INTRODUCTION

In conference rooms worldwide, enterprise IT departments are evaluating entry into ‘the cloud’. Armed with media reports and marketing materials, they are considering questions like, “Is the cloud appropriate for critical workloads? Will the cloud really save time and money? Does the cloud pose a security risk?”

There’s only one problem with such due diligence: there’s no such thing as ‘the cloud’. Instead, there are multiple clouds, with different configurations, offered by different providers and representing different degrees of benefit and risk.

As a result, enterprises should think of the cloud not in terms of a “yes/no” decision, but as a “how, when, and which” decision. They need to understand how specific IT challenges can be met by specific cloud-based options. They need to consider when and in what order to migrate workloads and processes to a cloud environment. And they need to carefully evaluate which provider offers the most robust and flexible cloud portfolio to meet current and long-term needs.

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In this white paper, we look at various cloud models, and assess their suitability to solve IT challenges. We provide recommendations on what to look for in a cloud provider. Finally, we take a look at the IBM Cloud portfolio.

MAKING SENSE OF THE CLOUD

One thing is for sure: the cloud is here to stay. In our increasingly technology-dependent world, the cloud represents a new model for creating and delivering IT resources and services, a model that offers the elasticity to deal with unpredictable workloads, the scale to handle exponential growth, and the shared costs to place computing resources within reach of any business user. The cloud is transforming the way we communicate, collaborate, and conduct business; and businesses that refuse to adopt the new model will find themselves at a competitive disadvantage.

But what exactly are ‘clouds’? Stratecast defines cloud computing as a flexible and scalable shared environment for creating and distributing computing resources to customers on an as-needed basis, via the public Internet or private network.

Businesses can access an increasing variety of cloud services from third-party service providers via the network. Software as a Service (SaaS) subscriptions enable users to access software applications over the network, with little or no client-side installations. This means users can access their favorite applications (e.g., LinkedIn, Twitter)
from any Internet-accessible device, without having to fuss with software versions or updates. More recently, **Platform as a Service** (PaaS) offers have come to market, providing IT professionals and developers with middleware and software for developing, delivering, integrating, and managing SaaS applications. **Infrastructure as a Service** (IaaS) offers have perhaps the greatest opportunity to transform corporate IT departments. IaaS provides users with on-demand, network-accessible storage and computing capacity, hosted in a cloud service provider’s data center. With IaaS, the provider is responsible for supplying and maintaining all infrastructure elements, including servers, storage and networking, as well as management and administrative management platforms. On-demand IaaS services may be offered in a variety of server configurations, including dedicated and shared, virtualized and bare metal.

Enterprises may choose to place their workloads in any or all of three types of cloud environments:

- **Public cloud** – A hosted environment in which server and network infrastructure is shared among enterprise subscribers. Enterprises upload their applications to servers in the cloud provider’s data center. In addition, enterprises can use the elastic capabilities of the cloud for applications designed for the Web. In most public cloud configurations, physical servers are shared among tenants, so that any given server may house applications from several different enterprises. Access is generally via the public Internet or via application programming interfaces (APIs).

- **Private cloud** – This term can be used to denote both hosted and premises-based environments. A third-party hosted private cloud is an environment in which server hardware and some ancillary equipment (e.g., load balancers and firewalls) are dedicated to a specific enterprise. Thus, the applications on a given server all belong to the same enterprise. A few cloud service providers, including IBM, allow enterprises to select dedicated configurations in either a virtualized or physical (bare metal) configuration. In a bare metal configuration, the enterprise workload has full access to the server resources, without being encumbered by the virtualization software. Alternatively, an enterprise may build a private cloud in its premises-based or self-managed data center by utilizing commercially available hypervisors, platforms, and management software, and high-density server hardware. In some cases, cloud vendors are offering optional managed services to augment their cloud offers.

In a bare metal cloud configuration, the enterprise workload has full access to the dedicated server resources, without being encumbered by the virtualization software.

- **Hybrid cloud** – A hybrid cloud generally comprises multiple IT environments (public and private). In a hybrid configuration, a single application may be deployed across environments; for example, an enterprise may host a marketing application in which the user-facing front end is hosted in a public cloud, while the private account data accessed by the application is stored in a premises-based private cloud.
The cloud model is attractive to enterprises because it solves many common IT challenges. Enterprises can turn to cloud solutions to:

- **Minimize capital investment in hardware** – In a 2013 Frost & Sullivan survey, 38 percent of enterprise IT decision-makers identified capital budget constraints as a top data center challenge; and 28 percent cited aging, inefficient infrastructure. With limited budget to replace old hardware and to add new capacity to support growing data volumes and a flood of new applications, IT is increasingly looking to the cloud. Because the cloud provider is responsible for purchasing and installing infrastructure components, the enterprise avoids investment in equipment and labor; instead paying a monthly subscription fee from the operating budget.

- **Maximize scalability** – Many workloads are dynamic, with peak usage requiring many times the processing power of downtimes. But traditional data centers do not easily accommodate scaling. Enterprises have traditionally built their data center infrastructure for peak usage, which means server capacity remains idle for the majority of times. In contrast, cloud infrastructures support scaling of applications. Capacity is allocated among workloads as needed, on demand. Furthermore, with most cloud offers, users pay only for the capacity they actually use.

- **Reduce lead time for launching new applications** – To remain competitive, enterprises must be nimble, quickly responding to opportunities and changes in the market. The cloud model supports fast deployment of workloads. Templates and application programming interfaces enable IT to deploy a new application in minutes, rather than days, whether in a test or production environment. Furthermore, when a cloud development platform is integrated with infrastructure services, enterprise developers can use templates and tools to avoid repetitive tasks and quickly develop, test, tweak, and roll out new applications.

- **Improve quality and consistency** – In addition to speeding application launches, the cloud can also minimize errors and bugs related to development and deployment. IT can test apps in a fully-scaled environment, enabling them to accurately gauge performance and load. IT can also standardize configurations, as needed, ensuring that instances deployed throughout the company adhere to corporate guidelines for security and performance, for example.

- **Minimize maintenance time** – Many IT departments operate close to the 80-20 guideline for resource allocation: 80 percent of resources (time and budget) go toward maintaining existing systems, and only 20 percent is invested in exploring new initiatives. It’s no wonder a third of IT decision-makers in Frost & Sullivan’s survey cited “keeping up with new technology” as a top data center challenge. With
cloud services, infrastructure maintenance is offloaded to the cloud service provider, freeing up in-house resources to devote to strategic initiatives.

A third of IT decision-makers in Frost & Sullivan’s 2013 cloud user survey cited “keeping up with new technology” as a top data center challenge.

However, cloud services also raise concerns among enterprises—concerns that are severe enough to keep many enterprises from engaging in the cloud in a meaningful way. The chief concerns, along with ways to alleviate them, include:

- **Security** – When server resources are shared, there is increased opportunity for data to become contaminated or lost. Furthermore, when applications are accessed over the Internet, there is greater risk of access by unauthorized users. While many enterprises address this concern by simply limiting their cloud presence to non-proprietary workloads and data, a better option is for enterprises to work with cloud providers to determine how to protect their information assets. One way is to select a private cloud solution, accessed through a private network, for sensitive workloads.

- **Performance** – In a shared environment, applications vie for infrastructure resources (e.g., processors, load balancers, firewalls). If the provider does not have sufficient infrastructure, or if the infrastructure isn’t configured to handle subscribers’ dynamic loads, bottlenecks may occur, introducing latency or jitter and affecting application performance. To alleviate this concern, enterprises may choose applications that are less latency-sensitive. Or they may select a provider that offers visibility into application performance as well as service level assurances.

- **Reliability** – Equipment failure, loss of power, and network Denial of Service attacks can strike any data center, whether cloud or enterprise-managed, and cause outages. While most cloud service providers have service level agreements that specify a minimum level of availability, the truth is that providers may not offer the same level of business continuity planning or backup resources as the enterprises do in their own centers. Enterprises should work with their providers to ensure that workloads are protected appropriately, and they should be prepared to pay for additional redundancy, and backup and recovery services for the most critical workloads.

- **Control** – Underlying many of the fears is loss of control. Enterprise IT is responsible for the overall security, performance and availability of applications and data. By placing responsibility into the hands of a third party, they believe they are ceding control. To overcome this concern, enterprises need to trust their cloud provider partners. And the partners need to earn that trust through transparency and information; that is, they must share processes and plans, and offer visibility into performance data.

While these benefits and challenges represent broad characteristics of ‘the cloud’, their applicability to any given cloud solution from an individual provider varies. Thus, the onus is on the enterprise to not only select the type
of cloud service and environment for each workload, but to understand at a granular level the solutions available from each provider. Furthermore, because the cloud represents the way IT services will be delivered in the future, it is imperative to understand a provider’s solutions in that context. The provider must not only offer solutions that are right for each individual workload, but the solutions must also work together to provide maximum value.

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In the next section, we explore tips for selecting cloud solutions and cloud providers.

CHOOSING A CLOUD SOLUTION PROVIDER FOR YOUR BUSINESS

The cloud service market is crowded with providers and vendors. In researching cloud offers, it’s important to understand how well the provider will meet your company’s needs, today and in the future. Here are some elements to probe for:

1. **Interoperability across environments:** Enterprises do well to select the right cloud environment (for example, public or private cloud) for each workload. But that doesn’t mean the environment should operate in isolation. Needs may change; workload sensitivity and volume may change; business continuity and disaster recovery plans must be met. For these reasons, enterprises should look for a provider that offers full interoperability across environments. Ideally, interoperability should extend beyond the provider’s own limited private and public cloud offers; it should also extend into the enterprise premises-based private data center.

   **Recommendation:** Understand how the cloud provider defines ‘interoperability’. Ask if the service will enable you to create a single virtual data center with full interoperability across all the environments that you currently or may in the future rely on: on-premises, private and public cloud; and even hosted offers that are managed by your Managed Service Provider (MSP), Value Added Reseller (VAR), or Systems Integrator (SI). If the definition is too restrictive to be useful for your needs, look elsewhere or limit your exposure.

   Interoperability should extend beyond the provider’s own limited private and public cloud offers; it should also extend into the enterprise premises-based private data center and even to hosted offers managed by other vendors.
2. Flexibility to Appropriately Support Different Workloads: The rich variety of business applications comes with different needs for security and performance. In determining the appropriate data center environment, it makes little sense to over-engineer (and overpay) or to under-engineer (and expose yourself to risk) for any given application. As a result, IT needs to build an environment that supports the right configurations for each workload.

**Recommendation:** Choose a service provider that enables not only a range of data center environments (on-premises and hosted, shared and dedicated, virtualized and bare metal), but also a range of configurations for each. Look for security and availability assurances for all applications, but opt to enable higher levels of both for your most sensitive and critical workloads.

3. Built-in Security: Security is cited by enterprises as a top concern about the cloud; yet, a surprising number of providers leave all or most security functions to the enterprise. The impact of that decision on cloud adoption is evident in the Frost & Sullivan survey. Not only do IT decision-makers consider cloud to be riskier than their private data centers, but among those who are familiar with cloud computing and have chosen not to adopt it, the perceived risk premium is nearly 50 percent. It’s hard to make an argument for them to adopt cloud services that they consider to be 50 percent riskier than traditional options. They will naturally turn to cloud providers that have invested in elements that protect user data and workloads from unauthorized access, inadvertent contamination from other users, service disruptions, and loss or leakage of data.

**Recommendation:** Understand what the cloud provider offers and is willing to stand behind when it comes to security. Look for security components that are baked into the fabric of every offer, such as isolation of enterprise workloads, and firewalls to protect against hacking. For more sensitive workloads, seek out greater degrees of security and availability. Don’t rely on marketing claims; insist on security certifications, and be sure any assurances are backed up with reports and SLAs.

4. Meaningful SLAs: Cloud providers are starting to issue SLAs associated with their services, although the industry has yet to gel on a standard definition. This leaves it to the enterprise to think through what performance metrics are most important, and what is appropriate compensation if they are missed. Unfortunately, many enterprises neglect to do that, which means they can be left without compensation for a business-impacting outage. Today, most IaaS SLAs relate to availability of service—more specifically, to average uptime associated with the provider’s cloud servers. But the trade press is full of reports of cloud outages that are not covered by standard SLAs; for example, because the outage impacted a peripheral component or service, or because the total duration was lower than the annual average cited in the contract.
**Recommendation:** Understand what is important to your business and be sure the SLAs support that. Think of SLAs as insurance to protect your business operations, rather than a way to manage your provider in the handling of small issues. If the provider’s standard SLAs don’t match your needs, ask for custom SLAs. For example, an average annual uptime figure may be less important to you than duration and repair time for any given outage.

5. **Enterprise Support:** Thanks to high levels of automation, the cloud is largely a “do it yourself” model, with enterprises responsible for configuring, deploying, and managing their own applications. As such, most vendors have adopted self-service support tools, such as an online library and, perhaps, a customer forum. Unfortunately, for many vendors, that’s where service options ends; they offer little or no live access to experts.

**Recommendation:** Adoption of any new technology will require some degree of expert technical assistance, whether to answer simple questions or to help with migration projects. So, be sure your provider has the expertise to provide guidance as you embark on your cloud journey. Ensure the provider and/or its network of partners understands both the technical challenges of cloud adoption and business process challenges. The provider should offer multiple channels to reach out with technical questions; for example, via phone, email, or chat. In addition, the provider and partners should offer professional services engagements to assist with projects such as cloud strategy planning, migration, and security assessments.

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6. **Support for Key Enterprise Applications:** Few enterprise IT leaders have the nerve to attempt to bring their critical systems into a cloud environment. Highly customized, far reaching systems like SAP are not conducive to compartmentalization into a VM; and the risks of failure are too high. Furthermore, many providers of complex ERP and similar systems will not unilaterally support cloud configurations, which means performance assurances may be void. Yet, IT departments could certainly benefit by introducing cloud-related efficiencies to their legacy work engines.

**Recommendation:** Ask cloud service providers if they support SAP and/or other commercial business applications. Does the provider have expert technicians and/or business consultants who are versed in the service? Will it help you assess and migrate your system workloads? Will you be able to easily upgrade and integrate system components after migration? Be sure to talk to the provider’s experts, as well as other enterprises that have deployed the service.
THE CASE FOR CHOOSING THE IBM CLOUD FOR YOUR CLOUD DEPLOYMENT

In selecting a provider that offers a breadth of cloud infrastructure solutions, enterprises would do well to consider IBM and the growing family of services that are part of the IBM Cloud portfolio.

Thanks to the addition of SoftLayer services to existing IBM Cloud Managed Services in 2013, IBM offers the industry’s broadest portfolio of high-performance, on-demand IaaS services. The powerful SoftLayer platform meets the needs of both enterprise IT and development organizations for flexible, scalable hosted infrastructure services.

SoftLayer offers an array of enterprise-grade features and functions, including:

- Multiple configuration options, including virtual and bare metal server configurations in a choice of operating systems, to support different types of workloads.
- “Triple network” architecture, comprising public network transport from Tier 1 global carriers, a private network for transport between and within SoftLayer data centers, and a separate management network for real-time monitoring and management.
- Powerful infrastructure management system to support rapid infrastructure provisioning and scaling. APIs support over 1200 functional calls, streamlining provisioning and supporting interoperability.
- Access to a robust catalog of preconfigured software images, from IBM and its partners. Or enterprises can upload images of their own licensed software.
- Persistent storage option, which can be ordered and dynamically attached/detached in blocks.
- Object storage system, for storing and sharing large files over the web.
- Access via public Internet or virtual private network.
- Standard and premium support options.

Furthermore, the SoftLayer portfolio addresses prevalent concerns about the cloud. For example:

- **Security** – SoftLayer services are hosted in a secure, multi-tenant environment, with isolation between tenants, dedicated firewalls, and VPN access by remote users secured via encryption/authentication.
- **Performance** – For high-performance computing or other applications where latency is a concern, SoftLayer’s bare metal services provides optimal price-performance. In addition, SoftLayer ensures rapid provisioning and full auto-scaling of apps, thanks to a robust API that supports more than 1600 function calls to over 200 services.
- **Reliability** – IBM and SoftLayer cloud centers worldwide are monitored 24x7 to assure that infrastructure-related issues are caught and eliminated before they impact your application. In addition, SoftLayer’s triple-network safeguards against network-related bottlenecks.
- **Control** – Authorized users can access and manage all their SoftLayer cloud services via a single Web-based customer portal. Hierarchical administrative tiers allow role-based permissions, allowing the enterprise to control usage and spending.
WHY IBM?

With over 20 years of experience managing mission-critical applications for enterprises, it’s not surprising that IBM launched the industry’s first set of enterprise-grade cloud services. Today, the IBM Cloud portfolio is the broadest in the industry, thanks to the incorporation of SoftLayer infrastructure services. IBM continues to invest in its enterprise cloud vision, with tightly integrated services that span infrastructure, platform, and software layers; and that support private, public, and hybrid cloud environments.

With the incorporation of SoftLayer, IBM differentiates itself from other cloud providers in two important ways:

- IBM one of few companies that provides solutions for each part of the cloud stack—infrastructure, platform, and software. Furthermore, thanks to the robust SoftLayer API, SoftLayer infrastructure services can be integrated with IBM platform and application layers. This increases the value of the cloud for enterprises, which can do more than simply deploy their applications; they can also build and manage their applications in the cloud.

- Furthermore, IBM enables enterprises to build on-premises private clouds and hybrid clouds that are interoperable with SoftLayer on-demand cloud offers and other public and hosted private cloud offers. Because the solution supports multiple environments, IT management is less complex, enabling applications and workloads to be moved across cloud environments and managed via a single console. Leveraging its reputation as a technology leader serving the world’s largest enterprises and bolstered by the SoftLayer technology and expertise, IBM is executing a cloud strategy that positions the company as the cloud provider of choice for enterprises. As enterprises increasingly seek to deploy cloud services, they can turn to IBM and its partners for products, services, and solutions that address their current concerns and meet their future needs.

In addition, IBM leverages its expertise by providing a broad range of managed and professional services, both internally and through its extensive network of certified partners. Services include strategic planning, assessment, migration, and management of workloads in the cloud.

THE LAST WORD

The cloud is not a single entity; nor do enterprises have identical needs. As a result, each enterprise needs to develop its own pathway into and throughout the cloud model. Adoption decisions should be made on a workload by workload basis, with careful consideration to the inherent qualities of the workload (e.g., does it contain sensitive data?); the resource restraints of the enterprise IT department (e.g., do we have trained employees to manage the migration?); and the cultural and regulatory factors (e.g., what degree of risk is the enterprise willing to accept?).

But cloud adoption is about more than solving today’s short-term challenges. To prepare their companies for the future, enterprises must seek a strong foundation to deliver tomorrow’s IT services to users, quickly, securely, and with highest availability and performance. That requires partnering with a cloud solution provider with a broad range of integrated services and the expertise to guide the enterprise along the journey.

IBM offers the breadth of solutions that enterprises need to maximize the benefit from the cloud, regardless of their point of entry. With the acquisition of SoftLayer in 2013, the company has enhanced its cloud portfolio with
one of the industry’s leading infrastructure platforms. The SoftLayer cloud delivers on the promise of scalability, budget-friendliness, and rapid, on-demand deployment of workloads, in a variety of deployment models (dedicated and shared, virtualized and bare metal, private and public). Bolstered by high availability, strong security, and ease of management, these services satisfy most enterprise short-term needs for efficiency and nimbleness.

At the same time, IBM solutions are designed to support broader IT and business requirements. The IBM SoftLayer portfolio offers a robust, comprehensive cloud infrastructure; one in which workloads can be deployed, integrated, and managed consistently, securely, and efficiently—regardless of infrastructure environment. The solution portfolio not only offers enterprises a solid reason to entrust their critical workloads to the cloud today, but it offers a blueprint for strategic IT growth in the future.

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For more information about IBM’s broad cloud computing portfolio, visit [ibm.com/cloud](http://ibm.com/cloud).
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