Dynamic Infrastructure
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The Benefits of Cloud Computing

A new era of responsiveness, effectiveness and efficiency in IT service delivery.

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IBM and customers both reap the benefits of cloud computing

IT executives today can be forgiven if accused of having their heads in the clouds. That's because the clouds that interest IT executives today aren't of the meteorological variety; they are computing clouds. Widespread interest and even unabashed excitement about cloud computing emanates from businesses, government agencies and other organizations seeking more dynamic, resilient and cost-effective IT systems than previous generations of technology allowed.

While the term "cloud" may connote an ephemeral quality to the type of computing it describes, the benefits of cloud computing to customers are very tangible. IBM itself—as well as clients around the world—is adopting cloud computing in recognition of its potential to usher in a new era of responsiveness, effectiveness and efficiency in IT service delivery.

> *"Cloud computing represents a key technology in delivering new economics, rapid deployment of services, and tight alignment with business goals"*
>
> — IBM Research Doubles its Productivity with Cloud Computing[1]

Cloud computing is a style of computing whose foundation is the delivery of services, software and processing capacity using private or public networks. The focus of cloud computing is the user experience, and the essence is to decouple the delivery of computing services from the underlying technology. Beyond the user interface, the technology behind the cloud remains invisible to the user, making cloud computing incredibly user-friendly. Cloud computing is an emerging approach to shared infrastructure in which large pools of systems are linked together in private or public networks to provide IT services. The need for such environments is fueled by dramatic growth in connected devices, real-time data streams and the adoption of service-oriented architectures and Web 2.0 applications, such as mashups, open collaboration, social networking and mobile commerce.

Continuing advances in the performance of digital components has resulted in a massive increase in the scale of IT environments, driving the need to manage them as a unified cloud.

Cloud computing represents the next phase in the logical evolution in the delivery of IT services, building on previous innovations that include grid, utility and on-demand computing that were first pioneered by IBM.

Early on, IBM recognized cloud computing's potential to dramatically improve not only how its customers deliver IT services, but also how cloud computing could streamline and enhance the way in which IBM meets its own internal demands for IT resources. As a result, IBM has moved aggressively and successfully within its own operations to implement cloud computing across the organization.

Thanks to cloud computing, IBM is able to respond rapidly to customer needs in a far more cost-effective manner. For example, cloud computing has enabled IBM to offer customers an extremely flexible, scalable solution for those peak periods when processing demands far exceed what customers' internal IT resources can accommodate. This is IBM's Computing on Demand service, in which clouds enable IBM to provision servers, storage and networking capability within hours of the time a customer requests the capacity. Thanks to cloud computing, IBM's Computing on Demand service is meeting the needs of more customers than was thought possible.[2]

Similarly, IBM has been able to markedly improve the productivity of its European Benchmark Center, which allows customers to test whether new IT resources will perform as required. With cloud computing, the provisioning of the Benchmark Center's

resources for customers has been condensed into a single day instead of a week or more. This has dramatically increased the Center's capacity and greatly shortened the sales cycle, directly contributing to IBM's bottom line.[4]

> *"With the advent of cloud computing, the IBM Watson and Zurich Research Centers expect to be able to provision more than 1,200 virtual machines in 2009–more than double the number provisioned in 2008."*
>
> — IBM Research Doubles its Productivity with Cloud Computing[3]

IBM's Watson and Zurich Research Centers embraced cloud computing to schedule and complete far more projects than they otherwise would have been able to undertake. Instead of the usual two weeks required to request, schedule and provision a particular software stack for a research project, cloud computing allowed them to reserve IBM resources in numerous remote locations in a fraction of the time. This has driven better resource utilization, consolidation of capital budgets, and greater productivity.[5]

The arrival of cloud computing comes none too soon. The model for the modern data center, having served the information technology needs of organizations so well for so many years, is facing challenges.

Data centers in an ever-changing world

Most IT executives recognize that the organizing principles underlying today's data center have outlived their utility and that a new paradigm is emerging. They are keenly aware of specific pain points within the underlying IT infrastructure, but are often so consumed with day-to-day IT issues that they lack the time and resources to formulate long-term solutions. According to a 2007 survey by Gartner Research, more than 70 percent of Global 1,000 organizations expect that they will need to significantly modify their data center facilities before 2012.[6]

The challenges facing the current data center construct include:

- *Ballooning labor costs*—IT budgets are increasingly strained by the rising cost of personnel required to maintain and manage the data center. Administration costs for servers have spiked by 400 percent since 1996 and now comprise the single largest cost within the data center.[7]
- *Sky-high energy consumption*—Power and cooling costs for data centers have skyrocketed by 800 percent since 1996, and the escalating costs see no end in sight, yet data center resources have low utilization (many below 20 percent).[8] Over the next five years, industry watchers predict that U.S. enterprise data centers will spend twice as much on energy costs as on hardware and twice as much as they currently do on server management and administrative costs.[9] Moreover, many data centers are realizing that even if they are willing to pay for more power, capacity constraints on the grid mean that additional power is unavailable.
- *Growing Demands from users*—Today's on-demand society assumes nearly universal access to real-time data and analytics in a resilient, secure environment. Anything short of that standard is unacceptable. These demands are being driven by a proliferation of data sources, mobile devices, radio frequency identification systems, unified communications, Web 2.0 services and technologies such as mashups. These rising expectations are also creating demands of data centers that IT administrators are challenged to satisfy.

> *"A recent IDC survey of IT executives, CIOs, and their line of business (LOB) colleagues shows that cloud services are 'crossing the chasm' and entering a period of widespread adoption,"*
>
> — Frank Gens, senior vice president and chief analyst at IDC.[10]

- *Chaotic data silos*—Too often, today's data center is a haphazard collection of multiple hardware systems, operating systems and applications that have accumulated over a period of years in response to the demands of various internal business units. These disparate systems grew without an enterprise approach to the data center that was based on a common set of goals and standards. Instead, the systems were often dedicated to meeting the specific needs of a single business unit or process function without a view toward interoperability with the rest of the data center or the needs of other parts of the organization. Often, the result was a data center with multiple versions of databases, operating systems and hardware from a variety of vendors. This environment can easily result in thousands of different system images in a data center. This high degree of complexity not only greatly increases the number of dedicated technical staff needed to troubleshoot issues—it also heightens the risk of service outages.
- *Exponential growth in data volume*—The proliferation of devices, compliance, improved systems performance, online commerce and increased replication to secondary or backup sites is contributing to an annual doubling of the amount of information transmitted over the Internet, according to market researcher IDC. The world's information, the raw material for databases, is projected to double every 11 hours by 2010.[11] As a result, more than a third of data centers in 2006 reported having databases in excess of a terabyte in size.[12]

The hidden cost in responding to these pain points is business innovation. Having to spend much of their day fixing problems prevents IT professionals from devoting the time and resources to development activities that could truly promote innovation and

tap the potential of the data center to drive the business forward in unanticipated directions. To move forward, one must begin to look differently at how the infrastructure itself can help drive innovation in the business. IT executives must reposition themselves as leaders who can bring their organizations to new levels of performance and efficiency through IT while also focusing on improving service, reducing costs and managing growing risks in an ever-connected world. IBM offers a cohesive strategy for the development of a dynamic infrastructure, one that will support the multitude of demands coming at IT today while also laying the foundation for a highly responsive, agile business environment that can leverage the many different types of cloud computing.

Cloud computing tangibly enhances business value

With cloud computing, IT professionals can devote more energy to enhancing the value of using IT for their enterprises and less on the day-to-day challenges of IT. Here are some of the ways that cloud computing addresses the pain points of today's IT environment.

Cloud computing liberates organizations to deliver IT services as never before. Cloud enables the dynamic availability of IT applications and infrastructure, regardless of location. More rapid service delivery results from the ability to orchestrate the tasks to create, configure, provision and add computing power in support of IT and business services much more quickly than would be possible with today's computing infrastructure. Enhanced service delivery reinforces efforts for customer retention, faster time to market and horizontal market expansion. Cloud computing can enhance SOA, information management and service management initiatives, which also support your service delivery initiatives.

Cloud computing also promotes IT optimization so that IT resources are configured for maximum cost-benefit. This is possible because cloud computing supports massive scalability to meet periods of demand while avoiding extended periods of under-utilized IT capacity. With the click of a mouse, services can be quickly expanded or contracted without requiring overhauls to the core data center. The benefits include lower cost of ownership, which drives higher profitability, enabling you to more easily reinvest in your infrastructure and answer the question, "How do I do more with fewer resources?"

Cloud computing can enhance SOA, information management and service management initiatives, which also support your service delivery initiatives.

Cloud computing fosters business innovation by enabling organizations to explore quickly and cost effectively the potential of new, IT-enabled business enhancements that can grow with unprecedented scale.

Not only does cloud computing deliver a greater return on IT equipment spending, but it also promotes more efficient and effective use of technical staff. IT labor costs alone represent as much as 70 percent of an IT operating budget.[13] With its highly autonomic character, cloud computing eliminates much of the time traditionally required to requisition and provision IT resources.

Cloud computing also yields significant cost savings in the real estate required for the data center as well as power and cooling costs. Thanks to virtualization and the cloud's capability of tapping resources (either through a private cloud or tapping publicly available cloud resources), data centers can rein in the relentless pressure to expand their physical footprint. That space savings translates into reduced energy consumption, an important consideration in light of the fact that power and cooling

costs for data centers have risen eight-fold over the past 12 years.[14] Studies have documented that cloud computing can save 80 percent on floor space and 60 percent on power, while tripling asset utilization.[15]

With clouds as architected by IBM, data security is built into the cloud. IBM incorporates next-generation security and cloud service management technologies, as well as simplified security management and enforcement, offering enterprise customers the same security and compliance guarantees that are equivalent or better than what they can expect in traditional computing environments. Built upon IBM's extensive industry security leadership, IBM's security surrounding clouds focuses on developing trusted virtual domains, authentication, isolation management, policy and integrity management and access control technologies designed specifically for cloud computing.

Resilient Cloud Validation: The next step in achieving resiliency

Just as they can incorporate security features to meet the demands of the most demanding services, clouds can also be designed so that they are inherently robust. IBM offers a Resilient Cloud Validation program to confirm the resiliency of any company delivering applications or services to clients within the cloud environment. As a result, customers can quickly and easily identify trustworthy providers that have passed a rigorous evaluation, enabling them to more quickly and confidently reap the business benefits of a cloud service. This way, customers can be sure that they avoid the unpredictable performance and potential high-profile downtime and recovery events which might occur with other cloud services.

"A leading provider of variable annuities also relies on IBM Computing on Demand (CoD) and cloud computing to analyze huge volumes of data needed by the company's actuarial team within 10 hours of the time the data becomes available. With IBM CoD, the annuity provider can scale from a modest 200 processors to as many as 500 processors for critical workloads."

—IBM Computing On Demand Uses Clouds to Increase Business Productivity[16]

IBM is helping new clients to move into the cloud. One of Houston's largest and fastest-growing human-services non-profit agencies, Neighborhood Centers, which serves over 200,000 citizens in Southwest Texas, depends on IBM cloud services to back up server and PC data from distributed environments and store it in secure off-site locations. As a provider of essential community services through 20 facilities, Neighborhood Centers could not tolerate a shutdown when hurricane Ike hit. With the cloud, Neighborhood Centers suffered no business interruption and enjoyed high-quality data protection. The resiliency and flexibility made possible by the cloud are enabling the non-profit to win new contracts.

IBM is applying the knowledge and insight gained from hundreds of related engagements to cloud technology. IBM is working directly with clients to create replicable, cloud-delivered, industry-specific services like Lender Business Process Services or Healthcare Process Services, as well as horizontal business services like CRM and supply chain management.

Cloud computing abroad: The success of the Yun platform

In China, IBM is piloting a newly developed cloud computing platform, codenamed Project Yun which is Chinese for "cloud," for companies to access business services. The platform is designed to make the selection and implementation of new cloud services as easy as selecting an item from a drop-down menu. With no need for back-end provisioning, the IBM platform stands to cut the time required to deliver new services dramatically. The Yun platform allocates storage, server and network resources for the customer application with zero human input, achieving top performance, availability and power utilization.

One of China's largest retailers welcomes more than 10 million customers per day; Wang Fu Jing Department Store has deployed several key cloud services from Project Yun, including a supply chain management solution for its vast network of retail stores to easily share supply chain information and visualize the execution of B2B business processes with thousands of their own SMB suppliers via the cloud.

To meet customers' growing appetite for cloud computing services, IBM has built more than a dozen cloud computing centers for customers around the world. For example, in China, the Wuxi Cloud Center provides on-demand virtual computing resources that allow up to 200,000 software developers to share a cost efficient IT environment from their PCs or other computing devices. This approach stimulates economic growth and creates more IT related jobs.

Cloud computing in Europe

In Europe, IBM helped a Software as a Service (SaaS) provider create computing resources with the security, continuity, compliance and fast delivery needed to meet customer demand, while keeping costs low. IBM cloud technology, with its strong Service Management capabilities, provided a reliable, resilient resource pool that is compliant with changing business rules and regulations. This provider can now expand to reach new customer segments, while also creating new jobs and improving customer satisfaction.

> *"Cloud made a considerable, positive impact on IBM's Technology Adoption Program (TAP). Instead of 488 new servers that would have required manual deployment, TAP only needed to procure 55 new servers to support its plan. That translated into annual hardware savings of $1.3 million and power savings of more than $69,600."*
>
> — Cloud Computing Saves Time, Money and Shortens Production Cycle[17]

IBM not only provides the vision that enables IT professionals to focus more on innovating within their IT system and less on the day-to-day IT operational issues—it also delivers an approach whose foundation is real-world experience built on open standards and reinforced by an ecosystem of technology partners. No other provider focuses on the process of data center transformation at all levels—from technology, consulting and strategy services to business processes—like IBM. The result is value creation at every stage of the process.

Feeling secure with IBM's track record

Taming disruptive technology and harnessing it to work for clients is in IBM's DNA. IBM's track record for transitioning data centers to new levels of reliability and performance through thousands of engagements worldwide is well documented. Whether it was its pioneering leadership with Linux®, e-business or grid computing, IBM has collaborated with clients to implement a more dynamic infrastructure and pave the way for innovation for enterprise clients that have become widely emulated within the industry.

The results are tangible and meaningful. In its own data center transformation, IBM's IT investments over the past five years have yielded cumulative benefits of $4.1 billion,[15] while enabling real-time integration of information and business services. IBM is looking to double its computing capacity by 2010 with no planned increase in energy consumption or carbon footprint.

Backed by deep technical capabilities, unmatched skills and a clear roadmap with assessments and solutions clients can act upon, IBM offers the key building blocks for realizing the possibilities of cloud computing. One of the foundational stones is the next-generation IBM System z10™ mainframe. The new System z10 represents decades of IBM innovation and collaboration with IBM's most advanced clients. It delivers up to 100 percent more performance, up to 100 percent utilization and potential costs savings of 80 percent or more versus competitive IT environments.[18] The IBM System z10 is the most powerful tool available to clients to reduce costs and complexity in their data centers.

A major part of IBM's value proposition rests on its commitment to client collaboration, which has enabled IBM to identify best practices for the implementation of a dynamic infrastructure, driving forward new levels of IT optimization and transformation. With a focus on process as well as technology transformation, IBM has identified leading-edge best practices for IT optimization and transformation. This allows IBM to provide customers with a proven, disciplined, strategic roadmap and implementation approach encompassing consolidation, virtualization, flexible IT infrastructure and "IT as a set of services," regardless of the current state of the customer's data center.

Cloud computing provides a new environment that enables organizations to leverage emerging technologies that address growing business challenges and to position their companies to be more competitive in a cost-effective manner. With experience at all levels—from technology, consulting and strategy services to business processes—IBM is uniquely positioned to collaborate with clients and enable them to reap the significant benefits of cloud computing.

In the final analysis, cloud computing is not just about data center technology. It's about streamlining business processes to make organizations and people more strategic, more responsive to change and more oriented to service delivery. There is no provider with more success and experience in achieving this for clients than IBM.

For more information

To learn more about Cloud Computing please contact your IBM representative or visit: **ibm.com**/cloud

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Route 100
Somers, NY 10589
U.S.A.

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