MANAGEMENT AND ORCHESTRATION
WORKFLOW AUTOMATION FOR VBLOCK INFRASTRUCTURE PLATFORMS

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VCE Authors:
Changbin Gong: Lead Solution Architect
Michael Bartlett: Solution Engineer
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Executive Summary

Businesses, IT organizations in particular, have embraced the capabilities of virtualization and cloud computing to move towards a more cost-effective and agile model of delivering IT as a service. Virtualization, the foundation for cloud computing, provides efficient pooling and standardization of resources. Cloud computing enables the process automation and self-service mechanisms that allow users to consume infrastructure without manual provisioning and configuration.

The combination of standardization, workflow automation, and self-service gives businesses the agility they need to offer IT as a service on virtual infrastructures at reduced cost. The Management and Orchestration Workflow Automation solution combines the converged infrastructure of Vblock™ Infrastructure Platforms with service catalog and process automation capabilities that enable IT organizations to deliver services rapidly, efficiently, and cost-effectively.

The Challenge

IT organizations face increasing pressure to do more with the same, or even fewer resources while expectations for greater IT responsiveness to organizational demands continue to rise. As a result, IT organizations are consolidating resources, centralizing resource management, and transitioning to an IT as a service delivery model.

However, traditional tools and processes that were designed for silos of static physical infrastructure do not provide the automation and control needed for dynamic virtual environments and cloud infrastructures. To offer IT as a service, businesses need new approaches to IT service delivery, operations, and management that address the key requirements: self-service and process automation. The virtualized infrastructure and cloud environment in the VCE solution provide the resource pooling, standardization, flexibility, and automation that is the foundation of an IT as a Service model.

The Solution

The Management and Orchestration Workflow Automation solution combines the service catalog and process automation capabilities of Cisco Intelligent Automation for Cloud, ready-to-use workflows developed by VCE, and the capabilities of VMware vCloud Director.
The solution provides the following:

- Consolidation and pooling of virtual resources on the Vblock platform by vCloud Director to increase efficient utilization
- Service catalog and service portal engineered by Cisco Intelligent Automation for Cloud that promotes standards and eliminates time-consuming manual information gathering
- VCE developed, redefined workflows in Cisco Intelligent Automation for Cloud to orchestrate the provisioning and configuration of infrastructure resources
- Ability to quickly publish and consume new services through Cisco Intelligent Automation for Cloud

Scope

This white paper presents an overview of a VCE solution for an automated self-service catalog on the Vblock platform. The paper presents:

- A description of the software and hardware elements used to create the solution
- A walk-through of creating a service definition in Cisco Intelligent Automation for Cloud
- Automated workflows and forms that can trigger from Cisco Intelligent Automation for Cloud
- Brief description of a use case for each workflow-and-form pairing
- Some server deployment recommendations

Audience

This paper is intended for technical specialists interested in an overview of a VCE solution that enables end-to-end automation from user request at the self-service portal to fulfillment of physical and virtual infrastructure resources.

Feedback

To suggest documentation changes and provide feedback on this paper, send e-mail to docfeedback@vce.com. Include the name of this paper, the name of the topic to which your comment applies, and your feedback.
## Terminology

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco Cloud Portal (CCP)</td>
<td>Formerly named Cisco newScale Front Office Suite.</td>
</tr>
<tr>
<td>Cisco Intelligent Automation for Cloud</td>
<td>An abstracted cloud management solution providing a self-service portal and process automation, and comprised of two main components: Cisco Cloud Portal and Cisco Process Orchestrator.</td>
</tr>
<tr>
<td>Cisco Process Orchestrator (CPO)</td>
<td>Formerly named Cisco Tidal Enterprise Orchestrator.</td>
</tr>
<tr>
<td>Cloud computing</td>
<td>Cloud computing is an evolving term used to describe a new model of computing whereby shared servers provide resources, software, and data to computers and other devices on-demand. Cloud computing is a natural evolution of the widespread adoption of virtualization, service-oriented architecture, and utility computing.</td>
</tr>
<tr>
<td>Converged infrastructure</td>
<td>A converged infrastructure packages multiple IT components into a single, optimized computing solution. Components of a converged infrastructure solution include servers, storage devices, virtualization, networking equipment, and software for IT infrastructure management, automation, and orchestration.</td>
</tr>
<tr>
<td>Enterprise Management Infrastructure</td>
<td>Infrastructure chosen by the customer to house management software. The management infrastructure is isolated from the infrastructure running core workloads because it is VCE best practice to separate management applications from the workloads that are being managed by the management software.</td>
</tr>
<tr>
<td>Information Technology Infrastructure Library (ITIL®)</td>
<td>The Information Technology Infrastructure Library (ITIL) is a set of concepts and practices for Information Technology Services Management (ITSM), IT development, and IT operations. ITIL is the most widely adopted approach for IT Service Management in the world. It provides a practical, no-nonsense framework for identifying, planning, delivering, and supporting IT services to the business.</td>
</tr>
<tr>
<td>IT as a Service</td>
<td>IT as a Service is the transformation of IT to a more business-centric approach, focusing on outcomes such as operational efficiency, competitiveness, and rapid response. In this model, IT shifts from producing IT services to optimizing production and consumption of those services in ways consistent with business requirements. This changes the role of IT from a cost center to a center of strategic value.</td>
</tr>
<tr>
<td>Process automation</td>
<td>Process automation is designed to speed the delivery of IT services while helping to remove manual errors. By defining, automating, and orchestrating processes across organizational silos that use disparate systems, process automation helps improve productivity while also enforcing standards. Process automation is a solution platform that enables organizations to orchestrate business or IT processes that span multiple organizational boundaries.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Service catalog</td>
<td>The service catalog provides a central source of information about the IT and business service offerings delivered to the business by the provider organization. A service catalog ensures that business areas can view an accurate, consistent picture of the IT services available, their details, and status. It also enables the provider organization to set expectations, communicate service levels, and provide visibility into service usage in financial terms.</td>
</tr>
</tbody>
</table>
Technology Overview

This solution uses the following major hardware and software components and technologies:

- VCE Vblock Infrastructure Platforms
- EMC Unified Infrastructure Manager
- VMware vCloud Director
- Cisco Intelligent Automation for Cloud
- VCE pre-defined use cases and workflows

VCE Vblock™ Infrastructure Platforms

Vblock platforms combine industry-leading compute, network, storage, virtualization, and management technologies into prepackaged units of infrastructure. Through standardization of building blocks, the Vblock platform dramatically simplifies IT operations—accelerating deployment while reducing costs and improving service levels for all workloads, including the most demanding and mission critical enterprise applications.

Vblock platforms scale to deliver the right performance and capacity to match the needs of business applications. The following Vblock platforms are available:

- **Vblock Series 300** is designed to address a wide spectrum of virtual machines, users, and applications. Ideally suited to achieve the scale required in both private and public cloud environments. Vblock 300 scales from smaller- to mid-sized enterprise Customer Relationship Management (CRM), Supply Chain Management (SCM), e-mail, file & print, and collaboration deployments.

- **Vblock Series 700** is designed for deployments involving very large numbers of virtual machines and users and is ideally suited to meet the higher performance and availability requirements of critical business applications. Vblock 700 scales to the largest deployments of enterprise CRM and SCM, datacenter operation environments, and service provider cloud computing offerings.

Refer to the [Vblock Infrastructure Platforms Technical Overview](#) for detailed information on the Vblock platform.

EMC Unified Infrastructure Manager

EMC Unified Infrastructure Manager (UIM) simplifies and automates IT infrastructure management, including provisioning, configuration, change, and compliance management. With a consolidated dashboard view, policy-based management, automated deployment, and deep visibility across the virtual environment, UIM is integral and essential to managing the underlying infrastructure of Vblock platforms effectively and efficiently.

UIM enables unified operations management across Vblock platforms superior to that provided by individual element managers. In addition, UIM integrates easily with third-party tools to provide even further operational management capabilities.
VMware vCloud Director

VMware vCloud Director (vCD) is a cloud computing management platform that abstracts virtualized resources to give users access to those resources through a self-service catalog. Tasks previously requiring significant IT staff resources and time to accomplish, such as configuring a network, are automatically executed in minutes with vCloud Director.

With vCloud Director, IT services are delivered as fully encapsulated and portable units called vApps, which can be manipulated through an open API and extended to deploy on any cloud compatible with VMware vCloud. End-user consumption is controlled through role-based access policies tied to organizational constructs and through virtual networking technologies that enable similar virtual machine environments to be deployed concurrently.

By logically pooling infrastructure capacity into virtual datacenters, IT organizations can manage resources more efficiently with complete abstraction between the delivery and consumption of the infrastructure and the underlying resources supporting it.

Cisco Intelligent Automation for Cloud

Cisco Intelligent Automation for Cloud is a self-service provisioning and orchestration software solution for cloud computing and data center automation. It helps enable secure, on-demand, and highly automated IT operations for both virtual and physical infrastructure across compute, network, storage, and applications. It is comprised of Cisco Process Orchestrator and Cisco Cloud Portal.

Cisco Process Orchestrator

Cisco Process Orchestrator (CPO) provides the orchestration engine for service delivery and operational processes. CPO leverages pre-defined and user-defined workflows to orchestrate the provisioning and configuration of infrastructure elements, operating systems, and application software. The automation core includes a process orchestration engine, an interactive automation design studio, and a reporting and analytics module.

As the foundation for standardizing, unifying, and automating IT processes in complex, heterogeneous environments, CPO integrates event and alert management data with best practices to combine decision-driven event processing with automated intelligent incident response. By automating the end-to-end service delivery process, CPO enables organizations to automate service delivery processes across the entire IT landscape, providing simplicity while increasing both flexibility and choice.

Cisco Cloud Portal

The Cisco Cloud Portal (CCP) provides a self-service portal, service catalog, and lifecycle management solution for private cloud or hybrid cloud computing, as well as for other virtual and physical infrastructure services. The result: improved IT agility, reduced costs, greater responsiveness to business needs, and faster time to market for application development.
VCE Pre-defined Use Cases and Workflows

As part of the validation of the solution, VCE identified and developed several typical self-service catalog use cases and the workflows associated with those use cases. These use cases and workflows are documented in the Service Catalog Use Cases section of this paper.

Figure 1 is a detailed example of a workflow that illustrates the interaction between the components of the solution. This example depicts the process to provision additional physical resources on the Vblock platform using UIM and vCloud Director.

![Sample Workflow Diagram]

Figure 1. Sample Workflow
Solution Architecture

VCE provides a consistent and repeatable self-service solution architecture that is scalable and easy to deploy. The Management and Workflow Automation solution can be deployed on any Vblock platform. However, for the purposes of this paper, the solution was validated on the Vblock Series 300 platform.

Logical Architecture

Figure 1 shows the logical architecture of the solution.

Deployment Recommendations

Deploying this solution on the scale of a Vblock platform drives high availability and scalability requirements. Therefore, VCE recommends the solution deployment include the following components:

- Two or more CCP application servers
- Two or more CPO engine servers
- Two or more vCD servers
These components are cloud management applications and therefore should be installed on a customer’s Enterprise Management Infrastructure. VCE best practice calls for the separation of workload (which runs on the Vblock platform) from management software. As a result, VCE recommends that all management components discussed in this paper be deployed on Enterprise Management Infrastructure. Each customer will likely have their own approach and infrastructure dedicated to housing management components.

Today, VCE provides an Advanced Management Pod (AMP), which can be considered part of an overall Enterprise Management Infrastructure. However, the AMP is designed to support only VCE base management applications and not broader enterprise or cloud management applications. Deploying this solution requires infrastructure to house the solution management components. For the purposes of this paper, it is assumed that this infrastructure will be separate from core workload infrastructure (per VCE best practice) and will be referred to as Enterprise Management Infrastructure.

In addition, VCE recommends the following:

- Deploy the solution components behind a load balancer.
- Use separate vCloud management and compute clusters to provide a scalable infrastructure and ensure high availability (HA) capacity for both N+1 redundancy and maintenance mode. For more information, refer to Best Practices for Deploying VMware vCloud Director on Vblock Infrastructure Platforms (http://www.vce.com/solutions/).
Service Catalog Design and Implementation

Figure 3 illustrates the service catalog design and implementation flow.

Figure 3. Design and Implementation Flow

Step 1: Create Service Definition

Creating a clear definition for each service is the first step in designing and implementing the service catalog. A typical service definition may include the following elements:

- Service name
- Service description
- Features and options
- Service levels
- Service response or service fulfillment timeframes
- Service prices
- Service billing units of measure

The CCP software provides a flexible, intuitive, and easy to use interface to create service definitions. Figure 4 shows a service definition created using the CCP Service Design module.
Step 2: Define Service Request

After creating a service definition, the next step is to define the form used to request the service. The CCP Service Design module includes a form designer for creating the service request that users use to request the service.

Figure 5 is an example of the service request form used by a new tenant to request cloud resources from the cloud administrator.

Step 3: Define Fulfillment Process

After creating the service request, the next step is to define the process that fulfills delivery of the service. VCE recommends that the process be modeled on standard business processes with the appropriate approvals and validation steps. After the service fulfillment process is defined, it is implemented using the interactive automation design studio and predefined workflows in CPO.
Step 4: Publish the Service

The final step is to publish the service catalog to users. Before publishing, it is good practice to perform usability and performance testing, taking into consideration the types and levels of users within the corporate structure, the roles that users have in their business units, and organizational policies. After the service is published, it becomes available to users on a self-service web-based interface.

Design Considerations

When deploying, designing, and implementing this solution, keep the following design considerations in mind:

- Understand business requirements and processes before beginning the detailed technical design. Start with a subset and expand from there.
- Minimize the number of levels that users must navigate to reach specific services when designing a service catalog structure.
- Introduce standardized configurations and service levels.
- Use the predefined workflows in CPO as a starting point to design custom workflows.
- Design synchronization services to synchronize the data among CCP, CPO, and vCD databases. For instance, when new vApp templates are published through the vCD interface, synchronization services can ensure the latest vApp templates are available in the CCP service catalog.
- Periodically reevaluate standards to ensure alignment with actual needs and requirements.
- Pay attention to disk space requirements for the CPO database. Disk space requirements depend on the number of records published to the database. Design the data retention policy for the CPO database carefully to satisfy disk space requirements for the CPO database server.

Integration Considerations

Integration points to consider when implementing this self-service solution are:

- Use LDAP server(s) for centralized user authentication and management.
- Both CCP and CPO have adapters to interact with external third-party systems, such as CMDB.
Solution Validation

The following sections describe the validation hardware, software, and environment.

Vblock Hardware and Software Components

The following table lists the hardware and software components that comprise the Vblock Series 300 Model FX used to validate this solution.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco UCS</td>
<td></td>
</tr>
<tr>
<td>▪ 4 x B-Series blade servers with 96 GB RAM each</td>
<td>4 chassis</td>
</tr>
<tr>
<td>▪ 2 x B-Series blade servers with 394 GB RAM each</td>
<td></td>
</tr>
<tr>
<td>Cisco Fabric Interconnect 6140</td>
<td>2</td>
</tr>
<tr>
<td>Cisco MDS 9148</td>
<td>2</td>
</tr>
<tr>
<td>EMC VNX 5500</td>
<td>1</td>
</tr>
<tr>
<td>VMware vSphere 4.1</td>
<td>1</td>
</tr>
<tr>
<td>VMware vCenter Server 4.1</td>
<td>2</td>
</tr>
</tbody>
</table>

Solution Software Components

The following table lists the software components that comprise the solution.

<table>
<thead>
<tr>
<th>Software</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco Intelligent Automation for Cloud</td>
<td>2.0</td>
</tr>
<tr>
<td>- Cisco Cloud Portal</td>
<td>- 9.3</td>
</tr>
<tr>
<td>- Cisco Process Orchestrator</td>
<td>- 2.10</td>
</tr>
<tr>
<td>EMC Ionix Unified Infrastructure Manager</td>
<td>3.0</td>
</tr>
<tr>
<td>VMware vCloud Director</td>
<td>1.0</td>
</tr>
<tr>
<td>Microsoft SQL Server</td>
<td>2008</td>
</tr>
<tr>
<td>Microsoft Windows Server Active Directory</td>
<td>2008 SP2</td>
</tr>
</tbody>
</table>
Validation Environment

Based on their characteristics and performance, the underlying physical resources on the Vblock platform were categorized as Gold, Silver, or Bronze services and corresponding service offerings were created in UIM.

Both DNS and DHCP server capabilities were enabled on the Active Directory (AD) installed on a Microsoft 2008 Windows server. A hierarchy of users for a sample organization was created and configured in this Active Directory. The CCP, CPO, and vCD software was then configured to point to this Active Directory.

Figure 6 illustrates the layers of the validation environment and shows how each component in a layer connects to the components in the next layer.
Service Catalog Use Cases

Many scenarios and variations are possible. To validate this solution and to illustrate the flexibility and usability of the solution, five use cases that represent the complete lifecycle of a cloud management task in a multi-tenant cloud environment were implemented. The use cases are:

1. New tenant onboarding (Tenant Administrator)
2. New tenant user onboarding (Tenant User)
3. Order and deploy vApp (Tenant User)
4. Decommission vApp (Tenant User)
5. Remove tenant (Tenant Administrator)

Service Catalog User Roles and Profiles

The following table lists the user roles and profiles used in these use cases.

<table>
<thead>
<tr>
<th>Role</th>
<th>Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cloud Administrator</td>
<td>Full administrative access to users, system infrastructure, administrative functions, data, and end user access.</td>
</tr>
<tr>
<td>Tenant Administrator</td>
<td>Administrative access to a specific organization including user management, approvals, and end user access.</td>
</tr>
<tr>
<td>Tenant User</td>
<td>End user of available resources through the service catalog, and lifecycle management of the resources allocated to this user.</td>
</tr>
</tbody>
</table>

General Best Practices

The following best practices are common to all use cases:

- Use conditional data and dynamic retrieval rules when designing the service request form in CCP so that the corresponding data can be pre-populated.
- Include one or more steps in the workflow to update the CCP service request record so that the user can easily check status and see historical information.
Use Case 1: New Tenant Onboarding

In this use case, the tenant administrator uses the self-service catalog to add a new tenant to the database and to request cloud resources for that tenant.

Description

The tenant administrator logs into the self-service catalog portal to request cloud resources for the new tenant. The request is sent to the cloud administrator for approval. When approved, the request is routed to CPO to trigger the automated workflow that fulfills this request.

If the cloud provider has adequate resources provisioned to fulfill the request, the requested resources are automatically provisioned for the new tenant. If adequate resources are not available, CPO triggers another automated workflow to provision more resources for the cloud provider to give to tenants.

Workflow

The following diagram shows the workflow implemented in CPO that adds a new tenant and provisions resources for that tenant.
Sample Form

The following figure is an example of a service request form a new tenant administrator uses to request cloud resources.

Best Practices

For this use case, include a step in the workflow to check whether additional physical resources must be provisioned on the Vblock platform to meet the service request.

Use Case 2: New Tenant User Onboarding

In this use case, a new tenant user requests to be added to an existing tenant organization in order to use the cloud resources of that organization.

Description

The new tenant user logs into the self-service catalog portal and requests to be added to an existing tenant organization. The request is sent to the tenant administrator for approval. When approved, the request is routed to CPO to trigger the automated workflow that fulfills this request. CPO validates that the user does not already exist in the Active Directory (AD) for the tenant. The new tenant user is added to the tenant organization and can consume the cloud resources of the tenant organization.

Note: One or more ADs may be used in real world scenarios. However, only one AD was used in validation of the solution.
Workflow

The following diagram shows the workflow implemented in CPO that adds a new user to a tenant organization.

![Workflow Diagram]

Sample Form

The following figure is an example of the service request form a new user uses to request to be added to a tenant organization.

![Sample Form]

Best Practices

For this use case, include a step in the workflow to check whether the new user already exists in the Active Directory before trying to add the new user.
Use Case 3: Order and Deploy vApp

In this use case, a tenant user orders a vApp from the service catalog.

Description

The tenant user logs into the self-service catalog portal and browses through a list of published vApp templates in the service catalog for the tenant organization. The tenant user chooses a vApp template and requests deployment. The request is sent to the tenant administrator for approval. When approved, the request is routed to CPO to trigger the automated workflow that fulfills this request. After this request is fulfilled, the tenant user can access the deployed vApp instance as needed.

Workflow

The following diagram shows the workflow implemented in CPO to instantiate and deploy a vApp.
Sample Form

The following figure is an example of the service request form a tenant user uses to order a vApp from the service catalog.

Best Practices

For this use case, the vApp instance may contain multiple virtual machines (VMs). Some VMs may take longer to boot up so longer waiting times and timeouts may be needed in the workflow. It is also a good idea to add dynamic resource checks to the form to prevent users from requesting a vApp if they do not have enough resources available to their tenant organizations.

Use Case 4: Decommission vApp

In this use case, a tenant user no longer requires a particular vApp and requests that it be removed to free up the resources.

Description

The tenant user logs into the service portal and browses through a list of deployed vApp instances. The tenant user chooses the vApp that is no longer needed and requests that it be removed. This request is sent to the tenant administrator for approval. When approved, the request is routed to CPO to trigger the automated workflow that fulfills this request. After the request is fulfilled, the vApp instance is removed from the service portal for the tenant organization and the underlying resources assigned to this vApp instance are released.
Workflow

The following diagram shows the workflow implemented in CPO to remove a vApp from the service catalog.

Sample Form

The following figure is an example of the service request form a tenant user uses to request removal of a vApp from the service catalog.

Best Practices

The data displayed in the CCP service portal is maintained in the vCD database. For this use case, include a step in the workflow to update the CCP database with data from the vCD database to ensure the data is consistent across the databases. It is also a good idea to first shut down the vApp and remove the vApp service item from the service portal, and then use a delayed task to remove the vApp from vCD. This will allow the Cloud Administrator to easily react to emergency 'accidental delete' scenarios.
Use Case 5: Remove Tenant

In this use case, the tenant administrator requests that an existing tenant be removed from the database.

Description

The tenant administrator logs into the self-service catalog portal and requests removal of an existing tenant organization. This request is sent to cloud administrator for approval. When approved, the request is routed to CPO to trigger the automated workflow that fulfills this request. After this request is fulfilled and the tenant is removed, the underlying resources are released to the cloud provider. Key data about the tenant is kept for a period depending on the data retention policy.

Workflow

The following diagram shows the workflow implemented in CPO to remove a tenant.
Sample Form

The following figure is an example of the service request form a tenant administrator uses to request removal of a tenant.

Best Practices

For this use case, it is important to understand the dependencies among different components of the vCloud stack so that the workflows are implemented in the correct order. For example, the tenant’s networks must be removed before removing the tenant. It is also recommended to have the form dynamically check for active vApps and prompt the tenant to confirm the delete request.
Conclusion

Virtualization and cloud computing have transformed the model for provisioning, delivering, and managing IT services. The Management and Orchestration Workflow Automation solution combines the converged infrastructure of the Vblock platform with self-service catalog and process automation capabilities to enable IT providers to meet business demands for ever-increasing speed, agility, and cost savings.

VCE has validated this solution by developing several self-service catalog use cases and the workflows associated with those use cases. Each use case and workflow was developed and validated with the following steps:

1. A service request and service request form were created using the CCP Service Design module.
2. The workflow that fulfills the request was created in CPO.
3. The user submitted a service request through the CCP self-service portal.
4. To fulfill the request, the CCP portal routed the request to CPO where the appropriate automated workflows were triggered.
5. The vCloud Director abstracted the requested resources on the Vblock platform and pooled the virtualized infrastructure capacity into a vApp, which was made then available to the tenant.

The Management and Orchestration Workflow Automation solution allows IT providers to quickly and easily create and publish services to meet the varied and changing needs of the business. In addition, standardized service offerings and process automation promote consistent and efficient deployments. With the Management and Orchestration Workflow Automation solution, IT providers are able to transform from a technical service provider to a business service provider, reduce service costs, and increase end-user satisfaction.

Next Steps

To learn more about this and other solutions, contact a VCE representative or visit www.vce.com.

Additional References

- Service Catalog Strategies for Vblock™ Infrastructure Platforms
- Best Practices for Deploying VMware vCloud Director on Vblock™ Infrastructure Platforms
- Cisco Intelligent Automation for Cloud (http://www.cisco.com/go/iacloud)
ABOUT VCE

VCE, the Virtual Computing Environment Company formed by Cisco and EMC with investments from VMware and Intel, accelerates the adoption of converged infrastructure and cloud-based computing models that dramatically reduce the cost of IT while improving time to market for our customers. VCE, through the Vblock platform, delivers the industry's first completely integrated IT offering with end-to-end vendor accountability. VCE's prepackaged solutions are available through an extensive partner network, and cover horizontal applications, vertical industry offerings, and application development environments, allowing customers to focus on business innovation instead of integrating, validating and managing IT infrastructure.

For more information, go to www.vce.com.

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