

HRG Assessment

The Cloud Computing Challenge

What is Cloud Computing?

Cloud Computing can be described as application services provided to end users through the web and managed by a third party. The services can be *private* meaning owned and operated by enterprises and only available to select users. Or the services can be *public*, which is open to everyone. Examples of public clouds are Googles' calendar and on-line Turbo Tax offerings.

The classic applications (sometimes referred to as SaaS, Software as a Service) which can be hosted in a cloud are those that are non mission-critical — even though mission critical applications will eventually be hosted in the cloud environment as technologies mature. Applications like CRM, HR, and ERP are now commonplace in the cloud. Users can also use specific services provided by clouds, such as backups and archiving.

The major premise behind using cloud technologies and services is to reduce the costs of IT, shorten the time-to-market window, and respond to competition — accomplished in cloud computing environments by sharing the costs with other users and having instant availability of resources.

Benefits and Trade-Offs

Cloud computing can be used in many ways, which makes it even more adaptable to business needs. Some providers of clouds allow users to host any environment they wish in the cloud. Users specify the resources needed (e.g., servers, network, storage, etc.) and the provider allocates and manages the resources. The user only has to worry about the applications. The obvious benefits are the elimination of costs associated with planning, acquisition, and maintenance of the deployment platform.

Other cloud providers offer users the whole enchilada, consisting of the platform and the application. Users not only eliminate the costs of planning and deployment of the platform but also the development and maintenance of the application. Everything is managed by the provider. The user only has to worry about their business objectives.

Of course there are cloud providers that offer services that range in-between the two just mentioned above. For example, providers offer not only deployment platforms but also a development platform for developing certain types of applications. And then at the very core of cloud computing there are specific services that are provided and these can be used from either inside the cloud or outside the cloud. Services of this nature are storage, backups, archiving, etc.

Cloud Computing can provide tremendous benefits to large enterprises and small to medium businesses (SMB). For SMBs, use of the Cloud can be a way to rapidly grow an IT infrastructure, both in the areas of hardware and application inventory that could not be attainable with existing in-house IT capability or budget. Cloud based applications such as Salesforce.com and Microsoft Azure, provide fee-based turn key application support. The

provider maintains the application, network, and subsequent deployment of IT hardware and storage, which allows the scale up of capacity without hitting the capital budget of the enterprise.

There are issues to consider if moving to Cloud Computing. Security of the application and data may be a major control point that some will have to consider. In addition, loss of control of the IT hardware and application software may seem a short term cost reduction blessing, but the enterprise is now at the mercy of a third party organization who may or may not respond in a timely manner. If that is the case, changing providers without losing application support and data security can be a major issue. The issue of provider lock-in has to be addressed in case of increasing provider costs or the provider going out of business. Application availability is also another concern, whether you outsource to a cloud provider or keep the application in house.

The business benefits of public and private clouds

Enterprises are strapped for IT expansion or even sustaining the current budget. Companies are continually deluged with requests from internal departments to improve performance and increase application functionality to meet changing business needs, as well as computing capacity and capability. Hence the CFO is looking to reduce the capital and operational expenditures if possible without decreasing current levels of functionality and on time performance. Cloud computing may not be a panacea but a relief, by shifting some of the non-business critical applications to a service provider such as email or HR.

The advantage of cloud computing gives internal staff some relief to focus on business critical applications and support, which reduces potential business shortfalls. An example of a public cloud is found at the Fidelity NetBenefits website. The cloud not only handles IBM retirement benefits but HP as well as others, thereby offloading this HR function which is supported and maintained by Fidelity as a SaaS business. This can be perceived as a public cloud opportunity, along with more everyday applications like gmail, hotmail, and samba that are hosted by Google, Yahoo, etc.

Private clouds are contained within an enterprise and/or its partners (at least that's the current rationale). An example is a data analytics system that is dynamically based on transactional data that can be accessed only through a controlled network. It is the classic private client-server model discussed so much in the past. In this case the data can be controlled, maintained and managed by internal enterprise staff and the system and network resources controlled by the enterprise. The decision between private versus public clouds has to do with criticality of the application and data, and the level of security, reliability and scalability needs for business continuity. CFO's and CIO's will be looking at cloud services to maximize their human staff and IT resources while allowing certain non-critical applications to move to cloud-based services. It's a matter of ROI and time to market with new applications and internal services, along with an increase in service levels to respond to end user demand.

Cloud Computing Hierarchy

Harvard Research Group (HRG) believes that Cloud Computing must be defined not by technologies employed but by the ultimate impact on the consumer using the service. The initial definitions comprising four Cloud Computing Levels (CCLs) described below and later depicted in Figure 1 represent a first step toward defining Cloud Computing from the user perspective:

CCL 4 - Cloud integration

This level encompasses standard cloud services that allow integration of multiple clouds whether they be public or private. Clouds are virtualized along with their services. The sophistication of the clouds provide for all necessary services required by the user or application including high availability and disaster backup. SLAs relating to performance, availability, reliability and security meet or exceed the user's requirements, and the costs associated with the company's IT are greatly reduced due to commoditization of the data center. Costs are predictable and controllable within negotiated subscription contract terms. In general, this level is where the laggards of the industry enter cloud computing, thus most issues have been resolved.

User concerns at this level are at a minimum since standards allow users to move between clouds and from one cloud to another without fear of vendor lock-in.

CCL 3 - Selected Mission Critical Applications

This level encompasses cloud services that allow many end-user developed or vendor subscribed mission critical applications to be hosted in the cloud. In addition, multiple development environments are provided for the development lifecycle depending on the type of application. User applications are deployed in hosted Green, virtualized data centers with the latest technologies. The user or application can dynamically provision resources based on business needs where many of the application services are provided and maintained within the cloud. Sharing of resources and licensing costs across a range of end user subscribers achieve a viable ROI for business applications. The SLAs available meet the user requirements. Security is acceptable.

User concerns at this level include mission critical application and data security, mission critical data center SLAs, and vendor lock-in. In addition, there are other costs and application issues that are not as easy to measure. Among these are the TCO related to SaaS applications over time; the decision as to what applications should be in the cloud and what applications should not be in the cloud based on flexibility and business demand; and the decision to use a public, private, or hybrid cloud architectures.

CCL2 - Non-critical third party and user Web Applications with a Development Platform

This level encompasses horizontal applications (CRM, HRM, ERP, etc.) that span most businesses, which are created and maintained by third party vendors. In addition, an application development environment is provided for user developed web applications. The user has access to the latest third party application technologies, a complete development environment, selected cloud services, worldwide application collaboration, and controlled provisioning of resources. Costs associated with developing and maintaining horizontal applications and time-to-market of new web applications are greatly reduced. Selected third party SLAs are available.

User concerns at this level include third party application functionality, control over third party application updates, development environment learning curve, application and services scalability, and data center security/availability/reliability.

CCL1 - Managed Cloud Services

This level encompasses the fundamental building blocks for all other cloud computing levels and consists of the necessary IT services to host applications. The provider of the cloud (public or private) owns, updates and maintains the data center. The user has access to the latest data center technologies that are available during their contract period, thus data center planning and deployment are eliminated.

The subscriber/user has control over data center configurations, operating systems, and middleware along with application deployments, maintenance, updates, and licensing. The development lifecycle is maintained as if developed on an in-house system. Costs associated with operating expenses and capital expenditures are reduced, and application time-to-market deployment is shortened. Selected data center SLAs – performance, availability, reliability – are negotiated.

User concerns at this level include hosted resources meeting user requirements, data security, performance, availability, reliability, and provider financial viability.

Cloud Computing Hierarchy

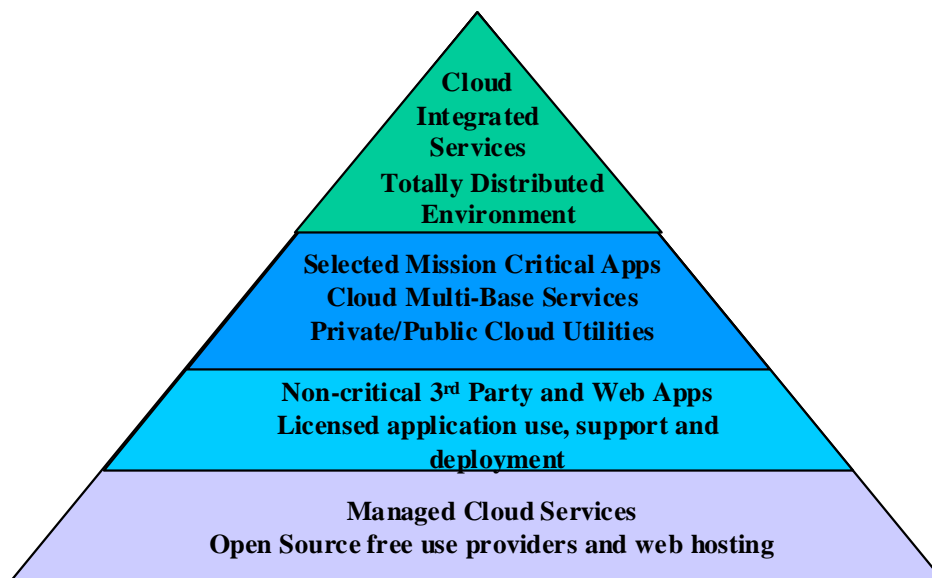


Figure 1

In the coming months, HRG will work with both vendors and users to characterize cloud computing in terms of additional dimensions, including reliability (the likelihood of an outage) and extendibility (the ability to scale without disruption of service or loss of data). The traditional measures of these dimensions, which are mean-time-between failures (MTBF) and service-level-agreements (SLAs), need to be supplemented to adequately characterize business requirements. Other topics include the impact of scheduled outages, and the application maintenance and deployment trade-offs of on-line maintenance vs. off-line maintenance.

The Challenge for Suppliers

To satisfy an end-user's application parameters, procedures may or may not be required in any one area. It's been proven that satisfactory performance and reliability can be obtained using commodity components with the proper levels of virtual machine software, dynamic systems management configuration, scalability, and load balancing. The challenge for suppliers of cloud-based products (hardware and software) is not just to produce components with specific reliability and reparability characteristics, but also to answer the marketing question: **Can your cloud service meet my system requirements?**

The short answer, for now, is . You are at the provider's mercy. Cloud computing services vary from provider to provider, and it is the proper inter-working of computers, storage, software, communications, and administrative procedures that make up the service levels that need to be negotiated. Without this understanding of the end-users application needs, it is unlikely that the provider can answer a buyer's legitimate question in a credible way.

Providers can specify operating environments, and types and frequency of maintenance. They can also specify operating and administrative procedures, which can have a profound effect on overall system performance. The results may vary from what your internal system performance, processes, and procedures have been providing. More likely, the assurance of application stability and availability will be provided by the stipulations contracted thru the SLAs. Initially, this level of detail should be collected up-front by your own internal Information Systems department, or by an external source such as a consultant or system integration vendor who can collect and assess this level of detail.

The Challenges of Cloud Computing

The demand for cloud computing and high availability systems presents distinct challenges. Companies remain reluctant, for a variety of reasons, to trust the cloud for their mission-critical applications.

Here are some of those reasons:

- *Data privacy.* Many countries have specific laws that say data on citizens of that country must be kept inside that country. That's a problem in the cloud computing model, where the data could reside anywhere and the customer might not have any idea where, in a geographical sense, the data is located.
- *Security.* Companies are understandably concerned about the security implications of corporate data being housed in the cloud
- *Licensing.* The typical corporate software licensing model doesn't always translate well into the world of cloud computing, where one application might be running on untold numbers of servers.
- *Applications.* In order for cloud computing to work, applications need to be written so that they can be broken up and the work is divided among multiple servers. Not all applications are written that way, and companies are unable to rewrite their existing applications.
- *Interoperability.* For example, Amazon has its EC2 Web service and Google has its cloud computing service for messaging and collaboration, but the two don't interoperate.
- *Compliance.* What happens when the auditors want to certify that the company is complying with various regulations, and the application in question is running in the cloud? It is a problem that has yet to be addressed.
- *SLAs.* It's one thing to entrust a third party to run your applications, but what happens when performance lags? The vendors offering these services need to offer service-level agreements.
- *Network monitoring.* Another question that remains unanswered is how does a company instrument its network and its applications in a cloud scenario? What types of network/application monitoring tools are required?
- *Business stability.* Can users buy the service and be assured that the service will stay in business or even viable going forward? In addition, can the service be able to expand to meet going user need?

Conclusion

Cloud computing has been evolving for years with the advent of low cost commodity servers, sophisticated virtualization software, and the pervasiveness of web technology. The time is ripe for distributed cloud computing to provide cost effective and energy efficient computing services for both small and large enterprises. However, costs are not the only benefits from cloud computing. Time-to-market, response to competition, and customer demand are also very compelling reasons for embracing cloud computing. It also delivers a web based personal computing environment for those individuals who may have the need for pay as you go computing. At present, enterprise executives have been deluged with articles and reports and studies on cloud computing but standards need to be addressed and a level playing field established. Businesses must be able to purchase the degree of scalability and service that is appropriate for each task. To make this possible, a clear understanding is needed between vendors and their customers about how each cloud component contributes to enterprise utilization.

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