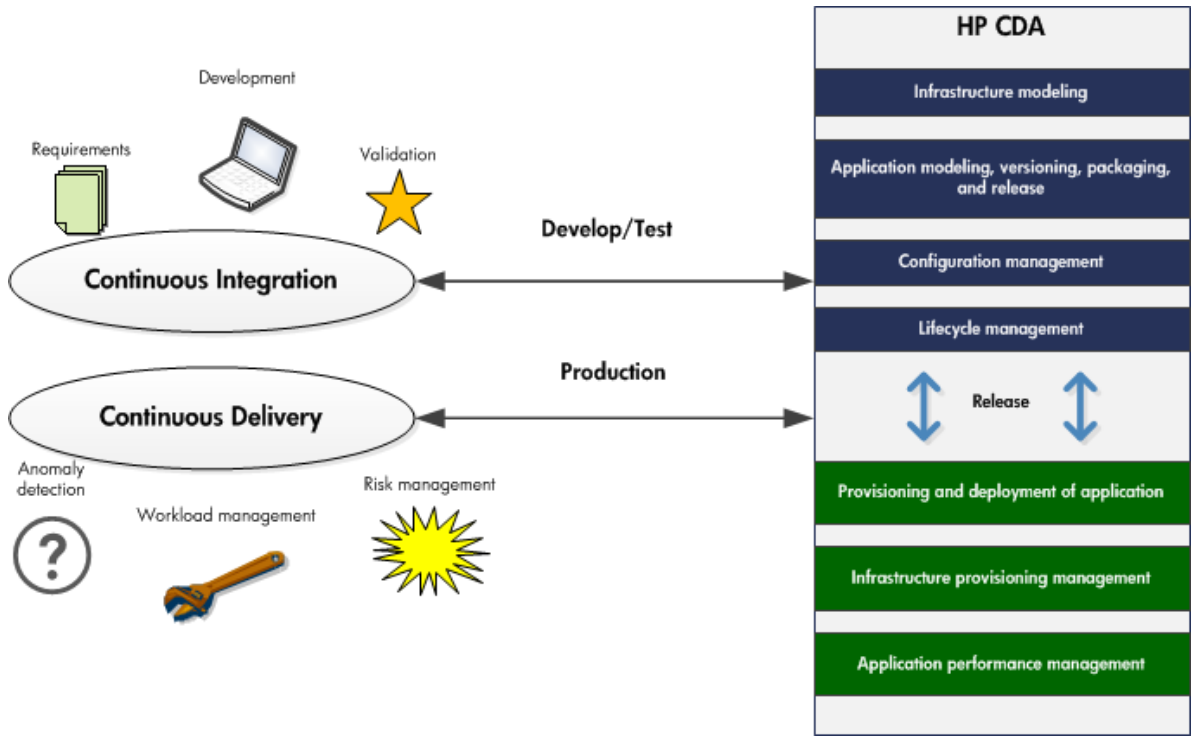
The Application Release Process

To bridge the gap between development and operations environments, organizations need a new level of coordination and communication. They require a defined pipeline of release stages and application candidates, moving regularly from planning to development and from release to operation. HP CDA's continuous integration and delivery enable application developers have visibility into and control over the entire process from development to production.

Continuous delivery results in a dynamic set of data and actions to turn data into realized deliverables. Data can be contained in documents, checklists, and wikis, but the realization of this data is susceptible to human error or interpretation. There are many enterprise tools and products available to instrument the process—from provisioning systems to deploying applications and monitoring—but without automation, standardization of tools and environments becomes hard to control. Delivery into a hybrid environment can magnify these inconsistencies when tools and processes must be managed both inside and outside the organization. HP CDA creates a centralized structure for implementing a DevOps agenda and standardizes the integration of tools best suited to drive the continuous delivery processes. HP CDA delivers this capability through the following methods:

- Model-driven approach
- Extensible, pluggable architecture

Model-driven Approach

To provide flexibility and portability of applications across platforms through continuous delivery, HP CDA provides a structured data model. This model represents the artifacts and relationships required to define how composite applications are delivered into a dynamic set of target environments. This model-

driven approach enables HP CDA to centrally store and version artifacts in a definitive software library and then orchestrate the requisite operations. Centralized storage and automation, in turn, leverages the models for automating tasks such as platform provisioning and application deployment. HP CDA defines several key models and relationships:

- **Platform**: the compute, storage, network, and additional software capability required to fully define the target environment (infrastructure) for an application. HP CDA integrates with the HP Matrix Operating Environment (Matrix OE) and HP CDA Cloud Connector through platform provisioner plug-ins to provide Infrastructure as a Service (IaaS). You design a platform based on your requirements and provision the platform accordingly. HP CDA can also incorporate any existing infrastructure that exists as an alternative to orchestrating actual provisioning operations.
- **Application**: the build artifacts, scripts, and commands per layer required to deploy the application, including the basic operations (start, stop, and so on) that can be performed on the application.
- **Policy**: monitoring providers and monitor templates, including the values and parameters to automate the configuration of system and application monitoring during deployment.
- **Topology**: the dynamic relationship between composite application layers and compute resources within a platform, which defines a unique deployment mapping.

This model-driven approach provides flexibility and portability of applications across platforms. It also allows for dynamic reuse of artifacts to meet delivery requirements. This translates into value as follows:

- Improved Time-To-Delivery (TTD) of application ecosystems and associated reduction in costs, errors, rework, and risks through model driven automation.
- Improved collaboration between functional groups within an organization (Development, Test, and Operations) by centralizing and standardizing information about setup, operations, and monitoring across the release pipeline. The HP CDA model becomes a collaborative library, which reduces rework of processes and reduces errors.
- Reduced vendor lock-in by separating the model that defines the delivery artifacts from the tools that operate on the model to realize the automation.

Extensible, Pluggable Architecture

Since no one delivery environment fits all businesses, HP CDA provides the flexibility to design continuous delivery around the existing tools and environments prescribed by an organization. Your organization can rapidly adopt a DevOps paradigm without disrupting business practices, and while maintaining organizational knowledge during the transformation. By allowing tools such as software deployers and application monitors to be configured and changed dynamically, HP CDA provides a future proof method for the continuous delivery processes that you require.

The architecture of HP CDA provides configuration of delivery providers in several key areas.

- Software deployment:
  - HP CDA models for applications can be translated into sequences of steps for leading products used for software deployment, such as HP Server Automation, Chef, and SSH. The same application model can be deployed to target platforms through different deployers, depending on the user configuration.

- o Many leading software deployment technologies have evolved significant libraries from off-the-shelf content, either within organizations or in public communities. HP CDA can leverage existing deployment content directly as extensions to both application and platform models.
- Monitoring:
  - o After infrastructure is in place and applications are deployed, monitoring becomes the focus. For monitoring services, you can choose between several tools, such as HP SiteScope, HP Diagnostics, HP Operations Manager, or Nagios. HP CDA monitoring policy models abstract vendor specifics, but provide a plug-in layer to configure tools based in the model.
  - o By normalizing and centralizing monitor policy definitions in a central library, monitoring is no longer an activity confined to production. The portability of policies across release pipeline environments provides a well-defined lifecycle of performance management.
- Hybrid infrastructure
  - o IT organizations use an array of private and public cloud technology and providers, plus traditional physical infrastructure. This heterogeneity creates the demand to make applications easily portable across technologies, as driven by organizational boundaries or investment decisions.
  - o HP CDA provides an extensible infrastructure layer for provisioning systems in environments such as VMWare, HP Cloud, or Amazon Elastic Compute Cloud.

HP Converged Cloud

The HP Converged Cloud—an initiative to provide a consistent user experience for all cloud solutions in the HP portfolio—simplifies tasks such as provisioning services, deploying a private cloud, or tracking resources.

By supporting the HP Converged Cloud, HP CDA can provision to public cloud environments, such as HP Cloud, in addition to provisioning physical hardware or virtual machines (VMs) in a private datacenter or private cloud environment.

Model Building for Continuous Delivery

HP CDA provides designer interfaces for building the models required to define a continuous delivery system. These designer interfaces enable HP CDA models to be built by users in your organization whose expertise matches the design area. Interfaces are customized for these user roles:

- Platform Designer, who uses an interface designed for infrastructure and platform architects
- Application Designer, who uses an interface designed for application architects
- Policy Designer, who uses an interface designed for system architects

Platform Model

The foundation of the HP CDA platform is the infrastructure template. HP CDA delivers an infrastructure service layer with a graphical design interface to define compute, storage, and network characteristics of infrastructure services. These services can represent compute capacity that is physical (hardware-based) or virtual (public cloud, private cloud, or hybrid). Infrastructure-as-a-Service (IaaS) definitions are synchronized with HP CDA and stored in HP CDA as infrastructure template models.

The HP CDA platform model is based on an IaaS template model, which defines the core capability of the platform, plus the location. After a new platform design is associated with a specific IaaS template, the Platform Designer tags the platform compute resources with built-in capabilities, including software (database, middleware, etc.), operating system, and hardware details. Tagging creates a complete profile to be referenced by the Application Designer.

The final design step is to optionally model additional software to be installed during provisioning. Platform Designers understand the underlying IaaS templates and the compute attributes. They are also aware of the unique requirements arising from application teams. When infrastructure services, such as HP Matrix OE or HP CDA Cloud Connector, cannot provide a complete platform environment for applications, the Platform Designers can use the HP CDA platform software library to create models of platform software packages: databases, middleware, or application servers, for example. This library can be leveraged to model additional platform capabilities to add to the IaaS service, making sure that the provisioned platform meets organizational requirements and standards.

For example, you can configure HP CDA to install HP Operations Agent software as platform software during platform provisioning. Then you can use HP Operations Agent to help you monitor the faults and performance for the provisioned platform.

Application Model

The HP CDA application model is positioned conceptually between the continuous integration (build) environment and the target deployment environment. This model defines a set of build artifacts, scripts, and commands required to deploy and manage the layers of a composite application. An application model defines several default operations to perform, such as deploy, un-deploy, start, and stop.

HP CDA also provides a hierarchy for managing application models. An application is comprised of versions. A version is then defined by one or more models. A model specifies a definition for the layers of the application, along with the recipe for managing the deployment of the application. An application version may define more than one model if, for example, the application can be deployed on different operating systems or middleware containers.

Within the application model, the Application Designer defines layers for composite applications. For each layer, the Application Designer can define specific endpoint services that the layer exposes to other layers. A layer can also define external services that the layer requires. The model defines its build configuration (that is, which external build artifacts to access) along with the location of the build artifacts. The model can define multiple build configurations, depending on how the artifacts are managed across iterations or other project milestones. After the layers and build configurations are modeled, the Application Designer models all the sequences by layer to manage the deployment. As part of the modeling process, the Designer can define the following:

- Placed file: based on the model's build configuration model, locate the source files and then define the target location and permissions.

- Executed script: define any custom scripting required to perform application actions (deploy, start, and, so on).
- Service command: execute a local service command on the target.
- External component: execute remote sequence automation from an external service, such as HP Operations Orchestration flows, HP Server Automation (SA) workflows, Database and Middleware Automation (DMA) workflows, or Chef cookbooks.

Sample modeled applications, which provide a starting point for the application modeling process, may be obtained from HP Live Network (HPLN).

Topology

When Designers use HP CDA to model applications and platforms, a topology relationship dynamically maps the layers of a specific application model to the compute resources of a platform. This is a modeled relationship that enables an application version model to participate in many topologies with different platforms. This relationship also ensures that a given platform model can be used as the target for many application models.

After applications, versions, and models are created in HP CDA, the application designers create the topology relationships required to support the release. A topology may be deployed multiple times across several provisioned platforms.

Policy

HP CDA not only models the application, but also models monitoring to accompany the application release, including specific monitor characteristics and parameter values from integrated providers (such as HP SiteScope and HP Diagnostics). These monitors can then be modeled dynamically into policies. A policy can contain multiple monitor definitions across several providers.

HP CDA policies are modeled separately from an application so that the policies can be reused both across applications and versions, and within a release pipeline. Policies are related in the topology model.

After a policy has been deployed, HP CDA provides the capability to integrate with monitoring providers to receive alerts based on the deployed model. This enables the HP CDA topology instances for deployment to provide status data based on the monitored environments. The HP CDA Policy Designer can also update a policy by adding a new monitor definition to a deployment, and then re-deploy the policy to dynamically update monitoring on the target platform instance.

Managing the DevOps Lifecycle

With today's composite applications, continuous delivery to hybrid infrastructure requires the ability to view application versions by DevOps stages, move applications and monitoring dynamically from one target platform to another, define target environments across different providers, and use different vendor tools along the release pipeline.

- The HP CDA model provides a comprehensive picture of applications and target platforms with topology relationships and monitoring policies. HP CDA adds the dimension of labeling models

and artifacts for specific release lifecycle stages, thus providing DevOps visibility for continuous delivery.

- The dynamic topology relationship in HP CDA allows application version models to be in multiple platform relationships, facilitating the assignment of versions from one release stage to the next. Within a specific application version model, you can have multiple deployment packages of application artifacts that can be uniquely tracked across deployments.

- HP CDA infrastructure template definitions support a wide range of public and private cloud environments, including specific physical provisioning. This means you can have a development platform based on a template defined to use a private cloud (VMWare, for example) and a Quality Assurance (QA) platform for the same application release on a template defined to use a public cloud (such as HP Cloud or Amazon Elastic Compute Cloud).

- HP CDA models are not vendor specific; instead they provide a plug-in architecture for managing external tools. Platform models define a deployment tool; however, because applications can dynamically map to multiple platforms, HP CDA can use multiple vendors through the release process. Monitor definitions are typically specific to a tool, but policies can provide definitions from multiple vendors, and different deployments can utilize different policies.

Consumer Self-service Portal

HP CDA integrates with HP Cloud Service Automation (HP CSA) providing a consumer self-service portal with access for service subscribers. Subscribers request services to be accessed using various browsers and devices. HP CSA is a unique platform that orchestrates the deployment of compute and infrastructure resources and complex multi-tier application architectures, providing a catalog-based subscription to order cloud and IT services. The subscriber request and access process for a required service through the consumer self-service portal is shown below.
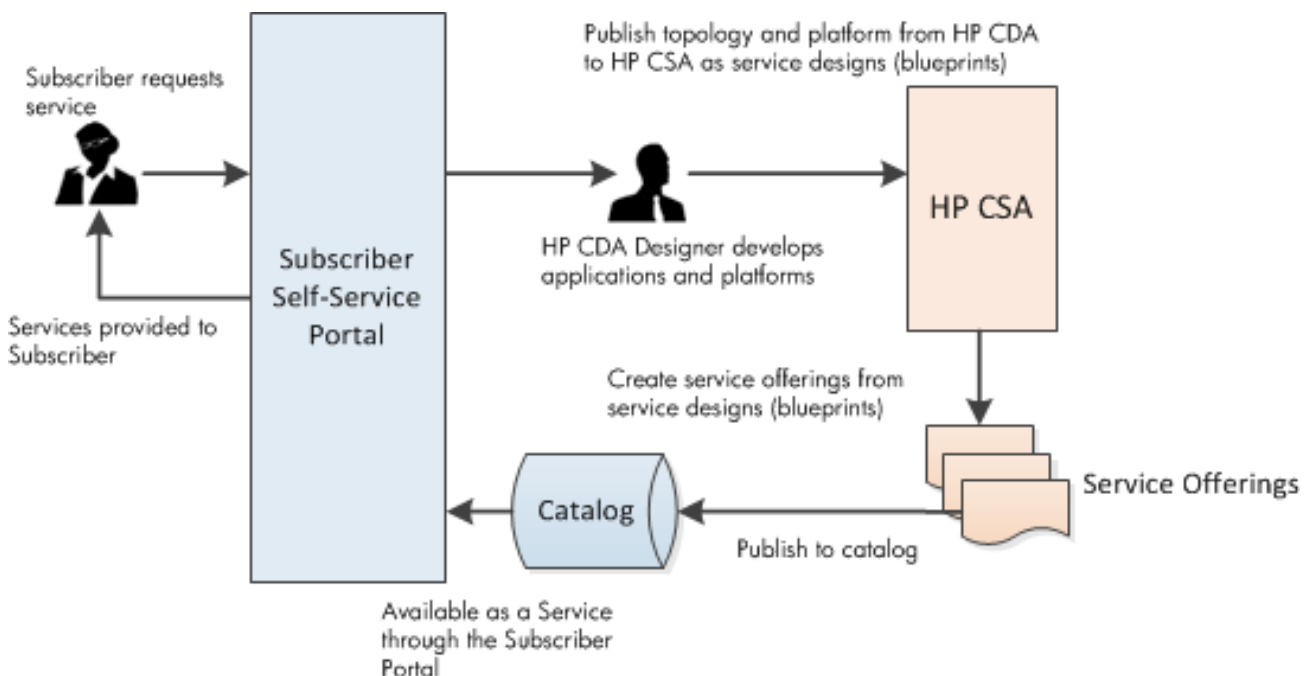
Summary

HP CDA reduces the disconnect between Agile development cycles and IT Operations, providing automation for nimble and repeatable infrastructure provisioning and application deployment across the entire application lifecycle. Through the ongoing management of the deployed applications and infrastructure, HP CDA reduces Time-To-Value (TTV) for application development, bridging the gap between traditional IT organizations and the transformed IT of the future.

HP CDA employs a model-driven approach, reducing configuration complexity while providing open, extensible integrations with the tools of your choice, reducing vendor lock-in. The diagram below shows the basic HP CDA integration and delivery workflows from application modeling and platform provisioning to deployment.
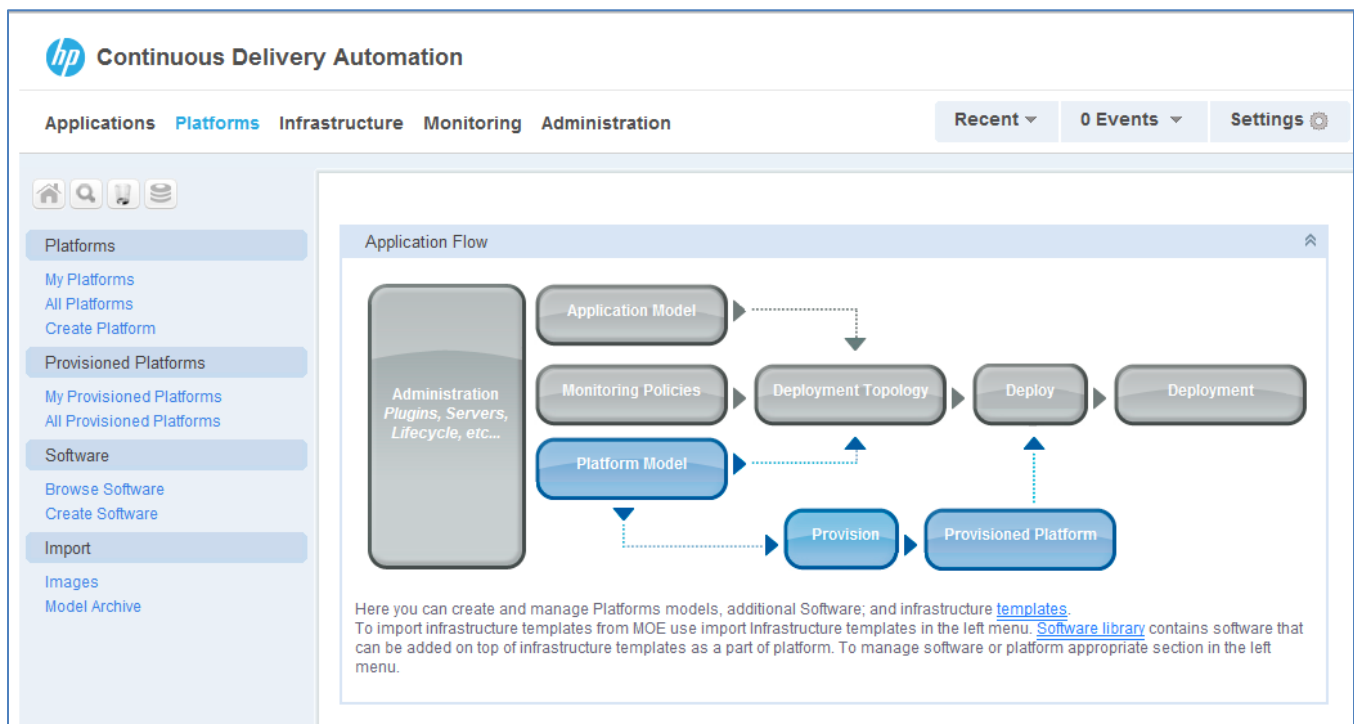
In summary, HP CDA enables organizations to employ the tenets of DevOps to join continuous integration and continuous operations together with continuous delivery. HP CDA provides the following benefits across the application delivery lifecycle:

- Improved collaboration among dispersed teams for reduction in costs, errors, and time.
- Support for heterogeneous infrastructure environments (both public and private clouds).
- Consistent composite application deployment, monitoring, and management across dynamic heterogeneous IT environments.
- Model-driven application ecosystem along with development of application-aware configuration parameters and blueprints for publishing service offerings into HP CSA.
- Correct first-time deployment of automation and testing tools.
- Reduced vendor lock-in through open and extensible architecture for provisioning, deployment, and monitoring.
- Support for different user personas and specific access controls for different user personas based on the role they play in the application lifecycle.
- Application and associated data, configuration, and artifact portability through the entire application lifecycle.
- Platform model that utilizes existing templates and content in an organization along with the ability to provide standardized platform provisioning services. The platform model also maintains a library of external software required to be deployed.

For More Information

Product Manuals

Publications for HP CDA and HP CSA, along with publications for related HP software products, are available on the HP Software Product Manuals website at:

http://h20230.www2.hp.com/selfsolve/manuals

To learn more about the current publications for each software release, refer to the *HP CDA Documentation List* or the *HP CSA Documentation List*.

HP CDA Sample Downloads

Sample application models and other content for HP CDA are available on HP Live Network (HPLN) at https://hpln.hp.com/