Taming the Cloud: Understanding the Risks and Returns of Enterprise Cloud Computing
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## TAMING THE CLOUD: UNDERSTANDING THE RISKS AND RETURNS

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Taming the Cloud: Understanding the Risks and Returns of Enterprise Cloud Computing

As one of the hottest buzzwords in IT today, and often misused, the term “cloud computing” has been the subject of much hype and much confusion. But the potential is real: with its promise of low-opex, zero-capex, on-demand infrastructure, cloud computing offers highly appealing economic and business benefits, such as accelerated innovation and time-to-market, that have given it traction among small and startup businesses, as it gives them low-cost, easy access to true enterprise-grade technology — that could otherwise cost millions to build. For these and other reasons, cloud computing has also drawn the cautious but serious interest of larger enterprises.

Merrill Lynch “conservatively” predicts a $160 billion cloud computing market by 2011, including $95 billion in enterprise business applications.¹ This magnitude makes one thing clear: cloud computing is too important a trend to ignore. Forrester Research agrees, “Cloud computing has all the earmarks of being a potential disruptive innovation that all infrastructure and operations professionals should heed.” Yet while cloud computing holds tremendous potential, regardless of what cloud computing taxonomy one adopts, the cloud is the Internet – and this weak link introduces a number of challenges — particularly within the enterprise market.

Cloud Optimization Services are required to address the enterprise market, and these services must go well beyond Content Delivery Network (CDN) cache-based technologies to remove the cloud-based barriers and accelerate enterprise adoption and realization of cloud computing’s benefits.

In this whitepaper we explore the components of the cloud computing ecosystem, demonstrate how Akamai is delivering services for cloud optimization, and briefly look forward into the evolution of this dynamic and growing market.

What is Cloud Computing?

As was the case with “Web 2.0,” everyone seems to have their own definition — their own flavor — of cloud computing. While the cloud market embraces a confluence of concepts — including scalability, abstraction, virtualization, service-orientation, elasticity, multi-tenancy, and pay-as-you-go, for example, at the most basic level, the term “cloud computing” simply refers to computational resources running somewhere in the Internet (the “cloud”) and made accessible as on-demand services.

IaaS, PaaS, SaaS developments have brought real-world cloud computing solutions to the brink of enterprise readiness.
This description encompasses a lot of different services, and, indeed, the term “cloud computing” has been used to describe offerings that exist at all different layers of the computing stack. As cloud computing has rapidly entered the mainstream business lexicon, various cloud models have emerged. SaaS applications, PaaS environments and IaaS resources are all taking shape to serve various market requirements.

**Infrastructure-as-a-Service (IaaS)** – the notion of access to basic computational resources, like storage, disk space, and servers, being provided on-demand through services. Rather than using physical machines, customers use IaaS to get access to virtual servers on which they deploy their own software, generally from the operating system on up.

**Platform-as-a-Service (PaaS)** – offerings which provide an environment for easily developing and deploying scalable Web applications without needing to invest in or manage any underlying infrastructure. By providing higher-level services (such as an application framework or solution stack) than IaaS, PaaS generally provides the quickest way to build and deploy a highly-scalable application, with the trade off being less flexibility and potentially greater vendor lock-in than with IaaS.

**Software-as-a-Service (SaaS)** – where applications such as CRM or e-mail are deployed and managed by a third party and delivered over the Web.

**How Will the Enterprise Use Cloud Computing?**

In addition to using these tiered cloud computing offerings, larger enterprises with existing, mature online channels will leverage a mix of public cloud, private cloud, and origin data center services. Akamai already sees established enterprises demonstrating a desire to leverage the cloud in a modular way. The ability to migrate and run components of Web applications across various cloud platforms — based on the business requirements of the application — will be a fundamental tenet of how enterprises will migrate to the cloud. A single site may use IaaS services for storage overflow, PaaS services for custom application modules and best of breed SaaS applications, along with on-premises origin systems. Some enterprises will even establish private clouds, creating a pool of infrastructure resources, typically deployed within their own firewall, that can be dynamically shared among different applications and functions within the enterprise.

Consider that the Internet is the common link between all these cloud computing modules, introducing its specific issues around performance, reliability, scalability, and security…thus, real world cloud computing implementations will include challenges presented by multiple cloud offering integrations as well as challenges inherent to the Internet cloud itself.

**Cloud Optimization Services** are required to address these challenges and need to comprise:

- Cloud Acceleration Services
- Cloud Business Continuity Services
- Cloud Security Services
- Cloud Application and Data Storage Services
- Cloud Integration Services

**Enterprise-ready Cloud Computing Requirements**

While cloud computing has gained significant traction among startups and small businesses, Enterprises require the following for cloud computing to deliver on its promise of creating a far more efficient, flexible, and cost-effective infrastructure for their IT needs:

**Performance:** As enterprises think about shifting from a LAN-sized, on-premises solution to a cloud-based offering, application performance becomes a key consideration. The performance of any centrally-hosted Web application — including cloud computing applications — is inextricably tied to the performance of the Internet as a whole — including its thousands of disparate networks and the tens of thousands of connection points between them. Latency, network outages, peering point congestion, and routing disruptions are among some of the problems intrinsic to the Internet that prevent make it difficult to rely on for business-critical transactions.

**Reliability:** The numerous recent, high-profile outages at many of the major cloud computing providers highlight the need to provide the high availability solutions enterprises demand, as even small amounts of down time can cost their companies millions in lost revenue and productivity. In addition, wide-scale network problems caused by trans-oceanic cable cuts, power outages, and natural disasters, can severely disrupt communications across large regions of the globe.
Security: Companies worry about loss of control and security when moving applications outside their firewall onto virtual infrastructure — where physical machines and locations are unknown. The Internet introduces new security issues including distributed denial-of-service (DDoS) attacks, DNS attacks, and even application-specific risks such as cross-site scripting attacks and SQL injections. Regulatory and legal compliance requirements present further challenges.

Visibility and Control: Cloud offerings need to provide enterprise-grade support, including robust logging, reporting, and monitoring tools that provide visibility into the infrastructure. Moreover, the Internet, with its many moving parts, presents a complex system to troubleshoot when things go wrong.

Ease of Integration: As most clouds are proprietary, they often require new skill sets as well as re-architecting or re-writing existing applications in order to take advantage of cloud benefits. Enterprises want solutions that allow them to leverage their heavy investment in their legacy applications. This challenge is compounded by the modular, multiple-cloud application solution strategies needed by large enterprises.

SLAs: Service-level agreements (SLAs) are rare among cloud computing providers. And while larger providers offer 99.9% uptime SLAs, this simply isn’t enough good enough for business-critical applications. In addition, these SLAs usually refer to the uptime of the cloud service provider’s own infrastructure, rather than the more relevant measure of availability to end users.

There are aspects of each of these cloud computing requirements that can only be addressed by dealing with Internet issues. To illustrate, while some cloud computing vendors (PaaS providers in particular) talk about providing scale and reliability for their offerings, they are typically talking in reference to the “origin” or first-mile infrastructure that they provide, not to the whole cloud. They may provide automated server failover or a virtual database cluster with automated replication, for example. However, these services are useless against the bottlenecks in the cloud that can adversely affect the end user experience.

This underscores the critical need for underlying Cloud Optimization Services that can tame the cloud — services that will enable cloud computing to reach its true potential.

Akamai Services for Cloud Optimization

In the previous section we developed a comprehensive set of cloud computing requirements that need to be met to facilitate enterprise adoption. Akamai has developed a set of services to address these requirements.

Akamai makes it possible for cloud computing providers and enterprise users to overcome the cloud computing performance, reliability, security, and management challenges to leverage the benefits of cloud computing without risk, and without re-architecting existing applications. Here we take a closer look at categories of offerings that help enterprises accelerate their adoption of and value extraction from cloud computing by addressing Acceleration, Business Continuity, Security, and Application and Data Storage in the cloud.

Cloud Acceleration

The fundamental enterprise requirements of cloud computing are performance and scalability. Akamai’s services for Cloud Acceleration address the challenges of delivering interactive and dynamic applications and content at LAN-level performance through the cloud. Although caching services are a key component of enterprise origin offload and help drive scalability and performance in cloud computing, it takes substantially more capabilities than a CDN to reach the enterprise requirements for cloud computing performance.

Communication and application level optimizations are required to increase performance of applications and data that must traverse the cloud. By developing new technologies to address inefficiencies in application, transport, and routing layer protocols, Akamai has transformed the time-tested globally-distributed EdgePlatform to provide the commercial-grade performance needed for enterprises and SaaS and PaaS providers to recognize the promise of cloud computing.

Cloud Business Continuity

Akamai’s services for Cloud Optimization address enterprise business continuity and reliability requirements in several ways. Designed from the ground up to recover on its own from all types of failures — whether at the machine level or Internet-wide, the Akamai EdgePlatform offers a zero-downtime infrastructure.
For the enterprise running multiple data centers, multiple cloud instances, or using multiple cloud providers, Akamai offers a cloud-based, highly-scalable, on-demand service that allows an enterprise to balance traffic between those entities based on a variety of business policy and Internet performance factors. For example, those policies can include automatic failover, weighted load balancing, or IP-based routing. Akamai offers a number of other business continuity options in case of origin server failure. Akamai’s services include the ability to monitor an origin server and, based upon setup, reroute origin requests to Akamai services, or an alternate origin data center.

In addition, the Akamai has a cloud-based, globally-distributed, on-demand service available to improve the performance, availability, and resiliency of your mission-critical DNS infrastructure.

These, combined with a 100% uptime SLA, enable enterprises to leverage cloud computing while maintaining the rock-solid availability their businesses demand.

Cloud Security

Earlier we highlighted the new security threats and regulations that arise from moving infrastructure and information into the cloud. Akamai’s services for Cloud Security address a broad array of security issues. Akamai eliminates public entry points to enterprise infrastructure and provides security at Levels 3-7 by locking down a security perimeter using a variety of technologies such as DNS security, IP layer DDoS protection, and IP layer access control.

Akamai’s services include handing SSL certificate management and delivery of SSL content over a PCI-compliant network, full support for certification, reporting and auditing of PCI Compliance, support of distributed and centralized access control, the ability to completely ‘cloak’ a Web site from the public Internet, and an in-cloud application firewall to identify attacks in HTTP and SSL traffic before they get to the enterprise servers.

Cloud Applications and Data Storage

Rounding out Akamai’s offerings for Cloud Optimization are our on-demand services which enable the full deployment of application processing and data storage capabilities onto the Akamai network. Using Akamai’s services for Cloud Applications and Data Storage, an enterprise can deploy J2EE applications onto the Akamai network, for true, on-demand distributed computing. Both the presentation layer and application business logic are executed on the Akamai EdgePlatform, providing high scalability, reliability, and end-user performance. The enterprise also has access to a secure, on-demand cloud data storage solution offering fully-managed high-availability storage supported by geographically-distributed replication of content and automatic global traffic management and failover.

Using these services, cloud computing providers and enterprises can realize significant improvements in application performance and availability, reliability, scalability and security — allowing them to focus on building their software and application hosting and development platform businesses — and enterprises can consider deploying business critical infrastructure into the cloud computing environment.
Looking Towards the Future

While it may seem a revolutionary concept, cloud computing is actually the product of a natural evolution of ideas and technologies dating back to the computer time-sharing and the utility computing concepts of the 1960s. Since then, developments in areas as diverse as virtualization, hosting and managed services, service orientation, database clustering, and distributed computing, along with recent trends toward ubiquitous, low-cost broadband access, have all converged to set the stage for cloud computing’s sudden thrust into the limelight. Because of cloud computing’s ability to greatly increase the flexibility and agility of IT and of business itself, enterprises cannot afford to ignore this trend.

Where is Cloud Computing Going?

The Economist magazine stated in a recent March 2009 issue, “the computing sky will probably always be cloudy, meaning that there will be many private and public clouds, and they will come in all shapes and sizes. And most of them will be interconnected.”

Various cloud models have emerged. Cloud Optimization services, SaaS applications, PaaS environments and IaaS resources are all taking shape to serve various market requirements.

For new organizations building an online presence from scratch or for business applications migrating from on-premises to cloud platforms, a single cloud platform strategy may be sufficient. However, the majority of larger enterprises with existing, mature online channels will leverage a mix of cloud and origin data center services.

As mentioned previously, early signs from established enterprises demonstrate a desire to leverage the cloud in a modular way. The ability to migrate and run components of Web applications across various cloud platforms — based on the business requirements of the application — will be a fundamental tenet of how enterprises will migrate to the cloud. A single site may use IPaaS services for storage overflow, APaaS services for custom application modules and best of breed SaaS applications, along with on-premise origin systems.

For example, core elements of a three-tier enterprise e-Commerce channel will likely continue to live in – an need to be accelerated from — an on-premise data center. Databases with strict security requirements and core application environments that have heavy legacy investment, and where internal control is highly valued, are in this category.

Yet certain elements of the site will migrate to the cloud to take advantage of various cloud services. For example, an e-Commerce site that may already be leveraging specialized 3rd party SaaS applications for dynamic imaging may begin to add basic IPaaS services to provide overflow capacity for flash crowds, or provide storage services that can be extended to customers.

The same online channel may leverage yet a separate APaaS to develop extensions, features and services of the core site. The site may add a distributed presentation application that uses device and user intelligence for custom presentation rendering in an application that runs in the cloud.

As firms continue to seek an online advantage by scaling, accelerating and innovating the site experience, even data elements will migrate to the cloud to support new applications and modules. The above described presentation application could also leverage distributed data caching services to deliver real-time pricing data or user-specific promotional offers, all without having to make return trips to the core origin pricing database.

To actualize this vision of a modularized cloud environment, cloud integration services and multi-cloud integration capabilities will be critical. Cloud standards bodies are beginning to emerge, such as the Open Cloud Consortium and the Cloud Computing Interoperability Forum. This indicates that the enterprise customers of vendors supporting these initiatives will require a high degree of cloud integration, and Akamai’s enterprise customers are no different.
As the concept of cloud computing matures into the actual roadmaps of enterprise-class online businesses, it’s clear that a modularized, targeted approach is emerging. Cloud Optimization services have already gained traction for initial cloud applications as witnessed by the growth of Akamai’s SaaS customer and partner base. Overflow storage and computing scenarios are emerging, while application components with integrated data acceleration services running in the cloud is the likely next phase.

What’s clear — as with the Internet itself — is that cloud computing won’t have a clear, single vendor, single cloud answer. What should also be clear is that Akamai is developing, and will continue to develop, new technology to optimize and integrate cloud computing solutions for cloud computing providers and our customers who need to leverage cloud computing capabilities.

Summary

IaaS, PaaS, SaaS developments have brought real-world cloud computing solutions to the brink of enterprise readiness. Enterprises will implement cloud computing services in a modular approach requiring inter-cloud connections and integration. The common link will be the Internet — the cloud — and the cloud is the foundation of the remaining challenges to enterprise readiness.

Akamai has 10 years experience with taming that cloud. As one of the earliest pioneers of computing in the cloud, Akamai has long recognized the potentially transformational impact this model of can have, and has continually innovated to advance the benefits cloud computing can provide.

By partnering with Akamai, cloud computing providers, enterprises and Web-enabled businesses can leverage a proven platform for transforming the cloud into a true, enterprise-ready medium for conducting business, and take full advantage of cloud computing as it evolves and grows.

Make the Internet the robust component of the cloud computing ecosystem…with Akamai’s services for Cloud Optimization.