

White Paper



Cloud Computing

Key Considerations for Adoption

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Abstract

Cloud Computing technology and services have been witnessing quite a lot of attention for the past couple of years now. We believe that, as with any new technology, it would take time for Cloud computing technology to evolve and mature over a period of time. In the path of evolution, the technology and particularly the application of this technology might undergo some changes. Nevertheless, there are definitive interests already shown by enterprises towards adoption of Cloud Computing Technology and Services. This is particularly so with respect to enterprises in the SMB (Small and Medium Business) segment. As per one of the estimates from Gartner, by year 2012, 20% of enterprise market e-mail seats will be delivered via a Cloud [1]. As per another estimate from Gartner, Software as a Service is forecast to have a compound annual growth rate of 17% through 2011 for CRM, ERP and SCM markets in SMB segment [2]. While the enterprises are exploring the possibilities of adopting this technology, it is imperative for these enterprises to critically evaluate the applicability and suitability of this technology for their specific businesses. This article provides key considerations that the enterprises need to take into account before embarking on cloud computing offerings. The key considerations dealt in this article are mainly from the perspective of consumers/users of cloud computing services rather than from the perspective of providers/vendors of cloud computing services.

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A few definitions

What is Cloud Computing?

Cloud computing refers to the technology that enables functionality of an IT infrastructure, IT platform or an IT product to be exposed as a set of services in a seamlessly scalable model so that the consumers of these services can use what they really want and pay for only those services that they use (Pay per Use). A more formal definition of clouding computing [3] as per Gartner is: “a style of computing where massively scalable IT-enabled capabilities are delivered as a service to external customers using internet technologies”

Cloud Vendors

These are companies which provide the required cloud computing enabling technologies to satisfy a particular cloud service offering like Software as a Service (SaaS) offering or a Platform as a Service (PaaS) offering, or Infrastructure as a Service (IaaS) offering. The vendors also host and manage the infrastructure required for the above technologies. (Note: The vendor can either host the infrastructure on his own or can employ another hosting provider. But the bottom line responsibility remains with the cloud vendor). Some of the vendors include Amazon, IBM, Google, Microsoft etc.

Cloud service Consumers

A consumer of a cloud service is an enterprise or an individual user who uses cloud services provided by cloud vendors. For example, an enterprise (for example a financial services company or a retail company) might use IaaS service offered by Amazon to implement the applications and processes used by the enterprise. These applications are built on top of the Infrastructure provided by Amazon. These applications are then hosted on Amazon infrastructure by the vendor (in this case Amazon). The vendor and the consumer will have service level agreements (SLAs) which are agreed upon contractually. The vendor can use and share the infrastructure to provide similar services to multiple consumers at the same time. This would enable the vendor to leverage the economies of scale to optimize the costs. The cloud vendor can then pass on these costs savings to the consumer as well.

Cloud computing ‘technology’ and Cloud ‘services’

Cloud computing ‘technology’ refers to the technology (including infrastructure, platforms and applications) that enables the IT functionality to be exposed as services in a multitenant manner. The enabling technologies include (but not limited to) virtualization, grid technologies, SaaS enabled application platform (SEAP), Service Oriented Architecture (SOA), Metering tools and technologies etc. Cloud ‘services’ refer to those types of services that are exposed by a cloud vendor and that can be used by a cloud consumer on a ‘pay per use’ basis. These services are exposed as industry standard interfaces like web services (using service oriented architecture, SOA [4] or REST [5] services or any proprietary (though rarely) services. The types of these services can be broadly classified as follows:

- **Software as a Service (SaaS):** Applications like customer relationship management (CRM), Email, Instant messaging (IM), office productivity applications that are offered as a ‘service’ by a cloud vendor. For example salesforce.com SFA services [6] or Google Office Productivity applications [7], or Microsoft Exchange Online [8] etc. Here the consumers of the service (an enterprise, or individual user) will use only those functionalities that they really want and pay for what they use. The vendor will host and manage the required infrastructure and applications to support these services. Consumers need not worry about deploying or managing the infrastructure required to host these applications.
- **Platform as a Service (PaaS):** This can broadly be defined as application development environments offered as a ‘service’ by the vendors. The development community can use these platforms to code their applications and then deploy the applications on the infrastructure provided by the cloud vendor. Here again, the responsibility of hosting and managing the required infrastructure will be with the cloud vendor. Some of the examples are, Google App Engine [9] or salesforce.com Force.com [10] etc.
- **Infrastructure as a Service (IaaS):** Here the entire computing infrastructure is provided as a ‘service’ by the cloud vendor. The actual computing infrastructure that is provided could be a storage environment, database environment, or a complete Linux environment. Here again the responsibility of hosting and managing the infrastructure will be with the vendor. Examples include, Amazon EC2 [11], Amazon SimpleDB [12] Amazon S[13].

Key Considerations before embarking on cloud services

These considerations are from the perspective of cloud service consumers, not from the perspective of the cloud service providers. The service providers would also have similar key considerations to be factored into before embarking on providing these services. This is out of scope of this article.

While there are many benefits for a service consumer to adopt some of the services offered by cloud service provider, the applicability of these services will depend on the nature and size of the enterprise. Not all services are applicable for a particular enterprise. In addition, the applicability of a particular service for a particular enterprise will also depend on the size of an organization. For instance, a particular service may be applicable for an enterprise when that enterprise is in startup stage. As the enterprise grows its business, the same service which was applicable earlier, may cease to be so when the enterprise becomes big. Factors like economies of scale will play a major role in determining the economic viability of a particular service to the enterprise.

Following are some of the key considerations:

- How is the demand for using the cloud services provided by the vendor? Is it mostly constant or widely varying? An enterprise with widely spread geographic presence might have constant demand. Cloud services are more appropriate for varying demands than for constant demand.
- How is your demand for using the cloud services provided by the vendor? Is it mostly constant or widely varying? An enterprise with widely spread geographic presence might have constant demand. Cloud services are more appropriate for varying demands than for constant demand.
- What is the frequency of usage? Is it highly frequent? Very frequent usage in fact makes less economic sense to go for Cloud based 'Pay as you Go' model.
- Do we need highly customized services/API (application programming interfaces) to be exposed by the vendor? Cloud vendors would not find it economically attractive to provide highly customized services and hence price for enterprise (users of cloud) might also be not very attractive.
- Is the application mission critical? A mission critical application would need very stringent SLAs, which cloud vendors could not be able to satisfy as yet.
- In which stage is your Line of Business (LOB) or the company in the growth path? A startup or a new LOB (with some inherent long term risks) would be more amenable for a cloud based model to start with. Once the business matures and stabilizes, moving to an on-premises model could be a better option (based on considerations like increased frequency of usage, demand and scale of operations).
- Is your application or industry requires stringent compliance needs? The vendor might not have support for the specific compliance needs of your organization and industry. An industry or application with highly stringent compliance requirements might still not find it suitable to consume key services from a vendor due to inherent risks involved.
- What are your organizations preferred technology and development platform? What are your long term plans for this? Vendor Lock in is one of the major issues in cloud based services like PaaS. Migration from one cloud environment to another would be much more challenging than migrating within on premise software.
- What are the integration requirements of the SaaS based applications with other applications/processes within your organization? The integration between SaaS offerings from different vendors is a challenge unless provided by the vendor out of the box.
- What are your internal IT and industry regulations for sharing data outside of your organization? Some industry segments/companies have very stringent data privacy and security needs. What is your tolerance level of risk?
- How do you prefer your expenses to appear in the balance sheet? As capital expenditure or operating expenditure? If you prefer to take as ongoing operating expenditure, a cloud computing model would be more suitable.
- What are the performance requirements of applications and services that you plan to utilize from the Cloud? End to End performance levels will get impacted if you use services from vendor even with distributed data centers. In spite of high performance SLAs, vendor may still not be able to satisfy the performance levels at all times due to inherent network latency of Internet. What is the tolerance level of your business processes for below-par performance levels?

The above list is by no means meant to be exhaustive, but provides a good starting point before embarking on cloud service initiative by an enterprise.

Illustrative Scorecard

Based on the above factors, we can arrive at a scorecard. An illustrative scorecard is provided below. But some of the factors in the scorecard like weight need to be customized by an enterprise or user. However note that, a decision to adopt and use Cloud Computing services in an enterprise is a major strategic decision which involves both an objective and a subjective decision making process. It would not be a straight forward objective decision which can be arrived at using a scorecard like the one presented below. However the scorecard can be used as an initial filter and to arrive at a decision for further analysis and decision making process rather than as only source of decision making process.

Illustrative Scorecard

Key Considerations	Weight	Raw Score	Weighted Score
How is your demand for using the cloud services provided by the vendor? Is it mostly constant or widely varying? An enterprise with widely spread geographic presence might have constant demand. Cloud services are more appropriate for varying demands than for constant demand.	1	6	6
What is the frequency of usage? How frequent is the usage? Very frequent usage in fact makes less economic sense to go for Cloud based 'Pay as you Go' model.	3	5	15
Do we need highly customized services or API (application programming interfaces) to be exposed by the vendor? Cloud vendors may not find it economically attractive to provide highly customized services and hence price for enterprise (users of cloud) might also be not very attractive.	4	8	32
How mission critical your application is? A mission critical application would need very stringent SLAs, which cloud vendors could not be able to satisfy as yet.	2	9	18
In which stage is your Line of Business (LOB) or the company in the growth path? A startup or a new LOB (with some inherent long term risks) would be more amenable for a cloud based model to start with. Once the business matures and stabilizes, moving to an on-premises model could be a better option.	1	2	2
Is your application or industry requires stringent compliance needs? The vendor might not have support for the specific compliance needs of your organization and industry.	5	1	5
What are your organizations preferred technology and development platform? What are your long term plans for this? Vendor Lock in is one of the major issues in cloud based services like PaaS. Migration from one cloud environment to another would be much more challenging than migrating within on premise software.	2	3	6
What are the integration requirements of the SaaS based applications with other applications/processes within your organization? The integration between SaaS offerings from different vendors is a challenge unless provided by the vendor out of the box.	3	8	24
What are your internal IT and industry regulations for sharing data outside of your organization? Some industry segments/companies have very stringent data privacy and security needs. What is your tolerance level of risk?	1	9	9

Key Considerations	Weight	Raw Score	Weighted Score
How do you prefer your expenses to appear in the balance sheet? As capital expenditure or operating expenditure? If you prefer to take as ongoing operating expenditure, a cloud computing model would be more suitable.	2	10	20
What are the performance requirements of applications and services that you utilize from the Cloud? End to End performance levels will get impacted if you use services from vendor even with distributed data centers. In spite of high performance SLAs, vendor may still not be able to satisfy the performance levels at all times due to inherent network latency of Internet. What is the tolerance level of your business processes for below-par performance levels?	3	2	6
	Total Score		143
	<ul style="list-style-type: none"> • < 100: Not Suitable. • 100 to 150 : Moderate • > 150: Suitable. 		

Conclusion and future work

While there are definitive advantages and similarly challenges to adopt cloud computing, the key considerations provided in this article can be used as a starting point by an enterprise/user. There could be other considerations which are specific for a particular industry (industry or vertical specific considerations are not dealt in this article) or for a particular enterprise within an industry. Once an enterprise chooses to adopt some of the cloud services, there are other equally important and different vendor considerations to be taken into account before choosing a particular cloud service vendor. These considerations are not dealt as part of this article. One more area of emerging interest is the use of open source and free ware software to implement some part of cloud computing infrastructure. Imagine the usage of say JBOSS application server by a cloud vendor to offer it as part of Platform as a Service (PaaS) offering. In this way the vendor can further reduce his operating cost (in addition to cost reductions due to usage of virtualization technologies and due to economies of scale), resulting in further reduction in costs for the service consumer. These are some of the possible future work items.

Key References

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