RED HAT® CLOUDFORMS™

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TECHNOLOGY DETAIL

ENTERPRISE GRADE MANAGEMENT FOR OPENSTACK

ABSTRACT

To deploy and manage Red Hat® Enterprise Linux® OpenStack® Platform you need the right balance between user control and user autonomy. Red Hat CloudForms provides essential enterprise-level management and automation capabilities not available in OpenStack. In this technical detail, we describe how CloudForms offers you a unified management framework with advanced life cycle management capabilities across infrastructure platforms, such as OpenStack, VMware, Red Hat, Microsoft, and Amazon.

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INTRODUCTION

Hybrid cloud computing service models present significant challenges to enterprise IT processes and staff already faced with the increased complexity and management issues of virtualization. The right balance between the cloud user's control and autonomy is critical to the manageability, scal-ability, and, ultimately, the success of hybrid cloud environments. Achieving and maintaining that balance requires a flexible set of management and automation tools that enable the widest range of self-management activities. These tools must provide policy-based visibility, control, and automa-tion for workload instances across multiple virtualization platforms, OpenStack, and public clouds to effectively manage overall IT capacity and provide effective customer service.

Red Hat® CloudForms fills a crucial management need for Red Hat Enterprise Linux® OpenStack® Platform, offering customers a unified management framework with advanced life cycle manage-ment capabilities not natively available in OpenStack. With CloudForms, enterprises gain a consis-tent set of capabilities across all infrastructure providers, including OpenStack, VMware, Red Hat, Microsoft, and Amazon.

GAIN MANAGEMENT FOR OPENSTACK

For enterprises who want to reap the benefits of using OpenStack, there's a crucial gap to close: Critical management capabilities do not exist and may prevent expanded use, beyond pilot, of this cloud operating platform. Red Hat CloudForms brings a host of life cycle management needs (approval, auto-provisioning, quota, placement/brokering, customization, security, retirement), enhanced operations (performance, capacity, utilization, and compliance to standards, policies, or regulations) and cost allocation (chargeback/showback) to not only Red Hat Enterprise Linux OpenStack Platform, but to any supported virtualization platform and public cloud. The goal is to provide you with comprehensive management capabilities to optimally manage your private or hybrid cloud, regardless of underlying infrastructure platforms.
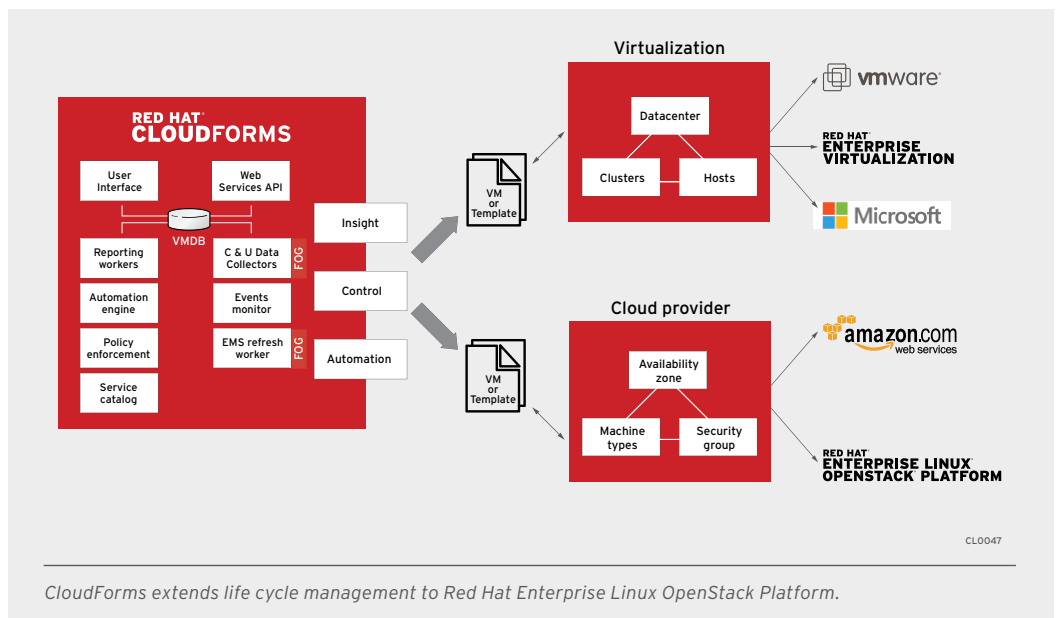
CloudForms extends life cycle management to Red Hat Enterprise Linux OpenStack Platform.

Continued

Cloud workload lifecycle management
Automatically discover, assess, classify, monitor, and track VMs in any state – powered on, off, or suspended – without installing agents. Maintain comprehensive visibility of VM configuration, virtual hardware, performance, utilization, allocation, and event information together with relationship and dependency mapping.

Capacity management and resource utilization
CloudForms provides IT with advanced capacity planning and sophisticated resource management capabilities, including trending and alerting. By combining extensive configuration and change information with operational event data and utilization and performance statistics, the product uniquely addresses both the quantitative and qualitative management requirements needed by enterprises to maximize their infrastructure investments.

SHORTEN EXECUTION TIME WITH CLOUDFORMS

CloudForms reduces the time to spawn and retire OpenStack instances by automating key process steps. Process steps in an enterprise, service provider or cloud consumer would include:

- **Approval**. Approval is an out-of-the-box experience where instances may require approval before spawning. Approval can be multi-dimensional, because CloudForms can apply business rules as well as technical constraints and checks against anything within the environment.

- **Quota management**. Quotas within a virtual infrastructure world are based on CPUs, memory and storage, but within a cloud infrastructure, such as OpenStack, you can choose to base quotas on existing instances provisioned or by flavor.

- **Customization**. Customizations can be automated based upon environmental, business, or technical attributes, which means you can name instances or change their storage if they are dev, test or production.

- **Placement**. CloudForms enables you to spawn instances into availability zones based on any IT or business rule you want to introduce. The following examples help articulate how CloudForms can place workloads:

  - Say you have two availability zones provisioned, isolating compute and networking for resilience. If one zone is dead, CloudForms will recognize it and can spawn instances into the live zone.

  - For a more complex example, imagine that you want to balance workloads across your availability zones by workload type and against the current utilization levels in the availability zones. Your multiple availability zones may be arranged by workload type, with secondary rules that allow for other availability zones to be used in the event your capacity hits a threshold. CloudForms can automate the placement of availability zones and filter those in the environment to the consumer based on role-based access control (RBAC). When a user is offered the choice of availability zone, it is based on their entitlements or even the workload type they have selected to spawn.

- **Security/Compliance**. CloudForms can see if an instance is provisioned into the right zone based on IT-defined tags or other attributes (e.g., dev, test, or production).

- **Retirement**. When an instance is spawned, it is done with the option to be automatically be retired. This includes pre-warning of the impending retirement timeframe to the original user or requester of the instance. CloudForms can also provide an opportunity to extend the retirement, or archive the instance data when being retired.

ENHANCED OPENSTACK OPERATIONS WITH CLOUDFORMS

The standard OpenStack platform lacks operations management; for instance, it doesn't include timelines, relationships, genealogy, and state drift. These features allow for operational staff to quickly resolve issues or problems in the environment. CloudForms fills this gap through better visibility and tracking of the environment.

For example, consider the provisioning of instances into the same availability zone as some Tier 1 workloads that are reporting performance issues. Timeline reporting will show this in addition to alerts. Notifications can be sent to people or external systems showing when thresholds are surpassed. CloudForms can create alerts for instance performance or state; if the state changes (e.g., an instance was terminated unexpectedly), then CloudForms can spawn a new instance. Better

still, if instances are running hot, CloudForms can spawn more instances and deal with all of the post configuration duties—likeupdating the load balancer pools—all in the spirit of maintaining business continuity.

With CloudForms, visibility is not limited to real time. The product stores all the data within its Virtual Machine Database (VMDB) allowing for reporting on a number of different levels. Users can access reports, and RBAC can restrict what they are allowed to see – they can report on their instances, how long they have been around, or how long they have before retirement. Operations staff can report on performance, consumption, and capacity, which allows administrators to see where capacity exists for new projects as well as report on what workloads are the highest consumers, enabling them to tier the support activities accordingly.

COST ALLOCATION/CHARGEBACK WITH CLOUDFORMS

CloudForms introduces the ability to track, trace, and charge for instances. So, whether you are an enterprise who wants to understand the internal cross charges of workloads or you want to charge back to the consumer of your IT service, you have the capability to do both.

For example, because Wordpress requires web server and database server, the database could be a resource utilized elsewhere in the enterprise – it comes with a fixed cost. Or, consider the Amazon way of charging, where you charge based on utilization of the instances. In this case, you can charge for each hour, day, week, or month the instance has been running.

With CloudForms, you can mix the charging as well. With the second example you charge a utilization/running cost but you can also attach a fixed cost, like the first example, that covers spawning and retirement.

The following section provides you a deeper view into the functions and capabilities CloudForms offers to help manage OpenStack as well as your multi-platform private/hybrid cloud.

Red Hat CloudForms management for virtual, private and public cloud platforms
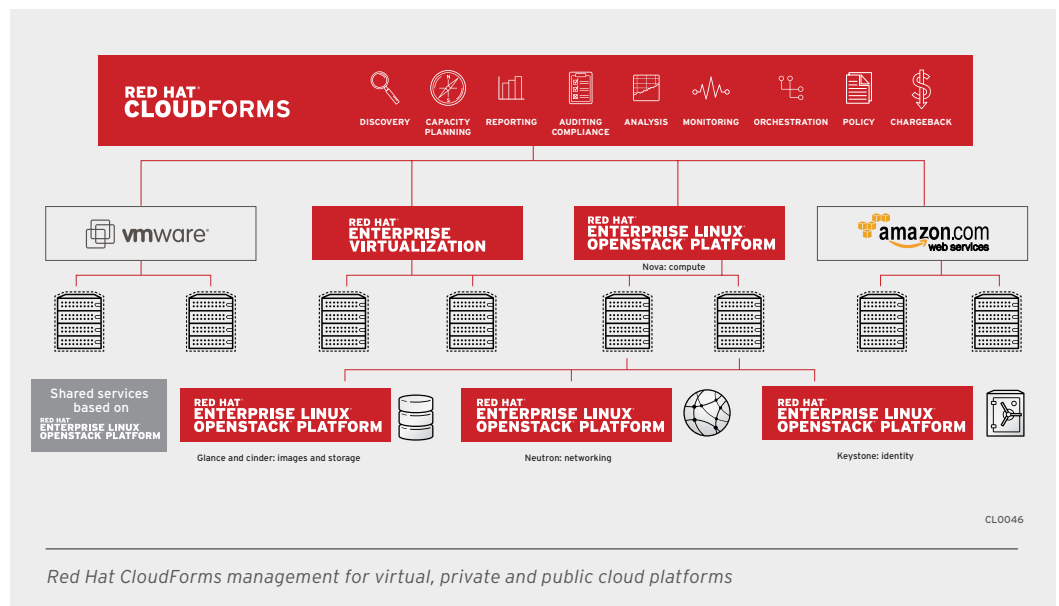
RED HAT CLOUDFORMS ADVANCED CLOUD MANAGEMENT

CloudForms enables organizations to extend existing virtual infrastructures into highly scalable, enterprise clouds. The solution removes the high costs and complexities of cloud infrastructures by delivering key management capabilities in a comprehensive solution.

CloudForms provides enterprises a quick-to-deploy and easy-to-use cloud management solution for rapid time-to-value. The solution provides a single management console and a seamless user experience across multiple virtual and cloud platforms, including VMware vSphere, Red Hat Enterprise Virtualization, Microsoft Hyper-V, Amazon, and Red Hat Enterprise Linux OpenStack Platform.

In addition, CloudForms offers:

- **Expanded management capabilities**, including discovery, performance monitoring, configuration management, policy-based standards enforcement, role-based delegation, infrastructure automation, and self-service provisioning.

- **Federated management** of large and distributed VMware vSphere infrastructures from a single management interface, enabling enterprises to rapidly scale out their VMware Sphere deployments.

- **Streamlined hybrid cloud management and automation** for enterprises running VMware vSphere together with platforms from other vendors, including Microsoft and Red Hat.

- **Installation** as an agent-less virtual appliance that can auto-discover your entire virtual infrastructure within minutes.

CloudForms has the unique ability to interoperate with other management agents and processes, enabling highly automated IT service management for hybrid clouds, private clouds, and virtual infrastructures. Service request, incident, release, change, and configuration management activities can be tightly integrated to provide end-to-end automated service management, including:

- **Seamless self-service portals**, able to run from multiple service catalogs, that provide users with role-delegated, automated self-provisioning via catalog-driven request management for IT services and enterprise service catalog integration.

- **Cloud life cycle management**, from service provisioning to retirement, with automatic aging, tracking, and monitoring.

- **Multi-factor chargeback and cost allocation**, with detailed usage tracking by configurable classifications and support for multiple rates tables, including fixed cost, allocation and usage, and reservation-based chargeback.

- **Continuous discovery and insight**, with automatic, agent-free deep discovery analysis, assessment and tracking of software, accounts, users, groups, patches, services, packages, registry keys, MD5s, and configuration files. Usage and metering information is aggregated into a central VMDB and used for CloudForms policy governance and process automation.

- **Unified operations management portal**, with multi-site federation that offers "single pane of glass" visibility across the entire cloud and virtual infrastructure, including runtime operations, service configuration, utilization, events, reports, and timelines.

- **Operational dashboards**, that let users track resource consumption, audit virtual instances and services, assess compliance, check configurations, and help identify "root cause" of operation problems.

- **Advanced capacity planning**, trending, and best-fit virtual machine and instance placement, which factors in resource availability, policies, and business classifications across time periods, optimizing planning and placement.

- **Reporting with automatic scheduling** and distribution, which includes a rich set of reports, timelines, and charts with detailed information on your virtual and cloud infrastructure so you can see application, network, service, user account, operating system, and snapshot information across your instances.

- **Integration with enterprise IT systems**, like service catalogs, CMDBs, incident, and event management tools.

SELF-SERVICE PROVISIONING AND MANAGEMENT

With CloudForms, enterprise IT organizations can use their virtual and cloud infrastructures to offer shared services where end users can request, provision, deploy, operate, manage, and decommission their own services composed of infrastructure resources. Using a web-based self-management portal that can operate across multiple service catalogs, users can configure approval processes and securely provision and deploy services with enterprise configuration standards enforced. Post-provisioning, users can operate and manage their resources with a portal dashboard offering fine-grained access and control policies, visibility to performance metrics, consumption, chargeback, and compliance along with life cycle management (e.g., reconfiguration, lease extension, retirement, and reporting). At the infrastructure level, CloudForms provides automatic best-fit resource selection to determine where new instances are placed.

GOVERNING, TRACKING, AND COMPLIANCE

CloudForms enables enterprises to deploy and manage private and hybrid clouds with the policy-based control, tracking, and management necessary to mitigate the risks associated with shared infrastructures. CloudForms allows IT organizations to safely and securely delegate self-service provisioning, administration, and operations to users while ensuring their preview is limited by role and service ownership. In addition to support for secure delegation, CloudForms ensures that IT organizations responsible for the private/hybrid cloud infrastructure can enforce compliance with enterprise configuration and security standards. Regardless of rapid workload provisioning, movement, and decommissioning, network zone policies and compliance must be tightly controlled and enforced. CloudForms can also ensure that requests go through appropriate approval processes, are tracked and audited, and that resource allocation, availability, and usage are managed in accordance with service-level agreements. Additionally, quota enforcement enables effective resource management, accurate planning, and forecasting with cost allocation back to the responsible lines of business.

COST ALLOCATION AND CHARGEBACK

With CloudForms, enterprises can create cost transparency and accountability so that business owners and IT administrators can understand the actual cost of the infrastructure required to support business services. In a cloud model, chargeback is complex because it requires detailed information on the utilization of resources in a shared infrastructure. CloudForms has been designed specifically for the cloud implementations. It constantly monitors the actual consumption of server, storage, and network resources and organizes the data by enterprise-specific classifications. Outside of formal chargeback programs, IT organizations implementing clouds often find themselves fighting the perception that "VMs/instances are free." Management has no way of tracking the costs of specific applications. And as the cloud infrastructure grows, it is difficult to assess the reasons

for growth. Even organizations that don't want to implement a formal chargeback program are challenged to understand who is using what part of the infrastructure and which users are driving the growth. In a private/hybrid cloud environment, fine-grained resource utilization and tracking is important to demonstrate the value of the resources being provided to users. Whether formal chargeback or simple showback is being used, it is beneficial to understand who is using the shared resources and the associated costs.

CLOUD VM LIFE CYCLE MANAGEMENT

CloudForms provides the ability to manage cloud instances across their life cycle, from provisioning or conversion (P2V/V2V) through operations and eventually to retirement. Managing and tracking instances from discovery and creation through retirement is essential to avoiding sprawl and keeping the cloud's environment well-managed and optimized. CloudForms automatically discovers, assesses, classifies, monitors, and tracks instances in any state – powered on, off, or suspended – without installing any agents. The product maintains comprehensive visibility of instance configuration, virtual hardware, performance, event, utilization, allocation, and event information together with relationship and dependency mapping.

CAPACITY MANAGEMENT AND RESOURCE UTILIZATION

Measuring utilization in a cloud model is impossible with traditional management tools and requires new technologies and approaches. Significant management complexity is introduced by the layer of abstraction that accompanies clusters and resource pools and hosts obscure visibility. New capabilities such as resource reservations, DRS, and high availability create fluidity and introduce even more complexity. While resource utilization data in a cloud infrastructure can be obtained using new, virtual-aware techniques, this data alone is insufficient to manage, optimize, and plan across the private/hybrid cloud infrastructure. Quantitative and qualitative capacity and utilization data is necessary to assess server utilization levels and demands, SAN utilization, instance allocations and utilization levels, instance performance, and compliance to standards.

CloudForms provides IT administrators and managers with advanced capacity planning and sophisticated resource management capabilities, including trending and alerting. By combining extensive configuration and change information—and operational event data with utilization and performance statistics—the product uniquely addresses both the quantitative and qualitative management requirements needed by enterprises to get the most out of their infrastructure investments.

REPORTING, ANALYTICS, AND DASHSBOARD VISUALIZATION

Reporting

CloudForms provides a rich set of reports that include timelines, charts, and out-of-the-box reports. Operations reports look at free space on registered and unregistered VMs to see power states for VMs, and to see which offline VMs have snapshots or have never been analyzed. Customizable, role-based views ensure that users only see the information that is appropriate for their roles and access privileges in reporting and visualization. Fine-grained, automatic, policy based classification makes certain that as the environment changes in real-time, the access rights and views are always correct. All reports can be scheduled to occur once or on a periodic basis so that you can see data for a certain point of time. Once a report is created, it can be exported to standard formats such as PDF, CSV, or TXT for further analysis.

Using CloudForms, you can view and customize reports to be used and viewed in multiple formats. In addition to the provided reports, you can also create your own reports customized precisely to your environment by editing one of the current reports or using the report builder functionality to create one with your own set of specifications, using information stored in the virtual management database. The reports are role-based to guarantee that users only see information that is appropriate for their roles and access privileges. Finally, the information collected in reports can be used with CloudForms policies to control and automate operations in your virtual infrastructure.

Analytics

CloudForms provides organizations with rich insight into their virtual infrastructure configurations, capacity, and usage. Automated summarization of key capacity data, along with utilization trend analysis allows users to quickly identify current and future bottlenecks in the environment. Using the product's categorization capabilities enables users to get a precise understanding of the allocation and usage of the virtual environment. Correlating usage information and configuration events provides a unique and extremely efficient approach to understanding how configuration changes are impacting the global virtual infrastructure.

Dashboard visualization

CloudForms provides powerful visualization capabilities and a rich, graphical experience. It supports dashboard mashups of cloud information such as VM discovery, security, policy, and usage information combined with external sources of information such as RSS feeds. This provides role-based views with a high degree of customization. The virtual timeline supports a user-friendly, time-based presentation of infrastructure events, including configuration events and discovery, operations events such as start and stop, and policy events. This view of events lets administrators, operators, and users see events in a temporal context by showing what was happening to a particular VM or cluster during a specific interval. Virtual thumbnails create an intuitive visual representation of information associated with the virtual infrastructure and virtual machines, including status, life cycle stage, and level of policy compliance.

CONCLUSION

Achieving and maintaining a balance of control and autonomy in cloud computing service models presents significant challenges for current IT processes and for IT staff already tasked with managing dense virtual infrastructures. Finding that balance requires new, flexible management and automation tools. CloudForms has unique management and automation capabilities, and interoperates with other management agents and processes to enable highly automated IT service management for hybrid and private clouds as well as virtual infrastructures.

ABOUT RED HAT

Red Hat is the world's leading provider of open source solutions, using a community-powered approach to provide reliable and high-performing cloud, virtualization, storage, Linux, and middleware technologies. Red Hat also offers award-winning support, training, and consulting services. Red Hat is an S&P company with more than 70 offices spanning the globe, empowering its customers' businesses.

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