Hype Cycle for Cloud Computing, 2010

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Cloud computing continues to be the most hyped subject in IT today. We look at the different aspects of the topic and where they are on Gartner's Hype Cycle.

ANALYSIS

What You Need to Know

Cloud computing remains the latest, most hyped concept in IT. As described in last year's "Hype Cycle for Cloud Computing, 2009," it is simplistic to look only at the hype around the high-level term. As aspects of the cloud move into mainstream adoption, there will be misunderstandings, and confusion and disillusionment that are specific to the aspect, not just the overall term. There will be overestimations and underestimations that will cause users to have doubts and to be disillusioned. There will be misuse and miscommunication among users and vendors, making it a subject that is ripe for Gartner's Hype Cycle. As usual, in cases like this, there is indeed overhype, but also benefits. Understanding those benefits requires tearing apart the hype surrounding cloud computing (just at the Peak of Inflated Expectations, and headed for the Trough of Disillusionment), and looking at the many more-granular topics, which are all part of the cloud phenomenon. This follows the pattern observed with other similarly broad labels as "the Internet" and "the Web." Like those before it, cloud computing is not likely to avoid some time in the Trough.

Our continued research on cloud computing looks at the big picture, as well as the details of cloud computing and the many issues facing enterprises today. With hype comes confusion. While cloud computing is about a very simple idea – consuming and/or delivering services from the cloud – there are many issues regarding the types of cloud computing and the scope of deployment that make the details not nearly so simple. Everyone has a perspective and an opinion, and while there are spots of clarity, confusion remains more the norm. Many misconceptions exist around potential benefits, pitfalls and, of course, cost savings. Cloud is often part of cost-cutting discussions, even though its ability to cut costs is not a given. There are also many reasons to talk about the capabilities enabled by cloud computing: agility, speed and innovation. These are the potential benefits that can be overlooked if hype fatigue sets in.

This Hype Cycle for Cloud Computing identifies which aspects of cloud computing are still primarily in the hype stage, which applications/technologies are approaching significant adoption and which ones are reasonably mature. There are an overwhelming number of technologies that are pre-Peak of Inflated Expectations, and are attempting to "piggy back" onto the cloud hype. There are many aspects of cloud (including cloud computing itself) clustered around the Peak. Cloud computing itself has just passed the Peak, although it is nowhere near the Trough as of yet. And while the term "cloud computing" is relatively new, it incorporates derivations of ideas that have been in use for some time. Hosting, software as a service (SaaS) and virtualization are well-established and being used in many ways.

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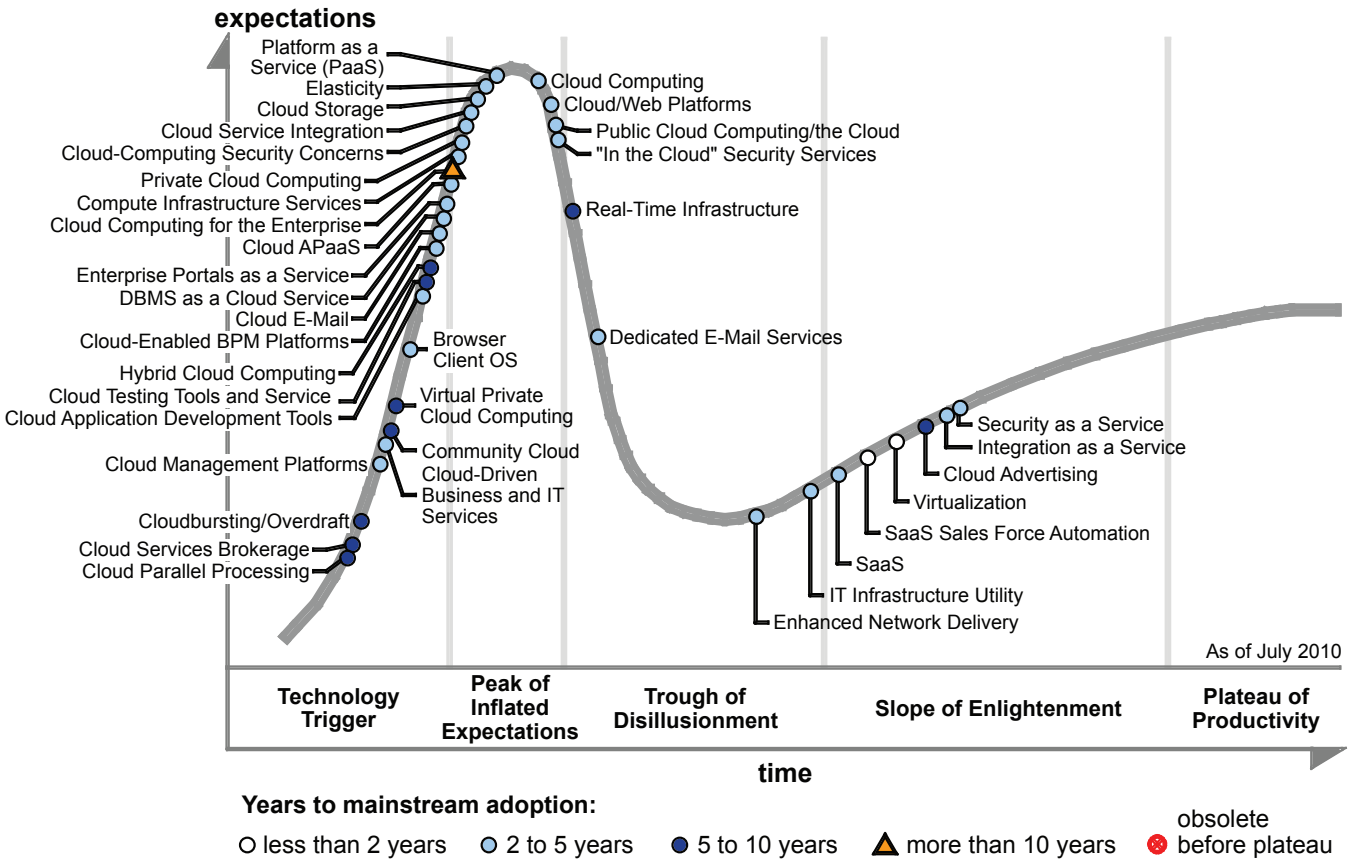
The prevalence of inexpensive computing power, inexpensive bandwidth and companies that have developed extensive capabilities in managing large data centers are all relatively new and are all required for the cloud to come to fruition. Newer concepts, such as private cloud computing, elasticity, cloudbursting and application platform as a service (APaaS), are taking these ideas and innovating the myriad ways that cloud can be used. As awareness of cloud computing continues to increase, so does the subsequent confusion and a gradual understanding of the inevitability of many of the concepts. As cloud computing continues to move beyond the pure hype stage and into mainstream adoption, it is important to dig beyond the main cloud term to the actual ideas and technologies, to dodge the hype and take advantage of the benefits that exist. As always, once the hype dies down, the true value will arrive.

The Hype Cycle

This Hype Cycle covers a broad collection of concepts and technologies associated with cloud computing. It is the second instance of this Hype Cycle.

Figure 1. Hype Cycle for Cloud Computing, 2010



Source: Gartner (July 2010)

The Priority Matrix

Most cloud-computing technologies and concepts are more than two years from mainstream adoption, with the exception of certain types of SaaS, such as sales force automation. Many cloud technologies and concepts will see mainstream adoption in two to five years. Some of the more impactful items include APaaS, virtualization, elasticity and private cloud computing. Some technologies and concepts (such as cloudbursting/overdraft) will take five to 10 years for mainstream adoption to occur.

Off The Hype Cycle

Cloud services governance was renamed to cloud services brokerage.

Grid computing and tera-architectures were dropped.

On the Rise

Cloud Parallel Processing

Analysis By: Daniel Sholler; David Cearley; Tom Austin

Figure 2. Priority Matrix for Cloud Computing, 2010

benefit	years to mainstream adoption			
	less than 2 years	2 to 5 years	5 to 10 years	more than 10 years
transformational	Virtualization	Browser Client OS Cloud APaaS Cloud Computing Cloud/Web Platforms Platform as a Service (PaaS) Public Cloud Computing/the Cloud	Cloud Advertising Cloud Parallel Processing Cloud Testing Tools and Service Community Cloud Hybrid Cloud Computing Real-Time Infrastructure	Cloud Computing for the Enterprise
high		Cloud Application Development Tools Cloud E-Mail Cloud Management Platforms Cloud Service Integration Cloud Storage Cloud-Computing Security Concerns Cloud-Driven Business and IT Services Cloud-Enabled BPM Platforms Compute Infrastructure Services Dedicated E-Mail Services Elasticity Enhanced Network Delivery Integration as a Service Private Cloud Computing	Cloud Services Brokerage Cloudbursting/Overdraft Virtual Private Cloud Computing	
moderate	SaaS Sales Force Automation	DBMS as a Cloud Service Enterprise Portals as a Service "In the Cloud" Security Services IT Infrastructure Utility SaaS Security as a Service		
low				

As of July 2010

Source: Gartner (July 2010)

Definition: Parallel processing techniques are algorithmic and code-structuring methods that enable the parallelization of program functions. These techniques have been automated at the processor level, but the coming availability of large-scale grid systems through the adoption of cloud architectures creates an opportunity to apply these techniques to application system design. Approaches to parallelism at this level are becoming necessary for applications to leverage the massive amounts of data available from the Web, social networks and large-scale systems.

Position and Adoption Speed Justification: While the concepts of parallel processing have been studied for years, the reality has not affected most developers. Parallelism techniques have been used to improve the performance of system software, databases and other specialty programs, but the typical enterprise developer has been shielded from the need to understand how to structure programs for parallelization through increasingly sophisticated middleware and other system components. Most of the progress of parallelization has focused on moving serial workloads onto multicore and multithreaded processes. However, as cloud-computing concepts become a reality, the need for some systems to operate in a highly dynamic grid environment will require these techniques to be incorporated into some mainstream programs. This is particularly true for analytical tasks that incorporate large data sets. The popularity of the Hadoop implementation of the map/reduce technique is a good example of this trend. While vendors will continue to package the middleware and extreme transaction processing components that will simplify parallelization, the application developer can no longer ignore this as a design point for applications that leverage huge transactional data sets or Internet-generated concepts.

Currently, few developers are trained in these tools and techniques, and there will likely be a flurry of interest as large-scale grids (public and private clouds) become readily available. While only a small percentage of applications will require the use of these techniques, these applications will be high-value, Web-facing systems. During the next five years, knowledge and skills will penetrate the market; by 2015, we expect that a sufficient percentage of developers will be able to use these techniques to build the required applications in the ensuing time. Systems supporting parallelization techniques exist, but will develop in range and sophistication during this evolution. For most purposes, developers will rely on improvements in automated parallelization techniques, but a small number of applications that leverage huge (usually Web-based) information sources will require these manual or assisted techniques. Generally, these applications will be those in which the cloud infrastructure enables a truly differentiated user experience. These applications are likely to be those linked to contextual computing, where (for example) the relationships among millions of locations must be recalculated every time one changes, or for Pattern-Based Strategy processes, where systems will sift masses of information for relevant patterns.

User Advice: Users should determine the timeline for using cloud- and grid-based computing, and should ensure that, as these infrastructures become available, there are appropriate skills in the developer community to fully utilize their potential.

Business Impact: Parallelization will make economically viable the implementation of many algorithms and workloads not currently feasible. The types of problems, the granularity of the analysis (and simulation), the scope of data and the speed with which it can be accomplished will all be affected. The widespread use of these techniques will enable many organizations to produce truly global-class applications. In many cases, a qualitative shift in user experience will result from dramatically speeding certain processes, or from the ability to analyze huge amounts of data (possibly generated through social media or other sources). These can make qualitative differences, for example, imaging being able to return product profitability in seconds, instead of the hours it takes for this calculation today, and production could be adjusted on a real-time basis to maximize margin.

Benefit Rating: Transformational

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Cloud Services Brokerage

Analysis By: Benoit Lheureux; Daryl Plummer; David Cearley

Definition: A cloud services brokerage (CSB) is defined in terms of a business model, providers, functions and enablers:

- CSB business model: a third party that works on behalf of the consumer of one or more cloud services to intermediate and add value to the service being consumed
- CSB providers: specific companies that offer CSB
- CSB functions: categories of business and technical value-added capabilities delivered by a CSB provider
- CSB enabling technology: various IT software or services leveraged to help implement a CSB provider

From a business model point of view, the value added by a CSB to cloud services varies widely from provider to provider, but may include – and is not limited to – service enrichment (including billing, aggregation, arbitrage, context, compliance and analytics). A CSB may or may not have a direct commercial relationship with the providers of services (for example, it may aggregate a mix of free and fee-based services), but it must have a commercial relationship with service consumers, particularly when enriching services (e.g., by extending a common billing mechanism to consumers across a wide range of services).

A viable CSB provider can make it cheaper, easier, safer and more productive for companies to navigate, integrate, consume and extend cloud services, particularly when they span multiple, diverse cloud services providers. A viable CSB provider may offer some combination of various value-added business and technical CSB functions, including but not limited to:

- Reducing the risk of consuming services (e.g., via federated security and compliance)
- Integrating diverse cloud services, including software as a service (SaaS; e.g., via protocol intermediation and semantic translation)
- Adding significant value to services (e.g., context and analytics)
- Centralizing cloud services functionality (e.g., service aggregation, archival and auditability)
- Providing a central point for governance (e.g., for U.S. Federal or European Union mandates)
- Offering various IT services to help consumers with CSB-related project implementations, ranging from managed services to business process outsourcing (BPO)
- Customizing services to create a new layer of value, and to meet the specific requirements of consumers
- Implementing consistent quality of service (QoS) to service consumers across services originating from, potentially, many discrete cloud offerings

CSB-enabling technology is leveraged by CSB providers to help successfully implement and manage their CSB-related offerings or projects. A CSB typically leverages some combination of the following technologies:

- Cloud infrastructure – some combination of infrastructure as a service and platform as a service
- Integration as a service – to integrate with cloud services consumers and cloud services providers
- Governance technology – for security and policy compliance of cloud services consumption
- Community management – to manage the provisioning of consumers and providers
- SaaS – where appropriate, some combination of SaaS functionality as part of service enrichment

Position and Adoption Speed Justification: Compared to having CSB intermediate access to cloud services across multiple providers, when companies consume cloud services directly (no CSB), they are responsible for managing any differences in security, integration and governance across cloud services providers. When companies consume cloud services via a CSB, they rely on their CSB provider to address these things. This is not to say that a CSB should always be involved in cloud services interactions among companies. On the contrary, a large proportion of cloud services will be executed directly between cloud services providers and consumers. In fact, cloud services consumers should be wary of potential intermediaries that do little other than "skim" value from cloud services as they are executed between providers and consumers. When sufficient value as an intermediary is well-established, then the CSB role will be justified and enduring.

CSB providers are only beginning to emerge from diverse backgrounds. StrikeIron aggregates business information services (e.g., corporate credit information, e-mail address verification, etc.) across a diverse set of providers, normalizing access to these services via one consistent cloud services interface and a consistent billing mechanism. Providers such as Sonoa Systems, Mashery and Vordel take on the role of a CSB when they deliver their fine-grained security and policy management capabilities as a service for use by companies that are exposing cloud services for consumption by a diverse set of consumers. Telcos that are incorporating context-aware services will implement CSBs for scalable and consistent provisioning, billing and service enrichments.

User Advice: Consider leveraging a CSB in cloud services consumption scenarios that involve multiple cloud services providers, a large number of consumers or when the CSB offers sufficient value-add to the services executed between providers and consumers to justify its role as intermediary. In particular, consider using a CSB when:

- The CSB makes it less expensive, easier or faster to navigate, integrate, consume or extend services.
- The CSB reduces the risk of consuming services from an operational (IT) or business point of view.
- The CSB adds significant value to services (e.g., aggregation or enrichment).
- When centralized services address a community need (e.g., consistent service billing, governance and auditability).
- When community members can't or won't do their own CSB (i.e., when a CSB is a sourcing decision or mandate of, for example, the federal government or European Union).

Business Impact: As cloud services proliferate across industries and geographies, CSBs proliferate as cloud services consumers seek to simplify and improve their consumption of cloud services across multiple cloud services providers. While a large portion of cloud services will be consumed directly, the diversity and complexity of direct cloud services consumption will drive some users to CSB providers to simplify and improve the process.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Sample Vendors: Alcatel-Lucent; AmberPoint; CommonIT; Layer 7 Technologies; Sonoa Systems; StrikeIron; Vordel

Cloudbursting/Overdraft

Analysis By: Daryl Plummer

Definition: One of the key value propositions of cloud computing is the ability to increase or decrease service capacity on-demand and to pay for only what you use. This is commonly referred to as "cloud service elasticity." Along with that idea is a complementary idea called "capacity overdrafting" or "cloudbursting" (we use the terms interchangeably). It is the ability to automatically get more capacity from a different cloud infrastructure when the primary cloud infrastructure is overloaded.

One way to describe cloudbursting is service "overdrafting," because the model is similar to what happens to a checking account that has overdraft protection from a savings account. When a check is written that exceeds the balance in the checking account, funds are automatically moved from savings into checking to cover the difference. Most banks provide this kind of overdrafting as a service (for which they charge fees) to their account holders. In the cloud-computing world, this usually happens when a request for more CPU power or storage space is made to a server by an application. With service overdrafting (aka cloudbursting), the request is redirected to another server that has more capacity to cover the difference, or to where new servers are rapidly/automatically provisioned to provide additional capacity.

Position and Adoption Speed Justification: The issue of cloudbursting (capacity overdrafting) is relatively new to the average IT organization. It is a natural outcome of rapid or automated provisioning. If shared pools of resources are available on-demand, then the ability to supplement the capacity that a company has available to it by using someone else's spare capacity makes sense. However, economic models, pricing models, service guarantees or even agreements about how the services will be used are immature or nonexistent. Adoption of cloudbursting, therefore, will trail the general issue of elasticity by about 12 months. Currently, cloudbursting seems to be low on the radar for enterprise adopters of cloud computing. This is primarily due to a narrowing of attention on getting started with cloud infrastructure, rather than on the more-general value propositions of cloud computing.

User Advice: End-user organizations will benefit from rethinking how capacity planning is done. This is the primary benefit of cloudbursting. If a company can expect to get increased capacity from someone else when, and only when, it is needed, then there is considerably less need to purchase excess fixed capacity before it's needed. This model will allow enterprises to exist in a hybrid cloud-computing environment, where on-premises capacity could be used and supplemented by off-premises capacity when a cloudburst happens. Users should not overestimate how much they will use this capability; however, fully elastic capacity is not the norm, and overdrafting will require prearranged agreements for payment that will be resisted by many budgeting authorities due to the wildly unpredictable nature of many overdraft situations.

Business Impact: The business will benefit from cloudbursting through the reduced cost of fixed capacity, use of operating expenses to pay for on-demand capacity and a gradual movement away from a technology model that forces each part of the business to pay for technology bought by the IT organization. The ability to get resources as needed will become an assumption of the business (within contracted and planned limits) that does not require the business to focus on whether cloudbursting is needed. Instead, the business will subscribe to a service that uses overdraft protection as a basic feature to ensure quality service delivery.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Emerging

Sample Vendors: Amazon; Enomaly; salesforce.com; VMware

Cloud Management Platforms

Analysis By: Cameron Haight; Milind Govekar

Definition: Cloud management platforms are integrated products that provide management capability for external (public) and internal (private) cloud environments to enterprise consumers and IT operations teams. Included in this category are products that provision system images, monitor performance and availability, enable metering and billing, monitor and manage applications, and integrate with enterprise management systems. A key ability of these products is the insulation of users of cloud services from proprietary cloud provider APIs. The distinction between cloud management platforms (CMPs) and private clouds is that CMPs primarily provide the upper levels of a private cloud architecture, i.e., the service management and access management tiers, and thus do not provide an integrated cloud "stack." The comparison also holds for public clouds, where the virtualization layer is provided by the cloud service vendor.

Position and Adoption Speed Justification: Although the demand for cloud-computing services is increasing, the tools for managing the applications and services running with these environments are only now emerging, especially for cloud-based service offerings at the system infrastructure service (also called infrastructure as a service or IaaS) level. Depending on the scope of the services offered by the (private or public) cloud provider, IT operations organizations acting in support of internal customers that use these cloud services will require many of the same types of tools that they use to manage their internal infrastructures, albeit adapted to support these new technologies.

User Advice: Enterprises looking at investing in cloud management platforms should be aware that the technology is still maturing. Although some cloud providers are beginning to offer management tools to provide more insight and control into their infrastructures, these are limited in functionality and generally offer no support for managing other cloud environments. A small (but growing) number of cloud-specific management platform firms is emerging;

however, the traditional market-leading IT operations management vendors – aka the Big Four (BMC Software, CA Technologies, HP and IBM Tivoli) – are also in the process of extending their cloud management capabilities. In addition, virtualization platform vendors (e.g., VMware) are also broadening their management portfolios to enhance the support of cloud environments.

Business Impact: Enterprises will require cloud management platforms to maximize the value of cloud-computing services, irrespective of external (public), internal (private) or hybrid environments – i.e., lowering the cost of service delivery, reducing the risks associated with these providers and potentially preventing lock-in.

Benefit Rating: High

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Sample Vendors: Abiquo; BMC Software; CA Technologies; enStratus; Elastra; HP; IBM Tivoli; Kaavo; Platform Computing; RightScale

Cloud-Driven Business and IT Services

Analysis By: Frances Karamouzis

Definition: There are two components of cloud-driven business and IT services.

The first area includes all types of consulting, advisory, business analysis, IT architecture analysis, application portfolio and cloud readiness, system integration, deployment and testing services delivered by service providers to enterprises. These services may also include a service aggregator role. An aggregator role is brought to bear where the service provider delivers a service that can include one or more of the following: responsibility of overseeing (program management), governance, brokering the delivery, managing the delivery, integrating the services, bringing together various vendors, taking on the specific areas of risk; legal compliance of the scope of services. The main objective of the business and IT services are focused on assisting enterprises navigate and implement various areas of cloud computing technologies and determining the impact on business and IT within the enterprise. This includes providing business advisory services to strategically help clients determine the potential impact on their business model, options for shifts in their technology architecture or future opportunities. The IT consulting, deployment and testing services include all types of IT services related to pilots or full engagement of all types of cloud computing in their IT portfolios. These efforts are being delivered across different layers of technology architecture, including system infrastructure, application infrastructure, applications, information, business process and ecosystem management. Thus, consulting, advisory, deployment and testing services cross different areas and may include multiple service companies.

The second area of cloud-driven business and IT services includes all types of solutions that are developed, bundled and packaged as outsourcing offerings, where the business or IT service provider leverages one or more cloud computing technologies within the solution's overall architecture. Gartner refers to these services as "cloud-enabled outsourcing offerings." Here, again, the services can include a service aggregator role. Depending on the type of outsourcing involved (business process outsourcing (BPO), application outsourcing or infrastructure outsourcing), the aggregator role can be within a layer of service, such as infrastructure aggregator, applications services integrator, process architect, business solution aggregator.

Cloud-enabled outsourcing solutions include all types of "managed" services solutions that are developed, bundled and packaged as components of outsourcing offerings, where the IT service provider (usually an outsourcer but may be any type of vendor) leverages one or more cloud computing technologies within the solution's overall architecture (either in the business process, applications or infrastructure layer).

Some clarifications of the definition are as follows:

- The term "services" can refer to either labor-based resources, automation, intellectual property or the combination thereof.
- The leveraging of the cloud computing technology can be organic or through some type of partnership or alliance. This may include the aggregation services described above.
- Managed or outsourced solutions are where an external third party is legally contracted (usually on an annuity basis) to assume responsibility (either in whole or in part) for business or IT services.
- Cloud computing technology is based on the previously published Gartner definition.
- The offerings themselves may be on a public cloud or private cloud. Here, again, we refer to Gartner definitions.

One example of cloud-enabled outsourcing may be a platform BPO offering, where the business process, application and infrastructure layers are bundled where the infrastructure is delivered through the cloud. This will be a common example of a cloud-enabled outsourcing offering. With so many variables and components in each outsourcing layer (BPO, application outsourcing and IT infrastructure), the combination of the different types of cloud-enabled outsourcing offering is extensive.

Position and Adoption Speed Justification: The first area (consultative and advisory services) of these cloud-driven business and IT services has already shown considerable adoption levels as enterprises are consistently evaluating and analyzing the impact of cloud within their organizations. Similar to previous Technology

Triggers, consultants and system integrators often experience a spike in demand when there is a great deal of hype in the market regarding disruptive options for cost savings or agility. These adoption levels will continue to be among strategic and high-impact business and IT services, where many service providers will be helping clients create cloud strategies, analyze application readiness, deploy private clouds, pilot solutions and seek to exploit the technologies for business benefit. Vendors will jockey to position themselves as thought leaders, strategic advisors, aggregators and implementers of the architected solutions. Gartner has forecast market size and growth. In summary, a large portion of this type of consultative, advisory and system integration work will likely take the same type of trajectory as other types of professional services that were premised on a disruptive technology-driven shift that comes to the market. It acts as a trigger, prompting clients to engage external service providers investing in specific expertise. Once some of the skills, competencies and solutions become mainstream, the spike in demand tappers off.

The second area, cloud-enabled outsourcing offerings, is still maturing, and many of the business and IT service providers have not yet fully marketed and priced their offerings. The market potential is so significant that all the large and midtier vendors are feverishly developing and piloting offerings with early adopter clients. Here, again, Gartner has forecast market size and growth of several components of outsourcing. Given that all areas of outsourcing can potentially be cloud-enabled and that service providers can also have service aggregator offerings, the outlook for growth is significant. Due to the hybrid nature of combining new and old styles of services, it will be difficult to directly quantify all the growth. The clear trend is that an overwhelming number (estimated to exceed 60%) of enterprises (both large and small) will evaluate and pilot some type of cloud-enabled outsourcing offerings within the next 18 months. However, the level of investment and long-term impact will vary by offering. As such, Gartner plans to conduct specific research within each layer of outsourcing.

As the adoption of cloud computing accelerates, so, too, will all types of advisory services that professional IT service firms deliver. The large service providers have already assigned senior-level global leaders to be directors or "cloud computing czars," supported by consulting teams of professionals as well as outsourcing resources that are leading the efforts to educate and assist clients with questions related to the impact of these new disruptive technologies. Furthermore, professional service firms have reported many ongoing strategic cloud services assessments and business and IT planning work with clients.

These firms have begun extensive R&D efforts and have created solution architecture teams to formulate, architect, construct and test their outsourced and cloud services offerings. Several have also formalized relationships with key cloud computing vendors, such as Google, Microsoft and Amazon, to utilize portions of their solutions in their outsourced offerings and their client relationships. Many of these offerings are still emerging, and others are in their early stages. Many of the vendors that Gartner has interviewed are actively working on their cloud services strategy, their value proposition, their go-to-market strategies, their pricing models and, most importantly, their service-level structure and SLAs.

It's important to monitor this area, because these new services are likely to be the most disintermediating offerings on the market, as well as representing the biggest paradigm shift for enterprise buyers. The primary reason is that the mature and established IT service firms have extensive risk management structures that form the basis of how they define and contract SLAs for their solution offerings. Thus, they will be focused on understanding, architecting, testing and ensuring that scalability, predictability and manageability of the entire end-to-end solution (including the cloud-based portion) will be what the IT service can support. This will be critical to the adoption and growth of cloud computing technologies and services.

Overall, we see the positioning of cloud-driven business and IT services as still emerging. However, the hype and momentum around the use of cloud-computing technologies will drive an accelerated pace and movement of cloud-driven business and IT services through the Hype Cycle milestones at a much faster velocity than other typical items that we normally track. As such, we believe that in less than five years, there will be major shifts and higher adoption ratios.

User Advice: With regard to consultative advisory and system integration services, the long-standing Gartner advice with regard to making choices based on alignment to key performance indicators, and new growth exploration while incorporating all choices in the business-driven sourcing strategies and management life cycle still prevail. Additional due diligence should be done during the evaluation and selection process, as well as the contracting process, due to the relatively new area of cloud computing and the incredibly dynamic and fast-growing technological changes being introduced. For each of the key phases of the sourcing life cycle, Gartner has published specific advice for moving forward.

With regard to cloud-enabled outsourced offerings that leverage disruptive cloud technologies and new vendor offerings, be cognizant that a significant number of offerings that IT service providers are introducing are in development or being piloted. As a result, each class of offering – whether an infrastructure utility solution leveraging cloud infrastructure or a software-as-a-service-based solution leveraging an application infrastructure or other types of business services – needs to be thoroughly evaluated for all the key risk areas. See "SaaS Dynamics Continue to Act as a Catalyst for the Convergence of Services and Software" for a sample decision framework.

It is critical that organizations maintain the appropriate level of ownership for governance to ensure that they drive the right behaviors among vendors to manage overall service delivery and contingency planning. Due to the embryonic nature of outsourcing solutions, at times, keep the resolution of operational issues separate from the resolution of commercial terms to ensure continuity of service and business. The enterprise approach and culture must support a problem-solving, rather than punitive, mentality when problems arise, as they undoubtedly will with embryonic technologies.

With regard to structuring the deal, enterprises must have accurate and usable end-to-end, service-level definitions that they can use to shape integration points, and manage and operate the program.

Integration and interoperability will be among the most important risk areas to analyze and manage on an ongoing basis. In this regard, cloud-enabled outsourcing offerings likely will have several integration points, as well as multiple vendors. Thus, operating-level agreements (OLAs) that align with the specific SLAs are critical but hard to achieve as the solutions are highly standardized. In a best-case scenario, OLAs should be agreed on at the contract negotiation level, before an award is made. For existing relationships, the organization must retrofit OLAs.

Business Impact: For advisory and consultative services, enterprises must be able to gain insights and analysis on how to harness cloud computing technologies to further their strategic use of IT. In the long term, the enterprise can more clearly identify and execute IT architectures that provide competitive parity versus competitive advantage.

With regard to outsourced offerings that utilize cloud computing, enterprises will need higher-level access to more-industrialized solutions that offer shorter adoption timelines and faster return on investment in IT services.

The long-term impact of cloud-driven business and IT services and solutions will be material and significant with regard to their size, breadth and savings levels within the overall IT service industry. It will provide more choices for enterprise buyers. It will reshape the service provider landscape, because major barriers to capital-intensive areas, such as infrastructure or applications, will be removed.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Emerging

Sample Vendors: Accenture; Capgemini; Convergys; CSC; Epam Systems; Fujitsu; HCL Technologies; Hexaware; IBM; Infosys; L&T Infotech; Tata Consultancy Services; Virtual Ark; Wipro

Community Cloud

Analysis By: David Cearley

Definition: Community cloud computing refers to a shared cloud-computing service environment that is targeted to a limited set of organizations or individuals (e.g., government agencies). The organizing principle for the community will vary, but the members of the community generally share similar security, privacy and compliance requirements. More importantly, a mechanism to review those seeking entry into the community should exist. At a minimum, there must be a strict and narrow admission policy to create trust among the members of the community. Ideally, other members of the community should have some mechanism to identify other members and, in some cases, have an opportunity to exert some level of influence over the admission of new members to the community.

Unlike more-limited forms of private cloud computing that serve a single organization community, cloud computing is similar to public cloud computing, in that it delivers shared services to multiple organizations. A community cloud environment can, therefore, achieve larger economies of scale, spread costs across the community and further reduce redundancy. However, unlike a public cloud service, a community cloud service serves substantially fewer users, and may require additional technologies and unique policies/practices to address the more extensive privacy, security, compliance and availability needs of the community. As a result, while a community cloud-computing approach will likely be less expensive than a custom, single-enterprise private cloud implementation, it is likely to be more expensive than public cloud computing.

An industry-based community cloud is a cloud environment that is built for and targeted exclusively to companies in a particular industry. This is currently the most common model and is a major theme in the government sector. The greater maturity of government community cloud efforts stems from previous efforts in government to create shared-service environments prior to the emergence of cloud computing. The initial focus for community cloud computing is limiting membership to known and trusted entities (e.g., defense agencies) to address common security needs. One potential concern with an industry-based community cloud is that members may have similar seasonal resource demands (e.g., retail with large demand spikes around Christmas) that limit the ability of the community cloud to elastically satisfy all member needs at peak times.

While an industry model is the most likely approach to forming community cloud environments, there is the potential to deliver community cloud services based on other organizing principles. A membership-based community has controlled membership, but is not limited to a particular industry. The community aspect is used to review membership applications and ensure that anyone with access to the cloud environment is trusted by other members of the community. Membership in these community cloud environments may require that applicants for membership meet certain requirements, with regard to their own security environments. While this membership-based approach does not currently exist, we believe it may emerge as an alternative to industry-specific community cloud platforms, because the ability to blend resource demands across industries provides additional flexibility and more closely approximates the leverage that can be obtained with public cloud models.

A community cloud service provider may organize in several ways. In the case of government community cloud computing, an agency is often specifically tasked with providing shared cloud-computing services to other government agencies. Commercial third parties (e.g., Google, Amazon, Microsoft and HP) will also establish community cloud environments to provide services to community members. In other cases, the members of the community may appoint one or more members, or may establish a jointly owned entity, to implement, run and manage the community cloud environment.

Position and Adoption Speed Justification: The leading concerns expressed by those considering the use of public cloud-computing services are security, privacy and compliance. These concerns stem from the fact that public cloud-computing services are provided via an open Internet-/Web-based model to the general public, and that the workloads and data of all consumers run in a common, shared environment. A community cloud model is one way to begin addressing these concerns, by limiting access and by focusing the types of services delivered. Although interest in community cloud computing is growing, its full scope and benefits are not yet well-understood. While there are more-mature examples of government community cloud computing, its use for other communities is embryonic or experimental. We expect substantial growth in the interest and popularity of community cloud computing during the next one to three years.

User Advice: Community cloud-computing models potentially offer enterprises with significant legal and compliance requirements an approach to using third-party cloud services in a more controlled manner. By limiting access to a cloud service environment to entities that have met some common membership criteria, trust in the cloud environment can theoretically be increased. However, the community cloud is an emerging concept, and users should examine community cloud offerings closely to ensure that they truly meet their needs. A community cloud provided by a public cloud provider should offer physical isolation (at least separate servers, though separate data centers is even better) between the community cloud and the vendor's public cloud offerings. Users considering a community cloud must examine the process of vetting potential members, as well as the mechanism for isolating the community cloud resource environment of a provider's public cloud environment, if one exists.

Business Impact: Community cloud computing offers a blend of public and private cloud benefits and challenges, and is likely to serve as an intermediary stage between private and public cloud computing. Like the public cloud, the cost of the cloud service environment is spread across multiple organizations, allowing economies of scale, higher utilization rates and reduced cost versus a single-enterprise private cloud. In addition, the community cloud offers a more controlled and limited environment where members are known, which reduces risk, versus an open, public cloud-computing environment. In the future, we expect industry-based community clouds to provide not only a common set of shared infrastructure services, but also specialized application, information and business process services of unique value and interest to the target industry. Emergence of community clouds based on a pooling of member resources will also provide the basis for a hybrid private-and-community cloud model.

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Terremark Worldwide

Virtual Private Cloud Computing

Analysis By: Lydia Leong

Definition: A virtual private cloud (VPC) refers to the partitioning of a portion of a public cloud-computing service provider's environment into an isolated environment that is dedicated for use by a single entity or group of related entities (such as multiple departments within a company). In addition, a VPC may be isolated from the Internet, utilizing a private network (virtual private network [VPN] or private connectivity) and/or a virtual LAN for access to the services to add an additional level of performance, security and control.

Just as with a public cloud-computing service, the provider of a VPC service owns, controls and manages the underlying infrastructure and other elements used to create the service or services being delivered via the VPC. The self-service interfaces, application programming interfaces (APIs) and other mechanisms used to access/consume, secure and manage the public cloud service analog are used as a starting point for the VPC. Customization of these elements by the provider for the target consumer may be available. Additional layers of security and management may also be layered by the consumer on top of the standard or customized VPC services.

In its simplest form, access to VPC services will be limited to a single consumer and will deliver a service consumption experience that is virtually identical to the public cloud-computing service analog. More-complex approaches will enable the consumer contracting for the VPC service to request customizations and exert some level of control over the access to the VPC services. Customers may choose to limit access to certain services to their company as the exclusive consumer of the VPC services. They may also choose to give other consumers (for example, business partners or customers) access to some VPC services. The specific type and degree of control available to the VPC purchaser, and pricing models, will vary among VPC offerings.

Position and Adoption Speed Justification: VPC services are emerging phenomena driven by consumers who are interested in the potential of cloud computing, but who do not want to cede that much control to, or share their entire service environment with, other customers. A VPC cloud model offers an alternative to a typical private cloud-computing environment that is potentially less costly and more quickly deployed. Most VPC providers are hosting companies that have expanded into cloud services.

User Advice: Users that are currently exploiting hosting services from providers that are revamping their offerings to offer public cloud-computing services may be able to consider a VPC as an easier step to the cloud from their current dedicated hosting model. Companies focusing on migrating traditional enterprise applications to cloud computing will find the potential security and control of a VPC attractive, as will those who want to create more-sophisticated hybrid solutions that mix internal and external cloud-based resources. However, long-term scalability, elasticity and financial benefits in comparison to public cloud computing remain

uncertain, as does the degree to which a VPC can fully match the security and operational management benefits of a full private cloud. Companies that do not have significant variability in their capacity needs are likely to find that public and VPC offerings are more closely matched in price, since they are not paying a premium for elasticity.

Business Impact: When combined with a hybrid cloud-computing model (for example, using internal resources and external cloud-computing services), VPC services have the potential to bridge the gap between the public and private cloud models. By providing additional control, management and security beyond that of public cloud services, the VPC approach reduces risks and makes it feasible to deploy a wider range of enterprise applications.

Benefit Rating: High

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Sample Vendors: AT&T; Layered Tech; Terremark Worldwide

Browser Client OS

Analysis By: Annette Jump; Michael Silver; Stephen Kleynhans

Definition: The increasing focus on Web-based applications is creating interest in a new form of simpler, pared-down OSs targeted at just supporting a browser and connection to the Internet. In browser client OSs, all applications are Web-based, and many traditional PC OS functions are missing. However, they can provide a much-simpler and lower-cost browsing experience.

Position and Adoption Speed Justification: The ongoing fragmentation of mobile PC devices and emergence of media tablets and Web books in 2010 created the need in the market for much-thinner and lighter OSs versus Windows OSs that can run on those devices. The usage scenarios for those new devices will be centered on the Internet; therefore, a full-featured client OS might not make sense. Additionally, the configurations of those devices are significantly lower versus traditional PCs, and PC vendors are actively looking for alternative OSs, such as Chrome OS or phone-based OSs, such as Android. The development of the browser OS is another symptom of the general trend toward commoditizing the footprint for applications on client devices.

While in the past, many vendors have created stripped-down versions of Linux to run on Web terminals and thin clients, these typically still contained local execution capabilities and exposed many extraneous services to administrators and users. Google's Chrome OS represents the first example of a new class of OS designed to hide all the complexity and configurability of the base OS, resulting in a very lightweight operating environment. While Chrome is based on Linux, it has been reworked to support applications based only on Web standards.

These OSs tend to suffer when compared directly with traditional PC OSs because they lack much of the open extensibility, broad device support, or ability to support local rich applications. As such, consumers may be disappointed if the marketing doesn't accurately reflect the appropriate usage models. However, with the emergence of richer Web development environments (for example, Flash, Silverlight and, most notably, HTML5), much-richer applications can be created to satisfy user needs, and within the next three to five years, it is likely that users will adapt to the new paradigms.

User Advice:

- Continue to focus on browser-based application development.
- Understand the limitations of these OSs and their associated devices, and plan potential use accordingly.

Business Impact: The browser client OS will likely be relevant in consumer client devices first, in combination with a new class of devices, such as Web books and media tablets. The success of a browser client OS as an enterprise platform would likely take much longer due to application compatibility issues. Browser client OSs will also face the concern from IT staffs that compatibility issues may arise in unpredictable fashion, as interoperability will be such a critical business issue for vendors (as is clear in that Google is now advertising a browser that brings it no or very little direct revenue). To succeed, browser client OSs must gain a significant market share in consumer client devices before it will even be considered for other PC computing devices, such as mini-notebooks or consumer standard notebooks. Therefore, it is very unlikely that any browser client OS will gain any market share among enterprise PC users as a PC replacement in the next three to five years. However, if browser client OSs will be successful on Web books or media tablets, some enterprise users might bring them into the enterprise, as an additional client device when they travel, and they might want to use them to access their corporate e-mails, calendar and contacts.

Benefit Rating: Transformational

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Sample Vendors: Google

Cloud Application Development Tools

Analysis By: Eric Knipp; Mark Driver

Definition: Cloud application development (AD) tools are used to create custom software applications deployed on an application platform as a service (APaaS), a cloud-enabled application platform (CEAP), or a cloud system infrastructure. These applications can range from simple, situational business process management (BPM) to complex, mission-critical, line-of-business systems. The distinguishing features of these tools include awareness of, integration with and control of the target cloud runtime environment where the finished application executes. Cloud AD tools can be categorized along two axes: target audience and runtime environment.

Situational applications targeted for APaaSs or CEAPs may be authored by non-IT staff, requiring a programming environment that is amenabΩ

User Advice: AD tools used for creating cloud applications – especially for those targeting an APaaS or a CEAP platform – must reflect the reality that applications designed for the cloud are different from their traditional on-premises counterparts. The spectrum of available cloud AD tools is composed of a wide range of capabilities and varying degrees of user-friendliness. When evaluating the capabilities of a cloud platform, include the toolset used for that platform as part of your evaluation, and do not assume that existing AD tools will be sufficient to build applications for this new medium. For example, citizen developers working outside the IT department will be better-served by a visual development environment (such as Qrimp, Trackvia, Sitemasher or Rollbase), but they will only be able to build somewhat limited applications, as compared with professional programmers who need advanced tooling (such as Eclipse with an AWS or a GAE plug-in) to construct advanced applications. Finally, recognize that cloud AD tooling is, at present, totally proprietary to the cloud system infrastructure, APaaS or CEAP offering chosen as the deployment medium; once you have invested in custom applications "in the cloud," there's no clean migration path to another vendor's offering.

Business Impact: The best cloud AD tools will be transformational in nature, but they depend on the maturation of APaaSs, CEAPs and cloud system infrastructures themselves; the most powerful cloud AD approaches are likely several years off. This next generation of cloud AD tooling will enable business users to create custom software applications that once required the assistance of professional programmers to realize. Professional programmers will still be critical for more-complicated applications, but they will be able to deliver them faster and less expensively, and without the need for expensive infrastructure.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Sample Vendors: Eclipse Foundation; Google; Microsoft; Qrimp; Rollbase; salesforce.com; Sitemasher; TrackVia

Cloud Testing Tools and Service

Analysis By: Thomas Murphy

Definition: The cloud is providing opportunities and challenges in the software testing market. For example, changes are required to effectively test solutions to be deployed to public or private clouds. These solutions require large scalability, strong technology coverage and the ability to work across applications using a mixture of technologies. The other direction is how to use primarily public cloud solutions to improve testing. Often, these issues are addressed by common vendors that deliver new solutions deployed using virtualized, service-oriented architectures (SOAs) that are aimed at testing applications that reside in similar environments.

Some solutions provide for the provisioning of development/test labs (e.g., Skytap and Sauce Labs) and tools for testing from the cloud (e.g., Soasta, Gomez and Keynote Systems). There are also solutions designed to test applications deployed to private or public clouds supporting complex networks and mixed technology stacks that provide emulation for services that may not be available for development and testing outside production (e.g., iTKO and Green Hat Software).

Position and Adoption Speed Justification: Solutions in this market are dominated by relatively small startups, with the traditional testing market leaders still in the investigation phase. In addition, the overall solution sets are still incomplete, with technology gaps. During the next two years, we expect to see a rapid acceleration of products into this market, including the entrance of the quality market leaders (e.g., HP, IBM and Micro Focus). However, the picture will remain murky, as public cloud platforms shake out, and issues concerning billing and provisioning management are worked through. These products are suitable only for the testing of Web applications; thus, they are most successful with e-commerce-oriented Web startups.

User Advice: There are a number of use cases for these products, but the primary considerations should be based on lab scalability and the ability to match production use scenarios. For companies looking to control the cost of lab setup and maintenance or controlling tool license costs, especially where the use of testing tools is seasonal, cloud testing services and tools provide good options. It's also a good option for companies that do not have tools and are relying on manual testing and faith to move to a higher degree of automation and best-practice behavior.

Business Impact: Moving test labs to use a virtualized infrastructure in private and public clouds can reduce the cost of management, hardware, software and power and should be a key element of any center of excellence effort for software quality. Hosted tools increase the ability to test Web applications in the way they will be used, thus reducing production errors and system failures. Taking advantage of cloud-based software provides more-flexible billing and capacity.

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Gomez; Green Hat Software; iTKO; Keynote Systems; Skytap; Soasta; Zephyr

Hybrid Cloud Computing

Analysis By: David Cearley

Definition: For the near future, virtually all large enterprises using public cloud-computing services will also have some form of dedicated IT systems using either a private cloud or traditional infrastructure and application model. These dedicated systems

may be deployed internal to the enterprise or using an outsourced model. Hybrid cloud computing refers to the combination of external public cloud-computing services and dedicated IT resources in a coordinated fashion to assemble a particular solution. However, hybrid cloud computing does not refer to the use of public cloud services simply as a hosting platform, or the use of dedicated systems and external cloud-based services in a disconnected or loosely connected fashion. Hybrid cloud computing implies some degree of integration or coordination between the dedicated and public cloud environments at the data, process, management or security layers.

Hybrid cloud computing can take a number of forms. These approaches can be used individually or in combination to support a hybrid cloud-computing approach:

- **Joint security and management** – Security and/or management processes and tools are applied to the creation and operation of both dedicated systems and public cloud services.

- **Cloudbursting** – This refers to dynamically extending an application or a portion thereof from an internal private cloud platform to an external public cloud service, or from one public cloud service to another, based on the need for additional resources.

- **Cloud service integration and composition** – This is the creation of a solution with a portion running on dedicated systems and another portion delivered from the public cloud environment in which there is ongoing data exchanges and process coordination between the internal and external environments. Mashups are a form of composition in which public cloud-based services are combined with internal application components into a composite application using Web APIs and data success mechanisms (such as Really Simple Syndication [RSS] feeds). Using integration solutions to link public cloud-computing application services (e.g., CRM systems) to applications running in a dedicated environment (e.g., internal ERP systems) is the most common example of hybrid cloud computing. More-sophisticated solutions, such as those using tokenization to combine selected data elements stored on dedicated systems to ensure compliance with Payment Card Industry or other regulations with process execution on cloud infrastructure, are emerging forms of hybrid cloud-computing integration.

- **Dynamic cloud execution** – The most ambitious form of hybrid cloud computing combines joint security and management, cloudbursting, and cloud service compositions. In this model, a solution is defined as a series of services that can run in whole or in part on a private cloud platform or on a number of external cloud platforms, and in which the actual execution (internal or external) is dynamically determined based on changing technical (e.g., performance), financial (e.g., cost of internal vs. external resources) and business (e.g., regulatory requirements) conditions.

Position and Adoption Speed Justification: Most companies will use some form of hybrid cloud computing. Early adopters are already using mashups and traditional application integration, as well as joint security and management approaches. Some are building more-sophisticated integrated solutions and experimenting with simple cloudbursting. Extensive and generalized use of cloudbursting and dynamic execution are of interest, but beyond the current state of the art.

User Advice: When using public cloud-computing services, establish security, management and governance models to coordinate the use of these external services with applications and services running in dedicated environments. Where public cloud application services or custom applications running on public cloud infrastructures are used, establish guidelines and standards for how these elements will combine with internal systems to form a hybrid environment. Build on traditional application integration approaches and explore emerging integration-as-a-service options to link internal and external applications. Approach sophisticated integrated solutions, cloudbursting and dynamic execution cautiously, because these are the least mature and most-problematic hybrid approaches. Whenever using public cloud-computing services, establish security, management and governance models to coordinate their use with internal applications and services. To encourage experimentation and cost savings, and to prevent inappropriately risky implementations, create guidelines/policies on the appropriate use of the different hybrid cloud models.

Business Impact: Hybrid cloud computing leads the way toward a unified cloud-computing model in which multiple cloud services can be dynamically assembled as needed. The source of these services may shift among public, private or community cloud environments based on changing requirements and/or pricing models. This ideal approach would offer the best possible economic model and maximum agility. It also sets the stage for new ways for enterprises to work with suppliers, partners (B2B) and customers (business-to-consumer) as these constituencies also move toward a hybrid cloud-computing model. In the meantime, less-ambitious hybrid cloud approaches focusing on linking specific services and applications still allow for cost optimization, flexible application deployment options, and a coordinated use of internal and external resources.

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Enomaly; IBM; Zimory

At the Peak

Cloud-Enabled BPM Platforms

Analysis By: Michele Cantara

Definition: Definition

A cloud-enabled business process management (BPM) platform is software that uses BPM technologies (BPMTs) to construct and optimize process-centric solutions in a software-as-a-service (SaaS) or cloud service delivery model. BPMTs include high-level process modeling tools, business process analysis software, workflow, automated business process discovery (ABPD) tools, BPM suites (BPMSs), business activity monitoring (BAM) and business rule management systems. Cloud-enabled BPM platforms may be consumed as a platform as a service (PaaS), or their capabilities may be embedded in solutions that are delivered as SaaS, business process services or business process utilities (BPUs). As a result, cloud-enabled BPM platforms may support public cloud services, as well as private clouds in an organization's own data center. In addition, one of the more common usage patterns for cloud-enabled BPM platforms is their use in cloud-enabled outsourcing arrangements, in which the platform is cloud-enabled, but components of the solution (such as data) are delivered via dedicated hosting versus multitenant cloud services.

Position and Adoption Speed Justification: Cloud-enabled BPMS platforms are positioned at prepeak with a time to plateau of two to five years due to uptake in the use of BPM platforms for collaborative modeling in the cloud, adoption of BPMS PaaS particularly for BPM pilot projects, and the development of cloud-enabled BPMS platforms by leading BPMS vendors. BPMS vendors are actively pursuing an OEM model with their cloud-enabled BPMS platforms, and are building up ecosystems of SaaS and cloud service provider partners.

Business process modeling is an example of a BPM activity that can be enabled through a BPM platform for cloud computing. Lightweight, high-level process modeling is particularly popular with companies that are looking for a low-cost mechanism to get business process modeling into the hands of a broad number of process stakeholders. As an example, Lombardi Blueprint, recently rebranded, IBM BPM Blueprint, is a cloud-based process modeling and milestone management tool, used by more than 6,000 companies. In addition, IBM also has BlueWorks, an online community featuring capability modeling, process modeling and a library of process artifacts to jump-start modeling projects. Another example of cloud-based process modeling is Raven Cloud, introduced in May 2010 by RavenFlow. Raven Cloud creates process diagrams from written descriptions of processes, making process modeling more accessible to business process improvement stakeholders who are not highly skilled at constructing formal process models. Social BPM, a concept that describes collaboratively designed and iterated processes, can benefit from the collaboration and consumability features of cloud-based process modeling. In social BPM, collaboration involves not only business and IT stakeholders within an organization but also "the collective".

Examples of BPM PaaS available from public cloud services providers include RunMyProcess, a platform for workflow as a service and business mashups, as well as the Cordys Process Factory, available from the Google Apps Marketplace. As of January 2010, 65 companies were using Cordys Process Factory.

Ten of the top 15 BPMS vendors (based on worldwide total BPMS software revenue in 2009) offer cloud-enabled BPMS platforms or have alliances with SaaS providers or external service provider (ESPs) that deliver a range of services from public cloud services to cloud-enabled outsourcing. Appian Anywhere, a BPMS delivered as a PaaS, is supporting business process solutions for 70 companies. Cordys makes its Business Operations Platform (BOP) available to organizations that want to use a BPMS as part of their own private cloud services. The Cordys BOP is also available as a PaaS from Cloud Harbor. Fujitsu, which has several alliances with SaaS providers that use Interstage BPM in their offerings, introduced Fujitsu Cloud BPM in 2009, and entered the PaaS market. Singularity introduced its LiveAgility BPM cloud service in October 2009. In March 2010, Logica selected Singularity as the platform to power a cloud services brokerage for U.K. telecoms in conformance with the Wholesale Line Rental 3 (WLR3) regulation. Pegasystems has had a cloud-enabled BPMS since 2007 via its SmartPaaS capability, which it made available to organizations and service providers that wanted to manage the environment themselves. Pegasystems now offers SmartPaaS directly as a cloud service. It is now available; however, it has principally focused on selling SmartPaaS for private cloud. In 4Q09, Adobe introduced LiveCycle Managed Services, a cloud-enabled outsourcing offering; its LiveCycle ES2 BPMS is hosted on Amazon EC2.

While on-premises use of BPMS is still the norm, some companies are opting for a BPMS PaaS delivery model, due to perceived cost savings and in situations where an organization's own IT department does not have the bandwidth to support the BPMS technology. BPM pilot projects are another driver of BPMS PaaS. Instead of paying upfront capital to purchase a BPMS for a BPM pilot, companies are supporting the pilot with a BPMS platform delivered as a service, rather than an on-premises solution. Once the pilot project has shown promising results, it's easier for the executive sponsor in the end-user organization to make a business case for the on-premises solution. Reducing costs by standardizing business processes has become a popular trend, and companies are using cloud-enabled BPMS products in internal shared-service data centers to support these standardized business services. Often, these implementations are styled as "private cloud services," and the BPMS functionality enables the enterprise to balance lower-cost standardization, while still providing business units or geographies with the ability to configure business processes to their unique needs.

The most-prevalent use of BPM capabilities in the cloud is when it is embedded in SaaS or cloud services consumed by end users. Consumers think they are purchasing specific application capabilities. For example, an organization may purchase call center agent coaching from a SaaS provider. The call center agent, which is the consumer of the service, uses coaching and talent management capabilities to develop upselling or cross-selling skills. However, the call center supervisor may want to tailor the coaching process and will make use of cloud-enabled BPM platform capabilities to alter the common functionality originally provided. Many organizations may not even realize they are using BPM platform capabilities in their SaaS and cloud services. Appian Anywhere is used by application vendors that are looking to BPM-enable their applications and offer it via SaaS. Examples of SaaS or cloud service providers that rely on cloud-enabled BPM platform capabilities to make their processes more agile include Anacomp,

CrimsonLogic, DST Systems, Enkata, First Data International, ISCorp, L@W, SunGard and Target Group.

User Advice:

- Seek out business process modeling capabilities that are available via SaaS or the cloud. This approach is a cost-effective way of getting a broad number of business stakeholders involved in submitting innovative process ideas and collaborating on "to be" process scenarios.
- Take advantage of BPMS products that are available via PaaS offerings for your BPM pilot projects. This approach can give you some quick wins that can help build a business case for an on-premises solution or more widespread use of the BPM PaaS approach.
- Evaluate BPM "in the cloud" alternatives for your internal shared-service initiatives.
- Evaluate the cloud-enabled BPM platform capabilities of the SaaS and cloud service offerings you plan to purchase. Do not expect infinite degrees of process agility from your service provider. Service providers that use a BPMS as part of their offerings will have predefined the range of changes to process flows, rules and user interfaces that can be made in the context of SaaS/cloud pricing and delivery. Ensure that the range of change and frequency of change options are clearly outlined in your service agreement.
- Process-centric solutions offered via SaaS that use BPM technologies will give you a greater degree of flexibility to tailor the solution's user interface, business rules, dashboards, process flows and other artifacts to fit your needs.
- Include provisions in your sourcing contract for exporting models and artifacts in the process repository in the event you want to switch to another provider or bring the solution in-house. These provisions may result in higher costs, but are likely to be better than rebuilding the solution from scratch.
- Ask your service provider whether it is using a BPMS, and find out how "portable" the models and definitions are. In addition, find out who owns the process artifacts you extend with BPM technologies – you or the service provider. In cases where the service provider plans to own the extended process artifacts, limit your usage to nondifferentiating business processes.

Business Impact: Using BPM technologies delivered "as a service" makes BPM accessible to midmarket enterprises that can't afford or lack the bandwidth to support on-premises BPM platforms, as well as Type A organizations committed to moving as much application infrastructure as possible into the cloud to avoid the capital expense of deploying it on-premises. As a result, more organizations can use these tools to improve business processes by making them visible to all process stakeholders.

BPM technologies delivered as a service are largely vendor-driven at present. End-user companies are not accustomed to expecting a lot of process flexibility from SaaS/cloud providers. The SaaS/cloud business model discourages customization to drive scale and contain costs. When service providers use BPM technologies for mass-customization capabilities, they do so primarily to leverage their application infrastructure and improve margins. Most are not yet passing on cost savings to clients, and most lack sufficient governance expertise to enable end-user companies to directly make changes to processes, rules and user interfaces.

During the next 18 months, end-user companies will need to pressure service providers to enable them to alter the process directly. If this is not possible, minimally, client companies should expect the service provider to make sufficient modeling capabilities available so that the process is visible to client business analysts.

The end result will be that processes, rules and user interfaces supporting business processes can be altered in hours or days, rather than weeks, and the client and service provider share a common view of the business process. Most importantly, the business processes supported by process-centric services are no longer unchangeable "black box" processes. These business processes are now fully visible and can be included as part of an end-to-end process in continuous process improvement initiatives.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Adobe; Appian; computas; Cloudharbor; Cordys; Fujitsu; IBM; Intalio; Pegasystems; Ravenflow; RunMyProcess; Savvion; Serena Software; Singularity; SunGard; Tibco Software; Vitria

Cloud E-Mail

Analysis By: Matthew Cain; Tom Austin

Definition: Cloud e-mail describes a vendor-offered, multi-tenant, Internet-delivered e-mail service that is scalable and flexible.

Position and Adoption Speed Justification: E-mail in the cloud continues to be a white-hot topic for IT professionals. Drawn by the lure of rock-bottom pricing and the perception that cloud e-mail is wildly popular, organizations are aggressively investigating the new provisioning model. In early 2008, we predicted that by year-end 2012, 20% of enterprise e-mail users would be employing a cloud-based e-mail service. We were wrong; the uptake of cloud e-mail services has been happening at a slower pace than previously expected. We now think that the percentage of corporate mailboxes using cloud services will be 10% by year-end 2012 – up from 2% to 3% at the end of 2009. There are about a dozen

reasons why cloud uptake is slower than we expected and these can be split into four categories – vendor dynamics, economics, service immaturity and customer dynamics.

User Advice:

- Organizations should approach cloud e-mail services with caution. These services are immature in their ability to provide a rich management and reporting infrastructure, and in some cases cloud e-mail services lack features commonly found with on-premises e-mail systems.

- Organizations also need to examine where they are in the e-mail cycle – those that have just gone through a significant version upgrade, or vendor migration, should generally realize more ROI from that change. Conversely, companies on the brink of changing e-mail vendors (or undertaking a substantial version upgrade), should look more closely at cloud e-mail services.

- Companies should also determine internal e-mail costs, to ascertain if a move to cloud e-mail makes economic sense.

Business Impact: Organizations with large populations of users that don't rely heavily on e-mail services – such as retail or manufacturing floor workers, data entry clerks or hospitality personnel – can immediately benefit from cloud e-mail services.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Sample Vendors: Cisco; Google; Microsoft

DBMS as a Cloud Service

Analysis By: Donald Feinberg

Definition: Database management systems (DBMSs) as a cloud service are DBMSs engineered to run as a scalable, elastic service available on a cloud infrastructure. These DBMSs are available only as a cloud offering and are not necessarily relational. For example, Microsoft's SQL Azure is a fully relational DBMS, while Microsoft's SQL Services, Amazon's SimpleDB and Google's BigTable are not relational and have different persistence models. Cloud-based DBMS services are provided in a multi-tenancy environment with elastic resource allocation, for use in simple to complex transactions. DBMSs as a cloud service excludes those DBMSs that will run on cloud infrastructure, but are not purpose-built as a cloud service. Most of the currently available DBMS engines will run on cloud infrastructure (for example, Amazon's EC2), but are not specifically engineered to take advantage of the cloud; this would include Amazon's RDS (really a MySQL implementation), IBM's DB2, MySQL, Oracle and many others. This differentiation is the reason for the change in name from "DBMS in the Cloud" to "DBMS as a Cloud Service"; running on cloud infrastructure does not define a DBMS as a cloud service.

Position and Adoption Speed Justification: All the currently available cloud DBMSs are relatively new. SQL Azure, the only fully relational DBMS available, began full production at the beginning of 2010 and still has some size limitations; Microsoft plans to reduce, and eventually lift, these restrictions. This is, however, the only atomicity, consistency, isolation, durability (ACID) DBMS available as a cloud service. Originally defined by Jim Gray in the 1970s, ACID is a set of properties that define how transactions against a database can guarantee reliability. Non-ACID DBMSs have a model (usually referred to as a key-value pair) that allows for eventual consistency; restricting them to less complex, and normally single-user, transactions – especially where data is used by only one transaction at a time and locking is not required. However, this model does allow for very large database sizes with rapid performance, as compared to the more restrictive ACID relational model. Non-ACID DBMSs are becoming more widely used for Web 2.0 development projects, where collocation of data in the cloud is a requirement of the application.

Today, DBMSs as a cloud service are used primarily for development and testing of applications – where database sizes are small and issues of security and collocation with multiple users are not a concern. Although many Web 2.0 applications may be experimenting with some of these services, most still rely on non-cloud-based DBMS implementations. One exception is where all the data already exists in the cloud and it is desirable to have the application there, with the data. One big advantage of cloud DBMSs is their elasticity: the more you use, the more you pay; the less you use, the less you pay.

The rate of adoption of cloud-based DBMSs will depend on the increasing maturity and acceptance of cloud system infrastructure in general, and in the maturing of the DBMS engines. Takeup will also depend on the usage model, and whether the relaxed consistency model can be used by an application. Gartner believes that there will be additional DBMSs available as a true cloud service during the next few years; in line with what Microsoft has done with SQL Azure.

User Advice:

- Use of cloud infrastructure to host a DBMS should be restricted to development and test systems, single-user systems, or those requiring file storage in the cloud with one writer and multiple readers.

- There are still issues with security and reliability, and with the non-relational DBMSs there are issues with concurrent user control.

- Limited use for hosting Web-specific content is also a possibility.

- Exercise care in systems with high amounts of data transfer; most cloud infrastructure vendors charge for movement of data in and out of the cloud.

- Latency is another data transfer issue – the time available to transfer large amounts of data to the cloud (for example, to support a data warehouse in the cloud) can be restricted. For these reasons, initial usage for development systems (with minimal data transfer) can be beneficial; moving the systems in-house after development.

Business Impact: Initially, cloud DBMSs will have an impact for vendors desiring a less expensive platform for development. As cloud infrastructure with DBMSs gains maturity (especially in scalability, reliability and security), cloud implementations used for short-term projects (such as small departmental applications and rapid development platforms) will show marked cost reductions compared with implementations within the IT department. This advantage is reinforced by the ability to set up a cloud DBMS environment without the use of expensive IT personnel. The speed of setup will be a primary driver to rapid deployment of systems – without the usual requirements and planning necessary for IT projects within the IT department. This will also reduce the necessity for IT to respond to short notice and short duration projects, reducing overall costs in IT.

As cloud DBMSs mature, during the next two to five years, it will be possible for an organization to host the entire DBMS infrastructure; with potentially far-reaching reductions in the cost of servers, storage, DBMS licenses, maintenance and support, storage management and database administration.

Benefit Rating: Moderate

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Sample Vendors: Amazon.com; Google; Microsoft

Enterprise Portals as a Service

Analysis By: Jim Murphy

Definition: Enterprise portals provide organizations with a unified Web environment on which to manage user access, and integrate and deploy Web applications. From a user perspective, an enterprise portal is a single, personalized point of access to enterprise information, processes and people. Enterprise portals as a service employ cloud services, whether at a hardware, middleware and/or software layer, to suit enterprise portal needs.

Position and Adoption Speed Justification: Interest in cloud-based portal platforms is rising rapidly, but vendors have been slow to respond. There are barriers for technology providers and enterprises seeking to use portals as a service:

For customers, the value of a horizontal portal comes in providing a single point of access to information, processes and people. If most of the systems and information applications managing these entities lie on-premises, then hosting this point of access externally seems counterintuitive. Companies also face numerous security, privacy and governance concerns that hinder progress toward cloud-based portal platforms.

For vendors and providers, enterprise portals have generally served as a platform upon which to build and deliver a variety of Web-based applications. Thus, they require a great deal of customization on the part of the user organization. Upgrades can be extremely disruptive, even when they're controlled, as in an on-premises deployment. Providers have struggled to offer a cloud-based portal platform with a useful balance of flexibility and control.

Several factors are helping vendors and user organizations to overcome these problems. First is the movement of key applications and information assets to the cloud, such as online collaboration suites and business applications, and the subsequent movement of data to the cloud as companies overcome governance and other organizational boundaries. Second, service-oriented architecture (SOA) and Web-oriented architecture (WOA) are better-equipped to enable cloud-based, on-premises and hybrid deployments. Third, a range of technology advances – including HTML5, rich Internet applications, and advances in browser technology, widgets and mashups – should help give organizations and individuals more flexibility while insulating them from change.

The portal market is ripe for a new approach, simply because so many enterprise portal initiatives have failed or grown stagnant. Many enterprise portal deployments suffer from low user satisfaction and poor adoption. In general, organizations want more cohesive and engaging portal experiences, and a cloud-based combination of ready-made applications (such as a knowledge management portal, an intranet, a business to supplier portal, or a customer-facing portal) would be extremely attractive. This indicates that portals in the cloud may take on application-centric, rather than infrastructure-oriented, characteristics in the cloud.

Microsoft is the only megavendor that offers a complete stack of portal infrastructure and software as a service in SharePoint Online and its broader Business Productivity Online Suite (BPOS), with a choice of dedicated or multitenant offerings. IBM offers a single-tenant version of WebSphere Portal Server and Lotus Web Content Management Standard Edition on the Amazon Elastic Compute Cloud (EC2) Web cloud. IBM may also address some portal demand with its range of LotusLive messaging, collaboration and social software products. As with IBM's WebSphere, Oracle's WebCenter offering is available running on top of Amazon EC2 using the infrastructure-as-a-service model.

More vertically oriented portals as a service have gained considerable momentum among customers. Compuware's Covisint was founded as a trading exchange focused on the automotive industry, and now offers portals as a service, with particular expertise in B2B scenarios for manufacturing, healthcare, financial services and public sector organizations. For higher education organizations, CampusEAI offers portals and Web content management as a service, including general-purpose campus portals, alumni portals and prospective student portals. Organizations with common needs and a large proportion of external constituencies with which they must collaborate and cooperate (such as healthcare, government and legal) are ripe for cloud-based portal services.

Several vendors may also enter the portal market via cloud applications. Google Apps Premier Edition attracts many potential

portal customers with its cloud proposition, Sites capability, iGoogle consumer portal offering and Gadget framework; but it currently lacks the granularity of security, personalization and depth of integration required of a true enterprise portal framework.

Other possibilities loom: As salesforce.com and NetSuite broaden their portfolios in areas like content management and collaboration, and as they offer partners a simple Web-based means of integration, enterprise portal services may be inevitable.

User Advice: Smaller organizations should find enterprise portals as a service attractive and feasible today. Large enterprises should adopt a cautious attitude, deciding how enterprise portals as a service complement and interoperate with established portal assets, paying special attention to how vendors address identity management, security, reliability and integration challenges. In the short term, most enterprises should focus on integrating cloud services into on-premises portals to provide a seamless user experience.

Business Impact: Portal-as-a-service offerings will provide cost savings for small and midsize businesses, as well as for large enterprises. However, most large enterprises are not yet using true portals as a service.

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Covisint; Microsoft

Cloud APaaS

Analysis By: Yefim Natis; Eric Knipp

Definition: Cloud application platform as a service (APaaS) is a development and deployment environment for cloud-based business applications (it's an extended application server "in the sky"). Cloud APaaS, as the name implies, is offered to IT organizations as a service. Business applications developed and deployed using a cloud APaaS are business applications as a service (also known as software as a service [SaaS]). Cloud APaaS is a general-purpose platform for building SaaS applications, which intermediates such concerns as multitenancy and scalability that complicate the architecture of global-class SaaS projects. Although many older SaaS applications use embedded proprietary enabling technology and not a general-purpose cloud APaaS, this practice is rapidly becoming outdated.

Cloud APaaS is, in principle, a specialized application server (and dedicated development toolset) that is deployed "in the cloud" and offered as a service to software developers. The technology internal to cloud APaaS that facilitates the service is referred to as a cloud-enabled application platform (CEAP). Some CEAPs are offered as general-purpose products for use by the cloud APaaS providers, SaaS providers or private-cloud IT developers. Other CEAPs are used only as internal technology to power a particular cloud APaaS and not offered for sale by themselves. In all cases, however, there is a CEAP (proprietary to the cloud APaaS or generally available) that enables delivery of the cloud APaaS. In addition to cloud APaaS, some providers also offer cloud-enabled data stores, integration middleware, portal technology and other cloud application infrastructure services. Cloud APaaS is part of a larger-scope application infrastructure platform as a service (PaaS), which encompasses other middleware-style service offerings, such as database as a service and message-oriented middleware as a service. The more application infrastructure technology a provider offers, the closer it is to offering a comprehensive PaaS.

Position and Adoption Speed Justification: With the introduction of Force.com by salesforce.com and Google's App Engine, the cloud APaaS option has become known to the majority of leading-edge IT organizations and most independent software vendors (ISVs). The Windows Azure operating system (OS) includes the .NET application platform technology as well and, although limited in cloud elasticity and multitenancy, begins to further expand the mainstream cloud APaaS options to software developers. The recent entry of VMware, now in partnership with salesforce.com to offer the VMforce "Spring/Tomcat in the cloud" service, further increases competition in this market. In addition to the larger enterprise-oriented software firms, myriad startup firms specializing in various flavors of cloud APaaS abound. The interest in cloud APaaS is further advanced by the growing awareness and interest in cloud computing in general, of which cloud APaaS is a notable part – the key component of the cloud middle layer of application infrastructure PaaS.

Although current industry attention is focused on the shared-hardware, virtualization-based model of cloud APaaS (for example, the Windows Azure OS and VMforce; see "Reference Architecture for Multitenancy: Enterprise Computing 'in the Cloud'"), the more-advanced shared-everything model (for example, Force.com and App Engine) is gaining traction as well. There is more understanding and recognition to be developed here, and, likely, more inflated expectations to develop as well, but we believe that behind the advancing hype is real market-changing innovation: the gradual transformation of a data center from a custom platform to a shared service (although lack of standards will likely serve as a delaying obstacle to large-scale mainstream adoption for a few years).

As with all innovation, leading-edge organizations are adopting cloud APaaS first, and the mainstream IT organizations are cautious and awaiting code and portability standards and assurance of safety. The industry is likely several years away from well-accepted safety of cloud APaaS for mission-critical, mainstream IT projects. However, the clear advantage of ease of use, rapid time to results, low cost of entry, massive scalability and reliability, and greatly reduced system support burdens make cloud APaaS especially attractive to startup ISVs and small and midsize businesses. The new ISV application as a service will lead to a growing number of applications that are available only as SaaS and are enabled by a cloud APaaS (and/or the underlying CEAP), instead of a traditional precloud application server. These unique cloud-only applications will help lead the way for cloud and cloud APaaS acceptance by mainstream IT organizations in the next five years.

User Advice: Users of SaaS applications should use the in-cloud programming capabilities offered by the SaaS provider to custom-extend the application (salesforce.com, NetSuite and most others offer such specialized programming tools with their cloud applications). These cloud development offerings are a good place to start getting familiar with the new model of software development as a service, without incurring undue risks.

ISVs and, especially, smaller startup ISVs should look at the cloud APaaS opportunity as a serious long-term, game-changing option. Its low cost of entry, low burden of operations, and high degree of productivity and scale enable less-technical ISVs to concentrate on their business expertise and leave the IT issues to others. The risk of today's cloud APaaS is an always-present degree of vendor lock-in. Until there is a standard and shared programming model for cloud application development, this risk will remain present, although the less-agile shared-hardware cloud APaaS offerings provide substantially greater backward compatibility and dual deployment opportunity (i.e., on-premises/off-premises) than the more-cloud-native shared-everything platforms.

Large-enterprise IT departments are typically well-invested in managing their IT infrastructure, and they are not looking to eliminate their data centers. Still, some will likely find attractive the productivity and the low project initiation and system management costs of a cloud APaaS, compared with traditional on-premises application projects. Most users should plan for a hybrid environment and assure that their application integration infrastructure is prepared to manage both on-premises and cloud-based resources.

IT users should be careful evaluating the long-term total cost of ownership of cloud APaaS: Its subscription costs may gradually increase. The pricing strategies for cloud APaaS are also evolving, and a future change in the pricing model can increase the total costs as well. On the other hand, the increasing competition as new vendors enter the space will likely drive down costs, at least for some period. If standards emerge, allowing the development and sale of generalized cloud APaaS services, prices will also be driven down. In the next two years, the real costs of cloud APaaS will fluctuate over time, across providers and use patterns.

The frequently raised objection to the use of a cloud APaaS for business system projects is the mistrust by enterprises of the cloud providers' ability to manage their sensitive business data and to provide adequate service-level guarantees. Indeed, today, not enough proof exists to ensure the market of full safety from intrusion for the cloud-managed data; furthermore, the existing cloud APaaS leaders do not provide SLAs matching the quality of service available in advanced enterprise IT settings. However, users should expect that the emergence of new technologies and processes, which ensure dependable protection of data integrity in SaaS applications, is only a matter of time; moreover, in the long term, professional management of data by cloud-based providers will likely prove more secure than the custom processes developed by most enterprises in-house.

Business Impact: Cloud APaaS is a part of a fundamental and discontinuous change in the application platform market. It is part of a larger SaaS and cloud-computing phenomenon, amounting to one core change – the transition from IT solutions that are conceived, deployed and managed under the control of an enterprise IT department to IT solutions that are built using shared platforms, services and components to deliver significant economies of scale. Just as with service-oriented architecture's advanced local software sharing (reuse), cloud computing extends this notion to sharing of a greater variety of computing resources and sharing within much-larger pools of users. It is a step toward greater industrialization of IT; here, common solutions will be shared at low costs, and differentiating solutions will be assembled from partly shared and partly custom software components (the hybrid model). Most IT organizations are or will become, in the next five years, partly dependent on cloud-sourced services, and some of them will begin developing some of their own custom applications on cloud APaaS as well, especially for new Web-facing projects. This will lead to a change in IT organizations and IT skills requirements, and will result in new models for budgeting and tracking of IT initiatives.

For platform vendors, the change is the new buyer landscape (dominated at first by ISVs). For application vendors, the change is the relief from multiplatform and multiversion customer support burdens, but, additionally, dependence on new technologies and possibly new platform vendors. Software giants will compete both to establish the next programming standard emerging in the cloud APaaS space (just like Java Platform, Enterprise Edition [EE] and .NET have battled for on-premises platform domination for the past decade) and to defend their on-premises strengths from new cloud-based challengers. Users will depend more than ever on their ability to perform application integration across platforms, architectures and languages.

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Apprenda; ForeSoft; Google; Heroku; Iron Mountain; LongJump; Microsoft; Qrimp; salesforce.com; VMware

Cloud Computing for the Enterprise

Analysis By: Gene Phifer

Definition: Cloud computing will see a varied adoption pattern in the enterprise. Enterprises already use software as a service (SaaS) offerings like those from salesforce.com, but these are frequently implemented on an ad hoc, departmental basis, without the consent or knowledge of the IT department. While IT is getting more involved in SaaS decisions, there is still a disconnect between IT and the business in many enterprises. Other enterprises are using infrastructure as a service (IaaS) cloud services like storage as a service and compute services, as well as platform as a service (PaaS) offerings like Force.com. Essentially, every infrastructure component and business application running in your IT department is or soon will be available as a cloud offering. But cloud computing is in its infancy, and adoption of cloud-based services has been limited to date. This trend will change in the future as the vendors and the offerings mature and as cloud-computing success stories start to proliferate.

However, there are risks that must be mitigated before many enterprises will feel safe in using cloud-computing services for business-critical processes:

- Security – Are my business transactions and users safe?
- Data – Is my data safe? Is it private? Is it recoverable within an acceptable time frame? Is it portable? Is it located in a region that I'm comfortable with?
- Reliability – Will the service be available when I need it? Are the service-level agreements acceptable, and are they being met?
- Cost – Are the promised cost savings being realized?
- Integration – How will I integrate my on-premises services with cloud-based services? How will I integrate multiple cloud-based services with each other?
- End-to-end process control – How will I control my business process when a mix of on-premises and cloud-based services is involved?
- Vendor – Will the vendor survive the eventual industry consolidation? Is the vendor trustworthy? What is the probability and potential impact of vendor lock-in?
- Culture – Can IT adjust to not owning the computing resources and people necessary to provide services to its customers?

In the current state of cloud computing, some of these questions don't have adequate answers. In this scenario, only Type A enterprises, those willing to take on an increased level of risk, will be willing to play extensively in the cloud. However, the cloud-computing providers are rapidly addressing these issues; therefore, cloud computing will soon pose an acceptable risk for Type B enterprises. Selective, low-risk cloud services (such as technology evaluation, application development and testing) are now ready for even Type B enterprises.

It is paramount that IT embrace cloud computing, if for no other reason than to protect the enterprise from incomplete or bad decision making from business users. Many cloud-computing services, especially for SaaS, are made by business users, without adequate (or in some cases any) input from IT. Business users don't know the right questions to ask regarding security, data privacy, reliability, recoverability, support, integration and process management. These are IT topics. It is critical that IT have a partnership with the business so that any cloud decision incorporates the appropriate oversight and input from IT, as well as from the business.

This technology profile focuses primarily on the enterprise adoption of cloud-computing services from the public cloud. It does not focus on the adoption of private clouds by enterprises since this is on a different trajectory.

Position and Adoption Speed Justification: At this time, Type A enterprises are the predominant users of cloud computing, because the risk-reward equation for various cloud services is unacceptable for many Type Bs and all Type Cs. As the technologies and vendors of cloud computing mature, broader sets of enterprises will take the plunge. However, despite the significant hype, there is still much to learn about cloud computing, and further hype will ensue.

Adoption of the cloud will accelerate in the 2010 through 2011 time frame, with small businesses and enterprises in developing nations taking great advantage of cloud-based services. Large enterprises will adopt the cloud at different paces, depending on their risk profiles, but even Type B enterprises will start to take significant advantage of the cloud starting in 2011 and 2012.

User Advice: Examine cloud-computing offerings as new IT solutions are addressed in your organization, or as a replacement for existing services that are cost-prohibitive to maintain or onerous to deliver. Match the maturity of cloud-computing offerings against the enterprise's risk profile, and move forward as appropriate. Experiment now with cloud computing, even if the solutions are perceived to be too risky to use in production scenarios. Work closely with the business in exploring cloud-computing alternatives, and assure that the business does not commit to cloud services without adequate input and oversight from IT.

Business Impact: Cloud computing can have significant business impact on an enterprise, including reduced total cost of ownership, increased agility and significantly reduced cycle time to provision new IT resources.

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Emerging

Sample Vendors: Amazon; Google; IBM; Microsoft; Oracle; salesforce.com

Compute Infrastructure Services

Analysis By: Lydia Leong

Definition: Compute infrastructure services are a type of infrastructure as a service (IaaS) offering. They offer on-demand computing capacity from a service provider. Rather than buying servers and running them within its own data center, a business simply obtains the necessary infrastructure from a service provider in a shared, scalable, "elastic" way and accesses it via the Internet or a private network.

Position and Adoption Speed Justification: Four main use cases exist for cloud-based compute infrastructure services: Web hosting, high-performance computing, test and development infrastructure, and general production infrastructure.

The most rapidly maturing use case is Web hosting, as it is convergent with the general Web hosting market. Features and capabilities formerly available only on dedicated hardware are now being extended to shared cloud resources.

The use of these services for test and development infrastructure is growing for pilot projects, rapid application development environments and formal lab environments. As test and development-specific features and management tools improve, formal development environments will become more common. Batch-oriented, compute-intensive workloads, such as modeling, simulation, scientific computing and one-time processing needs such as transcoding, are highly cost-effective in the cloud.

However, before cloud computing for general workloads can achieve mainstream adoption, security, risk and compliance issues must be overcome and costs driven down even further.

Most of the companies that offer these services are based in the U.S. Although global demand is robust, adoption will be slowed by a lack of strong competition in other regions, as well as by fragmentation resulting from users' desire to keep data and processing in-country.

User Advice: Cloud providers' capabilities vary significantly, but enterprise-class clouds, with strong service-level agreements backed by financial penalties, high levels of security, and solid service and support, have emerged. Businesses can safely adopt these services; the risks are not significantly greater than other outsourced hosting approaches, assuming the cloud service used matches the service-level and security needs of the application.

Businesses should consider pilot projects for test and development, compute capacity augmentation, and Web content and applications. Successful pilots can be expanded into broader production use.

This market is evolving extremely quickly, so the suitability of these services should be re-evaluated at least once every six months. Hybrid public-private cloud offerings, enabling "cloud bursting" for on-demand capacity and business continuity, will become available at the end of 2010.

Business Impact: Cloud compute infrastructure services will be broadly advantageous to IT organizations. The cost benefits, driven primarily by automation, will be particularly significant for small and midsize businesses. Larger enterprises will benefit primarily from greater flexibility, rather than direct cost reduction.

In the short term, the benefits will be driven primarily by rapid provisioning that requires minimal manual intervention. Over the longer term, more system management tasks will be automated, leading to more efficient infrastructure management.

The metered-by-use attribute of these services will result in more efficient use of capacity. The self-service nature of these services will empower employees outside of IT operations, improving developer productivity and making it easier for business buyers to obtain infrastructure.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Amazon; AT&T; GoGrid (previously ServePath); Rackspace; Savvis; Terremark; Verizon Business

Private Cloud Computing

Analysis By: Thomas Bittman; Donna Scott

Definition: Cloud computing is a style of computing in which scalable and elastic IT-enabled capabilities are delivered as a service to customers using Internet technologies. In the broadest terms, private cloud computing is a form of cloud computing in which service access is limited, and/or the customer has some control/ownership of the service implementation. This contrasts with public cloud computing, where access to the service is completely open, and the service implementation is completely hidden from the customer. For our purposes here, the focus will be on private cloud computing that is internal to an organization – in other words, the customer has control/ownership of the service, and service access is limited to the internal organization. However, two other variants of private cloud computing (not discussed here) are community cloud computing (in which a third-party provider offers services to a limited set of customers) and virtual private cloud computing, in which a third-party provider offers the services, but the customer has some control over the implementation, usually in terms of limiting hardware/software sharing.

Organizations building a private cloud service are trying to emulate public cloud-computing providers, but within their control and on-premises. In most cases, this is based on a virtualization foundation, but private cloud computing requires more, including standardization, automation, self-service tools and service management, metering, and chargeback, to name a few. Many of these technologies are still evolving, and early deployments often require custom tools. Regardless, the biggest challenges with private cloud computing tend to be process-related, cultural, political and organizational.

Unlike public cloud providers, which maintain a small number of offered services, enterprises have many complex and interrelated services to deliver. A private cloud-computing service can fit within a broader portfolio of services delivered by a real-time infrastructure.

Position and Adoption Speed Justification: Although some of the technologies required for private cloud computing exist, many do not, or are immature. Many early examples of private cloud-computing services are focused on development and test provisioning. However, the private cloud has become a marketing

buzzword for most of the largest IT vendors, and many new products have shipped or will be shipped in 2010 to address technology gaps. Since private cloud computing is a natural evolution for the hot server virtualization trend, no vendor wants to miss the "next big thing." The hype is already tremendous, and it's going to increase during the next year.

Enterprise interest is already high, with 76% of respondents in a recent poll saying they plan to pursue a private cloud-computing strategy by 2012.

User Advice: Let service requirements lead your private cloud-computing plans, rather than technologies.

Create a business case for developing a full private cloud service, versus using public cloud services, or modernizing established architectures.

Consider the long-term road map for your private cloud service. Build with the potential to take advantage of hybrid sourcing (using both your private cloud services and public) at some point in the future.

Start slowly with development/test lab provisioning; short-term, low-service-level agreement computing requests; and simple, non-mission-critical Web services (e.g., self-service requests and dynamic provisioning for Web environments). Pilot a private cloud implementation to gain support for shared services and to build transparency in IT service costing and chargeback.

Implement change and configuration management processes and tools prior to implementing private cloud services to ensure that you can standardize on the software stacks to be delivered through self-service provisioning and adequately maintain them.

Business Impact: Most private cloud implementations will evolve from a virtualization foundation. Virtualization reduces capital costs, but private cloud computing will reduce the cost of operations and enable faster service delivery. It's primarily attractive to the business, because it enables agility – self-service ordering of frequently requested services, as well as dynamic provisioning. Test lab provisioning is an early example of a private cloud service that enables testers to improve time-to-market and efficiencies, while labor costs associated with provisioning are reduced.

Private cloud computing also changes the relationship between the business and IT, transforming how IT is consumed. The shift to services (rather than implementation and assets), pay-per-use and chargeback enables the business to focus on rapidly changing service requirements and consuming IT based on variable costs, while IT can focus on efficient implementation and sourcing (including the potential to leverage public cloud services in the future, without negatively affecting the business).

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Abiquo; Adaptive Computing; BMC; CA; DynamicOps; Elastra; Eucalyptus; HP; IBM; newScale; Novell; Surgient; VMLogix; VMware

Cloud-Computing Security Concerns

Analysis By: David Cearley; David Mitchell Smith; John Pescatore

Definition: Enterprises need to be able to evaluate the security of any service provider, but many cloud-computing services are highly nontransparent, making it extremely difficult for potential customers to assess the relative security and compliance risks. This lack of transparency is due not only to the consumer origins of many cloud service providers (such as Google, Amazon and Yahoo), but also to the use of relatively new technologies, such as virtualization and geographical dispersion of data centers. There is also overhype about potential security issues with the use of cloud services, especially since best practices for the risk assessment and security control of cloud offerings have yet to be established. Security is continually seen as one of the major obstacles to enterprise adoption of cloud-computing services.

Position and Adoption Speed Justification: The consumer roots of many cloud vendors drove those vendors to ignore the need to provide adequate information to enable corporate buyers and security specialists to determine if their services were secure enough to store and process highly sensitive or regulated data. Salesforce.com led the way in using third-party audit programs, such as Statement on Auditing Standards (SAS) 70 and the International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) 27001, to address enterprise assurance needs. Microsoft and, to a lesser extent, Google have followed suit. As cloud service vendors increasingly chase enterprise revenue during the next several years, Gartner believes many of them will achieve the same security certification levels that traditional hosting firms or software-as-a-service firms have achieved.

However, there are areas where cloud-based services will require new standards, such as in audit approaches, as well as changes in legal and regulatory requirements that will remain obstacles for adoption in some industries and geographical regions. Notification and processes for legal discovery, law-enforcement investigation or data breaches must be addressed. Many cloud providers cannot restrict data to a specific geography, making compliance with regional laws a challenge. Providers that have global data center coverage and are able to restrict data to a specific region will have an advantage. The global security community has various nascent efforts to develop standards for transparency and assessments of cloud services, but none of these will be mature before year-end 2011.

Gartner believes that enterprises that have high security needs (federal government agencies, financial services, etc.) will stay with private or community cloud services where custom security capabilities can be delivered. Enterprises with lower security needs (universities and small businesses) will find the security built into cloud services will be sufficient. Security groups should develop policies for: (1) which types of data or processes are not appropriate for cloud computing until certain security or compliance thresholds are met, and (2) which security controls and processes

may be needed as compensating controls. Security/risk groups should also identify data sets and processes where the level of security available with cloud computing today is adequate. They should actively work to adopt new tools and technologies that will enhance the security of cloud-based applications and services.

User Advice: Highly regulated or sensitive proprietary information should not be stored or processed in an external, public cloud-based service without appropriate visibility into the provider's technology and processes, and/or the use of encryption and other security mechanisms to ensure the appropriate level of information protection. Where private cloud computing is used for these workloads, use standards-based security mechanisms (versus vendor proprietary) to allow easy migration toward incorporating future public cloud offerings. Look for opportunities to deliver "security as a service" as a way to secure private and public cloud-computing use, such as encryption, Web security or denial of service.

Security- and privacy-related capabilities should be criteria when evaluating providers. Ask for details on their technology, security models and operating procedures. Negotiate security and privacy clauses beyond the standard master service agreement terms for data breach notification and responsibility. The discussions should cover service-level agreements, and ongoing access to the results of vulnerability assessments and SAS 70 Type II applications. Ask for details on data center coverage, and whether you can restrict data to a specific geography. Some cloud-based service providers offer greater visibility into their security procedures "on an exception basis," usually for larger customers. They provide information under nondisclosure agreements beyond what is available on their websites. Over time, we expect this nondisclosure information will be available in a more standardized fashion as a part of defined service-level agreements.

Business Impact: A single customer information disclosure incident can cost a company millions of dollars. Therefore, security should be a key criterion when evaluating cloud service providers. However, organizations that avoid taking advantage of new forms of externally provisioned services will miss an opportunity to adopt products that their competitors will use effectively. Enterprises that develop strategies to ensure that cloud service providers deliver the necessary level of security will meet both demands – adopting new services and products.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Sample Vendors: PerspecSys; Zscaler

Cloud Service Integration

Analysis By: Benoit Lheureux; Jess Thompson; Eric Knipp

Definition: Cloud service integration is not new, per se, but it is a relatively new application of integration software or integration as a service to IT project scenarios that involve the direct integration of cloud service with each other (cloud-to-cloud service integration), or with on-premises applications and data (cloud service to on-premises integration). Cloud service integration is increasingly an IT enabler for SaaS (e.g., salesforce.com), PaaS (e.g., Google App Engine), cloud service brokerage (e.g., Strikelron) and a wide range of other cloud service.

Cloud service integration can be solved using integration technology and service that are similar to integration solutions used to implement on-premises (internal or integration) and traditional e-commerce (B2B integration) projects. Such integration functionality includes:

- Secure, reliable communications to connect cloud-based and on-premises functionality
- Translation tools to convert business data (when required, which is more often the case than not)
- Service orchestration or process flow to disposition service and process events – e.g., routing (propagating) a customer update or order approval from one application to another
- Optional governance technology to define and manage policies related to remote execution of service and access to data
- Adapter technology to integrate with various on-premises applications and data

Such integration functionality can be delivered as software, service, or a combination of both. Cloud service providers typically offer multiple approaches to cloud service integration – typically, a combination of the Web APIs, some form of lightweight, on-premises integration technology, plus a choice of cloud service integration delivered either as software or service from one or more third-party technology providers. Another popular form of cloud service integration solution is packaged integration – i.e., prebuilt solutions (from vendors such as Appirio and Celigo), such as integrating contact information between salesforce.com and Google. Cloud service providers vary widely in terms of the quality and breadth of solutions they offer for cloud service integration. Any IT user of cloud service from more than one provider must address a key issue: leverage cloud service integration from one or more of their providers, or use their own? Many IT users leverage on-premises integration software, e.g., from Informatica or Software AG, to address cloud service integration – most providers of integration appliances or middleware originally targeted at on-premises integration problems have been enhanced in recent years to also integration with at least popular cloud provider such as salesforce.com. Regardless of which options for integration a cloud provider offers, IT users should consider their own requirements and preferences, which may include in-house and B2B integration skills and infrastructure or leveraging some form of integration as a service, either from their cloud provider or from a third-party provider.

Position and Adoption Speed Justification: The rapid adoption of cloud service including SaaS-based functionality during the past few years, combined with increasing demand from end users for improved integration of business data and processes between

cloud service and on-premises applications and data, has created an acute need for solutions to address cloud service integration. The trigger for such solutions occurred several years ago, and rapid adoption of these solutions has revealed itself in a high-profile way via so-called "vendor ecosystems" of cloud-computing/SaaS providers that offer solutions to this problem. For example, salesforce.com customers that need a cloud service integration solution can now choose from dozens of technology partners and solutions. Google offers its own Secure Data Connector in conjunction with IT partners to address cloud service integration requirements for Google Apps and applications deployed within Google App Engine. IBM recently acquired Cast Iron Systems (acquired by IBM in May 2010) to strengthen its cloud service integration capabilities within its WebSphere product line and has indicated that it plans to also leverage Cast Iron's cloud service integration in cloud service offerings that are in development. Cloud service integration is also a key enabler for cloud service brokerage, where providers intermediate and add value to cloud service prior to consumption.

Although cloud service integration has been around only a few years, marketing hype and IT end-user interest have been high and are pushing users' expectations quickly to the Peak of Inflated Expectations on the Hype Cycle.

Most solutions that are targeted at the cloud service integration requirement have evolved from some form of integration software or service, including enterprise service bus suites, B2B gateway software or integration as a service (IaaS). For example, Boomi, Cast Iron Systems, Informatica and Pervasive Software – prominent providers of cloud service integration solutions – all extended or shifted their go-to-market strategies and integration solutions portfolios a few years ago from more-traditional forms of integration. They each heavily leveraged integration functionality previously sold for use in noncloud-based integration projects, and used that as the basis for new solutions developed more specifically to solve cloud service integration problems. This included adding new capabilities, such as cloud-based integration development tools and support for Web APIs published by cloud-computing and SaaS vendors and packaged integration for frequently occurring cloud integration scenarios. Vendors such as Cast Iron Systems and Pervasive Software also now deliver their solutions in a hybrid delivery model that includes integration software and integration as a service, which allows users to mix on-premises integration software with IaaS, where necessary, to meet diverse cloud service integration project requirements. There are a large number of diverse providers for solutions of cloud service integration, some of which we provide analysis with "Who's Who in Cloud-Computing/SaaS Integration, Volume 1," "Who's Who in Cloud-Computing/SaaS Integration, Volume 2" and "Cool Vendors in Multienterprise B2B, 2010."

The impact of this approach is that many cloud service integration solutions, unlike many other new IT solutions, are already relatively mature. Many aspects of core functionality, such as translation and adapters for integrating with on-premises applications, benefit from years of prior multigenerational product development. However, available features, such as support for Web APIs and new cloud-based integrated development tools, may still be in early generations. Because the core technology is sound, companies implementing cloud service integration solutions – including IT end users and as well cloud providers including SaaS, PaaS and cloud service brokerage – can be confident that these solutions are likely sufficiently mature to support their B2B projects. These factors are driving cloud service integration rapidly along the Hype Cycle from its prior position near the Technology Trigger up to the Peak of Inflated Expectations, after which we expect it to quickly pass through the Trough of Disillusionment and then move up onto the Plateau of Productivity.

User Advice:

- When available, consider packaged integration as a solution for specific, usually pairwise, integrations between cloud service and on-premises applications and data.
- In conjunction with the advice above, cloud providers should look for opportunities to develop packaged integration solutions to simplify integration for their customers, particularly for IT end users that lack sufficient IT skills to do integration themselves.
- Cloud providers, including SaaS and PaaS providers, and cloud service brokerages, should consider using mature solutions for cloud service integration as a way to simplify integration of cloud functionality with on-premises applications, which will lower barriers to adoption.
- Although solutions for traditional e-commerce versus cloud-computing-based integration scenarios are often distinct, look for opportunities to leverage a common integration solution (either software or integration as a service) to solve both types of B2B integration.
- Avoid using a particular cloud service integration solution if it does not resonate with your own internal (A2A) and external (B2B) integration strategy – for example, you may be able to leverage existing investments for A2A and B2B integration to address cloud service integration.

Business Impact: Companies across all industries and geographies that use cloud service will eventually want to integrate that functionality with on-premises applications and data to improve multienterprise process and data integrity. Doing so can save money (e.g., by reducing manual data entry using a browser) and generate revenue (e.g., by improving customer satisfaction and competitive advantage by ensuring rapid business process execution or that master customer data is automatically synchronized between cloud-based and on-premises business software). Cloud service integration will also be a key enabler for important emerging cloud service such as PaaS and cloud service brokerage. Therefore, cloud service integration will have a high impact on the cloud-computing scenario.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

Sample Vendors: Apigent; Appirio; Avankia; Bluewolf; Boomi; Cast Iron Systems; Celigo; eBRIDGE Software; iWay Software; Informatica; InterWeave Smart Solutions; Jitterbit; Loren Data;

LTech; Magic Software Enterprises; OpenSpan; Pervasive Software; QLogitek; RevX Systems; Sesame Software; SGC Software; SnapLogic

Cloud Storage

Analysis By: Adam Couture; Stanley Zaffos

Definition: Cloud storage is a storage utility offering that is defined by the following characteristics: pay-per-use model, software-agnostic, reservationless provisioning and provider-owned; it is also frequently geographically separated from the servers that are using it. For the purposes of this Hype Cycle, we focus on the enterprise, rather than the consumer community, and exclude software as a service (SaaS) because the storage associated with it is unavailable for other applications.

Position and Adoption Speed Justification: Cloud storage currently has several iterations available on the market. Its evolution is being driven primarily by market demand for low-cost storage alternatives. We expect this segment to peak in about five years as the larger established vendors that have recently entered the market capture early and mainstream adopters of new technologies and as emerging companies reach sustainable revenue growth rates. Full-scale adoption is not likely to occur earlier due to as-yet unanswered security issues, which could lead to potential legal exposure. Unpredictable monthly costs due to usage variability and the current lack of sufficiently differentiated storage services will also affect the absorption rate of the market.

User Advice: Evaluate cloud storage as a low-cost option for certain applications such as archiving and backup because they generally are not classified as mission-critical workloads, and they tolerate relatively long latencies better than transactional workloads; additionally, security requirements may dictate the cost and management expense of data encryption, both in flight and at rest. Due diligence should also include an evaluation of the organization's key management strategy and potential vendors' service and support capabilities, including monitoring and resolving issues and customer satisfaction. Considerable investments in time and money will often be required to integrate cloud storage options into current applications and environments.

Business Impact: The cost and agility expectations set by the public cloud storage vendors are forcing in-house IT operations to change their storage infrastructure management procedures and storage infrastructure strategy. User demands for lower costs, more agility and operations that are more autonomic are also influencing vendor R&D investments and cloud service offerings. Those services that have already been influenced by user demands include: backup, versioning, encryption and secure erasure. And in response to cost concerns, vendors are offering a variety of different pricing models that allow end users to align their storage costs with their usage rates, with the goal of lowering costs in the short and long term.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Sample Vendors: Amazon; EMC; Iron Mountain; Mezeo Software; Nasuni; Nirvanix

Elasticity

Analysis By: Daryl Plummer

Definition: In the service provider view, cloud service elasticity is the ability to increase or decrease the amount of system capacity (for example, CPU, storage, memory and input/output [I/O] bandwidth) that is available for a given cloud service on demand in an automated fashion. The degree of automation of elasticity is determined by the service provider. Finally, Gartner covers an area called real-time infrastructure (RTI), that is, the architecture behind the elasticity. It focuses attention on the automated nature of the changes to capacity. Manual means of adding capacity are generally discouraged, but are more commonplace in 2010.

The consumer view of this does not require the "terminology of elasticity" to be used. Consumers simply want the appropriate resources available to them while they are working. For cloud service consumers, the difference between traditional scalability and elasticity is the "scale down" aspect – the consumer of elastic services does not pay for a fixed portion of overall capacity. The consumer pays for only what is used, up to the limits that were previously agreed on with the provider. Payment, price or cost must also be metered and billed in a way that matches the elasticity of the service.

Position and Adoption Speed Justification: Elasticity is one of the more hyped aspects of cloud computing. It is rising rapidly toward the Peak of Inflated Expectations. There is little understanding of what elasticity truly is in the market, and even less of how it can be achieved consistently. However, elasticity techniques and products have existed for some time, and all they need to grow to maturity is the application of these technologies and techniques in a more automated fashion. As elasticity is automated, the ability to take advantage of shared pools of resources grows.

In 2010, elasticity is a part of almost every cloud conversation, yet its use is still relatively misunderstood. Its use, however, is increasingly delivered as part of the value proposition of notable service offerings "in the cloud." Thus, it has become more of an expected feature than a separate concern. That said, elasticity is still growing in hype, because cloud consumers feel it is one of the critical aspects of cloud computing.

User Advice:

- Companies seeking to use cloud computing should include elasticity as a critical element of capacity planning and cloud service pricing.
- Use elasticity to reduce the amount of overall capacity you plan to use.

- Supplement your capacity using elastic cloud services.

- Use elasticity in any formula for optimizing cloud-computing costs.

- Treat elasticity as an expected feature of cloud services embedded in the offering.

Business Impact: Elasticity is an inherent trait of shared pools of resources, and it refers to tailoring system capacity on demand to its use. The ability to add capacity and release is necessary for the economics of cloud computing's usage-based models to work. Without this capability, it becomes difficult to enable two key parts of the model:

- **Pay for only what you use:** Consumers of cloud services must be aligned with the amount of capacity that they use. A service provider that wishes to deliver a certain quality of service can throttle a system up or down by using scaling policies and elasticity engines liberally.

- **Economies of scale through sharing:** In an environment where capacity is large or underused, it is possible to share that capacity among unrelated users with the goal of reducing costs for all through sharing. When one segment of capacity is left unused, it can be allocated to any user requiring space. Doing this on a fixed capacity model, or a model in which capacity is always increased, does not allow a service provider to respond as effectively to market conditions or bad economic conditions.

To be sure, no amount of elasticity can prevent a service provider from going out of business. The fact that service providers charge for usage requires them to ensure that they can still make a profit – even if demand/usage is down for long periods of time. As a result, we expect service providers to charge extra for elasticity features, thus enabling them to recoup some of their fixed costs in down periods. Elasticity benefits the consumers and, therefore, is worth any reasonable incremental price they may pay. However, the use of an elastic approach provides more-flexible options for determining how much capacity should be purchased, as well as when and how that capacity will be allocated from hour to hour. Finally, because the largest cloud-computing providers are able to realize massive economies of scale, the cost to offer a marginal increase in capacity through an elastic pricing model is negligible, when compared with the provider's overall fixed costs. For this reason, providers are likely to encourage high consumption of computing resources by offering low marginal prices.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Amazon; Enomaly; salesforce.com; VMware

Platform as a Service (PaaS)

Analysis By: Yefim Natis

Definition: A platform as a service (PaaS) is a generally accepted reference to the middle layer of the cloud technology stack that Gartner refers to as application infrastructure services. The term "application infrastructure" is often used to mean "middleware" and vice versa – in traditional contexts and in the cloud context as well. PaaS is a highly hyped notion that, in fact, has a partly uncertain meaning. A comprehensive PaaS suite, usually depicted in cloud diagrams, is a broad collection of application infrastructure services offered by a cloud service provider. Such comprehensive PaaS suites would include technologies of application servers, database management systems (DBMSs), portals, application and data integration, business process management suites (BPMSs), messaging and many other forms of application infrastructure – all formatted to be offered as a service. In reality, however, no providers yet offer anything approaching such a comprehensive offering, nor even speak of such plans. The hype surrounding the notion of PaaS is largely focused on a subset of the complete layer – the cloud application platform as a service (APaaS). Users are well-advised to carefully evaluate vendor claims about their support of PaaS, with the understanding that a "PaaS" offering may, in reality, be a reference to a relatively small subset of the complete set of application infrastructure services.

As mentioned, APaaS alone is only a functional subset of a comprehensive PaaS suite; however, with time, the leading implementations of APaaS are likely to add the functionality of most of the PaaS functional spectrum, blurring the distinction between these offerings. Already, many include a dedicated DBMS as a service, and some degree of integration, portal and BPMS as a service as well. However, not all future comprehensive PaaS offerings will be centered around an application server functionality. Some will evolve from business process management technologies as a service, composition and portal technologies as a service, and from other initial core use scenarios. As is the case of application platform products deployed on-premises, the future comprehensive cloud PaaS will come from providers of different core expertise, and will offer competitive capabilities while retaining the differentiation in their long-term technology outlooks. Much as with precloud middleware, leading vendors will entice customers with unique features, and will retain them with high switching costs – the price of using the differentiated capabilities of the platform. Today, however, much of the discussion of PaaS is, in fact, dealing with subsets, such as APaaS, BPMS as a service and others, and the recognition of the distinct comprehensive PaaS suite is relatively low.

Position and Adoption Speed Justification: Much of the attention in cloud computing has been focused on software as a service in prior years, and on infrastructure as a service (IaaS) more recently – especially on the private cloud rendition of IaaS. However, as leading software vendors begin to adjust their long-term strategies to reflect the emerging importance of cloud computing to their customer and prospect bases, they are developing plans for establishing a leadership position in the middle layer of PaaS. Historically, leadership of the traditional on-premises software market required leadership in establishing the prevailing programming models and architectures for software developers,

and in building ecosystems of partners around these platform standards. In cloud computing, analogously, the leadership of the market will require leadership and influence on the evolution of PaaS standards and practices. Microsoft introduced Azure to advance its .NET architecture to the cloud, and VMware acquired SpringSource and partnered with salesforce.com, Google and others to bring the established enterprise Java programming to the cloud. Salesforce.com itself leads with a native cloud-based architecture of Force.com, and Google positioned Web-specialized Python as the initial platform for cloud computing, then extended it to Java to attract enterprise developers as well. Each vendor also takes a different approach to the PaaS DBMS services – each has implemented its own proprietary model, from Google BigTable, to the salesforce.com DBMS, to Microsoft SQL Azure, which, despite appearances, is not a port of Microsoft SQL Server. The process of establishing the platform architecture and standards for PaaS is in its early stages, but some of the largest software vendors are already actively engaged. We expect the next two years to see a strong increase in innovation and competition in the PaaS space, with the introduction of new services and a move toward comprehensive PaaS suites. All this activity will push the notion of PaaS toward the Peak of Inflated Expectations and beyond, to the inevitable Trough of Disillusionment.

User Advice: At present, the component technologies of PaaS are at different stages of development. APaaS and integration as a service have larger communities of vendors and users than DBMSs, BPMSs or portal services, although all are growing at notable rates. Still, as PaaS component technologies evolve, users should select the services for their projects carefully and based on specific requirements, not expecting just any provider to deliver a comprehensive end-to-end PaaS offering.

When engaged in long-term planning, users should give preference to vendors that are more likely to accumulate a comprehensive PaaS offering over time. Unlike on-premises – where users can take a best-of-breed approach to selecting component technologies from different vendors – "in the cloud," the winning scenario will be where many platform requirements of an application are provided out of one data center of one cloud provider.

Users who delay adoption of PaaS to sometime in the future, when the standards, leading providers and best practices are better established, should invest now in building expertise in service-oriented architecture (SOA) and, in particular, the event-driven form of SOA. SOA is a bridge from the traditional computing in the enterprise data center to the hybrid model of computing, engaging both enterprise data center and cloud resources.

Business Impact: In the next five years, new, strong competitive PaaS offerings from industry-leading providers will alter the business of engineering and delivering software solutions to enterprises and consumers. A mature, functional, low-cost, high-productivity PaaS will be the foundation for a wave of innovation in business application services. The new levels of agility, resource sharing and productivity of software engineering will change the way IT organizations plan and develop software solutions, the kind of skills that they will require, and the way they will be managed, evaluated and budgeted. Enterprise IT will refocus on its core differentiated business and will become more responsive, but the costs of IT will not decline; rather, they will be rearranged, with more spending going to cloud service providers in the form of subscriptions and more internal IT spending focused on the management and integration of the enterprise's IT resources (internal and cloud-sourced), as well as custom engineering of specialized "family jewels" software solutions.

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Google; Microsoft; salesforce.com; Tibco Software; VMware

Cloud Computing

Analysis By: David Mitchell Smith

Definition: Gartner defines "cloud computing" as a style of computing where scalable and elastic IT-enabled capabilities are delivered as a service using Internet technologies.

Position and Adoption Speed Justification: Users are changing their buying behaviors. Although it is unlikely that they will completely abandon on-premises models, or that they will soon buy complex, mission-critical processes as services through the cloud, there will be a movement toward consuming services in a more cost-effective way. As expected of something near the Peak of Inflated Expectations, there is deafening hype around cloud computing. Every IT vendor has a cloud strategy, although many aren't cloud-centric. Variations, such as private cloud computing and hybrid approaches, compound the hype and demonstrate that one dot on a Hype Cycle cannot adequately represent all that is cloud computing. Cloud computing has moved just past the Peak and will likely spend some time in the future in the Trough of Disillusionment. Subjects that generate as much hype rarely skip through the Trough quickly.

User Advice: Vendor organizations must begin to focus their cloud strategies around more-specific scenarios, and unify them into high-level messages that encompass the breadth of their offerings. User organizations must demand road maps for the cloud from their vendors today. Users should look at specific usage scenarios and workloads, and map their view of the cloud to that of any potential providers, and focus more on specifics, rather than on general cloud ideas.

Business Impact: The cloud-computing model is changing the way the IT industry looks at user and vendor relationships. As service provisions (a critical aspect of cloud computing) grow, vendors must become, or partner with, service providers to deliver technologies indirectly to users. User organizations will watch portfolios of owned technologies decline as service portfolios grow. The key activity will be to determine which cloud services will be viable, and when.

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Amazon; Google; Microsoft; salesforce.com; VMware

Cloud/Web Platforms

Analysis By: Gene Phifer; David Mitchell Smith

Definition: Cloud/Web platforms use Web technologies to provide programmatic access to functionality on the Web, including capabilities enabled not only by technology, but also by community and business aspects. This includes, but is not limited to, storage and computing power. We use the terms "Web platform" and "cloud platform" interchangeably, and sometimes use the term "Web/cloud platforms." They have ecosystems similar to traditional platforms, but Web platforms are emerging as a result of market and technology changes collectively known as "Web 2.0." These platforms will serve as broad, general-purpose platforms, but, more specifically, they will support business flexibility and speed requirements by exploiting new and enhanced forms of application development and delivery. Web platforms reuse many of the capabilities and technologies that have been accessible on websites for more than a decade through browsers by adding programmatic access to the underlying global-class capabilities. Reuse is occurring via Web services, and is being delivered via Web-oriented architecture (WOA) interfaces, such as representational state transfer (REST), plain old XML (POX) and Really Simple Syndication (RSS). In addition to the capabilities of Web 2.0, these platforms provide programmatic access to cloud-computing capabilities. The public API phenomenon has taken WOA beyond consumer markets (e.g., Twitter) into enterprise B2B integration.

Position and Adoption Speed Justification: The use of Web/cloud platforms is happening in consumer markets. In addition, the concepts are apparent in enterprises' use of service-oriented business applications. Enterprise use of Web-based capabilities, such as Amazon Simple Storage Service (Amazon S3) and Amazon Elastic Compute Cloud (Amazon EC2), has begun as well. However, mainstream adoption of Web/cloud platforms hasn't begun yet. Additionally, early adopters have limited experience with Web/cloud platforms, and will inevitably run into challenges and issues.

User Advice: Web platforms and related phenomena have affected consumer markets first, but enterprises should evaluate the growing space as an appropriate extension to internal computing capabilities. Use of Web platforms will drive WOA, which enterprises should adopt where appropriate, along with simple interfaces, such as REST, POX and RSS (wherever possible), to exploit the interoperability, reach and real-time agility of the Internet.

Business Impact: Web platforms can be leveraged as part of business solutions, and will form much of the basis for the next generation of interest in the virtual enterprise. Web platforms can decrease barriers to entry, and can deliver substantial value for small and midsize businesses that could not afford to build and maintain capabilities and infrastructures. Examples include Amazon Web Services (including S3 and EC2), salesforce.com's Force.com, Google's App Engine and Microsoft Azure Services Platform. Note that the term "Web/cloud platform" is broader than and includes multiple layers in cloud-computing terminology (e.g., integration as a service [IaaS], platform as a service [PaaS] and software as a service [SaaS]) and the use of the term "platform" is different from the term "PaaS."

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Early mainstream

Sample Vendors: Amazon; Google; Microsoft; salesforce.com

Public Cloud Computing/the Cloud

Analysis By: Daryl Plummer

Definition: Gartner's definition of cloud computing essentially describes public cloud computing as a style of computing where scalable and elastic IT-enabled capabilities are provided "as a service" to external customers using Internet technologies. Therefore, public cloud computing is the use of cloud-computing technologies to support customers that are external to the provider's organization. It is through public consumption of cloud services that the types of economies of scale and the sharing of resources will be generated to reduce cost and to increase choices available to consumers.

Public cloud computing carries with it the concerns that security, data management, trust, control and guarantees of appropriate performance will not be sufficient to support enterprise needs. Enterprises want the value delivered through cloud-computing services, but also need to ensure that the concept is ready for delivering services that a company can rely on over time. However, public cloud computing has proved itself time and again, in the context of the Internet and the Web, from what is commonly referred to as a "consumer perspective." Sites such as Flickr and Facebook, and countless business sites delivering services from entertainment to healthcare records, have been in use for some time in the public context.

Position and Adoption Speed Justification: The public cloud is at (and a little past) the Peak of Inflated Expectations. As enterprises get heavily into experimenting with the concept, they begin serious budgeting efforts for real projects. Evaluation of peer projects that solve actual problems are under way. In addition, cloud providers are advertising their ability to deliver enterprise services and reduce cost. Customers should still be cautious about the claims of most providers, because their models are still unproved for enterprise use.

User Advice: User companies should be moving experimental projects to feasibility discussions for serious implementation in 2010. The year 2011 will be one of continued investment, and the high growth of cloud computing will exist through 2012.

Business Impact: The business impact of cloud computing in the public sense can be varied, but the basic opportunity is for businesses to consume services from other companies that will allow them to cease providing those services themselves. This can lead to companies eliminating work that previously might have been done in-house. It can also lead to massive changes in the way money is spent (for example, using operating expenses to fund external services, rather than using capital expenses to fund IT projects).

Benefit Rating: Transformational

Market Penetration: More than 50% of target audience

Maturity: Early mainstream

Sample Vendors: Amazon; Google; Rackspace; salesforce.com

"In the Cloud" Security Services

Analysis By: Kelly Kavanagh

Definition: "In the cloud" security services can be delivered as a part of Internet bandwidth services or as independent cloud-style offerings. Threat-facing services, such as firewalls, intrusion detection systems, intrusion prevention systems, antivirus services, distributed denial-of-service protection services, messaging security and Web gateway security services have seen the earliest adoption.

Position and Adoption Speed Justification: Service providers must meet customer expectations for the effectiveness, scalability, ease of deployment and cost savings of delivering security controls in the cloud or as a service. Threat-facing services can more easily meet these expectations, while internal or business-facing services (such as identity and access management) face obstacles to adoption. Ease of deployment and a lower price point make the small or midsize business an appealing initial market for these delivery models. In-the-cloud and as-a-service offerings have the potential to change the landscape for vendors by tilting the advantage toward providers of bandwidth, cloud service and security as a service, and by giving buyers an additional option in build-or-buy decisions.

User Advice: Consider service continuity, response time, customization and switching requirements, in addition to functional requirements, for security controls. Look at leveraging security-as-a-service providers, and bandwidth and remote connectivity service providers for opportunities to consolidate premises-based equipment into cloud-based delivery options, especially for mobile technology and for remote-office or branch office situations that would otherwise require on-site deployment and hardware maintenance. Where service deployment requires a blend of premises-based equipment and cloud-based or as-a-service delivery, look for uniform administration, configuration and reporting capabilities across the service components.

Business Impact: In the cloud and security as a service have the potential for cost savings and for fast deployment, as compared with equivalent-capacity, premises-based equipment.

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Sample Vendors: AT&T; Barracuda Networks; Cisco; Perimeter E-Security; Prolexic; Qualys; Savvis; Symantec; Verizon Business; Webroot; Websense; WhiteHat Security; Zscaler

Sliding Into the Trough

Real-Time Infrastructure

Analysis By: Donna Scott

Definition: Real-time infrastructure (RTI) represents a shared IT infrastructure (across customers, business units or applications) in which business policies and service-level agreements drive dynamic and automatic allocation and optimization of IT resources (that is, services are elastic), so that service levels are predictable and consistent, despite the unpredictable demand for IT services. Where resources are constrained, business policies determine how resources are allocated to meet business goals. RTI may be implemented in private and public cloud architectures, and where it is implemented is what provides the elasticity functionality as well as dynamic optimization and tuning of the runtime environment based on policies and priorities.

Position and Adoption Speed Justification: This technology is immature from the standpoint of architecting and automating an entire data center and its IT services for RTI. However, point solutions have emerged that optimize specific applications or specific environments, such as dynamically optimizing virtual servers (through the use of performance management metrics and virtual server live migration technologies) and dynamically optimizing Java Platform, Enterprise Edition (Java EE)-based shared application environments. Moreover, enterprises are implementing shared disaster recovery data centers, whereby they dynamically reconfigure test/development environments to look like the production environment for disaster recovery testing and disaster strikes. This type of architecture can typically achieve recovery-time objectives in the range of one to two hours after a disaster is declared. Because of the advancement in server virtualization, RTI solutions are making some degree of progress in the market. However, there is low market penetration primarily because of lack of standards and lack of strong service governors/policy engines on the market. This leaves customers who desire dynamic optimization to integrate multiple technologies together and orchestrate analytics with actions.

User Advice: Surveys of Gartner clients indicate that the majority of IT organizations view RTI architectures as desirable for gaining agility, reducing costs and attaining higher IT service quality. Overall progress is slow for internal deployments of RTI architectures because of many impediments, especially the lack of IT management process and technology maturity levels, but also because of organizational and cultural issues. It is also slow for public cloud services, where applications may have to be written to a specific and proprietary set of technologies to get

dynamic elasticity. We see technology as a significant barrier to RTI, specifically in the areas of root cause analysis (required to determine what optimization actions to take), service governors (the runtime execution engine behind RTI analysis and actions), and integrated IT process/tool architectures and standards. However, RTI has taken a step forward in particular focused areas, such as:

- Dynamic provisioning of development/testing/staging and production environments
- Server virtualization and dynamic workload movement
- Reconfiguring capacity during failure or disaster events
- Service-oriented architecture (SOA) and Java EE environments for dynamic scaling of application instances

Moreover, many IT organizations that have been maturing their IT management processes and using run book automation technology to integrate processes (and tools) together to enable complex, automated actions are moving closer to RTI through these actions. IT organizations desiring RTI should focus on maturing their management processes using Information Technology Infrastructure Library (ITIL) and maturity models (such as Gartner's I&O Maturity Model [IOMM]), and their technology architectures (such as through standardization, consolidation and virtualization). They should also build a culture that is conducive to sharing the infrastructure and provide incentives such as through reduced costs for shared infrastructure. Organizations should investigate and consider implementing early RTI solutions in the public or private cloud, which can add business value and solve a particular pain point, but should not embark on data-center-wide RTI initiatives.

Business Impact: RTI has three value propositions expressed as business goals:

- Reduced costs, achieved by better, more-efficient resource use, and by reduced IT operations management (labor) costs
- Improved service levels, achieved by dynamic tuning of IT services
- Increased agility, achieved by rapid provisioning of new services or resources, and scaling capacity (up and down) of established services

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: CA Technologies; DataSynapse; IBM Tivoli; Novell; Scalent Systems; Univa UD; VMware

Dedicated E-Mail Services

Analysis By: Tom Austin; Matthew Cain

Definition: Dedicated e-mail services (DES) are one of three off-premises ways of provisioning e-mail. The other two are outsourced e-mail services and true multitenant mail (MTM) services (the only type that meets Gartner's definition of cloud-based services).

Although DES do not meet our definition of cloud-based services, we include them in this Hype Cycle to address confusion in the market. DES are more cloud-like than outsourcing e-mail to an outsourcing provider. Outsourced e-mail can be delivered in a wide range of customized ways, with customized terms and conditions (at a cost). DES, by contrast, are highly standardized and typically "fixed price, fixed service" offerings (such as Microsoft Exchange Online Dedicated). DES do meet Gartner's definition of software as a service (SaaS), but they fail the multitenancy test. DES represent the ultimate evolution of the earlier application service provider (ASP) business model. True cloud-based e-mail services (such as the Gmail component of Google Apps Premier Edition [GAPE] and Exchange Online Standard) reflect a more advanced underlying technology model, offering, at least in theory, greater flexibility and lower cost. Like DES, true MTM offerings are highly standardized and typically come as fixed price, fixed service offerings.

Position and Adoption Speed Justification: DES has passed the Peak of Inflated Expectations and is heading into the Trough of Disillusionment, based on widespread concerns about security, privacy and cross-system integration. It will take time for the market to reset expectations to reflect the true value of DES and the risk management issues.

User Advice: Although Gartner believes that MTM services will eventually dominate SaaS e-mail, we also believe that DES will thrive in the long term for more security-conscious customers.

Business Impact: Both DES and MTM services offer enterprises the opportunity to exploit many of the benefits of SaaS and cloud provisioning models, such as fixed pricing, elasticity, avoidance of complexity and evergreen technology.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Enhanced Network Delivery

Analysis By: Joe Skorupa; Mark Fabbi

Definition: Enhanced network delivery comprises a combination of network-based WAN optimization services and WAN optimization controller (WOC)-equipment-based deployments. Enhanced network delivery uses a combination of protocol spoofing, route control, compression and caching to provide enterprises with improved application performance across the WAN for cloud-based services.

Position and Adoption Speed Justification: As the cloud-computing market matures, consumers and providers are realizing that applications often suffer from performance problems as network latency increases. Additionally, providers also realize that their bandwidth costs will be a significant component of their overhead. As a result, this market is being driven simultaneously by consumers and providers. Many software as a service (SaaS) consumers (including a number of Microsoft Business Productivity Online Standard Suite [BPOS] customers) are demanding that their preferred WOCs be supported by their SaaS provider, primarily to optimize HTTP/HTTPS traffic. SaaS providers are realizing significant increases in customer satisfaction and lower support costs when they bundle network-based optimization (often from Akamai) into their offerings. In some cases, SaaS providers are leveraging asymmetrical acceleration for HTTP/HTTPS applications from companies such as F5, Citrix Systems, Aptimize and Strangeloop Networks. Cloud infrastructure as a service (IaaS) providers (particularly cloud storage) are adopting WOC-based acceleration to lower bandwidth costs and to improve performance of backup and replication traffic. Over time, all of these approaches will become mainstream.

User Advice: Cloud service consumers should test applications across actual network topologies rather than assuming that they will perform adequately. If performance problems (latency- or bandwidth-related) appear, insist that your cloud provider support the required WAN optimization products or services. Cloud providers that have customer-facing HTTP/HTTPS applications should consider enhanced network delivery based on WAN optimization services and equipment-based solutions as part of their core portfolios.

Business Impact: Enhanced network delivery can reduce the cost of WAN bandwidth, while delivering significant gains in application performance and customer satisfaction.

Benefit Rating: High

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Sample Vendors: Akamai; Aptimize; AT&T; Blue Coat Systems; BT; Cisco; Citrix Systems; F5; Orange Business Services; Riverbed Technology; Strangeloop Networks; Verizon Business; Windella

IT Infrastructure Utility

Analysis By: Claudio Da Rold; Frank Ridder

Definition: An IT infrastructure utility (IU) is a shared IT infrastructure architecture provided through on-demand services. Pricing is based on service use and proven, ongoing reductions in the fixed baseline (or subscription fees) and unit costs. The IU is open, flexible, predesigned and standardized, as well as virtualized, highly automated, secure and reliable.

Position and Adoption Speed Justification: The industrialization of the IT services industry continues within a range of alternative delivery models. IUs are increasingly accepted on the market, and more organizations include them in their IT services value chain. Especially during tough economic times, organizations consider IUs as a fast way to achieve benefits. Almost half of client organizations use outsourced IU services in North America and 35% in Europe already use these services. Of these, more than 25% plan to implement IUs within 24 months. This confirms that IU has already crossed the Trough of Disillusionment, and started on the path toward maturity and broad adoption.

Despite the challenging economic environment of 2009, the industrialization of the IT services industry actually accelerated. The evolution from traditional outsourcing delivery models toward cloud computing is driving innovation at an increased pace and is leading to significant investments at different service layers. Many of these investments are being made in the infrastructure layer, as this is an area where technology is mature, sharing is possible, willingness to outsource is high and knowledge is widely available. Most service providers have already incorporated or are currently adding IU solutions into their portfolios. They often start by delivering their traditional infrastructure services, in a usage-based model, before moving rapidly into standardization, virtualization, sharing and automation as they realize this as the only way to good economics. Most of the service providers position IU and cloud computing as two sequential or parallel steps toward industrialized, off-premises services.

Seven attributes define an IU, creating unique value for organizations of all sizes (these are outlined in "The Seven Golden Rules for Industrialized IU Services"). IUs are outcome-focused, ready-to-use and charged on a usage basis. Enterprises can scale their IU use up or down. IUs are also highly virtualized and shared, automated, lean, and standardized.

The most basic IU style is utility hosting, which has evolved from traditional dedicated hosting. Providers added service elements, such as virtual servers and virtual storage, to traditional hosting to support flexible provisioning, which often still requires manual intervention to execute. Most vendors and traditional outsourcers have already added these virtualized utility services to their portfolios. Especially during 2009, new players from the telecom space entered the market with offerings that add a computing part to the network. This is quite visible in the already mentioned European Magic Quadrant, where a quarter of the main players are telecommunication companies.

From a management content perspective, the most-developed IU offerings build on standard infrastructure blocks (such as computing, storage, networking) adding elements designed to support a specific application landscape, such as ERP, communication, collaboration or CRM. The client is still in full control of the customized applications, while the service provider controls and manages the operating platform up to a level underneath the logic of the application. The provider tailors the architecture/performance/price of the service to the application requirements – for example, billing on a per-user or per-SAP Application Performance Standard (SAPS) basis.

Amazon.com (EC2 and S3 offerings); smaller providers such as GoGrid, Joyent, OpSource and Softlayer; and virtual data center hosting companies deliver IU services that leverage a cloud computing approach. Virtual data center hosting companies enable the implementation of complex virtual architectures in their physical data centers. Traditional outsourcers and small startups, such as ThinkGrid, are also introducing virtualized desktop utility services into the market.

Pure public cloud solutions often do not give visibility to the structure, architecture, operations and security of the global data centers or computing environment, a fact that causes compliance issues for certain industries (such as banking, insurance and the public sector). IU solutions close the transparency gap and therefore enable regulated industries to leverage solutions based on the seven attributes as well.

Most infrastructure service providers have delivered some financial flexibility to their clients – even in the traditional dedicated environments. However, under the competitive pressure of virtualized and shared IU offerings, service providers must move ahead with real IT service industrialization to deliver standardized, virtualized and shared environments that also enable additional layers of automation, while increasing the level of security of their environment.

From a maturity perspective, we map the advancement of IU against our Infrastructure Utility Maturity Model (IUMM); see "Gartner Introduces the Infrastructure Utility Maturity Model." Leading IU providers are still delivering at Level 3 (virtualized) of the IUMM and are progressively implementing elements at Level 4, which is all about automation. What's stopping many service providers from running full speed into Level 4 is that an increased level of automation decreases the number of touchpoints with the client, something they currently rely on for upselling and relationship-improvement efforts. Although some IUs, like IU for SAP, are quite mature, and see high double digit growth rates, more complex and complete IU architectures will emerge within leading IU providers. These architectures offer basic IU services (virtual server and virtual storage) that are modular. Providers can group and combine these services to support more complex client requirements, aligned to specific application landscape or more broad vertical or segment-specific requirements.

The contribution that IU solutions make to a client's ability to control and increase flexibility is the key factor accelerating these solutions in the market:

- **Price:** Providers can spread costs across multiple clients because of the high use of virtualization technologies, standardization, and their investment in technology and tools. Process standardization and the use of automation also help to reduce cost. There is limited costly customization, and pricing for IUs decreased by between 10% and 20% in 2009 – driven by recession and competition – which is a great efficiency gain.

- **Flexibility:** Companies that grow through acquisitions or shrink due to restructuring, and other firms with dynamic resource needs can benefit significantly from an IU solution. Scaling the service up or down is easy, because providers offer usage flexibility of 50% and more, and thus very low baselines, which helps reduce costs quickly (by reducing volume).

- **Quality:** Providers invest a lot of money and brain power in process excellence and further automation. Client organizations we had discussions with – including references and case studies – seldom complained about failing service-level agreements, large downtimes or escalations with their IU service providers. This, over time, will lead to trust and acceptance of industrialized solutions.

Traditional providers must accelerate their investment and further industrialize their IT infrastructure service delivery, because new and disruptive approaches – especially those based on cloud computing – and new providers will progressively threaten the status quo of every insourced or outsourced solution. In the next five years, IUs will drive consolidation, and large providers will end up winning the market share battle, growing organically or by acquisition.

Overall, the outsourced services that are delivered through an infrastructure utility approach and fulfill the seven traits described above have been grouped into a subset of the IT services marketplace, defined as infrastructure utility services (IUS). These services represent the provision of outsourced, industrialized, asset-based IT infrastructure managed services (below the business application functional layer). IUS are defined by service outcomes, technical options and interfaces, and are paid based on resource usage, allocation, or number of users served.

For this market, Gartner has created a formal market sizing and forecast. The forecast shows that the IUS market was worth $7,101 million in 2009. By 2013 it will grow to $23,501 million, representing a compound annual growth rate (CAGR) of 34%. But this will represent only 11.8% of the combined infrastructure managed services market in 2013. This clearly underlines the huge potential impact associated with the development of IUS, both on traditional and cloud-based architectures.

User Advice: IU is a maturing alternative delivery and acquisition model for infrastructure management services.

All clients should:

- Gain an awareness and understanding of these offerings in order to leverage their value for their enterprise.

- Include IUs in the set of service options under evaluation as part of their sourcing strategy and enterprise architecture.

- Investigate critical areas, including pricing mechanisms and demand management, architectural specifications and limits, transition in and out, contract terms and conditions, security, compliance, auditing, and risk management.

- Use the Gartner IUMM as a road map to follow the evolution of infrastructure toward the real-time infrastructure concept. This evolution will affect most organizations, regardless of their decision to transform and run their infrastructure internally (insourced delivery) or externally (outsourced delivery or IU).

Organizations delivering their IT infrastructure services in-house should:

- Regularly check how IU offerings are advancing in the market. Increasingly, these offerings will become the external benchmark for price, efficiency and flexibility. Examples include an SAP production managed platform (excluding SAP licenses) at $15 per user per month (PUPM) or a Microsoft Exchange IU service at $5 PUPM. The entry level for IU for SAP has currently dropped below $10 PUPM.

- Organizations considering outsourcing deals or utility offerings should:

- Concentrate on pricing units and pricing schema – and on the related tools for service requests, metering, billing, and financial and service reporting – to understand the maturity of offerings. The degree of flexibility must align to client requirements and the maturity of the offerings.

- Request references from other clients using these offerings and pricing units, and exercise due diligence in actively checking those references.

- Ask the provider to carefully describe the processes, automation tools and service-level agreements underpinning service delivery quality and efficiency, because a focus on unit definition and pricing alone is insufficient to achieve the best value for money.

- Request that providers communicate their service/architecture road map to understand how their offerings evolve over time and to judge the potential for lock-in into their specific architecture.

- Understand how their sourcing life cycle (sourcing strategy, vendor selection, contracting and ongoing management) will change when embracing highly standardized solutions.

- Start piloting or using infrastructure utilities as part of their IT value chain.

- Request proof regarding statements of regulatory compliance and verification of security and location transparency of data stores.

- Verify the impact of software licensing models when moving from dedicated to shared IU-based hosting solutions.

Business Impact: IT IU can: optimize the cost-efficiency and service effectiveness of IT infrastructure; increase flexibility in response to business requirements; and deliver an open, predefined, automated platform for innovation. To benefit, clients must overcome significant cultural, financial and technical issues, such as standardization acceptance, independent software vendor pricing strategies, application portability, virtualization and policy-driven management on heterogeneous environments. The still uncertain economy and the further rise of cloud-enabled services solutions will accelerate the evolution toward industrialized IT services.

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Amazon.com; Atos Origin; AT&T; BT Global Services; Capgemini; CSC; HCL Technologies; HP; IBM; Logica; Rackspace; Savvis; Siemens IT Solutions and Services; T-Systems; Terremark; Unisys

Climbing the Slope

SaaS

Analysis By: Robert DeSisto

Definition: Software as a service (SaaS) is software that is owned, delivered and managed remotely by one or more providers. If the vendor requires user organizations to install software on-premises using their infrastructures, then the application isn't SaaS. SaaS delivery requires a vendor to provide remote, outsourced access to the application, as well as maintenance and upgrade services for it. The infrastructure and IT operations supporting the applications must also be outsourced to the vendor or another provider.

The provider delivers an application based on a single set of common code and data definitions, which are consumed in a one-to-many model by all contracted customers at any time. Customers may be able to extend the data model by using configuration tools supplied by the provider, but without altering the source code. This approach is in contrast with the traditional application-hosting model, in which the provider supports multiple application codes and multiple application versions, or a customized data definition for each customer.

SaaS is purchased on a pay-for-use basis or as a subscription based on usage metrics. Purchasing is based on a subscription (for example, a per-user, per-month fee) or usage basis (for example, allocating a certain number of transactions for a fixed time period). A perpetual license purchase is not considered SaaS.

Position and Adoption Speed Justification: The purpose of the SaaS positioning on the Hype Cycle is to provide an aggregate view of the state of SaaS in the context of cloud computing. There are examples of SaaS, such as isolated tenancy, that would not be considered cloud computing. The SaaS positioning reflects the maturity of SaaS in the context of leveraging the cloud-computing infrastructure. Because different software applications using SaaS

would be placed on different spots on a Hype Cycle, the post-Trough of Disillusionment positioning reflects the fact that SaaS is proven in certain markets, but remains nascent in complex application markets, such as ERP.

User Advice: Companies with complex requirements should not assume they will significantly lower their total cost of ownership or reduce complexity by moving to SaaS. Companies with tight capital budgets, and those that are IT resource-constrained or want to get something simple deployed quickly should consider SaaS. Even if one or more of the three elements involved in considering SaaS are not met, a SaaS solution still may be best for a company. As with any product, however, a company should evaluate the functional capabilities of the SaaS offering to meet the company's specific requirements.

Business Impact: SaaS has the effect of lowering expenses for the first two years because it does not require an upfront capital investment. However, in outlying years, SaaS may become more expensive, because the operating expense does not decrease. SaaS is also helpful to companies that do not have IT resources to deploy and maintain on-premises software. This is prevalent in small and midsize businesses, but also is applicable to large businesses that may have experienced downsizing in the IT department.

Benefit Rating: Moderate

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: Concur; Microsoft; NetSuite; salesforce.com; SuccessFactors; Taleo; Workday

SaaS Sales Force Automation

Analysis By: Robert DeSisto

Definition: Although there are many components of a sales force automation (SFA) solution (such as proposal generation, sales configuration and pricing management), the primary focus of software-as-a-service (SaaS) SFA is opportunity management. This is the practice of systemizing how sales channels pursue sales opportunities in the context of preferred philosophies, methodologies and strategies. As opportunities enter the sales cycle in the form of leads and move through a defined sales process, they are tracked and updated. Leads may be developed by an inside sales channel, then distributed to direct salespeople or selling partners to close. Pipeline management capabilities provide a view of sales opportunities by sales stage or potential close date. As required, salespeople can create and submit forecasts from their active opportunities. With visibility into opportunity data, sales management can inspect, coach and mentor sales representatives, while analyzing the opportunity data at each level in the sales hierarchy to predict sales performance.

The underlying customer information layer of opportunity management is contact management. Contact management systems provide internal data – such as name, address, interactions and product/revenue values – for the accounts in a territory and the contacts in an account. Salespeople can create and share valuable account/contact intelligence, such as account strategies, corporate goals or strategic objectives, competitive presence, and decision-making authority and disposition. Customer information can be enhanced further by incorporating external or third-party data, as well as customer profiles derived from marketing or customer service (for example, customer value or churn risks).

Position and Adoption Speed Justification: Introduced in 1999, SaaS SFA is more than 10 years old. Primarily driven by the early market success of salesforce.com, megavendors such as Oracle and Microsoft have also established SaaS SFA offerings. Gartner estimates there are at least 2.5 million SaaS SFA users. All market segments, from small to large, have validated its use, and users have a better expectation of the real benefits and costs associated with SaaS SFA. IT departments are more engaged in purchasing decisions, and are becoming more involved in vendor evaluations, placing higher scrutiny on the on-demand provider's data center operations, upgrade practices and service-level agreements (SLAs).

In 2009, support for disconnected laptops was an issue for SaaS SFA reaching the Plateau of Productivity; however, the increased adoption of smartphones, such as Apple's iPhone and those of Apple's competitors, is providing a richer user experience, thereby reducing the need for disconnected laptops in many parts of the market. We still gain a better understanding of the true total cost of ownership (TCO) during the three-to-five-year horizon. Gartner has also received an increased number of inquiries regarding the cost benefits of SaaS.

User Advice: Sales organizations with complex requirements (such as significant process automation outside of opportunity management and complex real-time integration) should not assume that they will significantly lower their TCO simply by moving to SaaS. Companies with tight capital budgets, those that are IT-resource-constrained and enterprises that want to get something simple deployed quickly should consider SaaS SFA. Even if one or more of the three elements involved in considering SaaS SFA are not relevant, a SaaS solution still may be best for a company. However, as with any product, sales organizations should evaluate the functional capabilities of SaaS SFA offerings to meet the company's specific requirements.

Business Impact: The primary business effect of SaaS SFA involves the capabilities that manage accounts, contacts, opportunities and sales pipelines. Sales organizations gain greater visibility, sales process formalization and help with bottom-up forecasting.

Benefit Rating: Moderate

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: B-kin Software; CDC Software (Pivotal); Highrise CRM; Landslide; Microsoft; NetSuite; Oracle; salesforce.com; Sage Software; Sawfish Software; SugarCRM; Zoho

Virtualization

Analysis By: Thomas Bittman

Definition: IT virtualization is the abstraction of IT resources in a way that masks the physical nature and boundaries of those resources from resource users. An IT resource can be a server, a client, storage, networks, applications or operating systems. Essentially, any IT building block can potentially be abstracted from resource users.

Abstraction enables better flexibility in how different parts of an IT stack are delivered, thus enabling better efficiency (through consolidation or variable usage) and mobility (shifting which resources are used behind the abstraction interface), and even alternative sourcing (shifting the service provider behind the abstraction interface, such as in cloud computing). A key to virtualization is being able to effectively describe what is required from the resource in a relatively independent and standardized manner, or having an interface that converts requests into a "portable" and abstracted form. In essence, cloud computing is all about abstracting service implementation away from the consumers of the services by using service-based interfaces (in other words, the interface for cloud-computing services is all about virtualization – an abstraction interface). But, to a provider, virtualization creates the flexibility to deliver resources to meet service needs in a very flexible, elastic, rapidly changing manner. The tools that make that happen could be virtual machines, virtual LANs (VLANs), or grid/parallel programming.

Position and Adoption Speed Justification: Virtualization is not simply one technology, rather it is many technologies that are all evolving at different rates. Virtual machines for servers, for example, were introduced on the mainframe more than 30 years ago. However, virtual machines for x86 architecture servers were first introduced in 2001, and, today, are used for less than 25% of all x86 architecture workloads. x86 architecture server virtualization is being rapidly adopted, however, and is expected to be used by half of all workloads by 2012. Storage virtualization is relatively mature within storage vendor offerings, originally in homogeneous forms only, but with a growing number of heterogeneous offerings. Networking is extremely mature in terms of virtualization. There are many different forms of virtualization, and the challenge is in choosing which form of virtualization to use. For example, server virtualization tools tend to dictate how storage and networking will be virtualized. Abstracting a resource usually means commoditizing it, so vendors will not promote an abstraction technology that hides their differentiation, and thus will promote their own virtualization technologies. There are many technologies and many competing solutions, and not all the technologies are mature as of yet.

User Advice: The virtualization trend has caused huge turmoil with vendors, threatening commoditization status and removing the vendor's ability to differentiate and influence buyers. Vendors are focusing on competing for ownership of the virtualization layers, and the management/automation tools that work with those virtualization layers. Be cautious about vendors that promote one technology to virtualize everything. Different technologies will be appropriate for different situations. Be cautious about vendors that promote one technology to manage everything. In the end, architectures will include many different virtualization layers, with many different management mechanisms. Effective tools will work with those different management mechanisms, rather than replace them. Virtualization is about much more than simply technology architecture. Virtualization causes cultural and political change. Virtualization projects, therefore, need strong executive support to drive those changes. Finally, virtualization requires processes and management tools to fundamentally change. Processes need to account for speed, agility and granularity – all of which are very different in virtualized environments. At the highest level, management tools need to shift from managing vertical, tightly integrated silos into managing horizontal resource pools to meet service needs. Virtualization projects that don't have effective management strategies will fail.

Business Impact: Virtualization makes it easier for IT to deliver faster, to have a lower barrier to entry and to deliver only exactly what is needed – no more and no less. This puts more pressure on the user to use IT efficiently, and to make good business decisions about the use of IT. As an IT catalyst, virtualization can help a business adjust to changing market trends much faster than before, transforming the business and its use of IT. However, a lubricant used badly can also cause a business to "slip and fall."

Virtualization forces enterprises to deal with IT like any other business unit – not simply as a cost center, but as an investment. Businesses will need to adjust to leverage the speed and granularity that virtualization provides (for example, virtual machines can be deployed roughly 30 times faster than physical servers). That includes making good decisions about how many resources to ask for, and taking advantage of speed to deploy IT-based solutions much faster to meet the business's needs. Part of an effective virtualization deployment requires shifting to usage-based costing and chargeback to treat this more-fluid IT resource as any other business.

Benefit Rating: Transformational

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: Cisco; Citrix Systems; EMC; HP; IBM; Microsoft; NetApp; Oracle; VMware

Cloud Advertising

Analysis By: Andrew Frank

Definition: Cloud advertising is a business process cloud service defined as the capability to deliver advertising where the content and the fee charged are determined at the time of end-user access, usually by an auction mechanism that matches bidders with "spots" as they become available. Search engine marketing (SEM) and various forms of online display advertising (for example, banners) are the most developed formats, but the concept is also evolving to other channels and platforms, such as online video, mobile devices, addressable television and out-of-home digital signage.

Position and Adoption Speed Justification: Cloud advertising has been developing steadily over the past decade, although its classification as such began in 2009. The trigger for this technology was arguably the emergence in 1998 of goto.com, a spinoff from Idealab that offered advertisers a platform on which they could bid to appear at the top of search results pages for specific searches. Goto.com was subsequently renamed Overture and acquired by Yahoo. Google launched AdWords in 2000 and later settled a patent dispute with Yahoo over search advertising in 2004. As the dynamic auction model proved successful, it moved beyond search to other formats and channels, although search continues to command the largest share of cloud advertising.

Cloud advertising is forecast to be the largest contributor to the growth of cloud services revenue during the next five years and, as such, is a large and slow-moving trend. Although it is somewhat mature in the online category, its growth in other digital media is still to come, and it is currently the focus of major investments all along the advertising, media and communications value chain.

The designation of this category as "business process as a cloud service" acknowledges the significance of its revenue contribution to the development of cloud infrastructure and applications.

User Advice:

- Marketers should hire or partner with specialists to realign advertising practices around cloud-based processes.
- Marketers especially need to develop integrated enterprisewide platforms and approaches to measure and optimize marketing activities across channels, based on the capabilities presented by cloud advertising services.
- Cloud service vendors should understand the opportunities and costs associated with various cloud advertising models, such as real-time bidding, and evaluate their impact on and applicability to cloud architectures.

Business Impact: Cloud advertising will have a high impact on the economics and accountability of advertising and marketing in general. Marketing is often characterized as largely unaccountable spending, particularly when a recession brings cost-cutting pressures to bear. Cloud-based marketing data and exchanges that support highly targeted delivery of rich messages and interactive response will create new opportunities to reduce risk and improve the efficiency and effectiveness of advertising, tying activities more closely to sales and, thus, making it less vulnerable to cuts.

Benefit Rating: Transformational

Market Penetration: More than 50% of target audience

Maturity: Early mainstream

Sample Vendors: AppNexus; Baidu; Google; Microsoft; PubMatic; Yahoo

Integration as a Service

Analysis By: Benoit Lheureux; Paolo Malinverno

Definition: Integration as a service (IaaS) is integration functionality – i.e., secure B2B communications, data and message translation, and adapters for applications, data and cloud APIs – delivered as a service. IaaS is always scalable, sometimes elastic, but is almost always deployed with enough multitenancy capabilities such that one instance of a provider's IaaS functionality can support multiple B2B integration projects across multiple B2B communities.

There are two categories of IaaS:

- IaaS for traditional e-commerce projects
- IaaS for cloud service integration

The first category has existed for over 20 years and is associated with traditional e-commerce (supply chain integration) projects, and the second category has emerged in the last four years in conjunction with the emergence of cloud services. While these two forms of IaaS share much in terms of their definitions and functionality, they differ substantially in terms of their approach to implementation, usage scenario, vendor landscape and user ecosystem.

IaaS for Traditional E-Commerce

Twenty years ago, providers of IaaS were generally called value-added networks (VANs), trading networks, Internet VANs, etc. However, in recent years, traditional EDI vendors have evolved, and new vendors have introduced new types of IaaS to address various forms of e-commerce. IT providers have labeled their various IaaS offerings as VANs, transaction delivery networks, Web services networks, business process networks, business integration networks, business process hubs, integration service providers, marketplaces, EDI SaaS, integration SaaS and so on. Regardless of what vendors have named their B2B services, we have considered and rated them as integration service providers for the purposes of the "Magic Quadrant for Integration Service Providers." Nearly 100 IT service providers worldwide offer some form of IaaS, but other than that point of commonality they are exceptionally diverse in their overall portfolios of IT services and industries served. Such providers include:

- Evolving EDI VANs – for example, GXS, Inovis and Sterling Commerce
- Emerging Internet VANs – for example, EasyLink Services International, Hubspan and SPS Commerce
- Providers from a particular industry (but now serving multiple industries) – for example, Compuware (Covisint), Elemica, Liaison Technologies, Quadrem and Railinc

- E-commerce-focused providers offering SaaS and IaaS – for example, E2open, eZCom Software, RedTail Solutions and SPS Commerce

- SIs offering IaaS – for example, Atos Origin, Bluewolf, HP Enterprise Services and IBM

IaaS for Cloud Service Integration/SaaS Integration

As SaaS and other forms of cloud services proliferate, there has been a corresponding increase in the need to integrate cloud service functionality with on-premises business applications and data, or to link cloud services directly among various cloud service providers. While integration software is one approach to solving this requirement, many IT users choose IaaS for cloud services, in part because that is consistent with their desire to shift the cost of IT infrastructure from a capital to an operational expense.

From the basic functionality point of view, IaaS for cloud service integration is much like IaaS for traditional e-commerce – it includes secure communications, data translation and adapters. But beyond these functional similarities, IaaS implementations for cloud service integration differ substantially. Most providers of IaaS for cloud service integration leveraged the intellectual property they originally developed for traditional e-commerce integration projects and enhanced it – e.g., by adding or improving multitenancy, provisioning capabilities and direct cloud API support – prior to launching new IaaS offerings for cloud service integration projects. Many IaaS for cloud service integration offerings – e.g., from Bluewolf, Boomi, Cast Iron Systems and Informatica —include cloud-based integration development environments (IDEs) that can be executed from a standard Web browser. IaaS solutions for cloud service integration are often distinguished by their emphasis on packaged integration specifically for cloud service integration problem scenarios, such as synchronizing customers and orders between salesforce.com and Intuit (QuickBooks).

Position and Adoption Speed Justification: IaaS Adoption for Traditional E-Commerce

Companies worldwide heavily leverage IaaS for traditional e-commerce projects (such as supply chain integration in retail and manufacturing) and for various other industry-specific requirements (such as track-and-trace in logistics or claims adjudication in healthcare). IaaS for such uses is quite mature, and providers of IaaS have invested in their IT operations to enhance functionality (e.g., adding business activity monitoring and improved community management), and to drive increasing scale and efficiencies (e.g., switching to more-modern, scalable IaaS architectures). Those IT modernizations, combined with increasing adoption and the prevailing perception that IaaS is increasingly a commodity, have been driving down IaaS prices for nearly a decade. Nevertheless, IaaS for traditional e-commerce is still a valuable IT service for companies doing B2B integration; therefore, adoption continues to increase, as indicated by the increasing numbers of companies and transactions handled by the providers of IaaS each year (generally ranging from a 10% to 100% increase in the number of companies served and transactions exchanged per year, depending on the size of the provider). This trend has been consistent worldwide year to year – even during the current worldwide recession – as more companies seek outsourcing (subscription) alternatives to the significant (capital) cost of expanding B2B infrastructure and staffing when it is necessary to scale up their B2B projects.

IaaS Adoption for Cloud Service Integration

Cloud service integration is a relatively new B2B integration project scenario, yet the buyers of IaaS for cloud service integration range from line-of-business IT buyers – primarily only focused on the cloud service to on-premises integration problem – to more-traditional IT buyers – focused on cloud service integration and on traditional e-commerce integration. Providers of IaaS for cloud service integration often sell directly to IT end-users; they also sell a substantial proportion of their IaaS services (we estimate 50%) through IT channel partners such as SaaS providers, system integrators, value-added resellers and megavendors, such as Amazon and Google. This is because many IT service providers – particularly SaaS providers – must address cloud service integration, yet would prefer to invest their limited R&D capabilities on differentiated functionality that builds a barrier to entry in their target markets, rather than making substantial investments to solve a technically complicated integration problem. Four years ago, there was basically no market for IaaS for cloud service integration. Today, we estimate that companies spend $50 million on IaaS for cloud service integration, and that this IT market segment will grow at 25% CAGR for the next five years.

IaaS Position Justification

The widespread use of IaaS for traditional e-commerce projects has been pulling IaaS steadily up the slope toward the Plateau of Productivity, and the fast-growing adoption of IaaS for multienterprise SOA projects and cloud-computing/SaaS integration projects is helping to drive IaaS' momentum up the slope and ultimately into the Plateau of Productivity during the next few years. IaaS is being offered by a wide range of providers, from vendors that are primarily focused on traditional e-commerce projects (such as GXS) and those focused primarily on cloud-computing/SaaS integration projects (such as Boomi).

Although the Trough of Disillusionment is several years past, IaaS is slowly traveling up the slope to the Plateau of Productivity. Vendors continue to expand and refine their IaaS offerings to incorporate new capabilities, including programmatic APIs (such as from Loren Data) to provision and access IaaS services. Vendors are also implementing Web-based IaaS development in support of IT end-user and independent software vendor (ISV) self-provisioning of IaaS functionality; adding better Web services and governance to support multienterprise service-oriented architecture (SOA) projects; expanding operations, including multisite regional data centers to more effectively support international B2B projects; and improving community management tools to enable self-service IaaS and drive down costs for hubs managing large multienterprise communities.

User Advice:

- Consider IaaS for traditional e-commerce when you need to electronically exchange transactions, documents and messages with external business partners, and you do not wish to deploy your own B2B-enabled integration middleware and directly connect to the members of your B2B community directly.

- Consider IaaS for cloud service integration when you must integrate cloud services among cloud providers or with on-premises applications or data, and you prefer to consume this capability as a service, rather than purchase and deploy integration software.

- Multinational IaaS capabilities are maturing, but prospects should always verify whether a potential IaaS provider can meet their particular country-by-country requirements, including local-language support, e-invoice formats and regulations, and in-country IaaS network points of presence.

- When negotiating an agreement with providers, look for transparent and predictable pricing. Customers are increasingly signing deals with "bundled" B2B integration features, such as a tiered number of external business partners and volume, fixed-price in-line translation, and process visibility that associates relevant B2B documents (for example, purchase orders, advanced shipment notices and invoices for order to cash).

- Refer to the "Magic Quadrant for Integration Service Providers," "Who's Who in Cloud-Computing/SaaS Integration, Volume 1" and "Who's Who in Cloud-Computing/SaaS Integration, Volume 2" to gain an understanding of the highly diversified IaaS vendor landscape.

- Integration projects can be deceptively complex, and, by itself, IaaS doesn't always sufficiently address customer requirements. Determine whether your IaaS provider also offers such services as B2B integration outsourcing.

Business Impact: IaaS has been widely deployed worldwide for more than a decade. In 2009, IaaS generated more than $1 billion in IT revenue worldwide for traditional e-commerce projects and more than $50 million in IT revenue for cloud service integration. This makes IaaS one of the most widely adopted and well-established forms of application infrastructure delivered as SaaS. Although many companies still implement B2B projects themselves, leveraging a combination of in-house integration middleware and B2B standards or Web APIs, companies of all sizes in all industries and in most well-developed regions have the option to outsource their B2B infrastructures, rather than licensing and deploying some form of in-house B2B integration software.

Multienterprise projects are typically mission-critical, but the increased modernization, reliability and scale provided by most providers of IaaS mean that companies have a viable alternative to B2B software and in-house B2B infrastructure projects. Hence, from a sourcing point of view, they should treat B2B infrastructure investments like any other IT investment when choosing between implementing an in-house B2B infrastructure or relying on IaaS.

Even the simplest in-house, single-server B2B infrastructure project may require off-site hosting, high-availability server configurations, disaster recovery capabilities, monitoring tools, archival of business documents and a well-trained staff. Service providers with well-established, multitenant infrastructures can generally achieve economies of scale to deliver such capabilities. For common integration scenarios, they often provide some form of configurable or customizable prepackaged integration solutions. This means they have the opportunity to save companies 10% to 30% on the cost of implementing B2B infrastructure themselves in-house, by leveraging their packaged integration, as well as fault-tolerant and disaster recovery capabilities across multiple B2B communities.

Benefit Rating: High

Market Penetration: More than 50% of target audience

Maturity: Mature mainstream

Sample Vendors: Bluewolf; Boomi; BT Group; Cast Iron Systems; Comarch; Crossgate; DiCentral; E2open; EasyLink Services International; Elemica; GXS; Hubspan; Informatica; Inovis; Kewill; Liaison Technologies; Mincom; nuBridges; OmPrompt; Perfect Commerce; Pervasive Software; Railinc; RedTail Solutions; Seeburger; SPS Commerce; Sterling Commerce; T-Systems; Tieto; True Commerce

Security as a Service

Analysis By: John Pescatore

Definition: "Security as a service" means security controls that are owned, delivered and managed remotely by one or more providers. The provider delivers the security function based on a shared set of security technology and data definitions that are consumed in a one-to-many model by all contracted customers anytime on a pay-for-use basis, or as a subscription based on use metrics. There can be some customer premises equipment involved, but only where dictated by the service provider, not by the enterprise.

Position and Adoption Speed Justification: Security as a service is a delivery option that offers several features that are attractive to enterprises and smaller businesses. It can be procured through operating budgets, rather than through capital expenditures, which reduce first-year costs and can decrease infrastructure maintenance and operating costs. Security as a service done right can also result in delivery of stronger security, because the security-as-a-service provider takes advantage of visibility across many customers to more rapidly detect and remediate emerging threats. Gartner believes that security as a service will be one of key delivery mechanisms for enabling enterprise use of public cloud-computing services.

Threat- and vulnerability-focused markets, in which access to continual updates and expertise is a ripe security-as-a-service target, are receiving the most traction. The markets for offerings,

such as e-mail security, Web security scanning and vulnerability assessment security as a service, are still dominated by best-of-breed security-as-a-service-only providers. E-mail security as a service continues to be the most mature and dominant security-as-a-service offering, with more than 40% of the e-mail security market delivered as a service in 2009. Newer and fast-growing security-as-a-service markets include Web security gateway, application security scanning and website protection, accounting for 2% to 20% of their respective markets in 2009. SIEM and IAM security-as-a-service adoption is still embryonic.

Recent changes in the market include mainstream security vendors acquiring growing security-as-a-service expertise, such as McAfee acquiring MX Logic, Barracuda acquiring Purewire, and Cisco acquiring ScanSafe. Gartner anticipates that infrastructure vendors offering "as a service" or cloud offerings will embed their own security-as-a-service capabilities, in addition to third-party "premium" security-as-a-service options, in which third-party services will sit within their hosted operations.

There are risks in consuming security as a service, as the failure of a vendor can lead to the immediate loss of the security control without customer premises capabilities. Enterprises should thoroughly vet the financial stability of pure-play security-as-a-service providers.

User Advice:

- When customization is limited, and limited levels of direct control are required on a security function, look for security-as-a-service delivery options:

- Weigh service-level agreements for availability, response and performance as part of your evaluation criteria.

- Carefully consider all costs in comparing security-as-a-service offerings with other service delivery options, including implementation costs, recurring costs (including upgrade costs and new feature releases), service continuity contingency plan costs, and termination or switching costs.

- Where technology vendors offer solutions based on their products plus a security-as-a-service delivery capability (to address, for example, remote-office or mobile user requirements), ensure that the features and management/reporting capabilities across the blended product and service provide sufficient control and do not increase management cost.

Business Impact: Security as a service offers the potential for lower-cost delivery of security controls and functions, with faster implementation cycles and easier switching among service providers.

Benefit Rating: Moderate

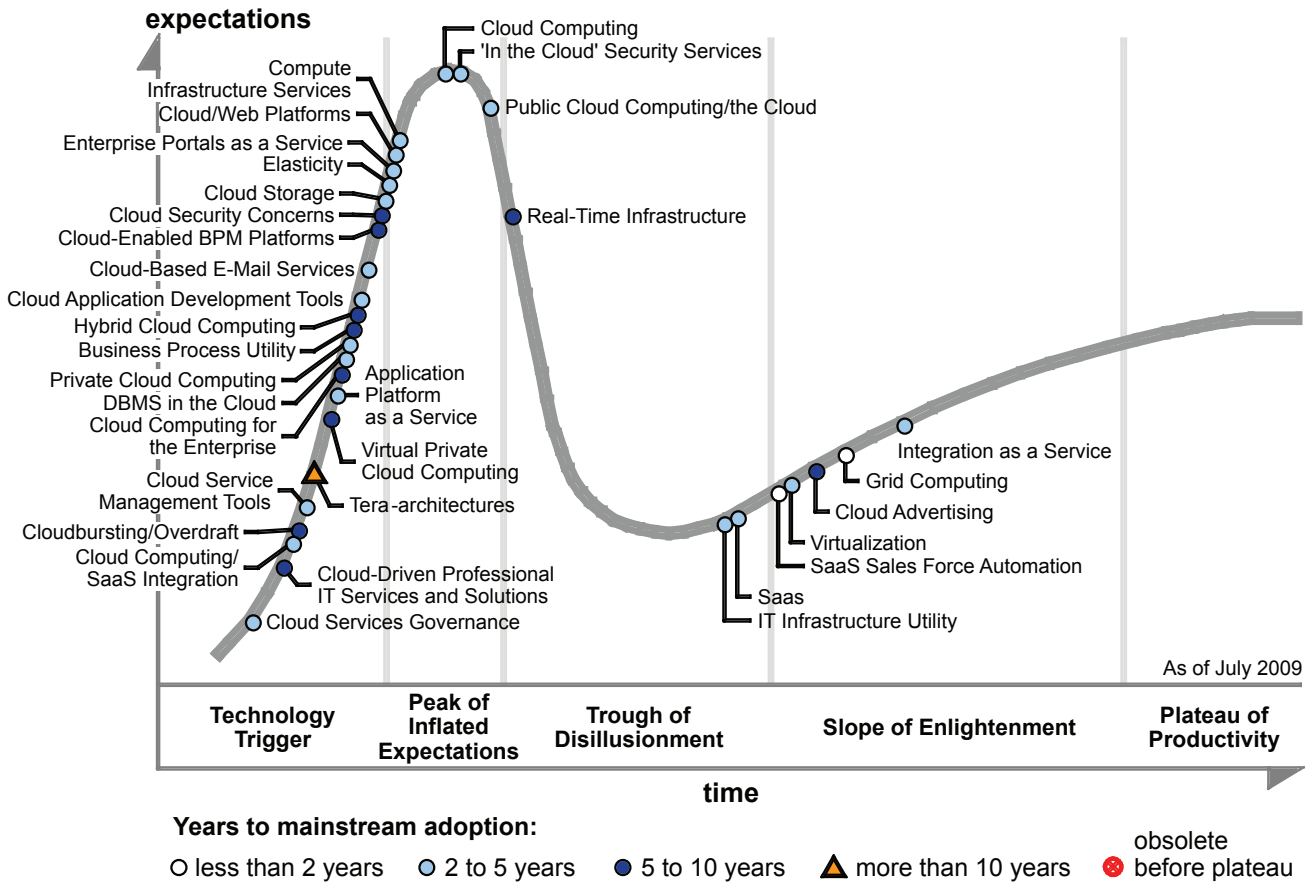
Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

Sample Vendors: Akamai; Barracuda Networks; Cisco; Google/Postini; McAfee; Mimecast; Qualys; Symantec; Symplified; TriCipher; Veracode; Webroot; WhiteHat Security; Zscaler

Appendixe

Figure 3. Hype Cycle for Cloud Computing, 2009



Source: Gartner (July 2009)

Hype Cycle Phases, Benefit Ratings and Maturity Levels

Table 1. Hype Cycle Phases

Phase	Definition
Technology Trigger	A breakthrough, public demonstration, product launch or other event generates significant press and industry interest.
Peak of Inflated Expectations	During this phase of overenthusiasm and unrealistic projections, a flurry of well-publicized activity by technology leaders results in some successes, but more failures, as the technology is pushed to its limits. The only enterprises making money are conference organizers and magazine publishers.
Trough of Disillusionment	Because the technology does not live up to its overinflated expectations, it rapidly becomes unfashionable. Media interest wanes, except for a few cautionary tales.
Slope of Enlightenment	Focused experimentation and solid hard work by an increasingly diverse range of organizations lead to a true understanding of the technology's applicability, risks and benefits. Commercial off-the-shelf methodologies and tools ease the development process.
Plateau of Productivity	The real-world benefits of the technology are demonstrated and accepted. Tools and methodologies are increasingly stable as they enter their second and third generations. Growing numbers of organizations feel comfortable with the reduced level of risk; the rapid growth phase of adoption begins. Approximately 20% of the technology's target audience has adopted or is adopting the technology as it enters this phase.
Years to Mainstream Adoption	The time required for the technology to reach the Plateau of Productivity.

Source: Gartner (July 2010)

Table 2. Benefit Ratings

Benefit Rating	Definition
Transformational	Enables new ways of doing business across industries that will result in major shifts in industry dynamics
High	Enables new ways of performing horizontal or vertical processes that will result in significantly increased revenue or cost savings for an enterprise
Moderate	Provides incremental improvements to established processes that will result in increased revenue or cost savings for an enterprise
Low	Slightly improves processes (for example, improved user experience) that will be difficult to translate into increased revenue or cost savings

Source: Gartner (July 2010)

Table 3. Maturity Levels

Maturity Level	Status	Products/Vendors
Embryonic	• In labs	• None
Emerging	• Commercialization by vendors Pilots and deployments by industry leaders	• First generation High price Much customization
Adolescent	• Maturing technology capabilities and process understanding Uptake beyond early adopters	• Second generation Less customization
Early mainstream	• Proven technology Vendors, technology and adoption rapidly evolving	• Third generation More out of box Methodologies
Mature mainstream	• Robust technology Not much evolution in vendors or technology	• Several dominant vendors
Legacy	• Not appropriate for new developments Cost of migration constrains replacement	• Maintenance revenue focus
Obsolete	• Rarely used	• Used/resale market only

Source: Gartner (July 2010)

This research is part of a set of related research pieces. See “Gartner’s Hype Cycle Special Report for 2010” for an overview.