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AMCHAM EU
AMERICAN CHAMBER OF COMMERCE TO THE EUROPEAN UNION
SPEAKING FOR AMERICAN BUSINESS IN EUROPE

POSITION STATEMENT

Discussion Paper on Cloud Computing

Executive Summary

Cloud computing has emerged as one of the most important IT trends in recent memory. While definitions may vary, it is universally accepted as a new way of providing applications and services through the internet. This provides users, individuals, companies and governments alike, added flexibility in conducting business or accessing information.

Like every significant evolutionary development of this magnitude, cloud computing will require decision-makers in Europe and globally, to better understand what it is, how it works and what the business, technological, legal and regulatory implications are. In particular, cloud computing will most likely lead to adaptations in IT infrastructure, business models, data protection, security, interoperability, reliability, standards, and governance are devised and implemented.

To ensure that the use of cloud computing grows as smoothly as possible; AmCham EU would like to open a dialogue with EU policy-makers to share our members' expertise on this issue to make sure its economic and societal value are maximised.

Introduction

This paper aims to serve as a thought-starter for EU policy-makers and stakeholders within discussions on cloud computing. It does not seek to define relevant notions or pre-define business models and technology developments. This should rather be seen as an effort to describe current thinking on what is the "cloud", how it may evolve and what this can mean for businesses and consumers with the view to start exploring which issues EU policy-makers may need to reflect upon in view of emerging trends and contribute to the debate.

Cloud computing

A number of information technologies that have been introduced changed the technology landscape in the last decade and have respectively been talked about as the "next big thing". In the technology world, Cloud computing has been discussed as today's "next big thing" and compared to the revolutionary shift for computing brought by the use of personal computers in the 1980s, or indeed

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"The Big Switch"[1] brought about by electrification. Rather than representing a single technological advancement, cloud computing represents a new business model and a novel approach to existing technology and platforms accessed via the internet. Just as businesses typically do not build their own power plants but outsource the generation of power, cloud computing allows companies to eliminate their in-house data centres or customised software applications in favour of having external specialists provide them with a range of services including , data storage, software such as messaging and productivity suites. Eventually, an enterprise will no longer need to own or manage physical infrastructure and non-core applications or services as these may all be sourced in clouds. Broadband, mobile connections and massive server farms enable companies to outsource their infrastructure, data and application needs to remote computers worldwide, sharing hardware and systems they do not own and that are potentially situated at distributed locations.

For consumers, cloud computing is pioneered by social networking sites, online trade business models and online search engines. Millions of users can simultaneously use e-mail, write on their blogs, update their schedules and do other tasks using the same shared facilities, for free or for a nominal amount. Further, because applications and data are stored in the cloud it enables end users to access applications and content from a range of devices including mobile devices – enabling anytime, anywhere access to ensure a continuous customer experience.

Drivers

General acceptance of using cloud-based services in personal environments is one of the factors that drive the hype around cloud computing in business environments today.

Equally, economic considerations and the cost effectiveness that cloud computing offers, make outsourcing of IT systems for companies attractive as this also means re-allocating capital expenditure to operational expenditure. Cloud computing will enable companies to save costs, and this is likely to enable growth in particular by small businesses as small businesses can scale up without making huge upfront capital investments. The UK Broadband Stakeholders Group (BBSG) estimates the online model would save companies £350 a year per person in support costs. If 30% of SME staff made the switch to cloud computing, the savings across the UK would total £620m a year.[2] Access to sophisticated computer systems, and all the value they can deliver, was previously the realm of larger companies. Cloud computing levels that playing field so that the small business has access to the same systems that large businesses do.

[1] Nicholas Carr, The Big Switch: Rewiring the World, from Edison to Google, 2008.
[2] UK Broadband Stakeholders Group report (see p. 64), "A Framework for Evaluating the Value of Next Generation Broadband", June 2008, http://www.broadbanduk.org/component/option,com_docman/task,doc_view/gid,1009/Itemid,63/

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Today's unprecedented increase in data volumes and the related cost of storage make the transition to the cloud imperative. On the one hand, the connected world is piping in data from all over leading to a surge in data volumes. IDC estimates that between 2006 and 2007, the number of exabytes of data captured and replicated nearly doubled. This data deluge continues to accelerate with a projected 1800 exabytes in 2011. On the other hand, the cost of monthly storage per gigabyte in a data centre of 1,000 servers is today $2.20. The University of Berkeley estimates that the equivalent cost in a cloud data centre of 50,000 servers would amount to $0.40.

The scale, resources usage optimisation and elasticity of resources that cloud hosting can provide are also important drivers. For example, start-ups and smaller internet and online service providers will no longer require large capital or manpower investments in hardware to deploy a new innovative service. This also reduces considerations about "over-provisioning" for a service whose popularity does not meet their predictions, thus wasting costly resources, or "under-provisioning" for a service that may become very popular, thus missing potential customers and revenue. The cloud "client" instantly gets the hosting space and services they need, at any given time, without wasting resources. This potentially enables small businesses and start-ups, to reach wider markets much more quickly with less expense.

The increased demand for "Green IT" is another consideration that business has to factor today in their IT investment and the management of their data centres. The transition to the cloud will have the benefit of limiting environmental impact in terms of physical installations and energy use. This includes energy used for the cooling systems in data centres.

Definitions

The technology world has not yet agreed on a universally acceptable definition of cloud computing. For example, some authors define the cloud by focusing more on the characteristics of its infrastructure and the virtualisation of software and hardware systems. Some base definitions on the business outcomes it enables (real-time collaboration, automation of resources management, immediate scalability). Still others focus more on the business model that the cloud enables (pay-as-you-go).

The US Federal Government, in its 2010 budget, defines cloud computing as follows:

"Cloud-computing is a convenient, on-demand model for 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."[3]

[3] See p 158 at http://www.whitehouse.gov/omb/budget/fy2010/assets/crosscutting.pdf

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There is also debate on the relation and conceptual boundaries between cloud computing and existing technologies or business models. Cloud computing builds upon, and encompasses concepts and technologies such as grid computing, utility computing, software oriented architecture, and Web 2.0 as well as Software as a Service (SaaS), Infrastructure as a Service (IaaS) and Platform as a Service (PaaS). In addition, some anticipate that there will remain substantial demand for data storage and processing on-premises as well as in the cloud, and use terms such as "cloud and client" or "software plus services".

While, it is arguably not necessary to agree on terminology and define what can be perceived as an evolution in order to discuss how the transition to the cloud may develop, the following three distinct cloud delivery models can be distinguished:

- In the **"Cloud Software-as-a-Service" model**, the provider offers both the hardware infrastructure and software application, accessible from various Internet-enabled devices through a thin client interface such as a Web browser. This is the one most familiar to the average consumer, with web-based email being one of the oldest cloud services. Because the service provider hosts both the application and the data, the end user is free to use the service from anywhere and any internet-enabled device. Examples include Google Apps, SAP, Salesforce.com and others. Web mail services include such examples as Gmail, Yahoo! Mail and Hotmail. Online data storage examples include IDrive, Mozy and Box.net. Online software examples include Google Docs and social networking sites such as Twitter and Facebook etc.[4]

- The **"Cloud Infrastructure-as-a-Service" model** provides customers with access to server processing, storage, networks, and other fundamental computing resources. The customer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, deployed applications, and possibly select networking components. Examples include Amazon EC2/S3, AT&T, IBM, Google, Verizon Business, Rackspace, 3Tera, Saavis, Citrix, HP, VMware, GoGrid, Rightscale etc.

- The **"Cloud Platform-as-a-Service" model** provides not just server resources but also a set of programming languages and tools supported by the provider's infrastructure for software developers to easily create and run their applications in the cloud. The costumer does not have to manage or control the underlying cloud infrastructure, network, servers, operating systems, or storage, but has control over the deployed applications and possibly application hosting environment configurations. Examples include Amazon, Microsoft Azure Services Platform (.NET), Google App Engine, Salesforce.com's AppExchange, Heroku (Ruby on Rails), Oracle etc.

[4] These examples and those following each of the categories below are not intended to be all includive but only a examples of some firms operating in this space.

The architecture of cloud computing

There are today divergent views on what the building blocks of the cloud will be. Some talk about eventually having a "unified cloud interface", a "cloud platform" comparable to today's internet infrastructures. Others believe that the cloud will be composed of many "clouds", private and public. Whether private or public, the term "intracloud" is also discussed and referred to as a federation of clouds. There is also talk of the "internet of services" in this context whereby a plethora of different cloud applications will be used by the ubiquitous networked objects in the so-called "internet of things".

- ***Software***

The emergence of the cloud has brought considerations and opportunities for new business models and applications to traditional software manufacturers. The shift to Software as a Service (SaaS) is an ongoing evolution for the software industry with online applications provided often with a "pay-as-you-go" model. This shift is a challenge for the software sector as it also potentially affect traditional software licensing and pricing models.

Data management in the cloud is one more challenge that the business world will be confronted with which will require the use of sophisticated tools. But this is also an opportunity: the use of business intelligence technology and analytics will empower new applications based on the wealth of information that cloud data will provide.

- ***Hardware***

Cloud computing deployments tend to be very compute intensive and require the use of a large number of high performance servers. Energy efficiency is a key consideration when deploying cloud, not just for the IT infrastructure but also for data centre facilities. Many advances are taking place in the hardware infrastructure available on which to deploy cloud with many computer manufacturers offering specific server platforms for cloud use. These servers typically utilise the latest high performance power efficient microprocessors which also offer direct support for the virtualisation software which is a key element of cloud deployments. These processors and servers offer mechanisms by which energy efficiency can be determined and management policies set to control overall power consumption based on workload, utilisation, time of day etc.

By using latest generation server designs, significant cost savings can be made in data centre power consumption at the same time being able to host more workload than older generation hardware.

- ***Interoperability/SLAs/Security***

A major consideration for many enterprise users of cloud services will be the portability of applications and data and the ability to land their workload on to different cloud providers based on service offerings, price and performance.

Today there is limited interoperability between the services offered by the various providers of cloud computing and as the market evolves it will be necessary for the industry to define standards that will enable interoperability across the various cloud service offerings.

Another area that enterprise IT departments need to consider when looking to utilise cloud services is that of Service Level Agreements. What is the guaranteed uptime of the service, what response times/through put is committed by the provider? Who bears the financial burden of a service failure? Many of today's services are provided without defined SLAs which may limit their use by many IT organisations.

Data security, backup, location & protection/disposal of data are also areas that need to be addressed along with ownership and provision of security keys to access data and applications stored in the cloud.

Policy considerations

It is undoubtedly too early to design specific policies to address hypothetical policy considerations within the cloud. However enlightened policies can be key enablers for technology innovation. With this view, we outline policy considerations in a new cloud paradigm

- ***Broadband access***

Ubiquitous broadband connectivity is even more critical in this new era of computing. To take full advantage of cloud computing, it will be vital for all homes, businesses, governments, and other organizations to have access to high-quality, affordable broadband. It is critical that governments recognise the need to stimulate the delivery of greater broadband capacity while enabling competition so that broadband networks can enable everything that can come to and from the cloud. A second important element is to ensure the right regulatory environment that will allow new and innovative services to emerge that will in turn drive user demand for more and faster broadband connections. Maintaining a favourable regulatory environment that creates incentives for both broadband infrastructure investment and innovation is essential.

- ***Economic Opportunities***

Cloud platforms will multiply the ways that independent developers in Europe can create IT services for their customers and build their business. Entrepreneurs benefit from the reduced risk of failure, which is in many cases one of the barriers to innovation. In turn, customers will have access to a greater range of powerful services that can help them benefit economically from efficiency gains. This is especially true as enterprises optimise their own IT infrastructures. These factors relate directly to current EU goals for enhanced entrepreneurship and economic growth.

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- ***Openness/interoperability/data portability***

Irrespective of how the cloud architecture evolves, it will be important to ensure that it remains open to innovation from all sources, encompasses all existing and future technologies, and uses internet protocols and standards to ensure accessibility.

Interoperability within the cloud and among the various clouds will be a crucial enabler for innovative applications to ensure customers have effective and secure data portability. Therefore, it is important that cloud providers ensure data portability to avoid lock in of users. In other words, the owners of application and data need to be able to export their data into common, open formats.

- ***Data protection/privacy***

Data protection and privacy considerations will need to be clarified. Some practitioners are already discussing challenges to data protection concepts in the cloud such as jurisdictional and access related issues. However, in this regard it should be noted that these challenges and issues are largely similar to those faced, and solved, with bureau and outsourced data processing, with those solutions largely applying to cloud computing too. It will be important to ensure that technological innovation will not be hampered by uninformed fears or legal hurdles but that data protection rights and the right to privacy will be safeguarded in the new architecture.

The user, not the service provider, must own their data in the cloud. In that regard, the user should be able to delete data in a reasonable time frame. As for data portability, it needs to be implemented so that the user is truly in control of their data and can move data between providers or return to an in-house solution at will.

Legal provisions will need to focus on universal requirements applying to the data controller and data processors regardless of the physical storage of the data. Data in the cloud exists within the physical infrastructure of the internet on the servers of the companies offering these services, as well as on users' own machines. Users of cloud services expect their provider not to lose their data and to respond to their queries quickly. Data centres therefore usually replicate users' data in more than one place (to ensure resilience), optimise the location to enhance the speed of a service (such as serving European users from a European data centre), and optimise computing power, automatically shifting work from one location to another, depending on how busy the machines are (e.g. when more capacity is needed in North-America and capacity is available in Europe during night, European data centers may serve North American users). Therefore, instead of a location-based model, the fundamental question to determine how a user's data is being protected, is who holds the data, and what are a provider's privacy policies and practices. It is on these issues that companies should compete. Those with the best privacy and security practices and records will prosper. Those with scant regard for these important principles, will suffer in the market place.

Global privacy standards deliberated in a multilateral forum representing policy-makers from around the world including those countries currently lacking any privacy regimes are needed to address the new technological reality. Global minimum standards for data protection become increasingly necessary in a world where data flows around the planet at the click of a mouse, but three out of four countries do not have any privacy laws in place whatsoever.

Finally, to ensure users' trust, policy makers should ensure that the privacy laws apply standards of protection from unauthorized access by governments to data stored in the cloud that are equally high than the standards applying to data stored on devices located at a user's home.

- ***Security***

For many types of government and private sector services security is a paramount concern. Security must be adequately addressed at the design stage to protect against any potential threats or breaches, create the necessary trust and allow the full potential of an ever evolving architecture. Cloud computing providers must ensure the security of the critical information stored in the cloud. At the same time governments must ensure that cloud service providers are not hampered in their efforts to prevent unauthorized access to networks or theft of data. Providers must retain the ability to introduce increasingly robust security measures, regardless of the underlying technology to stay ahead of hackers and malicious activities.

While no computing model can ever offer 100% security the following outlines the reasons we believe cloud services are more secure:

- First, many local infrastructures today – i.e. the very large majority - are run by users and organisations that often lack the expertise and/or resources to run professional software and network security policies. The cloud can enhance security because of its simpler and more homogenous architecture, the professional maintenance of the infrastructure by the cloud provider, and the ability to effectively and frequently role out security/ software updates without the need for any action by the user.

- Second, by not storing much data on local devices, the cloud mitigates one of the most common user security risks - data loss at the end point. Common examples of this include a stolen laptop, a lost USB key or an attachment accidentally emailed outside the company.

Since system security is paramount to the success of any computing provider, the increased availability of cloud computing will push providers to make a compelling case for security and differentiate themselves on their security credentials, with a dynamic marketplace reflecting user experiences.

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- ***Reliability***

Cloud based applications must be highly reliable. This is especially critical for enterprise business or government clients where work being performed using cloud based applications can be highly time sensitive and impacted by extended service outages.

- ***Global standards/harmonised regulatory regimes***

International business needs harmonised regimes that facilitate cloud operations and avoid the need to invest excessive human and financial resources in complying with divergent legislation and regulatory standards across the world.

- ***Governance***

Global and technology-neutral approaches are key from a cloud governance perspective although it is today too early to define governance models.

Conclusion

Cloud computing represents the latest evolution on how the ICT community has been developing and implementing services and applications over the past decades. In many respects, it embodies our information age marked by accessibility, ubiquity, and flexibility as well as sharing. The very elasticity of cloud computing makes it a major milestone in the race from past siloed resource model to tomorrow' shared utility model. By involving EU policy-makers into the discussion around cloud computing, AmCham EU expresses its confidence that the development of cloud computing will be fully understood and supported by decision-makers and that any related legal and regulatory questions will be addressed in full knowledge.

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AmCham EU speaks for American business committed to Europe on trade, investment and competitiveness issues. It aims to ensure a growth-orientated business and investment climate in Europe. AmCham EU facilitates the resolution of transatlantic issues that impact business and plays a role in creating better understanding of EU & US positions on business matters. Total US investment in Europe amounts to $700 billion, and currently supports over 4 million jobs.

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