IDC TECHNOLOGY SPOTLIGHT

The Benefits and Significance of Private Platform as a Service

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Enterprises are attracted to gaining the same type of development capability being enjoyed by born-on-the-Web companies. Platform as a service (PaaS) promises to deliver similar benefits to enterprises. The dynamics of the PaaS market indicate that hybrid models provide the most flexibility where the private and public PaaS components are the same or have been specifically designed to work together. Vendors that support hybrid models will be the most successful because they provide an enterprise with the most flexibility. In addition, it is noted that open source platforms and open standards are very effective at eliminating enterprise concerns over lock-in. This Technology Spotlight explores these trends and the role that Red Hat's OpenShift Enterprise plays in addressing the challenges associated with these trends.

Introduction

Enterprise IT departments have been perpetually burdened with functionality requests from business units. Businesses increasingly have to respond to disruptive threats from start-ups that build solutions with nimble cloud technology. As a result, enterprises are looking for agile solutions on a limited budget, and PaaS solutions promise to fit the need.

Reducing the backlog of requests requires availability of a number of tools for the IT department. Improving deployment speed requires a series of capabilities and a fresh approach to manage the application development life cycle. Businesses quickly leverage solutions delivered by the software-as-a-service (SaaS) model, and integration tools play a crucial role in connecting public offerings with legacy applications. When entire processes have to be changed, business process management platforms fit the bill. With the deluge of data, data-centric application platforms deliver data services enabling a variety of new solutions. Combined as platform services, they hold the promise of solving a perennial IT problem.

Platforms give developers the services necessary for processes associated with life-cycle data management and integration. In addition, abstraction of infrastructure provides services for access, security, application hosting, session management, load balancing, scalability, and manageability. Whether PaaS is deployed in a public or private cloud environment, fundamental customer expectations of the technology remain the same.

Platform-as-a-Service Market Trends

Vendor response to PaaS has been overwhelmingly positive. Nearly every leading application development and deployment (AD&D) software vendor has a public PaaS in the market. Private PaaS has taken a back seat to public PaaS because the design point for private PaaS is more demanding. This may sound counterintuitive, but delivering configuration-based deployment, scalability, multitenancy, and manageability into a private cloud environment with the same user experience as public PaaS is extremely challenging. In a public PaaS, users are shielded from how the vendor maintains the PaaS environment and its underlying infrastructural resources, which are abstracted away.

In a public cloud, as long as customers are being given reliable services within stated service-level agreements (SLAs), they are largely indifferent to what the service provider must do behind the scenes to deliver these services. However, in a private cloud, the presumption is that the PaaS services running on a virtualized infrastructure will be essentially self-managing, much like the experience in the public cloud. Most vendors simply have not had the time to retool enough to evolve their products to this state.

Many major cloud providers have no stated intent to provide their PaaS platform on a private cloud. This seems to fly in the face of IDC survey data that suggests that much of the IT in large enterprises will not migrate applications to the public cloud either because of their legacy status or because their mission-critical characteristics mean that enterprises cannot afford to entrust any aspect of these capabilities to anyone else.

Leading infrastructure-as-a-service (IaaS) providers do provide virtual private clouds and virtual private networks (VPNs) that attempt to bridge the gap by providing higher levels of hardware and network isolation. However, one major service provider correctly points out that the scale at which it and other leading public platform vendors operate can be achieved only by highly optimizing the underlying infrastructure and providing security well beyond what is typically found in an enterprise datacenter. For this reason, some public clouds will eventually provide numerous benefits related to scalability, high availability, disaster recovery, and security that no private cloud will be able to match. However, in the short run, concerns related to security, data sovereignty, governance, risk, and compliance are taking precedence over economies of size and scale, and interest in private PaaS is equal to and in some cases greater than interest in public PaaS. It is hard to imagine that public PaaS vendors will easily address the security issue — still a major concern. To keep prices down, PaaS service providers need to maintain high application densities on servers and at the same time distribute application instances over multiple servers to ensure reliability. The result is that, in a public PaaS, an enterprise's applications and data are likely to reside on heavily shared resources, which at worst could compromise security and at best exposes an enterprise to noisy neighbors.

The solution to this problem lies in isolation. If you can ensure isolation between virtual machines (VMs) and across regions within a VM, then you effectively solve the security problem without impacting application densities. Virtualization so far has been the mainstay of IaaS technology, but many have realized that to offer more cost-effective cloud capabilities, denser and more granular features to manage workloads are needed. Running applications in isolated and lightweight containers is an idea that has been around for a decade in various forms, but a Linux-based incarnation known as Linux Containers, or LXCs, may be the basis for many new PaaS offerings. A vendor-specific implementation of Linux container technology, called Docker, is garnering a lot of interest with the promise to ease the development life cycle.

The dynamics of the PaaS market indicate that there is robust demand for both public and private PaaS. Demand for public PaaS is strong because of accessibility, affordability, and application utility needs. Demand for private PaaS is also strong because of security, sovereignty, and application utility requirements.

Vendors that embrace the concept of public and private PaaS are also in favor of hybrid PaaS models where workloads can be directed to either public or private instances depending on how an enterprise sets application policy. Hybrid models provide the most flexibility where the private and public PaaS components are the same or have been specifically designed to work together. In fact, we believe that vendors that support hybrid models will be the most successful because they provide enterprises with the most flexibility.

Another decision that enterprises will need to make regarding PaaS is whether to choose an open source or closed source platform, relevant only to the private PaaS market. Enterprises are licensed to use a public PaaS, but they don't own the PaaS. The degree of private PaaS "ownership" can vary widely

depending upon how a vendor chooses to license private PaaS. However, open source private PaaS licensing tends to follow the traditional open source model that emphasizes just maintenance and support.

Two key reasons why the open source model is growing at an accelerated pace in the cloud model are cost leadership and the power of the community. Security fears are also leading a number of emerging market vendors to embrace the open source model. As the popularity of the open source model grows among customers because they can avoid lock-in, code contribution from the community grows proportionately. As a result, open source products enjoy unmatched cost leadership in the rapidly innovating PaaS space.

The Benefits of Private PaaS

IDC has identified a number of benefits that accrue when enterprises use private PaaS:

- **Service enablement.** The challenge with traditional development is the complexity of bringing together operating systems, middleware, and supporting software such as authentication in developing and delivering an application. As an application platform, PaaS delivers services such as systems administration and management abstracting features like deployment, high availability, and scalability. These capabilities help developers leverage the DevOps model, which makes infrastructure easily configurable, therefore removing the complexity that traditionally resides further down the stack. This accelerates time to market and enables enterprises to focus more on writing code instead of how to address application infrastructure needs.
- **Infrastructural independence.** Typically, private PaaS is designed to run on a collection of virtualized servers. Therefore, the infrastructural bar is set fairly low, so the servers can reside anywhere within a VPN. This means that some of the servers could be in the datacenter, and some could be in a third-party virtual private cloud environment. The advantage is that enterprises have the flexibility to make infrastructural capex or opex decisions without having to worry about the impact on systems running on the private PaaS.
- **Application portability.** One of the benefits of cloud computing is the ability to run workloads anywhere convenient, which assists scalability and high-availability features. It also helps optimize available IT resources among multiple datacenters and, when appropriate, public cloud resources. Allowing workloads to span environments (contingent on policy) is a key PaaS feature that is popular among customers.
- **Performance.** The hallmarks of PaaS are automated provisioning and dynamic scalability. Automated provisioning shrinks the time needed to implement an application instance from days or weeks to seconds or minutes. Dynamic scalability monitors workload against capacity and provisions or deprovisions instances to ensure that application SLAs are always met. Also included under performance are availability and the ability of more advanced public and private PaaS offerings to distribute workload across available instances in ways that optimize performance and enable true 24 x 7 x 365 availability.
- **Security.** Security encompasses identity and access as well as isolation. Private PaaS identity and access management (IAM) services provide identity, access, and single sign-on (SSO) services that are typically role based and designed to integrate easily with LDAP directory services. However, more advanced private PaaS products provide much higher levels of control over how servers are virtualized, segmented, and isolated. Achieving high application densities without compromising isolation is best accomplished through the careful coordination of controls within a security-enhanced operating system and can be accomplished via the container virtualization model. Kernel hooks and security permissions improve security through better isolation, which is another benefit of containers.

- **Efficiency.** Private PaaS delivers efficiency in a variety of ways. Advanced private PaaS offerings provide development environments, frameworks, or life-cycle integrations that offer efficient ways to build applications. Private PaaS automated provisioning, configuration-based availability, and dynamic scalability together eliminate most of the heavy lifting required when deploying and managing applications. The concatenation of these services enables continuous delivery of application functionality and allows the enterprise to focus on a more streamlined approach, helping the organization move to a DevOps methodology. As a result, enterprises can reduce time to market, cycle applications faster, and deliver applications that have much higher levels of quality, reliability, and availability. Along with the benefits mentioned previously, container virtualization PaaS can offer much better performance and efficiencies through high-density packaging of applications.

Red Hat's Approach to Private PaaS

Red Hat is best known as an open source software vendor and one of the leaders in enterprise application platforms (with the JBoss Middleware family) and cloud computing technologies (OpenStack and CloudForms) including PaaS (OpenShift).

OpenShift Enterprise is Red Hat's private PaaS that was launched in 4Q 2012. It is a multilanguage, auto-scaling, self-service, and elastic cloud application platform that is built on RHEL, which is essentially the only infrastructural requirement. A key subsystem of RHEL that is leveraged in the multitenant architecture of OpenShift is Security-Enhanced Linux (SELinux), which was developed by Red Hat and the National Security Agency (NSA). SELinux is an implementation of a mandatory access control mechanism in the Linux kernel, checking for allowed operations after standard discretionary access controls are checked. It can enforce rules on files and processes in a Linux system, and on their actions, based on defined policies.

OpenShift Enterprise runs on one or more instances of RHEL, each of which is termed by Red Hat as a "node." Each node can be segmented into secure containers, each of which runs an instance of a user application. Red Hat refers to these secure containers as "gears." Consequently, the node and gear constructs provide OpenShift Enterprise with the ability to segment a RHEL instance into as many isolated containers as are practical given the available memory and overhead associated with managing the operation of these containers.

OpenShift Enterprise coordinates the operation of these gears through the use of a broker. Each node has an OpenShift Enterprise agent running on it that communicates with the broker. The function of the broker is to make decisions about how to best provision and scale end-user applications based on existing demand and capacity.

Red Hat uses the term "cartridge" to define how OpenShift Enterprise installs languages and middleware products into a gear. A cartridge maps the API of a specific language or middleware component into the corresponding OpenShift Enterprise API class for a language, platform, or database. As of 2Q 2014, Red Hat provides the following cartridges for OpenShift Enterprise:

- Languages: Java, PHP, Python, Ruby, Node.js, and Perl
- Databases: PostgreSQL and MySQL
- Platforms: JBoss EAP 6 and JBoss Enterprise Web Server (EWS)
- Other: Custom

The custom cartridge provides a do-it-yourself cartridge for developers to add their own language, database, or middleware component.

OpenShift Enterprise primarily focuses on providing support for deployment and management of production applications. Developers build application code, quite possibly using a Git Repo (or equivalent) to coordinate team development. Maven can be used for builds and Jenkins for continuous integration. The ready availability of these tools makes them a classic choice for use with Red Hat products and services. Red Hat supplies enough cartridges to ensure that all of the tiers of a Web application (database, application server, and Web server) can be deployed on OpenShift Enterprise.

Benefits

Red Hat is well known for RHEL and its open source business model for RHEL support. The company is now finding that its reputation is effective leverage to open the enterprise middleware door. Many enterprises have adopted Red Hat's JBoss EAP because it is a full-function modular application server that competes effectively because of its open source roots and lower price points. This halo effect will also serve Red Hat well as it enters the PaaS market.

While many Red Hat customers are quick to mention price as a key factor in their decision to adopt Red Hat middleware products and services, others, such as large enterprises, cannot afford to rely on products that are not industrial strength. This enables Red Hat to compete effectively on features while maintaining a cost leadership position.

Although most enterprises are not keen on modifying open source platform code, because of the upgrade and maintainability risks that are created, there is no doubt that Red Hat's open source policy provides these enterprises with a useful insurance policy that simply is not available from closed source vendors.

Challenges

The public and private PaaS markets reflect high levels of immaturity because of the retooling complexity that vendors face in providing features as a service along with new features such as multitenancy, automated provisioning, dynamic scalability, and security. Consequently, no vendor has yet provided a complete public and/or private PaaS offering.

Open source is growing in popularity among enterprises using cloud technology. Red Hat has a history of success in this space and, not surprisingly, released the source code to the community under the Apache license. Open source products benefit from a large ecosystem of vendor participants that typically are significant contributors to the code base. Other than Cisco and Dell, Red Hat remains the major contributor to this product. While low vendor participation can reduce the number of code contributors, it can also reduce the time taken to make decisions while adding features to the product. Red Hat can overcome this challenge by using quick decision making to build a unique end-to-end stack resulting in promising customer references.

Conclusion

Red Hat surprised the vendor community by delivering a public PaaS and a private PaaS in less than two years. It is also the only leading middleware vendor that currently provides both. The importance of delivering a hybrid PaaS alternative cannot be underestimated. Most of the vendors with material market share in public PaaS have no intention of providing private PaaS. For three years in a row, enterprises have held the line on wanting private PaaS because of concerns about security. Red Hat's private PaaS does an effective job of mitigating security concerns while allowing enterprises to maintain high application densities and utilization rates and improve developer productivity. These characteristics enable OpenShift Enterprise to provide an optimal combination of security and efficiency at exactly the right time.

While OpenShift Enterprise is clearly a work in progress, it provides a crucial capability demanded by enterprises today and a clear road map that ensures a stream of improvements matching customer requirements. To the extent that Red Hat can address the challenges described in this paper, IDC believes that OpenShift Enterprise is well positioned for success.
