

OPPORTUNITIES AND CHALLENGES FOR CLOUD COMPUTING

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Abstract

Cloud computing is a new way of delivering computing resources and services. Cloud computing moved away from personal computers and the individual enterprise application server to services provided by the cloud of computers. The emergence of cloud computing has made a tremendous impact on the Information Technology (IT) industry over the past few years. Currently IT industry needs Cloud computing services to provide best opportunities to real world. Cloud computing is in initial stages, with many issues still to be addressed.

This paper is a readings on “cloud” computing and it tries to address, related research topics, challenges ahead and possible applications.

Keywords: *cloud, thick client, thin client, Iaas, Sas, Pas.*

1. Introduction

The rise of the cloud is more than just another platform shift that gets geeks excited. It will undoubtedly transform the information technology (IT) industry, but it will also profoundly change the way people work and companies operate. It will allow digital technology to penetrate every nook and cranny of the economy and of society, creating some tricky political problems along the way.

With the emergence broadband connectivity, cloud computing offers an alternative platform from which Information and Communications Technologies (ICT) providers can offer powerful and innovative new services, while providing users with the opportunity to gain access to computational resources and applications beyond those traditionally feasible. It challenges our perception of how to utilize and exploit ICT to engage

economically and socially more efficiently and effectively.

2. Cloud Technologies

Cloud computing has emerged over recent years as the latest manifestation of networked computing. It represents a shift in computing power from so-called ‘thick client’ solutions, whereby the applications used are present on personal computers while the data may be hosted and shared on a remote server, to a ‘thin client’ environment, where both the applications and the data reside on the remote server. This trend is being made possible by the widespread availability of fast resilient communication networks over which data can be transmitted. To an extent, the shift represents a

return to the early years of computing, when mainframes dominated the environment and where access took place through ‘dumb’ terminals. Cloud computing is not a single technological solution, but is rather an umbrella term used to describe a range of different technologies and market offerings.

Definition of Cloud computing

“Cloud computing provides flexible, location-independent access to computing resources that are quickly and transparently allocated or released in response to demand”.

Examining the different elements of this definition in further detail helps to better understand how cloud computing differs from other forms of IT services, such as outsourcing. First, ‘flexibility’ means that the computing resources are available to the user as and when needed, on-demand, with the associated efficiencies for both the user and provider, rather than fixed and dedicated for the customer. Second, ‘location-independence’ is possible as a result of the ‘death of distance’ made possible by modern communication networks, such as the internet.

In certain situations, the customer may be unwilling to share with other customers, due to security concerns. As such, ‘private’ cloud services may be utilized, whereby the resource is dedicated for a single user or shared by a restricted community rather than available to the public’, or a ‘hybrid’ cloud service, where certain resources are restricted, while others are public⁶. Finally, the reference to ‘charging’ reflects the fact that ‘public’ cloud services are generally purchased on a commodity-basis, on the provider’s standard terms and conditions, rather than individualized and negotiated agreements, as is usually the case in IT outsourcing.

3. Cloud Technology

Cloud computing, for the technologist, represents a tremendous opportunity to drive IT infrastructure efficiencies. In addition the architectural principles behind cloud computing offer completely new business models which, in some cases, offers a significant economic benefit.

	Owned/leased infrastructure	Not owned Infrastructure
Dedicated Infrastructure	Traditional Data Centre	Co-location, Hosting, Outsourced
Shared Infrastructure	Private Cloud	Public Cloud

For each model, the data centre functions as the fundamental building block for cloud computing. However, in the case of shared infrastructure, there is a case of a common layer that serves as the basic building block for the sharing. Traditionally the common layer is based on the compute model. As cloud computing emerges and gains acceptance, specialized services will become more prevalent such as specialized API's. There are plenty of examples of this happening today with solutions such Backup-As-A-Service or Storage-As-A-Service. The fundamental principle of cloud computing in the view of the Association is that the

cloud is a shared service - and that sharing is the important principle. The access method that a particular cloud offers can range from any number of things such as virtual machines to application services or API's .

Why move from dedicated to shared Infrastructure

The cloud model, with its standardized building blocks, serves a couple of scenarios really well and in particular - public cloud can serve these scenarios exceptionally well. These include use cases

involving high growth volumes, periodic high volumes, a periodic high volumes and on-off applications. Because the majority of the cost in dedicated infrastructure is spent to manage the peak demand, significant savings opportunities exist for shared infrastructure supporting workloads that experience these peaks and valleys of usage. In the public cloud case, the aggregation of multiple workloads allows for a significantly more efficient use of capital by distributing peak demand across multiple shared resources.

How does this change the way

As the adoption of cloud and particularly public cloud increase, there will be a new set of challenges for corporations. Many of these challenges have previously been solved in related areas such as hosting services or outsourcing. For instance, Service Level Agreements are an important part of the public cloud. Hosting companies and outsources have vast experiences managing to SLA requirements. There will be multiple new and emerging areas where corporations interested in cloud technologies will need to develop expertise. These areas involve defining the selection processes to determine service providers, auditing mechanisms, end-user constraints, geographic access, end-user provisioning and integration into corporate directories as well as understanding national constraints such as data sovereignty requirements.

4. Cloud Opportunities

Cloud computing offers the exciting opportunity for an overhaul of antiquated information systems. However, organizations prefer to re-use existing application code and binaries – which count as assets on the balance sheet. If the information system must be operational at all times, a migration is further complicated. How to build new cloud based applications that accomplish aforementioned promises of improved scalability and availability? How to migrate existing software into the cloud? An increasing number of heterogeneous end-user devices demands for connecting the cloud to multiple delivery channels. Applications and services should be delivered to smart phones and net books, TV sets, cars, et cetera. On the other

side, there are also multiple heterogeneous cloud services, such as data store solutions, compute clouds, and messaging services.

Cloud computing is a game changer as it allows companies to rent infrastructure instead of making large capital investments. This lowers the barriers to entry, particularly for SMEs and independent businesses. Once the service is set up it provides companies large or small with an easy delivery platform for a rapidly increasing array of digital services, including the deployment of sophisticated treasury solutions. Personal usage of cloud based “applications” such as Face book, Linkedin and Email applications have helped create awareness among potential user groups.

Cloud computing provides following opportunities:

Cloud Backup Some companies like Mozy are working to move businesses backup and disaster recovery data to cloud servers. Because of the presence of security concerns with cloud servers, businesses want to keep a back-up of their important data to avoid any unexpected turn of unforeseen events. The area of corporate cloud backup will continue to be sought after by companies for a number of years to come.

Collaboration Applications Business firms have already been managing their email and PIM by managed service providers for some years now. Some of the most important areas of collaboration applications will be for: Email, File Sharing, Online Video and Voice Conferencing. The low costs of cloud computing will make easier for decision makers to consider implementing it.

Business Applications Cloud based business applications provide tremendous opportunities to business firms to pay for what they have used. The Pay As You Go plan. Since companies don’t have to actually purchase the software, they have access to the latest solutions. The availability of solutions such as CRM, ERP, HR, and Finance and Accounting on cloud based servers means a decrease in up-front investment and other issues of in-house deployment.

Web Serving The web servers, management tools, analytical and business software are moving to cloud computing. Cloud based web infrastructure and software will save you a lot of money. Enterprises corporations are already benefiting by the low price.

Employee Productivity Applications

Applications used for improving employee's performance and better reporting within the office is another type of cloud application being widely used at present. This will be looked into by many new and old businesses wanting increased accountability and efficiency within the workplace.

4.1 Cloud opportunities in India

Cloud computing is helping corporations create new, cost-effective business models. It has opened a world of opportunities for Indian IT companies..

In line with the trend observed in other countries, the biggest IT spending in India was in the communications industry, followed by banks and securities. As banks embark on their next phase of transformation into more competitive, customer-friendly institutions, key opportunities are likely to come up in the areas of core banking systems and upgrades/ integration with other peripheral systems. Near-term opportunities in the banking sector will be in the areas of collections, contact center services, business intelligence (BI), mobility and IT outsourcing (ITO).

Relatively poor spending in the vertical industries of insurance, government and utilities set India apart from other countries. Nevertheless, these markets are likely to offer strong opportunities for service providers. Some of the largest IT deals are starting to come from central and state government. Specifically, opportunities are emerging in state and central government bodies that relate mainly to efficiency, transparency and e-enabling projects for citizen-facing services, as well as workflow-related projects.

“Compared with many markets, India offers a welcome opportunity for service providers looking for new business. Indian IT budgets continue to rise, and the categories of spending to widen in the coming year.”

4.2 Cost saver

Companies love the cloud as they have only operating costs to pay. The cloud is a win-win for everyone. As more and more people are using multiple screens, desktops, laptops, mobile phones and TV screens to access their data, the cloud is inevitable. Corporate India can save lots of money by using the cloud,.

Large enterprises may have some initial concerns on compliance, data security and unproven reliability of cloud computing. However, there will be pockets such as back-up storage and hosted email service where large enterprises will be more open to employ the cloud."

When a company needs more capacity during its peak season, it simply pays for it on demand. When business slows down and the company needs less capacity, its bill goes down because it uses fewer resources. In financial terms, this allows a company to move much of its infrastructure costs from being a capital expenditure to an operating expenditure.

"Security incidents in the cloud have made clear that this new promising technology comes with complexity and security and privacy challenges. Cyber attacks are executed with precision and patience and security technology seems to fall behind the threat curve,"

Vendors say they have the resources to make their data centres more secure than anybody ever could and resilience is better because data is distributed and backed up in geographically dispersed locations. "That cloud computing compromises security is a myth.

5. Cloud challenges

There are other hurdles too. Dearth of sufficient bandwidth, lack of robust networks, virtualization and security issues could delay adoption of the technology. More than 30 per cent of large businesses have some enterprise applications in the cloud, but two-thirds do not have a security strategy for cloud computing, a survey conducted by IDC found.

What barriers exist to the uptake of cloud computing? One leading concern is **data security**,

the trust, reliability and dependency in moving data and applications to a remote third party. While such concerns are real and need to be adequately addressed. This could be rephrased for a cloud environment as: “Everything is shared. Get over it!”.

Another barrier for cloud computing is the **availability of connectivity and sufficient bandwidth**. Accessing a cloud service ‘anytime, anyplace, anywhere’ requires a robust telecommunications infrastructure and network access. The past 30 years of market liberalization and technical development have enabled this in many parts of the world, especially with the current deployment of broadband next generation networks (‘NGNs’), satellite and 4G (IMT Advanced) wireless network infrastructures. However, adequate connectivity remains a problem in all countries, although it remains significantly challenging in the developing world.

Cloud computing is usually accessible to many different customers. If the provider fails to separate the resources, it could cause very serious security risks. For example, a customer requests to delete data stored in the virtual infrastructure; as with most operating systems, this may not result in true erasing of the data immediately. The data are still stored on the disk but are just not available .

In the multiple tenancies environment, hardware resources are reused by other customers. In this case, a third party could have access to another customer’s “deleted” data. This presents a higher risk to the cloud customers than with dedicated hardware.

Strong encryption with key management is one of the core mechanisms that cloud computing systems use to guard against data loss and theft. However, a poor key management procedure may cause loss of encryption keys, disclosure of secret keys or passwords to malicious parties, or unauthorized use for authentication. Following is a brief discussion on the challenges faced during implementing cloud computing.

Objection If you are a CIO you are likely to face challenges in convincing the management regarding the usefulness of transiting from your on-premise

set-up to cloud. To propose your case more powerfully you therefore should analyze your cloud requirements with precision. Focus on the areas like cost cutting, elasticity, scalability, expandability, data security, damage recovery etc.

Selecting cloud set-up There are three types of cloud available – private, public and hybrid. The secret of successful cloud implementation lies in choosing the most appropriate cloud set-up. When bigger companies feel safer with their vast data in private cloud environment; small enterprises may benefit economically by hosting their services in public cloud. Some companies are also preferring the middle way i.e. hybrid cloud as a balanced approach. Availability of cloud services in forms of as-a-service (aaS) namely – infrastructure as a service (IaaS), software-as-a-service (SaaS) and platform-as-a-service (PaaS) has further complicated the decision making process for the CIOs.

Receiving guidance While implementing cloud you need to adhere to both the governmental and internal regulations. The existing governmental policies may prove flawed and insufficient since cloud governance is still taking shape while internal policies may prove too stringent and inflexible. Hence, you may need external and professional help in implementing cloud set-up properly. Choose a cloud computing consulting service which is aware of the terms and conditions regarding cloud implementation and data security across borders.

Dealing with vendor One of the major issues with cloud computing is its dependency on the service provider. For uninterrupted and fast services you need to choose a vendor with proper infrastructural and technical expertise. You need a vendor who can meet the security standards set both by the government agencies and your internal policies. Read their service-level agreement (SLA) carefully to learn more about what’s in offering, compensations in case of outage, lock-in clauses etc.

Data security Often the major concern associated with cloud computing is data security and manageability. It becomes a more serious issue

while you involve multiple vendors. Since you would be running your company's assets and data from a third-party interface ensuring data security and privacy are of utmost importance. Hence, while engaging a cloud service provider always inquire about their cloud based security policies upfront. You'd also need to ensure that they have effective data backup plans to salvage data if a disaster strikes. However, cloud computing companies usually employ strict data security policies to prevent hacking and invest heavily on improved software and hardware. Moreover, some of the issues regarding data security can be mitigated by employing a hybrid cloud environment.

Disaster recovery A cloud provider must have a resilient infrastructure to deal with server breakdown and outage. A proper data backup policy should have been in place to deal with it. Quite naturally most prefer to set up their servers at politically and economically stable locations to avoid data loss issues due to unrests.

Data portability Even when you are in cloud you would still like to have control over your data and hence, ensuring data portability is essential. Often clients complain about being locked in with service providers and not being able to switch freely. Issues regarding data portability can seriously jeopardize your smooth transition to cloud.

6. Security Challenges in Cloud Computing

Cloud computing is not perfect (yet). Like many other technologies, it continues to suffer from a variety of issues that have made significant impacts on adoption rates and development. Overcoming the biggest challenges to cloud computing involves properly identifying and recognizing those challenges. A concerted effort by businesses, customers and service providers is the key to not only addressing these issues, but also to ensure the future successes of the cloud computing industry. There are many data security risks in the use of IT, such as hacker attacks, network breaks, natural disasters, separation failure, public management interface, poor encryption key management, and

privilege abuse. Specific risks to cloud computing are separation failure, public management interface, poor encryption key management, and privilege abuse.

Security and Privacy

Even outside of cloud computing, keeping data safe and secure is a foremost priority for businesses. Since many businesses are accustomed to having their most sensitive data tucked safely behind a corporate firewall, having that data residing within the cloud makes businesses understandably cautious.

Cloud providers must constantly reassure their clients of the numerous measures they take to prevent hacking and other malicious activities that could compromise their systems. Security applications, data loss software and encrypted file systems are among the many mitigating factors working toward preventing attacks on cloud infrastructures and keeping data safe.

Reliability and Availability

Although the vast majority of cloud providers continue to drastically improve their uptimes, service disruptions remain a common enough part of the cloud computing experience to dissuade some businesses away from the technology.

Many cloud providers have chosen to build upon their reliability and availability by creating multiple levels of redundancy within their systems. Cloud providers are also developing backup plans and disaster recovery setups as a way of mitigating cloud outages without compromising businesses or data.

Interoperability

Avoiding the prospect of being locked into a service is one of the many challenges businesses face when it comes to committing to a cloud infrastructure. Just as users value their freedom when it comes to service migration, many businesses value the same. Portability is a valued asset that allows businesses to migrate in and out of the cloud without any issues and businesses are keen on maintaining that asset. Lock-in periods and other impediments to client fluidity can stymie a business's desire to work with a cloud provider.

Cloud providers must also have the ability to seamlessly integrate a client's cloud computing needs with their on-premise IT operations. Many businesses cannot afford to have their operations within the cloud and their on-premise operations on two separate pages.

A Common Thread

Global management and strategy consulting firm Booz & Company recently performed research on the challenges facing cloud computing. From this research, Booz & Company identified a lack of standards as being the common thread for these issues. This lack of standards have come about due to the fragmented nature of cloud computing's overall development over the years.

7. Future Challenges for Cloud Computing

Will cloud computing continue sailing unchallenged into the future or will it face a decline that is so characteristic of every new technology? It's hard to tell, frankly, but by all counts it's here to stay. But that doesn't mean the journey forward is crystal-clear. For both technology-makers and vendors alike, a peek into the near-future of cloud computing is necessary.

Here's a list of what challenges are going to present themselves soon:

- **Harmful competition:** The problem with any open technology is that too many players can step in and crowd the stage. The result is a virtual fistfight where some are

not shy of using wrong tactics to gain the upper hand. This can include false claims or trying to damage the reputation of a competitor. Obviously, too much heat leads to unhealthy competition.

- **Major failures:** A few recent instances recently have cast a shadow over the reliability of cloud computing. Issues related to outages and data security need to be taken more seriously by the vendors, especially the big players. This is what is also causing businesses to instead opt for private cloud, which excludes the benefits of big data technology.
- **Government regulation:** Given the critical data involved, governments are trying to set up compliance standards for cloud computing vendors. If this comes into effect, many businesses will be forced to close shop or get into a long-drawn-out cycle of deciphering arcane guidelines. While the intention can be understood, governments usually should stay away from technology decisions.

Of course no technology sails through its course without hiccups, and cloud computing is no different. But given how critical it has become for modern businesses, there's need to think ahead.

Conclusions

In this paper, we presented challenges and opportunities of Cloud Computing technology. Such challenges and opportunities deal with the availability or performance of software running in the cloud, as well as privacy and data control. For these research fields, we highlighted the current state of the art, and presented approaches to mitigate the open problems. We argue that Cloud Computing introduces new trade-off decisions in the context of quality-driven software service architectures. These decisions include trade-offs between service quality attributes, such as availability, distributed data consistency, service runtime performance, and privacy. We envision a structured decision support framework for cloud-

based architectures that explicitly addresses these trade-offs.

References

- [1] Multimedia framework (MPEG-21) – Part 5: Rights Expression Language, 2004. ISO/IEC standard 21000-5:2004.
- [2] Adobe lifecycle rights management es. <http://www.adobe.com/products/lifecycle/rightsmanagement/indepth.html>, Aug. 2010.
- [3] G. Aggarwal, M. Bawa, P. Ganesan, H. Garcia-Molina, K. Kenthapadi, R. Motwani, U. Srivastava, D. Thomas, and Y. Xu. Two can keep a secret: A distributed architecture for secure database services. CIDR 2005.
- [4] B. Agreiter, M. Alam, R. Breu, M. Hafner, A. Pretschner, J.-P. Seifert, and X. Zhang. A technical architecture for enforcing usage control requirements in service-oriented architectures. In SWS, pages 18–25, 2007.
- [5] G. Amanatidis, A. Boldyreva, and A. O’Neill. Provably-secure schemes for basic query support in outsourced databases. In DBSec, pages 14–30, 2007.