**Cloud Computing Services**

In today’s world, there are many different delivery models for cloud computing services. The two main foundational services that are a requirement for making cloud computing into a strategic part of an overall computing are: *Infrastructure as a Service* ***(IaaS)*** and *Platform as a Service* ***(PaaS)***. In addition, *Software as a Service* ***(SaaS)*** provides packaged business process offerings that live in the cloud and leverage both *IaaS* and *PaaS* services. *IaaS* is the service that enables you to gain access to compute and storage resources in an on demand model, and *PaaS* is the service that sit on top of *IaaS* and enable you to build applications to support the business.

Cloud computing is a method of providing a set of shared computing resources that includes applications, computing, storage, networking, development, and deployment platforms as well as business processes. Cloud computing also turns traditional siloed computing assets into shared pools of resources that are based on an underlying Internet foundation. They come in different versions, depending on your needs. There are two primary deployment models of cloud computing: *Public* and *Private*. Most organizations use a combination of private computing resources (data centers and private clouds) and public services as a hybrid environment. Understanding the foundations of cloud computing calls for understanding three main cloud delivery models:

1. ***IaaS***: The delivery of services such as hardware, software, storage, networking, data center space, and various utility software elements on request. Both public and private versions of *IaaS* exit.
   * In the *public* *IaaS*, the user needs a mechanism to acquire resources. When users no longer need the resources, they simply de-provision them.
   * In a *private* *IaaS*, the IT organization or an integrator creates an infrastructure designed to provide resources on demand to internal users and sometimes partners. *IaaS* is the fundamental element used by other cloud models. Some customers bring their own tools and software to create applications.
2. ***PaaS***: A mechanism for combining *IaaS* with an abstracted set of middleware services, software development, and deployment tools that allow the organization to have a consistent way to create and deploy applications on a cloud or on-premises environment. A *PaaS* environment supports coordination between the developer and the operations organization, typically called ***DevOps***. A *PaaS* offers a consistent set of programming and middleware services that ensure developers have a well-tested and well-integrated way to create applications in a cloud environment. A *PaaS* requires an infrastructure service.
3. ***SaaS***: A business application created and hosted by a provider in a multi-tenant (shared) model. The *SaaS* application sits on top of both a *PaaS* and foundational *IaaS*. In fact, a *SaaS* environment can be built directly on an *IaaS* platform. Typically these underlying services aren’t visible to end-users of a *SaaS* application.

A hybrid cloud combines private with public cloud services where one or several touch points are between the environments. This means that if a few developers in a company use a public cloud service to prototype a new application that’s completely disconnected from the private cloud or the data center, the company doesn’t have a hybrid environment. On the other hand, a cloud is hybrid when a company uses public cloud services for tasks such as prototyping or testing a new application. When the application is completed, it may be moved to the private cloud. In another situation, the Web servers are on a public cloud service that’s integrated with payment systems that are run in a private cloud.

A company with a private cloud may choose to combine some public services for capabilities that are commodities with private services based on the ability to deliver fast innovation to their ecosystem. For example, companies are increasingly discovering that it’s practical to pay a per-user, per-year price for *Customer Relationship Management* ***(CRM)*** and leave the day-to-day management to a trusted vendor. But many companies also want to keep control over some of their most sensitive data. Therefore, they may choose to keep data about prospects on a public cloud. However, after those prospects become customers, the companies may begin storing that data on their own premises in their own servers, which is the hybrid cloud model.

Regardless of the model that you use, some core capabilities that are essential in the cloud environment include these areas:

1. **Elasticity and self-service provisioning:** A key feature of a cloud environment is that it provides a platform that’s designed to be elastic (you can use just the resources you want when you need them), so the users/customers provision resources, such as computing or storage resources, that they pay for on a per-unit basis. When the user no longer needs that resource and stops paying, the resource is released back into the pool of resources. This helps organizations avoid the cost of idle computing resources. Instead of purchasing, managing, and maintaining a server environment, for example, a business can purchase computing on demand, avoiding capital expenditures.
2. **Billing and metering of service usage:** A cloud service has to provide a way to measure and meter a service. Consequently a cloud environment includes a built-in service that tracks how many resources a customer uses. In a public cloud, customers are charged for units of resources consumed. In a private cloud, IT management may implement a charge back mechanism for departments leveraging services.
3. **Workload management:** The cloud is a federated (distributed) environment that pools resources so they can work together. Making this happen requires that these resources be optimized to work as though they were an integrated well-tuned environment comprised of a variety of workloads. A workload is an independent service or collection of code that can be executed. It’s important in the cloud that workloads be designed to support the right task with the right cloud services. For example, some workloads need to be placed in a private cloud because they require fast transaction management and a high level of security. Other workloads may not be so mission critical and can be placed in a public cloud.
4. **Management services:** Many management services are mandatory for ensuring that cloud computing is a well-managed platform. Security and governance are key services to ensure that your applications and data are protected. Data management is also critical because data may be moving between cloud environments. All of these services have to be managed and monitored to ensure that an organization’s level of service is maintained.

Developing an economic strategy for the cloud can be a balancing act. Some workloads may be more suited to your data center. There are compelling reasons why others belong in the cloud. And, while most organizations can’t predict the actual costs of running any given service in a data center, looking at direct and indirect costs of moving to the cloud is important. Here’s a fairly comprehensive list of possible costs:

* Server costs
* Storage costs
* Network costs
* Backup and archives costs
* Disaster recovery costs
* Data center infrastructure costs
* Software maintenance costs
* Platform costs
* Support personnel costs
* Infrastructure software costs

Some of these costs aren’t likely to be affected by migrating a single application to the cloud. However, if you move multiple applications to the cloud, you may realize a significant decrease in many of these indirect costs. One approach to estimating costs is to first examine your expected workloads in detail and then use an estimator tool to calculate real-world costs of running those workloads in the cloud. To manage all these capacity requirements without having to invest in excess capacity, you need to plan ahead and decide which workloads can be moved to a dynamic infrastructure. Some vendors, such as IBM, provide workload assessment tools and services, to help prioritize and classify potential workloads for cloud delivery. After selecting inputs in a spreadsheet-like form, the tool gives you a pain versus gain score that reflects a combination of effort (to migrate), investment, and benefit of migration.

In cloud computing, workloads are abstracted from their physical implementation, meaning that they’re isolated from the hardware they are running on. Therefore managing cloud workloads involves a different approach that companies may be accustomed to in a traditional environment. Because computing requirements are varied, so too are the workloads. Whether you are using and *IaaS* for infrastructure of you are developing *SaaS* applications using a *PaaS*, here are some of the kinds of workloads you are likely to find in a cloud environment.

* Batch workload
* Database workload
* Analytic workload
* Transactional workload
* Test/development workloads

Unquestionably, some workloads are simply not suited for a cloud implementation. One example may be a workload that needs high performance network storage. Because these workloads may need to be accessed very quickly, they may not be suited for the cloud (i.e., in an *IaaS* model) where you are dependent on the Internet for network speed. It makes sense to do a cost-benefit analysis that looks at your particular workload and what it costs you to migrate it to the cloud versus the expected benefit of that move.

A *Service Level Agreement* ***(SLA)*** is a document that captures the understanding between a service user and a service provider that defines uptime, availability, and performance. The *SLA* is also a contractual agreement between the participants in a service delivery contract. In the world of computing, an *SLA* is typically written based on the expectation that a system could be operational 99.99 percent of the month. It may also specify that the service provider’s help desk will respond to an outage in a set amount of time. Also, the service provider is expected not to share a company’s information with anyone and that data will be preserved for a set period of time and backed up regularly. In a complex hybrid cloud environment, managing *SLAs* of all the relationships of all cloud services a company may be dependent on can get complicated.

Planning for the cloud contains two parts:

1. A set of business considerations
2. A set of technical considerations

The most effective approach is actually to involve both IT and business teams in both assessments. This facilitates an understanding of issues and considerations. Five business considerations and five technical implementation considerations are covered.

The 5 Business Considerations can be described as followed:

Business considerations are the strategic goals and plans that determine how the business changes over the next five years. Planning your cloud journey is more successful if it’s planned in context with the issues driving the company’s strategy.

1. How’s the business changing?
2. How does the company want to provide services in the future?
3. What are the financial constrains for the company?
4. Is the company too siloed for the strategy?
5. Is there an easy mechanism to encourage experimentation and innovation

The 5 Implementation Considerations can be described as followed:

After the business and IT leadership teams have a common understanding of the business drivers, creating a cloud computing strategy will be much more straightforward. Implementation considerations are based on planning for an environment that’s long-term thinking and an environment that’s not tied to a single project.

1. Evaluating reference architectures
2. Focusing on efficiency and flexibility
3. Planning for a fabric of services
4. Assuming that you’ll plan for a lightweight approach
5. Monitored and managing everything you do

In conclusion, if your organization expects to be successful in an increasingly interconnected and highly instrumented world, you need to fundamentally transform the economics and flexibility of your IT environment. A good place to begin this transformation is by understanding the diverse requirements for your unique mix of workloads. It isn’t a one-size-fits-all IT world anymore. Ensure that your IT environments have the resiliency needed to adapt to the high velocity of business change. In addition, make sure to leverage all opportunities to incorporate the choice and flexibility of a hybrid environment. An IT strategy that leverages all your IT resources, including the dynamic scalability of IaaS and PaaS, gives you the flexibility to take on the challenges ahead.