BUILD YOUR PRIVATE CLOUD TODAY
Increase your business agility with hybrid IT

Gordon Haff

EXECUTIVE SUMMARY

IT organizations are increasingly becoming brokers of services sourced from a variety of providers, including public clouds. At the same time, however, those same organizations are expected to maintain the policy-based controls expected of enterprise IT shops.

To meet these and other requirements, many IT organizations are using private cloud architectures that operate as part of a broader set of IT infrastructures and services.

This whitepaper focuses on the ongoing shift to hybrid IT services and the ways in which private clouds can facilitate this transition. It details the distinction between cloud infrastructure (such as OpenStack) and the management and orchestration of that infrastructure, including provisioning, monitoring, and maintaining content and configuration compliance. Specifically, it describes the requirement for and definition of a cloud management platform and application lifecycle management above and beyond what's provided by the cloud infrastructure layer.

Red Hat's portfolio of cloud products provides the capabilities needed to build such a private cloud today, whether or not your workloads are fully cloud-enabled or whether you have an immediate requirement to span management across public cloud infrastructures. In this paper, we specifically focus on building infrastructure for cloud-enabled workloads using Red Hat® Enterprise Linux® OpenStack® Platform, managing heterogeneous infrastructure using Red Hat CloudForms, and managing applications using Red Hat Satellite.[1]

Taking such an approach to your IT deployments and operations will allow you to do much more than streamline your IT and improve your productivity. It will create a bridge to greater business agility and, ultimately, value. It will position you to draw from innovation and new technologies wherever they happen in an increasingly hybrid and connected world.

> "In 2014, organizations will face increasing pressure to support greater business agility, increase service availability and improve efficiency. Decisions regarding private cloud management, data center modernization and desktop transformation will dominate 2014 data center planning and operations."
>
> **GARTNER, INC**
> 2014 PLANNING GUIDE FOR PRIVATE CLOUD, DATA CENTER MODERNIZATION AND DESKTOP TRANSFORMATION
> 03 OCTOBER 2013

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1 *In other words, this paper focuses on Infrastructure-as-a-Service (IaaS) and the management of IaaS. This infrastructure can also serve as the foundation for an enterprise Platform-as-a-Service (PaaS) such as OpenShift by Red Hat.*

INTRODUCTION

Hybrid cloud management is the essential ingredient for building and operating flexible clouds that span existing and new infrastructures, traditional and cloud-enabled workloads, public clouds, and multiple on-premise virtualization platforms. It lets IT organizations transcend the products and technology roadmaps of any single vendor and keep their strategic options open — without increasing complexity, security risks, or introducing new management silos. Furthermore, by complementing a cloud management platform with application lifecycle management, IT organizations can maintain visibility into, and policy-based control over, their applications in addition to their resources at the infrastructure level.

But hybrid cloud management isn't just about a future vision in which IT resources and services are sourced from everywhere, while being centrally controlled.[2] It's also a great starting point for building private clouds today that support the multi-vendor virtualization infrastructures, which are increasingly the norm, while extending them with monitoring, provisioning, and policy. Private clouds, after all, are about more than simply extending a particular virtualization platform. They require a comprehensive architectural approach that abstracts a variety of computing resources and provides controlled self-service access to them.

In short, hybrid cloud management lets you build a private cloud today that's ready for tomorrow.

PRIVATE CLOUD CATEGORIES

It's a common source of confusion when products and technologies addressing different needs and serving different (albeit sometimes partly overlapping) purposes get lumped together under a single category. In the case of products related to private and hybrid Infrastructure-as-a-Service (IaaS) clouds, it's useful to think of three categories rather than considering them all to be just different varieties of the same thing.

CLOUD INFRASTRUCTURE

The underlying infrastructure used for a private cloud will vary based on a number of factors, including the nature of the workloads to be supported and existing virtualization investments. For example, traditional, stateful enterprise workloads tend to line up well with the features and capabilities of enterprise virtualization products. On the other hand, perhaps unsurprisingly, stateless and loosely coupled cloud-style workloads match the feature sets being built into new IaaS cloud products. Different application design patterns. Different infrastructure. (Which is yet another reason why even private clouds will often be heterogeneous and hybrid.)

A private cloud consists of three categories:

1. Cloud infrastructure
2. A cloud management platform
3. Application lifecycle management

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2 *Although that hybrid "future" is rapidly becoming today's reality. For example, Forrester Research , Inc. analyst James Staten wrote in a May 2013 blog post that "I've noticed a bit of a disturbing pattern of late in my cloud discussions with clients. They have been talking about hybrid cloud in the future tense. If you are planning for hybrid down the road, I have a wake up call for you. Too late, you are already hybrid. " "Hybrid Cloud Future? Too Late!"*
http://blogs.forrester.com/james_staten/13-05-16-hybrid_cloud_future_too_late

Cloud infrastructure, such as OpenStack, often provides virtual infrastructure and the associated virtualization management. It also allows resource pools to be created from the underlying virtual infrastructure using hooks into virtualization management to do so. Thus, you can have pools of compute, pools of networking, and pools of various types of storage that can be allocated to users through a self-service interface. Self-service access and dynamic resource pools are the features that most clearly distinguish an IaaS from a more traditional enterprise virtualization platform.

Typically, an IaaS often has additional features such as identity and access management, an image repository, and a dashboard for basic monitoring and management. These features, collectively, make it possible to use an IaaS as a standalone cloud platform—augmented by whatever scripts and operational tooling a cloud provider puts in place. You can think of these as public cloud or public-cloud-like use cases. However, enterprises will typically complement an IaaS platform with additional software both to provide hybrid cloud management and orchestration and to manage the applications running within the cloud.

CLOUD MANAGEMENT PLATFORM

There are probably as many detailed cloud management platform (CMP) definitions and feature lists as there are analysts and consultants writing about this segment of the market.[3] However, typical definitions include functions like self-service access under policy-based control, metering and billing, intelligent workload placement, system image provisioning, capacity planning, governance, and lifecycle management—while recognizing that different products have different levels of capabilities today and that the bar will likely be raised over time. For this whitepaper, we're going to focus on three aspects of a CMP that are of particular importance to enterprises.

1. **Provides unified management and resource pooling across hybrid infrastructure.** Even if a given organization isn't using public cloud resources (yet), they are already hybrid in the sense of operating multiple infrastructure platforms, such as for virtualization, that a cloud management platform can help to unify under a single management interface. Doing so is key to building a private cloud that can take advantage of existing IT investments. Unified management also gives IT shops a consolidated view of geographically distributed virtualized resources for allocation, capacity planning, and chargeback purposes.
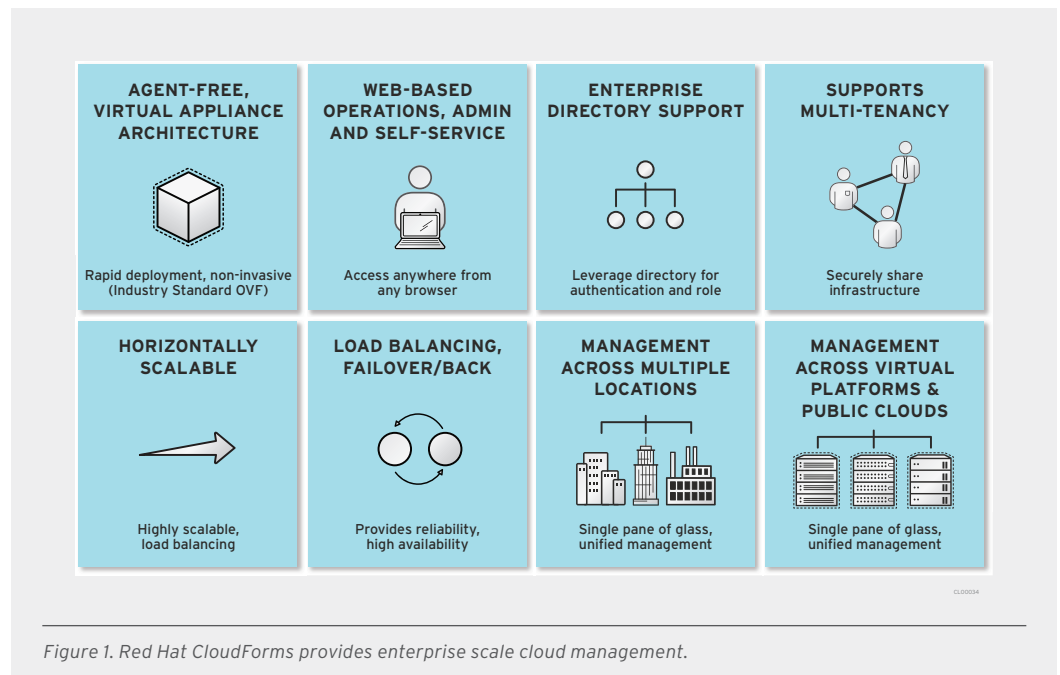
2. **Enables delegated administration and self-service for users under granular policy control.** Provide a public cloud experience for users under IT governance. That's the one sentence storyline underlying what organizations are trying to accomplish when they build a private cloud. They're trying to meet the needs of users who are using public clouds because that's where the users can get access to computing resources in minutes rather than the weeks common to traditional IT procurement. (And a private cloud project that doesn't match the public cloud user experience might as well be shut down.) A CMP is the way to deliver that user experience in the context of IT control over access, quotas, and standardization.

"If you think a private cloud is just another name for virtualization automation, think again. The business sees value from cloud services that deliver agility, autonomy, and pay-per-use economics. If your private cloud doesn't deliver this, the business will look elsewhere to get this value, even going so far as to build its own."

FORRESTER RESEARCH, INC.
THE RISE OF THE NEW CLOUD ADMIN
FEB. 21, 2013

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3 *The CMP term comes from the Gartner IT Glossary (www.gartner.com/it-glossary). However, many analysts have identified a product class in the same vein.*

3. **Orchestrates and monitors workloads across resource pools.** A CMP provides control over many aspects of workload deployment and ongoing operation. This is needed, not only to make efficient use of the underlying infrastructure, but to ensure ongoing adherence to SLAs – which can be complex and multi-faceted in the case of an enterprise software portfolio. And although relatively few organizations are implementing full chargeback pricing models at this point, an increasing number are starting to at least implement some form of showback as they shift toward a more services-centric view of IT application delivery.

AGENT-FREE, VIRTUAL APPLIANCE ARCHITECTURE	WEB-BASED OPERATIONS, ADMIN AND SELF-SERVICE	ENTERPRISE DIRECTORY SUPPORT	SUPPORTS MULTI-TENANCY
Rapid deployment, non-invasive (Industry Standard OVF)	Access anywhere from any browser	Leverage directory for authentication and role	Securely share infrastructure
HORIZONTALLY SCALABLE	**LOAD BALANCING, FAILOVER/BACK**	**MANAGEMENT ACROSS MULTIPLE LOCATIONS**	**MANAGEMENT ACROSS VIRTUAL PLATFORMS & PUBLIC CLOUDS**
Highly scalable, load balancing	Provides reliability, high availability	Single pane of glass, unified management	Single pane of glass, unified management

Figure 1. Red Hat CloudForms provides enterprise scale cloud management.

APPLICATION LIFECYCLE MANAGEMENT

While an operating system such as Linux includes a variety of features and tools that make general management relatively easy, these tools mostly focus on managing a single system – or a few at most. For organizations that are attempting to manage dozens or hundreds of systems, manual management approaches quickly become unworkable.

By contrast, an application lifecycle management product can operationally manage large numbers of running systems across physical, virtual, and cloud environments. Red Hat Satellite provides continuous compliance of content and configurations (as well as entitlements for many Red Hat products) consistent with the application definitions. The product also supplies the content needed for quickly building and deploying images. Without application lifecycle management, it would be difficult to achieve the levels of automation and standardization that are essential characteristics of any at-scale cloud deployment.

THE SHIFT TO HYBRID

In the prior section, we mentioned hybrid in the context of a heterogeneous IT infrastructure. One of the ways in which enterprises most starkly differ from cloud service providers is that they run a much more varied set of hardware and software. New platforms get added while existing systems aren't necessarily retired. This is the reality of enterprise IT. Hybrid is broader than that though.

Hybrid is also about sourcing external computing resources (e.g., from a public cloud provider) when it makes sense to do so. Doing so may be justified by purely economic reasons; the scale of an external provider may allow it to offer certain resources, such as storage, less expensively than they can be built and managed internally. Or an organization may decide to use an external provider primarily for workloads with highly variable capacity needs or that only run some of the time. "Own the Base and Rent the Peak" is a common expression for this approach. Or, less commonly, an organization may simply decide that operating computing infrastructure isn't a core competency and should therefore be outsourced in some manner.

Whatever the details though, the clear trend is toward a more hybrid computing infrastructure that is sourced from multiple providers depending upon the needs of a given project and workload. In fact, it's most accurate to think of the modern IT organization as procuring, building, and aggregating services for business users rather than being primarily a maintainer of computing infrastructure. Given that it will almost invariably include a variety of cloud-based applications (a.k.a. Software-as-a-Service (SaaS)), the management of this diverse service supply chain goes beyond infrastructure cloud management as we've covered here. But hybrid cloud management will certainly need to be part of the mix for any organization that's making use of IaaS—whether internal or external—and whether or not they extend that infrastructure with a PaaS for developing applications.

THE RED HAT APPROACH

Red Hat's cloud infrastructure and management portfolio aligns with the capabilities needed to build a private cloud today.

Red Hat Enterprise Linux OpenStack Platform combines the power of Red Hat Enterprise Linux with the OpenStack cloud platform to deliver a secure and scalable foundation for building a private or public cloud.

OpenStack is one of the fastest growing open source cloud community projects, bringing together developers, users, and technology companies with the goal of producing a standard cloud comput-ing platform for all types of public and private clouds. The resulting software consists of multiple interoperable projects that provide the basic service foundation for cloud computing. OpenStack depends on Linux to provide the operating environment for OpenStack components. Red Hat is a platinum member of the OpenStack Foundation and, just as we do for our Linux, middleware, storage, and virtualization offerings, we develop in the upstream OpenStack project. Doing so is the best way to maximize the innovation that comes from the open source development model.

Red Hat CloudForms is Red Hat's cloud management platform. It supports web-based access to service catalogs with role-delegated automated provisioning, quota enforcement, and chargeback across vir-tualization and cloud platforms, including Red Hat Enterprise Virtualization, Red Hat Enterprise Linux OpenStack Platform, VMware vSphere, Microsoft Hyper-V, and Amazon Web Services. It supports complex policy-based task and resource orchestration and automation to help ensure service availability and performance.

You can simulate allocation of resources for what-if planning and continuous insights into con-sumption levels to allow chargeback, showback, and proactive planning and policy creation. There's unified monitoring, management, and automation across on-premise platforms like OpenStack as well as public clouds. You also get control over workload resources, configurations, capacity, and usage levels, with event timelines, and change and drift tracking to help IT maintain control of applications and infrastructure capacity.

Red Hat Enterprise Linux OpenStack Platform and Red Hat CloudForms are available either individu-ally or as part of Red Hat Cloud Infrastructure, a single integrated product that also includes Red Hat Enterprise Virtualization.

Application lifecycle management is provided through Red Hat Satellite, an easy-to-use advanced system management platform for your Linux infrastructure. Red Hat Satellite provides simple tools to provision new systems, manage their updates and configuration changes, and monitor system performance. These capabilities allow for scaling the management of cloud environments, giving system administrators more power and freedom to manage their ever-growing infrastructures. Furthermore, these capabilities enable the automation of standard operating environments on which cloud flexibility and dynamism depends.

Other aspects of Red Hat's cloud portfolio are beyond the scope of this paper. For example, OpenShift Enterprise by Red Hat can use the infrastructure and management elements discussed here as a foundation for organizations building a PaaS. Red Hat also makes it simple to consume products such as Red Hat Enterprise Linux in public clouds through our Certified Cloud Provider Program. It's a portfolio that spans many aspects of cloud computing but one that, at the same time, doesn't tie you into a single monolithic product or vendor's approach.

CONCLUSION

In a sense, the large public cloud providers set a new benchmark for IT organizations. They demonstrate the levels of efficiency, speed of deployments, and user engagement that standardization, modern open source software, and operational best practices make possible. However, those public cloud providers also operate under a vastly different set of constraints from most enterprise IT shops. This isn't a statement on public cloud safety or security. Rather, it's an observation about the realities of enterprise risk mitigation, existing investments, and the desire to optimize for core applications.

This is not to suggest that lessons from cloud providers never apply to enterprises. Even before cloud computing came fully onto the scene, forward-looking IT organizations were discovering the value of standardizing on modern x86 and Linux infrastructures and adopting standard operating environments to take many of the one-off manual tasks out of systems management.

Today, we're at the stage of that advance. The same tools that will make it possible to extend policy-based controls and management over hybrid IT also enable building and operating private clouds today. They do so by giving users the self-service public cloud experience while enabling administrators to maintain visibility into and control over how their systems are used. And in so doing, they start IT down the path to becoming a broker of services in support of the business.

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.