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# Private PaaS: the next generation platform for enterprises

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*This report underwritten by: Apprenda*

a cloud report

# Private PaaS: the next generation platform for enterprises

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The early cloud computing adopters, mostly website developers, made initial use of emerging public PaaS technology such as Heroku, Engine Yard, and Google App Engine. Driving this movement was the use of the instant sandbox, which allowed developers to begin writing their apps without worrying about the underlying infrastructure.

However, enterprises practically ignored public PaaS for obvious reasons, such as security and governance. While enterprises have the desire to create a standard development and deployment platform for the enterprise, they cannot afford the risks of multitenant public cloud services.

So how do you make PaaS work for your enterprise? The answer lies in understanding new models of delivery, such as private PaaS. Moreover, there are emerging patterns of use that provide more business agility. These include standardized business solutions development, such as a common business system, or a cost-effective platform to build and externalize services to customers and partners, such as providing and managing web services that allow controlled access to core business data or processes from outside the organization — in essence, turning the enterprise into a cloud provider.

The successes of this technology are beginning to appear, as is the business case for leveraging private PaaS. Traditional approaches to application development and testing are still very expensive. IT wants to get out of the cycle of endless hardware and tool upgrades. We need to centralize and standardize development around a common toolset and platform that will support how applications are built for years to come.

In addition, PaaS provides the ability to improve development operations (devops). It allows users to more tightly couple the needs of the business with the ability to define and build business applications. The path to PaaS, specifically private PaaS, is not obvious. An enterprise needs a good understanding of its requirements, including data, applications, services, processes, the needs of the users, and the ultimate needs of the business.

In this paper, we'll help you understand the path to a more effective and efficient way to design, build, test, and deploy business applications. Using case studies of JPMorgan Chase, Diebold, and AmerisourceBergen, we'll also help you understand the core drivers, the emerging patterns, and how you should consider PaaS within your enterprise IT strategy.

If you follow the advice in this paper, chances are you'll be successful with your PaaS deployment. Miss any of the steps or ignore the advice and you're putting your project at risk.

## What today's enterprise needs in business applications

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Some core benefits that enterprises want in the design, development, test, and deployment of business applications include:

- Business solutions on-demand
- A standard enterprise development platform
- Strategic use of data
- Next-generation application development
- Pervasive use of services

**Business solutions on-demand** provide the modern enterprise with the ability to automate business processes as required by the business. With it there are no long wait for months, sometimes years, for the automation of key business processes.

Enterprise IT has done a poor job of meeting the needs of the business over the past 20 years. Application backlogs are commonplace, and the inability to get the right business application into production hinders the growth and the agility of the business.

There is an industry movement afoot to provide a standard platform for the design, development, testing, and deployment of business applications to remove much of the latency we've experienced in the past. The goal is to provide true business solutions on-demand.

With the understanding that we need to leverage business solutions on-demand, we should also leverage a **standard enterprise development platform**. This allows enterprises to focus on a single place where we define, design, develop, test, and deploy business applications.

Doing so stops the inefficient process of leveraging different and incompatible development environments, which require many different skills, platforms, and operations models. The idea is to leverage one standard development platform, thus making building business applications an efficient, speedy, and cost-effective process.

The **strategic use of data** means that we're able to leverage most of our business data assets to the benefit of the business. Data that once existed in hard-to-access silos is now available for core business applications and processes.

Building applications by leveraging **next-generation application development** technology means using state-of-the-art programming languages, data access technology, built-in middleware services, and integration design, test, staging, and deployment technology.

The **pervasive use of services** refers to the development platform's ability to produce and consume services, such as cloud services, for consumption inside or outside the enterprise.

The ability to produce and manage services provides those building business applications with a few distinct advantages:

- The ability to mix and match services to form and reform business solutions to quickly automate strategic business processes
- The ability to provide services for sharing among other enterprise applications or perhaps with business-partner applications that reside outside the enterprise or in another cloud
- The ability to consume services hosted by others, perhaps business services such as tax calculation or infrastructure services such as storage and compute

## The rise of private PaaS

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Consider where things are headed, as defined in the previous section. The emergence of PaaS, specifically private PaaS, provides a clear opportunity for enterprises to get much better at building business applications at the speed businesses need them.

The key advantages when leveraging a private PaaS include:

- You have the ability to provide developers with a centralized and unified self-service cloud application platform that can deploy and manage their application development processes, as well as the resulting application. You have all of this while still maintaining control, consistency, and quality of the applications built, tested, and placed into production.
- You have the ability to utilize data center resources more effectively, as the private PaaS will manage server utilization on your behalf. This reduces the hardware and software costs and improves overall operational effectiveness. You accomplish this by simplifying the management of servers, transforming them into a single resource pool, and defining policies that allow developers to consume predefined configurations of things like memory, storage, and compute services using a self-service model.
- You can utilize your existing skill sets and investments while taking advantage of new management capabilities that can be fully integrated with your existing tooling. This means that you don't have to replace your existing staff to better utilize your private PaaS; the existing skill sets will assimilate nicely. Moreover, the addition of the new application-management capabilities and built-in services will increase developer productivity. This allows for the quick delivery of services into production.

## Understanding the PaaS market

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[According to GigaOM Research](#), the PaaS market is predicted to reach \$20.1 billion dollars in 2014. The core takeaway is that PaaS is growing.

Much of this growth is around the use of private PaaS, which is driven largely by the advantages we have already defined. Enterprises want to become more agile. The goal is to build and deploy applications at the speed of the need. At last, new approaches and technology can meet the requirements of the business once and for all.

While PaaS offerings vary greatly, most provide facilities for application design, deployment, testing, and self-provisioned hosting. More-advanced services may exist in the offering as well, such as team collaboration, database integration, middleware services, web service integration, storage, state management, and version management services.

When selecting private PaaS, those in enterprise IT are typically driven by some common desires. Table 1 represents an informal survey of those who have leveraged private or public PaaS in the past year (55 respondents) or plan to buy it in the next year. They have ranked each driver from 1 to 10 in terms of importance to the mission of the business. This is to determine the overall value of the PaaS concept to the business.

**Table 1. Ranking of primary PaaS drivers from those enterprises that have deployed private or public PaaS or will do so in the forthcoming year**

<b>Drivers</b>	<b>Ranking (1–10)</b>
The ability to innovate quickly, providing business solutions on-demand	9.6
The ability to provide self-service development	7.8
The ability to offer a standard development platform	9.1
The ability to manage resources more effectively	8.7
The ability to better leverage enterprise data assets	8.9

*Source: Linthicum Research*

Clearly, the need to improve on an enterprise’s ability to deliver applications and services becomes the primary motivation for enterprises moving toward public or private PaaS. The ability to provide centralized and standard development and the ability to better leverage enterprise data assets better come in a close second and third.

Table 2 focuses on why enterprises have selected private PaaS versus public PaaS, polling the same audience as for Table 1. Each driver is ranked from 1 to 10 in terms of importance to the mission of the business.

**Table 2. Ranking of primary private PaaS drivers from enterprises that have deployed private PaaS or will do so in the forthcoming year**

<b>Drivers</b>	<b>Ranking (1–10)</b>
The ability to maintain or improve upon the existing levels of security	9.5
The ability to maintain or improve upon the existing levels of performance	8.1
The ability to maintain compliance with existing or emerging industry regulations	9.8
The ability to manage internal resources more effectively	9.2

*Source: Linthicum Research*

From both the growth of the market as well as the reasons for moving into public or private PaaS, we can conclude this movement is largely driven by the desire to reduce or completely remove the application backlogs as well as the ability to leverage resources more efficiently. The drivers behind using private PaaS extend the benefits of PaaS to environments that provide the right amount of security, compliance, and control over core business processes and data.



## Leveraging private PaaS at JPMorgan Chase

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With over \$2.4 trillion in total assets, JPMorgan Chase is one of the largest banks in the world. The firm has developed thousands of custom .NET and Java applications that run on the bank's infrastructure. The organization has tens of thousands of developers and members of its IT staff, as well as servers numbering in the tens of thousands that develop, run, and manage applications.

In 2010 JPMorgan Chase's Distributed Technology Engineering and Architecture team realized that some significant and systemic problems were affecting JPMC and thousands of software developers. These problems resulted in productivity loss, inefficient infrastructure spending, and lack of agility.

The team identified the following key issues:

- Long lead times for application deployment due to infrastructure provisioning and software stack build and verification
- Inflexible capacity management that required precise, up-front forecasting and had difficulty in meeting unexpected scaling needs
- Lack of effective cost control with large up-front cost requirements and severe underutilization of physical and virtual infrastructure
- Redundant effort among development teams that caused developers to treat application architecture patterns, security configuration, high availability, and common services (such as application caching) as one-off engagements rather than relying on standards

Given the scale and growth of JPMorgan Chase's application portfolio, the bank came to the conclusion that it could reap significant time and money savings by modernizing its IT investments to operate as a private PaaS that would directly address the identified inefficiencies.

The solution today consists of globally deploying the Apprenda private PaaS throughout a number of production sites, across server clusters totaling more than several terabytes of memory. The platform is used by over 430 development teams across the bank, having more than 2,000 .NET and Java applications running live today, with close to 600 of those applications deployed within the first 12 months of production. JPMorgan Chase is now using a private PaaS for mission-critical applications.

Key benefits of leveraging this technology include:

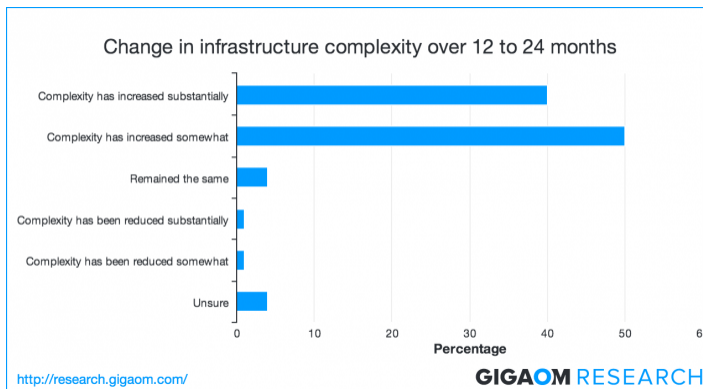
- Application time to market improvement of 59 days
- Better utilization of infrastructure from an average of 40 percent to 70 percent, resulting in a 45 percent drop in infrastructure costs
- 100 percent uptime to date with no unscheduled environment outages
- Standardization across development teams in terms of deployment and availability of standard application building blocks, resulting in boosts in developer productivity and agility

## The value of private PaaS

As we've seen in the JPMorgan Chase case study, the business benefits from the use of private PaaS are easy to define in the context of a complex business. Thus, the core value of PaaS is its ability to counter that complexity and provide an innovative way to consolidate, isolate, standardize, and control. This leads to less complexity, more agility, and quicker time to market. That is the ultimate value of PaaS.

The rise of complexity and the corresponding fall of business agility have been well documented. A 2012 study by Information Technology Intelligence Consulting (ITIC) found that when those in IT were asked, "How has the complexity of your IT infrastructure changed over the last 12 to 24 months?" the most popular responses were that the complexity increased substantially or the complexity increased somewhat (see Figure 1).

**Figure 1. IT reports that the complexity of its IT infrastructure has increased significantly**



*Source: Information Technology Intelligence Consulting*

The rise in complexity emerged as a byproduct of the lack of centralized design, development, and deployment. IT built systems as they were needed using whatever technology was popular at the time. Thus, deployment suffered from too much heterogeneity, with systems becoming silos of both information and business processes. This led to higher development and operational costs that are easy to measure. However, most costly is the loss of business agility, which typically has the largest impact but is also more difficult to measure.

While the architectures are bound to become more complex around the natural evolution of technology, the inability to configure and control these resources centrally, as well as the inability to build and deploy business solutions rapidly, is at the core of the problem. The list of issues that limit agility and business growth includes:

- Lack of productive use of resources and services
- Lack of centralized development and governance
- Inability to manage complexity and heterogeneity
- Lack of agility within devops

The use of private PaaS allows us to overcome many of these issues. Development and operational costs are reduced, and the costs incurred by the lack of business agility are reduced over time as IT becomes more agile around the use of PaaS.

The idea is to drive development from a single internal platform that provides a centralized foundation for new and existing business applications. Enterprises can manage resources more efficiently, and they can utilize centralized control using a private PaaS. Moreover, they can better manage complexity and heterogeneity, as well as provide more capabilities within the devops processes and enabling technology.

## Diebold

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Diebold is the largest U.S. manufacturer of automated teller machines (ATMs), with reported revenue of \$2.8 billion. Diebold needed to knock down existing roadblocks and growth inhibitors in order to maximize its team's effectiveness. By automating and streamlining its application deployment process, Diebold teams would increase productivity and efficiency while reducing time-to-market constraints.

As Diebold reviewed both public and private PaaS solutions, it became clear that having information accessible outside of its data center (i.e., public PaaS) would carry added risks by the simple fact that it would be in the public domain and therefore outside the absolute governance of its own IT organization. Unlike a publicly hosted platform, a private PaaS would run within its own data center.

The four key drivers leading Diebold to select a private PaaS were:

1. Security and regulatory control
2. Strict governance standards within its IT environment
3. Control and customization requirements
4. Optimization of existing infrastructure investments

The evaluation yielded objective proof points and data that highlighted the benefits of Apprenda private PaaS and how it could deliver on Diebold's selection criteria, including:

- Increased developer productivity
- Decreased deployment cycle time
- Enabled single-click scale up and scale down

## Evaluating PaaS technology: a how-to guide

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In selecting a PaaS provider, those in enterprise IT must first consider the benefits of PaaS, including the concepts outlined in this paper and presented in the case studies highlighted in this paper.

However, they should consider some additional issues, including:

- The choice of public or private PaaS
- How to create a cloud-based application or service
- Service delivery and management capabilities

Let's address each issue, with the idea of creating a process to evaluate your own requirements, and then select the right PaaS provider.

## Step one: public or private?

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There are many considerations when looking at public PaaS providers, such as Google App Engine or Engine Yard, and control of the PaaS cloud provider on behalf of the enterprise. In contrast, private PaaS technology is hosted within the enterprise's data centers and is under the complete control of enterprise IT.

Many enterprises need to keep the data in-house; among the reasons are compliance issues that regulate the use and location of data. In many cases, hosting data outside the enterprise is not possible or the risk of hosting data on a public cloud is too high. In these cases, private PaaS is typically a better choice. Note, however, that while most enterprises are private PaaS, hybrid cloud is preferred.

Application performance is also a consideration. Not having to transmit requests and responses over the open internet, which can be limited by network latency, means that performance is more reliable and consistent.

## Step two: creating a cloud-based application or service

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A core capability of your PaaS technology is making the creation of cloud-based applications or services efficient. This means that the PaaS provider should automate the design and definition of the applications, binding to the database, building the user interface, and providing core middleware services.

Core features of a PaaS technology provider are much the same as we seek in any design, development, test, and deployment environments. However, in the case of private PaaS, we're also looking for the flexibility and extensibility of the platform, in terms of the ability to provide a single point of development and deployment for most business requirements, for most developers, and for most business-solution deployments.

Moreover, the PaaS provider should provide core governance capabilities, such as the ability to track applications and services, as well as place policies around them when in production. Also, you must consider your need for core security features, including support for federated identity management.

Finally, private PaaS should provide use-based metering, allowing for chargebacks within the enterprise and perhaps for those outside the enterprise who are leveraging the services. Also, the private PaaS should be able to provide self- and auto-provisioning of core applications services within the private PaaS as a developer, as well as a consumer of the ultimate business application built within the private PaaS.

## Step three: service delivery and management capabilities

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In looking at service delivery and management capabilities, we need to consider service development, service deployment, service production, and service consumption. This means the private PaaS technology's ability to build and place services such as business services that provide data analysis for sales forecasting on-demand into production, directly from the PaaS platform. It also means the ability to consume services from the outside in, such as data-validation services for vertical-specific applications (e.g., validating patient diagnostic data in health care).

Additionally, you need to consider the PaaS technology's ability to support automatic and systemic multitenancy. This allows the application to operate, serving many tenants simultaneously, without tenants interrupting the processing of one another. This should be an automatic process that does not require any special development approaches on the part of the developers.

In some instances, the PaaS provider should offer the ability to “work to the metal,” or access the native features of the platform. For example, they should have the ability to read and write directly to memory or the ability to directly access disk I/O. Typically these are features found within private PaaS providers because the infrastructure is wholly owned, whereas public PaaS providers typically require that you work in a protected sandbox.

## Step four: what to do when things go wrong

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What if things go wrong? While we've done all we can to show you the path to success, there are times when issues arise that must be corrected. These problems are typically related to one of the following issues:

- Performance
- Integration
- Unforeseen requirements

**Performance issues** typically arise when we've not done a good job in considering the potential for performance bottlenecks. These are usually around network latency, database latency, or even tenant management inefficiencies. Your best approach to fixing performance issues is to find and eliminate the bottlenecks, such as upgrading the underlying network or tuning the database. In many instances, performance models can



be created to detect performance issues before they become an actual problem in production.

**Integration issues** typically mean that we've neglected to understand the data that must flow among business systems and have discovered the problem after deployment. In this case you need to add integration technology and to begin to map information flows among source and target systems, PaaS-based or not.

**Unforeseen requirements issues** mean that for some reason you missed a core requirement that must be addressed before the system is able to provide the desired business value. There's no easy fix here: You need to add the functionality and redeploy the system.

## AmerisourceBergen

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As part of the AmerisourceBergen Specialty Group, IntrinsicQ® provides the health care industry with state-of-the-art oncology-focused software. Through its customer-facing application offerings, IntelliDose® and IntrinsicQ Data®, IntrinsicQ provides oncology practices with intelligence on every aspect of patient cancer care, from treatment decisions to drug administration.

The advent of cloud computing created a new world of market opportunities for IntrinsicQ. But it had to embrace technology advances and evolve its product model in order to take advantage of them. Focusing on the mantra "saving community oncology," IntrinsicQ realized that in order to deliver on the vision of democratized access to its oncology solutions, its software had to become scalable and fit today's cloud delivery model.

IntrinsicQ needed a scalable cloud platform that provided out-of-the-box capabilities, like cloud architecture, multitenancy, caching, provisioning, and metering systems. The solution also had to be compliant with strict industry regulations. Delivering 100 percent accurate data, with zero tolerance for error given the software's need for data precision, was paramount. This would speed time to market and increase quality. Moreover, HIPAA laws required state-of-the-art security of patient information. Being able to deploy PaaS on a private cloud was critical.

By leveraging Apprenda as its PaaS, IntrinsicQ was able to focus its team on the core IntrinsicQ application functionality and launch its new customer-facing cloud application 18 months sooner than it had originally anticipated. Its team of oncology software experts achieved high levels of productivity by focusing on its software and leaving the complexity of cloud architecture to the PaaS.

In addition, the private PaaS technology provided out-of-the-box management portals and systems for application scaling, end-user provisioning, metering, and more, which gave Intrinsic a huge advantage. Thus, there is far less code to maintain ongoing activities, and Intrinsic was able to provide all relevant parties across central IT with access to the tools they needed to work together more efficiently.

## Call to action

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Let's get back to the original question: How do you make PaaS work for your enterprise?

As we have explained in this paper, it's a matter of understanding new models of delivery such as private PaaS as well as the emerging patterns of use. These include standardizing business solutions development, which provides more business agility, as well as a cost-effective platform for building and externalizing services to customers and partners.

Moreover, we have learned that private PaaS can finally allow for the development of business applications using a standard platform that both simplifies as well as speeds up the delivery of business solutions. This provides the value of agility and thus the ability to finally allow IT to meet the needs of the business with very little latency. The benefit is that we move the business in the direction it needs to move, when it needs to move. The value is huge.

The path to PaaS, specifically private PaaS, is not obvious. Understanding your requirements — including data, applications, services, processes, the needs of the users, and the ultimate needs of the business — is key. However, for most enterprises, there is value in leveraging private PaaS as a path to better serving the needs of the business, without adding security and compliance risks and providing a more effective and resource-efficient means of supporting applications in production.

The call to action is to enterprise IT. Now is the time to go look at the value of private PaaS technology and perhaps stand up proof-of-concept projects to better understand its value to the business. If the case studies presented in this paper are any indication, this could be the most positive step enterprise IT has made in years.

## About David S. Linthicum

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David S. Linthicum is an internationally recognized industry expert and thought leader in the world of cloud computing and the author or co-author of 15 books on computing, including the best-selling *Enterprise Application Integration* and his latest book, *Cloud Computing and SOA Convergence*. He is a blogger for InfoWorld, Intelligent Enterprise, eBizq.net, and *Forbes*, and he conducts his own podcast, the Cloud Computing Podcast. His industry experience includes tenure as the CTO and CEO of several successful software companies and upper-level management positions in Fortune 100 companies. In addition, Linthicum was an associate professor of computer science for eight years and continues to lecture at major technical colleges and universities.

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