

# ACS' ITO Perspective on Cloud Computing:

## “Is it Ready?”

An ACS White Paper



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## Summary

This paper introduces and describes the benefits of PeopleSoft virtualization using the new Windows® Server® 2008 Hyper-V™ technology and how to effectively implement this new technology into a PeopleSoft environment. This paper discusses the architecture used, and describes various key scenarios including high availability, server consolidation, scaling, and testing. It is written for enterprise business decision makers, technical decision makers, information technology (IT) architects, and deployment managers.

## Executive Summary

Cloud computing is on everyone's mind these days, but asking someone to describe it is almost like asking someone to describe the color orange. There are as many elements, pigments, chemicals, shades, emotions, likes, and dislikes that surround our personal view of orange. While it's hardly anyone's favorite, any kid will tell you that an eight-box of Crayola Crayons just isn't complete without the orange one. As an IT leader, not having a collective understanding, focus, viewpoint, and investment in Cloud will be an obvious omission in the IT portfolio. This paper attempts to share ACS' perspective and bring clients up to speed on the subject, thereby becoming a starting point for the journey to develop potential Cloud offerings.

*At ACS, cloud computing is all about enabling and managing Enterprise Clouds for our clients. It's not about selling computing or software, it's all about creating the ACS Trusted Environment that embodies global computing to meet each client's specific needs.*

Generally, Cloud computing is computing available at will, by a variety of devices, wherever and whenever it is needed. From an end-user perspective, Cloud computing enables computing services without requiring a comprehensive understanding of the necessary technology. For a company, Cloud computing brings consumer and business applications in a simplified way. Flexible scale and improved quality brings clients the infrastructure for rapid innovation and decision-making. It is also a service acquisition and delivery model for IT resources. If correctly used within an overall strategy, Cloud computing can help improve business performance and control the costs of delivery in a manner where information technology (IT) will become viewed as business technology (BT).

Basically, this means clients don't own the infrastructure; they access it and rent it, much like an "all-bills-paid" apartment, with shared walls and shared common grounds. It frees businesses from having to constantly maintain expensive infrastructure and personnel, thus becoming a potential cost-saving measure, especially important now. Typically, Cloud computing is characterized in a few key service scenarios, billed on a transactional basis:

- Software as a Service (SaaS)
- Application Components as a Service (CaaS)
- Software Platform as a Service (PaaS)
- Virtual Infrastructure as a Service (VaaS)
- Infrastructure as a Service (IaaS)

Ray Ozzie, Microsoft's chief software architect, is going so far as to use the term, "Everything as a Service" as that is the ultimate expression of the Cloud concept.

## Trends to watch

As Web 2.0 technologies offer more capabilities and services over the Internet, the term “Cloud Computing” or “Cloud” are replacing terms such as “utility computing” and “grid computing.” The following information lists some of the trends driving Cloud:

- New service process to make the complex appear simple or straightforward
- New IT infrastructure architectures that differ by application workload type
- New integrated service and product offerings that are neither pure product nor pure service
- New business models that enable more flexible use or payment for technology capacity
- New ubiquitous and enterprise-wide applications such as collaboration and messaging
- Companies embracing consumer applications/services for the enterprise

*We're following a Global-class computing approach to design systems and solutions that will extend our computing processes outside the enterprise and into the environments of the consumer, enterprise worker, mobile worker, and business partner.*

*This approach exploits the characteristics of today's Enterprise computing, Internet-enabled computing, and mobility, using applications and services that are more flexible, inclusive, simpler, and less expensive than those designed for traditional enterprise use.*

How we view the Cloud often depends on when we personally entered the IT marketplace. Wise veterans tend to view it as a return to centralized computing. Seasoned pros describe it as a new form of the traditional distributed environment. Young enthusiasts see it as the next step of Web 2.0. And while it may be some of all of that, there's a lot more to learn and even more to do.

## Market signals

Many flavors of Cloud computing are emerging. Microsoft's radical Ozzie has a mission to wholly change Microsoft's business model to deliver software through Cloud. IBM is dedicating entire centers to Cloud computing in North America, Europe, and China. Some have gone as far to suggest that HP's purchase of EDS was to gain the critical infrastructure mass to enable Cloud. These efforts are not surprising, as IDC expects Cloud computing to grow from its current market size of about \$16 billion today to \$42 billion by 2012<sup>1</sup>. And there's no time like the present to begin to understand and create a dialog with clients and prospects about the possibilities of Cloud computing. As a matter of fact, it's happened before.

Cloud is certainly in the ideation stage, where companies can gain credibility embracing and understanding the possibilities even before solid offerings are created. It hardly seems like it was 13 years ago when in 1996 IBM launched its e-business campaign. No one quite knew what it was, but IBM took a lot of credit for defining it and making it stick.

## Current Products and Services

Almost all Cloud vendors are providing a niche component or service. Facebook, Salesforce.com, Apple's phone applications, Google Apps, and others currently provide “Cloudlet's” that are being used in companies and organizations throughout the world. However, no single vendor has put together a solid, high-quality, reliable and secure “Enterprise Cloud.” Yet. Those who have an offering tend to play in only one of the service areas.

*While many niche applications are currently available, no single vendor has released a viable enterprise approach. This is an obvious opportunity for ACS.*

Software as a Service (SaaS), including applications as web sites, collaboration, e-mail, office productivity, and client applications with connections to services in the Cloud:

- Cisco Weber Web office
- IBM Bluehouse
- Microsoft Exchange Online
- Oracle SaaS platform
- Salesforce.com Sales Force Automation
- NetSuite
- Google Apps
- Workday Human Capital Management

Application components as a Service (CaaS), including application programming interfaces (APIs) for service access or integration:

- Amazon Flexible Payments Service and DevPay
- Flickr API
- Google Calendar APIs
- Salesforce.com's AppExchange
- Yahoo! Maps API

Platform as a Service (PaaS), including development platform as a service, application servers, messaging, database, and file sharing:

- Microsoft SQL Server Data Services
- Bungee Lab's Bungee Connect
- Amazon SimpleDB, Simple Storage
- Etelos
- Coghead
- Google App Engine
- HP Adaptive Infrastructure as a Service
- LongJump

Virtual infrastructure as a Service (VaaS), including virtual computing, virtual storage, virtual networking and systems management:

- Amazon Elastic Compute Cloud (EC2)
- Joyent
- Sun Microsoft's Network.com
- HP Flexible Computing Services
- IBM Blue Cloud
- 3tera
- OpSource
- Jamcracker
- Terremark

Infrastructure as a Service products deliver a full computer infrastructure through the Internet, much like ACS ITO does today.

## The Foundation

While Cloud is still mainly in the conceptual stage, some foundational elements come to play around technology. Services can be hosted through grids of distributed servers or multiple blade servers run by a master controller—where a single server runs one or more operating systems in a single session. This enables multiple clients to run on a single server. When this capability is scaled up, usage peaks and valleys can be spread across the servers to meet changing demand.

*Cloud computing can literally be "served up" in a variety of ways with as many or more billing scenarios.*

Dynamic management software can rapidly and efficiently scale the infrastructure as needed to meet demands, often without any intervention by service providers. This is the "elasticity" required to make the cloud scale appropriately.

An API or Web interface can control Cloud-based infrastructures. Software developers use published APIs to control the systems with Web services standards, such as SOAP, or proprietary APIs using the provider's own semantics within standard structures. This allows for quicker and more dynamic integration.

Clients are billed on scenarios such as number of minutes or hours spent, bandwidth consumed, computing cycles, data transferred, storage space consumed, or some combination thereof. Clients and providers may have better opportunities to structure payment scenarios that can tie more directly to an overall business strategy, rather than existing as a fixed operating expense.

## Traditional Advantages with a Stronger Impact

With Cloud, the traditional benefits of outsourcing remain; however, they're pumped up to the new levels, giving them a stronger, more direct business impact. Cost reductions are top-of-mind, as clients only use what they need at the levels they require. CFOs embrace the effect on the balance sheet, with minimal capital outlays to maintain the latest capabilities. The pay-as-you-go aspects of Cloud are especially attractive during a downturn.

*Cloud can have a tremendous upside on the balance sheet, while sales, marketing and operations can respond dynamically to changing market and business conditions.*

Speed and quality are enhanced as integration within a well-designed Cloud is far easier and open. Legacy resources and other infrastructure services come together through non-proprietary web protocols, many of which are XML-based. Major infrastructure changes may only take one-quarter of the time and effort required in a non-Cloud scenario. For these reasons, clients can focus and invest in business and innovation where the Cloud actually supports change and new thinking, rather than being an impediment.

The right Cloud computing approach should result in lower costs. By taking advantage of economies of scale and automated IT operations while optimizing investment in existing infrastructure, the Cloud can adjust to workload increases or decreases while payment or IT chargeback responds accordingly.

## Obvious Challenges

As with many new concepts, the technology is here, but can we effectively put it together and use it? Since Clouds aren't constrained by geopolitical boundaries, what laws control the privacy of information? Who decides disputes? For example, how does the Cloud respond to the differences in existing laws surrounding encryption? The Cloud currently brings with it a set of complex, intertwined challenges inherent in any open system arrangement, but often with more concern.

*Cloud presents significant but not insurmountable challenges. Rather than shying away from it, there is no time like the present to begin formulating strategies and solutions.*

## Control

Control is the issue that initially jumps up when discussing Cloud. Platforms are generally designed to support world-class, but nevertheless generic, business practices. Individuals and companies don't typically have the ability to change many aspects of the platform, but the providers do—and they will—when it suits them. Think Apple iTunes. Just when your laptop and your iPod have it all together, they change it. Mostly for the better, but it's still a change forced upon you.

## Performance

Concerns about performance, latency, and reliability also are considerable challenges. Just how flexible does the capacity need to be? What's the right model to provide unlimited but reasonable server space and internet links? What about clients experiencing slow response time due to distance, traffic, and non-optimized code? And what about downtime and outages? SLAs and credits only partially salve the wound of missed sales opportunities and tarnished reputations.

## **Security**

Most companies rank security as their main concern about Cloud. Will platforms that share multiple clients' data pass common security standards? Will they pass national data-storage laws concerning privacy and record keeping? IBM's Cloud center in Europe is undoubtedly set up in a large part to deal with EU privacy laws.

## **Networking**

While companies save money on equipment and software in a Cloud scenario, they could incur higher network-bandwidth charges. And while this may be insignificant for smaller Internet applications, it could dramatically increase for applications using a multi-terabyte database.

## **Portability and Lack of Standards**

There are no clear Cloud standards for elements and processes such as APIs, the storage of server images for disaster recovery, and data import and export. This begs the question: if a client is dissatisfied with one Cloud, how easy is it to move to the next Cloud or to bring it back in house? Today, without standards, this is a time-extensive and expensive business, requiring significant staff or contract man-time.

## **Transparency**

Clients can't pass audits if they can't demonstrate who has access to their data and how they keep it safe. Vendors are addressing this concern by having third parties audit and document systems and procedures designed to address data security needs.

## **The ACS Approach**

With Cloud, ACS can provide a more client-directed solution focused on what do you want to do today?

We view the public Cloud services as those available to clients from a third-party service provider through the Internet. The term "public" does not always mean free, but it can be free or fairly inexpensive. The other model of Cloud computing, where we see ACS participating, is called a "private" Cloud-based service, offering many of the benefits of a public Cloud computing environment. The difference is that in a private Cloud-based service, data and processes are managed within an ACS trusted environment without the security exposures and legal requirements that come with using public Cloud services across open, public networks. Additionally, private Cloud services can offer the enterprise greater control, thus improving security and resiliency as user access and the networks are restricted and designated.

*A private Cloud-based service gives clients the benefits of a public Cloud environment without the security issues and potential risks. This is where the ACS opportunity begins.*

We also anticipate the creation of various business models, which include the integration of services from different providers (public and private) to support and drive business innovation and optimization.

## Global Class Enterprise

At ACS, Cloud computing is all about enabling and managing Enterprise Clouds for our clients. It's not about selling computing or software; it is about creating a trusted environment—an ACS Trusted Environment, which embodies global computing to meet each client's specific needs. It's about creating Clouds across the ACS enterprise to be leveraged by our clients; an option may be private Clouds to meet each client's specific needs. It's about exploiting the characteristics of today's Internet-enabled computing with services that are more flexible, inclusive, simpler, and less expensive than those designed for traditional enterprise use. And it's about delivering all that in a manner that is appealing to clients from a capability, usability, and financial standpoint. It's a natural, elegant way to combine the benefits of ITO and BPO in a client-directed solution scenario.

*Cloud enables ACS to bring together ITO and BPO offerings in an elegant enterprise scenario.*

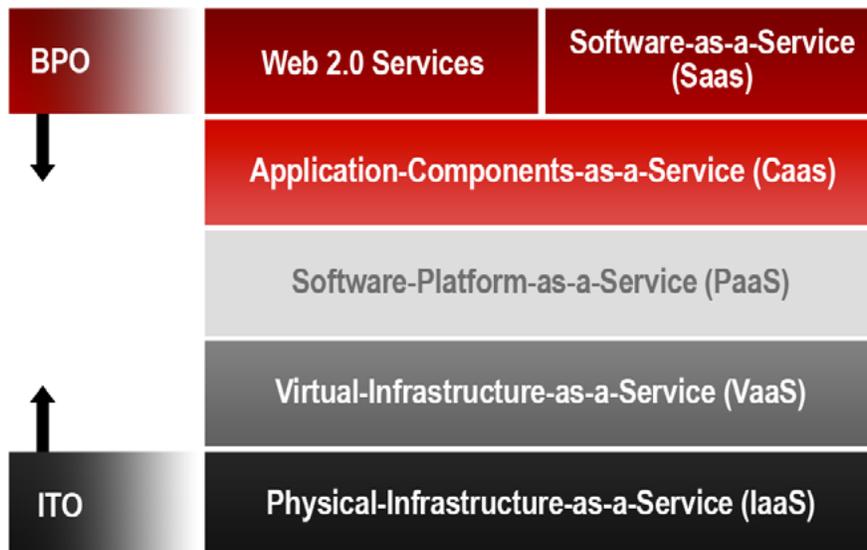
## “Future View”

Forrester's “Future View: The new Tech Ecosystems of Cloud, Cloud Services and Cloud Computing” echoes what we view as the most logical path to enable Cloud services. ACS can build Clouds for clients based on existing product categories, developer tools, middleware, and IT infrastructure. Much more than just hosting servers, our approach is about building on existing business models and best practices between the ITO and BPO organizations.

*Forrester's view complements and is in agreement with ACS' path to Cloud computing.*

By virtualizing the business in layers, ACS will be able to couple and decouple as needed to provide the best solution available while addressing the varied needs of our clients. In the end, this will make ACS a more efficient and resilient service provide.

**CaaS**—Spans a spectrum from modular web services that enable mashups, web services to environments that enable clients to assemble enterprise services from existing software modules. All of this is aimed at offering developers higher-level software modules for combining existing code to create applications, rather than coding everything from the ground up. And developers don't need to work with or know about the underlying middleware.



Source: Forrester, August 2008, “Future View: The New Tech Ecosystems of Cloud, Cloud Services, and Cloud Computing”

**PaaS**—Offers a full or partial application development environment that enterprises can access and use online, even in collaboration with others. But, can't control the infrastructure details underneath any of this middleware, such as which operating system is being used or the infrastructure architecture. Client developers of Cloud-based applications who want more control of the software environment work directly with middleware, just as conventional developers do; this means they can code to hosted instances of conventional databases.

**VaaS**—Offers developers and IT operations full control of IT infrastructure, but only the virtual infrastructure elements, not the physical elements as in conventional IT hosting. Rather than own or lease server, storage, and network gear, enterprises can configure virtual servers, a virtual network layout, and file storage in the arrangement needed. Enterprises will only gain control of how the elements work together.

*Gartner lines up with our approach surrounding layers and multi-tenancy.*

**Multitenancy**

The key for ACS is to offer multitenancy, where services are provided to multiple client enterprises in an elastic, common computing resource. Gartner's "Reference Architecture for Multitenancy: enterprise Computing 'in the cloud'" echoes what we view as the most logical path to an ACS multitenancy model as follows:

Today's well-established layered technology architecture used in enterprise computing applies to Cloud computing as well. Because the computing resources that underlie the business application are layered, the application's multitenancy can be implemented at several of the underlying layers.

Isolated tenancy is just that: a stand-alone house, no connecting walls with any neighbor. It's the way we offer it today.

In the virtual multitenancy scenario, tenants have their own dedicated stack of technology, but the infrastructure is virtual. For ACS clients, it's a lower-cost, more immediate way into Cloud computing, where they gain the savings and elasticity of a Cloud environment but are the only tenant on their applications.

Isolated Tenancy	VaaS Multitenancy	CaaS Multitenancy Isolated & Multitenant Storage	
Service	Service	Web 2.0 Services	Software-as-a-Service (SaaS)
Application	Application	Application-Components-as-a-Service (CaaS)	
Application Platform	Application Platform	Software-Platform-as-a-Service (PaaS)	
Data Platform	Virtual-Infrastructure-as-a-Service (VaaS)	Virtual-Infrastructure-as-a-Service (VaaS)	
Physical Infrastructure	Physical Infrastructure as-a-Service (IaaS)	Physical Infrastructure as-a-Service (IaaS)	

Multitenancy

Multitenancy

Source: Gartner, December 2008, "Reference Architecture for Multitenancy: enterprise Computing 'in the Cloud'"

In the Application Component as a Service multitenancy scenario, each tenant is associated with a separate logical or physical DBMS. The execution environment is shared, but the data platform isn't. Keeping intrusions from one client's transaction into another isn't certain today, as no server is designed specifically with that in mind. Intrusions of these kinds by hackers and/or competitors are the primary objection to Cloud today.

A key component of the CaaS scenario is that multiple tenants' transactions will need to be executed in the same instance of a specialized application server (SEAP), but each tenant is associated with a separate logical or physical instance of the DBMS. To ensure this isolation of tenants inside a single instance, the SEAP container must be designed to manage resource allocation to tenants. The SEAP also must prevent accidental or fraudulent intrusions of the transactions of one tenant into the space of another tenant. No current application server is designed to provide this functionality today, and ACS will need to work with our strategic partners to make this a reality.

Clients will undoubtedly have a variety of ways in which they want to use and manage their Cloud scenario; therefore, providing customized tenancy in a private Cloud enables them to direct what they want to do and how isolated they want to be.

*Our work with AMP will help drive our Cloud offerings.*

## Key Technology Enablers

For Cloud computing to be efficient, ACS will need to continue and expand its implementation of AMP and demonstrate the following technology attributes:

**Automated service delivery**—Cloud computing supports business processes, applications, and IT infrastructure collaboratively and cohesively. It allocates services dynamically, and it optimizes workloads and data across the shared infrastructure while integrating added resources to scale with minimal intervention by ACS personnel.

**Services-focused environment**—Cloud is about providing services to any authorized user, anywhere, from any device. For this reason, the technology foundation must be built on a service-oriented architecture and deployed with industry best practices.

**A shared, highly scalable, networked infrastructure**—Cloud is a new IT infrastructure, where applications and business processes are made available leveraging the web 2.0 paradigm. This means standardized, highly efficient, shared, virtualized compute resources (servers, storage, network, data, middleware, applications, and business processes) can be rapidly scaled up and down through automated workload management. And this occurs in an elastic, secure, and high-quality service delivery.

**Enhanced, standardized user experience**—Easy-to-use interfaces and straightforward information access enables enterprises to fulfill their computing needs.

## Considerations

When considering Cloud computing, we simplified it down to three basic questions:

### ***Will Cloud computing help create and deliver innovative services to achieve greater competitive differentiation?***

Cloud computing can enable greater innovation through collaboration, rapid deployment, and lower costs. Several future innovations will integrate innovative application and information services from others (suppliers, third parties, clients, business partners, and government) that may be built as cloud-based services.

*To discover the benefit of Cloud computing to clients and prospects, start with three basic questions around innovation, speed, and competitive advantage.*

### **Are there sustainable competitive advantages gained by using Cloud computing?**

Enterprises taking a leadership role in harnessing the power of Cloud computing may gain competitive advantage through more rapid innovation, massive scalability (up and down) to optimize resources and costs, and access to resources otherwise not readily available. The key is an enterprise's ability to integrate Cloud computing into a broader strategy and architected plan to align IT resources closely with overall business goals and objectives.

### **Will Cloud computing enable a quicker path to achieve goals for IT optimization, cost savings, and faster time to market?**

Cloud computing is about the "industrialization" of IT infrastructure, including the data center, to reduce costs while improving quality and time to delivery. Cloud computing provides a set of core services or building blocks that can be rapidly assembled into higher level business services for quick deployment.

*Cloud computing may not be for everyone. But by sharing our perspectives with clients and prospects, we can deliver the one thing no one else can—trust. We believe clients need a trusted foundation on which to build secure, efficient and resilient platforms. And ACS is helping clients and the industry sort out an approach to Cloud computing they can trust.*

### **Embarking on the Future**

Cloud may not change everything, but it will have an impact on everything. New independent software vendor solutions will emerge that are only available in the Cloud. New multitenant platforms will offer high-levels of productivity along with reduced costs. Elastic resources will reduce the costs and risks of spikes, becoming a requirement for most IT organizations conducting business on the web.

Despite the risks, the benefits will bring clients to gradually adopt some level of Cloud. ACS must be prepared for clients to adopt Cloud models over time that will need to exist with their non-Cloud operations. It isn't too early to begin work on an ACS Private Cloud with a dedicated group focused on Cloud architectures, services, and multitenancy business models. This group should begin to work with vendors to build new products and develop new licensing contracts to meet the changing environment. At the same time, we should be talking with our clients and prospects about Cloud. Do they see the potential? What are their fears? How would they like to pay for it? What would they be willing to put in the Cloud?

As much as the technology can be ready, it will take the practical and experiential collaboration of providers, vendors, and clients to develop the right solutions and models that will shape the way that ACS delivers ITO and BPO throughout the next decade.

### **About the Authors**

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