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Cisco CloudCenter Solution with Cisco ACI: Common Use Cases

Introduction

Cisco ACI increases network security, automates communication policies based on business-relevant application requirements, and decreases developer wait time, accelerating application deployment in the next-generation data center.

At the core, Cisco ACI application policies are white lists within a zero-trust model. It helps ensure that no communication is allowed between application tiers unless a policy specifies that an object can be on the network, the other objects to which the object can talk, and what the object can talk about. Cisco ACI translates and applies the logical business-based policy definitions into concrete infrastructure configuration.

Cisco CloudCenter is an application-centric hybrid cloud management platform that provisions infrastructure resources and securely deploys application components to more than 19 data center, private cloud, and public cloud environments. Users can easily model, deploy using a self-service system, and then manage both new and existing applications without detailed knowledge of the underlying environment, cloud services, or APIs.

Users work in the Cisco CloudCenter solution's drag-and-drop modeler, shown in Figure 1, to create cloud-independent and portable application profiles that can be deployed to any environment. Users can choose from a flexible mix of easily customized OS images, application and cloud services, containers, and configuration management tools to model new or existing and simple or complex applications.

Each application profile combines infrastructure automation and application automation layers into a single deployable blueprint. With a Cisco CloudCenter application profile, one Cisco CloudCenter platform can be used to deploy and manage any modeled application in any data center or cloud environment in a consistent and predictable way.

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Executive summary

The Cisco CloudCenter™ solution is an application-centric hybrid cloud management platform that securely provisions infrastructure resources and deploys application components to more than 19 data center, private cloud, and public cloud environments. Cisco CloudCenter application-centric and policy-based hybrid cloud management is an excellent fit with Cisco® Application Centric Infrastructure (Cisco ACI™) and policy-based network management.

IT organizations pursuing a hybrid IT strategy need flexibility in how and where applications are deployed in data center, private cloud, and public cloud environments. Cisco CloudCenter users can deploy applications on demand to any environment using a self-service system. But when they choose to deploy an entire application or just a single tier to an environment with a Cisco ACI managed network, they get public cloud agility with greater network security and more cost-effective deployment options than with a public cloud deployment alone.

Cisco CloudCenter and Cisco ACI together provide a single solution that gives IT organizations exceptional flexibility to choose the best deployment option for a wide variety of enterprise IT workloads. Cisco CloudCenter with Cisco ACI provisions infrastructure and securely deploys applications based on the desired end state and needs of the application. Cisco CloudCenter automates the entire application deployment process and communicates directly with Cisco ACI APIs to automate creation of Cisco ACI policy objects, including Application Network Profiles (ANPs), Endpoint Groups (EPGs), contracts, filters, and any other objects required for microsegmented secure communication.

IT gets optimal network security and operational efficiency without the need to manually create and maintain policies or learn new programming languages. Users get self-service on-demand flexibility without the need for any network skills or knowledge of cloud environment details. Scaling and end-of life actions are automated as well, resulting in automatic updating and termination of network policies.

This document summarizes three powerful uses cases enabled by Cisco CloudCenter and Cisco ACI deployments.
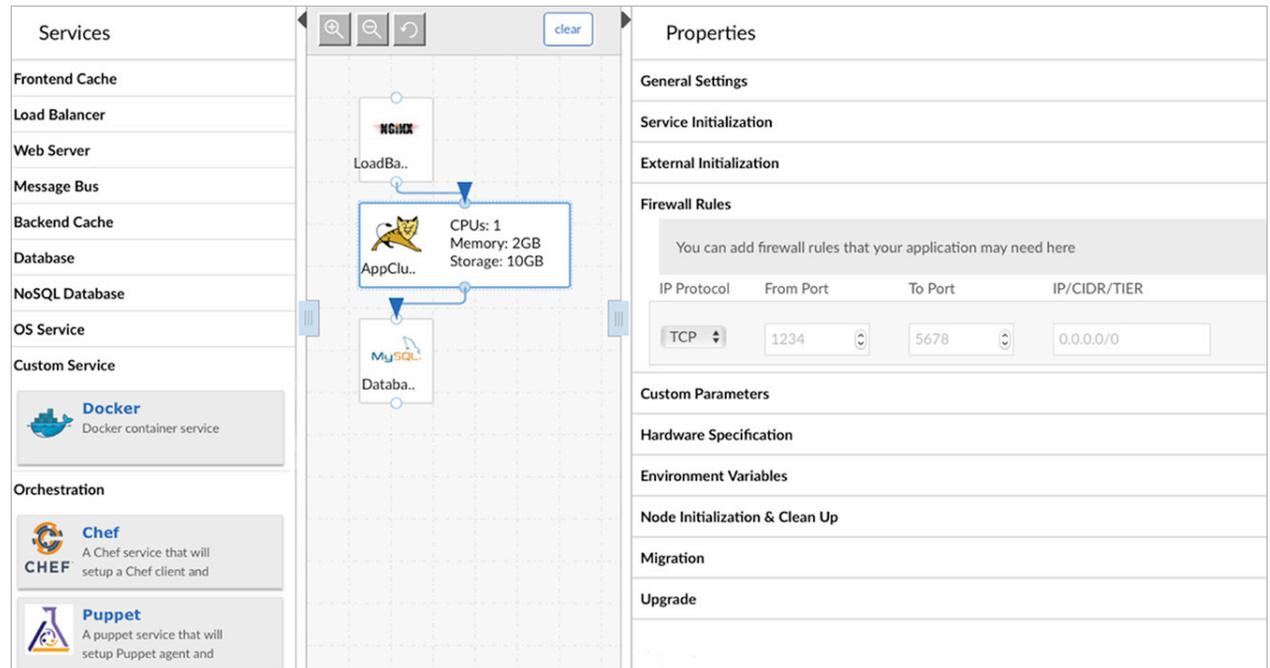
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Figure 1.   Application profile topology modeler

The solution's cloud-independent application profile coupled with its cloud-specific orchestrator abstracts the application from the cloud by interpreting the needs of the application and translating those needs into cloud-specific API calls. As a result, Cisco CloudCenter eliminates the cloud-specific scripting and cloud lock-in that often reduce both developer and IT operational efficiency.

Working with Cisco ACI

Cisco CloudCenter integrates transparently with Cisco ACI. If a user chooses to deploy the application profile to an environment managed by Cisco ACI, nothing additional is required by the user or network administrator. Cisco CloudCenter interprets the needs of the application and calls the Cisco ACI northbound API to automate network policy objects that deliver the full power of Software-Defined Networking (SDN).

Cisco CloudCenter and Cisco ACI are often deployed in an environment that uses VMware or OpenStack APIs, as shown in Figure 2.

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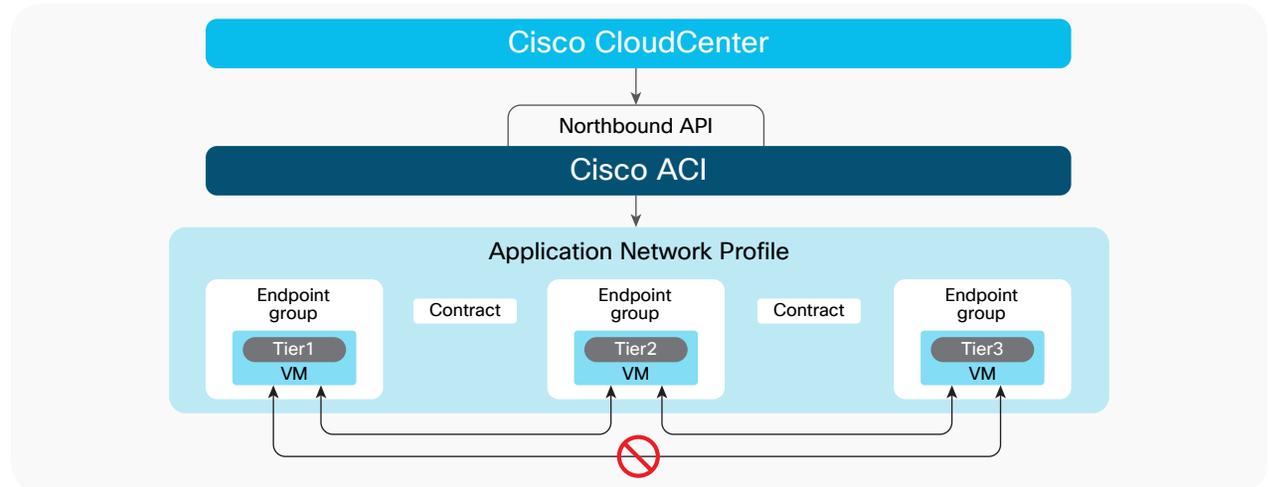Figure 2.   Cisco CloudCenter with Cisco ACI and VMware vCenter

Cisco CloudCenter and Cisco ACI work together without the need to install plug-ins, create environment-specific scripts, or modify any application code. Network administrators don't need to learn programming languages to get the most out of the Cisco ACI programmatic interface.

The flow of orchestration managed by Cisco CloudCenter includes:

- Model an application profile: A service manager can use the Cisco CloudCenter GUI to create a cloud-independent application profile and then share it with specific users or publish it to a marketplace.

- Use self-service deployment: Role- and user-based access controls, paired with tag-based governance, help users choose an appropriate deployment environment that optionally includes Cisco ACI.

- Create and deploy Cisco Application Policy Infrastructure Controller (APIC) policy objects: If a user chooses an environment that is part of a Cisco ACI fabric, Cisco CloudCenter automates creation of the appropriate policy objects and calls the APIC northbound REST API to create networks specifically for the application.

- Provision infrastructure: Cisco CloudCenter calls infrastructure APIs (for example, OpenStack and vCenter) to provision computing, memory, and storage resources in the appropriate network segment.

- Deploy application tiers: Cisco CloudCenter deploys and orchestrates all application components based on the topology and dependencies modeled in the application profile.

- Perform ongoing management: Both users and administrators can review the deployment progress and take action to help ensure proper configuration.

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• Block east-west traffic: if a tier is manually or automatically scaled, Cisco CloudCenter updates Cisco ACI policies to block east-west traffic and confine breaches to a single device if a device is compromised.

• Perform end-of-life actions: Infrastructure and network policy objects are automatically deleted, preserving the integrity of the network and conserving infrastructure resources.

With Cisco CloudCenter and Cisco ACI, IT gets a powerful solution that improves security, simplifies application deployment, and increases DevOps and network administrator efficiency.

The remainder of this document describes three primary use cases for Cisco CloudCenter with Cisco ACI.

Use Case 1: Securely deploy N-Tier applications

Cisco CloudCenter simplifies and expedites the deployment of an application by programming governance rules, which dictate policies such as infrastructure placement and security profiles. These rules help obscure the complexity of increasingly diverse infrastructure environments.

Users get the flexibility of self-service on-demand deployment, and network administrators can control port settings and other security configuration parameters. Security and network directives are included in each Cisco CloudCenter application profile that is published or shared with users (Figure 3).

Figure 3.   Cisco CloudCenter application profiles determine Cisco ACI Application Network Profile objects
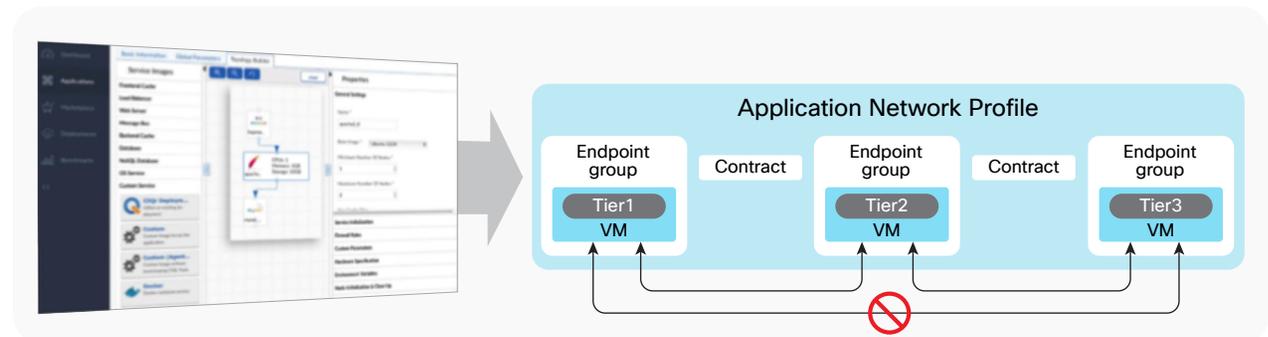
When a user initiates deployment through Cisco CloudCenter Manager as shown in Figure 3, Cisco CloudCenter Orchestrator uses topology and network settings information in the application profile to automate creation of policy objects for Cisco ACI. The orchestrator calls the local APIC API to instantiate the Cisco ACI ANP, the EPGs, and the consumer and provider contracts based on the topology and security requirements of the application profile. Each application tier is placed in a unique and isolated application-tier network. The connectivity between the application-tier networks is automatically guided by the application topology.

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In Figure 4, the Cisco ACI user interface displays a deployed three-tier application, and the Cisco CloudCenter interface shows the same application deployment. The side-by-side diagrams show three EPGs and the contracts that manage network traffic between them.

Figure 4.   Cisco CloudCenter orchestration and Cisco ACI segmentation
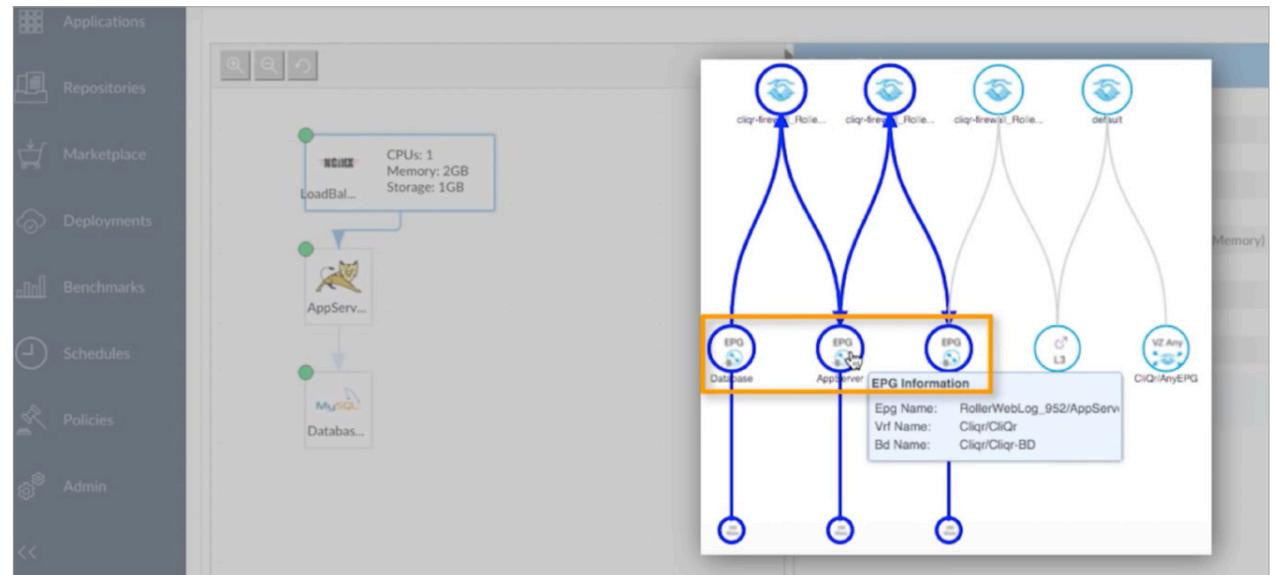
Cisco CloudCenter automatically generates contracts and filters that restrict the protocol and port access on the application-tier network based on the application stack service requirements contained in the Cisco CloudCenter application profile.

Combining Cisco CloudCenter and Cisco ACI couples the application topology, application stack services, network configurations, and end-to-end network isolation for both application deployment and individual application tiers. The combined solution provides an intuitive interface to allow both users and administrators to review the progress of the deployment. It also helps ensure that naming conventions are consistent across both platforms.

After the application is terminated, the autoprovisioned infrastructure objects that are associated with the application are deleted, thereby preserving the integrity of the application lifecycle, reducing remnant policies that can cause security threats, and saving valuable memory resources.

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Use Case 2: Deploy stretched applications

Cisco CloudCenter supports deployment of applications with different tiers in different environments. When users deploy an application, they normally choose a single deployment target data center, private cloud, or public cloud location that is available to them based on the role, governance rules, and other controls. But they also have the option to choose a stretched deployment, which enables users to select specific target sites for each tier in the application.

Several factors justify a stretched application deployment:

- Cost: Cloud pay-per-use and scalability is well suited for transitory workloads. But renting infrastructure may not be the best choice for long-running workloads. Therefore, the user-interface tier of web applications or mobile applications may be well suited for a pay-per-use environment such as a public cloud, but more stable and long-running tiers such as application servers and database servers may be more cost-effectively deployed in a Cisco ACI managed network in a private cloud or data center.

- Security and compliance: Even if the application-server or load-balancer tiers can be deployed in various other environments, the database tier is well suited for a Cisco ACI managed network environment in a private cloud or data center, to address security and compliance requirements.

- High-availability and disaster-recovery master-slave configuration: Users can model an application profile that contains both master and slave components that are deployed in different cloud availability zones or different data centers and clouds. If users can use one click to deploy the full application stack with a high-availability and disaster-recovery setup in different availability zones or even different data centers and clouds, they can easily and cost-effectively test various failover scenarios and delete the whole setup when they are done. And they can have the same fully tested configuration automatically deployed for production workloads as well.

With Cisco CloudCenter, a stretched application topology is easy to deploy when multiple deployment environments are available. At deployment time, the user just selects Hybrid as the target cloud, as shown in Figure 5. Then the user interface exposes a separate cloud deployment drop-down menu for each tier modeled in the application profile.
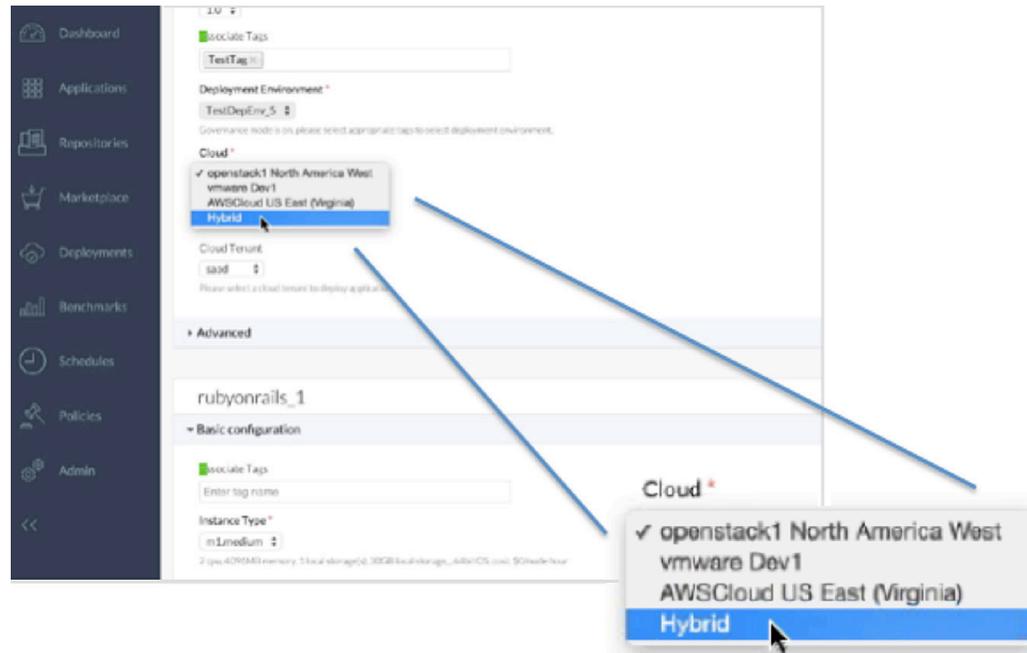
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Figure 5.   User selects "Hybrid" to activate the stretched application deployment feature

Placement decisions for the entire stack or for individual tiers can be guided by the Cisco CloudCenter tagging and rules engine. For example, a Health Insurance Portability and Accountability Act (HIPPA)–compliant application can be tagged so that users can choose only a Cisco ACI managed data center for the database tier, regardless of where other tiers are deployed.

Cisco CloudCenter with Cisco ACI supports three stretched application deployment topologies. In each case, the user can select the appropriate deployment environment for each application tier without the need to change the application's architecture or attributes or have any domain knowledge about Cisco ACI or SDN. There are no environment-specific scripts or workflows that lock any tier to any particular environment.

• Multiple pods: Cisco CloudCenter can deploy N-tiered applications in a data center with multiple Cisco ACI pods. In this scenario, the application can be distributed across different pods in a single data center. Different tiers of an enterprise web application can be placed in different networks with different VLANs. The unique Cisco ACI label-based, dynamic directional routing helps ensure that the consumer virtual machines connect only to the provider virtual machines with matching labels. This approach provides a truly isolated network for each tier in the application.

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• Stretched fabric: Cisco CloudCenter can deploy N-tiered applications in a Cisco ACI fabric that is stretched across geographically dispersed sites and over long distances. In this scenario, the application can be distributed to different pods in separate data centers while taking advantage of the network services provided by the single stretched network fabric. For example, the load balancer and the application server can be in data center A, and the database can be in data center B. The stretched fabric topology extends the capabilities of Cisco ACI integration with Layer 4 through Layer 7 (L4-L7) services.

• Multiple clouds: Cisco CloudCenter can deploy N-tiered applications across a Cisco ACI pod and a public cloud. Part of the application can be deployed in a data center or private cloud with a Cisco ACI managed network, and part of the application can be deployed in a public cloud. This scenario works well for web applications that have edge caches in multiple distributed cloud locations and for mobile apps for which the application tier or database tier is in a secure data center.

Cisco CloudCenter and Cisco ACI together offer a truly unique and flexible solution to address the cost, security, and agility requirements for increasingly complex enterprise workloads. The "profile once, deploy anywhere" capabilities of Cisco CloudCenter extend to stretched deployment topologies.

In all these stretched application deployment topologies, the Cisco CloudCenter application profile doesn't need to be changed, no environment- or topology-specific scripts need to be written or maintained, and the application remains portable.

Use Case 3: Migrate applications to a Cisco ACI environment

Users can take applications that were previously deployed in data centers not enabled for Cisco ACI and in public cloud environments and migrate them to a more secure Cisco ACI managed data center. The joint solution fully automates migration as well as creation of relevant Cisco ACI policy objects.

Application workloads that are deployed managed by Cisco CloudCenter are made portable across different clouds through the Migrate feature. Cisco CloudCenter application profiles are cloud independent and portable—they are not hard-wired to a single environment. As a result, Cisco CloudCenter and Cisco ACI support a hybrid IT strategy that allows users to optimize workload placement based on business need. And users can easily choose to migrate to, from, or between different data centers, private clouds, and public clouds based on use, governance rules, cost and performance requirements, and the application lifecycle phase.

The solution supports three main migration scenarios: migration back from the cloud, cross-cloud Software Development Lifecycle (SDLC) migration, and data center migration.

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Migration back from the cloud

Many IT organizations have deployed applications as part of a cloud strategy and are now reconsidering their strategy as monthly public cloud costs add up. Or they are concerned about whether the public cloud meets their security and compliance requirements. With Cisco CloudCenter, users can migrate an application from a public cloud back to a data center or private cloud with a Cisco ACI managed network.

As shown in Figure 6, users can select an existing deployment and choose a range of management actions, including Migrate. If a Cisco ACI environment is selected as the migration target, Cisco CloudCenter automates the creation of policy objects and instantiates the network configuration through the APIC API.

Figure 6.   User selects "Migrate" for an existing deployment

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Cross-cloud software development lifecycle migration

Using a public cloud for development and testing activities and using the data center or private cloud for the production environment is the most common hybrid cloud use case. Cisco CloudCenter supports that scenario with a powerful and integrated CliQr® Continuous Integration and Continuous Delivery (CI/CD) project board feature that manages the complete software development lifecycle.

Managers create projects in Cisco CloudCenter that mirror their software development lifecycle. They can allocate resources or budget for the overall project or for specific phases. User access controls and policies define who can promote code along stages of the lifecycle and which cloud is suitable for each phase.

Figure 7 shows the CI/CD project board with different stages, each with different owners and project budget allocations.

Figure 7.   CI/CD Project board with Cisco ACI environment for production
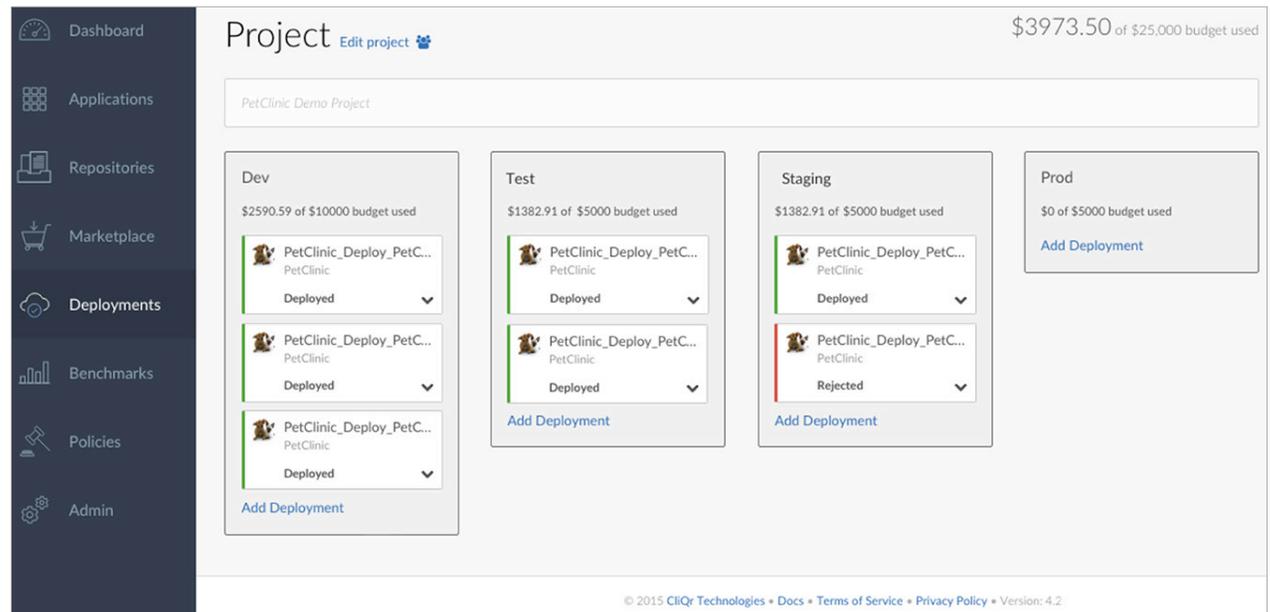
For a DevOps scenario that includes an environment that does not use Cisco ACI for development and testing but does use a Cisco ACI environment for production, the CI/CD project board can be set up with a cross-environment workflow that gives developers some choices in preproduction environments, but that limits choices in the more secure Cisco ACI managed network environment for the final production phase.

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Cisco CloudCenter also includes a powerful tagging and governance engine that can modify security settings based on the phase. So the deployment in a development phase might be configured to leave open certain ports. But when the application is migrated to the production phase, it benefits from microsegmentation applied based on Cisco ACI policy, and the cloud also automatically closes those ports. Conversely, promotion to the production phase might open certain ports for network or security monitoring agents in the production network.

Cisco CloudCenter and Cisco ACI together provide exceptional flexibility and security control not possible with deployments in public cloud environments.

Data center migration

Many IT organizations continue to modify their data center footprints as they evolve their hybrid IT strategy, pursue mergers and acquisitions, and for many other business reasons. Cisco CloudCenter can simplify the process and bring workloads into a Cisco ACI environment to gain the benefit of SDN.

In a migration scenario, IT organizations typically scope the move and then bring existing workloads into the Cisco ACI environment in phases through a rolling upgrade. By profiling each application, Cisco CloudCenter can help convert VLAN ports to Cisco ACI managed ports and provide the Cisco ACI benefits of traffic monitoring and visibility into packet loss, latency, and network loops.

Conclusion

Cisco CloudCenter is an application-centric hybrid cloud management platform that makes it easy to deploy and manage application data center, private cloud, and public cloud environments. Cisco CloudCenter and Cisco ACI together provide a single solution that gives IT organizations exceptional flexibility so that they can choose the best deployment option for a wide variety of enterprise IT workloads. This combined solution also delivers agility, security, and efficiency that is unmatched by public cloud alone.

Cisco CloudCenter and Cisco ACI together offer unique capabilities to securely provision multitier applications; automate stretched application deployments without the need to modify applications, blueprints, or deployment scripts; and efficiently migrate applications to Cisco ACI environments.