



Integrating HP and VMware Software to Build Your Cloud

November 2011
TECHNICAL INTEGRATION GUIDE

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Introduction

Hewlett Packard, VMware and AdvizeX Technologies have created a joint offering to provide a real, actionable (repeatable) solution for deploying and managing private cloud platforms. The solution uses industry-leading software from HP and VMware that can be implemented in a relatively short amount of time. In the process, AdvizeX helps demystify both public and private clouds and their role in the enterprise.

In general, cloud computing is taken to mean a computing resource that's elastic, available on demand, is widely available to users and features measured service. Both public and private clouds should exhibit these attributes. AdvizeX focuses on delivering the following characteristics which it sees as critical to a successful cloud environment:

1. Service Oriented
2. Self-Service Portal
3. Service Catalog
4. Service Orchestration
5. Metering and or Chargeback
6. Converged/Cloud Infrastructure

Clearly, there are differences between the generic understanding of public and private clouds. However, to AdvizeX, the private cloud provides one significant advantage; each item is specifically deliverable by a currently released product from industry-leading providers HP and VMware. This document will explain, in detail, one individual use-case in which each of these characteristics is addressed, along with how each product is implemented and the integration points to create a fully deliverable private cloud platform.

Solution Overview

Many organizations are beginning to understand the benefits of cloud computing and are implementing solutions to deliver on the ability to pool datacenter resources, deliver an elastic environment and provide self-service. Those attributes are delivered while intelligently provisioning virtual workloads in minutes on a common converged infrastructure. Another critical attribute of delivering a complete cloud solution is the use of automation in order to reduce operational costs. Therefore, customers are applying automated policy management to these already efficient workloads to further ease configuration, placement, availability, and scale of the applications provided by the underlying cloud infrastructure. Integrating a cloud platform with IT management components, like monitoring, has become a critical component of the highly optimized and automated cloud. It's important to note that cloud computing is a new method for delivering IT as a service. Proper delivery requires the ability to allocate resources from a single, common underlying infrastructure while providing elasticity, automation and self-service. Cobbling together legacy applications and infrastructure and calling the resulting combination a cloud is not a proper solution.

This document will provide an example of automation, provided by the integration of VMware and Hewlett Packard components, in order to solve a sample scenario for a fictitious company named *Rainpole*.

Solution Components

VMware vCloud Director 1.5, which is part of the vCloud product family, enables an organization to deliver cloud infrastructure on-demand, allowing consumers to access virtual resources with maximum agility. vCloud Director enhances datacenter consolidation and optimizes the use of converged infrastructure, while providing built-in security and role-based access control. Additionally, vCloud Director enables migration of workloads between clouds and provides the ability to integrate existing management systems using customer extensions, APIs, and open cross-cloud standards.

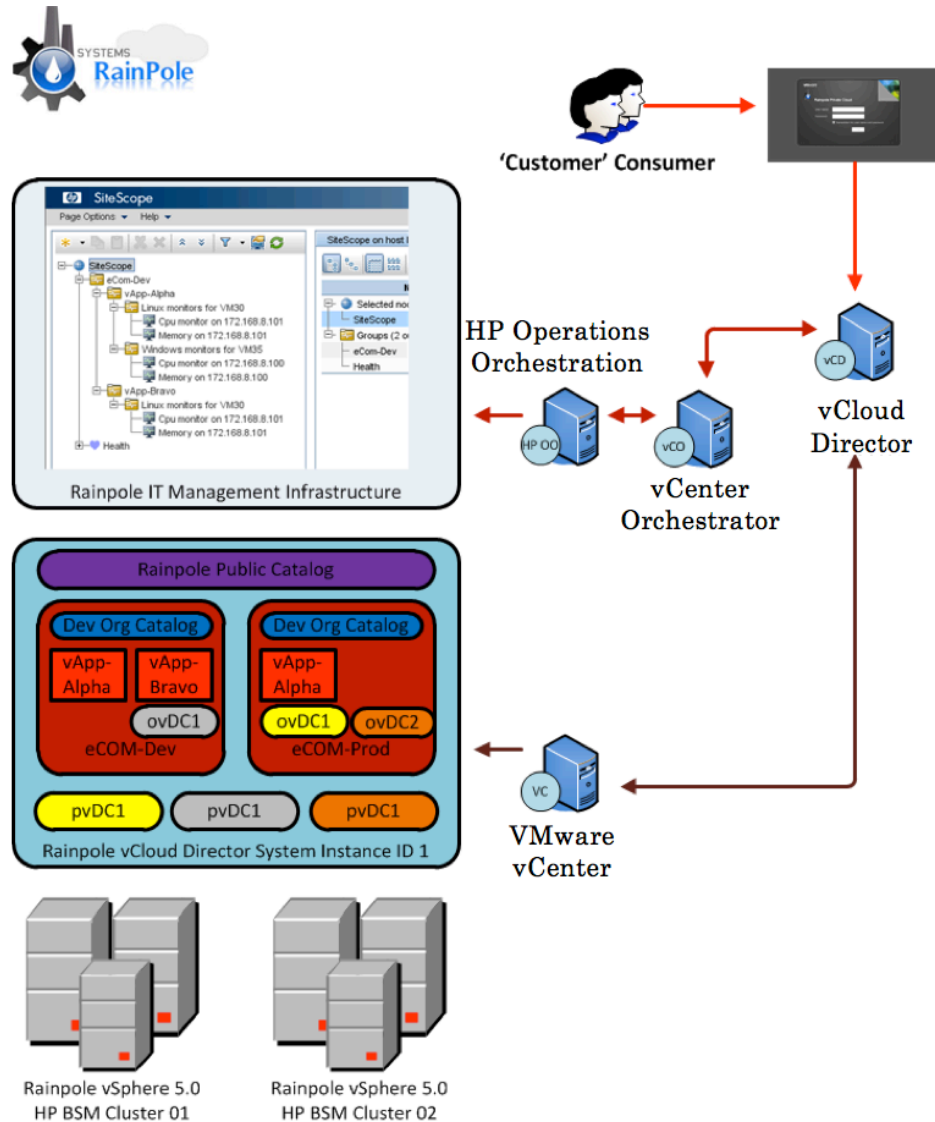
VMware vCenter Orchestrator automates tasks for VMware powered clouds enabling orchestration between multiple solutions. VMware vCenter Orchestrator allows administrators to capture their best practices and turn them into automated workflows. Used in conjunction with vCloud Director API's as well as advanced tasks and notifications available in vCloud Director 1.5, vCenter Orchestrator initiates various automation tasks, which allow the vCloud Platform to integrate with leading Cloud offerings.

RabbitMQ is designed from the ground up to **interoperate** with other messaging systems: it is the leading **implementation of AMQP**, the open standard for business messaging, and, through **plug-ins**, supports STOMP, HTTP for lightweight Web messaging, and other protocols. A full range of commercial support services is available through the SpringSource division of VMware, and RabbitMQ is supported by a thriving community of active contributors.

HP Operations Orchestration (HP OO) software automates the tasks and processes in the data center using workflows that help IT teams execute change with greater speed, quality, and consistency. HP Operations Orchestration software includes OO Studio, an intuitive and easy-to-use tool for authoring and designing workflows. It also includes OO Central which is the engine used to run and manage flows. And the third component is OO Content that includes prepackaged flows, out-of-the-box integrations, and orchestration of multiple systems.

HP SiteScope software monitors IT infrastructure and applications remotely without installing software on target servers. SiteScope collects server and application availability and performance data very quickly, across physical and virtual servers, and an easy installation and configuration process delivers rapid time to value.

Figure 1. Solution System Architecture



Company Background

Rainpole, which is a fictitious company that we'll use to describe and illustrate this solution, is a service provider uniquely positioned in the public cloud hosting arena as one of the first companies offering cloud services as their core business model. Rainpole is preparing to position itself as the logical option to CIOs by offering customers granular control over their cloud environment. Rainpole has a virtualization first policy and their entire virtualization platform is based on VMware technologies, but they also have a large legacy physical estate to manage as well. The company has deployed a physical infrastructure based on HP's VirtualSystem for VMware which is a converged compute, network and storage infrastructure. At Rainpole, HP SiteScope is the corporate standard for the collection and monitoring of performance and availability metrics of the workloads deployed in the environment. HP Operations Manager consumes the data provided by vCenter Orchestrator and vCloud Director and then interacts with SiteScope to enable

monitoring of newly deployed vApps. vApps are a single virtual machine or a combination of VMs that deliver a service and are treated as a single entity. For example, a vApp might contain three virtual machines including a database server, an application server and a Web server.

The environment must continue to manage and report on the health of the every service provisioned by VMware vCloud Director in order to increase automation, deliver critical insight into the health of the environment, reduce downtime and as a result reduce cost of providing cloud services internally.

vCloud Director allows policy driven, self-service consumption, in environments of all sizes. Deployments are common in datacenters, which are highly automated with advanced vSphere adoption. Utilization of automation tools in a cloud infrastructure helps to further reduce costs and increase the overall availability and health of the cloud. Many IT Service Management (ITSM) components, such as monitoring systems require a substantial degree of administration to keep accurate tie-ins to rapidly growing cloud environments. vCloud Director 1.5 includes a notification feature that allows a cloud platform to "call out" and interact with other ITSM components in a cloud to introduce an integrated level of automation. This document will demonstrate the capabilities of vCloud Director to provide a cloud IaaS consumption platform and interact with HP SiteScope, an enterprise level monitoring environment and part of HP's software monitoring stack.

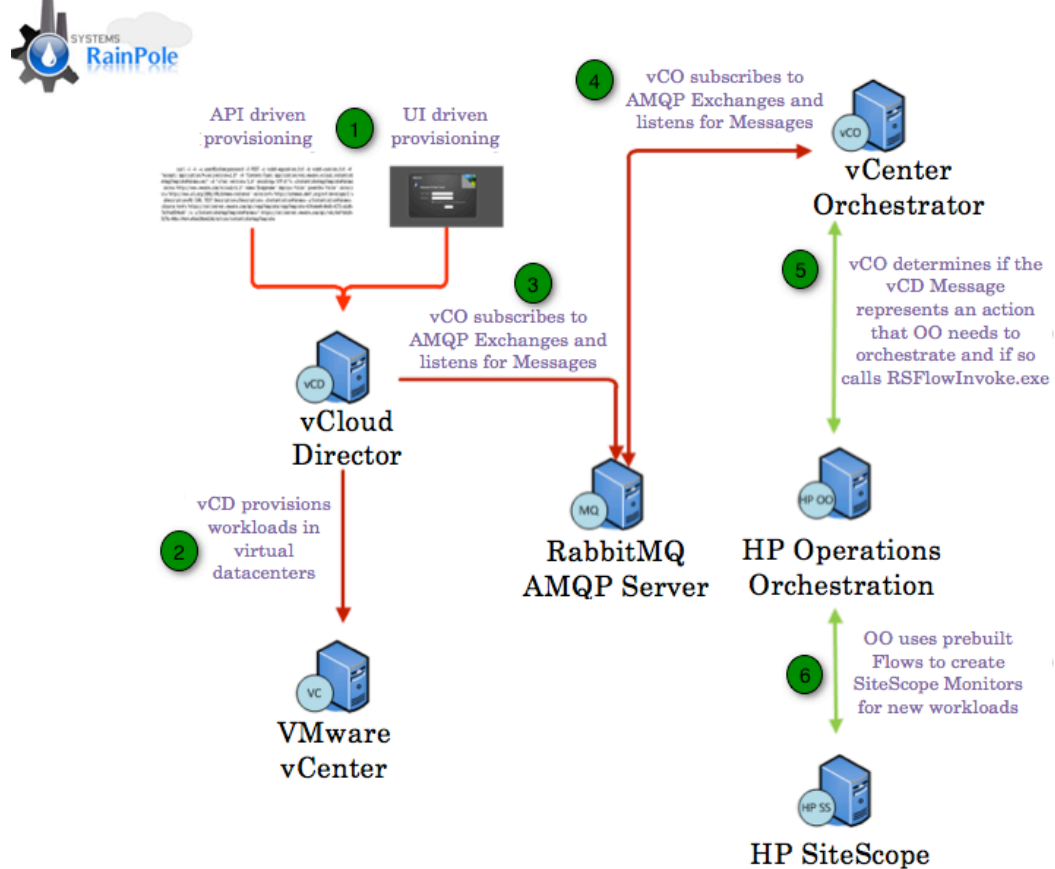
Rainpole's Requirements:

- Provide a self-service portal for rapid, policy-driven deployment of Virtual Machines in the private cloud
- Leverage a single underlying infrastructure that can be flexibly allocated as granularly as GHz for processor allocation and MB for memory. Minimum allocation of an entire physical server is unacceptable.
- Enforce corporate standards with approved catalog templates and integrated Virtual Network Security
- Provide inter-cloud workload portability
- Automate ITSM actions based on added VM workloads
- Monitor health and performance across entire physical and virtual environment

Due to Rainpole's efficient vCloud Director platform, the company is experiencing a very high rate of virtual workload growth and provisioning. These new workloads must be monitored by HP SiteScope and aggregated along boundaries that match vCloud Director Organization and vApp constructs. Rainpole requires a solution to automate this process in order to maintain their streamlined self-service provisioning model. The solution must accomplish the following core requirements:

1. New Workloads must be provisioned as vApps from vCloud Director's portal in a self-service manner, requiring no other manual processes.
2. Whenever a VM is provisioned as part of a workload via vCloud Director, HP SiteScope Monitors must be created in in groupings that match the vCloud Director Organizations and vApp hierarchy and begin collecting data on the new workloads.
3. Automation components (vCenter Orchestrator & HP Operations Orchestration) must broker these actions between vCloud Director and SiteScope.

Figure 2. vCloud Director Message Administration



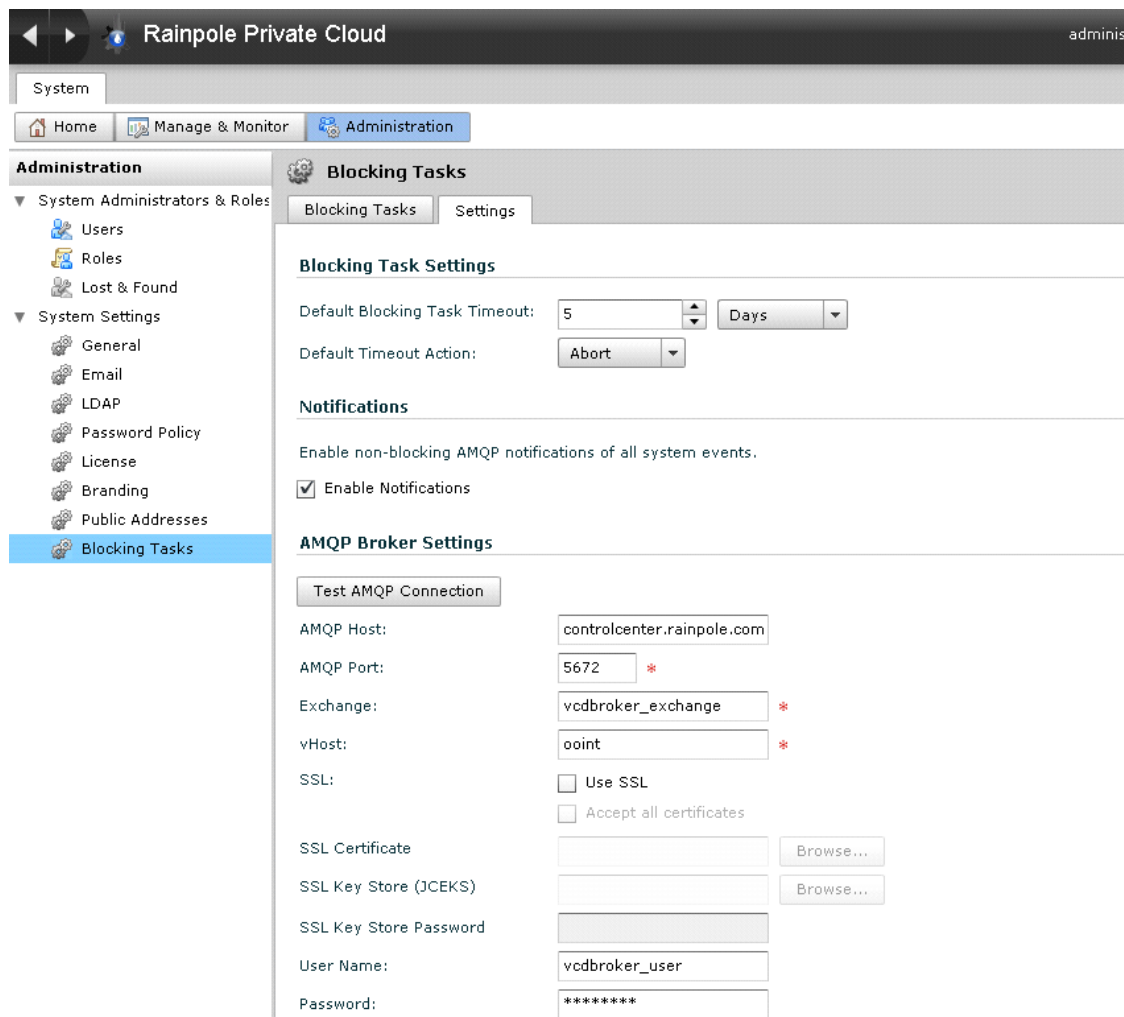
Configuring vCloud Director Messaging

These steps provide a basic description of how Rainpole might configure the messaging function of vCloud Director. Note that while these steps are intended to provide guidance, the information should match the specific implementation in your organization.

vCloud Director 1.5 allows a system administrator to configure many operations to create blocking or non-blocking tasks. Blocking tasks are jobs which are suspended until a system administrator acts on them or a preconfigured timeout occurs. Blocking tasks generate AMQP messages that can be used to automate external actions related to actions initiated by vCloud Director operation. Tasks can also be set to a non-blocking state which sends an AMQP message for most cloud operations notifications with no acknowledgement requirement necessary.

vCloud Director messaging is configured through the use of the vCloud Director Message Administration console as shown below.

Figure 3. vCloud Director Message Administration



Administration

- System Administrators & Roles
 - Users
 - Roles
 - Lost & Found
- System Settings
 - General
 - Email
 - LDAP
 - Password Policy
 - License
 - Branding
 - Public Addresses
 - Blocking Tasks**

Blocking Tasks

Blocking Tasks Settings

Default Blocking Task Timeout: 5 Days

Default Timeout Action: Abort

Notifications

Enable non-blocking AMQP notifications of all system events.

Enable Notifications

AMQP Broker Settings

Test AMQP Connection

AMQP Host: controlcenter.rainpole.com

AMQP Port: 5672 *

Exchange: vcdbroker_exchange *

vHost: ooint *

SSL: Use SSL
 Accept all certificates

SSL Certificate: Browse...

SSL Key Store (JCEKS): Browse...

SSL Key Store Password:

User Name: vcdbroker_user

Password: *****

In this document non-blocking tasks will be utilized to facilitate communication to external systems such as SiteScope. Critical Settings for enabling non-blocking notifications can be found by navigating, within the vCloud Director System UI, to: [System->System Settings->Blocking Tasks->Settings Tab](#)

Critical vCloud Director 1.5 Notification Settings are:

- **Enable Notifications** = Check this to enable all non-blocking notifications to the configured AMQP server
- **AMQP Host** = Enter the IP Address or FQDN of an AMQP capable Host, like RabbitMQ
- **AMQP Port** = Defaults to 5672
- **Exchange** = AMQP Exchange created on the AMQP server to accept messages from vCD
- **vHost** = the vHost created on the AMQP server to host the Exchange and bound AMQP queues
- **User Name & Password** = credential of AMQP created user on the AMQP server

Configuring Advanced Message Queuing Protocol

AMQP, the Advanced Message Queuing Protocol, is an open standard for message queuing that supports flexible messaging for enterprise systems. vCloud Director 1.5 can be configured to submit messages to RabbitMQ or other AMQP servers to provide cloud operators with a stream of notifications about events in the cloud. Those notifications can be utilized to automate tasks in external systems. As we will discuss further in this document.

For this guide, RabbitMQ was utilized as the AMQP broker. Installation code and documentation for RabbitMQ may be obtained from <http://www.rabbitmq.com/>. The AMQP server can be deployed within a Linux or Windows Operating system, which can either be physical or virtual.

Critical RabbitMQ Settings utilizing the `rabbitmqctl` configuration tool are:

- `rabbitmqctl add_user vcdbroker_user vmware1!`
- `rabbitmqctl add_vhost ooint`
- `rabbitmqctl set_permissions -p /ooint vcdbroker_user ".*" ".*" ".*"`

The commands listed above will create an AMQP vHost called '/ooint', an AMQP user named `vcdbroker_user`, and grants full rights to the /ooint vHost to that user. This was the configuration used in the lab setup for this document.

With a correctly deployed vCloud Director notification configuration and accompanying AMQP server, multiple external components can bind and subscribe to the Message Exchange and begin listening for operations that may trigger external tasks.

The VMware vCenter Orchestrator receives messages from the AMQP server and initiates workflows using HP OO to create SiteScope Monitors.

SiteScope 11.x does not have an automation function to integrate with AMQP based messaging applications that would allow it to automatically create monitors when vApps are deployed by vCloud Director. A client must listen to the AMQP Exchange, receive and parse incoming messages and then initiate appropriate workflows or runbook automation within HP OO. The message consumer that we're using for this deployment is VMware vCenter Orchestrator, which is included with VMware vCenter 5.0.

Configuring VMware vCenter Orchestrator

vCenter Orchestrator, or vCO, version 4.2 provides an installable AMQP plugin that can perform many functions with AMQP servers, including:

- Declaring AMQP Queues
- Binding Queues to Exchanges
- Subscribing listeners on Queues

vCenter Orchestrator and Plug-in documentation can be found on vCenter installation media or downloaded from VMware.com from the following URLs...

https://vmware.com/support/pubs/orchestrator_pubs.html

<http://www.vmware.com/products/datacenter-virtualization/vcenter-orchestrator/plugins.html>

This document will not cover vCO or vCO plug-in installation, however the following section will cover critical configuration settings for using the vCO AMQP plug-in to interact with HP OO.

First, you will need to modify the vCO server configuration file since issuing an OS command is prohibited by default for security reasons. Please also keep in mind that whatever you are doing here is executed with the credentials of the user running the vCO process (localSystem by default).

The file to modify is vmo.properties under the app-server/server/vmo/conf directory.

Add a line to the bottom

```
com.vmware.js.allow-local-process=true
```

and save the config file.

Figure 4. Utilize vCO AMQP Plugin ‘Add a broker’ Configuration Workflow to create a vCO AMQP broker...

- **Name**= Name vCO will know the broker as, example *vcdbroker*
- **Host** = Enter the IP Address or FQDN of an AMQP capable Host, like RabbitMQ
- **Port** = Default 5672.0
- **Virtual host** = the vHost created on the AMQP server to host the Exchange and bound AMQP queues
- **User Name & Password** = credential of AMQP created user on the AMQP serve

Figure 5. Utilize vCO AMQP Plugin 'Declare an Exchange' Configuration Workflow to create an AMQP exchange...

Start Workflow : Declare an exchange

Declare an exchange

AMQP Broker

Broker: vcdbroker [vcdbroker_user@192.168.110.10:5672/ooint]

Exchange Properties

Name: ooint

Type: fanout

Durable: Yes No

Auto delete: Yes No

Define the exchange properties.

Type

direct - direct match between the routing key provided in the message and the routing key used when a queue is bound to this exchange.

fanout - any message sent to this exchange is forwarded to all queues bound to it. Queues bound to this exchange contain no arguments.

headers - queues are bound to this exchange with a table of arguments that can contain header values. A special argument named "x-match" determines the matching criteria.

Reset to default Cancel Submit

- **Broker**= vCO broker bound to the AMQP server, example *vcdbroker*
- **Name** = name of the Exchange to be created on the AMQP server, example *ooint*
- **Type** = fanout, this will allow multiple queues to bind to the exchange
- **Durable** = Yes, forces the exchange to be permanent and survive AMQP server restarts
- **Auto Delete** = No, prevents exchange deletion when queues are no longer bound to it.

Figure 6. Utilize vCO AMQP Plugin 'Declare a queue' Configuration Workflow to create an AMQP queue...

- **Broker**= vCO broker bound to the AMQP server, example *vcdbroker*
- **Name** = name of the queue to be created on the AMQP server, example *vcdbroker_queue*
- **Durable** = Yes, forces the queue to be permanent and survive AMQP server restarts
- **Exclusive** = No, allows multiple clients to bind to the queue.
- **Auto delete** = No, prevents queue from being deleted if no more subscriptions are bound to it.

Figure 7. Utilize vCO AMQP Plugin 'Bind' Configuration Workflow to bind an AMQP queue to an AMQP exchange...

- **Broker**= vCO broker bound to the AMQP server, example *vcdbroker*
- **Queue Name** = name of the queue to be bound to and Exchange, example *vcdbroker_queue*
- **Exchange Name** = name of the Exchange that the queue is to be bound to, example *vcdbroker_exchange*
- **Routing_Key** = Route key to control message routing through the queue, example *vcdbroker_key*

Figure 8. Utilize vCO AMQP Plugin 'Subscribe to Queues' Configuration Workflow to bind and listen to the AMQP queue...

The screenshot shows a configuration window titled "Start Workflow : Subscribe to queues". The main content area is titled "Subscribe to queues" and is divided into three sections:

- Subscription:** A text input field labeled "Name" contains the value "vcdbroker_subscription". To the right is a yellow box with the instruction "Type a name to display."
- AMQP Broker:** A dropdown menu labeled "Broker" shows the selected value "vcdbroker [vcdbroker_user@192.168.110.10:5672/ooint]". To the right is a yellow box with the instruction "Select a broker to add subscription."
- Queues:** A dropdown menu labeled "Queues" shows the selected value "Array [vcdbroker_queue]". To the right is a yellow box with the instruction "Select all queues for message subscriptio".

At the bottom right of the window are three buttons: "Reset to default", "Cancel", and "Submit".

- **Name** = vCO Name of the Subscription, example *vcdbroker_subscription*.
- **Broker** = vCO broker bound to the AMQP server, example *vcdbroker*
- **Queues** = List of names of bound queue's that the subscriber will listen to, example *vcdbroker_queue*

Once the preceding steps have been completed, you will have created an AMQP Exchange for vCloud Director to publish messages into, as well as an AMQP queue that is bound to that Exchange. You also created a 'subscription', that will allow vCenter Orchestrator to listen for messages from vCloud Director.

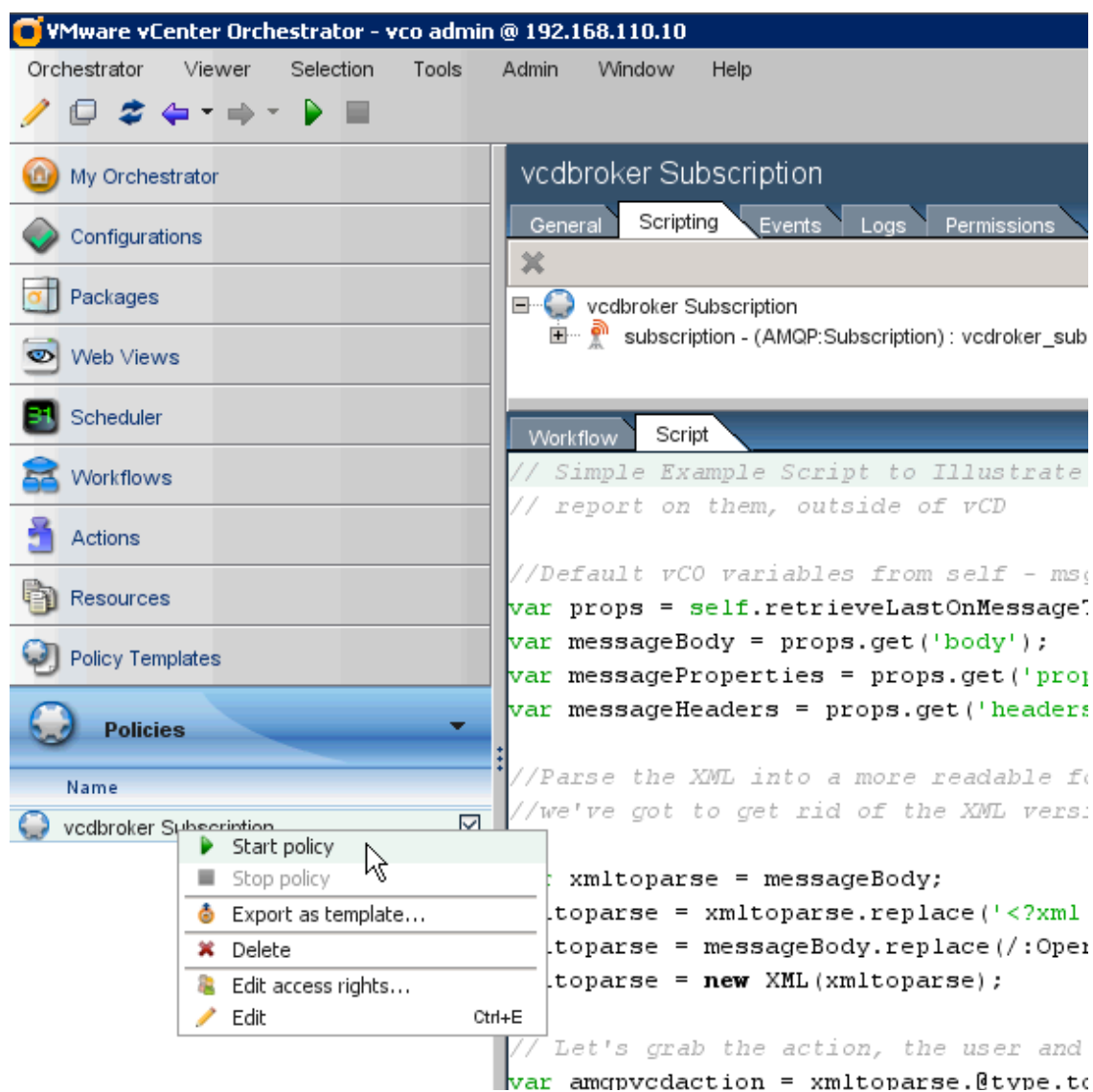
The next step is to decide what to do with those messages initiated by the vCloud Director actions. To accomplish this, you must create a vCenter Orchestrator policy, from the AMQP 'subscriptions' Policy Template.

Figure 9. **Policy Application**

- **Policy Name** = vCO Name of the new Subscription Policy, example *vcdbroker Subscription*.
- **AMQP Subscription**= Name of the subscription created in a previous step, example *vcdbroker_subscription*

The policy that you create in this step will allow Rhino JavaScript to be executed after each received AMQP message. You must also ensure the vCO Policy is 'started'.

Figure 10: Starting the policy



This JavaScript will collect various variables from the AMQP messages and perform the following conditional logic:

Collect variables...

1. What is the vCD action in the notification message?
2. What is the vCD Organization in which the action occurred?
3. Did the Action Succeed?
4. What is the vCD Rest API URI or http reference URL of the VM object of the action?

Once variables are collected....

- Did Action Succeed? If no exit the script, If yes continue execution
- Was the Action a VM create action? If no exit the script, If yes continue execution
- Call The HP OO provided 'RSFlowInvoke' executable that has been placed on the vCO server.
This executable will invoke an HP OO workflow and pass it the following variables:
 - vCD action
 - vCD Organization
 - vCD VM object of VM create action

This conditional login in the JavaScript will initiate the HP OO workflows when VM's have been successfully created. The full JavaScript used in the lab setup for this document is provided below. When re-using this code, the following 2 variables must be modified:

```
//// This Variable must be set to the IP Address on the HP //// Ops
Orchestration host that is running HP OO web
//// services...
```

```
var glbl_oohost
```

```
&
```

```
//Shell Execution call Framework - Insert OOint Fire cmd
//here, must be set to correct location of RSFlowInvoke on
//vCO Host and vCDCoreInput location on the OO Host as well
//as login creds for the OO Host.
```

```
cmd
```

Both Variables must be set to match requirements to deployed environment.

```

//BEGIN
// Automation Script to trigger HP OO workflows based on vCD Messages
so we can
// Integrate SiteScope
// mglynn@vmware.com

//Default vCO variables from self - msg body
var props = self.retrieveLastOnMessageTrigger();
var messageBody = props.get('body');
var messageProperties = props.get('properties');
var messageHeaders = props.get('headers');
//// This Variable must be set to the IP Address on the HP //// Ops
Orchestration host that is running HP OO web
//// services...
var glbl_oohost = "192.168.110.13";

//Parse the XML to collect variables

var xmlltoparse = messageBody;
xmlltoparse = xmlltoparse.replace('<?xml version="1.0"?>', "");
xmlltoparse = messageBody.replace(/:OperationSuccess/g,
"OperationSuccess");
xmlltoparse = new XML(xmlltoparse);

var amqpvcddaction = xmlltoparse.@type.toString();
var amqpvcdduser = xmlltoparse..*.(@type ==
"vcloud:user").@name.toString();
var amqpvcddorg = xmlltoparse..*.(@type ==
"vcloud:org").@name.toString();
var amqpvcddsucces = xmlltoparse.vnextOperationSuccess.toString();
var amqpvcddvmhref = xmlltoparse..*.(@rel ==
"entityResolver").@href.toString().replace('api/entity/', "") +
xmlltoparse..*.(@type ==
"vcloud:vm").@id.toString().replace('urn:vcloud:vm:', "api/vApp/vm-");
var amqpvcddauth = xmlltoparse..*.(@rel ==
"entityResolver").@href.toString().replace('api/entity', "api/login")

////////////////////////////////////
//Test if action is a triggerable action to fire an OO workflow
////////////////////////////////////
var oointtrigger = ["com/vmware/vcloud/event/vm/create];

for(var n=0; n< oointtrigger.length ; n++) {
    if (oointtrigger[n] == amqpvcddaction && amqpvcddsucces == "true")
    {
        System.log(oointtrigger[n]+ "=" + amqpvcddaction);
        System.log("Firing OO Trigger");
    }

//Shell Execution call Framework - Insert OOint Fire cmd here, must be
set to //correct location of RSFlowInvoke on vCO Host and vCDCoreInput
location
//on OO Host.

```

```

        cmd = new Command("c:\\vcdbroker\\tools\\RSFlowInvoke -host "+
        glbl_oohost +" -flow \\Library/My Ops Flows/MG Dev/vCDCoreInput\" -
        inputs \\url=" + amqpvcldauth + "&oointvmhref=" + amqpvcldvmhref +
        "&oointvcdaction=" + amqpvcldaction + "&oointorg=" + amqpvcldorg + "\\\" -u
        admin -p Matrix123");
        cmd.execute(true);
    }
}

// Dev Logging
System.log("Received Message");
System.log("");
System.log("Action: "+amqpvcldaction);
System.log("User: "+amqpvclduser);
System.log("Org: "+amqpvcldorg);
System.log("Success: "+amqpvcldsuccess);
System.log("href: "+amqpvcldvmhref);
System.log("");
System.log("Entire XML Message");
System.log(messageBody);

//EOL
//Reindeer Flotilla

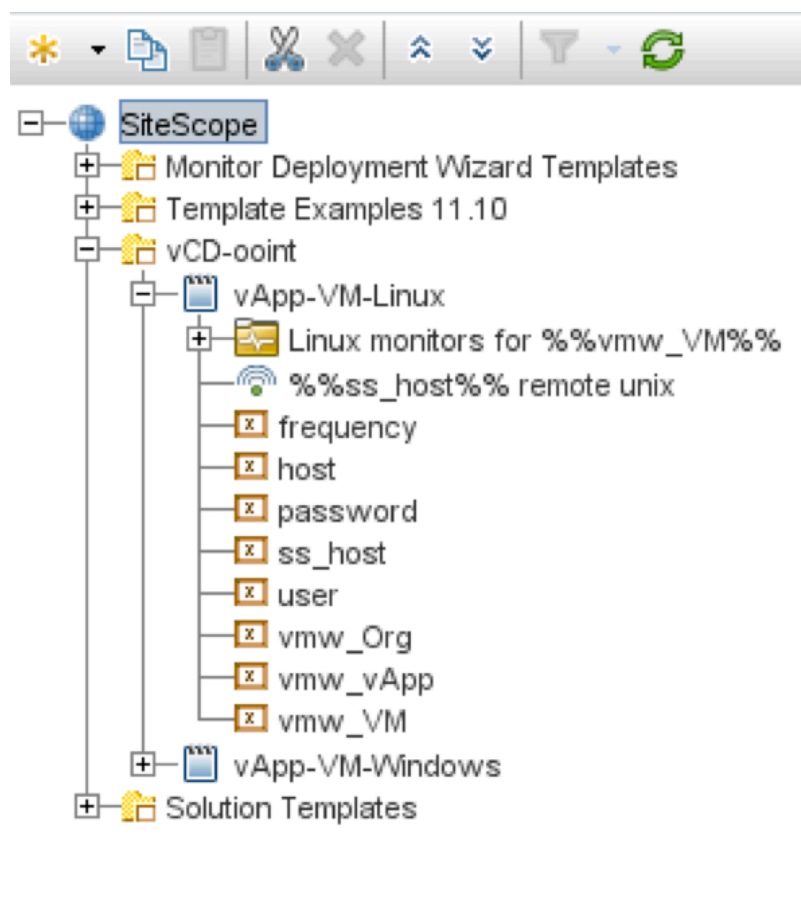
```

Configuring HP Operations Orchestration

Now that vCenter Orchestrator is able to invoke workflows in HP OO based on successful VM create criteria, HP OO must now use its Rest API Capabilities to collect more information about the newly created VM, the vApp it is a member of, its vCloud Director Organization, and other critical data to create a SiteScope monitor. HP OO will then use SiteScope Integrations to Deploy Monitoring templates associated with the new VMs.

6. Another REST GET call is then made to collect the vApp Name (Get vApp Name)
 - vApp Name
7. Next, the Guest OS is checked for Windows or Linux to determine which SiteScope template (Windows or Linux) is to be deployed. (Is Windows?)
8. The Final step is the execution of the appropriate SiteScope Template deploy passing the following variables:
 - vmw_VM - VM Name
 - vmw_vApp - vApp Name
 - vmw_Org - Org Name
 - ss_host - Management Network IP Address

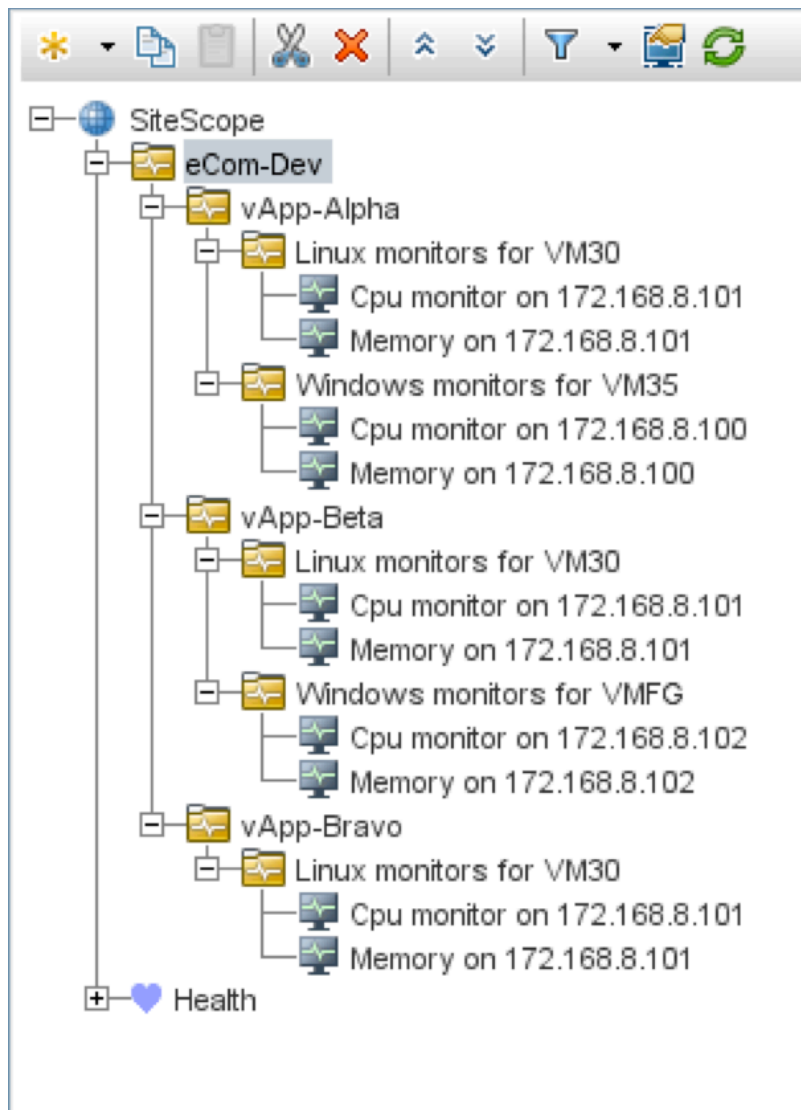
Figure 12: Executing the template



At the Conclusion of the HP OO workflow, a New SiteScope Monitor will have been created, based on a pre-existing SiteScope Monitor template. The Template will utilize the provided variables from HP OO to ensure that the monitor is created in a group structure that resembles the vCD Org, vApp, VM hierarchy.

The following diagram is an example of three vApps named vApp-Alpha, vApp-Beta and vApp-Bravo, which have been deployed in the eCom-Dev organization. SiteScope monitors have automatically been deployed for these vApps and they are being monitored and managed using the Rainpole corporate monitoring strategy.

Figure 13: An example of three vApps



Conclusion

Integration of vCloud Director and vCenter Orchestrator with AMQP Queues enables datacenter events to trigger HP Operations Orchestrations flows. This blended solution makes for a flexible and powerful private cloud solution that addresses the requirements to lower costs, while maintaining the desired level of control over the environment. HP OO features debugging, componentization; Java Doc style documentation generations, reporting, and flow run visibility enable management and support of the complicated logic necessary for complete service integration.

Although we are only showcasing HP OO's ability to automate HP Site Scope, OO has feature rich integration capabilities via accelerator packs. Out of the box integration capabilities include most major platforms, vendors, and tools in categories such as Operating Systems, App servers, Networking, Databases, Virtualization, Service Desk, Monitoring, Configuration and Change management, and CMDB. This level of integration is necessary to automate solutions that adhere to enterprise standards and ensure consistency and reliability.

VCD 1.5 integrated with HP OO is a world-class turnkey private cloud solution. This integration occurs via an AMPQ queue and is enabled by vCloud Director's integration with AMPQ queues and HP OO REST exposed flow execution. With this blended solution, complicated services can be deployed rapidly via virtual application images. During this deployment, as strategic lifecycle events occur, pre-defined HP OO flows are executed. These flows can perform service integration tasks to ensure provisioned services are monitored, backed up, have virus protection, meet SLAs, adhere to networking policies, and the list goes on. This process produces a fully provisioned and enterprise-integrated service.

Delivery of this solution was made possible by a combined effort of HP, VMware and AdvizeX engineers. For additional information on this solution please contact members of the HP Alliance team at VMware or AdvizeX Technologies.

Resources

For more information about VMware and related products, use the links and references below.

VMware

- VMware vCloud Director:
<http://www.vmware.com/products/vcloud-director/overview.html>
- VMware vCloud Director Resources:
<http://www.vmware.com/products/vcloud-director/resources.html>
- VMware vCenter Orchestrator:
<http://www.vmware.com/products/vcenter-orchestrator/overview.html>
- VMware Web site:
<http://www.vmware.com/>
- VMware Download Center:
<https://www.vmware.com/download/>
- VMware Community:
<http://www.vmware.com/vmtn/>

HP

- HP Operations Orchestration:
<http://www.hp.com/go/oo>
- HP SiteScope:
<http://www.hp.com/go/sitescope>

AdvizeX Technologies

http://www.advizex.com/solutions/virtual_data_center/

This document provides an overview of private cloud computing using a joint solution developed by VMware, Hewlett Packard and AdvizeX Technologies to deliver a flexible cloud environment. The solution utilizes currently available products, and it can be implemented in a relatively short period of time. Implementation is illustrated using the example of a service provider with both cloud and legacy offerings. The examples provide detailed, specific actions using the vCloud Director platform, vCloud Director Messaging, vCenter Orchestrator and HP's Operations Orchestrator and SiteScope.

The examples are both high-level and include deep technical detail to give a clear description of what would be required to implement such a solution. The result is a cloud services environment that gives customers granular control. The examples also include detailed configuration descriptions and JavaScript code examples to provide an in-depth view of the implementation process.

