— Presents —

DZone's Definitive Guide to Cloud Providers

Private and Public Cloud, PaaS, IaaS, BaaS, and More!

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Executive Summary

Have you ever tried sifting through the hundreds of cloud solutions available in today's market? Several years ago cloud computing was touted as the next major advance in IT. There was a huge influx of services and solutions from companies that already had infrastructure to spare, and from scrappy startups that could just build their cloud services on top of other larger cloud services.

DZone Research expects the number of new cloud products to continue growing. There are already so many categories of cloud providers that it's hard to know if you're researching the right ones for your use case. How do you distinguish the contenders from the pretenders? Even if you have nailed down the type of cloud provider you need, you're still facing a litany of choices.

The cost and time savings of choosing the right cloud provider can revolutionize your business and drive significant new profit, but the selection process is daunting. DZone observed many developers and IT professionals struggling to find the right solution for their organization, so we decided to mount this unprecedented research project to create the Definitive Guide to Cloud Providers. We hope it helps you.

Objective

DZone's Definitive Guide to Cloud Providers is tailored to answer your questions about the many types of cloud services and to remove the obstacles preventing you from finding the right cloud computing solution for your organization. This guide will help you answer two major questions:

1. What type of cloud service is the best fit for my use case?
2. How does each cloud product compare to other offerings in the same category?

Features

DZone Research has compiled vendor interviews, feature lists, trends in the IT community, and expert opinions into this one comprehensive guide so that you don't have to spend months compiling the whirlwind of incomplete data available on the web. DZone's Definitive Guide to Cloud Providers covers:

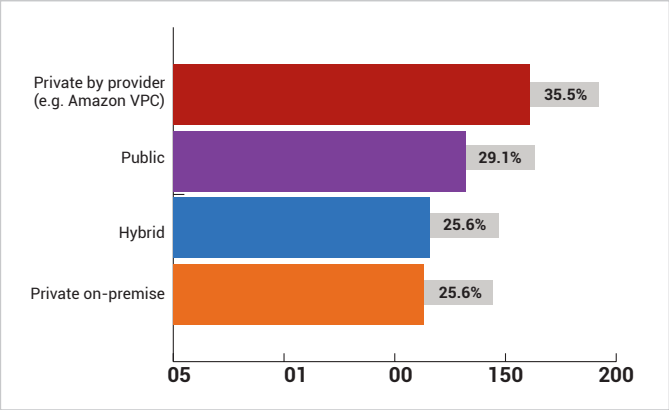
- 100 pages of cloud product analysis
- 9 categories of cloud providers analyzed and compared
- 35+ of the most active cloud solutions and their feature sets
- Surveys of 400+ IT professionals on their cloud preferences

Key Findings

The key findings of DZone's Definitive Guide to Cloud Providers come from our survey of more than 400 developers and IT professionals. Some of our high-level findings are that:

- 71% of respondents have used a cloud tool or service professionally
- 36% of respondents use them regularly.

DZone's research also uncovered a close race between IT professionals that preferred private, public, hybrid, or VPC clouds.



More survey findings are contained within the "Audience Survey" section of the guide.

Data Organization

Our research is arranged into five intuitive sections:

- **Introduction to Cloud Categories:** Overviews that provide detailed background information to help you distinguish various categories of cloud providers and select the right one.
- **Comparison Grids:** Side-by-side feature-comparison tables for various cloud providers with vendors grouped by category.
- **Solution Data Sheets:** Summaries that list the main features for each cloud vendor along with unbiased, expert reviews.
- **Audience Survey:** A summary and analysis from our 2013 survey of developers and IT professionals about their cloud technology preferences and usage patterns.
- **Cloud Glossary:** A helpful dictionary for terms related to cloud computing.

These sections were designed to make it quick and easy for you to compare the complex array of cloud vendors and choose the solution that fits your unique preferences. When you begin your search for the right cloud solution, this guide should be your first consultant.

Sponsors

This guide was commissioned by DZone Research and is sponsored by CloudBees, RedHat, and WSO2. We sincerely thank them for their support.

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About DZone, Inc.

For 15 years, DZone has produced and published valuable content for a global audience of software architects, developers and IT professionals. DZone's network of tech media sites is among the most popular resources in the world for advanced programmers and web designers.

DZone reaches an audience of 3.5 million software architects, developers and managers, 73% of which play a role in business decisions for their organizations. They trust DZone to provide them with valuable information and resources to help them solve problems, keep up with the rapid changes in software technology and share knowledge with each other.

DZone is located in Cary, North Carolina, USA and is also the maker of the world's most popular Q&A platforms, AnswerHub and OSQA (open source Q&A software).

"DZone is a developer's dream", *says PC Magazine.*

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Introduction

This guide is a tool for navigating the major PaaS and IaaS categories and matching the solutions to your needs. It will help you answer two major questions:

1. “What type of cloud service is the best fit for my use case?"

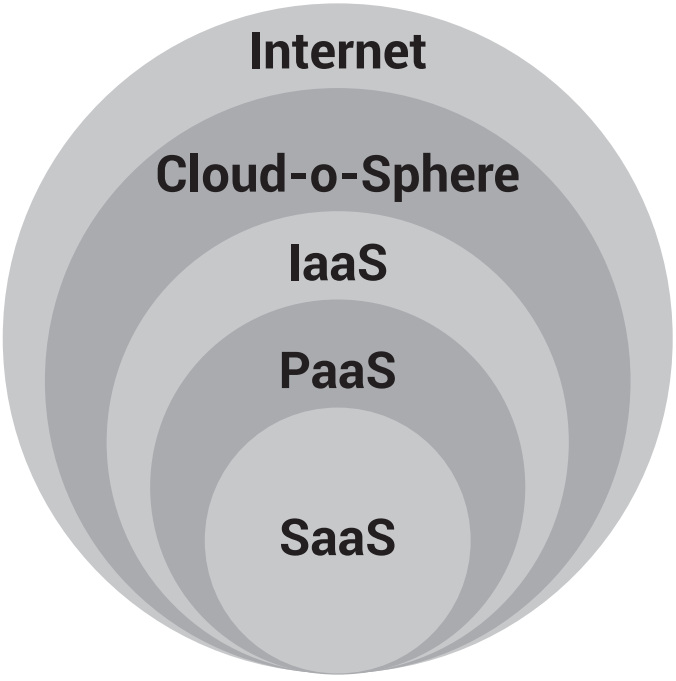
2. “How does one cloud product compare to other offerings in the same category?"

With our simple comparison grids and product description pages, which include unbiased, third-party reviews, you'll be able to make a well-informed, data-driven decision about the cloud services you want to adopt.

The most common examples of cloud services are Software-as-a-Service (SaaS), Infrastructure-as-a-Service (IaaS) and Platform-as-a-Service (PaaS). The combined use of these three is sometimes referred to as the SPI model (SaaS, PaaS, IaaS).

These categories above are generally well-known and well-defined within the tech industry, but there are countless offshoot categories and subcategories of IaaS, PaaS, and SaaS, including Storage-as-a-Service (STaaS), Communications-as-a-Service (CaaS), Network-as-a-Service (NaaS) and Monitoring-as-a-Service --(MaaS).

For this guide we've interviewed vendors, researched features, polled our massive software engineering community, and collected expert opinions so that you can quickly and easily make a decision about the products you want to adopt with the research to back it up.



How Was This Guide Created?

DZone's 2013 guide to PaaS and IaaS solutions was created to help IT professionals make the best decision concerning what cloud services to adopt. DZone's goal is to give the most well-rounded view of PaaS, IaaS, and other cloud services using three main information sources:

1. A survey of 400 DZone Audience members about their feature preferences for cloud services.

2. Security, scalability, usability, and pricing data collected directly from cloud service vendors.

3. Polling data from topic experts to provide unbiased, third party reviews. The experts also reviewed this guide.

How to Use This Guide

This guide has several sections listed in the index that provide various forms of information about cloud computing topics and cloud offerings:

- **Introduction**: The opening sections provide background information to help you distinguish various subcategories for cloud platforms.
- **Comparison Grids**: A side-by-side feature comparison of various cloud solutions. There are individual data tables for each cloud subcategory.
- **Solution Descriptions**: These single page data sheets list the main features for a single cloud vendor. Some also include "Pros" and "Cons" from third-party reviewers. DZone's pool of reviewers did not review all of the solutions in this guide. They only reviewed solutions that they had used previously.
- **Cloud Glossary**: A dictionary for terms related to cloud computing.

What this guide covers

The scope of this guide includes several major categories of Platform-as-a-Service and Infrastructure-as-a-Service:

- General PaaS
- APaaS
- Open-source PaaS
- Language-Specific PaaS
- Private PaaS
- IaaS
- 'Build Your Own' IaaS
- BaaS/MBaaS
- Multi-Cloud AMP

What this guide does not cover

A guide covering every single type of cloud service would be too bulky for many readers, so there were many categories that DZone opted to leave out of this guide. These topics may be covered in future guides.

- SaaS (Software-as-a-Service)
- MaaS (Monitoring-as-a-Service)
- DBaaS (Database-as-a-Service)
- Cloud CDNs
- STaaS (Storage-as-a-Service)
- CaaS (Communications-as-a-Service)
- NaaS (Network-as-a-Service)
- iPaaS (Integration Platform-as-a-Service)
- Cloud IDEs (Integrated Development Environments)

How to Read the Comparison Grids

DZone gathered data directly from each vendor represented in this guide. (A handful of vendors elected not to contribute data at this time, and these vendors are absent from the 2013 guide.)

The entries in each column come directly from the vendor. DZone made very few modifications to this data.

The entries in each column come directly from the vendor. Blank cells indicate either a feature that is not applicable to the cloud solution in question, or that the vendor did not provide information about that feature.

Each subcategory has its own separate comparison grid for a more balanced analysis between similar offerings.

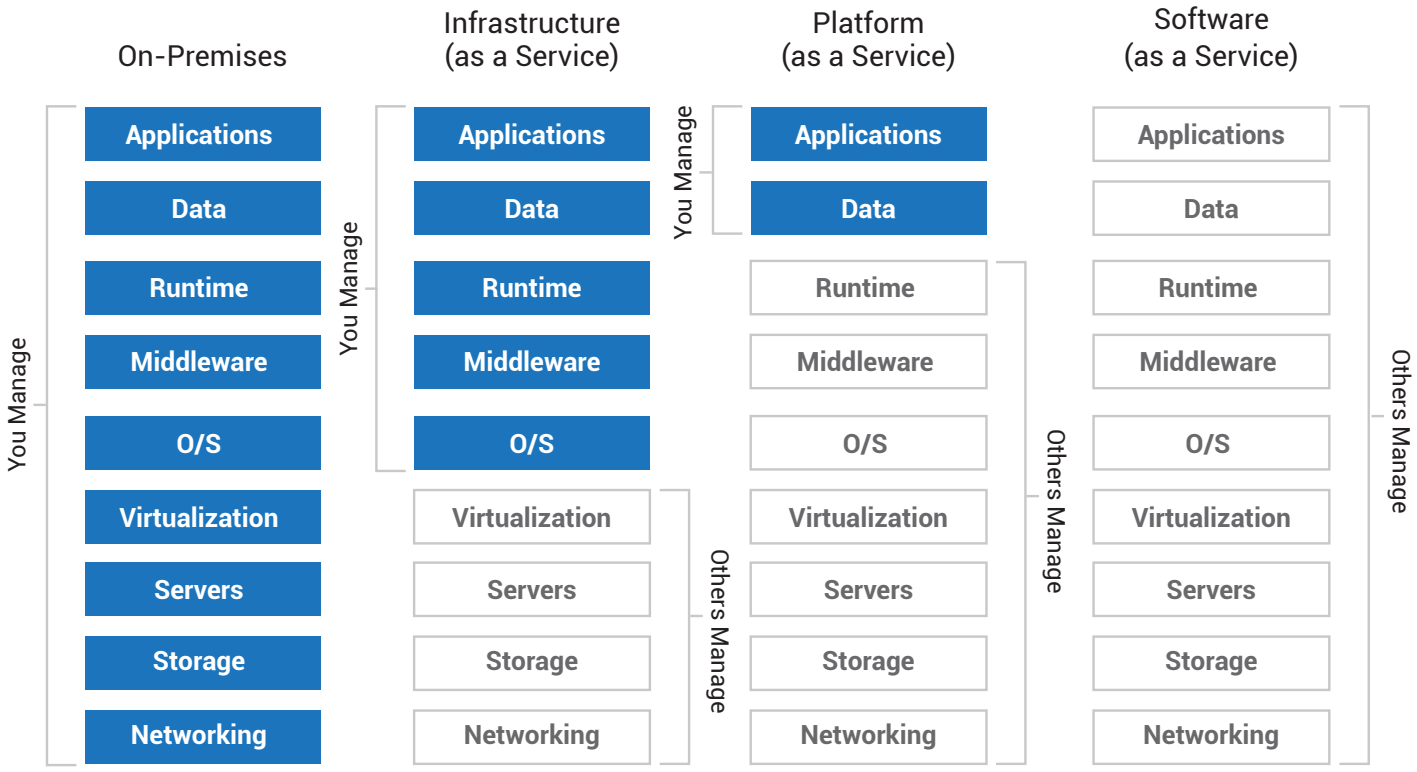
Vendors

Features

	Red Hat OpenStack	Amazon EC2	HP Cl
Geo-Replication	No - customer is responsible for replication	Yes	Geo repli U.S. Wes container
Self Service Provisioning	Yes	Yes	Yes
Auto-scaling	No	Yes	Yes
High Availability	No - customer must set up high availability using supported HA technologies	Yes	Yes
Stateless Service	Yes	Yes	Yes
Load Balancing	Load balancing must be customer provided	Elastic Load Balancing Service (http://aws.amazon.	

Differences Between PaaS and IaaS

While PaaS and IaaS are similar in many respects, there are significant differences between them. Where IaaS essentially provides raw computing resources, PaaS provides customers with software, Virtual Machines (VM), and typically handles all aspects of system administration for the customer. So while IaaS and PaaS both provide the customer with cost-saving, scalable cloud infrastructure, PaaS provides additional middleware utilities on top of the common IaaS services. The PaaS model can do everything the IaaS model can do, with the added benefit of managing underlying resources, application frameworks, and tools.



Private vs. Public Clouds

The terms public and private refer to two deployment models of a platform-as-a-service or infrastructures-as-a-service. Public clouds are shared infrastructure platforms provided by a third party, which allows greater cost savings and hands-off administration. But since public cloud data may be housed in any number of physical locations, the customer may be forced to share resources with other users. This may present challenges in certain use-cases outlined in the comparison points below.

Private clouds may be physically located in the customer's data center, or they may be administered by the vendor as a Virtual Private Cloud (VPC). In a VPC, the servers in question are isolated from public servers and used exclusively by one customer. The distinguishing feature between private and public clouds is exclusivity. When weighing private and public options, you will also want to consider the following:

	Private Cloud	Public Cloud
Pros	• On-premises datacenters are more likely to pass the most stringent security compliance standards and regulations • More customizable than public clouds on the most granular levels of hardware and the operating system • VPCs and hybrid clouds can provide some of the scaling and convenience of public clouds along with isolation from other customer instances • Certain types of software work better in dedicated environments.	• No up-front investment • Predictable pay-as-you-go pricing models • Fast setup and scaling • Flexible infrastructure that can make changes quickly based on changing needs or swings in traffic
Cons	• Larger up-front investment • Much slower to get up and running on-premises • Requires more administrators with technical proficiency • Even the best administered on-premises datacenters can't match the scalability and elasticity of most public clouds.	• Customers must handle their own special security concerns • Less customizable than Private on the most granular levels of hardware and the operating system • Public cloud providers don't guarantee data safety sufficiently enough to meet certain regulations. • Certain types of software don't function optimally in shared, virtualized environments.

Public and private clouds both have their place in the industry. If you have to pass strict regulations and security audits, or you have software that doesn't work well in shared environments, private cloud may be your only option. If your organization already has an internal data center and a dedicated operations team, an on-premises cloud is probably feasible, but if you don't have these resources, there's also a middle-ground (but sometimes more complex) option: VPCs or hybrid cloud.

If you really want to take full advantage of cloud benefits like limitless scalability and elasticity without a lot of customization effort, then public cloud is your best bet. Common use-cases for public clouds include research computing, web applications, and test or development environments.

What is PaaS?

Platform-as-a-Service (PaaS) is one of the three major categories of cloud computing services (along with IaaS and SaaS). PaaS provides the customer with the requisite hardware architecture (the platform) and software subsystems and components (the solution stack) to deliver the customer's product or service. In a PaaS model, the customer uses tools and libraries from the provider to build the software implemented on the PaaS platform. Depending on the tools that the provider supports, the customer can sometimes implement their own custom stack of development tools.

PaaS is appealing to clients who don't want to devote resources to hosting, maintaining, and managing the underlying hardware and software used in the implementation of their service or product. PaaS is composed of an operating system and middleware (software that allows applications to run on the cloud), with the provider handling security and scaling. With a PaaS model, the client is free to focus on its application and its customers. The development environment is set up and automatically maintained, from hardware to tooling.

Benefits

- **Speed of development**: customers can spend more time developing their application and less time managing hardware and software.
- **Cost**: The PaaS model allows the customer to consume resources on-demand, reducing overhead cost by preventing the customer from investing in additional hosting capacity that may go unused. A PaaS also eliminates the overhead cost of maintaining hardware and software.
- **Scalability**: As the load fluctuates, the PaaS model allows infrastructure to scale computing resources to meet demand while facilitating uninterrupted end-user experience.

Downsides

- **Less Flexible than IaaS:** A PaaS typically handles or streamlines more of the complications in building software and maintaining the development environment, but the downside is a more prescriptive framework. Your development team may need more control over the inner workings of their environment than a PaaS allows. In most cases, the more complexities your cloud service handles, the less control you have over your development process.

Subcategories of PaaS

APaaS (also spelled 'aPaaS')

Application Platform-as-a-Service (also called "Visual aPaas" by some) is a subcategory of PaaS that is often lumped into the PaaS category with other solutions that provide more flexibility and a larger array of middleware than APaaS. APaaS, does not provide the same level of flexibility as a general PaaS. APaaS tends to be built within a proprietary framework of developer tools and often features its own ecosystem and marketplace for distributing and running the apps in the enterprise. Here are some more defining traits of an APaaS:

- Extreme ease of use, enabling rapid development (sometimes point-and-click development) processes.
- Some APaaS offerings allow users to create and manage business objects, not code, so software development expertise is not required to create an application.

The simplest description of APaaS is ***Abhishek Ghosh's*** definition: "The user is more consumer than a developer." The main advantages of an APaaS are having a hands-off software development environment and allowing non-technical, business-level employees to create applications. Some examples are Force.com, which is an ecosystem for the Salesforce.com Software-as-a-Service.

Benefits

- **Rapid Development**: The friendly interface and the limitations of what can be built make development much simpler and more streamlined.
- **Simplicity**: Nearly all of the development and operational complexities are handled by the platform.

Downsides

- **Minimal Flexibility:** If a non-technical employee will be developing applications with APaaS, their ability to implement finely-customized features will be very limited.
- **Prescriptive Environment:** The proprietary environment of APaaS offerings often place strict limits on the tools and programming languages your developers may use, limiting the range of applications they might create.

Open Source PaaS

Open Source Platform-as-a-Service is a more flexible, community supported cloud middleware platform that can be deployed on a variety of cloud infrastructures, public or private. Many open source solutions also support a diverse array of languages, frameworks, and databases due to community-built utilities that plug into the platform. The platform is free-to-use and great for companies that need a specific architecture or mix of tool support. With an open source PaaS, you can custom-build a PaaS that meets your precise needs.

The most well-known Open PaaS solutions are driven by developers from a steward company, while community developers outside of the company contribute to the platform as well. In this way, open source platforms benefit from both the steady foundation of a dedicated team as well as expanded support and implementation of more niche features by an enthusiastic community.

Major Open Source PaaS offerings include:

- OpenShift Origin - RedHat
- Cloudify - GigaSpaces

Benefits

- **Free and Open Source**: Even though you have to pay for the infrastructure that you use, the platform software is free to use. Because it's open source, you can modify the software in just about any way you choose.

- **No Lock-in**: Not only can you choose from use a wide variety of cloud infrastructures, you can also move your platform easily from one cloud to the next if your current infrastructure doesn't suit your needs.

Downsides

- **More Work**: You have to set up your own middleware environment, but once you have it set up your development workflow will be more streamlined than just working straight off of an IaaS.

- **Dependent on Community**: Although a steward company usually keeps an open source platform moving forward, the quality of the ecosystem depends greatly on the activity of the community, which can vary.

Language-specific PaaS

In most discussions of the PaaS market, language-specific offerings go undifferentiated from their competitors. This guide draws a distinction, however, between language-specific and non-language-specific solutions. Numerous PaaS offerings only support one or two programming languages (and some related tools) natively, without the help of third-party add-ons.

If a vendor has chosen to make a PaaS that focuses on one language and one technology ecosystem, it can often be a strength of the platform rather than a weakness. If your engineering team primarily uses a particular set of technologies for development, like Java or Node.js, there are PaaS solutions focused specifically on those technologies that could provide several benefits which PaaS solutions with more generalized support may not allow. Jelastic is one example of a Java-specific PaaS, while Nodejitsu is a Node.js-focused (server-side JavaScript) PaaS.

Benefits

- **Better Language Support:** In many cases, the PaaS vendors that are focused on a specific language's ecosystem provide first-class support for that technology stack.

Downsides

- **Narriow Choices:** If you choose a language-specific PaaS, you should be certain that your developers won't need to change their programming language ecosystem for several years, because you won't be able to continue using the PaaS if you decide to start building with other ecosystems, unless the vendor, or a 3rd party add support.

Private PaaS

Early on, the major PaaS players were generally public cloud services, but many PaaS providers now offer private or hybrid cloud platforms as a service in addition to public cloud offerings. The advantages of public vs. private cloud deployments are outlined in our "Private vs. Public PaaS" section. Some of the major private-enabled PaaS providers include WSO2 Stratos, OpenShift Enterprise, CumuLogic, and Apprenda.

What is IaaS?

Among the three main categories of cloud computing services, Infrastructure-as-a-Service, or IaaS, can be considered the most basic and the most flexible. The IaaS cloud-computing model provides clients with the scalable hardware architecture they need to implement their own middleware and software on which to run their application. An IaaS provider delivers on-demand and scalable cloud infrastructure based on various operating systems, usually including Windows and Linux.

IaaS is ideal for a customer that wants to implement their own software infrastructure and handle their own system administration, while not having to worry about housing, configuring or updating physical servers.

Benefits

- Customization: Since IaaS is just hardware and an operating system, the customer is free to create and modify all aspects of the development environment and software architecture as they see fit.

- Scalability: IaaS scales resources to meet demand as load fluctuates, while facilitating uninterrupted end-user experience.

- Cost: The IaaS model allows the customer to consume server resources on-demand, so they don't have to buy more hardware during periods of increasing server load. An IaaS also eliminates the overhead cost of maintaining servers and updating operating systems.

Downsides

- More Work: Although you save money for the on-demand usage pricing with most IaaS solutions, and the hosting and physical maintenance is done for you, you still have to build, configure, and maintain your own middleware stack of development tools.

Subcategory of IaaS

‘Build-Your-Own’ IaaS

‘Build-Your-Own’ IaaS is essentially software that lets you build your own Infrastructure-as-a-Service by deploying and managing large networks of virtual machines. There are both commercial offerings and open source, community-developed offerings of this type of software. You can download the software and transform your own servers into an internal IaaS cloud, or you can find a service provider that offers public cloud services that are built using this software. There are also commercial offerings of ‘Build-Your-Own’ IaaS. OpenStack, CloudStack and Eucalyptus are the main players in the open source ‘Build-Your-Own’ IaaS space. VMware’s vCloud is a commercial variant of ‘Build-Your-Own’ IaaS software. RedHat, Rackspace and Citrix are companies that provide pre-built IaaS offerings that were constructed using software such as OpenStack and Cloud Stack. The technical specifications and APIs of these Do-It-Yourself clouds are very similar to the Amazon Web Services specifications, and as a result they can form hybrid clouds with services such as Amazon EC2 and S3.

Benefits

- **Free and Open Source**: You have the flexibility to modify the software in just about any way you choose. You also won’t be paying anyone except your own developers to use this.

- **No Lock-in**: Put your DIY IaaS on just about any infrastructure, internal or external.

Downsides

- **More Work**: You have to set up your own cloud and handle your own administration, but there are many ways to streamline the deployment process with your own customizations. However, the pure open source software can also be user-friendly.

- **Dependent on Community**: Although a steward company usually keeps an open source platform moving forward, the quality of the ecosystem depends a lot on the activity of the community, which can vary.

What is BaaS/MBaaS?

Backend-as-a-Service, also called “Mobile Backend-as-a-Service,” is a specialized cloud utility that allows customers to connect their web and mobile applications to cloud-based databases and provide user management, push notifications, and integration with social networking services. These services are made available through software development kits (SDKs) and application programming interfaces (APIs).

Having a BaaS greatly simplifies and accelerates development and implementation of the previously listed services because without one, developers would need to separately incorporate each API into the app. Using a BaaS, developers can work with one unified API and SDK.

The BaaS marketplace is highly competitive, which is great for buyers.

Data Storage
User Management
Messaging
Push Notifications
Social
Analytics
Location

What is Multi-Cloud AMP?

Multi-Cloud Application Management Platforms are a subcategory of Software-as-a-Service aimed at managing a large amount of applications that are running on an IaaS. They also allow you to more easily administrate the IaaS resources that you are currently using. IaaS solutions like Amazon Web Services have many different services, and AMPs let you manage these as well. Some solutions also assist customers in building and managing private cloud infrastructures.

A Multi-Cloud AMP is the weapon of choice for the IaaS customer who is having difficulty managing a growing number of cloud services. The commercial offerings in this space include RightScale and Cloudsoft AMP, and there are also open source offerings in this space, like Scalr.

Audience Survey Results

The purpose of DZone's PaaS and IaaS community survey was to determine the usage patterns and preferences of various IT professionals. The DZone community includes developers, designers, managers, system administrators, and others, with 79% of respondents defining their primary role as "development." From prior community surveys, we have learned that DZone readers typically participate in company buying decisions and have worked with a wide range of PaaS and IaaS providers.

We asked our respondents about their primary concerns surrounding cloud computing, how buying decisions are made within their companies, best fits for their organizations, preferred languages and frameworks, and perceived benefits and challenges.

The DZone community is experienced with cloud technologies: 71% have used a cloud tool or service professionally, and 36% do so regularly.

Developers want a polyglot cloud: We found that on average, the companies represented by our survey require support for four programming languages in a PaaS solution.

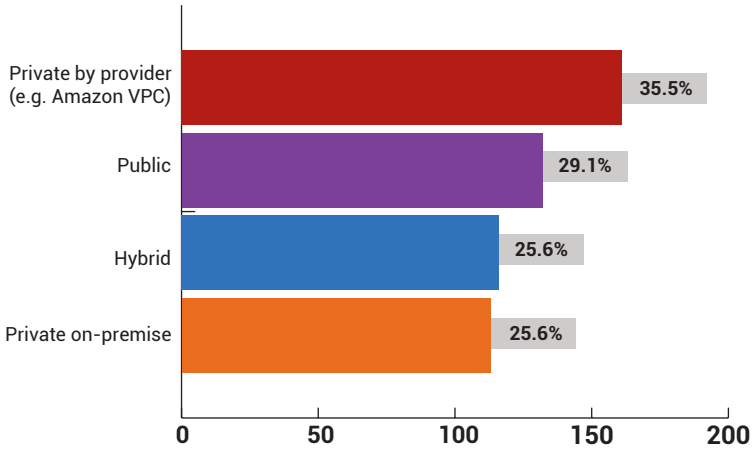
Close contest–Public vs. Private vs. VPC vs. Hybrid: Security emerged as a primary concern, which means that professionals will sometimes assume that private cloud styles are the safest option even though many experts assert that public clouds can be just as secure. Despite this common assumption, all four cloud types had relatively equal numbers of supporters.

Performance is an obstacle to adoption: 53% of respondents reported that they were currently experiencing performance-related issues with a cloud service. 48% reported that they expected to experience such problems in the future.

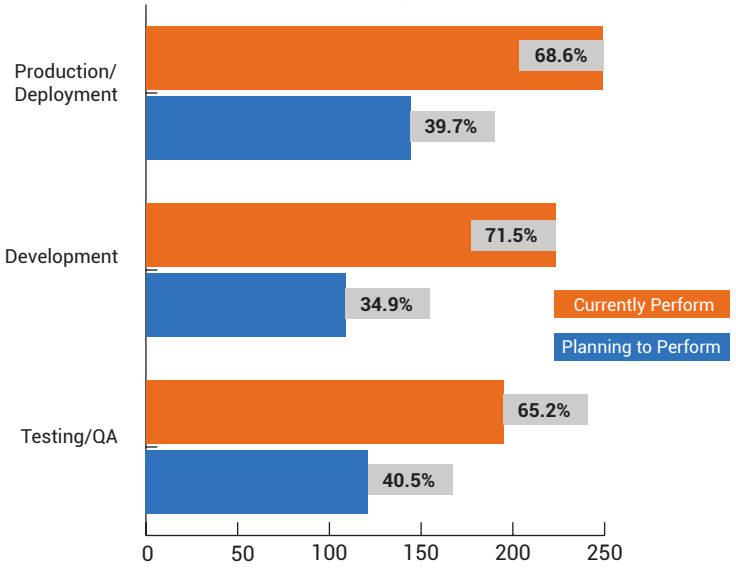
Cost is an unexpected challenge: 45% of respondents expected challenges while managing cloud costs, but 57% said they were currently experiencing cost issues. This was the largest gap in expectations.

Cloud outages are the biggest concern: Although only 24% of respondents were affected by a cloud outage last year, uptime was the most important feature for them. Of those affected, 53% were affected for 8 hours or less, and 18% (4% of total the response pool) were affected by an outage lasting more than 12 hours

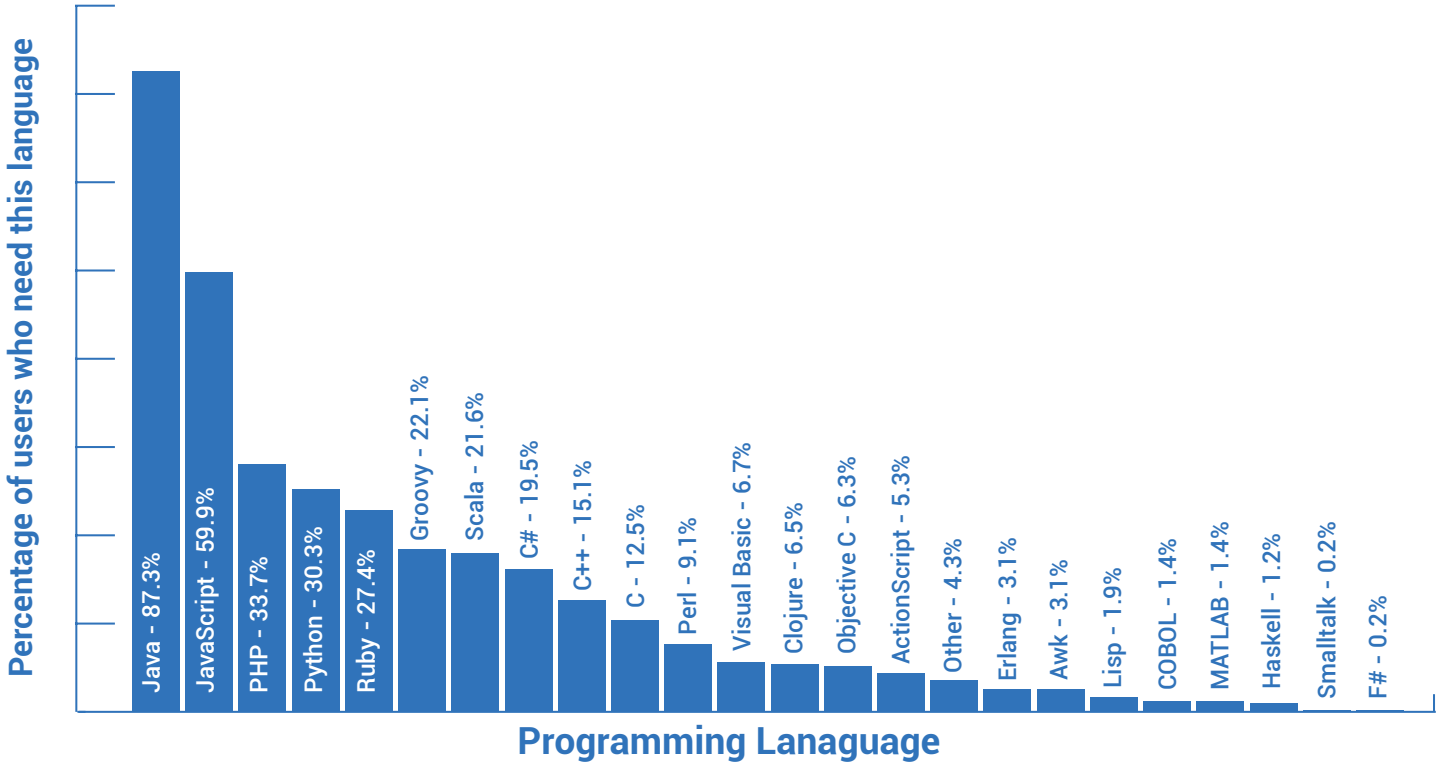
1 Which cloud type would currently be the best fit for your company?



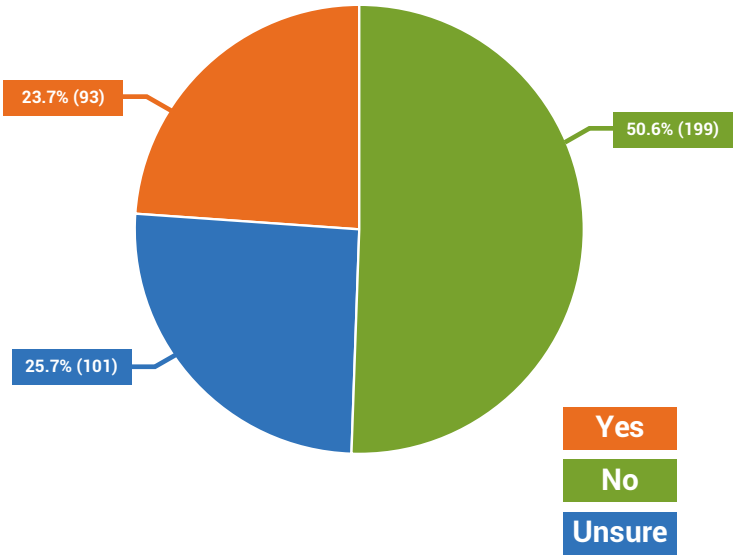
2 What Stages of the Software Development Lifecycle Do You Perform on a Cloud Platform?



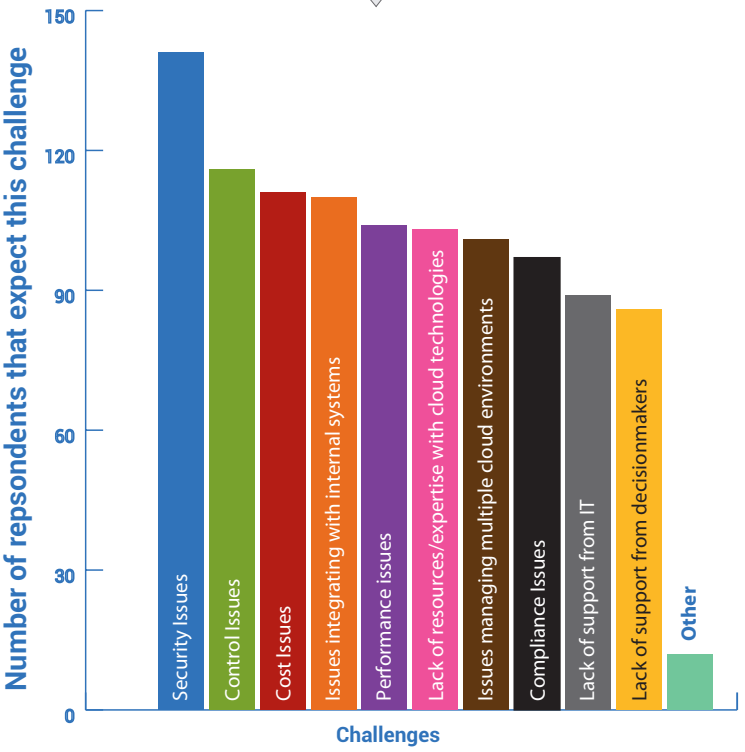
3 What languages would the PaaS you use need to support?



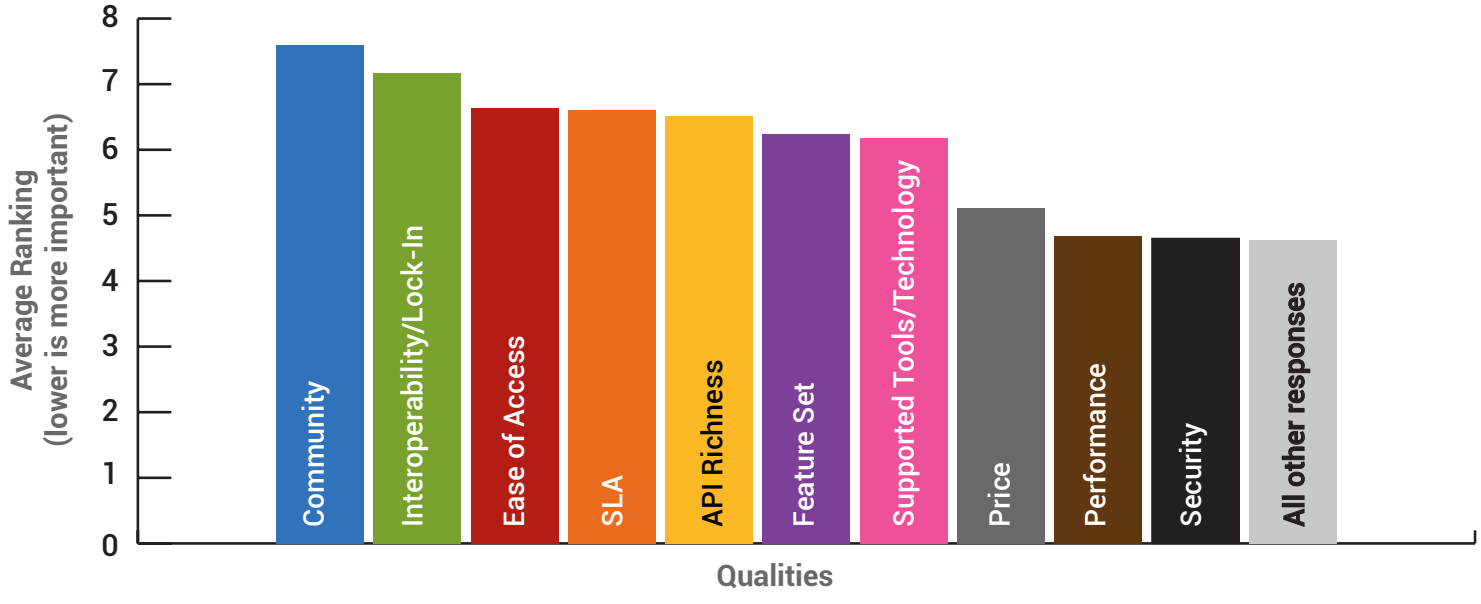
4 Was your company affected by a cloud outage in the past year?



5 What challenges does your company face or expect to face in using cloud services?



6 Please rank the following qualities in order of importance to you when selecting a cloud provider.



Cloud Solutions

Different providers offer significantly different styles and features in their PaaS and IaaS products. This section of the guide will help you find out which provider is the best fit for you by aggregating their relevant technical information for easy side-by-side comparison.

Solutions are divided by category. PaaS categories include:

- General PaaS
- APaaS
- Private PaaS
- Language-Specific PaaS
- Open Source PaaS

IaaS categories include:

- General IaaS
- "Build Your Own" IaaS

Other categories include:

- MBaaS/BaaS
- Multi-Cloud AMP

Each category begins with a comparison table of all the solutions included in the guide. This will allow you to compare features side-by-side. The comparison tables are followed by individual entries for each cloud solution, which delve deeper into company details and major features. Any third-party reviews will also be included in the individual entries section.

PaaS Solutions

Comparison Table

*Note: Comparison data based on information provided by vendors.

	CloudBees	OpenShift Online	AppFog	CleverCloud	cloudControl	dotCloud	Heroku	Engine Yard	Google App Engine
Cloud Specifications									
Hosting Styles	Public, private, hybrid, private by provider (Amazon VPC)	Public	Public, private by provider, private on-premise, and hybrid	Public	Public	Public	Public and other	Public	Public
Secure Authentication Options	BasicAuth, SSH keys, delegated external auth, and OAuth2	Red Hat Account Single Sign-On	LDAP, SSL	SSL	Public/private key authentication, Multi-factor-authentication coming		Email, password, API token and SSH Key authentication. Heroku applies security controls at every layer, isolating customer applications and data, and the ability to deploy security updates without user interaction or service interruption.	All communication is done via encrypted protocols, either SSH or SSL. All access to instances is done using SSH private/public key pair. SSH passwords are not permitted in the environment. All access to the dashboard is protected by industry-standard password controls.	Authentication uses: * Google Accounts (including Apps) * Users with an OpenID Provider (Experimental) See https://developers.google.com/appengine/articles/auth for details Of course we support HTTPS, including on custom domains and integration of AppEngine-hosted applications with other services are done via OAuth 2.
Server Security Features	Process-based isolation, security groups and firewalling, RBAC, documented security practices	Dedicated Servers	Dedicated servers and firewalled servers	Dedicated servers, DDoS protection and firewalled servers			Dedicated servers, firewalled servers, and local back up	Dedicated servers, firewalled servers, and local backup	Dedicated servers, firewalled servers
Data Security / Availability Zones	Operational data is secured. Encryption of user data is the responsibility of the user utilizing the services we and our partners provide such as AWS RDS, S3 and Postgres.	The OpenShift PaaS architecture allows a number of options for data locality and security. Data can be located on the underlying infrastructure that supports the PaaS, or it can be located in external systems that are accessed by the PaaS, depending on your security requirements and data locality requirements.	A variety of network and data management techniques are used to keep information secure including SSl for any app, security audits and monitoring.	SSL for all apps on --.clvereapps.io domain, all apps run on their own VM, backups every day for data repository, and intensive monitoring.	Separation on a per deployment basis with Linux Containers (LXC). All users are unprivileged accounts without access to the host system.	Application isolation is achieved using light weight, software virtualization. dotCloud uses GRSEC, a hardened linux kernel shared across all the containers with no overhead. Each service runs on its own separate container.	Data is stored in separate access-controlled databases per application, each requires a unique login. Multiple applications and databases are assigned separate databases and accounts to mitigate the risk of unauthorized access.	Servers are provisioned with additional persistent storage devices; data stored in the database are kept on these devices and frequently backed up. Each customer is located in its own AWS security group, with their own instances. Instances are not shared. Backup can be encrypted using GPG.	Google Datacenters, servers and storages, those same used by Google services such as Search, Gmail or Maps. For more on Google Datacenters, check out: http://www.google.com/about/datacenters/
Hosting Locations	AWS locations in USA and Europe		AWS in North America, Europe and Asia. HP Cloud in North America	CleverCloud servers, in Europe (Paris)	cloudControl servers	dotCloud servers		Outsourced	United States and Europe

PaaS Comparison Table (cont'd)

	CloudBees	OpenShift Online	AppFog	CleverCloud	cloudControl	dotCloud	Heroku	Engine Yard	Google App Engine
Cloud Specifications									
Encryption	Transport-level encryption, but data encryption is the responsibility of the user.	Encryption on the network. Operational interactions with the PaaS are encrypted via SSH. Developer interactions with the PaaS, commands, code pushes, etc, are encrypted with SSH. For applications deployed to the PaaS, the developer has the flexibility to use whatever encryption approach is best suited for their requirements.	SSH Encryption on the network.	SSH Encryption on the network	SSL/TLS available terminated at the routing tier. Encrypted connections to backend services depending on the services capabilities. (e.g. support for MySQL)		Encryption on the network and on storage; SSH, SSL and other industry standards for encryption	Applications use SSL to encrypt incoming data. Customer can use application, database or third-party encryption tools.	The Google Cloud is ISO 27001-certified, has completed SSAE-16 and ISAE 3402 audits.
Compliance Standards			PCI and HIPAA	PCI, HIPAA, FISMA, GBLA	ISO 27002:2005 Standard control objectives		PCI, HIPAA, FISMA, GBLA	ISO 27002:2005 Standard control objectives	SSAE 16
Software Compatibility									
Tech Support	StackOverflow forums for free tech support - Standard time-committed support plan levels with web-based support portal - Social media monitoring - Single point of contact for all integrated partner service issues - Regional support through service partners	Email, forums, IRC, and telephone support	Tickets and phone support	Tickets and phone support	"Range of paid support plans from start-up to enterprise. Minimum response times and available features depend on the selected plan (e.g 24/7 emergency hotline). Regular support channels are email and phone. Additional services, consulting and training is available from a network of solution providers."	Community (IRC, email, stackoverflow, documentation) Paid Customers (liveChat, Ticket system) Expedited (24/7 Operation support with guaranteed response time, individual app monitoring)	Basic support via email and support forums available free to all users, Heroku Help allows users to query all resources from a single location and open a support ticket, premium support provides direct access to a Heroku engineering team 24/7	Live chat, ticketing system, email, phone, forum and IRC. 24x7 global coverage. All customers receive Standard Support and access to Knowledge Base. Premium support is available with target response times as low as 30 minutes.	Community support via StackOverflow and Google discussions groups. 24/7 support for commercial customers starting at $150/month. Details at https://cloud.google.com/support/packages
Self Support	Yes	Yes	Yes	Yes	Yes (Community support is available via Stackoverflow. Detailed documentation on platform features and add-ons aswell as guides and tutorials are available in the developer center.)	Yes	Yes	Yes	Yes
Documentation	https://developer.cloudbees.com	http://openshift.redhat.com	http://docs.appfog.com/	http://doc.clever-cloud.com/	https://www.cloudcontrol.com/dev-center	http://docs.dotcloud.com/	https://devcenter.heroku.com/articles/support-channels	http://support.cloud.engineyard.com/home	https://developers.google.com/appengine/docs/

PaaS Comparison Table (cont'd)

	CloudBees	OpenShift Online	AppFog	CleverCloud	cloudControl	dotCloud	Heroku	Engine Yard	Google App Engine
Software Compatibility									
Languages Supported	Strong JVM-based support across the board, including Java, Groovy, Scala, Clojure, JavaScript/Node.js, PHP, and other languages supported via user-customizable stacks.	Java, Ruby, Python, Perl, PHP, JavaScript	Java, Ruby, Python, PHP, JavaScript, Groovey, Clojure, Scala, HTML/ XML, Node	Java, Ruby, PHP, JavaScript, SQL, Scala, NodeJS, Groovy, Closure, noSQL	Java, Ruby, Python, PHP supported officially. 13+ (e.g. Nodejs, Erlang, Closure) additional languages and ecosystems via custom buildpacks.	Java, Ruby, Python, Perl, PHP, JavaScript, Node.js, SQL, any programming language using dotCloud Custom Service.	Ruby, Python, PHP, JavaScript, Node.js, Java, Groovy, Clojure, Scala	PHP, Ruby, Node.js, JavaScript	Java, Python, PHP, and Go
Frameworks Supported	Spring, Grails, Play, Lift and other JVM-language related frameworks.	Spring, Java Enterprise Edition, Rails, Grails, Django, Zend, CodeIgniter, Symfony, Sinatra, Java EE6	Spring, Java Enterpise Edition, Rails, Grails, Django, Zend, CodeIgniter, Symfony, Sinatra	Rails, JEE, Grails, Django, Symphony, Zend, PlayFramework, Express, Spray, Flask	Framework support is only limited by available languages.	Rail, Grails, Any frameowrk for the lanaguages dotCloud supports	Spring, Java Enterprise Edition, Rails, Grails, Django, Sinatra, Play	Rails, Sinatra, PHP-FPM	Spring, Java EE, Grails, Django, Zend, CodeIgniter, Symfony, Sinatra
Databases Supported	MySQL natively. Amazon RDS, CouchDB, MongoDB, PostgreSQL via partners.	MySQL, MongoDB, PostgreSQL	MySQL, MongoDB, PstgreSQL	MySQL, MongoDB, pgSQL, Couchbase, file storage	MySQL, PostgreSQL, MongoDB, Redis, Couchdb and more via third party Add-on marketplace.	MySQL, MongoDB, any DB using dotCloud Custom Service	CouchDB/Couchbase, MongoDB, SQL Server, PostgreSQL, Cassandra, and more through third-party add-ons	MySQL, MongoDB, PostgreSQL, Riak	MySQL, Google DataStore (BigTable)
OS Support	Linux-based	Windows, OS X, Linux-based, iOS, Android OS	Ubuntu Linux	Linux-based	Windows, OS X, and Linux-based	Windows, OS X, Linux-based	OS X, Linux-based, iOS, Android OS	Linux-based	N/A, Abstracting away the OS
Windows Versions (if applicable)		Windows 2000, Windows XP, Windows Vista, Windows 7, Windows 8, Windows Server 2008	N/A	n/a			n/a	n/a	"Windows 2000 Windows XP Windows Vista Windows 7 Windows 8 Windows Server 2008"
Linux Distros (if applicable)	N/A		Xen, KVM, Vmware	n/a		No restrictions	n/a	Gentoo and Ubuntu	
Hypervisors Available	N/A	Xen, KVM, Vmware	Yes	No				Xen	N/A
Open Source	Partially	Yes	Cross-platform web app	No		No	Yes	Yes (open source components)	Yes
Mobile Platforms with App Support	iOS and Android app development and testing	cross-platform web app					Cross-platform web app	Yes	Cross-platform web app

PaaS Comparison Table (cont'd)

	CloudBees	OpenShift Online	AppFog	CleverCloud	cloudControl	dotCloud	Heroku	Engine Yard	Google App Engine
				Platform Control					
API Options	Included API/First party API	Included API/First Party API	Included API/First party API	Included API/First party API	Fully featured REST API	Included API/First party API and Third party API support	Included API/First Party API, Third Party API Support	API options are a command line tool to deploy applications and an API to provision/deprovision instances.	Included API/First party API
Dashboard and/or Command Console	Dashboard and Command Console	Command Console	Dashboard and Command Console.	Dashboard	Dashboard and Command Console	Dashboard and Command Console	Dashboard and Command Console	Dashboard and Command Console	Dashboard and Command Console
GUI Options	Web console for access to complete platform functionality across dev/test/stage/ production. Integration with popular IDEs including Eclipse, IntelliJ and Codenvy.	The OpenShift Web Console is designed as a responsive web application and supports any size browser for access	Console GUI based on the same API customer has access to.	Console	Scriptable command line client and HTML5, Javascript based web interface	The dashboard can be presented in a browser on any smartphone or tablet	Apps are managed using the Heroku command-line tool.	Customers have access to a centralized dashboard and command console.	appengine.google.com hosts the console and provides: * usage charts (req, mem, instance, ...) * instances stats (QPS, latency, ...) * consolidated logs in any TZ for all app versions * versions: management of all app versions, and traffic splipping (see https://developers.google.com/appengine/docs/adminconsole/trafficsplitting) * management or crons, task queues, datastore, memcache, text search... * application mgnt permissions: dev, admin, ... * detailled quota & billing info
Reporting Options	status.cloudbees.com for overall system health reporting- Native reports on application resource usage such as memory, CPU, response time, etc.- Log and system access reporting- Integration with partner solutions for APM such as New Relic and AppDynamics	Data extraction	Real-time datafeed and REST API	Console and mail	Deployment availability, status and consumption available via API and frontends. Performance monitoring and profiling available via third party Add-ons (e.g. New Relic)	Dashboard shows RAM usage and HTTP traffic by application. HTTP response health is also shown.	Heroku offers a variety of third party approaches. Additionally Heroku offers their Postgres database as a service. Heroku Postgres is a standalone service (so you don't have to use Heroku). Third party options including Hadoop, MongoDB, CouchDB and others are available.	Customers have complete access to their servers and their databases. Monitoring and alerting are done automatically for the customer and notifications are sent to the customer via email.	AppStats is built in AppEngine, can be turned on/off and access protected: https://developers.google.com/appengine/docs/java/tools/appstats Export of logs to Cloud Storage is another common practice and the logs API helps provide finer-grained access to the system.
Resource Monitoring	Native support for monitoring memory, CPU, response time, etc- Integrated support for New Relic and AppDynamics and others	Web Console Dashboard, Command-line tools, and RESTful API	Dashboard and Command Console.	Console and mail	API, Web interface	Users can monitor their applications using dotCloud dashboard. Dashboard can be used to estimate monthly billing	Integrated monitoring technology is available	Engine Yard monitoring agent, AppFirst and New Relic Add-Ons	The capabilities API can help: https://developers.google.com/appengine/docs/java/capabilities/ Global system uptime is provided by code.google.com/status/appengine Cloud Endpoints (see https://developers.google.com/appengine/docs/java/endpoints/overview) is the basic RESTful building block to build an application-specific monitoring tool

PaaS Comparison Table (cont'd)

	CloudBees	OpenShift Online	AppFog	CleverCloud	cloudControl	dotCloud	Heroku	Engine Yard	Google App Engine
				Pricing					
Pricing Page	http://www.cloudbees.com/platform/pricing/devcloud.cb	https://www.openshift.com/developers/pricing	https://www.appfog.com/pricing/	http://doc.clever-cloud.com/pricing/	https://www.cloudcontrol.com/pricing	https://www.dotcloud.com/pricing.html	https://www.heroku.com/pricing	www.engineyard.com/products/cloud/pricing	https://developers.google.com/appengine/docs/billing
Pricing Model	Metered Threshold	Free-to-use service tier, premium tier based on monthly flat fee then consumption model based on resource use.	Threshold	Metered monthly use and pay-as-you-go. Another option allow you to define the min and the max of instances to use.	Metered per second	Metered	Metered	Metered pricing that starts at $0.05/hr. All prices include Engine Yard Cloud, Standard Support and the cloud infrastructure with varying server sizes (choices of ECU, RAM, storage, bandwidth, etc.). Additional support levels are available for additional fees.	Metered, monthly
Usage Limits	CloudBees offers a free version with all features for evaluation. Paid packages that include production capabilities start at $15/month.	Additional cost on monthly flat fee based on resources used beyond the base amount.	Free - 2GB RAM, 8 service instances, 100MB storage. Pricing starts at $20/mo, and is based on RAM, service instances, storage and SSL endpoints.	Prices rise based on the number of "drops" used	Unlimited apps and deployments with usage based billing above free tier limit.	Free Sandbox or Monthly RAM-based pricing.		None	
Free Trial	Free Trial - restriction on production oriented capabilities	Free below a certain number of application containers	Free below a certain amount of data	Yes. 2000 drops given for each new account.	750 128mb container hours are free per deployment per month. Deployments are unlimited	Free Sandbox mode	Free below a certain amount of data	500 Hours free	Free below a certain amount of data.

PaaS Comparison Table (cont'd)

	CloudBees	OpenShift Online	AppFog	CleverCloud	cloudControl	dotCloud	Heroku	Engine Yard	Google App Engine
Scalability, Performance, and Availability									
Storage Limitations	Hosted MySQL database service has storage restrictions based on plan.				Non-ephermeral storage on a per container basis.		Heroku is dyno-local and ephemeral; third parties are recommended for permanent storage.	There are no storage limitations. You are charged for the amount of storage you use.	Google DataStore (now available from any application via Cloud DataStore, https://developers.google.com/datastore/) scales independently of the amount of data it stores. The BigTable whitepaper covers this..
Throughput Limitations	None							There are no throughput limitations. You are charged for the amount of throughput you use.	Throughput for AppEngine-hosted application is only limited by Google's network pipes and global CDN.
Multi-tenancy/ Isolation	Multi-tenanted with dedicated resources also available.		Multi-tenancy available	Every app has its own Virtual Machine.	Kernel lightweight virtualization via Linux Containers (LXC)			Engine Yard Cloud customer clusters are isolated, and self-contained environments that include compute, storage, and database services. No functionality is shared between virtualized instances. Customers own and operate their own instances, including full administrative access.	Multi-tenancy available
Vertical/Horizontal Scaling Strategy	Scale out via additional instances - Scale up in 128MB increments using App Cells - Autoscale based on a variety of user selectable parameters such as memory, response time, etc.	OpenShift PaaS supports automatic horizontal scaling based on the incoming load to an application exceeding a pre-determined number of concurrent connections.	Allows both	Vertical and horizontal auto-scaling depending on needs and user configurations. All data (including files) are shared on distributed accessible things, that allow the majority of applications to scale out without modification.	Horizontal scaling to more containers for improved availability and handling more requests at the same time. Vertical scaling of memory available per container to handle memory intensive tasks.	Scale horizontally to handle more requets in parallel and add instances of web servers, or store databases on different servers. Scale vertically and add more resources to the service (memory, CPU, disk, I/O).	Apps use a process model that allows them to scale up or down instantly from the command line or Dashboard.	Horizontal scaling is done by developers adding servers through the dashboard or API. The dashboard also supports scaling vertically.	Auto-scaling is one of App Engine's key features. No matter how many users you have or how much data your application stores, App Engine can scale to meet your needs. AppEngine also offers different sizes of bother frontend instances (see https://developers.google.com/appengine/docs/adminconsole/instances). Warmup requests, idle instances and latency are configurable or can be set to automatic. See https://developers.google.com/appengine/docs/adminconsole/performancesettings for details.

PaaS Comparison Table (cont'd)

	CloudBees	OpenShift Online	AppFog	CleverCloud	cloudControl	dotCloud	Heroku	Engine Yard	Google App Engine
Frequently Requested Features									
Geo-Replication	All CloudBees functionality available in both US and EU	Yes	Yes	Yes			Yes	Yes	Yes
Self Service Provisioning	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Auto-scaling	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes
High Availability	Yes	Yes	Yes	Yes	Yes (depending on number of containers provisioned)	Yes	Yes	Yes	Yes
Stateless Service	Yes	Yes	Yes		Yes	Yes	Yes	Yes (done at application level)	Yes
Load Balancing	Integrated routing service provided via Nginx			All clever cloud applications are behind a reverse proxy defining one or many backend for one app. It's built on clever cloud console and API, and activated by default.	HTTP/HTTPS loadbalancing is included/required. cloudControl does offer Varnish based caching as part of the routing tier as well.	dotCloud uses open source Hipache to power our HTTP routing layer which runs on an elastic pool of dedicated machines called gateways. dotCloud's gateways handle load balancing and failover., and it can scale up the machines to handle load increases and reduce latency.		Engine Yard offers two load-balancing options: HAProxy or Amazon Elastic Load Balancers.	
Resource-Pooling	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

PaaS Comparison Table (cont'd)

	CloudBees	OpenShift Online	AppFog	CleverCloud	cloudControl	dotCloud	Heroku	Engine Yard	Google App Engine
Software Production Support									
Auto-Provisioning	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Self-Service Configuration	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Continuous Integration	Yes, hosted JenkinsCI is an integral part of the CloudBees offering.	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Continuous Deployment	Yes, hosted JenkinsCI is an integral part of the CloudBees offering.	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Continuous Delivery	Yes, hosted JenkinsCI is an integral part of the CloudBees offering.	Yes	Yes		Yes		Yes	Yes	Yes
Configuration Management	Yes, CloudBees offers hosted Git, SVN, and Maven repositories.		Yes		Yes		Yes	Yes	Yes
Deploy from templates/ OS Image Creation	No				Yes	Other: jenkins, Buildbot, your own scripts	Yes	Yes	
Future Updates		Additional middleware services	.NET support and persistent file system	Plans to integrate New Relic, Groovy and Grails, S3 API, best API, github integration, out of beta organisaiton model, wake up on request	Websockets, Multi-factor-authentication, Webinterface relaunch.	Improvements to the HTTP routing layer including the use of Nginx.		Visit www.engineyard.com/products/cloud/preview for information on newest features and a preview of upcoming releases.	

CloudBees
www.cloudbees.com

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CloudBees

PaaS Customers: 30,000

Woburn, Massachusetts USA

Launch Date: April 2010

Free trial - Free Offering with Paid Upgrades

Current Version:

Related Products: Jelastic, Heroku

https://grandcentral.cloudbees.com/login

http://developer-blog.cloudbees.com/

@cloudbees

UPDATES: WEEKLY

Product Description

CloudBees is a production-ready PaaS aimed at providing both development services and runtime services for Java and other languages. CloudBees takes a no IT, no middleware approach, which lowers costs for Java users. CloudBees focuses on Continuous Cloud Delivery, full lifecycle support, and rapid development.

Pricing Details

CloudBees offers a free version with all features for evaluation. Paid packages that include production capabilities start at $15 per month.

Features

1. CloudBees offers hosted services throughout the entire application lifecycle. Most PaaS competitors only provide runtime services.
2. CloudBees supports any JVM-based language, including Java, JRuby, Grails, Scala, Groovy, and Spring Framework.
3. CloudBees also supports JavaScript/node.js, PHP, and even Erlang natively.

Claim to Fame

Developer-focused solution with Continuous Cloud Delivery makes applications ready-to-release.

3rd Party Review

Especially Good For:

Small and Medium Sized Buisineses

Pros:

- Easy to download the SDK and get a sample app running and integrated into CI
- Convenient development model that directly accepts standard Java EAR or WAR files

Cons:

- Less appropriate as a hybrid

OpenShift Online

PaaS

Raleigh, North Carolina USA

Launch Date: April 2011

Free trial - Free for a fixed number of applications, no time limit

Related Products: Heroku, dotCloud

http://openshift.redhat.com

openshift.redhat.com/community/blogs

@openshift

UPDATES: MONTHLY

Claim to Fame

Leading auto-scaling public PaaS platform from a trusted enterprise technology leader.

Product Description

OpenShift Online accelerates development by providing an elastic, multi-language, PaaS architecture that automates the provisioning, management and scaling of applications. With OpenShift Online, developers get to focus on writing code. OpenShift Online leverages the OpenShift Origin open source project which also powers the OpenShift Enterprise Private PaaS from Red Hat.

Pricing Details

Flat monthly fee for service access and world class technical support from Red Hat. Hourly surcharges for resource consumption above the included amount.

Features

1. Supports multiple programming languages including Java (EE6), Ruby, Node.js, Python, PHP, and Perl using open source runtimes preventing lock-in and insuring application portability
2. Provides IDE integration, web console, and command-line interfaces to give developers self-service, automated access to auto-scaling application stacks in the cloud.
3. Supported by Red Hat's world-class technical support

AppFog

PaaS Customers: 114K

Portland, Oregon USA

Launch Date: September 2011

Free trial - 2GB RAM, 8 instances, 100MB of storage

Current Version:

Related Products: Heroku, dotCloud

https://www.appfog.com/

http://blog.appfog.com/

@appfog

UPDATES: WEEKLY

Product Description

AppFog gives users instant installation and N-tier cloud deployment for PHP and other applications. Users can install tools like Drupal and WordPress with one click. Their focus is on simplicity, taking the pain out of deploying PHP apps. AppFog handles all the tweaking and managing of cloud servers, databases and storage.

Pricing Details

Prices based on RAM: 2GB RAM with 200 MB storage, $20/mo; 2GB RAM, 500MB storage and 1 dedicated SSL endpoint, $50/mo; 4 GB $100/mo; 16GB $380/mo; 32 GB $720/mo.

Features

1. Work can be run on one Cloud and easily transferred to another
2. Self-service configuration and auto-provisioning
3. Compatible with Git, Mercurial, and Subversion version control systems

Claim to Fame

"Takes the pain out of deploying and managing apps by handling IT tasks and servers"

3rd Party Review

Especially Good For:
Start-ups

Pros:

- Easy to get up and running
- A good free plan for PHP

Cons:

- Occasional difficulties with enterprise applications

Clever Cloud

PaaS

Nantes, France

Launch Date: January 2013

Free trial - Up to 2,000 free "drops"

Related Products: Heroku, EngineYard

http://www.clever-cloud.com/

http://blog.clever-cloud.com/

@clever_cloud

UPDATES: BI-WEEKLY

Product Description

Clever Cloud PaaS is able to run in many languages including PHP, Java, Scala, Python and node.js. Their hosting features automatic scalability, keeping applications available and responsive even under high traffic. Clever Cloud is easy-to-manage and integrates well with existing activities, allowing users to simply and quickly host apps and websites.

Pricing Details

Pricing is based on how many drops (instances) are used. Users purchase drops as necessary. Fixed pricing plans are also available on request.

Features

1. Wide range of languages supported, and fault-tolerant in any circumstance
2. Unique "drops" (instances) usage model
3. Users "come as they are," there's no need to change app code

Claim to Fame

"High scalability in a pay-as-you-go model."

cloudControl

PaaS

Berlin, Germany | Customers: 18000

Launch Date: July 2010
Free trial - 14 Day Free Trial
Related Products: Heroku, EngineYard

https://www.cloudcontrol.com
https://www.cloudcontrol.com/blog
@cloudcontrolled
UPDATES: WEEKLY

Product Description

cloudControl is a European PaaS supporting Java, PHP, Python, Ruby and more via custom buildpacks. Multiple environments for production, staging, and development are supported. cloudControl offers enterprise-grade support plans and a solution provider network with a focus on helping European ISVs become SaaS providers.

Pricing Details

Billed per the monthly sum of memory provisioned across containers, 128MB/hour is € 0.01. The free tier has 750,128MB/hour per month. Add-ons priced according to provider plans.

Features

1. Development, staging and production environments included
2. An extensive add-on market with integrated third-party Cloud services
3. Agile/continuous, zero downtime deployments and self healing capabilities

Claim to Fame

"The first production-ready, multi-language PaaS in Europe."

dotCloud

PaaS

San Francisco, California USA

Launch Date: January 2011
Free trial - Sandbox mode is free
Current Version: dotCloud CLI 0.9
Related Products: Heroku, EngineYard

https://www.dotcloud.com/
http://blog.dotcloud.com/
@dot_cloud & @getdocker
UPDATES: WEEKLY

Product Description

dotCloud PaaS is an easy-to-use service that allows developers to deploy and scale their applications simply and quickly. DotCloud is compatible with a number of languages, databases, caching and messaging components, giving developers a lot of flexibility and total control of their technology stack.

Pricing Details

Free, open source sandbox for self-hosting available on GitHub. Live mode starts at $4.32/ month and is billed based on RAM use.

Features

1. Pre-configured components available to facilitate the technology stack creation
2. Offers built-in load balancing, monitoring and failover that run 24/7
3. Scales very quickly, making it easy to handle surges in traffic and supports a variety of databases and languages

Claim to Fame

"Extremely flexible and easy to use."

3rd Party Review

Especially Good For:
Small-Medium Businesses

Pros:
- Excellent auto-provisioning support
- Flexible configuration model
- No lock-in
- Direct acces to the box via SSH and ability to run commands

Cons:
- CI/CD is difficult to set up
- API documentation is hard to find
- CLI is difficutl to install on windows

Heroku

PaaS

San Francisco, California USA

Launch Date: April 2009

Free trial - 2GB RAM, 8 instances, 100MB of storage FREE

Related Products: dotCloud, Engine Yard

https://www.heroku.com

blog.heroku.com

@heroku

UPDATES: ANNUALLY

Product Description

Heroku is a multi-language PaaS that allows developers to focus on developing while Heroku handles servers and system administration. Cloud application can be built, deployed and run using Ruby, Node.js, Clojure, Java, Python and Scala. Heroku provides and manages a platform that has a runtime for scalability, is fault tolerant, and features an add-on system.

Pricing Details

There are two types of computing instances called "dynos" that both cost $0.05/hour. See the full pricing here: https:/www.heroku.com/pricing

Features

1. Fast and fault-tolerant
2. Open stack; no lock-in
3. Add-on architecture allows Heroku to support a vast array of utilities

Claim to Fame

A strong technical team building the product, including the creator of the Ruby programming language.

3rd Party Review

Especially Good For:
Small-Medium Businesses

Pros:

- Good Range of Tool Support
- Easy to get started, use and integrate with existing systems
- Handles mobile applications well

Cons:

- Less Sophisticated API
- Vendor Lock-in, not well suited for Java and PHP apps
- No support for configuration management

Engine Yard

PaaS Customers: 2000+

San Francisco, California USA

Launch Date: January 2006

Free trial - 500-hour free trial

Related Products: Heroku, dotCloud

http://www.engineyard.com

http://www.engineyard.com/blog

@engineyard

UPDATES: DAILY

Product Description

Engine Yard Cloud supports Ruby on Rails, PHP, and Node.js applications. Engine Yard runs everything from small-scale web applications to large-scale enterprise applications. Engine Yard is committed to open source technology and gives the customer a variety of options to customize configuration, deployment and management of their application.

Pricing Details

Starts at $0.05/hour for Cloud with Standard Support. Prices include Cloud, Standard Support and infrastructure with varying server sizes (ECU, RAM, storage, bandwidth, etc.)

Features

1. Offers granular control over the environment with an easy-to-use cloud dashboard
2. The technology stack is built through continuous integration, ensuring consistency and quality
3. Allows customers to replicate their master databases on both PostgreSQL and MySQL

Claim to Fame

Gives the choice of balance between automation and full control over instances, backed by technical and DevOps support.

Google App Engine

PaaS

Mountain View, California USA

Launch Date: April 2008

Free trial - Free below a certain amount of resources

Related Products: Heroku, Engine Yard

https://developers.google.com/appengine/

http://googlecloudplatform.blogspot.com

@googlecloud

UPDATES: WEEKLY

Product Description

It's very easy to get started with Google's PaaS. Tools are provided to help create, test, launch and update apps. Google App Engine was one of the earliest PaaS offerings. It offers reliable scaling, load balancing, and support for common web technologies. Google App Engine is suitable for building websites, business applications (with strong SLAs), and mobile apps.

Pricing Details

Free below a certain amount of resources used. Paid is $9/app/month and Premier starts at $150/account/month.

Features

1. Supports Java, Python, Go and PHP programming languages.
2. For security, applications are sandboxed.
3. Use Google's model for deployment and persistence.

Claim to Fame

"First provider to offer something between SaaS and IaaS, i.e. PaaS."

3rd Party Review

Especially Good For:
Startups

Pros:

- Simple and easy to get started and manage.
- Good CI/CD experience across different operating systems.

Cons:

- Somewhat stringent limitations on applications
- No third-party module/plugin ecosystem

APaaS Solutions

Comparison Table

*Note: Comparison data based on information provided by vendors.

	Rollbase	WorkXpress	Xuropa
Cloud Specifications			
Hosting Styles	Hybrid	Public and private	Public, Private and Hybrid
Server Security Features		Firewall	
Data Location / Availability Zones	Application definition information is decoupled from the underlying platform code which eliminates compatibility risks and allows Rollbase to maintain a high frequency of updates. Individual tenant can be backed up and restored manually or via scheduled batch jobs.	Host publicly or behind a firewall, supports local backups, hardened against XSS, no JS allowed by visitors, hardened against SQL injection, no anonymous API or user access, data encryption in transit, data encryption at rest, and data redaction of critical privacy information	The Xuropa Platform leverages all of the security features of the host infrastructure provider, including backups, firewall configuration, inbound/ outbound data encryption, and intra-networking data encryption.
Hosting Locations	Rackspace, Amazon, Joyent, Azure, in-house servers	Public and Private Cloud options, including amazon, storm on demand, and more	Outsourced
Encryption		Data encryption in transit and as needed.	Inbound/outbound encryption and intra-netoworking encryption
Compliance Standards		SASS70, Federal, HIPAA, HITECH, PCI and more	
Support Availability			
Tech Support	Customer support representatives can help via an online support portal, online community forum, tickets, phone, and email support	Different tiers of support that include: telephone, email, instant message, on-site, and forums.	Email and phone
Self Support	Yes	Yes	Yes
Documentation	https://www.rollbase.com/rollbaseinaction.shtml	http://wiki.workxpress.com	Not available for the general public

APaaS Comparison Table (cont'd)

	Rollbase	WorkXpress	Xuropa
Software Compatibility			
Languages Supported	Java, C#, PHP, JavaScript, SQL, HTML/XML	PHP, Javascript, SQL, HTML/XML, other	Java, C#, Ruby, Python, Perl, PHP, JavaScript, Groovy, SQL, Scala, HTML/XML
Frameworks Supported	Other	WorkXpress 5GL Development	Other
Databases Supported	MySQL, MS Access, Oracle	MySQL	MySQL, CouchDB, MongoDB, Oracle NoSQL DB, MS Access
OS Support	Windows, OS X, Linux-based, iOS, Android OS	Linux-based	Winodws and Linux-based
Windows Versions (if applicable)	Windows 2000, Windows XP, Windows Vista, Windows 7, Windows 8, Windows Server 2008	n/a	Windows Server 2008
Linux Distros (if applicable)		Ubuntu	CentOS
Open Source			No
Platform Control			
API Options	Included API/First Party API and Third Party API support	Included API/First party API	No API options
Dashboard and/or Command Console	Dashboard	Dashboard	Dashboard
GUI Options	All applications have a set of components which combine to form a functioning user interface layer. Each component is customizable using point-and-click, drag-and-drop. You can define your own UI components completely from scratch, or plug in third party scripts, widgets, etc.	100% visual building environment	Available using the Xuropa platform

APaaS Comparison Table (cont'd)

	Rollbase	WorkXpress	Xuropa
Platform Control			
Reporting Options	Using Rollbase report builder, reports can be created and modified to meet specific needs. Tabular report, HTML, Word and PDF document template based on reports and JavaScript based report for complete control of report output.	Users can query the database, and resulting data can be put into a table style report, with charts and graphs. Document reports can be created that merge data sources, and output can be generated in html, word, excel, pdf.	Dashboard
Resource Monitoring	Central management dashboard is provided	A wide range of cloud monitors including ability to set custom monitors and to configure self-healing parameters.	Dashboard
Pricing			
Pricing Page	https://www.rollbase.com/pricing.shtml	http://www.workxpress.com/pricing-workxpress-12-13	
Pricing Model	Metered	Metered Threshold	Metered
Usage Limits		$9.99/mo to build and another $9.99/mo to test. Deploy: $15 for 1 to 10 users, $10 for 11 to 100 users, $5 for 101+ users. Dedicated Private and Public cloud start at $149/mo.	Free for enterpise software companies to use / free below a certain number of users
Free Trial	30 days for Rollbase.com, limited tenant and users for Private Cloud	30 Day free trial	Free below a certain number of users
Scalability, Performance, and Availability			
Multi-tenancy/ Isolation	Multi-tenancy	Multi-tenancy available	
Vertical/Horizontal Scaling Strategy	Tenants are not assigned, they are load balanced. Tenants can span app servers horizontally as needed.	Single server scaling depends on the cloud provider, and multi-server scaling is achieved using server clustering. Web servers can be clustered to handle web traffic, and database servers can be clustered to scale data requests and volumes.	Scales up the number of instances hosting enterprise software infinitely

APaaS Comparison Table (cont'd)

	Rollbase	WorkXpress	Xuropa
Frequently Requested Features			
Auto-scaling	No	No	Yes
High Availability	Yes	Yes	Yes
Stateless Service	No	No	No
Load Balancing	Rollbase dynamically loads tenants onto the available production component with the lowest current resource utilization and load balances users across all available production components. Tenants are dynamically unloaded from production components after a configurable period of inactivity to minimize resource consumption. The dynamic tenant loading process consistently clocks in at sub-second times on the order of 700ms.	Varies based on IaaS provider chosen	Built into the infrastructure provider.
Resource-Pooling	Yes	Yes	No
Frequently Requested Features			
Auto-Provisioning		Yes	Yes
Self-Service Configuration	Yes	Yes	Yes
Continuous Integration		Yes	Yes
Continuous Deployment		Yes	Yes
Future Updates	Visual workflow editor, native mobile and tablet apps, improvements to HTML5 mobile app, increased control over application development and publishing process for ISVs	Self-documentation of application code, new mobile development patterns and frameworks, and additional integrations.	Greater API integrations to other platforms

Rollbase

PaaS **Customers: 50**

Saratoga, California USA

Launch Date: August 2008
Free trial - 30 Day Free Trial
Current Version: Version 4.0
Related Products: Force.com

http://www.rollbase.com
http://www.rollbase.com/blog
@rollbase
UPDATES: BI-WEEKLY

Claim to Fame

Cheap and stable method of building your SaaS solution.

Product Description

The Rollbase platform allows users to create SaaS business applications using point-and-click and drag-and-drop tools in a standard web browser. This requires minimal programming skills and is fairly easy to use. On the backend, Rollbase is programmed in JavaScript and SQL, making it easy to adapt if necessary.

Pricing Details

Available as either a licensed product (run on whatever server you want) starting at $1000/month, or a hosted product starting at $30/month. There are a variety of payment plans available.

Features

1. Rollbase runs on pretty much any operating system, and on the most popular relational databases
2. Rollbase allows you to import Salesforce.com CRM and other Force.com app data
3. When used as a licensed solution, Rollbase can be deployed to most any cloud infrastructure or in-house server

WorkXpress

PaaS **Customers: 200**

Harrisburg, Pennsylvania USA

Launch Date: February 2003
Free trial -
Current Version: Click
Related Products: Rollbase, Force.com

http://www.workxpress.com
http://www.workxpress.com/blog
@WorkXpress
UPDATES: WEEKLY

Claim to Fame

The only PaaS with completely end-to-end visual administration and development environment.

Product Description

WorkXpress is a fast and powerful rapid application development PaaS. Visual systems administration and software development environments are offered end-to-end, making workXpress very user-friendly and allowing businesses to "click not code." Users can opt for private clouds, public clouds, flexible partnerships or private labeled branding.

Pricing Details

$9.99/month to build and $9.99/month to test. Deployment fees are based on users per month, starting at $5 for 101+ users. Dedicated private and public clouds start at $149/month.

Features

1. Applications are built in a 100% visual environment; very user-friendly
2. Backend security, data backups, scalability, usage and compliance are all handled by WorkXpress
3. WorkXpress offers security, compliance, multi-tenancy, billing, auditing, and data and disaster recovery

Xuropa

PaaS **Customers: 6**

San Francisco, California USA

Launch Date: September 2010
Free trial - Free trial available
Current Version:
Related Products: Force.com

http://www.xuropa.com
http://www.xuropa.com/blog/
@xuropa
UPDATES: MONTHLY

Claim to Fame

Different model of engaging customers.

Product Description

Xuropa provides a provisioning system for cloud-based desktop environments. The platform leverages stages of customer engagement, including demonstrations, proof-of-concept interactions, product evaluations and customer support including training. Users can access software in the cloud using SSO, remote application virtualization, client-side download or install. Rollbase and WorkXpress, by comparison, provide a product for developers, not end-users.

Pricing Details

-

Features

1. Built on unique lead nurturing and analytics engine.
2. Sales engine means real-time dynamic qualification of prospects based upon interactions.
3. Cloud automation engine allows customers to securely use software in the cloud IT free.

Interview with DNS Refcard Author Michael Hughes

I have a Bachelors Degree in Telecommunications Engineering and have worked for energy companies, web hosting companies and even large financial institutions as a technical specialist and more recently a security specialist, and in doing so was required to develop a deep knowledge of the workings of numerous technologies.

Read more...

Language-Specific PaaS Solutions

Comparison Table

*Note: Comparison data based on information provided by vendors.

	Fortrabbit	Jelastic	Nodejitsu
Cloud Specifications			
Hosting Styles	Public	Public, private, and hybrid	Public
Secure Authentication Options		Any Java and PHP frameworks supported	Secure token-based single sign on
Server Security Features		Dedicated virtual machines, firewalls, backup	Firewalled servers
Data Location / Availability Zones	Managed high availability systems always including the latest patches	Complete server and database isolation, access to server configuration, use of custom libraries, public IP addresses can be used to connect with remote tools for remote debugging, data management, FTP access.	As a web host, Nodejitsu provides ephemeral hard disk access to every app, as well as a selection of third-party database providers.
Hosting Locations	AWS	Multiple hosting companies around the globe - http://jelastic.com/partners	Outsourced
Encryption		SSL support including custom domains. Support for database encryption and application data encryption. Permissions and delegation of different levels of access to different team members for various environments: dev/test/prod	SSL support is provided, each app must deal with its own data encryption needs
Compliance Standards	N/A	Provided by hosting partners. Include: ISO27001 (ISMS), SSAE 16, ISO 9001, ISO 14001, OHSAS 18001, PCI DSS, TUEV Trusted Cloud Certificate	
Support Availability			
Tech Support	Twitter, online support ticket system, email, telephone	Local technical support is provided through phone, email, forums and online documentation.	Real time support in IRC, email, and proactive reactions to problems.
Self Support	Yes	Yes	Yes
Documentation	http://support.fortrabbit.com	http://jelastic.com/docs	handbook.nodejitsu.com

Language-Specific PaaS Solutions Comparison Table (cont'd)

	Fortrabbit	Jelastic	Nodejitsu
Software Compatibility			
Languages Supported	PHP, SQL, HTML/XML	Java, PHP, Groovy, Scala, JRuby, ColdFusion/CFML	JavaScript
Frameworks Supported	All PHP Frameworks	Spring, Grails, ColdFusion/CFML	Node.js
Databases Supported	MySQL	MySQL, CouchDB, MongoDB, PostgreSQL, MariaDB, Memcached	CouchDB, MongoDB, Redis
OS Support	Windows, OS X, and Linux-based	Linux-based, iOS, Android OS	Windows, OS X, Linux-based
Windows Versions (if applicable)	Windows 2000, Windows XP, Windows Vista, Windows 7, Windows 8, Windows Server 2008	n/a	Windows XP, Windows Vista, Windows 7, Windows 8
Linux Distros (if applicable)		CentOS	
Hypervisors Available			
Open Source	No	No	Yes
Platform Control			
API Options	No API options	Included API/First party API and Third Party API support	Included API/First party API
Dashboard and/or Command Console	Dashboard	Dashboard	Dashboard and Command Console
GUI Options	An up to date, ready to use PHP stack where web developers can leverage latest technologies, like PHP Composer and can rely on standards like SSH/SFTP. Plans scale from a free development environment to an affordable shared cloud to dedicated managed cloud resources.	"Application-compatible Java and PHP PaaS that easily selects the application servers and databases that you need, then get your application up and running. Jelastic provides automated vertical scaling, horizontal scaling, environment cloning and swapping."	Nodejitsu uses a custom low-latency in-house load balancer to handle incoming requests, and make horizontal scaling of applications - and of our own load balancing layer - extremely simple.
Reporting Options	Comprehensive analytics presented in a nice graphical way. Automatic sytem alerts sent by e-mail.	Built-in reporting and monitoring solutions to track load and usage, detailed billing data, full access to all log files and server configuration files, advanced monitoring and reporting through 3rd-party services like New Relic, Plumbr, Chronon, Logentries, etc.	REST API provided to access to application logs
Resource Monitoring	Near real-time statistics in the control panel	Built-in basic monitoring and integration with advanced external tools & services such as New Relic.	Simple server logging, monitoring and auto-scaling tools.

Language-Specific PaaS Solutions Comparison Table (cont'd)

	Fortrabbit	Jelastic	Nodejitsu
Pricing			
Pricing Page	FortrabbitPricing.pdf	http://jelastic.com/pricing	https://www.nodejitsu.com/paas/pricing/
Pricing Model	Metered	Metered Threshold	Flat pricing structure based on nodes/VMs.
Usage Limits	Prices are based on the number of processes, nodes, storage, APC and uptime	Starts at $0.01/hour and increases depending on how much customers use - no limits	$3/mo - 1 drone. $7/mo - 3 drones. $11/mo - 5 drones. $.0042 per hour per drone for infinite drone usage.
Free Trial	Free below a certain amount of data	At least 2 week free trial, depends on the hosting partner	30 Day free trial
Scalability, Performance, and Availability			
Multi-tenancy/Isolation		Multi-tenancy available	multi-tenancy available
Vertical/Horizontal Scaling Strategy	Vertical scaling is achieved by adding more resouces (processes, storage, cache, CPU cycles). Horizontal scaling is achieved by adding multiple nodes.	Automated vertical scaling within client specified limits, and horizontal scaling.	VMs can be provisioned and configured easily. Adding servers can be done with a single command.
Frequently Requested Features			
Self Service Provisioning		Yes	Yes
Auto-scaling	No	Yes	No
High Availability	Yes	Yes	Yes
Stateless Service	Yes	Supports both stateful and stateless applications	Yes
Load Balancing	Load-balancing is built in.	Built-in and automatically configured NGINX load-balancer, including support for sticky sessions and session replication - providing for automated highly available cluster configurations	We have a custom low-latency node.js load balancer, built on the first open-source reverse proxy to support the proxying of websockets.
Resource-Pooling	Yes	Yes	No
Software Production Support			
Auto-Provisioning		Yes	
Self-Service Configuration	Yes	Yes	Yes
Continuous Integration	Yes	Yes	
Continuous Deployment	Yes	Yes	Yes
Continuous Delivery		Yes	
Configuration Management		Yes	
Deploy from templates/ OS Image Creation	N/A	Yes (through cloning)	N/A

Fortrabbit

PaaS Customers: 1,000

Berlin, Germany

Launch Date: October 2012
Free trial - Free below a certain amount of data
Current Version: Version 4.0
Related Products: Jelastic, Nodejitsu

http://fortrabbit.com
http://blog.fortrabbit.com
@fortrabbit
UPDATES: MONTHLY

Product Description

Fortrabbit is a European PaaS designed with PHP developers in mind. Fortrabbit saves developers time by eliminating system administration, increases their productivity by using the latest technology, and saves costs by removing initial server investments. Users can deploy with Git, SSH, or SFTP.

Pricing Details

Different pricing plans based on data usage; prices start at about €0.33 per day.

Features

1. Develop using PHP 5.4, Git and native Composer integration
2. System operations are automated
3. A single dashboard displays an overview of all your applications

Claim to Fame

A great PaaS for IT shops that are deep into the PHP ecosystem.

Jelastic

PaaS Customers: 50,000

Palo Alto, California USA

Launch Date: October 2011
Free trial - 2 Week Free Trial
Current Version: Jelastic 1.9
Related Products: Google App Engine, Heroku

http://jelastic.com
http://blog.jelastic.com
@Jelastic
UPDATES: MONTHLY

Product Description

Jelastic is a Java and PHP focused Platform-as-a-Service that allows developers to simply select a stack, upload and go. Jelastic deploys Java and PHP applications without needing to worry about the specific language or API that the application was created with. Jelastic provides automated vertical and horizontal scaling, as well as automated updates to your environment.

Pricing Details

Prices start at $0.01/hour and increase depending on use. Discounts available for high volume use.

Features

1. Customers aren't locked-in and don't have to code specifically for the platform they are using
2. Vast selection of popular app servers and databases including Tomcat, TomEE, GlassFish, Apache and more
3. Plugins for all popular IDEs, build and continuous integration systems, GIT and SVN hooks, FTP or web upload

Claim to Fame

Focused on hosting and auto-scaling any Java and PHP application.

Nodejitsu

PaaS Customers: 25,000

Manhattan, New York USA

Launch Date: April 2009
Free trial - 30 Day Free Trial
Current Version: Version 4.0
Related Products: Windows Azure

http://nodejitsu.com
http://blog.nodejitsu.com
@nodejitsu
UPDATES: WEEKLY

Claim to Fame

Created by members of the node.js community, Nodejitsu is user-friendly, reliable, and scalable PaaS.

Product Description

Nodejitsu is a Platform-as-a-Service dedicated to node.js (JavaScript). Open source applications will be hosted by Nodejitsu for free, as the company is dedicated to development and open source. Nodejitsu provides an application marketplace that enables the deployment and monetization of open-source node.js projects.

Pricing Details

If the application is open source, then Nodejitsu will host it for free. Otherwise, flat rates are offered based on Nodes and VMs.

Features

1. Nodejitsu's infrastructure is provided by their partner Joyent, where the node.js creator works.
2. Nodejitsu is compatible with the databases MongoDB, CouchDB, and Redis.
3. First platform to support Websockets.

Ofir Nachmani

MVB

Website
http://iamondemand.com

5 Essentials of Cloud Workloads Migration

05.15.2013

The benefits of migrating workloads between different cloud providers or between private and public clouds can only truly be redeemed with an understanding of the cloud business model and cloud workload management. It seems that cloud adoption has reached the phase where advanced cloud users are creating their own hybrid solutions or migrating between clouds while striving to achieve interoperability values within their systems. This article aims to answer some of the questions that arise when managing cloud workloads.

Q1: What is a cloud workload and cloud workload management?

A cloud workload is dependent on the cloud layer (i.e. infrastructure, compute unit, storage unit, etc.). In infrastructure the workload is the compute or storage units that are being utilized by the cloud consumer during a period of time. In PaaS, the workload refers to the software stack processing efforts while in SaaS it refers to the usage and demand habits of the end user or system. One method of measuring workload throughput is by analyzing the utilization efficiency. Cloud workload management requires an understanding of resource demand in order to ensure efficient capacity utilization at all times. Additionally, it means having the visibility and tools to utilize fixed capacity for steady demand as well as the ability to burst on-demand peaks while aiming for ideal throughput of IT and cloud resources.

Read more...

Open Source PaaS Solutions

Comparison Table

*Note: Comparison data based on information provided by vendors.

	OpenShift Origin redhat	Cloudify
Cloud Specifications		
Hosting Styles	Open source PaaS project useful for public, private, or hybrid PaaSes	Public, Private by provider, private on-premise, Hybrid
Secure Authentication Options	LDAP, Kerberos, and extensible via Mod-Auth	Fully secure, SSL, plug into an authentication provider, can control authorization at multiple levels by users and tenants, users can be assigned specific roles and privileges.
Server Security Features		Dedicated servers, firewalled servers, local backup
Data Location / Availability Zones	There are a number of options for data locality and security within the OpenShift PaaS architecture. Data can be located on the underlying infrastructure that supports the PaaS, or it can be located in external systems that are accessed by the PaaS, depending on your security requirements and data locality requirements.	Supported by 3rd party provider.
Hosting Locations		
Encryption	Operational interactions, developer interactions, commands, code pushes, etc, with the PaaS are encrypted via SSH. Interactions with deployed applications can use any encryption best suited for the developer requirements	"Don't save usernames and passwords, communication is encrypted and all that happens in Cloudify nodes. "
Compliance Standards	FISMA, ISO 27001, PCI DSS Level 1, Sarbanes-Oxley (SOX), SOC 1 / SSAE 16/ ASAE 3402	
Support Availability		
Tech Support	Community support via IRC, forums, and email	Community, 24/7 Phone, Email
Self Support	Yes	Yes
Documentation	http://openshift.github.io/origin/file.README.html	http://www.cloudifysource.org

Open Source PaaS Comparison Table (cont'd)

	OpenShift Origin redhat	Cloudify
Software Compatibility		
Languages Supported	Java, Ruby, Python, Perl, PHP, JavaScript, Groovy, Clojure, Scala	Language-neutral through middleware
Frameworks Supported	Spring, Java Enterprise Edition, Rails, Grails, Django, Zend, CodeIgniter, Symfony, Sinatra	Neutral
Databases Supported	MySQL, MongoDB, PostgreSQL	Relational and nonrelational databases.
OS Support	Windows, OS X, Linux-based, iOS, Android OS	Windows, Linux-based
Windows Versions (if applicable)	Windows 2000, Windows XP, Windows Vista, Windows 7, Windows 8, Windows Server 2008	
Linux Distros (if applicable)	n/a	Ubuntu, CentOS
Hypervisors Available	Xen, KVM, Vmware	
Open Source	Yes	Yes
Mobile Platforms with App Support	Cross-platform web app	
Platform Control		
API Options	Included API/First party API	Included API/First party API, Third Party API support
Dashboard and/or Command Console	Command Console	Dashboard
GUI Options	The OpenShift Web Console is designed as a responsive web application and supports any size browser for access. In addition, OpenShift provides the RHC command-line toolset for interaction with the PaaS.	Dashboard
Reporting Options	Data Extraction	Can see current statuses about deployment, available instances, sequence of events. Defining specific metrics to trigger events.
Resource Monitoring	Web console dashboard, command-line tools, and RESTful API	Console that shows all monitoring
Pricing		
Pricing Page		http://gigaspaces.com/cloudify-go-pro
Pricing Model	Free-to-use tool	Free to use with support
Usage Limits		
Free Trial	Free and Open Source	Open source, hosting prices depend on provider

Open Source PaaS Comparison Table (cont'd)

	OpenShift Origin redhat.	Cloudify
Scalability, Performance, and Availability		
Multi-tenancy/ Isolation		Multi-tenancy - ability to separate nodes, separate a specific node into multiple tenants, and can splice a specific VM.
Vertical/Horizontal Scaling Strategy	OpenShift PaaS supports automatic horizontal scaling based on in the incoming load to an application exceeding a pre-determined threshold concurrent connections.	
Frequently Requested Features		
Geo-Replication	No (customer is responsible for replication)	Yes
Self Service Provisioning	Yes	
Auto-scaling	Yes	Yes
High Availability	Yes	Yes
Stateless Service	Yes	Yes
Load Balancing		
Resource-Pooling	Yes	Yes
Software Production Support		
Auto-Provisioning	Yes	Yes
Self-Service Configuration	Yes	Yes
Continuous Integration	Yes	Yes
Continuous Deployment	Yes	Yes
Continuous Delivery	Yes	Yes
Configuration Management		Yes
Deploy from templates/ OS Image Creation	No	Yes
Future Updates	Additional middleware services	Providing a repository feature, connecting Cloudify to GitHub and manage recipes there and push from there. Continuous delivery with finer grained control with rollouts and testing. Enriching the ecosystem with more integrations, build tools, CI tools, monitoring tools.

OpenShift Origin

PaaS

Raleigh, North Carolina USA

Launch Date: April 2012
Free trial - Free-to-use tool
Current Version:
Related Products: Cloud Foundry, Cloudify

http://openshift.github.io
openshift.redhat.com/community/blogs
@openshift
UPDATES: WEEKLY

Product Description

OpenShift Origin is the open source upstream project of OpenShift, a PaaS created by Red Hat. Both the OpenShift Online public PaaS and the OpenShift Enterprise private PaaS are built on the OpenShift Origin open source project. The entire OpenShift family leverages the strength of a trusted stack of open source Red Hat technologies including Red Hat Enterprise Linux and JBoss.

Pricing Details

OpenShift Origin is an open source project licensed under the Apache 2 license agreement. Free to use and modify.

Features

1. Supports multiple programming languages using open source runtimes preventing lock-in and insuring app portability
2. Leverages unique, highly-secure, multi-tenancy model through automatic configuration of SELinux and Linux Control Groups
3. Automatically scales guest applications horizontally to handle fluctuations in traffic and demand

Claim to Fame

Open Source PaaS project by the open source enterprise software leader, Red Hat.

3rd Party Review

Especially Good For:
Startups

Pros:
- No Lock-in
- Easy to get up and running; easy to integrate with internal systems

Cons:
- Not officially production-ready so scaling, performance and security are still uncertain.
- Trial account only gives non-clustered, very small instances

GigaSpaces Cloudify

PaaS

Israel

Launch Date: February 2012
Free trial - Open Source
Current Version:
Related Products: Cloud Foundry, OpenShift

http://www.gigaspaces.com
http://www.cloudifysource.org/blog
@CloudifySource
UPDATES: QUARTERLY

Product Description

Cloudify is an open source PaaS, able to be hosted just about anywhere, that allows a pre-existing program to be entered into the cloud as a SaaS with a flexible back-end, comprehensive security, and powerful admin tools. Cloudify has open source configurations called "recipes" that allow nearly any language, framework, and database combination to be pushed to the cloud.

Pricing Details

Free and open source; paid tier available for professional services and tech support.

Features

1. Auto and manual scaling, with the ability to scale horizontally across VMs.
2. No changes to local code should be necessary to turn your existing program into a SaaS.
3. Supports the full life cycle of development including Chef and Puppet integration.

Claim to Fame

Allows easy transition to the cloud for legacy software and can turn most local code into a SaaS.

Private PaaS Solutions

Comparison Table

*Note: Comparison data based on information provided by vendors.

	WSO2 Stratos	OpenShift Enterprise	Apprenda	Cumulogic
Cloud Specifications				
Hosting Styles	Public, private by provider, private on-premise, partner PaaS, and hybrid PaaS.	Private by provider and private on-premise	Private on-premise and hybrid	Private
Secure Authentication Options	XMPP Multifactor Authentication, Federated authentication such as OpenID and SAML2, Google App SSO, Oauth, WS-Security mechanisms powered by Apache Rampart, custom webapps can be integrated with tenant specific user store in SLive.	LDAP, Kerberos, and extensible via Mod-Auth	All - Federated Identity with existing enterprise authentication systems	
Server Security Features	Dedicated servers, firewalled servers, and local backup	Dedicated servers, firewalled servers, local backup	Dedicated servers, firewalled servers, and local backup	
Data Location / Availability Zones	The run-time contained data is secured by OSGI-based multi-tenant aware class loader and java security manager. Custom code deployed by tenants does not have access to data processing code. Incoming connections from only a set of trusted hosts are granted access to the data storage.	There are a number of options for data locality and security within the OpenShift PaaS architecture. Data can be located on the underlying infrastructure that supports the PaaS, or it can be located in external systems that are accessed by the PaaS, depending on your security requirements and data locality requirements.	Data is stored wherever clients choose. Secure shared multi-tenancy at the platform and application level.	App isolation at VM level (isolated group of VMs, SSH authentication keys). Secure firewall/security groups based on app tier. Security groups configured to lock down all ports (VMs use internal IPs to support app topology, secure data sources connections) Secure RESTful API.
Hosting Locations	StratosLive runs on AWS EC2. Stratos may be deployed on-premise or private cloud.	Internal hosting or through the cloud provider of your choice.	Internal hosting or through the cloud provider of your choice.	Internal hosting or through the cloud provider of your choice.
Encryption	Encryption on the network. Browser to back-end Admin Services uses transport-level SSL encryption. Registry data can also be encrypted and custom encryption can be used when storing data in the relational data service.	Encryption on the network. Operational interactions with the PaaS are encrypted via SSH. Developer interactions with the PaaS, commands, code pushes, etc, are encrypted with SSH. For applications deployed to the PaaS, the developer has the flexibility to use whatever encryption approach is best suited for their requirements.	Data encryption handled based on client's environment. Encryption on the network	
Compliance Standards	Java, WS-BPEL 2.0 Standard, and BPEL4WS 1.1 standards			
Support Availability				
Tech Support	Production support available 24/7 in the form of a support portal, training and email support request form. Community support offered on StackOverflow forums.	Email, forums, IRC, telephone, and Tech support from Red Hat Global Support Services	Online, email, phone and onsite	Phone, email, and on-premise
Self Support	Yes	Yes	Yes	Yes
Documentation	http://wso2.com/cloud/services/support/	https://access.redhat.com/site/documentation/OpenShift_Enterprise/	http://docs.apprenda.com	http://www.cumulogic.com/resources/documentation

Private PaaS Comparison Table (cont'd)

	WSO2 StratosLive	OpenShift Enterprise	Apprenda	Cumulogic
Software Compatibility				
Languages Supported	Java, PHP, JavaScript	Ruby, Python, Perl, PHP, JavaScript, Java	Java, Visual Basic, C#, C/C++	Java, PHP
Frameworks Supported	Spring, Java Enterprise Edition, JavaScript frameworks, Hive (BigData analytics), Esper (complex event processing).	Spring, Java Enterprise Edition, Rails, Grails, Django, Zend, Codelgniter, Symfony, Sinatra	Spring, Java Enterprise Edition, .NET	Spring, Java Enterprise Edition
Databases Supported	MySQL, Cassandra	MySQL, PostgreSQL	MySQL, MongoDB, Oracle DB, SQL Server, PostgreSQL	MySQL, MongoDB, Oracle DB
OS Support	OS X, Linux-based	Windows, OS X, Linux-based, iOS, Android OS	Windows and Linux-Based	Linux-based
Windows Versions (if applicable)		Windows 2000, Windows XP, Windows Vista, Windows 7, Windows 8, Windows Server 2008	Windows Server 2008	n/a
Linux Distros (if applicable)	n/a		n/a	Red Hat Linux, CentOS
Hypervisors Available	Xen, KVM, Vmware	Xen, KVM, Vmware	Xen, KVM, Vmware, hyper visor independent	
Open Source	Yes	Yes	No	No
Mobile Platforms with App Support		Cross-platform web app	Cross-platform web app	
Platform Control				
API Options	Included API/First party API and Third Party API support	Included API/First party API	Included API/First party API and Third Party API support	Included API/First party API and Third Party API support
Dashboard and/or Command Console	Dashboard and Command Console	Command Console	Dashboard and Command Console	Dashboard and Command Console
GUI Options	A web application administration interface is provided for run-time management. Developers can also use an Eclipse based plug-in to deploy code into the PaaS.	The OpenShift Web Console is designed as a responsive web application and supports any size browser for access.	API, developer portal for managing and deploying apps, business end user portal for subscribing to apps and managing subscriptions, and a system operations center for IT ops managing the PaaS environment, defining policy and governance controls.	Self-healing infrastructure (heartbeat solution for recovery, restart or re-provision services), high availability (multi-node deployment for resiliency), monitoring (availability and utilization).
Reporting Options	Downloadable multi-tenant log file, access management dashboard and use an API with multi-tenant event database.	Data extraction	There are key dashboards for highlevel reports, as well as platform and application performance metrics. Deeper reporting can be done through the client's existing BI/ Reporting systems, given that the platform is managed by them.	Real-time data feed
Resource Monitoring	Web based management console and business activity monitoring dashboards, integrate directly with business activity storage and resource monitors.	Web Console Dashboard, Command-line tools, and RESTful API	System operations center portal, as well as integration with standard enterprise monitoring tools like Microsoft System Center.	Logging, APM, custom DNS, and usage. Log files from all servers are collated for debugging; logs can be sent to third-party services like Splunk. Integration with APM services like New Relic: can be enabled per application environment. Configure custom DNS names per application. Usage metrics: resource usage per cloud per application.

Private PaaS Comparison Table (cont'd)

	WSO2 StratosLive	OpenShift Enterprise	Apprenda	Cumulogic
Pricing				
Pricing Page	Price list available on request	https://www.openshift.com/developers/pricing	http://apprenda.com/platform/licensing/	$100/user/month (For Cloud Providers, a revenue share model is offered. Enterprises are charged by nodes under management.)
Pricing Model	Threshold measured by Nodes or VMs.	By Nodes or VMs	Metered	Threshold. Cloud Providers - revenue share model. Enterprises - charged by node under management.
Usage Limits	none for the private-enabled PaaS	OpenShift Enterprise is priced based on the estimated capacity of the PaaS that will be deployed on-premise. Please contact Red Hat for a pricing quote.	Based on RAM footprint that the platform runs on. Free license for up to 12GB.	
Free Trial	Open Source available for free download and self-installation.	30 day unsupported trial and 60 day support trial	Free below certain usage	Yes
Scalability, Performance, and Availability				
Storage Limitations	none		Specific to client environment	No limit - depends on IaaS
Throughput Limitations	none		Specific to client environment	N/A
Multi-tenancy/ Isolation	In the public PaaS, shared container muti-tenancy offered via OSGI for exceptional tenant density. On-premise, customers may choose VM isolation, LXC isolation, or shared container isolation.		Multi-tenancy at both infrastructure and application tier. Apprenda can transform regular single tenant applications into single instance, multi-tenant applications.	Multi-tenancy available
Vertical/Horizontal Scaling Strategy	To enhance scalability, Cloud controller, elastic load balancer, artifact deployment controller, and deployment synchronizer are built into the PaaS foundation.	OpenShift PaaS supports automatic horizontal scaling based on in the incoming load to an application exceeding a pre-determined threshold of concurrent connections.	The platform allows scaling at all application tiers independently.	Users can set autoscaling rules that allow users to add or remove VMs based on utilization.

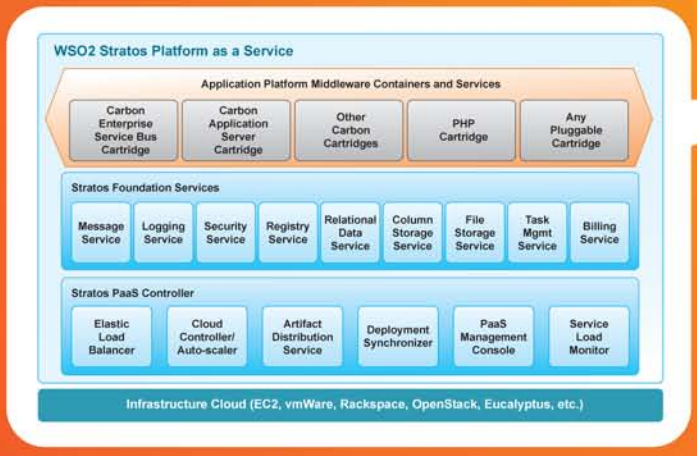
Private PaaS Comparison Table (cont'd)

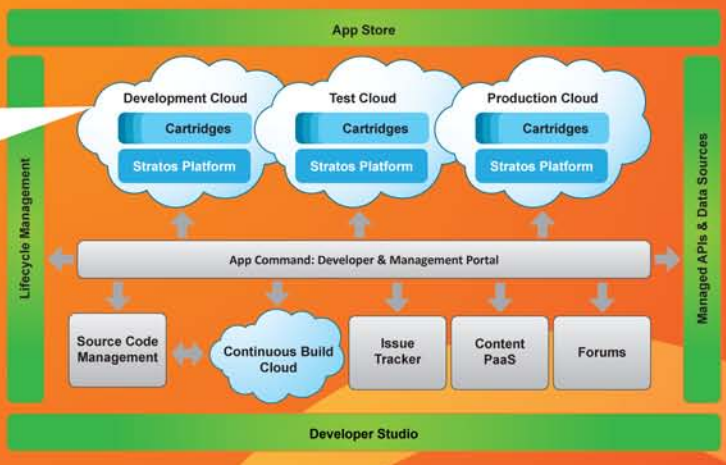
	WSO2 StratosLive	OpenShift Enterprise	Apprenda	Cumulogic
Frequently Requested Features				
Geo-Replication	No	No (customer is responsible for replication)	No (customer is responsible for replication)	
Self Service Provisioning	Yes	Yes	Yes	
Auto-scaling	Yes	Yes	Yes	Yes
High Availability	Yes	Yes	Yes	Yes
Stateless Service	Yes	Yes	Yes	Yes
Load Balancing	A service-aware and tenant-aware Elastic Load Balancer (ELB) routes traffic. The deployment synchronizer adds/remove code			Configurable load balancer
Resource-Pooling	Yes	Yes	Yes	Yes
Software Production Support				
Auto-Provisioning	Yes	Yes	Yes	Yes
Self-Service Configuration	Yes	Yes	Yes	Yes
Continuous Integration	Yes	Yes	Yes	
Continuous Deployment	Yes	Yes	Yes	Yes
Continuous Delivery	Yes	Yes	Yes	
Configuration Management	Yes		Yes	
Deploy from templates/ OS Image Creation	Yes			
Future Updates		Additional middleware services		Continuous integration, messaging, support for other languages, and others as customers' requirements evolve

New IT Services Accelerate Agility

With a WSO2 Cloud, multiple New IT services accelerate team agility. Teams have rapid, self-service access to application,integration, business process, and analytics services that enable teams to build an industry ecosystem PaaS. Industry ecosystem PaaS links your customers, distributors, and suppliers into an agile connected business.

WSO2 Delivers a Cloud-Native Architecture for New IT





WSO2 Stratos

WSO2 Stratos delivers an extensible, Cloud-Native platform foundation. Your Languages, frameworks, or servers plug-into the foundation, and the architecture components deliver increased reliability, scalability, and resource efficiency.

WSO2 App Factory

WSO2 App Factory extends Enterprise DevOps practices across your development environments and runtime clouds. Accelerate agility by incorporating self-service, provisioning, automated governance, and lifecycle management into your development cycle.

WSO2
lean • enterprise • middleware

WSO2 Stratos

PaaS Customers: 2,000

Palo Alto, California USA

Launch Date: November 2010

Free trial - Free Open Source

Current Version: 2.0

Related Products: Apprenda, OpenShift

http://wso2.com/cloud/stratos

http://wso2.com/blogs/

@wso2

UPDATES: BIANNUALLY

Claim to Fame

The software that powers WSO2 Stratos is available as an on-premise Private PaaS and developed as an extendible Open PaaS.

Product Description

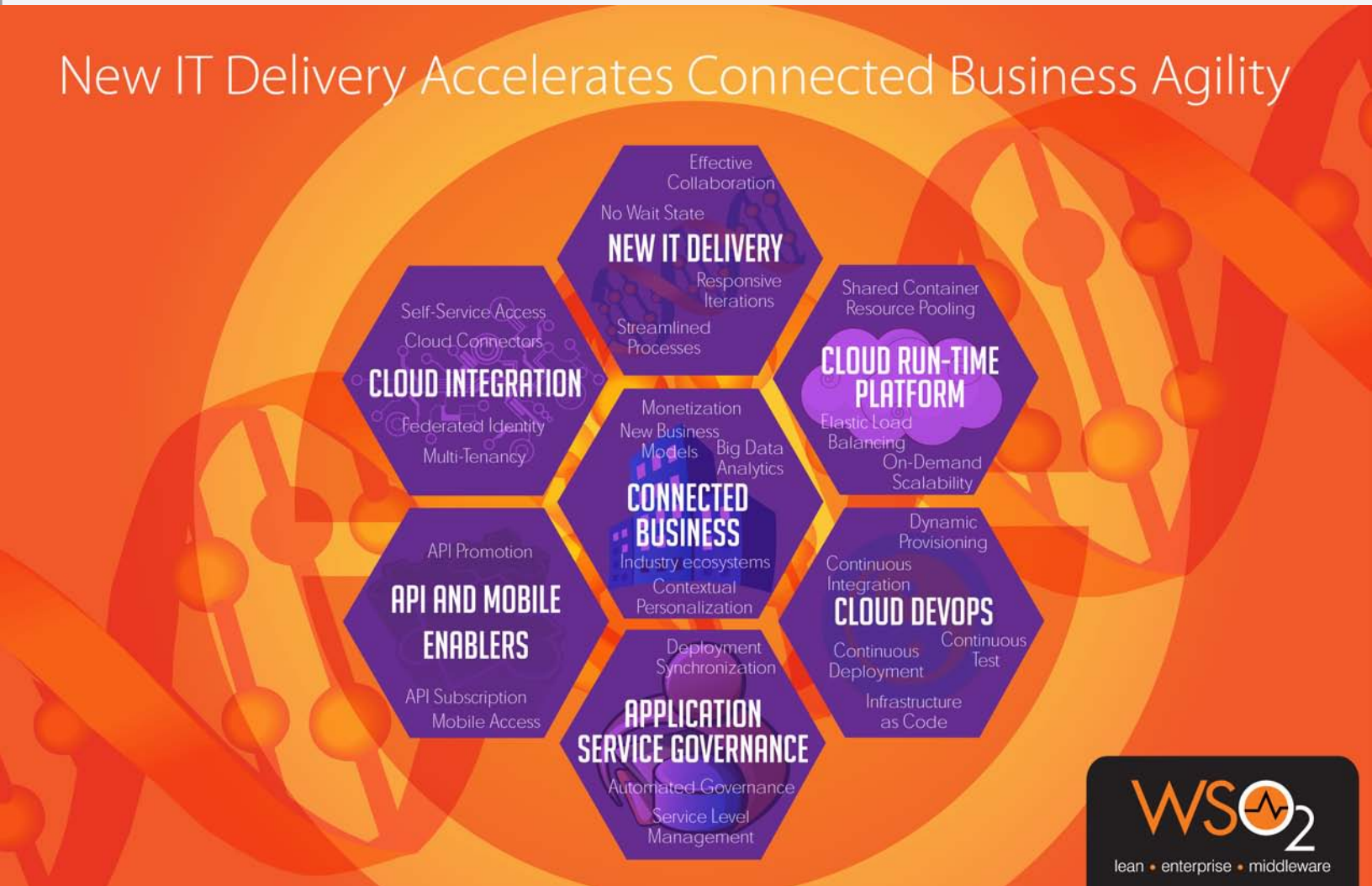
WSO2 Stratos is a private-enabled Java PaaS that lets Java developers deploy web applications instantly, integrate applications in their cloud, and host business processes in the cloud. Clients have the option to host processes in the cloud or install, run, and manage them on-premise. WSO2 offers the same PaaS software as WSO2 StratosLive, which is a completely public version of WSO2's PaaS service.

Pricing Details

A Stratos support subscription is priced at $70K/year, and requires at least one Service Type. Service Type subscription prices range from $25-70K/year and represent multi-tenant/elastic middleware services.

Features

1. Comprehensive application platform services enabling rapid development of complex applications
2. Rapidly integrates applications with cloud services and web APIs to easily move from public PaaS to private data center without lock-in
3. Single sign-on for applications deployed through WSO2 and select other cloud services available



OpenShift Enterprise

PaaS

Raleigh, North Carolina USA

Launch Date: November 2012

Free trial - Free trial 30 day unsupported or 60 day supported

Related Products: Apprenda, CumuLogic

http://openshift.redhat.com

openshift.redhat.com/community/blogs

@openshift

UPDATES: QUARTERLY

Claim to Fame

On-premise Private PaaS product built on trusted open source enterprise datacenter technologies including Red Hat Enterprise Linux and JBoss.

Product Description

OpenShift Enterprise by Red Hat brings the benefits of the OpenShift PaaS to the enterprise in the form of an on-premise private PaaS deployable in data-centers or private clouds. Utilizing OpenShift Enterprise, customers can realize improvements in developer productivity, operational efficiency and hardware utilization without the security or data-privacy concerns of running in the public cloud. OpenShift Enterprise is built from the open source OpenShift Origin project which is also the engine behind OpenShift Online, the public PaaS offering from Red Hat.

Pricing Details

Annual subscription pricing based on size of deployment

Features

1. Supports multiple programming languages including Java (EE6), Ruby, Node.js, Python, PHP, and Perl using open source runtimes preventing lock-in and insuring application portability
2. Provides IDE integration, web console, and command-line interfaces to give developers self-service, automated access to auto-scaling application stacks in the cloud.
3. Built from trusted enterprise-class technologies and supported by Red Hat's world-class technical support

Apprenda

PaaS Customers: 1500

Clifton Park, New York USA

Launch Date: December 2008

Free trial - Free below an amount of data

Current Version: Apprenda 4.5 and Apprenda 4.0.5 SDK

Related Products: Windows Azure, CumuLogic

http://www.apprenda.com

http://www.apprenda.com/blog

@Apprenda

UPDATES: QUARTERLY

Claim to Fame

Currently the world's largest enterprise private PaaS deployment (JPMorgan Chase).

Product Description

Apprenda is a PaaS aimed at enterprises, specifically targeted at users that want to deploy, run and manage .NET applications. A hybrid cloud solution, Apprenda allows its users to modernize their existing apps, create new apps, manage their apps and infrastructure, and extend their platform when necessary. Apprenda can be used to create mobile, multi-tenant, webscale, and distributed applications.

Pricing Details

Pricing is based on the RAM footprint that the platform runs on. Free up to 12GB.

Features

1. Self-service cloud platform that can be both private or public
2. Flexible and free from lock-in, offers standardized application architectures
3. Users can modernize and deploy existing web and SOA apps built in .NET or Java

Cumulogic

PaaS Customers: 15

Santa Clara, California USA

Launch Date: February 2013

Free trial - 10 Day Free Trial

Current Version: CumuLogic 2.0 (beta)

Related Products: dotCloud, Appfog

http://cumulogic.com

http://cumulogic.com/company/blog

@cumulogic

UPDATES: MONTHLY

Claim to Fame

Built with a focus on security and platform isolation.

Product Description

CumuLogic allows organizations to create and distribute PHP and Java applications in public, private and hybrid clouds. Users also have the ability to move between private and public clouds, enabling their apps to do the same. CumuLogic is made for applications that are secure, isolated and fault-tolerant.

Pricing Details

$100/user/month. Revenue share model for Cloud Providers. Enterprises charged by nodes management.

Features

1. No vendor lock-in, scalable, components and applications can be deployed across multiple clouds
2. Platforms are isolated, ensuring privacy even in public clouds
3. End-to-end infrastructure services for applications (monitoring, management, and auto scaling)

Christopher Taylor

MVB

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The Cloud Isn't a Beverly Hills Nose Job at a Tijuana Price *05.23.2013*

Too many business people see the Cloud as a way of outsourcing IT's function to a cheaper, newer set of applications. That's not surprising when you consider that Cloud vendors are going straight to business owners the world over and offering to give their technology tools a radical facelift at a steeply discounted price.

No matter how enticing the argument, you can't simply rent a BMW M6 and replace the Dodge Caravan in the garage and expect the same benefits and cost. You can't get a nose job in Tijuana and expect a Beverly Hills result. The world doesn't work that way.

A little Cloud reality

Business owner, as you reach for the checkbook, pause for a moment to understand what cloud really is and isn't. Before you think this is a Cloud-bashing viewpoint, it really isn't but instead is an effort to get honest about something that's in a tornado of hype at the moment.

Scalability – Cloud computing is highly scalable, if done right. It is a new paradigm that takes advantage of clusters of commodity hardware that balance the load as it goes up and down through distributed computing.

Read more...

IaaS Solutions

Comparison Table

*Note: Comparison data based on information provided by vendors.

	Red Hat OpenStack	Amazon EC2	HP Cloud IaaS	Lunacloud	Rackspace Cloud	Virtustream xStream	Windows Azure	Hostway
Cloud Specifications								
Hosting Styles	Public, private on-premise, hybrid	Public, Private by provider, Hybrid and Other	Public, Private by provider, private on-premise, and hybrid	Public	Public, Private by provider, private on-premise, and hybrid	Public, private by provider, private on-premise, hybrid	Public, Private, Private on-premise, Hybrid	Public, Hybrid
Secure Authentication Options	Red Hat OpenStack supports all the authentication protocols currently supported in the Keystone project.	Different levels of authentication and various options to suit almost every need are offered. Offerings include SSL, Identity Federation (for LDAP, AD) MFA, x.509 certs, IAM users, and industry standards such as PKI are also supported.	HP Identity Service built on a foundation of OpenStack Keystone		Rackspace's OpenStack Keystone implementation is known as Rackspace Cloud Identity Service v2.0; the identity service performs authentication, generating a token in response to valid credentials, and identification, matching users and their roles. SSL is standard.	2-Factor Authentication, Integrated Firewall IDS/IPS, Intel TXT - Trusted Computing, Intel TXT - GeoTagging, Isolated Application Zones, Integrated GRC, Continuous SIEM Protection, Encrypted Data Storage	Configurable LDAP, SSL, SSH	Username/ password authentication over SSL
Server Security Features		Firewalled servers and local backup	Firewalled servers and users are given the tools to backup their servers on-demand		Dedicated servers, firewalled servers, and local backup	Dedicated Server, firewalled servers, local backup	Run by Microsoft Global Foundation Services in compliance with key industry standards	Dedicated servers, firewalled servers, local backup
Data Location/ Availability Zones	User defined, mix of on-premise or off-premise through supported interfaces with OpenStack Glance, Swift, and Cinder. Support for Red Hat Storage scale-out storage also included.	Data is located and secured in the region of the client's choice. Their data will not move across regions unless they want it to. There are nine regions around the world today (list at: http://aws.amazon.com/about-aws/globalinfrastructure/).	Object storage data is automatically replicated to three copies across availability zones.	Infrastructure physically located in ISO 27001 datacenters in Europe. Hosts are redundant to provide Cloud Server reliability. Cloud Storage is replicated in three different nodes.	Data centers located in North America and the United Kingdom. Object storage data is replicated 3 times throughout DCs.	Data is stored and secured in a redundant, geographically separated Data Center in the US, UK or Saudi Arabia based on customer geography.	Microsoft has a longstanding commitment to privacy, and data is replicated multiple times on multiple devices in case of any failures.	Data is located and secured in Austin, TX; Vancouver, BC; Tampa, FL
Hosting Locations		North America, Europe, Asia, South America and Australia.	HP owned servers in North America	N/A	Data centers in North America and United Kingdom	2 US and 2 UK Data Centers. Data is geo-replicated for HA, Backup, DR.	US, 2 Europe, and 2 Asia data centers. Data is (optionally) geo-replicated.	Data is located and secured in Austin, TX; Vancouver, BC; Tampa, FL

IaaS Solutions Comparison Table (cont'd)

	Red Hat OpenStack	Amazon EC2	HP Cloud IaaS	Lunacloud	Rackspace Cloud	Virtustream xStream	Windows Azure	Hostway
Cloud Specifications								
Encryption	OpenStack supports encryption technologies such as HTTPS, SSH, SSL, TLS, digital certificates, and data encryption.	Encryption on the network and encryption on storage. Features range from encryption (data at rest) with one-click to complex encryption mechanisms like Transparent Data Encryption. Products that securely store client's keys and rotate them in a hardware applicance are offered.	All data is encrypted in-transit and a variety of partner solutions such as cloud gateways encrypt data at rest and in transit.		SSL, encryption on the network	Encryption on the network. Vormetric Data Security used to encrypt databases and files. Cloud-to-Cloud encryption via Intel CPU that supports Advanced Encryption Standard New Instruction Set (AES-NI), encrypted VPN, encryption in archive and GRC tools.	Encryption on storage is offered.	Data isn't automatically encrypted on the cloud, but there are encryption options available that customers can set up on their own.
Compliance Standards		PCI, HIPAA, SOC, SSAE 16, FISMA, GBLA, and SOX			ISO 27001/2, PCI-DSS, SSAE16, SOC 1/2/3, CPS http://www.rackspace.com/security/management	ISO 270001, PCI, HIPAA, SOC, SSAE 16, FISMA, GBLA, SOX	"Industry standards such as ISO/IEC 27001:2005, SSAE 16/ISAE 3402 Attestation, HIPAA Business Associate Agreement, G-Cloud Impact Level 2"	
Support Availability								
Tech Support	Standard (business hours) and 24x7 production support available worldwide through local phone numbers, web ticket, email.	One-on-one fast-response support channels that are staffed 24/7 by experienced and technical support engineers. Leels of tech support are basic, developer, business and enterprise.	Chat, phone, email, community forum, knowledge base, and tickets	Telephone, email, tickets	Phone, online chat, community forums, and tickets. Direct, immediate access to your team 24x7x365. No automated menus when you call. 100% power. 100% network uptime. One hour hardware replacement guarantee for hardware failure.	24/7 phone support, email support, automated notifications for events exceeding thresholds	Online forums, service dashboard, and technical and billing support.	Telephone, email, and tickets 27/4
Self Support	No. Community distribution RDO, distinct from the enterprise Red Hat OpenStack product, is available at openstack.redhat.com	Yes	Yes	Yes	Yes	yes	Yes	Yes
Documentation	https://access.redhat.com/site/documentation/Red_Hat_OpenStack/	http://aws.amazon.com/documentation	http://docs.hpcloud.com/	http://www.lunacloud.com	http://docs.rackspace.com/	http://www.virtustream.com/content/solution_sheets	Yes - http://www.windowsazure.com/en-us/documentation	http://forums.hostway.com/forum.php https://manage.hostwaycloud.com/Home/HelpDocumentation

IaaS Solutions Comparison Table (cont'd)

	Red Hat OpenStack redhat	Amazon EC2	HP Cloud IaaS	Lunacloud	Rackspace Cloud	Virtustream xStream	Windows Azure	Hostway
Software Compatibility								
Languages Supported			Java, Ruby, PHP, Clojure		All		C#, Java, PHP, JavaScript, Node.js, Python, Ruby	Python, Perl, PHP, JavaScript, HTML/XML
Frameworks Supported			.Net, Rails				Can be configured to run any library of framework that can run on Windows Server (using a startup Script). .NET is the default.	.Net
Databases Supported		MySQL, CouchDB/Couchbase, MongoDB, Oracle DB, MS Access, SQL Server, PostgreSQl, IBM DB2, Cassandra, DynamoDB	MySQL		MySQL, Oracle, MSSQL		MySQL, CouchDB/ Couchbase, MongoDB, SQL Server, No SQL	MySQL, MSSQL
OS Support	Windows and Linux-based	Windows, Linux-based, iOS, Android OS	Windows, Linux-based	Windows and Linux-based	OS X, Linux-based, iOS, Android OS	Windows and Linux-based	Windows and Linux-based	Windows, OS X, Linux-based
Windows Versions (if applicable)	Windows 7 and Windows Server 2008	Windows Server 2008	Windows Server 2008	Windows Server 2008	Windows Server 2008 and Windows 2012	Windows 2000, Windows XP, Windows Vista, Windows 7, Windows Server 2008	Windows Servers 2008, Windows Server 2008 R2, Windows Server 2012	Windows Server 2003, Windows Server 2008, Windows Server 2012
Linux Distros (if applicable)	End to end support for Red Hat Enterprise Linux, other Linux distributions known to work	N/A	CentOS, Ubuntu, Debian, Fedora	CentOS, Debian, Ubuntu, Red Hat, Fedora, SUSE, OpenSUSE	Arch, CentOS, Debian, Fedora, FreeBSD, Gentoo, openSUSE, Red Hat, Ubuntu		Ubuntu, SUSE, OpenSUSE, CentOS	CentOS, Ubuntu, RHEL
Hypervisors Available	KVM	Xen	KVM		Xen, KVM, ESX	KVM and VMware	Windows Server 2012 HyperV	Hyper-V
Open Source	Yes	No	Yes	No	Yes	No	No	No
Mobile Platforms with App Support	Cross-platform web app	Android, Cross-platform web app	Responsive GUI management console on any mobile device browser		iOS, Android, Cross-platform web app	Cross-platform web app	Cross-platform web app	

IaaS Solutions Comparison Table (cont'd)

	Red Hat OpenStack	Amazon EC2	HP Cloud IaaS	Lunacloud	Rackspace Cloud	Virtustream xStream	Windows Azure	Hostway
				Platform Control				
API Options	Included API/First party API	Included API/First party API	OpenStack (open source standards) APIs	Included API/First party API	Included API/ First Party API	Included API/First party API and Third Party API support	Included API/First party API and Third Party API support	Included API/First Party API and Third Party API Support
Dashboard and/or Command Console	Dashboard	Dashboard and Command Console	Dashboard and Command Console (online console GUI and Windows CLI and Unix CLI)	Dashboard and Command Console	Dashboard and Command Console	Dashboard	Dashboard	Dashboard and Command Console
GUI Options	Self-service UI Horizon offered. Most access is programmatic through OpenStack APIs, accessible through CLI as well.	Customers can access the platform using the AWS Management Console (Web Interface), Command line interfaces, a number of SDKs (Java, PHP, Python, .NET, iOS, Ruby, Android, etc.) and IDEs (Eclipse, Visual Studio) and hundreds of third-party management user interfaces	Online console GUI, as well as a Windows CLI and a Unix CLI	A Cloud Server can be created in just 15 seconds. Resizing RAM, CPU or DISK space in a Cloud Server doesn't require a reboot.	A RESTful API, language SDKs built on top of the API, and a web application GUI.	Multi-tiered GUI (SP, Tenant, and Group levels), AWS compatible API access. SP-Level allows provisioning and monitoring, Tenant-Level allows resource requests/approvals, Group-Level accesses the service-catalog, resources, budgets, integrated GRC and SIEM Application monitoring.	The Windows Azure platform is generally accessed through an HTML web interface. However, the backend has APIs that can be used either directly in code or via scripting (PowerShell) to carry out administration tasks.	
Reporting Options	Fully documented API, Project Ceilometer included in release for reporting and metrics.	Customers can get granular billing and usage info on the website portal as well as via data feeds.	Monitor up to 13 pre-selected compute metrics and up to eight block storage metrics. Threshold-based notifications with delivery through SMS or email. Streaming metrics available.	Queryable API and database, Web Control Panel	All information is available via the API.	Bring your own monitoring tools, dashboard level reporting of resources, access to system logs, access to application-level monitoring, automated notifications upon thresholds	High level diagnostics available, performance counters configurable, queryable database, and SQL Reporting Services.	Bandwidth, disk, and CPU usage
Resource Monitoring	OpenStack Ceilometer APIs are available	Amazon CloudWatch monitors AWS resources such as Amazon EC2 and Amazon RDS DB instances, and it can also monitor custom metrics. With Amazon CloudWatch you gain system-wide visibility into resource utilization, application performance, and operational health.	Built-in monitoring with real-time statistics and a web console	The Web Control Panel and the API provide a server status in real-time	Users can monitor their website, whether they're on the Rackspace Cloud, Rackspace dedicated servers, servers in users' data centers, or servers in other providers' data centers. Alert monitoring infrastructure includes a website, ports, protocols,graphs, and more.	Access to system logs, AWS compatible API, Application-level monitoring and "bring your own" monitoring tools	Service dashboard, 3rd party tools and performance counters.	Self-service portal and full admin access to install any 3rd party applications

IaaS Solutions Comparison Table (cont'd)

	Red Hat OpenStack redhat.	Amazon EC2	HP Cloud IaaS	Lunacloud	Rackspace Cloud	Virtustream xStream	Windows Azure	Hostway
				Pricing				
Pricing Page	OpenStack is free and open source. RedHat's OpenStack-based service has not yet announced pricing	http://aws.amazon.com/pricing and http://aws.amazon.com/calculator	https://www.hpcloud.com/pricing	http://www.lunacloud.com/en_eu/cloud-server-pricing	http://www.rackspace.com/cloud/servers/pricing/	http://www.virtustream.com/company/contact_us	http://www.windowsazure.com/en-us/pricing/calculator/	http://www.hostway.com/cloud-servers/pricing.html
Pricing Model	By Nodes or VMs	Simple pay-as-you-go, reserved and volume pricing.	Metered starting at $0.035/hour	Metered. Charged by GB, Ram, CPU and DISK space per hour	Pay-as-you-go monthly	Metered - measured in 5-minute intervals and aggregated on a monthly basis. Unit of purchase is a uVM which is an aggregated measurement of CPU, RAM, Storage I/O and Network I/O	Pay-as-you-go 6-month and 12-month pricing plans. Pricing varies depending on what features are being used.	Usage-based monitored by Nodes or VMs
Free Trial	N/A	Yes	3 month trial offer	20 Euros of Credit	Yes	Yes	Yes	Yes
Limits of Trial	30 day free trial	Free below a certain amount of data	You can get any combination of offered services that total $20 of credit per month.		2 months at $100/month	30 Day Free Trial	90 Day Free Trial. Free Instance Model: 10 websites/165 MB data transfer, 10 mobile services/165 MB data transfer, 20 endpoints/350GB of data transfer, 30,000 connection hours, 5 concurrent storage accounts, and more limitations.	7 days or 15 days free, depending on promotion

IaaS Solutions Comparison Table (cont'd)

	Red Hat OpenStack redhat	Amazon EC2	HP Cloud IaaS	Lunacloud	Rackspace Cloud	Virtustream xStream	Windows Azure	Hostway
Scalability, Performance, and Availability								
Storage Limitations	Storage dependent on integrations with OpenStack APIs. Red Hat Storage available as fully supported scale out cloud storage layer.		No Limitations		Varies by size of cloud server: http://www.rackspace.com/cloud/servers/pricing_b/	No limits on capacity, but storage is provided in three Tiers with each having guaranteed latency levels.	Blob max - 100 TB	200 GB VMs, 8 additional volumes at 200 GB each, 135 IOPS/host
Throughput Limitations			No Limitations		Varies by size of cloud server: http://www.rackspace.com/cloud/servers/pricing_b/	No limitations	SQL Max - 150 GB	
Multi-tenancy/ Isolation	Tenancy built into OpenStack	Amazon has regions and availability zones. Core foundational services spread workloads across multiple instances in an AZ, and across multiple AZs in a region, or across multiple regions. Data is can be automatically spread across multiple availability zones for maximum durability.			Customers can deploy isolated cloud networks, a combination of Nicira NVP and OpenStack Networks. RackConnect allows customers to connect dedicated servers to cloud by using a hardware device (F5 or ASA) with ACL and packet filters to segment traffic.	Isolated application zones, isolated management zones, network segmentation, and Multi-tenancy at the GUI	Varies by offering. Windows Azure Web Sites, for example, is multi-tenant, whereas VMs and Cloud Services are dedicated VMs.	
Vertical/Horizontal Scaling Strategy	Scalability is programmatic through standard OpenStack APIs.	The auto-scaling service allows clients to scale horizontally automatically.	Distributed architecture and the nature of the system at both the HW and SW level.	Using the Web Control Panel or the API, customers can create as many Cloud Servers as needed, as well as resize RAM, CPU and DISK in each Cloud Server.	Customer can add more cloud servers for horizontal scaling, resize cloud servers for vertical scaling, add more cloud servers to a load balancer, and monitor with cloud monitoring.	Clustered compute/ server resource pooling, clustered storage resource pooling, and burst-Levels above committed uVMs	Both are available. Users must monitor their data (no auto-scaling)	Horizontally: ability to load balance and add/ remove VMs via self-service portal. Vertically: adjust CPU, memory and disk space via self-service portal.

IaaS Solutions Comparison Table (cont'd)

	Red Hat OpenStack redhat	Amazon EC2	HP Cloud IaaS	Lunacloud	Rackspace Cloud	Virtustream xStream	Windows Azure	Hostway
Frequently Requested Features								
Geo-Replication	No - customer is responsible for replication	Yes	Geo replication across U.S. West and East via container sync		No, customer is responsible for replication	Yes	optional	
Self Service Provisioning	Yes	Yes	Yes		Yes	Yes	Yes	Yes
Auto-scaling	No	Yes	Yes	No	Very close to release, curently in preview. More info at: http://bit.ly/ZW9X2b	Yes	No	No
High Availability	No - customer must set up high availability using supported HA technologies	Yes	Yes	Yes	No	Yes	Yes	Yes
Stateless Service	Yes	Yes	Yes	Yes	Yes	No	No	Yes, RESTful statless API offered
Load Balancing	Load balancing must be customer provided	Elastic Load Balancing Service (http://aws.amazon.com/elasticloadbalancing) automatically distributes incoming application traffic across multiple Amazon EC2 instances. Customers can choose from a range of features and different types of routing based on their needs.		Web load balancer is provided, that can be configured via the Web Control Panel (customer console) or the API	Cloud Load Balancers. Information at http://www.rackspace.com/cloud/monitoring	Network-based load-balancing (provided as a service). Customers can bring their own LB solution to run within VMs on Virtustream Cloud.	Varies by offering. Typical VMs/cloud services are stateless, non-sticky, load balancing. Windows Azure Web Sites does session persistence.	Round robin and IP based session persistency
Resource-Pooling	Yes	Yes	No	Yes	Yes	Yes		Yes

IaaS Solutions Comparison Table (cont'd)

	Red Hat OpenStack	Amazon EC2	HP Cloud IaaS	Lunacloud	Rackspace Cloud	Virtustream xStream	Windows Azure	Hostway
Software Production Support								
Auto-Provisioning	Yes	Yes		Yes	Yes - Roadmap 2013	Yes	Yes	
Self-Service Configuration	Yes	Yes	Yes	Yes	Yes - Roadmap 2013	Yes	Yes	Yes
Continuous Integration	Yes	Yes	Yes		Yes		Yes	Yes
Continuous Deployment	Yes	Yes	Yes		No		Yes	Yes
Continuous Delivery	Yes	Yes			Yes		Yes	
Configuration Management	Yes	Yes			Yes	Yes	Yes	
Deploy from templates/ OS Image Creation	Project Heat. Heat is a service to orchestrate multiple composite cloud applications using the AWS CloudFormation template format, through both an OpenStack-native ReST API and a CloudFormation-compatible Query API.	Yes			Yes	Yes	Yes via the VM Image Gallery or custom images	
Future Updates	Focus on increasing features and functionality in core projects, working on the Heat deployment project, participating in the Ceilometer project for development of metering and metrics, OpenStack Networking for management of virtual networks and Software-Defined Networking (SDN), and more.	Working to add new features, new services, new geographies (regions, new security and compliance certifications and making all current features and services abailable in all regions.		Geographical redundancy for the Cloud Storage service, Additional physical locations / datacenter, Database as a Service.	Autoscaling, Stack deployment, more that cannot be discussed at the moment	Multi-site federation, Hyper-V hypervisor support, network and storage automation, Hadoop-as-a-serivce, SAP HANA-as-a-Service, disaster recover-as-a-service, remotely managed xstream cloud appliance for greenfield SPs		Platform to upgrade to System Center 2012 and Windows Server 2012, Hyper-V replica - cloud replication, Network isolation, 10Gig iSCSI

Red Hat OpenStack

IaaS

redhat

Raleigh, North Carolina USA

Launch Date: 2013
Free trial - Free for testing
Current Version: Grizzly
Related Products: Windows Azure, Amazon EC2

http://www.redhat.com/openstack
@openstack
UPDATES: SEMIANNUALLY

Claim to Fame

Red Hat delivers enterprise-ready OpenStack on the Red Hat Enterprise Linux platform.

Product Description

Red Hat OpenStack delivers the fastest way to create, deploy and scale a secure and reliable public or private OpenStack cloud. Red Hat OpenStack combines the world's leading enterprise Linux, Red Hat Enterprise Linux, and fastest growing cloud infrastructure platform, OpenStack, to give you the agility to scale and quickly meet customer demands without compromising on availability, security, and performance.

Pricing Details

TBA

Features

1. Enterprise hardened Red Hat OpenStack built on Red Hat Enterprise Linux delivers full compatibility with community OpenStack in an enterprise-ready product
2. Certified ecosystem of hardware, software, and services partners
3. World-class support, extended lifecycle, and Red Hat technology leadership in OpenStack and the broader Linux communities

Amazon EC2

IaaS Customers: 100K+

Seattle, Washington USA

Launch Date: March 2006
Free trial - Free below an amount of data
Current Version:
Related Products: Windows Azure

http://aws.amazon.com
http://aws.typepad.com
@awscloud
UPDATES: WEEKLY

Product Description

Amazon Web Services offers a variety of cloud solutions that are relatively easy for clients and organizations of all sizes to begin accessing and using. Amazon EC2 is the IaaS arm of AWS. It is an extremely easy infrastructure to get up and running (in minutes if needed), which makes it especially good for startups, and it still is widely considered to be the best value IaaS on the market and the most mature cloud services provider.

Pricing Details

Pay-as-you-go pricing, costs can be estimated using the AWS Simple Monthly Calculator (http://aws.amazon.com/calculator).

Features

1. Clients can bundle "lopsided" options that provide just more RAM or a better CPU, etc.
2. Clients can choose to use a pre-configured template that allows them to get started immediately.
3. Elastic offers complete control of instances, and is compatible with other Amazon Web Services.

Claim to Fame

One of the earliest and most reliable Cloud providers worldwide.

3rd Party Review

Especially Good For:
All (startups, SMB, and Large Organizations).AWS is more useful and geared towards businesses as opposed to individuals.

Pros:

- Wide range of tool support
- Good Web Console and API

Cons:

- Occasional failures and lack of tech support
- Some of the newer solutions lead to lock-in

HP Cloud Compute

IaaS

Palo Alto, California USA

Launch Date: May 2012
Free trial - 3 Month Free Trial
Current Version: CumuLogic 2.0 (beta)
Related Products: Windows Azure, Amazon EC2

http://hpcloud.com
http://blog.hpcloud.com
@hpcloud
UPDATES: MONTHLY

Product Description

The HP Cloud is a public and open-source solution built using OpenStack technology, aiming to avoid complicated vendor lock-in. HP aims to provide end-to-end service allowing management and deployment across hybrid, private, managed private, and public clouds. HP Cloud is also beta testing persistent block storage. They also offer strong SLAs.

Pricing Details

Packages differ based on Compute Units, RAM, and Disk space. Packages start at $0.035/hr (Linux) or $0.06/hr (Windows) and go up to $1.12/hr (Linux) or $1.92/hr (Windows).

Features

1. Architecture based on OpenStack technology, making it easy for clients to change vendors.
2. Mix-and-match solution of hybrid clouds, allowing enterprises to tailor tools to their needs.
3. CDN allowing for faster response time and a RESTful API for retrieving and storing files.

Claim to Fame

XaaS - offers a wide range of products from compute and storage to APaaS and Monitoring.

Hostway FlexCloud Servers

IaaS **Customers: 500**

Chicago, Illinois USA

Launch Date: November 2010

Free trial - 1-2 Week Free Trial

Related Products: Lunacloud, Rackspace

http://www.hostway.com/cloud-servers/

Launching Soon

@Hostway

UPDATES: BIWEEKLY

Claim to Fame

Launched one of Canada's largest public clouds.

Product Description

Hostway is a hosting company and IaaS provider that sells both public and private cloud capabilities under its own FlexCloud brand. Private Cloud offerings are in the form of off-premises Virtual Private Cloud hosting.

Pricing Details

Pricing is usage-based. Hostway bills down to the hourly usage rate. Monthly contracts are available.

Features

1. Create hybrid clouds with Hostway's VPC or your on-premise private cloud.
2. Non-proprietary, open API compatible with OpenStack.
3. Three North American cloud datacenters; choose preferred location.

Lunacloud

IaaS

London, United Kingdom

Launch Date: June 2012

Free trial - RTPROMO20 20 Euros of credit

Current Version:

Related Products: Amazon EC2, Rackspace

http://www.lunacloud.com

http://blog.lunacloud.com

@lunacloud

UPDATES: MONTHLY

Claim to Fame

Consistent disk IO and networking performance. Claims to outperform Amazon EC2 and Rackspace.

Product Description

Lunacloud lets users servers run applications, storage, and special purpose servers. Lunacloud's focus is to provide reliable, scalable and low cost infrastructure. Developing with Lunacloud is very flexible. Web apps can be created using any mix of RAM, CPU, and DISK space. Also offers installed tailored applications, helping users get started more quickly.

Pricing Details

Pay-per-use. Different rates are available for varying amounts of RAM, vCPU and DISK.

Features

1. RAM, CPU, and DISK space can all be resized in the Cloud Server without a reboot
2. Storage can be accessed through the web or a compatible API
3. Different physical locations of datacenters are available

Rackspace

IaaS **Customers: 205,000**

San Antonio, Texas USA

Launch Date: January 2003
Free trial - Open Source cloud can be used free
Current Version: OpenStack Grizzly
Related Products: Amazon Web Services, Lunacloud

http://www.rackspace.com
http://www.rackspace.com/blog
@rackspace
UPDATES: WEEKLY

Product Description

Rackspace offers public, private and hybrid IaaS clouds. Their IaaS offering gives customers a very customizable IaaS. Rackspace offers flexibility, from a single-tenant environment to a highly scalable public cloud, working with customers to find the right performance and security for each application.

Pricing Details

Based on use; databases, files, load-balancing, block-storage. Prices start at $0.100/GB/mo for 1TB of storage, and $0.12GB for 10TB of CDN Bandwidth.

Features

1. No Vendor Lock-In.
2. A lot of building support including training and certification programs and architectural guidance.
3. Software-defined networks for isolation, packet filtering, and supporting broadcast/multicast.

Claim to Fame

"Provides "Fanatical" support to help you find the right solution to your problem."

3rd Party Review

Especially Good For:
All (startups, SMB, and Large Organizations)

Pros:

- Good Support
- Easy to integrate with existing systems

Cons:

- Less Sophisticated API

Virtustream xStream

IaaS **Customers: 1,000**

Bethesda, Maryland USA

Launch Date: January 2009
Free trial - 30 Day Free Trial
Current Version: xStream 2.1

http://www.virtustream.com
http://www.virtustream.com/blog
@virtustream
UPDATES: QUARTERLY

Product Description

Targeted at Fortune 500, government, service providers and mid-market enterprises, xStream is a high-performance platform built to handle quickly evolving app environments. Based on Virtustream's unique µVM(trademarked) technology, xStream is offered as a private, virtual, or public secure cloud. xStream can integrate easily with all major hardware and hypervisors, working with existing customer service providers.

Pricing Details

Consumption based pricing. Pay only for resources used in small increments of time.

Features

1. Enterprises can manage internal and external computing from the same software console.
2. Users can run legacy and web-scale software and applications like ERP, CRM, and more in the cloud.
3. Compute, memory, storage and network resources are pooled to assure application performance.

Claim to Fame

"HA and elastic resources offered at consumption-based pricing; aim to offer financial flexibility."

Windows Azure

IaaS Customers: 200,000

Redmond, Washington USA

Launch Date: February 2010

Free trial - 90 Day Free Trial

Current Version:

Related Products: Amazon EC2, Amazon S3

http://www.windowsazure.com

http://blogs.msdn.com

@windowsazure

UPDATES: MONTHLY

Claim to Fame

Microsoft is the only cloud provider with fully supported IaaS and PaaS offerings, spanning a comprehensive hybrid cloud solution.

Product Description

Windows Azure enables customers to build, deploy and manage applications across a global network of Microsoft-managed data centers. Microsoft's cloud platform is an optimal choice for working with Windows-based cloud instances, but it also gives users the option to use Linux instances as well. Windows Azure is the only cloud platform offering both platform services as well as infrastructure services.

Pricing Details

Demo is free; SMB (unlimited users, 50 Mb data) $100/mo; Professional (unlimited users, 500Mb data) $500/mo;Enterprise (unlimited users, 5Gb data) $2000/mo.

Features

1. Unique platform services including Web Sites, Mobile Services, Media Services, and Cloud Services
2. Windows VMs allow developers to move apps without changing code
3. A managed class library is provided to clients

‘Build Your Own’ Solutions

Comparison Table

*Note: Comparison data based on information provided by vendors.

	OpenStack	CloudStack
Cloud Specifications		
Hosting Styles	Public, private on-premise, hybrid	Public and private
Secure Authentication Options	N/A	
Data Location / Availability Zones	User defined, mix of on-premise or off-premise through supported interfaces with OpenStack Glance, Swift, and Cinder.	Apache CloudStack is designed to deploy and manage large networks of virtual machines, as a highly available, highly scalable IaaS. CloudStack is used by service providers for public cloud services, and to provide an on-premise cloud offering, or as part of a hybrid cloud solution.
Encryption	OpenStack supports encryption technologies such as HTTPS, SSH, SSL, TLS, digital certificates, and data encryption	
Compliance Standards	N/A	N/A
Support Availability		
Tech Support	Open source community forum. Support can also be purchased from third parties.	Open source community forum, vendors that provide value-added services and support
Self Support	Yes	Yes
Documentation	http://docs.openstack.org/	http://incubator.apache.org/cloudstack/

‘Build Your Own’ Comparison Table (cont'd)

	OpenStack	CloudStack
Software Compatibility		
Languages Supported	N/A	Java
Frameworks Supported	N/A	Spring, .NET, Ralis, Grails
Databases Supported	N/A	
OS Support	Windows and Linux-based	Windows and Linux-Based
Windows Versions (if applicable)	Dependent on hypervisor	Windows 2000, Windows XP, Windows Vista, Windows 7, Windows 8, Windows Server 2008
Linux Distros (if applicable)	Dependent on hypervisor	
Hypervisors Available	KVM (most widely deployed), VMware ESXi, Xen, LXC	VMware, Oracle VM, KVM, XenServer and Xen Cloud Platform.
Open Source	Yes	Yes
Mobile Platforms with App Support	Cross-platform web app	
Platform Control		
API Options	Included API/First party API	Included API/First party API and Third party API support
Dashboard and/or Command Console	Dashboard	Dashboard and Command Console
GUI Options	Self-service Horizon UI	
Reporting Options	Fully documented API, incubating project Ceilometer provides reporting and metrics API	Query Databases, Dashboard Real-Time reporting
Resource Monitoring	API monitoring available in project and through third parties	API monitoring via third party tools like CA Nimsoft Cloud Monitoring, Nagios and Zenoss
Pricing		
Pricing Page	N/A	N/A
Pricing Model	Free- Open Source	Free - Open Source
Usage Limits	Free- Open Source	Free - Open Source
Free Trial	N/A	N/A

‘Build Your Own’ Comparison Table (cont'd)

	OpenStack	CloudStack
Scalability, Performance, and Availability		
Storage Limitations	Dependent on storage integrated from OepnStack APIs	
Multi-tenancy/Isolation	Tenancy built in to OpenStack	
Vertical/Horizontal Scaling Strategy	Scalability is programmatic through standard OpenStack APIs.	Scaling is inherent. Users can scale servers, clusters or zones
Frequently Requested Features		
Geo-Replication	No. Customer responsible for replication	
Self Service Provisioning	Yes	
Auto-scaling	No	No
High Availability	No. Customer responsible for high availability	Yes
Stateless Service	Yes	No
Load Balancing	No. Customer responsible for load balancing	Bundled HA Proxy or integration with third-party tools like Citrix Netscaler, F5 and other load balancing technologies.
Resource-Pooling	Yes	

‘Build Your Own’ Comparison Table (cont'd)

	OpenStack	CloudStack
Software Production Support		
Auto-Provisioning	Yes	Yes
Self-Service Configuration	Yes	Yes
Continuous Integration	Yes	Yes
Continuous Deployment	Yes	Yes
Continuous Delivery	Yes	
Configuration Management	Yes	
Deploy from templates/ OS Image Creation	Yes	
Future Updates	Integration of Heat (provisioning) and Ceilometer (metering and monitoring) into the core project	Microsoft Hyper-V support

OpenStack

IaaS

Launch Date: 2010
Free trial - Open Source
Current Version:
Related Products: VMware and CloudStack

http:// www.openstack.org
https://www.openstack.org/blog/
@openstack
UPDATES: SEMIANNUALLY

Product Description

OpenStack is an open-source IaaS project for building clouds that run on standardized hardware, creating flexibility that eliminates client lock-in. The public cloud platform includes provisions for compute, storage, databases, networks, and is highly scalable. App developers can control resources through APIs, while administrators and general users can access resources through web interfaces.

Pricing Details

Free and Open Source

Features

1. OpenStack can be used to build a public or private cloud hosted on customer premises, through a managed hosting provider, or bundled as a hardware appliance.
2. The technology is generally built and run on Linux systems.
3. Governed by a Foundation that includes members of companies such as Rackspace, IBM, and Red Hat (full list: DreamHost, eNovance, CERN, Cloudscaling, Nebula, Sina Corporation, SUSE, HP, AT&T, Dell Aptira, Canonical Ltd., Piston Cloud Computing, Mirantis, Yahoo!,and Cisco Systems).

Claim to Fame

Working towards creating an open, global cloud environment without vendor lock-in.

3rd Party Review

Especially Good For:
Startups

Pros:
- Excellent configuration management
- Great for developing and hosting web, mobile, multimedia and social applications

Cons:
- Not very easy to integrate with internal systems
- Compiling projects from the foundation version is very complex

Apache CloudStack

IaaS **Customers: 5,000**
Forest Hill, Maryland USA

Launch Date: April 2011
Free trial - Open Source
Current Version: Apache Cloudstack 4.0.1
Related Products: OpenStack

http://www.cloudstack.org
https://blogs.apache.org/cloudstack
@cloudstack
UPDATES: MONTHLY

Product Description

Apache CloudStack is an open source software utility that manages large networks of virtual machines through its easily available and scalable IaaS platform. As a turnkey solution, CloudStack features compute orchestration, Network-as-a-Service, user and account management, full and open native API, resource accounting, and a Graphical User Interface.

Pricing Details

Free and Open Source

Features

1. Developers can build using .NET, PHP or Node.js, deploying with FTP, Git or Team Foundation Server
2. Multi-role support available
3. CloudStack supports VMware, KVM, XenServer and Xen Cloud Platform. The provided API is compatible with AWS, EC2 and S3

Claim to Fame

Working towards creating an open, global cloud environment without vendor lock-in.

MBaaS/BaaS Solutions

Comparison Table

*Note: Comparison data based on information provided by vendors.

	AnyPresence	Parse	FatFractal	Kii Cloud
Cloud Specifications				
Hosting Styles	Both cloud based and on-premise options	Public	Public and Private (cloud-in-a-box offering)	Public
Secure Authentication Options	Support for built-in or third-party authentication from the mobile app to backend identity management frameworks (LDAP, AD, SAML, OpenID, etc.). Secures communication channels between mobile client and server components, using 256-bit SSL certificates.	Every request must be signed with an application id/client key pair	Facebook (OAuth 2) and Twitter (OAuth 1a) authentication OOB, user-extensible to arbitrary OAuth providers. Script-based authentication allows arbitrary authentication code. All communication channels are secured with SSL.	Oauth2 SSL
Server Security Features	Dedicated servers	Dedicated servers, firewalled servers, and local backup	Linux containers (LXC), dedicated LVM partitioned disk storage, firewalled access using custom Iptables and EC2 security rules and multiple DMZs.	Dedicated Servers, Firewalled servers and local backup
Data Location / Availability Zones	AnyPresence uses Amazon and Heroku as default cloud services.	Data is transmitted over SSL.	All passwords are stored using one way hashes, all data is transferred over SSL, and dedicated LVM partitioned disk storage for app footprints and databases.	Amazon
Hosting Locations	Heroku and Amazon	Parse's servers	Amazon EC2 (East and West)	
Encryption	256-bit SSL based encryption	SSL	SSL	SSH
Compliance Standards	HIPAA, PCI		PCI	

MBaaS/BaaS Comparison Table (cont'd)

	AnyPresence	Parse	FatFractal	Kii Cloud
Support Availability				
Tech Support	Training and on-boarding, documentation, ticketing system, on-line and off-line support, technical services	Email support, self-support, guaranteed response time for Enterprise customers	Email Support, self support, and guaranteed response time for certain pricing tiers.	Email, forum, and phone; based on customer package level
Self Support	Yes	Yes	Yes	Yes
Documentation	http://docs.anypresence.com/#home	https://parse.com/docs	http://fatfractal.com/prod/docs/	http://documentation.kii.com
Software Compatibility				
Languages Supported	Ruby for back-end	Java, visual basic, C#, C/C++, Objective-C, JavaScript, HTML/XML	Java, Objective-C, Ruby, JavaScript, Scala, Clojure, HTML/XML	Java, Objective-C, JavaScript, Other (Any if interfacing through REST APIs)
Frameworks Supported	Rails	.Net	Spring, Rails, Sinatra, Merb, Servlets	Other
Databases Supported	MySQL, MongoDB, Oracle NoSQL DB, Postgres, SQLserver, SharePoint	MongoDB	MySQL, Cassandra, ElasticSearch	MySQL, PostgreSQL, Other
OS Support	Linux-based, iOS, Android OS	Windows, OS X, Linux-based, iOS, Android OS	Windows, OS X, Linux-based, iOS, Android OS	iOS, Android OS
Windows Versions (if applicable)		Windows 7, Windows 8, Windows Server 2008	Windows 2000, Windows XP, Windows Vista, Windows 7, Windows 8, Windows Server 2008	n/a
Linux Distros (if applicable)			Ubuntu 12.04 (Cloud-in-a-box offering)	n/a
Hypervisors Available			No	
Open Source	No	No	No	No
Mobile Platforms with App Support	Native iOS, native Android, HTML5		iOS, Android, and HTML5/JavaScript	

MBaaS/BaaS Comparison Table (cont'd)

	AnyPresence	Parse	FatFractal	Kii Cloud
Platform Control				
API Options	Included API/First party API and Third Party API support	Included API/First party API and Third Party API support	Included API/First party API and Third Party API support	Included API/First Party API
Dashboard and/or Command Console	Dashboard	Dashboard and Command Console	Dashboard and Command Console	Dashboard
GUI Options	GUI based multi-tenant designer to design and generate the back-end and front-end of the apps. Generates back-end, SDKs and mobile apps.			Developers interface with the cloud through REST APIs or SDKs. iOS, Android and JavaScript SDKs are available.
Reporting Options	Queryable data sources and life-cycle events	Queryable database via the REST API	Application logs, analytics, monitoring, and data browser access to database.	Built in analytics and an add-on/standalone analytics product called Kii Analytics.
Resource Monitoring	Platform analytics for app platform usage, real-time server logs, default tools offered by underlying PaaS	Status page that shows the general health of the platform	Real time logs, analytics, and monitoring that can be accessed through a dashboard.	Developer portal and system status dashboard
Pricing				
Pricing Page		https://parse.com/plans	http://fatfractal.com/prod/our-pricing/	http://www.kii.com/en/technology/price
Pricing Model	Metered. Detailed pricing is provided in engagements with enterprises.	Metered	Monthly tiered plans and metered	Metered
Free Trial	Unlimited usage for 1 app	Free: 1million requests/mo, 1 million pushes/mo, 20 second burst limit. $199/month: 15million requests/month, 5 million pushes/mo, 40 second burst limit. Enterprise: contact for details.	Limits based on domains, API requests, storage, and bandwidth (outgoing).	Free up to 1 million calls, 1 GB storage, and 1 million push notifications. $199 for 15 million calls, 20GB Storage, and 5 million Push notifications.
Limits of Trial	15 Day free trial	Free below a certain amount of data	Free below certain compute usage	Some users qualify for 6 months free on paid plans

MBaaS/BaaS Comparison Table (cont'd)

	AnyPresence	Parse	FatFractal	Kii Cloud
Scalability, Performance, and Availability				
Storage Limitations	no specific limitation		Based on pricing tiers	
Throughput Limitations	no specific limitation		Based on pricing tiers	
Multi-tenancy/ Isolation	The AnyPresence app designer is multi-tenant environment. Generated apps have dedicated instances and are completely isolated/ exclusive.		Multi-tenancy and LXC isolation are supported	
Vertical/ Horizontal Scaling Strategy	Scalability is dynamically achieved by upgrading (degrading) workers and dynos	User needs are monitored and Parse scales accordingly	Auto-scaling, clustered databases, clustered servers and load balancing.	Amazon
Frequently Requested Features				
Geo-Replication			Advanced search, data graphing, data import/export, WebSockets.	
Self Service Provisioning	Yes		Yes	
Auto-scaling	Yes	Yes	Yes	Yes
High Availability	Yes	Yes	Yes	Yes
Stateless Service	Yes	Yes	Yes	Yes
Load Balancing	This relies on the underlying hosting services i.e. Heroku or Amazon	Work to manage all load-balancing requirements for customers	All user data is persisted in multiple clustered master databases and NoSql stores which are load balanced. All user applications are deployed to multiple containers/EC2 instances which are load balanced by our directors (customized reverse proxies)	
Resource-Pooling	No	Yes	Yes	Yes

MBaaS/BaaS Comparison Table (cont'd)

	AnyPresence	Parse	FatFractal	Kii Cloud
Software Production Support				
Auto-Provisioning		Yes	Yes	Yes
Self-Service Configuration	Yes	Yes	Yes	Yes
Continuous Integration		Yes	Yes	Yes
Continuous Deployment	Yes	Yes	Yes	Yes
Continuous Delivery			Yes	Yes
Configuration Management			Yes	Yes
Deploy from templates/ OS Image Creation			Yes	
Future Updates	Support for additional backend language (Play framework for Java and Scala), additional front end SDKs in addition to currently supported iOS, Android, HTML5, and UI development features, additional data connnectors, additional mobile services required by enterprises.		Client SDKs for RIM and Windows8, additional language and framework support for Node, Python, advanced search, and a cloud-in-a-box offering.	

AnyPresence

BaaS Customers: 15+

Reston, Virginia USA

Launch Date: June 2012
Free trial - 15 Day Free Trial
Current Version: AnyPresence v.3.x
Related Products: Appcelerator, Urban Airship

http://www.anypresence.com
http://www.anypresence.com/blog
@AnyPresence
UPDATES: BIWEEKLY

Product Description

AnyPresence is an enterprise mobile app development platform that can create native apps for iOS and Android and HTML5. It has back-end capabilities for data integration, data persistence, caching and user authentication. Implementation can be through the AnyPresence cloud, or enterprises may use their own private cloud or data center to run the server components.

Pricing Details

Pricing is provided in engagements with enterprises.

Features

1. Organizations can develop and deploy HTML5, native iOS and Android apps without installing software
2. Offers pre-built templates and interfaces that can be customized, and offers on-premise hosting options
3. Creates native app code that includes Storyboard metadata for iOS and XML layout for Android apps

Claim to Fame

"Develop and deploy enterprise apps with unique "no platform lock-in" guarantee"

FatFractal

BaaS

Distributed with base in NV, USA

Launch Date: September 2012
Free trial - Free below certain usage
Current Version: xStream 2.0
Related Products: Appcelerator, Urban Airship

http://fatfractal.com
http://fatfractal.com/prod/blog
@fatfractal
UPDATES: MONTHLY

Product Description

FatFractal's PaaS-based technology stack allows developers to quickly build and deploy mobile and web apps. FatFractal offers an environment to build apps where developers can focus on creating applications, and FatFractal handles the backend. Users aren't locked in, which allows them to use any infrastructure, multiple languages/frameworks, and export application data.

Pricing Details

FatFractal pricing is both tiered and metered.

Features

1. Enterprise-grade security
2. Automatic elastic scaling
3. Enterprise-grade analytics, monitoring, reporting and alerts

Claim to Fame

"Tightly coupled BaaS services and great security with no vendor lock-in."

Kii Cloud

BaaS

San Mateo, California USA

Launch Date: February 2013
Free trial - 6 months free paid version
Current Version: AnyPresence v.1.0
Related Products: Parse, Kinvey

http://www.kii.com
http://blog.kii.com
@KiiCorp
UPDATES: BIWEEKLY

Claim to Fame

Focused on helping turn apps into full businesses.

Product Description

Kii's PaaS focuses on the mobile backend to provide users with snap-in SDKs for iOS, Android, JavaScript SDK and REST APIs. Kii programs the backend, manages databases, and doesn't lock vendors in; storing anything that a user's app can create. Kii is focused on helping users monetize and grow their business with their mobile apps and provides users with analytics.

Pricing Details

Free - 1 million calls, 1GB storage, 1 million push notifications. $199 Pro - 15 million calls, 20GB storage, 5 million push notifications. Custom pricing available.

Features

1. User management and social integration.
2. Data management with object/file storage/retrieval, multi-device data sync and sharing.
3. Apps can easily be enabled for push notifications.

Parse

BaaS

San Francisco, California USA

Launch Date: June 2011
Free trial - 30 Day Free Trial
Current Version: xStream 2.0
Related Products: Kii Cloud, Kinvey

https://parse.com
http://blog.parse.com
@parseIt
UPDATES: WEEKLY

Claim to Fame

Popular BaaS recently acquired by Facebook.

Product Description

With a focus on mobile apps, Parse handles the technical, back-end component of development, which frees up developers to focus on the design and user experience of what they're building. Parse allows its customers to quickly launch mobile and web applications, and offers ready-to-go sample templates and UI views of the most popular application features.

Pricing Details

The Basic plan is free, Pro is $199/month, Enterprise has a custom annual price.

Features

1. Parse offers push notifications, social integration, data storage, and customization.
2. Integrated syncing allows content to be accessed across multiple devices.
3. Server-side data can be exported if customers choose to leave the service.

Multi-Cloud AMP Solutions

Comparison Table

*Note: Comparison data based on information provided by vendors.

	Cloudsoft AMP	Scalr
Cloud Specifications		
Hosting Styles	Public, private on-premise, and hybrid	Public, Private, Hybrid
Secure Authentication Options	Several enterprise grade security options are available for backend systems including SSH and SSL/TLS. End-user facing authentication implemented by application owners.	
Server Security Features	Dedicated server, firewalled servers, and local backup	
Data Location / Availability Zones	Works with private clouds. Final choice for data location and security is left to application owners. (AMP does not restrict choice.) AMP provides automated controls with data, allowing application owners to easily manage data governance and jurisdiction issues.	
Hosting Locations	Outsourced	
Encryption	Encryption supported. Implementation depends on user requirements.	Data preservation - In the form of snapshots and dumps (on your cloud's object store). Security - Support of advanced access control.
Compliance Standards		
Tech Support	Cloudsoft Application Management Platform (AMP) is the offering under which Cloudsoft provides professional open source services and support. 'Brooklyn' can be downloaded and used in a self-supported manner.	Support Tickets, phone, emergency support.
Self Support	Yes	Wiki and Scalr-discuss Google group.
Documentation	brooklyn.io || github.com/brooklyncentral	http://wiki.scalr.com

Multi-Cloud AMP Comparison Table (cont'd)

	Cloudsoft AMP	Scalr
Software Compatibility		
Languages Supported	Java	
Frameworks Supported	Spring, Grails	
Databases Supported	MySQL and Mongo DB	
OS Support	OS X and Linux-based	Linux-based
Hypervisors Available	Xen, KVM, Vmware	
Open Source	Yes	Yes
Platform Control		
API Options	Included API/First Party API and Third Party API support	Included API/First party API
Dashboard and/or Command Console	Dashboard and Command Console	Command Console
GUI Options	n/a	Command Console
Reporting Options	Realtime datafeeds and APIs show metrics created by AMP	Dashboard reports for current activity, log export
Resource Monitoring	Web based management console and multiple APIs	Web-based control panel. Expenditure monitoring.
Pricing		
Pricing Page	Free	http://www.scalr.com/pricing/
Pricing Model	Free	metered, threshold
Free Trial	Free	30-day free trial, no credit card required
Limits of Trial	Free	
Scalability, Performance, and Availability		
Vertical/Horizontal Scaling Strategy	Applications and platforms are automatically scaled. Policy based management engines monitor systems, instantiating additional resources if required, and scaling back once load has passed. Metrics and Scaling behavior are completely customizable.	Cloud management solution. Autoscaling is provided, and users can change instance types on their IaaS to scale vertically

Multi-Cloud AMP Comparison Table (cont'd)

	Cloudsoft AMP	Scalr
Frequently Requested Features		
Self Service Provisioning	Yes	
Auto-scaling	Yes	Yes
High Availability	Yes	Yes
Stateless Service	Yes	Yes
Load Balancing	AMP integrates with software and hardware loadbalancers and will scale the resourcesa bailable to an application as it requires to handle current demand. AMP intelligently updates loadbalancers before and after scaling events to handle adding and removing resources from the load balancer pool.	Nginx-based load balancing and using Amazon ELB.
Resource-Pooling	Yes	No
Software Production Support		
Auto-Provisioning	Yes	Yes
Self-Service Configuration	Yes	Yes
Continuous Integration		Yes
Continuous Deployment		Yes
Future Updates	https://github.com/brooklyncentral/brooklyn/wiki/Roadmap	Support for Amazon VPC. Infrastructure redesign.

Cloudsoft AMP

Multi-Cloud AMP

San Mateo, California USA

Launch Date: February 2013
Free trial - Free
Current Version: AnyPresence v.1.0
Related Products: RightScale, Scalr

http://www.cloudsoftcorp.com/amp
http://www.cloudsoftcorp.com/blog
@cloudsoft
UPDATES: QUARTERLY

Product Description

Cloudsoft Application Management Platform (AMP) is an open-source tool that specializes in multi-cloud application management. Cloudsoft's AMP is formed by Apache Whirr, jclouds, and Cloudsoft's Brooklyn (open source control plane). This open source platform allows users to develop, deploy and manage large-scale applications at reduced cost, complexity and risk.

Pricing Details

Free and Open Source

Features

1. Cloudsoft provides comprehensive professional open source support and services.
2. Actively sponsoring established open source projects such as Apache Whirr and jclouds.
3. Reusable Service Blueprints enable automated deployment and configuration.

Claim to Fame

Completely free and open source cloud management.

Scalr

Multi-Cloud AMP

San Francisco, California USA

Launch Date: January 2008
Free trial - 30 Day Free Trial
Current Version: Sclar 2.2.1
Related Products: RightScale, Enstratus

http://scalr.com/
http://scalr.com/blog
@scalr
UPDATES: WEEKLY

Product Description

Scalr makes it easy for users to manage and deploy their applications across multiple clouds. Scalr is also an open source codebase under the Apache License. Using Scalr, clients can easily design and manage web applications that require bandwidth, storage, and the ability to compute capacity. Scalr helps scale relational and fault-tolerant databases, app servers, and script interfaces. Scalr also helps to automate data back-ups.

Pricing Details

Two options: either based on a threshold of a maximum number of running instances, or metered and based on instance hours. Hosted starts at $99/month for 5 servers.

Features

1. Compatible with AWS, Rackspace and other services
2. Software auto-scales and adjusts for their clients' applications, increasing operational productivity
3. Pre-configured images are available, but users also have customization options and API control

Claim to Fame

A much cheaper alternative to the competitors, with many of their features.

Cloud Concerns and Solutions

Cloud Security

Cloud computing is all about taking application resources, moving them from dedicated environments to shared environments, and expecting to deliver value either faster or at a lower price point. Security is all about isolating and protecting IT resources from both known and unknown problems. Security is often listed as the #1 cloud computing concern of IT professionals precisely because of these conflicting models. Being able to solve security challenges while unlocking the value of faster-delivery or lower-costs is critical to the success of a cloud offering.

As IT professionals and developers begin to evaluate the security of IaaS and PaaS offerings, it's important to keep several critical factors in mind. First, understanding how your data will be treated (location, protection, encryption) both in the short-term and long-term. Second, understanding how your application resources will be protected from inside and outside threats (isolation, multi-tenancy, firewalls). Third, understanding what additional capabilities are available from either the IaaS provider or as 3rd-party add-ons. And finally, it's critical to understand what level of transparency your business will have to these resources and how well that aligns with your business requirements for security, auditing and compliance. Security for cloud computing is rapidly evolving and improving, but it's critical to understand what you're buying before you make an assumption and potentially become the next negative headline in your favorite tech journal.

Scalability and Performance

For many developers, deploying onto a cloud computing environment means a large number of unknowns that must eventually be addressed. These unknowns are things like scalability, availability, and performance – but when, and how can these be addressed? Since it can be difficult for developers to predict how popular an application might be, it's critical for them to understand what capabilities are provided by IaaS or PaaS services to assist them when demand exceeds expectations, potentially impacting performance, availability and costs.

Scalability not only impacts the ability to scale-up and scale-down resources, but also allow the customer to distribute workloads across different geographic domains (i.e. availability zones) if the provider has more than one. Multi-Tenancy may be provided through application-level or infrastructure-level isolation. Load Balancing may be provided as an integrated service, or can be added on via 3rd-party services. Understanding how all of these capabilities will impact an application is critical to success. It's also important to know if all of these services can be automated into an application's lifecycle.

Cloud Reliability

It's been said many times that modern cloud computing architectures "design for failures." The reality of cloud computing is that various IaaS and PaaS services have had well documented failures over the past few years. Understanding the architecture of various IaaS or PaaS platforms is critical to the success of applications that must manage the risk of failures. And as more critical business applications are run in the cloud, true application-level SLAs (Service Level Agreements) will be more and more critical for businesses running in the cloud.

Almost all IaaS and PaaS platforms have clearly defined SLAs. It's important to understand how these are measured and what penalties or payments are incurred if aspects of an SLA are not met.

- Are the SLAs for availability, or do they also include performance?
- How are outages or service failures communicated, and how can you reach support if problems arise?

All of these elements should play a role in how you evaluate cloud reliability, and how you manage risks and costs associated with any cloud failures.

Cloud Disaster Recovery/Backup

SaaS services eliminate the need to worry about IT challenges such as backup and recovery by building them into the service. This is one of the reasons why this model is so attractive to business users. But in the case of IaaS or PaaS services, those may still be challenges that need to be addressed, though some vendors provide services that make backup and recovery simpler and more cost effective.

IaaS and PaaS users must consider many variables when evaluating these services, not just storage costs.

- How much data must be backed up, and how much bandwidth is available to move the data?
- Can data reduction techniques (deduplication, compression) be used to reduce storage costs?
- How granular are the backups and what RPO/RTO times can be expected?
- Are backups done at the application level or VM level? And most importantly, how is recovery handled?

All of these questions must be well understood in order to properly manage the risks of running business applications in any cloud.

Cloud APIs

Cloud APIs are the crucial interface between developers and a cloud platform. The primary advantage of the cloud is programmability—the ability to build and automate your infrastructure with code. That code is written to the cloud API. Developers can and should have a large say in what cloud platform to adopt. They can make or break a cloud platform. The accessibility of the API will, in large part, determine developer preferences.

When choosing a cloud platform to work with, an early consideration will have to be whether or not the API is open. Proprietary APIs controlled by one company will lead to lock-in and ultimately higher costs. Open APIs based on open source software developed by a collaboration of companies will lead to a cloud ecosystem with more choice, innovation, and ultimately lower costs. Also look for software development kits (SDKs) in the programming languages you use with excellent documentation and examples. Support for software configuration management tools like Chef and Puppet can be critical for your operations as well.

Cloud Lock-In Interoperability, Migration

Cloud computing has become ubiquitous in how we live our lives and accomplish our work. We can access cloud-based applications and services on many devices and from almost any location. But the promise of consistency and standards between different cloud infrastructures is still an evolving challenge, and one that concerns many IT professionals and developers that are trying to balance time-to-market and risk-management. Until cloud-computing services reach the level of standardization that we have with USB or Ethernet, many projects will have to make difficult decisions about today's technologies vs. tomorrow's options.

In evaluating a cloud computing strategy, it's important to consider how today's decisions will effect options in the future.

- Are applications being built on top of open-source or proprietary technologies?
- Does the cloud provider adhere to open APIs that enable 3rd-party tools and transparency?
- How will you be able to migrate information and applications from your data center to the cloud, or potentially to another cloud in the future?

These, plus many more questions should be at the core of your evaluation of both IaaS and PaaS services for your business applications.

Price Comparison

Depending on where someone is in the lifecycle of an application or IT process, there can be a significant difference between price and cost. Price is a starting point. Cost is a continuum that can include many elements. Understanding the true cost of IaaS or PaaS services can often be complicated, as cloud computing is not sold via a consistent unit of measure (eg. ounce of gold). Being able to determine how costs are incurred for a given application or process will often make the difference between project success or failure.

While price gets all the headlines, cost is what truly affects the business. Understanding cost means understanding the combination of many elements – people costs (engineering, architecture, strategy, consulting), process costs (cost of money, opportunity cost) and technology costs (hardware, software licensing, maintenance fees). Cost should also involve estimates of how much it will cost to change (frameworks, platforms, cloud providers) as well as termination costs. It may not be possible to make apples-to-apples comparisons on cost, but it is a valuable exercise to better understand where money is being spent, and if it's primarily being spent on the elements of a cloud service that the business values the most.

PaaS Outlook for 2013

During 2012, more platform vendors established a Platform-as-a-Service (PaaS) offering, business leaders evaluated use case benefits, and early adopters battle-tested PaaS availability, reliability, and maturity. In 2013, PaaS capabilities will mature to overcome earlier PaaS challenges, encompass more project archetypes, and re-invent IT into a more responsive and agile team.

During the transition from static, on-premise, and dedicated application platform deployments to dynamic, off-premise, shared Platform-as-a-Service, teams encounter significant challenges. While security and quality of service (QoS) assessments initially held back adoption, financial total cost of ownership, operational skills, and breadth of platform coverage are rapidly becoming key adoption hurdles.

PaaSes Add More Programming Language Support

In order for PaaS to maintain its momentum, PaaS providers will need to deliver a polyglot programming experience, continue to reduce operational skills by supporting automated governance and self-service access, and deliver a comprehensive platform that supports the integration, APIs, business processes, data, and presentation aspects required for systematic solution projects.

Many early PaaS offerings were optimized for hosting single-language web applications in the cloud, and did not offer the ability to host applications requiring APIs, integration flows, business processes, or analytic components. Today, many specialized PaaS offerings (integration PaaS, business process PaaS, API management PaaS, and application PaaS) are converging to deliver a comprehensive PaaS platform. PaaSes are expected to build and expand their plug-in architectures to allow support for multiple languages, frameworks, and run-time containers.

Cloud-Based DevOps Processes

More IT organizations are expected to adopt a PaaS incorporating innovative DevOps tooling that will shield developers from infrastructure concerns and provide a unified experience throughout the entire software development lifecycle.

DevOps principles and practices combined with PaaS characteristics will accelerate IT solution development and delivery. A DevOps focus on continuous activity execution (e.g. continuous build, continuous integration, continuous test, continuous delivery) creates a 'no wait' environment, meaning teams do not have to wait for the next script to run or for the next activity to commence.

Automation is another growing aspect of software development. By incorporating automation into developer and operations processes, teams bypass time consuming manual tasks saving significant time and effort. Both DevOps and PaaS promote simple, on-demand self-service environments that shield team members from complexity and reduce skill hurdles. As PaaS evolves to gain more DevOps-supporting capabilities, an increasing number of organizations will harness that technology to rapidly iterate solutions and increase innovation.

Hybrid Platforms

Demand for hybrid platforms could also grow in order to decrease operation and development burden. Hybrid platforms are single cloud platforms that can span on-premise and off-premise PaaS deployment scenarios with the same user experience.

- In the short term, the PaaS landscape will continue to evolve towards:
- The convergence of Application Platform-as-a Service (APaaS), Integration Platform-as-a-Service (IPaaS), and Mobile Backend-as-a-Service (MBaaS) into holistic service offerings.
- Integrating automated governance, DevOps tooling, and TCO dashboards into PaaS offerings
- Supporting advanced resource partitioning, isolation, and pooling scenarios across multiple tenant groups and service levels.

Conclusion

We hope this guide has given you the clear, concise information you need to decide what cloud offerings are a good fit for your organization. However, the best way to find out if a cloud solution is right for you is to try it out. Our data tables include information about free trials and free options for nearly every cloud provider listed. If any of the solutions piqued your interest, you should take the next step and try them out within your organization's specific use cases. If you've never used a cloud solution for infrastructure, mobile backend, or development environments, you'll be amazed at how fast, flexible, convenient and scalable your development and system administration processes can become.

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The DZone team would like to thank you for downloading this guide. We'd also like to thank our many contributors who provided information, feedback, and reviews. These individuals are featured in the Credits section.

Glossary

APaaS - Application Platform-as-a-Service is a subcategory of PaaS that features a proprietary software ecosystem and features interfaces and utilities that can make it possible for non-technical business-level employees to develop applications.

Billing and Service Usage Metering - This is a pay-as-you-go billing method where usage is monitored/metered and customers pay only for what they consume.

BPaaS - Business Platform-as-a-Service manages billing, HR, payroll, advertising, and other businesses processes as a cloud-hosted service

Cloud Broker - An entity that serves as a connection between cloud customers and cloud service providers, helping maintain relationships between the customer and provider.

Cloud Bridge - When an application runs in a way that integrates its components into multiple cloud environments.

Cloud Bursting - A technique where a hybrid cloud provides extra resources on an as-needed basis to private clouds.

Cloud CDN -Cloud Content Delivery Networks are geographically distributed server networks that improve web content delivery by serving web objects (text, graphics, media files, software, documents and more) without causing significant strain on a company's telecommunications infrastructure.

Cloud Computing - A computer model where infrastructure, applications, and business processes can be delivered "as a service" over a network (the internet). This gives computing clients convenient, 24-hour access to a shared collection of customizable resources. Cloud computing has five basic components; on-demand self-service, broad network access, resource pooling, rapid elasticity, and measured service.

Cloud Servers - Virtualized machines running either a Windows or Linux operating system that behaves similarly to a physical server but is made accessible to clients through either a web interface or API. A Cloud Server can be controlled at the administrative or root level.

Cloud Service Architecture (CSA) - (coined by Jeff Barr, chief evangelist at AWS) A design in which applications and components act as services on the cloud, supporting apps within the same cloud.

Cloud Storage - A data storage service where customers transfer their data over the internet or another network to an offsite storage system maintained by a third party.

Cloud Washing - When organizations or vendors add the word "cloud" to already existing products and services. In many cases these 'cloud washed' products do not have all the attributes of cloud computing.

Federation - When a cloud provider or cloud broker merges data across multiple cloud networks.

High Availability - Refers to a system or part of a system that is always operational and available, meaning applicatons on the system won't go down even if some servers go down. Generally, to achieve this, a system or network must have backups and failover processing.

Hybrid Cloud - An environment that combines public and private cloud infrastructure.

IaaS - Infrasructure-as-a-Service is a cloud computing model where a provider delivers components of an infrastructure, such as servers, network equipment and software, over the Internet. Instead of purchasing the actual products, clients purchase the resources and generally pay based on what they consume.

iPaaS - Integration Platform-as-a-Service is an emerging subcategory of PaaS that offers a platform for building and deploying integrations within the cloud and also between public clouds and internal datacenters.

Lock-in - When a client has difficulty moving from one cloud vendor to another due to non-standardized APIs, data structures, and service models.

MaaS - Monitoring-as-a-Service is a type of SaaS that tracks, analyzes and visualizes cloud computing resource usage.

Multi Tenancy - A system attribute where a single instance of a software application serves multiple client organizations (tenants). Multi-Tenant software separates data and configurations, making it so that each group works with a customized virtual application instance. More on Multi-Tenancy.

NaaS - Networking-as-a-Service provides computing and connectivity resources that allow network connections and inter-cloud connections. Typically this includes bandwidth-on-demand, DNS as a service, and VPN.

PaaS - Platform-as-a-Service offers the operating system, middleware, development tools, and associated devices as a service over the internet. This allows developers to build applications while harnessing the flexibility and resource sharing of a cloud-based environment. Some PaaSes can also provide developer devices to build and provide data access, database services, and billing services.

Private Cloud - A virtual data center inside a company's firewall. It can also be located behind a private space dedicated to a company within a cloud provider's data center. Services are offered to only select users (a company) not the general public.

Public Cloud - Services are offered over the Internet and available to the general public - anyone who wants to pay can purchase the service.

SDN - Software Defined Networking is an approach to networking (enabled by a commercial or in-house hardware solution) that decouples switching and other network handling processes from the hardware and instead allows these processes to be controlled completely by a software application called a centralized controller. This provides more control over network traffic flow and allows the organization to buy less expensive network switches.

SLA - Service Level Agreement is a contract that specifies the consumer's requirements and the provider's commitment to them. Generally includes things like uptime, privacy, security and backup procedures, level of service, performance and guarantees.

SaaS - Software-as-a-Service resides on a level of abstraction above IaaS and PaaS with all of the software and features already built and provided over the network. The main advantage of this model is that a customer does not need to install or maintain this software on-premises, or store any of its data.

VPC - Virtual Private Cloud (coined by Reuven Cohen, CEO and founder of Enomaly) is private cloud that exists within a shared or public cloud and is not located in the customer's datacenter.

XaaS - Everything-as-a-Service refers to the increasing movement of various computing services being available over a virtualized network as opposed to on-site.

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