Hybrid Cloud Management with Red Hat CloudForms

This book will equip you with a hands-on approach on how to build a hybrid cloud environment and then manage, control, and gain operational insights into it.

The book starts by showing you how to install and configure Red Hat CloudForms, and add infrastructure and cloud providers to build the hybrid cloud environment. Next, you will learn to provision virtual machines and instances to these platform providers, and manage and control the life cycle of these resources. You will also get to know about automating provisioning.

Moving on, you’ll get to grips with the management of resources using policies, events, conditions, and actions. You’ll also learn how to monitor these resources from a single pane of glass. Finally, the book covers viewing capacity and utilization trends to optimize the overall hybrid cloud infrastructure, and also introduces you to supported APIs.

By the end of the book, you will be able to deploy and use Red Hat CloudForms.

Who this book is written for
If you are an existing Red Hat administrator who is new to the Red Hat cloud infrastructure and would like to manage and deploy hybrid clouds, then this book is for you. Red Hat Linux administration experience is assumed.

What you will learn from this book
- Install and configure Red Hat CloudForms 3.1 on the Red Hat Enterprise Linux OpenStack platform
- Add Amazon EC2 and OpenStack as cloud providers and VMware as an infrastructure provider
- Provision an instance from the Red Hat CloudForms web console
- Manage the life cycles of virtual machines and instances
- Create custom domains, namespaces, classes, schemas, instances, and invoke automation workflows
- Monitor and gather intelligence information about the hybrid cloud environment
- Get to know about supported APIs that can be used to integrate third-party systems with Red Hat CloudForms

Sangram Rath

Build, manage, and control an open hybrid cloud infrastructure using Red Hat CloudForms

In this package, you will find:

- The author biography
- A preview chapter from the book, Chapter 1 'Red Hat CloudForms Internals'
- A synopsis of the book’s content
- More information on Hybrid Cloud Management with Red Hat CloudForms
About the Author

Sangram Rath is a Co-founder and cloud architect at Voverc and has 10 years of IT experience, primarily in the cloud computing and virtualization domains. He is also a freelance consultant and trainer and works on delivering solutions and trainings on OpenStack, Microsoft Azure, and AWS. In the past, he has worked for companies such as Hewlett-Packard, Microland, Mphasis, Bristlecone, and a start-up called CloudThat Technologies.

He took his first computer lesson at the age of 6 and knew that this was where he wanted to head. Sangram has a bachelor's degree in computer applications from Bangalore University and many technical certifications, such as Mirantis Certified Administrator on OpenStack; Microsoft Certified Solutions Developer: Azure Solutions Architect, AWS Certified Solutions Architect, VMware Certified Professional; and many more to his credit.

He is an avid reader and a foodie. He loves traveling and capturing moments through a lens. When he's not working, he loves spending time with his pet Labrador, Junior, in his hometown of Jeypore, Odisha, India.
Cloud adoption has grown by leaps and bounds in the last few years and so have the challenges in managing different cloud providers and the existing virtualized infrastructure. Enterprises end up managing these environments separately, causing management and cost overhead.

In comes Red Hat CloudForms, a unified management platform for both your cloud and virtual infrastructures. Red Hat CloudForms is built using the open source project ManageIQ, and is packed with added capabilities and enterprise benefits that Red Hat provides, such as subscriptions, updates, and support.

Red Hat CloudForms supplements your existing infrastructure—which consists of Red Hat Enterprise Linux OpenStack, Red Hat Enterprise Virtualization, and VMware vSphere—with advanced management and automation capabilities, chargeback, life cycle management, control and governance, capacity planning, and optimization. It also supports public cloud infrastructures, such as Amazon EC2.

In this book, we will explore its architecture, components, and feature sets. You will learn how to install and configure Red Hat CloudForms, build a hybrid cloud environment, and use the individual features. By the end, you should have practical knowledge of how to work with Red Hat CloudForms.

What this book covers

Chapter 1, Red Hat CloudForms Internals, highlights some of the challenges faced in managing a hybrid cloud environment, introduces Red Hat CloudForms, and provides information about its architecture, components, and features. They provide a unified management platform.
Chapter 2, Installing Red Hat CloudForms on Red Hat OpenStack, shows you how to deploy CloudForms in a Red Hat Enterprise Linux OpenStack environment as an instance; perform initial configuration tasks, such as setting the hostname, network parameters, and time zone; set up an internal PostgreSQL database; and start the management engine process.

Chapter 3, Building a Hybrid Cloud Environment Using Red Hat CloudForms, explains how to build a hybrid cloud by adding providers and viewing and editing provider information after adding. We also take a look at provisioning dialogs, which are used to raise a provisioning request.

Chapter 4, Provisioning Instances Using Red Hat CloudForms, outlines the steps to provision an instance into Amazon EC2 and OpenStack from the CloudForms web console. This chapter also introduces service catalogs. These can also be used to provision instances and virtual machines.

Chapter 5, Life Cycle Management Using Red Hat CloudForms, explores one of the key features of Red Hat CloudForms—life cycle management. In this chapter, you learn about the different stages of life cycle management, that is, request, approval, and retirement.

Chapter 6, Automation Using Red Hat CloudForms, talks about the automate model of Red Hat CloudForms, its hierarchy, and creating organization units such as domains, namespaces, classes, and instances. Here, you also learn how to create and invoke methods in automation.

Chapter 7, Managing Red Hat CloudForms, shows you how to control and govern the installation of Red Hat CloudForms and the hybrid cloud infrastructure using policies. We cover different types of policies and see how to take automated actions based on events and conditions.

Chapter 8, Monitoring a Hybrid Cloud Infrastructure Using Red Hat CloudForms, highlights the Insight feature set of Red Hat CloudForms. In this chapter, you learn how to view information about the hybrid cloud using the cloud intelligence dashboard, work with reports, collect usage metrics from virtual machines, use chargeback for billing and metering, and use alerts and the SmartState analysis.

Chapter 9, Optimizing Using Red Hat CloudForms, covers another key feature of Red Hat CloudForms, which is the optimization of the hybrid cloud. This chapter focuses on how to perform capacity planning of the virtual infrastructure by collecting and analyzing capacity and utilization data, creating charts of the data, and viewing the utilization trends.

Chapter 10, APIs for Red Hat CloudForms, introduces the two supported APIs in Red Hat CloudForms, that is, the REST API and the SOAP API.
This chapter highlights some of the challenges faced in managing hybrid cloud environments that contain a mix of private and public clouds and traditional virtualized infrastructure. It then introduces Red Hat CloudForms, its architecture, its components, and features that overcome these challenges.

The following topics are covered in this chapter:

- What is a cloud management platform?
- Hybrid cloud management challenges
- Introducing Red Hat CloudForms
- Architecture
- Components
- Capabilities
- Benefits
- Supported providers
- Types of provisioning
- The open source version of Red Hat CloudForms

At the time of writing this book, Red Hat CloudForms 3.1 is the latest version.
What is a cloud management platform?
Simply put, a cloud management platform is a piece of all-in-one software with integrated tools that provide a unified platform for provisioning, management, billing, control, and governance of resources across different types of cloud deployments, such as private and public, and virtualized infrastructures.

A more formal definition of a cloud management platform is well made by Gartner, which is a global research company in America.

Gartner defines a cloud management platform as:

Integrated products that provide for the management of public, private and hybrid cloud environments. The minimum requirements to be included in this category are products that incorporate self-service interfaces, provision system images, enable metering and billing, and provide for some degree of workload optimization through established policies. More-advanced offerings may also integrate with external enterprise management systems, include service catalogs, support the configuration of storage and network resources, allow for enhanced resource management via service governors and provide advanced monitoring for improved "guest" performance and availability.

The source is http://www.gartner.com/it-glossary/cloud-management-platforms.

According to Gartner, when choosing a cloud management platform, here are some capabilities to look for:

• Self-service automated provisioning
• Chargeback
• Capacity management
• Performance management
• Configuration and change management
• Life cycle management
• The service catalog
• Orchestration
• External cloud connection
Chapter 1

Hybrid cloud management challenges

One of the important challenges in running a cloud infrastructure is management. This challenge is compounded if you also have a heterogeneous environment of on-premise virtualized infrastructure. Let’s take a look at some of the most common hybrid cloud management challenges companies face in day-to-day operations:

- **Centralized management**: Most companies will already have a virtualized infrastructure and also be using either both private and public clouds or at least one of them. Hence, they will have management tools for each of these infrastructures, for example, a management tool for VMware, another for a public cloud (such as Amazon Web Services), and then maybe a tool for managing a private cloud (such as OpenStack). The challenge is in managing them separately.

- **Life cycle management**: Life cycle management involves automation of tasks such as requesting resources, approval, provisioning, customization, reconfiguration, and finally retiring the resources. A lack of life cycle management capabilities can lead to losing track and continuing to run needless resources, causing management and cost overhead. This results from the need to manage individual silos.

- **Capacity management**: One of the reasons for which companies move to the cloud, especially a hybrid one, is to be able to meet the sudden demand of resources from a public cloud, such as Amazon Web Services (AWS). The challenge is to know when to cross over and provision new resources through automation.

- **Chargeback**: Being able to accurately collect utilization data and charge back a tenant or internal department is another challenge that most companies face. It involves performing a manual process or the use of a vendor-specific tool, which again results in manual aggregation in the case of a heterogeneous environment. Companies face the lack of a unified platform for chargeback.

- **Governance**: With self-service being one of the main reasons for cloud adaptability, governance becomes key to hassle-free, automated commissioning and decommissioning of resources. Also, in the case of a hybrid cloud, the challenge is to make it work seamlessly across environments instead of separate governance policies for virtual and the cloud.

- **Orchestration**: Orchestration templates are vendor-specific and fail to work across providers. The challenge is a platform from where an orchestration template will be able to deploy resources across virtual and cloud environments.

- **Integration**: A diverse IT environment consisting of physical, virtual, and cloud infrastructures running in different types of hardware, stack, and platform in different geographical locations makes integration of services difficult.
• **Security** and **Compliance**: This is a challenge that always figures at the top of the list. Administrators need to ensure that compliance is met when provisioning resources across different types of infrastructures, users do not have more than the required permissions, and resources are provisioned with a set standard or configuration.

• **Unified analytics**: Having a unified view of resources, their consumption across environments, and providers to monitor; viewing trends; checking performance; and forecasting are other challenges that businesses face with a hybrid cloud deployment.

• **External cloud**: Another challenge with hybrid cloud deployments is integration with external or public clouds for workload deployment. In most cases, this is managed separately in a manual way, or it is sometimes scripted, but still it requires a lot of hassles. Presenting external clouds as an extension of your data center or private cloud is still a challenge.

### Introducing Red Hat CloudForms

Red Hat CloudForms is a scalable, open, and extensible management platform that provides insight, control, automation, and integration capabilities all under a single pane of glass. It is apt for managing resources distributed across private and hybrid clouds, and also includes support for traditional virtualized environments.

It can help you build a private cloud using existing virtualized infrastructure and deliver self-service infrastructure resources, such as compute, storage, and networking. It provides an advanced virtualization management platform with capabilities such as:

• Monitoring and tracking
• Capacity management and planning
• Resource usage and optimization
• Workload life cycle management
• Policies to govern access and usage

Red Hat CloudForms can also help you build and manage a hybrid cloud from a unified platform, or just provide enhanced management capabilities to existing private cloud environments built using platforms such as Red Hat Enterprise Linux OpenStack. Some of these capabilities include:

• A self-service portal and catalogs
• Controls for managing requests
• Quota enforcement and usage
• Chargeback and cost allocation
• Automated provisioning

It follows an open-hybrid cloud strategy, making it possible to use external technologies such as VMware, Hyper-V, and Amazon Web Services EC2 and run Linux, as well as Windows workloads alike.

The platform provides operational visibility and control across environments in a unified view using capabilities such as:

• Dashboards
• Reports
• Policies
• Alerts
• Approval workflows

**Advantages**

Red Hat CloudForms provides a host of advantages that provide a seamless management experience. Some of the highlights are as follows:

• An easy-to-deploy management appliance available for different virtualization and cloud platforms
• A lightweight web-based interface meant to administer, manage, and operate a private or hybrid cloud
• Directory integration support for control and compliance, which supports existing technologies such as Active Directory, IBM Blue Pages and LDAP
• A multitenant architecture that’s secure and isolated, with each tenant containing its own data and network
• It provides secure and compliant management across infrastructure platforms by using policies
• Scalability
• It ensures high availability through the clustering of hosts and zoning of cloud resources
• Load balancing capabilities through clustering
• The unified management of resources spread across geographical locations
Support for heterogeneous infrastructure and cloud platforms
- Improved automation through services and service catalogs
- A better optimization of resources
- A single tool to manage it all

**Architecture**

The architecture of Red Hat CloudForms consists of a host of features that together form the *adaptive management platform*, which sits on top of the virtualized and cloud infrastructures, providing a unified management experience.

![Architecture Diagram](http://redhat.com/)

**The components of Red Hat CloudForms**

Red Hat CloudForms consists of the CloudForms Management Engine, which is the primary component. This appliance is provided as a secure, high-performance, and preconfigured virtual machine in different formats for different deployment environments, such as **Open Virtualization Format (OVF)** for VMware, **Qcow2** (QEMU Copy On Write) image for Red Hat OpenStack, and **Red Hat Virtual Appliance** for RHEV.
In addition to the CloudForms Management Engine, there are some other components that make up the platform:

- **CloudForms Management Engine Server**: This component is part of the CloudForms Management Engine Appliance and provides secure communication between SmartProxy and the virtual management database.

- **Virtual Management Database**: This collects information about the virtual infrastructure and appliance. It is usually part of the CloudForms Management Engine Appliance, but can be deployed on another machine as well.

- **CloudForms Management Engine Console**: This provides the User Interface (UI) required to view, manage, and control the CloudForms Management Engine Appliance. It uses Web 2.0 mash-ups and web service interfaces for communication.

- **SmartProxy**: This component can either be used as part of the CloudForms Management Engine Appliance or be installed separately on an ESX server. It performs actions on behalf of the CloudForms Management Engine Appliance on data stores. The communication between the appliance and SmartProxy takes place over HTTPS.

## Capabilities

Red Hat CloudForms provides a lot of capabilities which can be broadly categorized into four different feature sets, that build upon one another to provide seamless, unified management of the hybrid cloud infrastructure:

- **Insight**: The insight feature set includes discovery, monitoring, utilization, performance, reporting, analytics, chargeback, and trending, which give operational visibility of the hybrid cloud environment

- **Control**: The control feature set includes security, compliance, alerting, policy-based resource access, and configuration enforcement, which provides control over the hybrid cloud environment

- **Automate**: This feature set contains IT processes, tasks and events, provisioning, workload management, and orchestration

- **Integrate**: This contains features such as systems management, tools and processes, event consoles, **Role-based Administration** (RBA), and web services
Benefits
Red Hat CloudForms provides a host of infrastructure management benefits depending on the use case and implementation, some of which include:

- Flexibility in managing a heterogeneous environment from a single pane of glass
- Lower implementation and acquisition costs
- An open-hybrid cloud strategy
- A single tool to manage it all
- Quicker failover to the cloud
- Increased automation compared to vendor-specific tools
- Continuous optimization of resources

Supported providers
In Red Hat CloudForms, virtualization platforms and private or public cloud platforms are called providers. They are categorized as infrastructure providers and cloud providers.

Infrastructure providers
Infrastructure providers are platforms that provide virtualization capabilities to on-premise/co-located hardware consisting of machines that run a piece of virtualization software. Currently, the following infrastructure providers are supported:

- Red Hat Enterprise Virtualization Manager
- VMware vCenter
- Microsoft SCVMM

Cloud providers
Cloud providers are platforms or vendors that provide private or public cloud infrastructures with scalable computing, storage, and networking capabilities. The following is the list of currently supported cloud providers:

- OpenStack
- Amazon Web Services
Types of provisioning
Provisioning is the process of preparing, creating, or setting up a resource and making it available for use. This resource can be a virtual machine or a server in generic terms.

Red Hat CloudForms can provision virtual machines (also called as instances in the cloud terminology) and hosts (otherwise called servers).

Virtual machines
Virtual machines are provisioned from templates. The provisioning type (or where to provision from) varies from provider to provider.

The provisioning types supported on VMware are:
- NetApp
- VMware
- PXE

The provisioning sources supported on a Red Hat infrastructure are:
- ISO
- PXE
- Native clone

Instances
The term “instance” is used for virtual machines when creating in Amazon EC2 and OpenStack infrastructures. CloudForms uses images to deploy instances that are available from the respective cloud providers.

Hosts
Apart from the automated provisioning of virtual machines or instances, Red Hat CloudForms also supports provisioning of hosts using the Automation Engine server role and a template. The provisioning technologies supported are:
- PXE
- IPMI
- ISO (only from RHEV data stores)
The open source version of Red Hat CloudForms

There is an open source version of CloudForms available, called ManageIQ. Red Hat CloudForms is actually a downstream of this community product, to which Red Hat is a major contributor. More information about ManageIQ can be obtained from http://manageiq.org/.

Summary

In this chapter, we looked into the challenges that system administrators and DevOps personnel face in managing multiple environments spread across traditional virtualization and cloud platforms, and saw that the architecture and components of CloudForms have features that can solve this.

In a nutshell, Red Hat CloudForms is a heterogeneous cloud management platform that solves many operational challenges, not only for cloud infrastructures, but also for virtualized infrastructures from a unified platform. It addresses the capabilities that you should look for and much more.

In the next chapter, we will learn how to install and configure Red Hat CloudForms appliance on an OpenStack environment, access the browser-based user interface, and navigate around.
Where to buy this book

You can buy Hybrid Cloud Management with Red Hat CloudForms from the Packt Publishing website.

Alternatively, you can buy the book from Amazon, BN.com, Computer Manuals and most internet book retailers.

Click here for ordering and shipping details.