

HP Continuous Delivery Automation

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Concepts Guide

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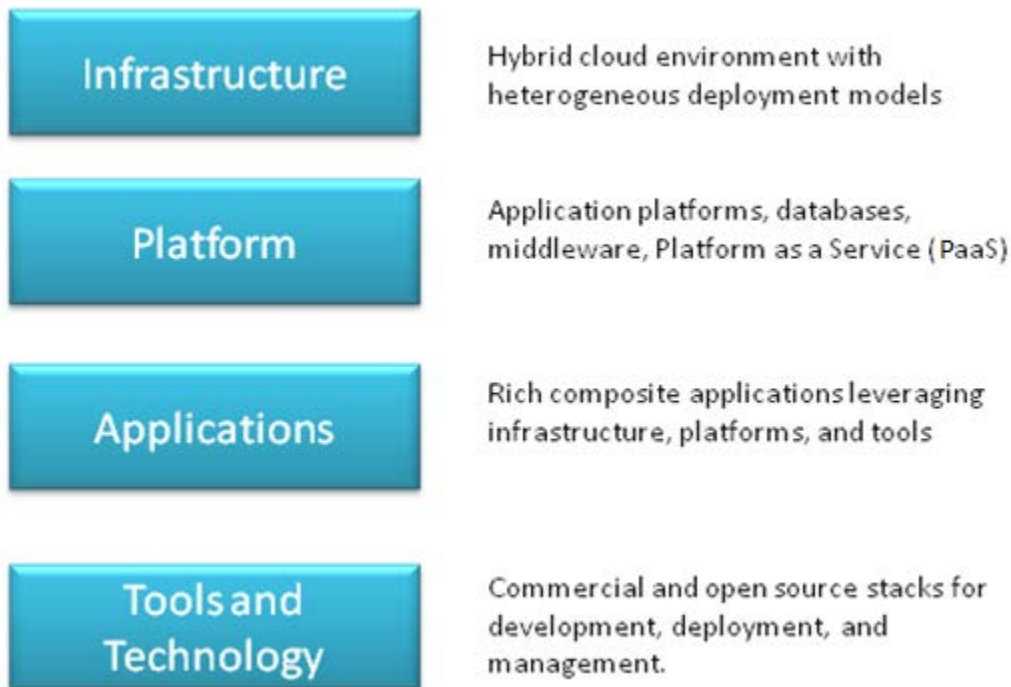
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Application Lifecycle Challenges and Opportunities

In the end-to-end delivery life cycle, aspects 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 organization silos. The following diagram illustrates the different ecosystem tiers of the application life cycle.



Software Development Life Cycle (SDLC)

Following the current Software Development Life Cycle (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 key factors that drive planning, development, release, and operations toward faster time-to-value are:

- Agile development
- Continuous integration and delivery
- Agile operations

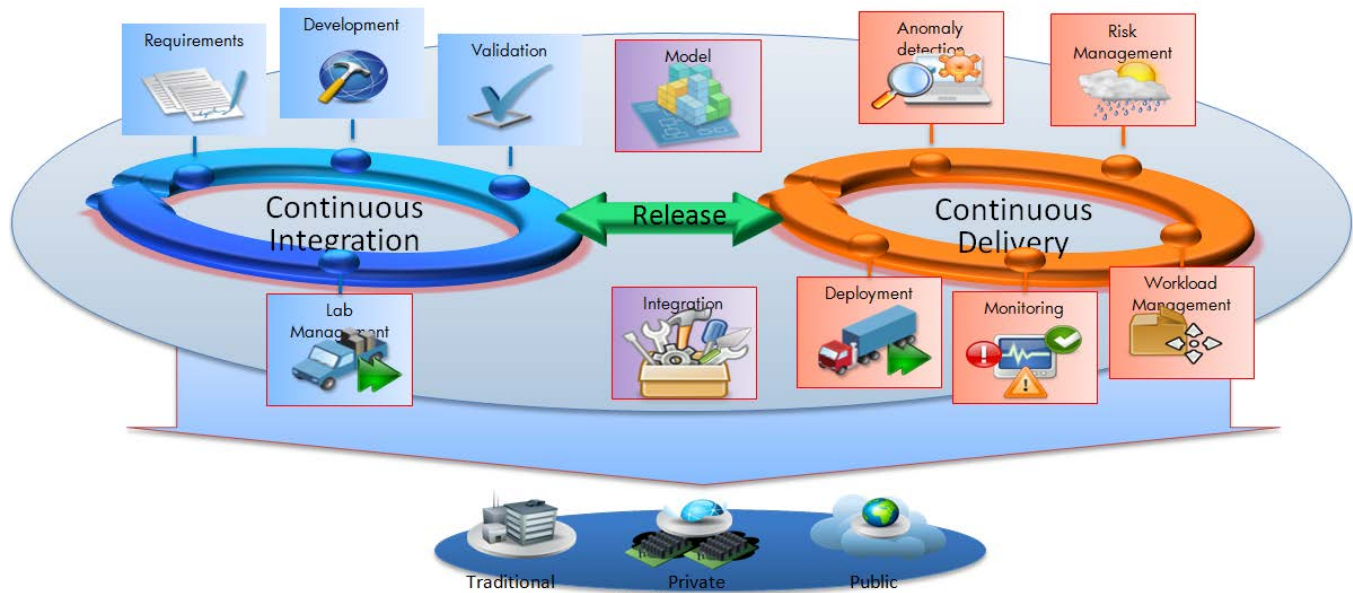
Combined with disruptive technologies such as cloud computing, virtualization, and consumerization of IT, organizations are now required to manage the end-to-end life cycle of modern composite hybrid applications. These applications leverage the following entities to set up and manage the composite application 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

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 following diagram illustrates the continuous integration and continuous delivery cycle in a DevOps environment.



DevOps provides key values to organizations such as:

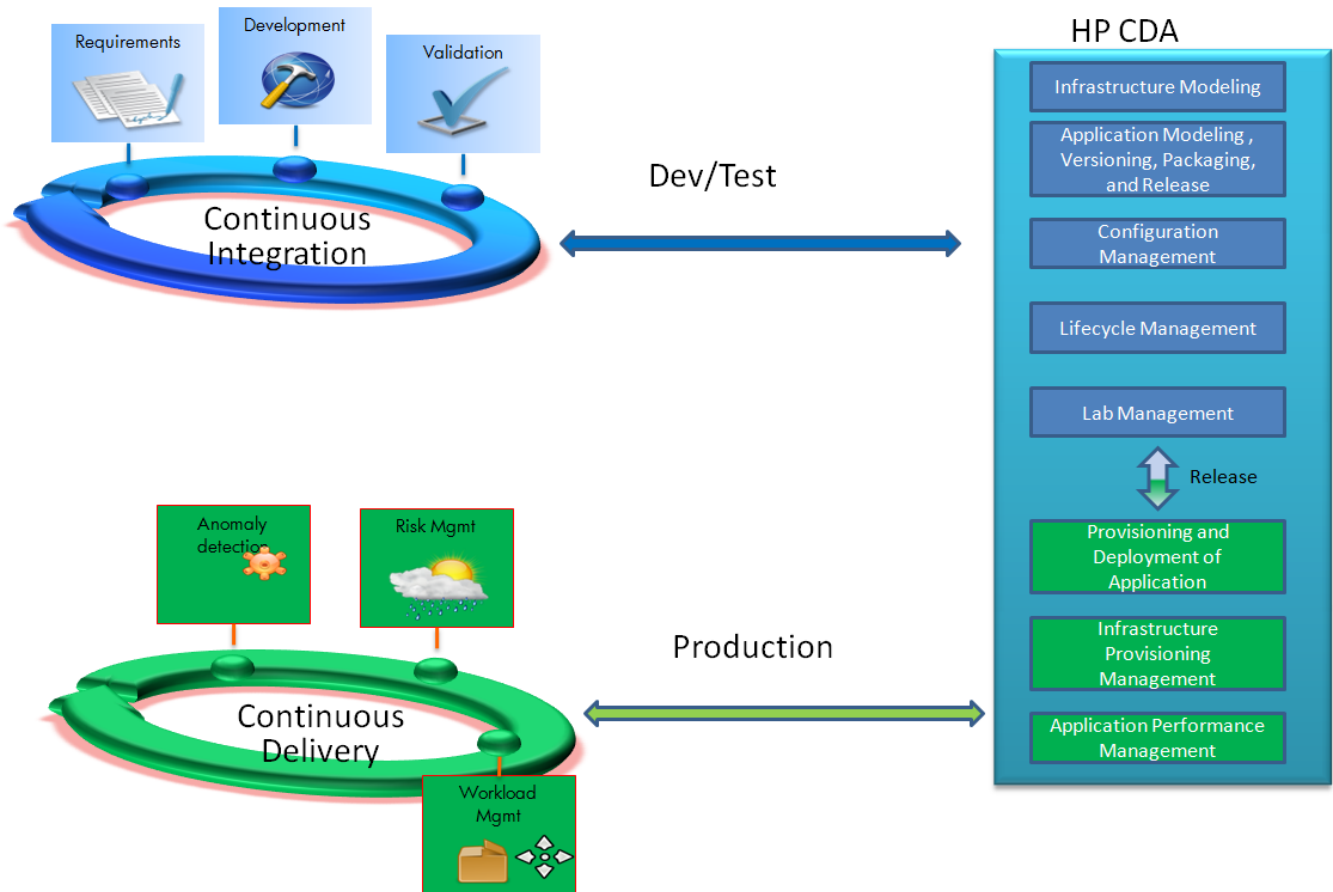
- Enabling application developers to use IT resources directly, according to centralized policy.
- Standardizing application and release versions, as well as life cycle promotion
- Modeled artifacts that normalize releasing into production and include performance monitoring, workload management, and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

HP CDA: Driving the DevOps Environment

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 life cycle 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 following diagram illustrates where HP CDA is positioned in a DevOps environment.



The Application Release Process

To bridge the gap between dev and ops environments, a new level of organizational coordination and communication is needed. The requirement is for a defined pipeline of release stages and application candidates moving regularly from planning to development and from release to operation. This ensures application visibility to the developers when their applications are pushed into production.

Continuous delivery results in a dynamic set of data and actions to turn the 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 enact 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 that are 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 data model that represents the artifacts and relationships required to define how composite applications are delivered to 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, which leverage 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 HP Matrix Operating Environment (HP MOE) to provide the capability to provision Infrastructure as a Service (IaaS).
- 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: the monitoring providers and monitor templates as well as 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 the delivery requirements. This translates into value as follows:

- Improve Time-To-Delivery (TTD) of application ecosystems and associated reduction in costs, errors, rework, and risks by having model driven automation
- Improved collaboration between organization teams (dev, test, operations) by centralizing 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

HP CDA provides the flexibility to design continuous delivery around the tools and environments prescribed by an organization, as there is no one delivery environment that fits all businesses. This allows you to rapidly adopt a DevOps paradigm, as you do not need to re-tool the organization and, at the same time, you can maintain the 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 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 and Chef. This

- allows the same application model to be deployed to target platforms through different deployers depending on the user configuration.
- 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:
 - After infrastructure is in place and applications are deployed, monitoring becomes the focus. With many available tools, customers may use any of a number of monitoring tools such as HP SiteScope, HP Diagnostics, or Nagios. HP CDA monitoring policy models abstract vendor specifics, but provide the plug-in layer to configure specific tools based in the model.
 - 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 life cycle of performance management.
 - Hybrid infrastructure
 - IT organizations use an array of private and public cloud technology and providers as well as traditional physical infrastructure. This heterogeneity creates the demand to make applications easily portable across technologies, and may also be driven by organizational boundaries or investment decisions.
 - HP CDA provides an extensible infrastructure layer for provisioning systems in environments such as VMWare or Amazon Elastic Compute Cloud.

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 whose expertise matches the design area:

- Platform Designer: used by infrastructure and platform architects and specialists in the organization.
- Application Designer: used by application architects and specialist in the organization
- Policy Designer: used by system architects and specialists in the organization

Platform Model

The foundation of the HP CDA platform is the infrastructure template. HP CDA delivers a packed installation of an infrastructure service layer, which also provides a graphical designer for defining the compute, storage, and network characteristics of infrastructure services. These services can represent compute capacity that is physical (HP Matrix hardware-based) or virtual (public cloud, private cloud, or hybrid). The Infrastructure as a Service (IaaS) service 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 as well as the location. After a new platform design is associated with a specific IaaS template, the designer then tags the platform computer resources with the built-in capabilities. This includes any included software (database, middleware, and so on) as well as OS and hardware details. This tagging creates a complete profile that will be referenced by application designers.

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 the application teams. When MOE services cannot provide the complete platform environment for applications, the platform designers can use the HP CDA platform software library to create models of software packages. This library can then be leveraged to model additional platform capabilities to add to the IaaS service, which ensures that the provisioned platform meets organizational requirements and standards.

Application Model

The HP CDA application model is positioned conceptually between the continuous integration (build) environment and the target deployment environment. This model defines the 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, stop, and so on.

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 is a specific definition that defines 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 designer defines the layers of the composite applications. For each layer, the 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 either by iterations or other project milestones. After the layers and build configurations are modeled, the designer models all the sequences by layer to manage the deployment. As part of the modeling process, a designer can define the following:

- Placed file: based on the model's build configuration model, locate the files and then define location and permissions on the target
- Run script: define any custom scripting required to perform the application actions (deploy, start, and, so on)
- Service command: execute a local service command on the target
- External component: execute a remote sequence automation from an external service (such as HP Operations Orchestration flow or Chef cookbook)

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 topology relationships as required to support the release. A given topology may be deployed multiple times across several provisioned platforms.

Policy

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

HP CDA policies are modeled separately from the application so that the policies can be reused both across applications and versions as well as 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 the monitor 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 user can also update a policy for a deployment to add a new monitor definition and then re-deploy the policy to dynamically update monitoring on the target platform instance.

Managing the DevOps Life Cycle

Continuous delivery in today's composite applications to hybrid infrastructure requires the ability to view application versions by DevOps stages, move applications dynamically from one target platform to another along with desired monitoring, 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 along with topology relationships and monitoring policies. HP CDA adds the additional dimension of labeling models and artifacts for specific release life cycle 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 to facilitate 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
- With HP CDA and MOE, infrastructure template definitions can support a wide range of public and private cloud environments as well as specific physical provisioning. This means you can have a development platform based on an MOE template defined to use a private cloud (i.e. VMWare) and then a QA platform for the same application release on a template defined to use a public cloud (such as Amazon Elastic Compute Cloud).
- HP CDA models are not vendor specific, but instead provide a plug-in architecture for managing external tools. Platform models define a deployment tool, but because applications can dynamically map to multiple platforms, HP CDA provides the flexibility of using multiple vendors

through the release process. Monitor definitions are also typically specific to a tool, but policies can provide definitions from multiple vendors, and different deployments can utilize different policies.

Summary

To summarize, 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 blue prints with application-aware configuration parameters
- Correct deployment of the automation and testing tools the first time
- 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.
- Application models that utilize the existing deployment content. This model provides capabilities such as action sequence, parameter passing, and other actions necessary to manage the lifecycle of the application.

A For More Information

HP CDA Publications

The following publications are available on the HP Software Product Manuals website at <http://support.openview.hp.com/selfsolve/manual>), which requires an HP Passport sign-in:

- *HP CDA Documentation List* – lists all other HP CDA publications, shows where they are located, and indicates when they are updated.
- *HP CDA Concepts Guide* – this publication, introduces the HP CSA solution.
- *HP CDA Solution and Software Support Matrix* – provides information about platform support requirements for HP CDA core function with links to requirements for component products.
- *HP CDA Release Notes* – contains product release notes; please read before installation.
- *HP CDA Installation and Configuration Guide* – provides instructions for HP CDA installation and configuration.
- *HP CDA User Guide* – provides step-by-step information about how to design and deploy HP CDA applications.
- *HP CDA Troubleshooting Guide* – contains solutions and workarounds to known problems.