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Will Your Cloud Fit Within Your Existing IT Infrastructure?

While extensibility may not be part of an initial cloud production pilot, knowing this option is available can help grow and evolve your deployment to meet the unique needs of business groups within your enterprise. This paper demonstrates the extensibility capabilities of VMware vCloud® Automation Center and the skill set needed to allow IT personnel to enable, adapt, and extend their cloud to work within existing IT infrastructure and processes.

Cloud management is not a standalone entity. For private or hybrid clouds to be successful, they need to integrate and work with your existing IT management infrastructure and best practices.

There has been a lot of debate about what capabilities constitute a private or hybrid cloud deployment. Regardless of whose definition you use, automating the delivery of IT services requires orchestrating service deployment across multiple technology components, such as configuring physical servers, storage, networks, virtualization hypervisors, connection brokers, and so on. Unless you have a very basic infrastructure, delivering IT services requires integrating with the surrounding management ecosystem. This can require generating or acknowledging a work order ticket, updating a Configuration Management Database (CMDB), or installing software using existing server automation tools.

Most cloud automation products only automate a portion of your provisioning, ongoing management, or decommissioning processes. To facilitate integration with current IT infrastructure and management ecosystems, a cloud management platform must deliver broad multivendor support as well as extensible architecture. When evaluating cloud management platforms, you need to assess whether a solution has the capabilities that enable it to work with your IT infrastructure. Your cloud management choice not only impacts prior investments, it can limit your future investment options.
The Importance of Cloud Management Extensibility

According to Wikipedia, “In systems architecture, extensibility means the system is designed to include hooks and mechanisms for expanding and enhancing the capabilities without having to make major changes to the system infrastructure.” Often this means making modifications at runtime without requiring changes to the original source code. While extensibility may not be part of an initial cloud production pilot, knowing this option is available can help grow and evolve your deployment to meet the unique needs of business groups within your enterprise.

vCloud Automation Center Extensibility Options

VMware® offers one of the most comprehensive and flexible cloud automation products, with extensive interoperability and a broad spectrum of deployment and management technologies. To make it easy for customers to augment our out-of-the-box processes for their unique needs, VMware provides a number of extensibility options that range from customization of standard capabilities to developing models that automate additional tasks. Our rich, purpose-built functionality, broad multivendor support, and built-in extensibility empower IT to deploy a business-relevant cloud in the shortest possible time at low cost.

This paper demonstrates the extensibility capabilities of vCloud Automation Center and the skill set needed to allow IT personnel to enable, adapt, and extend their cloud to work within existing IT infrastructure and processes.

Figure 2. vCloud Automation Center Extensibility Spectrum
1. **Enabling a business-relevant cloud.** Extensibility options empower administrators to configure user-centric, business-aware policies without writing any code.

2. **Adapt the cloud to your environment.** Designer’s visual workflow editor provides an administrator-level capability to modify the existing vCloud Automation Center process and adapt it to specific environments and processes.

3. **Extend to new use cases.** Based on Microsoft technologies (Visual Studio, C#, and .NET), VMware software empowers developers to automate additional tasks and processes.

**Option 1: Enabling a Business-relevant Cloud**

In larger companies, it is very common for different business groups to have different needs, deployment technologies, and management tools. Yet this problem is not unique to large companies. Consider an example of a smaller company with three different departments: Dev/Test, Production, and Desktops. How they deliver and manage their infrastructure service can be dramatically different. Each group has varying needs related to how they provision software on their machines, and individual users within groups have varying requirements for attributes such as service level and resource location (Figure 3).

![Figure 3](image-url)
Let's look at machine provisioning methodology to see how the differing needs of each group affects cloud infrastructure services.

- **Dev/Test.** The Dev/Test group needs machines quickly to test new features. While machines typically are not needed for long periods of time, developers and test engineers want them as soon as they are needed. For their needs, cloning an existing machine or template can be the most appropriate provisioning methodology.

- **Production.** Production machines stay around for long periods of time. For this group, compliance with supported software revision levels and patch management offered by enterprise management tools from BMC, CA, Microsoft, HP, IBM and others are critical. Therefore, the cloud management platform needs to orchestrate the provisioning and management of a production machine using one of these tool sets.

- **Desktop.** Due to the relatively high cost of datacenter storage as compared to desktop storage, desktop administrators look for space-efficient mechanisms for deploying or streaming operating system and application software to their virtual desktops. For this group, provisioning with space-efficient tools such NetApp Flex Clones, Citrix Provisioning Server, or Microsoft App-V is essential to achieving their price point.

One company with three different groups, each with very different methods for provisioning new systems, is a very common occurrence. The differences between how these groups operate typically are not limited to just provisioning methodologies. For example, approvals, machine naming, network configuration, resource allocation, service levels, resource location, and the management functions users can perform after machines are provisioned, are just a few of the hundreds of attributes that can differentiate a service provided to one business versus another.

**Configuring Business-aware Policies**

Using the vCloud Automation Center console, administrators can configure business- and user-specific policies. An IT administrator can deliver different cloud services to different businesses without writing any additional code. By leveraging vCloud Automation Center’s broad multivendor interoperability and business-aware policies, IT administrators can define cloud services that meet the unique needs of diverse groups such as dev/test, production, and desktop operations, as well as the different business groups they need to support. vCloud Automation Center’s policy granularity allows customers to deliver business-aware governance and differentiates VMware from other vendors.

Let’s take our provisioning example and see how vCloud Automation Center’s policies can be used to provision and manage cloud infrastructure services that meet the specific needs of each group. vCloud Automation Center’s Blueprints define how a cloud service is delivered and managed throughout its life. A Blueprint contains policies that define the type of services (such as Microsoft Windows 2008 or SharePoint Server) and the resources and service level it receives, including how individual machines or multimachine services are provisioned and managed. Blueprints can be global across multiple groups, limited to a specific group, or unique for an individual user or group of users within a group.
vCloud Automation Center supports a variety of ways to provision the operating system and application software. Changing the provisioning methodology is as simple as selecting the appropriate workflow and defining a few parameters that need to be passed to the software deployment tool. Additional vCloud Automation Center extensibility options can be used to integrate with other provisioning tools not shown in this list.

In the example use case of three groups with different needs, each group can use a different software deployment methodology. The policy granularity of vCloud Automation Center’s enables each service available to that group to have its own unique provisioning methodology, management processes, and predefined resources. In fact, vCloud Automation Center’s policies are so granular that different users within the same group can have different services available in their user-specific service catalogs. The self-service management functions they are allowed to perform also can be user-specific. This level of policy granularity allows vCloud Automation Center administrators to deliver a user-centric, business-aware, cloud infrastructure in the shortest possible time.
Customizing provisioning methodology is just one of the many ways vCloud Automation Center allows administrators to extend off-the-shelf functionality. vCloud Automation Center enables hundreds of these use cases through the definition of policies and custom properties in the administrator’s portal. The amount of customization and level of granularity of these policies is what differentiates VMware from other vendors.

**Use Case Examples**

Here are just a few examples of how vCloud Automation Center policies can be easily customized to create a business-relevant cloud that meets the specific company needs as well as the unique requirements of various businesses and departments.

- **Creating custom approval workflows.** Administrators can define criteria that triggers approvals and specify who is required for the approval.
- **Collecting custom data.** For example, administrators can capture project codes or cost centers during the request machine process and store it with the machine properties.
- **Passing parameters to out-of-the-box and custom workflows.** For example, this facilitates machine customization (configuration of disk drive names and sizes).
- **Configuring different provisioning workflows.** Administrators can select Clone or Create workflows and configure custom properties to make the Create Machine workflow work with different provisioning methodologies, such as the Pre-Execution Boot Environment (PXE Boot), Windows Preinstallation Environment (WinPE), and Linux Kickstart, or external tools such as BMC BladeLogic, HP Server Automation (HP SA), or Microsoft System Center Configuration Manager (SCCM).
- **Create custom reclamation workflows.** Users can define the criteria used to identify a potentially inactive machine, the process to verify the machine no longer is needed, and the process to reclaim resources.
- **Control management security by user and service type.** Administrators can limit which management functions each user can perform on the machines they own.
Option 2: Adapting Cloud Services to Your Environment

A number of use cases require integrating your cloud management platform with existing systems that fall well beyond the bounds of standard product functionality. Most of these adaptations cannot be delivered out of the box since they require interfacing to proprietary databases, invoking custom scripts, or performing a company-unique function.

Using Design Center to Modify Out-of-the-Box Automation

The vCloud Automation Center Designer provides a visual workflow editor. It enables IT administrators and developers with scripting skills to modify out-of-the-box automation to better fit within their existing ecosystem of technology, tools, and processes.

Designer includes a tool box full of activities for tasks such as script execution, email, event logging, and basic programming constructs including if statements, do while loops, and error handling. Designer users can drag and drop predefined code snippets to modify vCloud Automation Center’s standard workflows. Each activity has a number of parameters that can be set. These variables can be passed by custom properties or supplied at runtime via user input. Design time error checking assures all activity variables are set correctly. Changes are saved to the vCloud Automation Center repository where they can be run by the vCloud Automation Center’s Distributed Execution Managers (DEMs).

Figure 6. vCloud Automation Center Designer Visual Workflow Editor
**Integrating with vCenter Orchestrator Plug-in Library and Workflows**

Integration with vCenter Orchestrator significantly expands vCloud Automation Center’s available activity library, improving the ability to rapidly integrate with third-party deployment and management technologies as well as proprietary systems. The following is a quick summary of how easily vCenter Orchestrator’s workflow and plug-ins can be involved from within a vCloud Automation Center process.

1. vCloud Automation Center’s visual workflow designer provides a new activity (Invoke VCO Workflow) that can be inserted into workflow stubs within existing process automation.

2. Administrators can browse, filter, and select plug-ins from vCenter Orchestrator’s activity library. In addition to VMware provided plug-ins, partner plugins can be found on the VMware Solutions Exchange. Users can quickly create custom plug-ins using the vCenter Orchestrator Plug-in Software Development Kit.

3. After the vCenter Orchestrator plugin is selected, the user is prompted to define the appropriate input and output parameters.

![Figure 7. Invoking vCenter Orchestrator Plug-ins using Visual Workflow Designer](image-url)
Use Case Examples

The following use cases highlight some of the ways customers have extended vCloud Automation Center’s out-of-the-box capabilities to better adapt cloud infrastructure to specific business environments.

- Users can modify vCloud Automation Center’s workflows, adding activities from an activity library or calling scripts at lifecycle state transitions. Examples include:
  - Retrieving information from a database, such as user location, cost center, or manager
  - Updating a database, such as CMDB, patch management, and so on
  - Calling an external application, such as generating a work order ticket
  - Invoking a script that performs a specific function during a provisioning, reconfiguration, or decommissioning process

![Figure 8: Modifying an Existing vCloud Automation Center Workflow](image)
• Users can add commands to each machine's management menu, such as archive/reactivate and backup/restore.

Option 3: Extending to New Use Cases

Sometimes it is necessary to extend vCloud Automation Center’s process automation to completely new use cases that are not addressed by off-the-shelf capabilities. These use cases likely go far beyond modifications to vCloud Automation Center’s standard workflows that manage virtual, physical, and external cloud resources. Examples implemented by VMware customers include creating new infrastructure services (storage, email), automating new employee onboarding, and replacing the vCloud Automation Center portal with an existing self-service portal.

Development Kit Empowers IT to Extend Automation to New Use Cases

The optional vCloud Automation Center Development Kit contains the tools IT developers need to extend a cloud infrastructure solution in new and unique ways. This is accomplished through integration with Microsoft Visual Studio and the vCloud Automation Center’s distributed execution engine. The development it enables companies to easily define and deliver context-aware cloud services that automate business-specific best practices.

Figure 9: Modifying a Machine's Command Menu with New Commands
The vCloud Automation Center Development Kit lets IT developers create new activities, workflows, and models. These new automation policies are stored within the vCloud Automation Center repository and can be invoked by the distributed execution manager based on administrator-defined policies. The processes can be executed based on a machine state transition, scheduled to run at a specific date and time, or invoked ad hoc by a user or administrator.

**Use Case Examples**

The following are actual examples of how companies extended vCloud Automation Center’s off-the-shelf functionality.

- **Custom Portal**
  - Calling vCloud Automation Center’s services from an existing portal or service desk application
  - Creating a new custom self-service portal
- **Provisioning machines on Oracle VM Server**
- **Delivering new Infrastructure services**
  - Storage as a Service
  - Email as a Service
  - Backup as a Service
- **Interfacing to existing management tools**
  - Using a performance monitoring tool to identify inactive virtual machines and initiating a reclamation workflow
- **Provisioning a virtual desktop on resources close to the user’s location**
- **Automating a new employee onboarding process**, such as including the provisioning of a new virtual desktop

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*Figure 10: Using the vCloud Automation Center Developers Kit to Create New Custom Modules*
Why VMware is the Best Choice for Your Cloud

Many IT organizations looking to implement the cloud are stymied by rigid products that are limited in scope and require extensive coding to the core platform for even minimal extensibility. Not only must they spend time and money tailoring solutions to their business, updating and managing the cloud environment become untenable.

VMware empowers IT organizations to deliver an enterprise-class infrastructure for cloud computing that fits their IT infrastructure in the shortest time and at low cost. Comprehensive, purpose-built cloud management functionality is based on a broad range of deployment use cases from the world’s most demanding cloud and VDI implementations. In addition, extensive multivendor support combined with the operational extensibility built into the software enables companies to achieve fast time-to-cloud value while leveraging prior investments in technology, processes, and people.

Additional Information

For more information, visit the vCloud Automation Center product page.
For information or to purchase VMware products, call 1-877-4VMWARE (outside of North America, +1-650-427-5000), visit http://www.vmware.com/products or search online for an authorized reseller.
For detailed product specifications and system requirements, refer to the VMware vCloud Automation Center installation and configure guide.