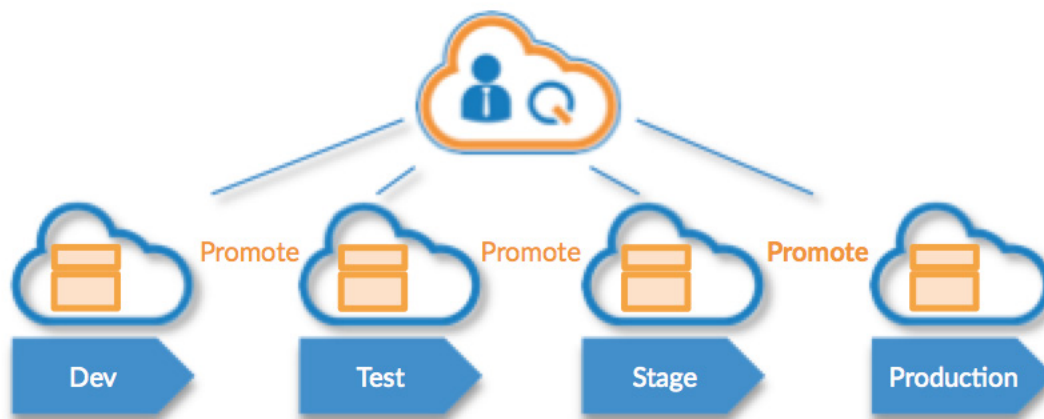# DevOps and Continuous Delivery

DevOps and Continuous Delivery

In the digital economy, increasing application velocity is key to success. In order to thrive in this new application-oriented business environment, IT organizations are acting now to change their tools and processes to better support agile development methodologies. Increased release frequency of more complex application architectures across a growing mix of execution venues requires change in how development and operations interact.

Figure 1. DevOps and Continuous Delivery

Continuous delivery — including both continuous integration (CI) and continuous deployment (CD) — is a methodology that automates and accelerates individual tasks at each phase as well as the overall software development lifecycle.

During the software development lifecycle, developers and operations people typically interact in two ways:

1. **Dev requests infrastructure resources from Ops.** Developers need temporary deployment of compute, network, and storage to develop and test new applications, and to update features of an existing application.

2. **Dev passes each new software release to Ops.** Code changes move through a defined process from development and test environments to staging and finally to production where Ops typically has strict process and environment controls.

Both of these touch points are often strained due to misaligned incentives, different skill sets, and different standard operating procedures.

DevOps was born to bring these two groups closer together and bridge the cultural divide separating them (speed versus stability).

Automation Challenge

The development and CI processes used to aggregate code changes and produce a build package with related artifacts are well defined and highly automated. However, the CD processes used to stand up an environment and install the latest build (also known as deployment) for testing, staging, or production are often less mature. Lack of CD process maturity as well as environmental complexity increases the difficulty of automating CD processes.

CD processes require two levels of automation:

1. **Infrastructure automation.** Provision an environment that might include virtual machines, storage resources, and network IP addresses as well as application and web servers, load balancers, and other software components.

2. **Application automation.** Deploy and configure the latest build package that includes code changes.

Artifacts that guide infrastructure and application automation (such as scripts, manifests, recipes, blueprints, and templates) are often environment specific. So automation routines used to deploy at one phase in one cloud or datacenter environment don't usually work in another phase in another environment. Consequently, hardwired automation presents a problem when different phases of the lifecycle occur in different environments.

IT organizations can't increase velocity and implement CI/CD without automation. But the automation offered by traditional solutions doesn't integrate application and infrastructure deployment, and it doesn't work across environments. Because hardwired automation doesn't scale across cloud environments, multiple automation artifacts must be created, version controlled, and maintained. In addition, linking multiple single-purpose tools does not provide an overall project view that federates management of applications/projects, user groups, and execution environments.

To optimize the value of DevOps and CI/CD automation, enterprise IT organizations need to combine application and infrastructure automation, and enable consistent deployment across different datacenter and cloud environments. They also need to be able to manage deployed applications across a federation of users, applications, and clouds.

What's Unique about CloudCenter?

CloudCenter provides the technology foundation to support an automated DevOps or CI/ CD strategy. CloudCenter deploys both build (deployable package) and environment (including infrastructure resources, database, middleware, web, application servers, and other resources) on demand or via an integrated toolchain, in any supported datacenter or cloud environment.

Users create an Application Profile which is a cloud-agnostic deployable blueprint of the entire application stack. The profile defines the deployment and ongoing management requirements for the build and environment. CloudCenter also includes a cloud-specific Orchestrator that is installed in each target deployment environment. The Orchestrator abstracts the application programming interfaces (APIs) and cloud services for each environment.

The combination of Application Profile and Orchestrator enables developers, DevOps engineers, and operations personnel to quickly and repeatedly deploy applications to different development, test, and production environments using a fully automated process.

For example, development can be done in Amazon cloud, test in Openstack, and production in a virtualized datacenter. Developers and project managers can launch a development project, get end-to-end visibility, and execute tasks such as scaling and promoting deployments, all without having detailed knowledge of automation tools, APIs, or underlying infrastructure resources.

One Profile - Whereas other solutions separate infrastructure automation, and application automation, CloudCenter requires only a single Application Profile for each application stack. Once a user creates a profile, he or she can deploy it on demand or via an integrated tool chain into any supported environment.

One Platform - Unlike other deployment solutions that are hardwired to specific target environments such as AWS or vSphere, CloudCenter automates deployment into any environment. So users get fully automated, consistent deployment across all supported deployment environments, without having to create and maintain target-specific deployment artifacts such as scripts or templates.

In addition to its model-once-deploy-anywhere capability, CloudCenter offers enterprise-class administration and governance features that provide end-to-end visibility and control. Unlike tool chains that consist of a patchwork of single-purpose tools, CloudCenter provides governance control that spans the boundaries of applications, users and clouds all from a single platform.

Three Design Patterns

CloudCenter enables three basic design patterns that support DevOps strategies and automated continuous delivery processes.

1. **Self-service environment.** Developers can self-service deploy on demand simple or complex application profiles to any supported datacenter or cloud. An example of a simple application is a Windows 2008 Server or an Ubuntu image. A complex example is a multi-tier application stack that includes database, app server, load balancer, and multiple packaged applications that may all be needed to develop and test code changes. CloudCenter's self-service capability empowers developers but also reduces the amount of manual provisioning IT has to perform.

   CloudCenter's role-based access control determines what Application Profiles are available to each developer. Specified plans and budgets can be used to control quantity or cost of resources deployed. And CloudCenter's tag-based governance can be used to automate placement, deployment, and runtime decisions that guide developer actions — without the user having to know the details of the underlying policies.

2. **Integrated tool chain.** CloudCenter provides the foundation of an integrated DevOps tool chain. Code changes in the integrated development environment (IDE) can trigger automated build and deployment.

   - The Jenkins plugin allows a Jenkins build to be deployed to any environment provisioned by CloudCenter.

   - CloudCenter leverages Chef and Puppet investments. Users can easily model in the Application Profile nodes provisioned by these and other configuration management tools.

   - Docker containers can be modeled as part of an Application Profile and deployed to any supported datacenter or cloud environment.

   - A ServiceNow service catalog can include CloudCenter Application Profiles. The profiles can be automatically imported as catalog items. Because only one profile is required for each application stack and it can be deployed to any target cloud, the number of catalog items is significantly reduced.

3. **Cross-cloud CI/CD.** A software development lifecycle can span multiple environments such as development in AWS, test in OpenStack private cloud, and production in a virtualized datacenter. Using a single Application Profile that can be used to automate deployment in both pre-production and production environments reduces errors and inconsistencies that drag down developer efficiency.

Advanced Features

CloudCenter delivers a number of innovative features that support automated deployment as part of DevOps or CI/CD efforts.

CI/CD Project Board

The solution includes an integrated CI/CD Project Board with a visual view of project phases, deployment health, and overall project cost and status. (See Figure 2.) The Project Board is a CloudCenter management platform feature and not a separate tool. Actions are linked to underlying infrastructure and application automation. Because CloudCenter's patented technology combines the cloud-agnostic Application Profile with the cloud-specific Orchestrator, the solution works seamlessly across datacenter and cloud environments.

Figure 2. Multi-phase project with cost budget per phase
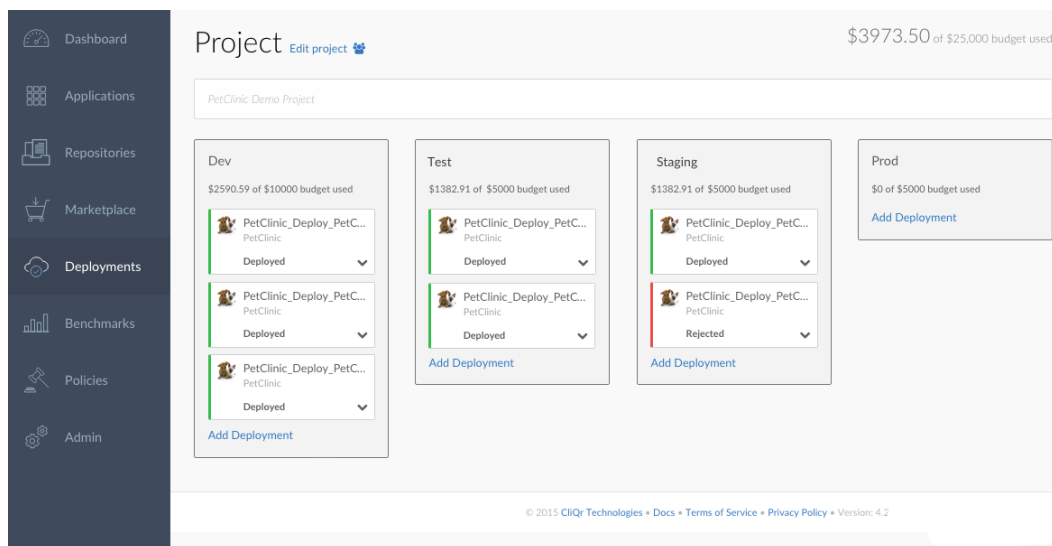
Developers and project managers can improve efficiency and simplify tasks without having to understand the underlying infrastructure and application automation, cloud services, or APIs.

Jenkins plugin

The Jenkins plugin allows Jenkins to call the CloudCenter API to deploy the latest build into a CloudCenter provisioned environment. A developer making a code change in the integrated development environment (IDE) triggers deployment of the latest Jenkins build in the target datacenter or cloud environment. CloudCenter maintains version control of each Application Profile and can track multiple deployments at each project phase.

Composite topologies

CloudCenter can model and deploy Application Profiles that include a variety of OS image formats, application and cloud services, containers, and nodes deployed by configuration management solutions.

As illustrated in Figure 3, composite topologies can be easily modeled as part of any Application Profile and then deployed and managed in any datacenter or cloud environment. With CloudCenter's graphical topology modeler, users can drag and drop more than 30 out-of-box application services into the profile and can easily modify services. Users can also create their own custom services and add Docker containers and Chef and Puppet nodes.

Figure 3. Model with application services, containers, and configuration management
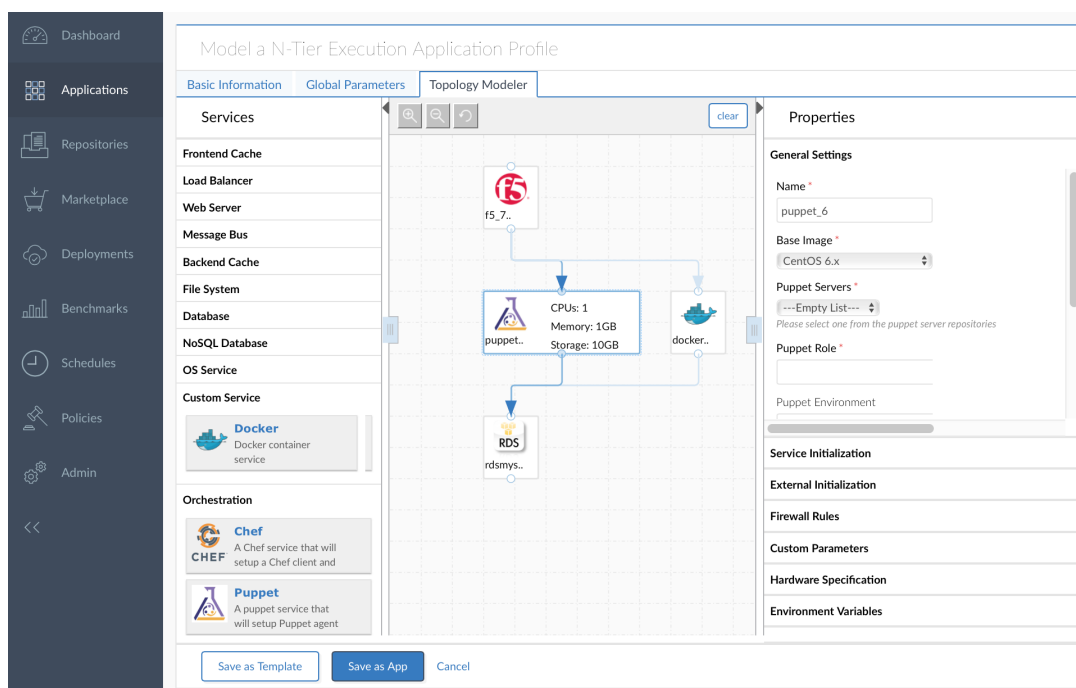
Cost Controls

CloudCenter supports cost- or usage-based plans and bundles to help ensure that developer self-service does not result in cost overruns that undermine the strategic value of DevOps and CI/CD automation. IT can centrally control and monitor cost and usage, and report costs back to specific development projects, even if lifecycle phases are in different datacenter, private, and public cloud environments. Developers can come through IT to self-service, on demand deploy to cloud, and don't have to manage cloud accounts and billing.

Real World Examples

Global positioning technology provider offers a proprietary global positioning platform for use by heavy industry. The company's partners develop commercial applications that tap positioning information managed by the global positioning platform. The provider uses CloudCenter to automate deployment of custom development and production environments on AWS, with a composite topology that includes more than 20 VMs, multiple load balancers, and 30 custom parameters that tie back to global positioning data.

The company has replaced its previous traditional service request and manual provisioning process that took 4 days to complete. With CloudCenter, partner developers can immediately obtain the environment they need with one-click. Using this approach, the partner developers have created and deployed more than 10 commercial applications and boosted their topline revenue growth in the process.

Independent software vendor has streamlined its development process to enable rapid deployment of production releases to multiple datacenter and cloud environments. The vendor can deploy on demand and manage multiple release versions for production in any cloud that their customers choose.

The vendor now uses CloudCenter to model most current releases and multiple past releases in cloud-agnostic Application Profiles. The company deploys the profiles on demand to target clouds, and maintains and supports ongoing production.

Media content delivery provider has optimized the CI/CD process with automated deployment at every phase of the application lifecycle including production. The provider has created profiles and automated releases for more than 25 applications. The company replaced its previous manual service request ticket and provisioning with the CloudCenter self-service solution for developers. The result is reduced deployment effort, increased quality, fewer errors, and accelerated deployment across the application portfolio.

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