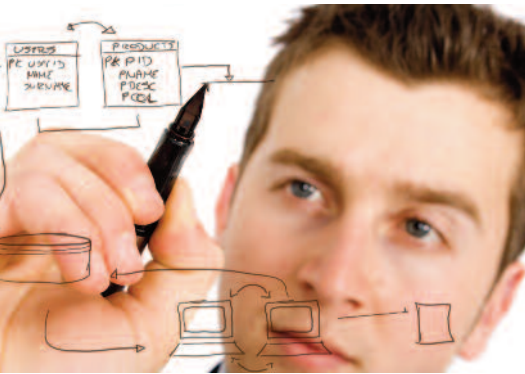


The Private Cloud Revolution

Meeting the challenge of provisioning software development and testing computers



Introduction

Developing and testing mission-critical applications has never been an effortless undertaking. In recent years, however, deploying scalable and secure solutions has become even more complex. The result: developers and quality assurance professionals have been hard-pressed to keep up, and increasingly turn to unorthodox, unsafe procedures to get their jobs done. Fortunately, virtualization paired with private clouds offers a way out of this predicament.

In this article, which is intended for anyone running an IT organization or tasked with developing or testing software, we'll enumerate some of the challenges faced during these processes, along with some of the expensive and insecure workarounds that have been employed to surmount these obstacles. We'll then explain how self-service, private cloud-based solutions from Eucalyptus can streamline operations, reduce both cost and risk, and most importantly: help developers and testers perform their daily responsibilities more effectively.

Barriers to Efficient Software Development and Testing

Software development and testing professionals are burdened by reduced budgets that have failed to keep up with their workload, shortened schedules driven by new paradigms such as agile development, and a general philosophy of 'do more with less'. These pressures are found everywhere, but are particularly prevalent in large enterprises and governmental organizations, where distributed teams combined with globalized outsourcing further complicate the picture. To make matters worse, modern software environments are multifaceted, and feature many intricate components. These include various flavors of operating systems like Linux, Windows, and Mac OS, development environments such as Eclipse and Visual Studio, numerous types of databases including Oracle, SQL Server, and PostgreSQL, collections of integrated technologies such as LAMP (Linux, Apache, MySQL, and PHP), and a variety of assorted application servers, Web servers, and other middleware.

All of these factors have coalesced to make provisioning software development and testing computers more difficult than ever before. Yet despite these headaches, these processes are carried out using many of the same methods as they have for decades. For example, functional and load testing are both crucial prior to placing an application or Web service into production. To accurately test these solutions it's essential to replicate the configurations that will be found in production.

To support their efforts, developers and testers look to IT to provide and configure these environments. Sadly, these solicitations are often unfulfilled, for a variety of reasons including IT backlog, lack of budget, organizational policies, or the sheer complexity of the requested configurations. Even in those cases where IT is able to provide the desired formation, it's often too late. Failing to adequately support the software creation and testing processes is painful to the entire organization. Applications don't ship on time, or contain numerous errors. Correcting these problems and delays can be costly, and degrade the enterprise's ability to quickly respond to competitors and market realities.

Faced with these impediments, developers and testers must either find a way to work around them and thus satisfy their job responsibilities, or miss their deadlines and suffer the consequences. As we've seen with the rapid adoption of Software as a Service (SaaS), Cloud Computing is a well-proven technique for surmounting internal barriers. This trend has now extended to software developers and testers.

In numerous instances, they use their own credit card to create an Amazon Web Services account. This gives them access to as many offsite virtual machines as they're willing to pay for. Once the account is set up, the next step is to upload, install, and configure any necessary supporting software components, followed by internally-developed software and test data. In fact, it's becoming more common for developers to write their applications on these public cloud-hosted computers.

While this workaround demonstrates dedication to getting the job done and helps expedite the process of preparing software for production, there are many risks to following this approach. These include loss of control for the organization, software licensing issues (including potential liability), and unexpected costs. In addition, there is significant exposure related to storing intellectual property and sensitive test data offsite.

Fortunately, two separate, yet inter-related technologies have arisen to address the needs of enterprises seeking to resist the move towards uncontrollable public cloud adoption.

Self-service Provisioning with Eucalyptus Enterprise Edition

Virtualization and private clouds are two complementary techniques that offer a better way to manage essential software development and testing tasks without introducing the risks inherent in using the public cloud. First, virtualization makes better use of scarce physical resources such as computers and storage systems. Administrators are free to configure the machine images to exactly match the requirements for the job at hand. These images may then be reused as often as needed. However, virtualization by itself isn't enough: if IT is unable to provide sufficiently rapid turnaround, developers and testers will continue to use the public cloud to meet their needs.

Fortunately, private clouds augment virtualization to deliver the same benefits of public clouds while remaining within the enterprise's control. This reduces risk and helps manage cost. As an added benefit, as

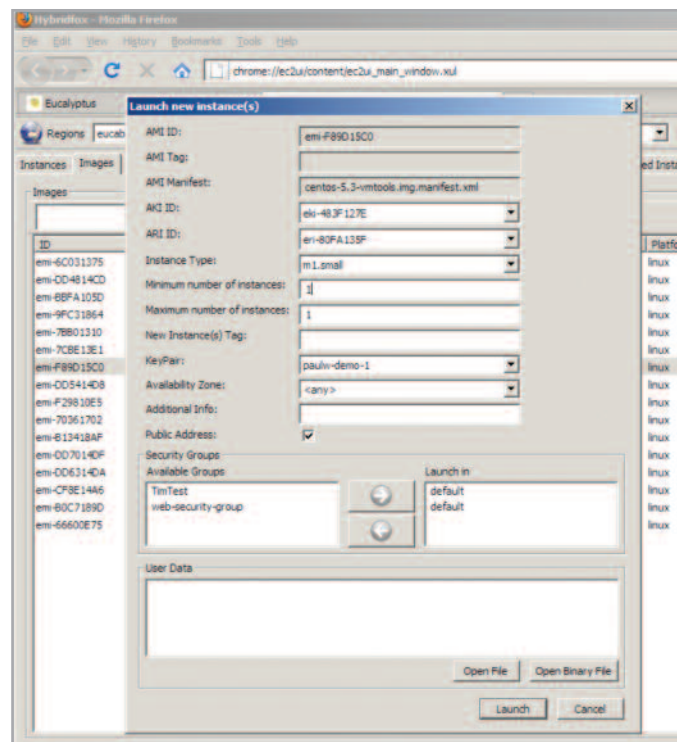


Figure 1: Launching a new private cloud instance with HybridFox

"We are using Eucalyptus for development across multiple, cross-domain availability zones between the PDC Center for High Performance Computing and the Swedish Institute of Computer Science. We looked at other private cloud software and chose Eucalyptus because of its efficient, modularized architecture and open source approach. With Eucalyptus, our team has been able to increase its efficiency and productivity, and we look forward to expanding with another cross-country availability zone with Germany in the near future."

Åke Edlund, PhD
KTH-SICS Cloud Innovation Center,
Swedish Royal Institute of Technology
www.kth.se

long as a standards-based private cloud has been chosen, administrators are free to extend their virtualized environment into the public cloud. As we'll see in the next section, Eucalyptus-based private clouds let management equip their teams with the proper tools to do their jobs more securely and cost-effectively than using ad-hoc procedures.

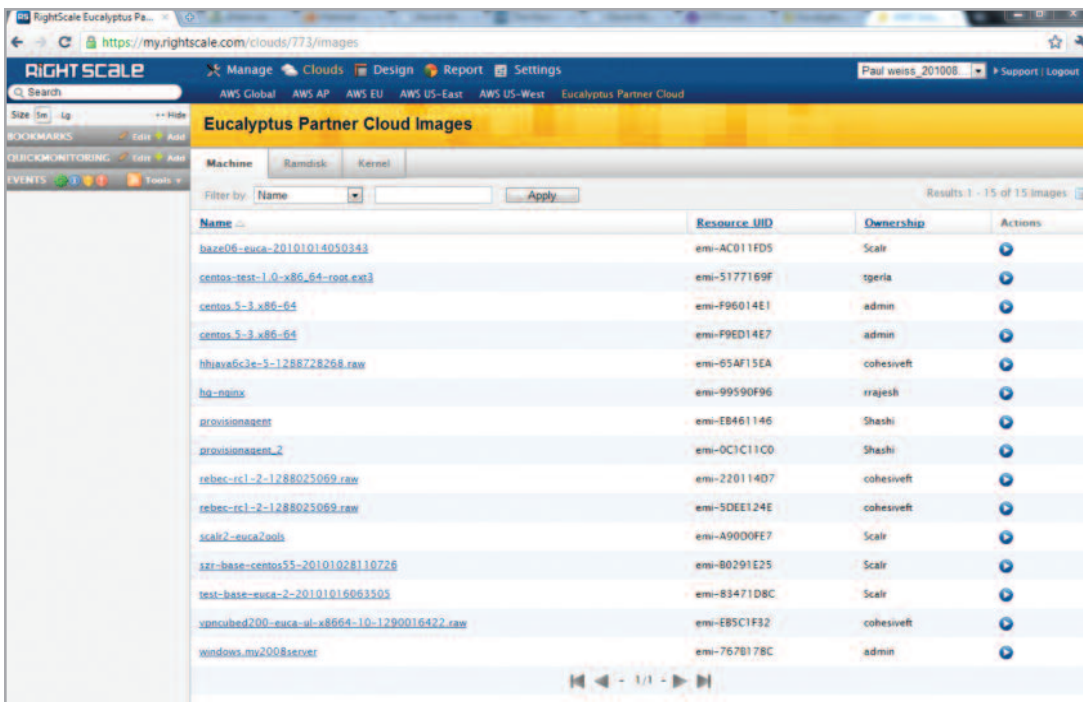


Figure 2: Viewing private cloud instances with RightScale

Eucalyptus is the most popular open source private cloud software, relied on by organizations in industries as varied as government, high tech, and media/entertainment. It uses existing IT resources without needing any modifications, special hardware, or other costly and time-consuming alterations. To maximize portability, it works with hypervisors from all major virtualization platforms, including Xen, KVM, vSphere, and ESX/ESXi.

To further enhance interoperability, Eucalyptus automatically converts virtual machine images to different hypervisors including Amazon’s Elastic Compute Cloud (EC2). Storage technologies such as iSCSI, Storage Area Networks (SAN), and Network Attached Storage (NAS) are all capable of being managed from within the Eucalyptus private cloud. In keeping with the theme of flexibility combined with proper security, administrators are able to assign fine-grained control over key resources, at the user, group, and role levels.

Given Eucalyptus’ commitment to standards-based cloud computing, it’s not surprising that a vibrant ecosystem has arisen. Dozens of diverse partners such as Dell, Cloudberry, F5 Networks, GigaSpaces, and RightScale all provide products and services designed to streamline the cloud-based software development and testing process. For example, figure 1 illustrates the HybridFox Firefox plugin, which lets users easily launch a Eucalyptus virtual machine. Figure 2 showcases the how the RightScale cloud management platform interacts with Eucalyptus virtual machines.

You can learn more about the Eucalyptus partner ecosystem at www.eucalyptus.com/partners

By offering an internally-maintained virtualized development and test environment using Eucalyptus, enterprises benefit in the following ways.

- **Rapid provisioning.** Virtual machines can be launched immediately and then shut down when no longer needed. For example, a developer may wish to conduct an immediate test of a small application logic update. Using the self-service Web portal, it’s easy to quickly launch a virtual machine, perform the test, and then resume development.
- **Cost-control.** In contrast with ad-hoc, employee-generated public cloud instances, internally-managed virtualized resources incur predictable expenses.
- **Policy compliance.** Since the resources provided in a private cloud are under IT control, organizational policies can be enforced.
- **Portability.** Because Eucalyptus is compatible with Amazon Web Services, it’s easy to move external virtual machines to the internal private cloud, and vice-versa.
- **Intellectual property protection.** Proprietary application logic and sensitive test data remain within the firewall.

- **Efficient resource utilization.** During development and testing, tasks and workloads are highly variable and unpredictable. By using a private cloud, resources are pooled instead of being tied to a single developer. This makes them available for whoever needs them, rather than being dedicated to an individual who may not need them at the time.
- **Support for internal and external personnel.** As we saw earlier, development and test teams are often comprised of employees and outsourced resources. Private clouds are able to seamlessly serve both of these constituencies.
- **Scalability.** In circumstances where there aren't enough internal compute or storage resources, authorized IT administrators are able to extend the internal Eucalyptus cloud to Amazon Web Services, thereby offering nearly limitless resources to their users.
- **Reuse.** As we described earlier, modern software provisioning environments are made up of numerous complex components. By standardizing on a private cloud, these environments can be configured once and then repeatedly reused.

Conclusion

While forecasts of technology industry futures are notoriously inaccurate, one thing is certain: the job of developing and testing software applications will continue to increase in complexity, especially when it comes to provisioning realistic environments for building and testing these solutions.

The tandem of virtualization and private clouds offer a better, more scalable way to carry out these important responsibilities. However, to fully realize these benefits, it's essential that the selected offering follow well-adopted standards, leverage internal resources, and make the most of the Amazon Web Services ecosystem.

To learn more about Eucalyptus, download the free open source version and sign up for a trial of Eucalyptus Enterprise Edition 2.0, visit www.eucalyptus.com.

EUCALYPTUS FEATURE COMPARISON

	OPEN SOURCE	ENTERPRISE EDITION
Amazon AWS Interface Compatibility	■	■
Flexible Clustering and Availability Zones	■	■
Network Management, Security Groups, Traffic Isolation	■	■
Cloud Semantics and Self-Service Capability	■	■
Bucket-Based Storage Abstraction (S3-Compatible)	■	■
Block-Based Storage Abstraction (EBS-Compatible)	■	■
Xen and KVM Hypervisor Support	■	■
VMware Hypervisor Support		■
Virtual-to-Virtual Image Conversion for VMware		■
Microsoft Windows Guest Support		■
Direct SAN Integration		■
Quota Management and Accounting		■
User Group and Role-Based Access Management		■
Scalable MySQL Database Backend		■

About Eucalyptus Systems

Eucalyptus Systems develops enterprise-grade technology solutions built on the open source Eucalyptus software for private and hybrid cloud computing. Originally developed as part of an academic research project, Eucalyptus technology is quickly becoming the standard for on-premise cloud computing, delivering the cost efficiencies and scalability of cloud architecture with the security and control of deploying on an organization's own IT infrastructure. Eucalyptus Systems' mission is to support the open source Eucalyptus platform and to deliver private and hybrid cloud computing solutions for large-scale enterprise deployments.

