

CHOOSING THE RIGHT CLOUD COMPUTING SOLUTION FOR YOU

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ABSTRACT

This article provides an introduction to cloud computing and choosing a vendor. The first part includes definitions and service models while the body of the article lists pros and cons for specific service models and discusses the cost efficiency of implementing a cloud computing solution. In the last part, a general overview of cloud computing advantages and disadvantages further helps to inform the reader of opportunities and pitfalls.

Keywords: cloud computing, cloud computing models, cloud computing advantages and disadvantages

1. INTRODUCTION

One of the most heavily-cited definition by NIST² describes cloud computing as “a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.”

Margaret Rouse, of techtarget.com, defines cloud computing(CC) as “a general term for anything that involves delivering hosted services over the Internet.”

In the online article, she presents 3 differentiating traits when compared to traditional hosting” **sold on demand**, typically by the minute or the hour;” ... “**elastic** -- a user can have as much or as little of a service as they want at any given time; and the service is **fully managed by the provider** (the consumer needs nothing but a personal computer and Internet access)”.

Though these two definitions appear quite different at first glance, with the former being very specific compared to the all-encompassing latter, they are actually brought together by the traits they ascribe to CC.

Mell and Grance(2011) have identified the following characteristics as essential to CC:

- On-demand self-service.
- Broad network access
- Resource pooling
- Rapid elasticity
- Measured service

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²Mell, P., Grance, T., “The NIST Definition of Cloud Computing”, Special Publication 800-145, National Institute of Standards in Technology, latest version September 2011, accessed on December,6th,2013

Both definitions agree that CC is on-demand and elastic, while one of them talks about “minimal management effort or service provider interaction” and the other specifies “fully managed by the provider”.

2. CLOUD COMPUTING MODELS

Grance and Mell[2011] have classified CC into three service models, a taxonomy widely accepted :

- Software as a service (SaaS), where software applications(organization emails, ERP suites,etc.) are run on a provider’s infrastructure and can be managed through a web browser.
- Platform as a service(PaaS), where computing platforms are “rented” so that users may develop and run applications.
- Infrastructure as a service(IaaS), where hardware and IT infrastructure resources are managed by the vendor and everything else by the customer.

The NIST definition(2011) also categorizes cloud computing platforms into four deployment models:

- “Private cloud. The cloud infrastructure is provisioned for exclusive use by a single organization comprising multiple consumers (e.g., business units). It may be owned, managed, and operated by the organization, a third party, or some combination of them, and it may exist on or off premises.
- Community cloud. The cloud infrastructure is provisioned for exclusive use by a specific community of consumers from organizations that have shared concerns (e.g., mission, security requirements, policy, and compliance considerations). It may be owned, managed, and operated by one or more of the organizations in the community, a third party, or some combination of them, and it may exist on or off premises.
- Public cloud. The cloud infrastructure is provisioned for open use by the general public. It may be owned, managed, and operated by a business, academic, or government organization, or some combination of them. It exists on the premises of the cloud provider.
- Hybrid cloud. The cloud infrastructure is a composition of two or more distinct cloud infrastructures (private, community, or public) that remain unique entities, but are bound together by standardized or proprietary technology that enables data and application portability (e.g., cloud bursting for load balancing between clouds).”³

A graph by Venturebeat explains the difference between the 3 models:

³ Mell, P., Grance, T., “The NIST Definition of Cloud Computing”, Special Publication 800-145, National Institute of Standards in Technology, page 3, latest version September 2011, accessed on December,15th,2013,

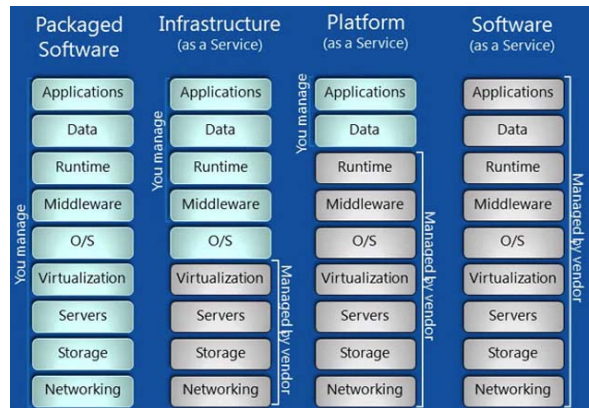


Figura 1, source: <http://venturebeat.com/2011/11/14/cloud-iaas-paas-saas/>

Another article⁴ from cloud computing “broker company” ComputeNext, signed by its marketing director, Eamonn, summarizes the key aspect for each service model.



Figura 2 source <https://www.computenext.com/blog/when-to-use-saas-paas-and-iaas/>

In IaaS, all the hardware and IT systems work is taken care, which gives the company freedom to **build** software.

In SaaS, you **buy** the whole package, and have no control over any part of it, essentially creating a “black box” outside of the organization.

In PaaS, you can focus solely on your applications and data, while everything else acts as a place for **deploying** these.

Each of these models is preferred by different types of users. As explained here⁵, developers prefer PaaS, because it allows them to focus on their core competency, which is development, and users find SaaS convenient because they usually don’t need or want to know what makes the service possible (e.g.: Facebook, hosted email services). IaaS is usually suited to users with research or high computing needs.

⁴ <https://www.computenext.com/blog/when-to-use-saas-paas-and-iaas/>, accessed on 10 December, 2013

⁵ <http://stackoverflow.com/questions/16820336/what-is-saas-paas-and-iaas-with-examples>, accessed on December, 10, 2013

Another perspective⁶ on these three models offers us a “stacking” perspective, emphasizing how IaaS is akin to outsourcing the foundation of your IT department, and each subsequent model adds another layer of outsourced components, until you reach SaaS, where the vendor manages everything.

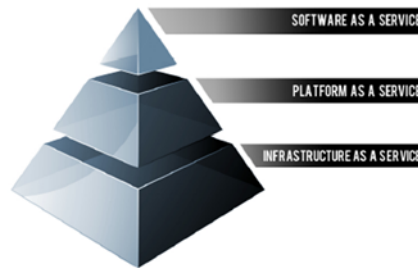


Figura 3 source:http://www.rackspace.com/knowledge_center/whitepaper/understanding-the-cloud-computing-stack-saas-paas-iaas

In this whitepaper, Kepes (2013) elicits appropriate and inappropriate cases for the three models. Below I have compiled his views in a table:

Cloud computing models and when to use them		
Cloud computing model	High utility in the following situations	Low utility in the following situations
IaaS	For new organizations without the capital to invest in hardware	Where regulatory compliance makes the offshoring or outsourcing of data storage and processing difficult
IaaS	Where the organization is growing rapidly and scaling hardware would be problematic	Where the highest levels of performance are required, and on-premise or dedicated hosted infrastructure has the capacity to meet the organization's needs
IaaS	Where there is pressure on the organization to limit capital expenditure and to move to operating expenditure	
IaaS	For specific lines of business, trial or temporary infrastructural needs	
PaaS	In any situation where multiple developers will be working on a development project	Where the application needs to be highly portable in terms of where it is hosted

⁶Kepes,B., Rackspace Support, “ Understanding the Cloud Computing Stack: SaaS, PaaS, IaaS” whitepaper, last updated 22nd October, 2013, accessed on 14th December 2013 from http://www.rackspace.com/knowledge_center/whitepaper/understanding-the-cloud-computing-stack-saas-paas-iaas

PaaS	Where external parties need to interact with the development process	Where proprietary languages or approaches would impact the development process
PaaS	For those who have an existing data source – for example sales information from a customer relationship management tool, and want to create applications which leverage that data	Where a proprietary language would hinder later moves to another provider – concerns are raised about vendor lock-in
PaaS	Where developers wish to automate testing and deployment services	Where application performance requires customization of the underlying hardware and software
SaaS	“Vanilla” offerings where the solution is largely undifferentiated	Applications where extremely fast processing of real time data is required
SaaS	Applications where there is significant interplay between the organization and the outside world	Applications where legislation or other regulation does not permit data being hosted externally
SaaS	Applications that have a significant need for web or mobile access	Applications where an existing on-premise solution fulfills all of the organization’s needs
SaaS	Software that is only to be used for a short term need	
SaaS	Software where demand spikes significantly, for example tax or billing software used once a month	

Source: Ben Kepes, Rackspace Knowledge Center,
http://www.rackspace.com/knowledge_center/whitepaper/understanding-the-cloud-computing-stack-saas-paas-iaas

3. IS CLOUD COMPUTING COST-EFFICIENT?

To ascertain the economic viability of a CC service, we must apply some financial formulas. In a whitepaper⁷ by the former Information Systems Audit and Control Association(now simply ISACA) the tools chosen are ROI(return on investment), TCO(total cost of ownership),IRR(internal rate of return),NPV(net present value). In the whitepaper, the most frequent costs and benefits are listed, and each of the formulas is explained in great depth. For the purpose of this article, the most important things to notice are

- It is easy to fall into the trap of considering cloud computing a magic bullet that replaces most of the IT department

⁷ISACA, whitepaper “Calculating Cloud ROI:From the Customer Perspective”, An ISACA Cloud Computing Vision Series White Paper, published on July 2012, accessed on 15 December 2013, http://www.isaca.org/Pages/FileDownload.aspx?file=http://www.isaca.org/Knowledge-Center/Research/Documents/CalculatingCloudROI_whp_Eng_0712.pdf

- Whenever considering a CC solution, the IT manager or CTO must take into account the short-term, but most importantly the medium and long-term costs
- Sometimes CC platforms have hidden costs, or costs that are easily ignored, the most important being the cost of changing the vendor or having to revert to in-house services because of regulation changes
- Part of the hidden or obscure costs are related to support and customization (because of the highly standardized nature of these solutions), part are because of integration and implementation(change management, more bandwidth, employee training, cloud solution coordination in the case of multiple CC vendors)
- Cloud computing is not the magic solution for cutting costs; as with every big opportunity, it comes with certain risks which must be understood and taken into account; the company management must provision a risk countermeasure, “backup plan” in case these risks do happen
- Some of these risks can be avoided entirely by choosing a less standardized solution(i.e.: PaaS or IaaS over SaaS)

So is CC cost-efficient? That depends on the particularities of the business, yet every business should and must calculate the value of any cloud computing vendor for its specific case, by estimating in currency the potential benefits and costs and by taking a long-term view on this choice. As the ISACA paper mentions(2012), the best time to weigh a CC solution is before implementing it.

4. OTHER ADVANTAGES AND DISADVANTAGES

General cloud computing strengths and weaknesses from the perspective of a user company	
Main benefits	Main disadvantages
Pay-as-you go billing model (the company is typically billed by the minute, hour or data transferred, also called “utility computing” ⁸)	Security (i.e.:project MUSCULAR wiretapping Google ⁹ data centers)
Automatic scalability(though this might incur additional costs)	Vendor lock-in(the difficulty of migrating to a different cloud computing provider)
Only pay for the components you use (as opposed to buying a bundle and not using it exhaustively)	Short-sightedness when calculating costs by management
Complete outsourcing of anything process related, letting the company focus on their core competencies	Choosing the wrong vendor can turn a cost-cutting opportunity into a huge financial loss
The opportunity to enter new markets by adopting a SaaS solution	Lack of transparency as to what happens in the cloud with your data

⁸ <http://searchcloudcomputing.techtarget.com/definition/cloud-computing>, accessed on December,5,2013

⁹Associated Press, “NSA tapped Yahoo, Google data centers”, published on October 30, 2013, in the New York Post, retrieved from: <http://nypost.com/2013/10/30/nsa-secretly-hacked-yahoo-google-data-centers/>,

Global accessibility and mobility (tablets, smartphones, laptops, the only requirement being an internet connection and a web browser in some service models)	Lack of legal certainty as to which laws apply to a globalized cloud(data centers in different countries)
	Lack of clear-cut regulations for securing and storing customer data in the cloud (as laws catch up with cloud computing advancements, there is a risk that companies will be forced to revert to in-house services)

5. CONCLUSION

Cloud computing is a great opportunity for firms young and old alike, small or big, yet there are certain risks which may be overlooked because of the ongoing trend to adopt this new technology and the advertising that goes along with this new information systems evolution. It is worth investigating with a cold, calculated mind, in a management-level meeting, making sure the company knows the potential benefits and risks and is willing to take them.

6. REFERENCES

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