

## PaaS Road Map: A Continent Emerging

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In 2011, there is great anticipation regarding platform-as-a-service (PaaS) offerings for cloud computing, as many notable vendors enter the field. More than a dozen categories of middleware have been delivered by vendors as cloud services. Here, we track the evolution of the PaaS market from its early fragmentation to a consolidated market of useful and predictable offerings.

### Key Findings

- All the major software vendors — including IBM, Oracle, Microsoft, SAP, Red Hat, salesforce.com, Google and VMware — will deliver new and notable technology in this market, making 2011 the "year of PaaS." However, most of the offerings will require additional investment to reach maturity.
- There will be no comprehensive PaaS offering from any vendor in 2011; however, by 2015, there will be several.
- The shakeout of the smaller PaaS vendors, which began with VMware's acquisition of SpringSource in 2009, is accelerating in 2010 with salesforce.com's acquisition of Heroku. As the shakeout heats up, acquisition premiums for PaaS capabilities are rising.
- PaaS providers will offer multiple, use-pattern-targeted PaaS functionality suites, even if they are also equipped to offer a single comprehensive offering.

### Recommendations

- The risk of being too late to understand and benefit from the distinct computing style of cloud services may outweigh the potential risks of jumping into PaaS too soon. Most users are advised to look for reasonable opportunities to build hands-on familiarity with the basics of PaaS.
- Today's fragmented, specialized PaaS offerings will consolidate into targeted suites of services, although many of these services will survive as parts of larger suites. Advanced users that begin to utilize PaaS offerings in 2011 must prepare to change during the next three years, as technologies and services evolve. However, the experience of hands-on cloud computing is likely to be worth the costs of the early projects.

- IT projects that cannot tolerate risk should delay the use of cloud resources for mission-critical work, understand the nature of their objections and monitor the evolving PaaS offerings to know when the obstacles have been mitigated. Meanwhile, less-demanding projects will benefit from PaaS opportunities sooner.
- Users should plan for a gradual shift from on-premises IT architectures toward a hybrid model in which these architectures coexist and interoperate with public-cloud-based architectures. For most midsize to large user organizations, a shift to a totally public-cloud-based strategy will not happen during the next five years.

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## STRATEGIC PLANNING ASSUMPTIONS

By 2015, most enterprises will have part of their run-the-business software functionally executing in the cloud, using PaaS services or technologies directly or indirectly.

By 2015, most enterprises using PaaS services or technologies, directly or indirectly, will have a hybrid environment in which internal and external services are combined.

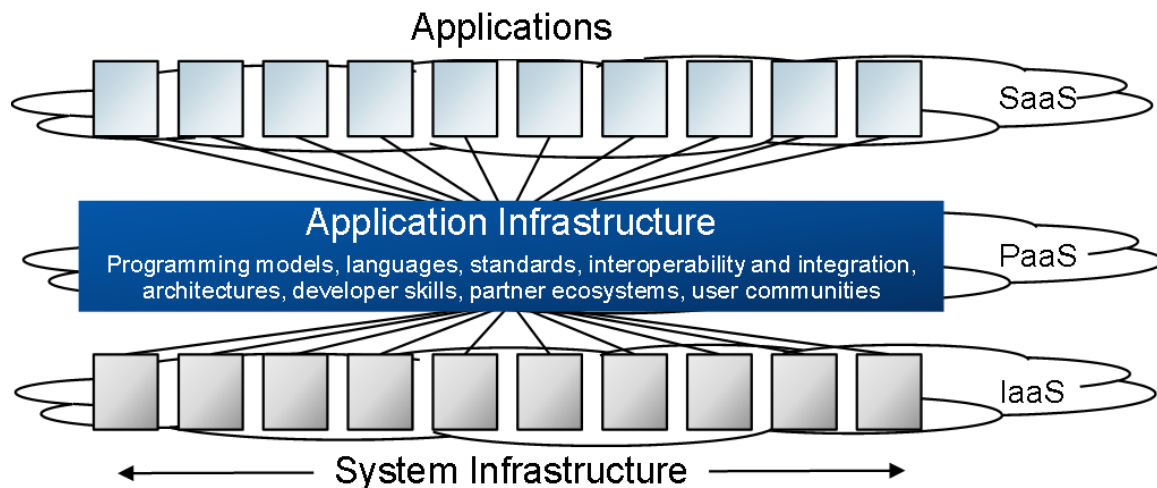
By 2015, cloud-based solutions will be growing at a faster rate than on-premises solutions.

By 2015, 50% of all new application independent software vendors (ISVs) will be pure software-as-a-service (SaaS) providers.

## ANALYSIS

PaaS is a common reference to the layer of cloud technology architecture that contains all application infrastructure services, which are also known as middleware in other contexts (see the National Institute of Standards and Technology's [Computer Security Division](#)). One of only three fundamental technology layers in the cloud — system infrastructure services and application services are the other two — PaaS represents a wide range of functionality (see Figure 1).

**Figure 1. Application Infrastructure at the Center of the IT Software Stack**



Source: Gartner (January 2011)

The application server functionality, business-process-enabling functionality and some of the integration functionality are the most-developed PaaS capabilities. Some vendors and users equate PaaS with its notable subset manifestation of application platform as a service (aPaaS, see "Introducing SaaS-Enabled Application Platforms: Features, Roles and Futures"), which is short-sighted. During the next three to five years (and rapidly during the next two years), the other forms of application infrastructure technology, such as database management systems (DBMSs), messaging, business activity monitoring (BAM), distributed caching, complex event processing (CEP) and governance, will become well-established as services, just as they are established now as products. However, the manner of packaging these services and the business model for the consumption of these services will differ markedly from the traditional on-premises practices.

Although the earliest PaaS offerings from the leading enterprise software vendors are attempting to preserve the backward-compatibility and familiar use patterns for users' comfort, the long-term use of PaaS capabilities is likely to differ substantially from the practices and patterns established in IT data centers. Cloud computing will not amount to a re-creation of an enterprise data center "in the sky"; rather, it will emerge as a new model for consuming IT resources in organizations' new information intelligence strategies.

During the next five years, the adoption of PaaS in most midsize and large organizations will not lead to a wholesale transition to cloud computing. Instead, it will be an extension of the use patterns of on-premises application infrastructures to hybrid computing models where on-premises application infrastructures and PaaS will coexist, interoperate and integrate.

## **Application Infrastructure: The Architectural Center of Software**

Historically, new stages of IT have been associated with new software architectures. These architectures were realized through dedicated platform technologies (refer to Figure 1). The evolution of computing patterns centered on emerging new platform technologies that enable and extend the new pattern include online transaction processing of the 1970s, such as the Customer Information Control System platform; distributed computing of the 1980s, including the Common Object Request Broker Architecture platform; two-tier-client/servers of the late 1980s (e.g., the PowerBuilder platform); three-tier component computing of the 1990s; and service-oriented architectures (SOAs) of the 2000s, such as Java Platform, Enterprise Edition (Java EE) and the .NET platform.

The middle-tier platform technology layer is the part of the software stack where architecture, standards, best practices, prevailing protocols and programming models are defined. Vendors have always understood the central importance of this layer and, at each stage, engaged in fierce competition to control the fundamentals of emerging application infrastructures. The leaders able to define the new platform technologies attract an ecosystem of partners and a large community of users seeking safety in numbers. A large and effective ecosystem elevates a vendor to market leadership; however, the establishment of market leadership does not happen overnight.

At the beginning of each of the past IT stages, the technology landscape was overly fragmented, vendor offerings proliferated and commonly agreed-on standards were lacking or were in the early phases of development. Only the leading-edge users, looking for competitive advantage, had the nerve to adopt the emerging technologies from leading-edge vendors. Most mainstream enterprises were "on the fence," waiting for the dust to settle, for technology and vendor consolidation, and for standards and leading providers to emerge. The PaaS market is in this state at the start of 2011.

## **The PaaS Road Map**

The cloud-computing era is just beginning, and the prevailing patterns, standards and best practices of cloud software engineering have not yet been established. This represents an opportunity for new software providers to build a leading presence in the software solutions market. It is also a major technical and business challenge to the established software vendors — to retain their leadership by extending into the new space without undermining their hard-earned strength in the dominant on-premises computing market.

During the next five years, the now-fragmented and uncertain space of cloud application infrastructure will experience rapid growth through technical and business innovation. Large vendors will grow through in-house development, partnerships and acquisitions, while small vendors will grow through partnerships and specialization. Users will be driven into cloud computing as business applications (e.g., SaaS) and advanced platform tools (e.g., PaaS)

become available as services and offer innovative technology and business model features that will become increasingly hard to resist.

During the next two years, the fragmented, specialized PaaS offerings will begin to consolidate into suites of services targeting the prevailing use patterns for PaaS. Making use of such preintegrated, targeted suites will be a more attractive proposition than the burdensome traditional on-premises assembly of middleware capabilities in support of a project. By 2015, comprehensive PaaS suites will be designed to deliver a combination of all specialized forms of PaaS in one integrated offering.

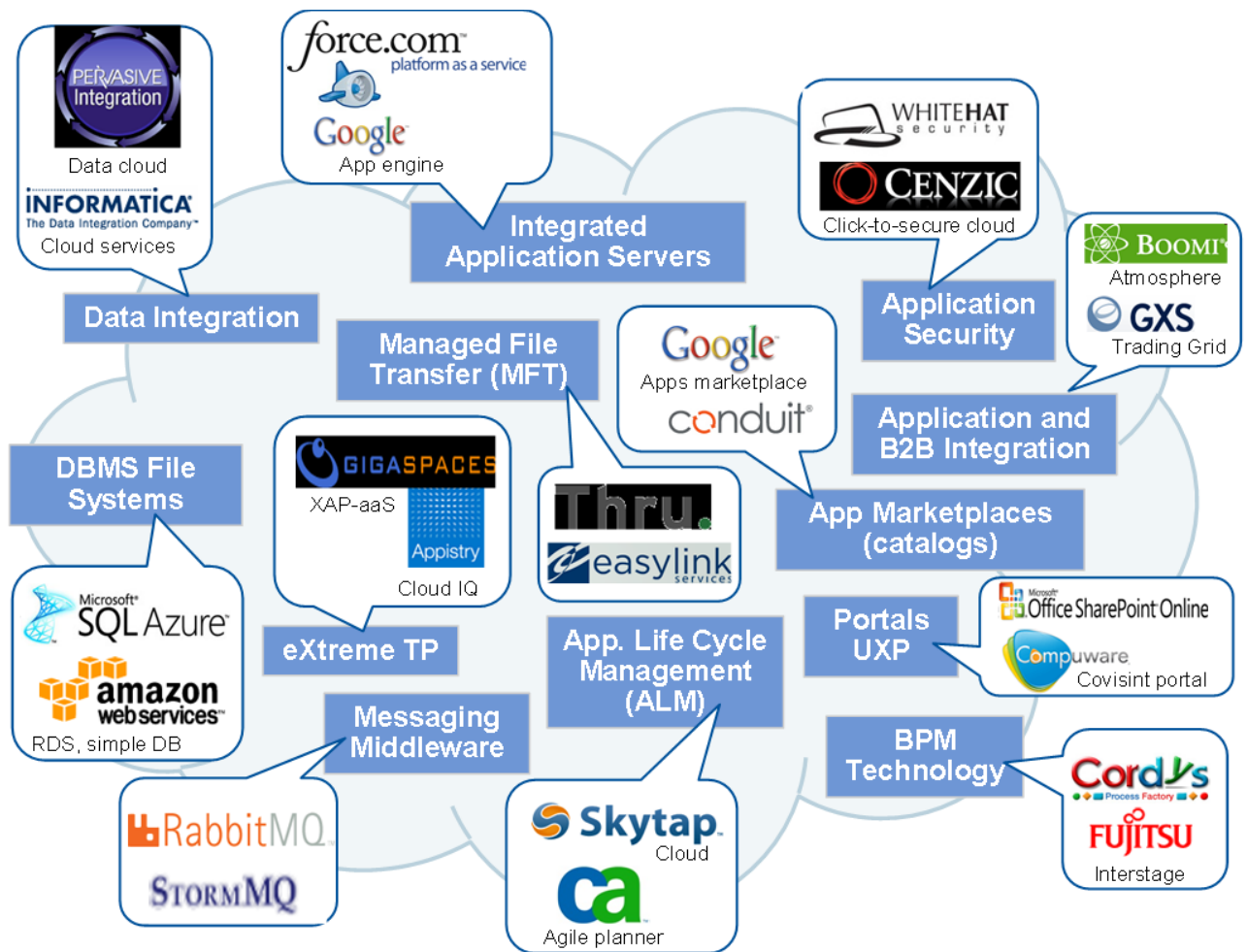
This process of gradual consolidation will mirror what happened in the traditional application infrastructure market during the past 10 years, when a wide variety of application development tools, application servers, integration middleware, business process management (BPM) tools and DBMSs consolidated around a few technology standards (e.g., SQL, Java EE, .NET, XML and HTTP) and end-to-end vendors (such as Microsoft, IBM and Oracle). In the case of PaaS, the consolidation process will be faster, because vendors and users are now familiar, from the on-premises experience, with the concept of the application platform suite and because of the practical challenges with the custom best-of-breed integration of the specialized PaaS offerings, including data sharing, application and system integration, management, security, deployment and billing.

By 2015, most enterprises will have part of their run-the-business software functionally executing in the cloud, using PaaS services or technologies directly or indirectly. At the same time, more enterprises using PaaS services or technologies, directly or indirectly, will have a hybrid environment in which internal and external services are combined. By 2015, cloud-based solutions will be growing at a faster rate than on-premises solutions, and 50% of new application ISVs will be pure SaaS providers (see "Predicts 2011: Platform as a Service: The Architectural Center of the Cloud"). In its multiple forms as a service and in its product incarnation (cloud-enabled application infrastructure) — by 2015 PaaS will enable most new SaaS offerings and will be used by most IT organizations for some software projects.

## **PaaS Circa 2011: A Fragmented Best-of-Breed Field**

The PaaS market is fragmented and largely experimental. We track 13 different categories of specialized application infrastructure services (see Figure 2) offered by a variety of specialist providers (see "Application Infrastructure for Cloud Computing: A Growing Market, 2010"). Several other categories of specialized PaaS offerings are likely to emerge during 2011.

**Figure 2. PaaS Road Map (2011 to 2015)**



Source: Gartner (January 2011)

The fragmented state of the middleware market is not unusual in the traditional on-premises context. Most IT projects are equipped with middleware technology that originates with more than one vendor. However, what is normal on-premises will not always suffice in the cloud. Traditional middleware products are bought from different vendors, then brought into one data center and many are integrated by the IT organization (or hired professional services). However, in the cloud, each of the middleware services offered by different providers typically remains in its own data center and does not easily fit together with other middleware services (other than through arm's-length Web interoperability).

In many cases, such as many performance-sensitive, enterprise-class applications, the operation of the multiple application infrastructure functions across data centers is impractical — for example, an application server and a DBMS, or an enterprise service bus (ESB) and a registry, ought to be co-located and well-integrated to deliver essential levels of performance, manageability, security, availability and agility. Like on-premises solutions, some specialized middleware functions will continue to be offered as stand-alone specialized services, but many user projects will require (or at least benefit from) consolidation of the middleware functionality.

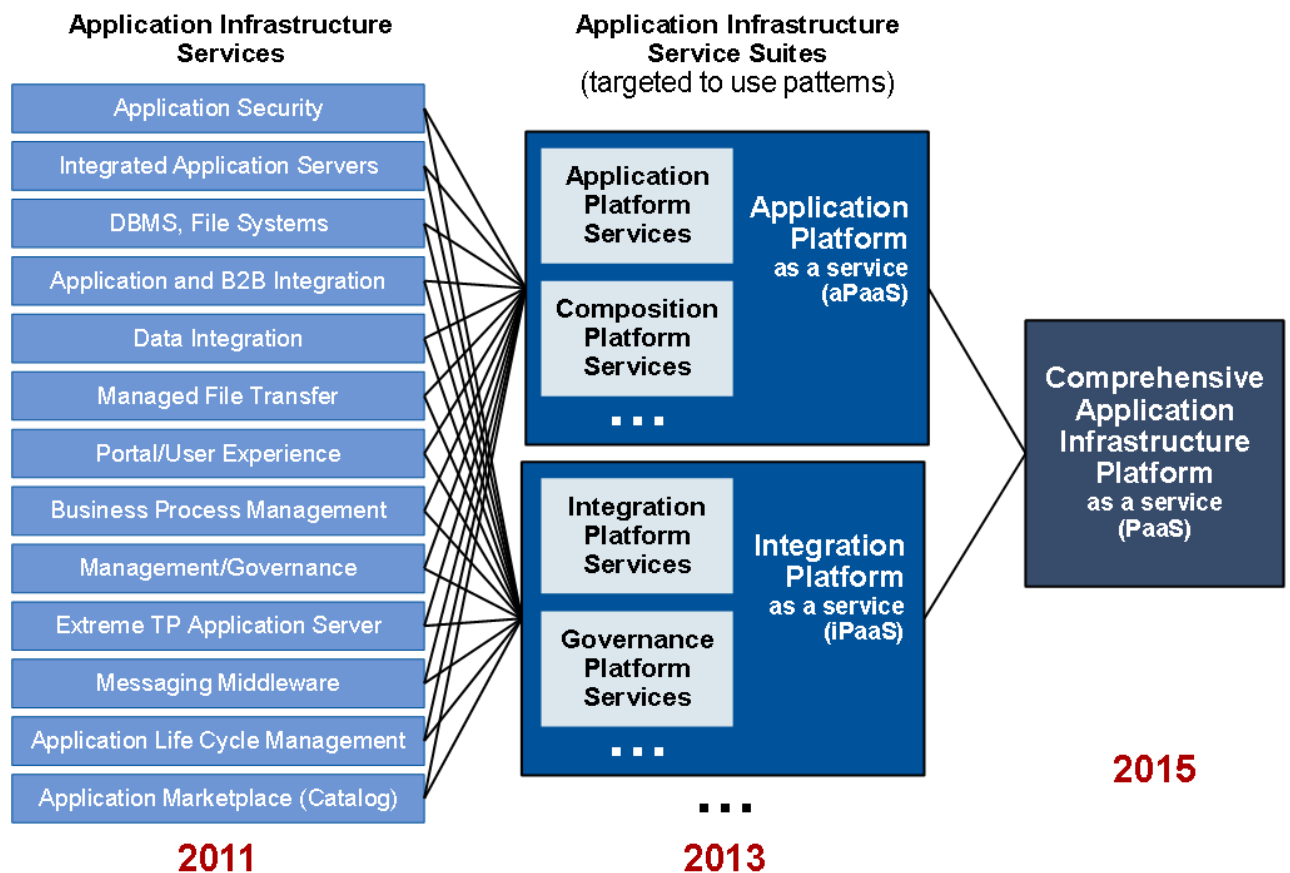
In the cloud, the consolidation will be done by the providers (not the users) of the middleware services. This will result in suites of middleware services targeted at prevailing middleware use patterns: the use-pattern-targeted PaaS suites.

The early PaaS market is highly and impractically fragmented, which indicates its immaturity and the limits of its usefulness. It is not yet applied to significantly challenging software projects. The more advanced PaaS offerings — such as aPaaS, integration as a service or the BPM suite as a service — show early signs of consolidation, offering multiple application infrastructure functions preintegrated and co-located by the provider. This early consolidation is the beginning of a strategic trend in PaaS.

## PaaS Circa 2013: Use-Pattern-Targeted PaaS Suites

The consolidation of PaaS functionality that is in its early stages in 2011 will flourish by 2013 and will result in a number of categories and instances of consolidated suites of PaaS services — designed to meet requirements of the prevailing PaaS use patterns (see Figure 3). To meet requirements of user projects for integrated governance of a PaaS service and essential levels of performance, agility and availability, PaaS providers will look to co-locate all PaaS services required by the project types they target under their central control and over their centrally-controlled network of data centers.

**Figure 3. PaaS Vendors in 2011 (Representative Examples, Not a Complete List)**



Source: Gartner (January 2011)

Some will achieve this consolidation through technology partnerships, others through acquisitions or in-house development. The co-located services will be easier to integrate for consistent data sharing, performance optimization, resource management, integrated security, development support, customization and billing.

Some consolidated targeted suites of PaaS functionality will begin by being superficially integrated separate technology stacks, and some will be designed as an integrated platform from the start. Deep internal integration and a cohesive extensible architecture will emerge as state of the art for PaaS.

The nature of the targeted, consolidated PaaS suites will be driven by the nature of the prevailing user projects. Providers targeting ISVs will face a number of specialized demands (stemming from the need to support multitenancy on a potentially massively large scale), compared with the providers catering to enterprise IT projects. IT projects in different industries or geographies might evolve toward PaaS in a different way, some arriving at satisfying high-end demanding requirements faster than others.

Vendors targeting mainstream projects will face requirements tending toward high developer productivity. Providers engaging unique software projects will have to offer PaaS suites prioritizing high levels of control for software developers. Because the targeted PaaS suites will be designed to meet the requirements of commonly used project types, these suites will also change over time, just as the types of the projects they sell to change.

The 2013 PaaS market will offer consolidated application infrastructure service suites. However, it will remain fragmented, in that different kinds of suites will be offered by a variety of vendors, and the list of consolidated PaaS suites will vary.

Nevertheless, among the variations of targeted PaaS suites, several major and sustainable types are likely to emerge and stabilize from 2013 and beyond. These will reflect the fundamental division of labor in engaging application infrastructure to address the ongoing business information processing requirements. These long-term, targeted and consolidated PaaS suite types will include (see Figure 2):

- **aPaaS** — the platform for hosting and managing individual application services and data

The services of this platform will include container services for optimized multitenant execution of application software, persistent and in-memory data management, point-management and point-security of services in a homogeneous context, multilingual development tools, programming models, internal orchestration and composition, metadata management, and tracking for billing and optimization purposes. The multitenancy models will differ. Some projects will select the backward compatibility of the shared-hardware model. Others will choose the advanced elasticity and versioning of the shared-everything model (see "Gartner Reference Architecture for Multitenancy").

- **Integration PaaS (iPaaS)** — the platform for intermediation and integration of the application services hosted and point-managed by aPaaS

The service of this platform will include a variety of intermediation applicable to heterogeneous multilocation service environments, including registry and repositories, policy management, security, application and data integration, adapters, composition, orchestration, flow management, partner community management event brokering and more. iPaaS offerings will be used to support integration among SaaS applications, cloud services, aPaaS-based applications, and on-premises custom and packaged applications in internal and B2B integration scenarios.

Frequently, iPaaS offerings (especially those from megavendors) will leverage aPaaS infrastructures (from the same vendor or a third party) to support cloud attributes (elastic scalability, multitenancy, cloud transaction processing, metering and billing). However, in some cases, iPaaS will implement the cloud attributes as a core foundation, not necessarily exposed to users in the form of a PaaS.

iPaaS will be primarily offered as a public cloud service, but the underlying technology foundation — the Cloud-Enabled Integration Platform (CEIP) — will be also offered "as a product," for private or community cloud deployment, gradually replacing traditional forms of integration middleware. iPaaS/CEIP will emerge as next-generation integration and governance technology from established SOA application infrastructure players (see "Magic Quadrant for Shared SOA Interoperability Infrastructure Projects"), as evolution of classic integration-as-a-service offerings (see "Magic Quadrant for Integration Service Providers") or from new players.

- **Other**

In addition to the two major types of targeted PaaS suites, multiple specialized PaaS suites might also emerge to meet the requirements of some large customer constituencies. Most will be specialized variants of aPaaS or iPaaS. All will assemble functionality of multiple types of middleware — offered as an integrated service. Some illustrative examples are listed here, but the market is likely to generate a variety of offerings before it settles on a few primary options:

- **Knowledge PaaS (kPaaS)** — the platform for access and analysis of broad data resources in context

The services of this platform type may include functionality to facilitate data gathering and analysis covering a broad spectrum of data sources and formats, as well as interpretation of data using elements of business intelligence, BAM, CEP, content (textual, graphical, video and voice) management and analysis, context-aware analysis, data integration, master data management, etc. kPaaS would be used to build unique user experience applications (e.g., SaaS) tracking the available data and extracting action-oriented insight from the sea of relevant data and its surrounding context. This platform is a variant of iPaaS that focuses on data integration and analysis.

- **User experience PaaS (uxPaaS)** — the platform for multichannel, multidevice user-facing applications

Supporting and expanding horizontal portal functionality, the uxPaaS might incorporate the core capabilities of user experience platforms (see "Generation 7 Portals: Unifying the User Experience") and the context-aware functionality of ensemble programming (see "Ensemble Programming Will Emerge to Help Designers Create Context-Aware User Experiences"). This platform is a variant of aPaaS, focused on the user-facing side of the larger SOA-style application scope or simple user-centric applications.

- **Data PaaS (dPaaS)** — the platform for hosting and serving data

A cloud database abstraction, extended with stored procedures for local programming and SOA-style programmatic access for external access, would serve as a central integration point for some applications. Because data-intensive access to dPaaS content is likely to be implemented as stored procedures, this platform is a variant of aPaaS, focused on development of SOA-style back-end data services.

The PaaS suites will overlap in functionality, but will be focused on meeting the requirements of the relevant project types with the relevant set of functionality, avoiding the function overload

typical of the on-premises alternative middleware suites and will be priced in proportion to the scope of use. Nevertheless, because of the functional overlap among all targeted PaaS suites, the market will evolve toward some vendors assembling a large-scale, comprehensive, multipurpose, multiproject, all-in-one PaaS.

## **PaaS Circa 2015: A Comprehensive PaaS**

By 2015, the largest PaaS providers, targeting multiple use patterns with multiple, targeted PaaS suites, will assemble their comprehensive PaaS offerings. This will be a massive functional suite that is comprehensive enough to meet the requirements of most projects from a single co-located, integrated and optimized cloud platform.

A decisive push toward integrated, comprehensive end-to-end PaaS will come from the entry into the market of application infrastructure players, such as IBM, Microsoft and Oracle, which will try to replicate the "best-of-brand" strategy they successfully pursued for their traditional on-premises business, as well as for the cloud. An early example of such a strategy is Tibco Software's Silver, which provides functionality of an application server, ESB, governance and BPM — all as cloud services. Some providers will focus primarily on the business model of a cloud provider; some will focus on the role of an enabler, providing the cloud-enabled application infrastructure for other players to implement their own (private, community or public) PaaS. Some players will target both markets.

Like the technology families of the largest application infrastructure vendors (such as IBM WebSphere, Oracle Fusion or Microsoft Windows Server), the comprehensive PaaS will demonstrate that the PaaS provider can be a long-term partner to an organization. In that sense, offering a comprehensive PaaS will be important to vendors to grow long-term business relationships with customers. Most projects will not contract for the entire comprehensive PaaS, but many will prefer comprehensive PaaS providers, with an eye on continuity of future engagements. The comprehensive PaaS offerings will serve as a brand umbrella for multiple, targeted PaaS suites, as well as some specialized PaaS functions, promising synergy in operations and optimized integration among the component functions of the PaaS.

Comprehensive PaaS providers will have the opportunity to offer integrated environments in the cloud that permit the tracking, managing and optimizing of the execution of various PaaS-based projects deployed by a single tenant. Potentially, this centralized control over a portfolio of tenant's services would enable providers to reduce the cost of their operations and pass some of the savings to the tenant. The comprehensive PaaS providers are likely to develop pricing strategies in which the more of the comprehensive PaaS a tenant is using — the less it costs per unit that is tracked for billing.

Successful comprehensive PaaS providers develop large ecosystems of partners and users. They will try to establish their technology architectures as industry standards. These services offered by the ecosystem partners will be typically co-located with the "master PaaS" and integrated into its development, management, security, multitenancy, elastic scalability, cloud transaction processing and licensing/billing infrastructure, offering users an all-in-one purchasing, development, deployment and management experience. For the largest PaaS providers, a comprehensive PaaS, enriched and extended by a broad ecosystem of partners and their added services — is the standard-setting endgame objective in this market. The smaller providers will align with one or multiple of the leading ecosystems.

Three or four vendors offering comprehensive PaaS are likely to emerge as the leading PaaS providers, controlling more than 50% of PaaS business among them by 2015 (see "Predicts 2011: Platform as a Service: The Architectural Center of the Cloud"). However, dozens of suite specialists and point application infrastructure service providers will remain competitive in a

variety of geographies, verticals and other special contexts, providing as much as 50% of the remainder of the PaaS market revenue between them.

A comprehensive PaaS will emerge as the foundation for PaaS brokerages, which combine technology and professional services to meet the requirements of many enterprise projects. Cloud service brokerages (CSBs) will provide a channel for comprehensive PaaS suites (see "Cloud Service Brokerages Create a New Role for Integration Service Providers"). Offering a variety of value-added services extending the PaaS technology functions, CSBs will emerge as solutions for enterprises looking to delegate the operations of their IT environments beyond the technology layer. Some CSBs will work with multiple comprehensive PaaS (or PaaS suites) to attract the IT organizations looking to avoid a lock-in with one PaaS provider.

## Private and Community PaaS

In 2011, private cloud projects will be mostly about system infrastructure services ("if you liked virtualization, you will love the private cloud"). They pursue three main objectives:

- Introducing central management and order to the uncoun­ted and proliferating number of virtual machines
- Reducing redundancy by centralizing provisioning and the use of hardware and software and offering it in a self-service format to IT users
- Achieving the above goals without subjecting the IT organization to discontinuities or unnecessary costs

Some of the objectives of private cloud can be met without introducing multitenancy. The IT projects are exposed to some degree of self-service in interacting with the centralized data center services; thus, they experience the interaction as cloud interaction without multitenancy behind it. However, the long-term evolution of the private cloud will inevitably lead to multitenancy.

Considering the desire for minimal disruption to application projects at the early stages of private cloud initiatives, introducing multitenancy can be counterproductive. However, large organizations have enough tenant count (e.g., lines of-business, subsidiaries and departments) to achieve some economies of scale in sharing resources among tenants from the start. However, for most enterprises, the cost-benefit of multitenancy and PaaS in a private cloud context will come later.

The centralized data center offers shared resources to the divisions of an organization, as well as multiple applications. Although the number of divisions that require tenant-style isolation is low (dozens at most), the number of applications that can improve their costs by sharing resources with other applications is in the hundreds. Once cloud-enabled application platforms become widely available and safe for mainstream use, most IT organizations will choose them to improve the data center performance of their application portfolios.

In the early stages of PaaS, vendors are attempting to take application infrastructure products that are successful on-premises and modify them to become cloud services — for example, application servers become aPaaS, and B2B integration brokers become IPaaS. At the later stages, however, vendors will offer native, cloud-based PaaS technologies. These multitenant platforms will then be ported down to support private clouds and single-tenant execution. Microsoft has already recognized this reverse dynamic and plans to migrate its new Windows Azure technologies back to on-premises, replacing the current single-tenant options and ensuring continuity between on-premises and on-cloud environments without compromising its cloud platform performance.

Community cloud is a semiprivate arrangement in which multiple independent organizations act as tenants in a shared environment that is inaccessible by any organization that is not a member of the designated community (see "Private Cloud Computing: An Essential Overview"). The PaaS road map described here applies to the community cloud, as well as the public cloud. With time, most public cloud PaaS offerings will have equivalent renditions in community cloud contexts as well, although the community cloud providers will have to acquire the necessary cloud-enabled technology as products, before they offer PaaS services to their tenants.

## Understanding the PaaS Market

Gartner initiated its research of PaaS in 2007 (see "Introducing SaaS-Enabled Application Platforms: Features, Roles and Futures"). Since then, the IT industry and IT user interest has evolved, and Gartner research in this space has expanded and has continued to cover the emerging PaaS technology options and user experiences. In recent months, we have published key research findings on PaaS offerings, including the following:

"The State of the BPM Platform Cloud Market, 2011"

A broad range of BPM cloud service offerings give platform infrastructure leaders more deployment options and more collaboration capabilities. Shared-service managers or external service providers looking for multitenancy and elasticity in BPM-enabled cloud platforms have fewer options.

"Cloud Messaging is Positioned for Rapid Growth" [Not Yet Published]

The cloud is a great place to run messaging services for certain business situations. This research explains the features and characteristics of various cloud messaging services.

"Data in the Cloud: The Changing Nature of Managing Data Delivery" [Not Yet Published]

Data in the cloud must be accessible and capable of being integrated into an enterprise's broader IT ecosystem. Overall cloud-based IT trends are impacting data integration efforts in several distinct areas: emerging technologies, evolving data needs, and data delivery planning.

"Is 'PaaS' Passé Yet?" [Not Yet Published]

The terms "platform" and "service" have multiple meanings. The combination of these in a term such as PaaS is a recipe for tortured confusion.

"Productivity Versus Control: Cloud Application Platforms Must Split to Win" [Not Yet Published]

Cloud application platforms will differentiate by focusing on developers' high productivity or high control. High-productivity platforms will be targeted at mainstream projects, but high-control alternatives will be needed for the most-demanding, cloud-based development initiatives.

"From OLTP to Cloud TP: The Third Era of Transaction Processing Aims at the Cloud" [Not Yet Published]

Cloud transaction-processing design principles, architectures and technologies are incorporated in the most-advanced cloud application platforms to support business-critical, global-class requirements. Users will often not use cloud transaction-processing designs and technologies directly, but, for the most demanding projects, they will.

"Salesforce.com Unveils Potentially Disruptive Cloud DBMS, database.com"

Salesforce.com's new database.com is a DBMS cloud service for applications that need a reliable, elastic, multitenant and low-cost DBMS cloud solution. If successful, it may disrupt cloud DBMS and other DBMS platform vendors.

"Predicts 2011: Platform as a Service: The Architectural Center of the Cloud"

PaaS technology remains fragmented, but continues to gather increasing investment from vendors and increasing interest by users.

"Windows Azure AppFabric: A Strategic Core of Microsoft's Cloud Platform"

Continuing strategic investment in Windows Azure is moving Microsoft toward a leadership position in the cloud platform market, but success will not be ensured until user adoption confirms the company's vision and its ability to execute in this new environment.

"Competitive Landscape: Platform as a Service, Worldwide, 2010"

PaaS is a dynamic new market opportunity, providing the capability for organizations to develop, deploy and integrate business applications on a platform hosted by a PaaS provider or via a third-party hosting arrangement.

"Innovation Forces in Information Infrastructure: Q&A on Alternative Delivery Models for Information Infrastructure"

In addressing how innovation forces are changing information infrastructure, this set of questions and answers provide insights to how alternative delivery models can meet business needs and mitigate the challenges of managing information.

"In a Change of Heart, Oracle Endorses Cloud"

At Oracle OpenWorld in San Francisco, most of the news involved Oracle's commitment to cloud computing. This leading IT vendor is now endorsing the future of cloud-enabled IT.

"Consider Security Implications When Choosing Between MFTaaS and On-Premises MFT Solutions"

In this research, we look at how organizations deploy managed file transfer (MFT) technology as an on-premises or an MFT-as-a-service offering. We look at the differences between these deployment options, and consider the security implications of each type of deployment.

"Gartner Reference Architecture for Multitenancy"

Multitenancy is a distinct characteristic of cloud computing. To achieve it, some providers take expedient shortcuts, while others invest in discontinuous change. Learn the difference between these approaches to make informed choices.

"Market Trends: Multienterprise/B2B Infrastructure Market, Worldwide, 2009-2014"

Spending on multienterprise/B2B infrastructure technologies is poised to grow at a healthy pace during the next five years. Growth will be driven by the trend toward the provision of B2B technologies via a SaaS model, as well as via outsourcing services.

"Gartner Reference Architecture for Cloud-Enabled Application Platforms"

Cloud application platforms require advanced technology investment to deliver the ease, scale, productivity, efficiency and reliability expected of cloud-computing offerings. To make informed choices, users and prospects should be aware of the core characteristics that distinguish these offerings.

### "IBM Adds Comprehensive Cloud Service Integration to WebSphere via Cast Iron Acquisition"

IBM's acquisition of Cast Iron Systems adds comprehensive cloud service integration capabilities to WebSphere. However, adding another solution to its already-crowded integration solution portfolio will make it harder for some users to select the appropriate IBM integration product.

### "VMware and salesforce.com: The Beginning of a Beautiful Friendship?"

VMware and salesforce.com have announced the VMforce joint cloud service. Both companies have a strategic interest in the success of VMforce. In the process, they are likely to influence the direction of the entire cloud application platform market.

### "Who's Who in Cloud-Computing/SaaS Integration, Volume 2"

This research provides a brief analysis of seven providers of solutions for cloud-computing/SaaS integration scenarios. It also offers advice on when to consider engaging with each vendor.

### "Cool Vendors in Application Platforms as a Service, 2010"

Innovation in application platforms for cloud computing continues across technology platforms and languages. The growing variety of options builds a foundation for a broad set of adoption scenarios, increasing opportunities and risks for newcomers.

### "Application Infrastructure for Cloud Computing: A Growing Market, 2010"

Application infrastructure (middleware) is an essential enabling technology for business applications, whether deployed on- or off-premises. This research looks at the emerging trends in aPaaS.

### "Prepare to Use Data Management Services for External Data"

Four major drivers will lead enterprises to use cloud-based services to manage external data. Data management leaders should take several steps to prepare, including surveying those projects and data sources in which data management services can help.

## **Looking to 2011: The Year of PaaS**

In 2011, all the leading enterprise software vendors, as well as large cloud specialists, will introduce new PaaS offerings. SAP, Oracle, Microsoft, IBM, Red Hat, salesforce.com, Google, Tibco and VMware are expected to deliver new or strongly expanded PaaS service offerings and cloud-enabled application infrastructure products. By the end of 2011, the "war" for leadership in PaaS and the key PaaS segments will engulf the software industry. Early consolidation of specialized PaaS offerings into PaaS suites will also be evident. New vendors will enter the market through acquisitions or in-house development.

Users can expect a wave of innovation and of hype. It will be harder to find a consistent message, standards or clear winning vendors. Gartner will track industry events, vendor strategies and users' experiences with PaaS to provide IT planners and decision makers, including CIOs, CTOs, IT architects, project leaders and others, with clarity and insight in this developing and often confusing, yet strongly impactful, market.

In 2011, Gartner's PaaS research will focus on bringing clarity to the key issues, including:

- Who should adopt PaaS and when?
- Who should avoid PaaS and for how long?

- How will specialized PaaS vendors transition to offering PaaS suites — aPaaS, iPaaS, etc.?
- What kinds of PaaS suites and specialized PaaS will be sustainable for long-term use?
- What are the best practices of PaaS adoption?
- What lessons have been learned by the leading users?
- Which vendors will emerge as the long-term leaders in PaaS?
- What ecosystems and standards can mainstream users safely depend on?
- How will PaaS providers address the challenges of security, performance, availability, integrity, functional completeness and manageability for their PaaS offerings?
- How will private cloud solutions evolve toward PaaS?
- What will be the technology solutions for a hybrid private/public cloud use?

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