Cloud Computing—
Latest Buzzword or a Glimpse of the Future?

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Executive Summary:

The chairman of the Cloud Summit Executive 2008 conference reportedly started the event by joking that he asked 20 people to define cloud computing, and got 22 different answers.

The term came into vogue a few years ago and has since generated its share of controversy. Here are some descriptions we found for cloud computing:

- Something that will "profoundly change the way people work and companies operate." (*The Economist*)
- "Reliance on the Internet for satisfying the computing needs of the users." (Wikipedia)
- "The next step in the evolution of software-as-a-service (SaaS) technology." (Knowledge@W.P. Carey, Arizona State University's online business publication)
- "Industry-speak for just about anything tangentially related to the Internet." (Ben Worthen, *The Wall Street Journal*)
- "We've redefined cloud computing to include everything that we already do. I can't think of anything that isn't cloud computing with all of these announcements." (Larry Ellison, Oracle)

Clearly, there is a diversity of opinion on what cloud computing is, what it isn't, and whether it's a sea change or just another technology fad.

Our opinion: Don't get hung up on definitions. Don't focus on the jargon of whether something is cloud computing, or software as a service, or the latest buzzword.

Instead, focus on the changing IT equation. The world of computing is moving away from the on-premises IT model, where you keep buying servers, PCs and software licenses as your business grows. Cloud computing disrupts the conventional model and opens a new IT path for the small-to-midsize business: "clouds" of computing power, accessed over the Internet, become your server and your data center. Among the clouds: inexpensive applications that users can access on demand from any location and through a variety of devices.

Cloud computing—or SaaS, if you prefer—frees up budget for companies hand-cuffed by IT expenses. Instead of purchasing additional software licenses and hardware for new employees and new locations, businesses can simply open new employee accounts with providers of their cloud-based services to expand computing capacity. It ultimately helps CIOs rationalize their legacy systems and get their "arthritic IT" in order.

This paper provides a snapshot of what is happening in the arena of cloud computing. What are the benefits? Why are businesses embracing it? What does it mean to a business owner or executive? How does it affect the workplace? What are the payoffs and the pitfalls? Is it really ready for "prime time"?

The Market Landscape

The market for cloud computing applications is just beginning to heat up. Consumer applications, such as tax preparation services, sites to maintain photos and create albums, and social networking sites, have blazed the trail for successful SaaS business applications.

As cloud computing matures, users are finding that it's much more than just a way to offload desktop applications to the Internet. Cloud computing enhances the framework companies need to foster greater cooperation and collaboration among their work teams—which may include employees at multiple locations as well as advisers, suppliers, and partners outside a company's firewall.

In addition, cloud computing opens up innovative ways to use rich-media capabilities, such as integrating video into documents or presentations. Web-based applications make it easy to publish the results of a single source file in many locations. For example, a chart containing "company results" can easily be shared in a memo to executives, a presentation to shareholders, and in an announcement to employees. Any changes to the source spreadsheet automatically flow to the multiple instances of the published charts.

Mashups provide a quick way to aggregate business or consumer services with different data types from multiple sources into integrated applications. Many map-based services integrate business data, such as real estate listings, with the mashup facilities of Google Maps or other cartographic databases. Amazon, the world's most successful online shopping site, uses mashup technologies to aggregate product descriptions with partner sites and user profiles, commentaries, and images. Travel sites, such as Travelocity, Kayak, Matador, and Travature, integrate standard content (such as airfare search engines, travel guides, maps, and hotel reviews) with comments, ratings, and images from users.

As Computing Evolves, So Does its Jargon

Few observers agree on what cloud computing is, except for what the word cloud represents. When geeks draw network diagrams, they often represent the Internet as a cloud.

Cloud computing, many say, is a form of software-as-a-service. Wikipedia defines software-as-a-service (SaaS) as "a model of software deployment where an application is hosted as a service provided to customers across the Internet. By eliminating the need to install and run the application on the customer's own computer, SaaS alleviates the customer's burden of software maintenance, ongoing operation, and support."

The Economist noted that throughout the short history of modern computing, technology has evolved to more distributed forms—from mainframes, to minicomputers, to personal computers, and now to hand-held devices and smart phones. But now, states The Economist's report, "Computing is taking on yet another new shape. It is becoming more centralized again as some of the activity moves into data centers. But more importantly, it is turning into what has come to be called a 'cloud,' or collections of clouds. Computing power will become more and more disembodied and will be consumed where and when it is needed."

Infoworld editors Galen Gruman and Eric Knorr wrote that "cloud computing might be more accurately described as 'sky computing,' with many isolated clouds of services which IT customers must plug into individually. ... the idea of loosely coupled services running on an agile, scalable infrastructure should eventually make every enterprise a node in the cloud. It's a long-running trend with a far-out horizon. But among big megatrends, cloud computing is the hardest one to argue with in the long term."

In the business arena, cloud computing is gaining momentum as companies seek applications that are easier and cheaper to implement, use, and maintain. Providers are introducing a steady stream of cloud-based services for enterprise resource planning (ERP), web conferencing, data backup, and other key applications. Some cloud applications come from established companies, such as Salesforce.com, a leader in customer relationship management applications. These companies use cloud computing as a competitive weapon against old-line companies selling conventional products and services. Intacct, for example, is an on-demand financial management and accounting system.

"A really interesting and perhaps counter-intuitive phenomenon is that there is a huge demand for SaaS services from enterprises that are firmly committed to the on-premise model," observed Phil Wainewright, ZDNet's SaaS expert. "Perhaps even more surprising is that IT departments are some of the most avid buyers of SaaS services — and they're turning to SaaS to help them manage their on-premise infrastructure." Security services, email management and security, Help Desk and service management are among the applications that IT managers are handing over to external SaaS providers, Wainewright noted.

Wainewright also points out that SaaS is a made-to-order antidote for shrinking capital budgets during economic downturns. He wrote: "... cash-strapped businesses will find the pay-as-you-go SaaS model highly appealing — especially if it helps deliver operational cost savings at the same time." A survey by ScanSafe, a SaaS provider of security services, supports this thesis. The survey of 300 IT managers found that 78% of them believe economic uncertainty makes SaaS more attractive.

From Banking Convenience to Business Productivity

Long before the moniker became popular, most Internet users have been engaged in various types of cloud computing. For years, people have banked online, shopped online, prepared their tax returns online, and communicated using webmail accounts—all without having any database or software for these applications resident on their computers.

With so many people comfortable with personal forms of cloud computing, the migration to using it for business productivity was inevitable. Now that trend is gaining traction.

The Clouds are Soaring

- "By 2011, early technology adopters will forgo capital expenditures and instead purchase 40 percent of their IT infrastructure as a service," states Gartner Group. "Increased high-speed bandwidth makes it practical to locate infrastructure at other sites and still receive the same response times."
- 69 percent of America's Internet users are using some form of Internet-based computing, such as web-based e-mail or photo storage, according to a study by Pew Research Center.
- By 2013, 12 percent of world software market will be Internet-based forms of SaaS and cloud computing, according to Merrill Lynch.
- What impact will a long-term, global recession have on cloud computing? A survey by ScanSafe, a SaaS provider of security services, revealed that 78% of IT managers believe economic uncertainty makes SaaS more appealing.
- "A move towards clouds signals a fundamental shift in how we handle information," writes Stephen Baker in Business Week. "At the most basic level, it's the computing equivalent of the evolution in electricity a century ago when farms and businesses shut down their own generators and bought power instead from efficient industrial utilities."

"Spurred by the need for easy to use, implement and maintain IT solutions and limited infrastructure and IT resources, and fueled by growing choice and solution availability, SaaS is gaining popularity in the SMB market," stated AMI-Partners in a report. A survey by the consulting firm found that small and medium-size businesses are increasingly attracted to SaaS solutions. Adoption rates doubled from 2004

to 2008, with 21 percent of small businesses and 31 percent of medium-size companies currently using SaaS.

According to a survey by Gartner, "Nearly 90 percent of organizations surveyed expect to maintain or grow their usage of software as a service (SaaS), citing cost-effectiveness and ease/speed of deployment as primary reasons for adoption."

Most companies begin with modest, risk-free steps into the new realm of cloud computing—becoming more aggressive once they see the value. A firm that did just that is Home Care Assistance, which provides non-medical home care services for older adults as an alternative to nursing homes or assisted living facilities. Seeking better, faster ways to set up the computing infrastructure for new franchisees, the Palo Alto, California-based firm selected Google Apps as its business solution. At the outset, new franchises use Google Apps to quickly implement mail, calendar, and instant messaging applications. Soon they are sharing spreadsheets, documents, and project plans with their peers using the collaboration suite of apps. Google Docs gives everyone "living, breathing, evolving documents that keep everyone on the same page," says Lily Sarafan, the firm's principal and chief operating officer.

Open the Door with Email

For many organizations, mail is the "door opener'" that introduces cloud computing. Genentech, a leading biotechnology company, selected Google Apps as an online, fully integrated "collaboration suite" to replace its e-mail and calendar systems.

According to Todd Pierce, Genentech's vice president of corporate information technology, cloud computing from Google and other providers avoided the need to build and operate a new data center. Cloud computing, he said, "saves us millions of dollars over five years over any of the other alternatives we looked at and provides us with worldwide data recovery, unprecedented integration and ease of use, and device independence."

Scalability is an additional cloud computing advantage that Genentech has experienced. "You can go from one to 15,000 [users] instantly. Just imagine if you tried to do that in your own data center. It would take weeks just to order the equipment and get it installed. ... You don't need all that capacity 365 days a year; you need it at peaks, and that's possible with Google Apps."

He added, "We now have a device independent, online, available anywhere, easy-to-use set of collaboration tools that allow us to share information in a way that works best for the employee. They can choose how they want to work and how they want to share. The technology doesn't dictate that; it enables it. And it does it at a price that can't be beat, because of the scale that Google operates, and my ability to just buy what I need."

With so many matters demanding their attention, why should business executives look into cloud computing? Here are some of the drivers of cloud computing's surging relevance:

- Cloud computing enables budget-strapped small companies to achieve high-quality solutions with limited capital. The cost of entry is low; some compare it to a developing country that implements wireless networks without ever building a landline telephone infrastructure. As needed, businesses can tap "clouds" of computing power, without regard to where the cloud is physically and without the complexities of managing it. As a result, small and midsize organizations gain better redundancy and continuity than they usually have for internally managed applications.
- Cloud computing thrives in entrepreneurial environments where leap-frogging the competition is a daily motivator. Innovators need tools that fit their fast pace, work-anywhere mentality, collaborative instincts, and intolerance of budgetary barriers.

- Cloud computing minimizes or eliminates the ongoing costs of traditional on-premises applications, such as software maintenance and upgrades.
- Cloud-based services are typically priced modestly, so a business can ramp up quickly—an approach that may be ideal for entrepreneurs, start-ups, and fast-growing businesses. Cloud-based applications can be easily scaled upward as a company grows. Likewise, a company can readily scale back on its cloud applications if necessary when business conditions turn sour.
- Cloud computing sets the stage for corporate innovation. Freed from lengthy implementation projects, moribund legacy applications, and armies of consultants, IT personnel can turn cloud computing into a competitive advantage.

Winning Converts to a New Way of Working

Of course, no form of computing is a panacea. For many employees, cloud computing will represent a radically different way of thinking about computer systems, resources, and workflows. Consequently, companies may experience some resistance when employees are asked to move away from familiar work habits, routines, and applications.

Web-based email applications provide a good example. Long-time users of local desktop email clients, such as Outlook, are comfortable dragging and dropping messages into folders. Google's Gmail, on the other hand, uses labels to categorize messages. Resistance to Gmail tends to disappear once users experience its advantages, such as the ability to put a single message into multiple categories and later access it by any of its labels or by advanced search. The web-based approach also supports new best practices, for example, chat is integrated into the Gmail interface. And a person's email inbox can become a customizable portal with quick, easy links to frequently accessed applications and topics.

User resistance has some interesting implementation implications. For example, many companies have achieved success by using a path-of-least-resistance approach: Ask enthusiastic "power" workers to be the early adopters of cloud computing applications. Genentech, one of the largest users of Google Apps, achieved tremendous success by tapping "Google guides" to lead deployment.

Advantages of a Cloud Computing Approach

- **Low start-up costs** make cloud computing especially attractive to small businesses and entrepreneurs.
- **Low cost for sporadic use**. TurboTax online is free for "standard" taxpayers. Similarly, some cloud-based business services, such as Google Apps, do not need to be purchased for one-time or infrequent computing.
- **Ease of management**. No need to worry about keeping licenses current or purchasing additional hardware.
- **Scalability**. High-growth companies can easily expand the number of users and locations at modest cost.
- **Device and location independence**. The way you access a cloud could be your desktop. It could be someone else's computer. It could be a smart phone.
- **Rapid innovation**. Because vendors are able to roll out new features incrementally, they can respond to user needs more rapidly.

People in their twenties and thirties have grown up with the Internet and readily grasp cloud computing. A research study, the Pew Internet & American Life Project, confirms that younger employees are quickly adopting cloud-based applications: about three fourths of Internet users in the 18-29 age bracket have used webmail services.[1]

[1] Horrigan, John. Use of Cloud Computing Applications and Services, page 5. Pew Internet & American Life Project, September 2008. http://www.pewinternet.org/pdfs/PIP_Cloud.Memo.pdf, accessed on January 27, 2009.

Beyond Cost Savings

Once user acceptance is achieved, companies often experience cascading benefits.

The main driver for launching the first cloud computing application is usually to save money. Executives want to leverage high-quality applications that would be expensive in an on-premise format.

But later, adopters discover other eyebrow-raising advantages. Take scalability, for example. In addition to its cost advantages, cloud computing offers speed and convenience in adapting to growth, new locations, staffing changes, and reorganizations. As some Google Apps fast-growing customers find, all it takes to open new locations is to open new accounts and train the staff.

Users quickly discover that cloud computing doesn't end with webmail. Ultimately the realization comes that cloud computing boosts productivity and fosters innovation through networking, remote access, and collaboration. Examples include real-time editing of documents by multiple authors, the ability to easily share rich media files from web sites, and YouTube-like usage of video within the enterprise.

Is Cloud Computing Reliable and Secure?

Some businesses are reluctant to implement cloud-based applications because of their concern with downtime. IT managers should conduct an objective evaluation comparing internal downtime with the service level assurances of the proposed cloud application and the track record of the vendor providing it.

To put it in perspective, ask yourself this: Is there any reason to be less comfortable having your data in a "cloud" than your own data center? When managing a data center, you should compare your ability against that of a third-party provider in supporting high availability, continuity, disaster recovery, power consumption, and the ongoing management of technical and physical infrastructure.

Can You Do Everything "In the Cloud" that You Can Do with Conventional Software?

Not yet. The range and functionality of applications may be a limitation currently, but the array of cloud computing services available to businesses is mushrooming. There are several factors driving this trend:

- A number of companies, including Google, Microsoft, Amazon, and IBM, have built enormous datacenter-based computing capacity all over the world to support their Web services offerings (search, instant messaging, Web-based retail, etc.). With this computing infrastructure in place, these companies are already poised to offer new cloud-based, software applications.
- Large enterprise software solutions, such as ERP (Enterprise Resource Planning) applications, have traditionally only been affordable to very big enterprises with big IT budgets. However, companies that sell these solutions are finding they can reach small to medium businesses by making their very expensive, very complex applications available as Internet-based software services. These new market segments have encouraged them to expand their SaaS offerings.
- New kinds of hardware, such as Mobile Internet Devices (MIDs), lighter and more portable notebook computers (net books), and even high-end smart phones with Internet accessibility, make it easier for end-users to log into their cloud-based applications any time, any place. This means the market for SaaS is also being driven at the user end by new Internet accessible devices.

Eventually, you can expect to see competitive offerings for most enterprise applications. Meanwhile, many companies will likely mix SaaS with more traditional on-premises applications. When considering

augmenting your existing computing capacity with SaaS, it's important to determine that data formats are portable between your applications that need to share data (spreadsheets and documents, for instance).

Evaluating Risk

In the infancy of online banking, people thought it was risky. Today, we know there's far less risk of fraud or identity theft with online banking than there is with manual mailing of checks and statements.

Generally, cloud computing has a different set of risk factors than operating an on-premises data center. In essence, you are exchanging internal technology management risk—in other words, the risks of less-than-excellent internal performance and the need to maintain internal server systems—for vendor risk (the quality of the service provided by the SaaS vendor). By offloading the former, you have to be confident in the latter's capabilities.

In three areas of risk, cloud computing enjoys big advantages:

- **Upgrade management**. With SaaS, applications are always current. In traditional on-premise environments, software updates occur at intervals, and they typically represent major changes in functionality and sometimes incur significant costs. With cloud-based applications, updates happen automatically. Updates are incremental and typically do not disrupt workflow. You never need to worry about updating hardware to accommodate new software capabilities.
- **Spam and virus threats**. Threats of virus outbreaks and spam can easily overwhelm even the largest company's servers. Cloud computing providers can optimize the load across data centers so that the impact of a large attack is defused.
- **Public accountability**. Established cloud computing providers understand that switching costs in the cloud are lower. They must work to establish – and maintain – the customer's trust. They might set in place rigorous security controls and protocols to which they hold themselves accountable by regular, independent audit, for example. Or, if there is a service disruption or an outage, providers may post notices to the public with a complete post-mortem accompanying the resolution of the incident. The very public nature of their service, in essence, functions like an additional level of oversight,

Think Differently When You Evaluate 'Cloud' Services

Whether your company outsources most IT functions or has its own IT staff, cloud computing applications are worth evaluating. However, you may find yourself thinking a little differently about cloud-based applications when comparing them to traditional on-premises software.

In some cases, your questions may be the same, but the answers may be considerably different. For example:

- **What is the total cost of ownership?**

  Lower client hardware costs, faster implementation and time to value, and possibly lower license costs all change the calculation.

- **What are the hardware, software and maintenance considerations?**

  In a cloud-based computing environment, computer memory, speed, and disk space are not so significant because data is stored and computation occurs "in the cloud."

For software, a key issue is managing updates. Typically, in cloud-based computing, updates trickle in incrementally. Does this present problems for users, or does it introduce risks of feature changes that impact your data? Good questions for your service provider.

- **What's the best fit for your business process?**

  When comparing systems, some cloud-based applications may not have the feature depth of their traditional on-premises counterparts. However, some activities such as document sharing and setting up work-groups on the fly may be easier with cloud-based applications; similar capabilities in a traditional environment may require additional software tools.

  Also, examine how the application will impact work flow. Little things can make a big difference. For instance, in the traditional world of software applications, you might send a document to your co-worker via email and be confident that at least one of you would have a copy if something happened. In fact, you would likely have two copies of the document on your system – one in a folder and one in your sent email queue. By going through your sent emails, you can always recover earlier drafts if you must. However, if you create a document in the cloud, there is only one copy of that document, and it's not on your computer. Does this change the way you typically work? Does this change the way you manage your documents?

- **What are the security risks?**

  In a cloud-based software environment, physical security is stronger because the loss of a client system does not compromise data or software. However, how secure is the service provider's system against outside attack? What do you feel about possibly having your proprietary business information in the same cloud as your competitor's? What happens if there is a system failure – is the data secure? How reliable is your service provider? These are all questions you should ask when evaluating the cloud computing alternative.

- **How do you work in an offline environment?**

  With on-premises applications, employees usually can access some key information even when online access isn't available. Cloud applications may address the issue quite well or not at all, so this is an excellent question for your service provider.

Conclusion

Just as the interstate highway system introduced a completely different kind of driving when it supplanted the system of undivided highways as the principle means of diving any great distance, cloud computing and SaaS represent a completely different kind of client computing.

Anyone who has done their banking over the Internet, or purchased something from a Web-based store, or used an instant messaging service has already experienced cloud-based applications.

Just as Google AdWords revolutionized the online advertising business, Google Apps has the same potential to revolutionize the productivity of IT operations for small to mid-size businesses. The cost savings are immediate, and the potential for innovative collaboration is boundless.

Google Apps offers simple, powerful communication and collaboration tools for enterprises of any size in business, education, or government—all hosted by Google to streamline setup, minimize maintenance, and reduce IT costs. With Gmail, Google Calendar, and integrated IM, users can stay connected and work together with ease within or across company firewalls. And, using Google Video, Google Sites and Google Docs, which include word processing, spreadsheet, and presentation tools, they can share files

and collaborate in real-time, keeping versions organized and available wherever and whenever users work.

This white paper has a sequel titled “Cloud Computing--What is Its Potential Value for Your Company?” In this paper, you'll read what other companies have achieved with Google Apps. This insight may help you examine whether cloud computing makes good business sense for your company.

About Google Apps

Whether your business is moving everything to the cloud, or struggles to give employees access to critical information, or just wants an affordable email solution, Google Apps can help you stretch resources and work smarter.

Google Apps offers simple, powerful communication, and collaboration tools for enterprises of any size in business, education, or government—all hosted by Google to streamline setup, minimize maintenance, and reduce IT costs.

Google-powered e-mail, IM, and calendaring help users stay connected and work together effectively. The essential collaboration tools—Google Docs, Google Video, and Google Sites—boost productivity and encourage innovation.

Google Apps has multiple layers of protection to keep your business data safe and secure. Google operates one of the largest networks of distributed data centers in the world, and the company goes to great lengths to protect the data and intellectual property on these servers. Each piece of content can be as private or as public as necessary.

Google Apps includes a 99.9% uptime guarantee. Phone support is available for critical issues.

Google strives to make Google Apps as open as possible, with full accessibility and an ever-growing library of plug-ins. In addition, the Google Apps engine provides an infrastructure for people to do their own applications development within the Google Apps architecture.

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