colegio oficial
ingenieros de telecomunicación

Public Consultation on Cloud Computing

1 Purpose

The purpose of this questionnaire[1], is to obtain structured input from stakeholders and interested parties on the needs, barriers and opportunities of the use and provision of cloud computing. This input will feed into the Commission's work on a European Cloud Computing Strategy along the lines set out by Vice-President Kroes on 27 January 2011 http://europa.eu/rapid/pressReleasesAction.do?reference=SPEECH/11/50 .

2 Background

The Digital Agenda is Europe's strategy for a flourishing digital economy by 2020. It outlines policies and actions to maximise the social and economic potential of information and communications technologies (ICTs), notably via the internet. The development of a European Cloud Computing Strategy is one of the actions of the Digital Agenda.

Cloud Computing represents a paradigm shift away from today's decentralised IT systems. It is already transforming providers of IT services and it will change the way other industrial sectors provision their IT needs as end users, as well as the way citizens interact with their computers and their mobile devices. Cloud Computing, although in its early days, is already a commercial reality and the adoption rate of Cloud Computing services is growing. One study [1] has predicted a Compound Annual Growth Rate of 19.5% in Cloud Computing. According to Gartner,[2] the industry is poised for strong growth through 2014, when worldwide cloud services revenue is projected to reach USD 148.8 billion.

The EU needs to become not only cloud-friendly but cloud-active to fully realise the benefits of Cloud Computing. Besides allowing for the provision of Cloud Computing in its various forms, the relevant environment in the EU has to address the needs of end users andprotect the rights of citizens.

At the same time, it should allow for the development of a strong industry in this sector in Europe.

With this consultation, the Commission asks stakeholders and interested parties for their experiences, needs, expectations and insights into the use of Cloud Computing. This input will be used in developing future Cloud Computing policies and actions.

The purpose of the questionnaire is to collect information that is as detailed as possible. This implies that detailed free text answers will be more useful than short answers in a multiple choice style. It is not necessary to answer all the questions, please focus on those where you can provide relevant insights based on your knowledge and experience.

[1] http://ec.europa.eu/yourvoice/ipm/forms/dispatch?form=cloudcomputing&lang=en

3 References

[1] Study by PAC Report D2 Figure 3
http://cordis.europa.eu/fp7/ict/ssai/docs/20090730-d2-eu-ssbs-industry_en.pdf

[2] http://www.informationweek.in/Cloud_Computing/10-06-22/Global_cloud_services_market_to_surpass_USD_68_billion_in_2010.aspx

4 Questionnaire

4.1 Your Profile

1. Are you responding for a Company?* (compulsory)

   No

2. Size in number of employees* (compulsory)

3. Sector* (compulsory) (between 1 and 20 characters)

   Telecommunications

4. Country where legally established* (compulsory) (between 1 and 30 characters)

   Spain

5. Are you a Public Administration?* (compulsory)

   No

6. Size in number of employees * (compulsory) (between 1 and 50 characters)

   33

7. Sector* (compulsory) (between 1 and 50 characters)

   Telecommunications

8. Country where legally established * (compulsory) (between 1 and 50 characters)

   Spain

9. If you are not a company nor a public administration, are you...* (compulsory)

   Other

10. If other, please explain...* (compulsory) (between 1 and 50 characters)

    Professional College

11. If you are a user of cloud services: Please describe your current use of cloud computing.

We have web services and e-mail accounts hosted in a provider.

What kind of problems do you encounter when using cloud computing solutions in the EU? Elsewhere? (optional) (between 1 and 2000 characters)

- Security. Because the information is not directly under the customer's control, cloud computing infraestructure has the potential to leave this information exposed in some cases. Anyway, information residing on cloud computing platforms may be as secure as, or even more secure than, on-premise systems.

- Cost. While there are clear cost benefits, there are many instances in which cloud computing is not at all cost effective. In some cases, applications are more costly to operate in the clouds, above all when considering the cost of porting, special features that the application may require, and the fact that on-premise platforms may be less expensive. A business case is recommended anyway.

- Interoperability and portability to services offered by other cloud providers.

- Training. Each Cloud provider has its own way of doing things, different products, differents services, different ways of charging for services, etc. Although Cloud Computing is supposed to be self-service, reality shows that some training can be required before using the provided services.

- Control. When a company or a user leverages a cloud computing provider, it is giving up control of its ICT infraestructure to another company/organization. So, the customer is at the mercy of another company/organization who could cause a bunch of trouble.

- Relying on external providers always implies some business risk. The cloud computing provider may go out of business for any number of reasons or it may perhaps decide that you have violated some policy and discontinue your service. For instance, an acquisition could take place, and the purchasing company may decide that a particular cloud computing platform is unprofitable and must be shut down.

- Software is a very complex matter, highly prone to failures and security holes, more in a dynamic environment like Cloud Computing.

- Pay per use. Theoretically, cloud computing should allow to consume computing resources in a granular way and pay only for the resources that have been consumed. But, in practice, providers tend to establish a subscription model or a flat fee.

- Legal requirements. Legislation is not always known or accomplished by providers and users. Personal data are particularly sensitive, of course they will be better protected under the European Union's umbrella.

- Compliance. Cloud computing providers may not provide the logging and auditing features that the user needs to stay compliant with the many laws.

- Backup and restore. Users of cloud computing cannot be always sure that the provider has correct backup processes. Restore tests are difficult because the infraestructure is under control of the provider and it is frequently shared among many customers. Disaster recovery plans are also difficult to test because of the same reasons.

- Elastic adaptation to demand fluctuations is difficult to accomplish by the providers.

- Best practices in governance, management, security, auditing and contingency plans are more difficult in a dynamic infraestructure.

12. If you are a potential user but not active yet: What are the main reasons for not (or not yet) using Cloud Computing? (optional) (between 1 and 2000 characters)

    Inertia when IT infraestructure is already deployed.

13. If you are a provider of cloud services: Please describe your offer.

    We are not exactly a provider, but a facilitator. We put in contact some cloud providers with potential customers associated to our Professional College.

    What kind of barriers do you face in providing your cloud computing services within the EU? Elsewhere? (optional) (between 1 and 2000 characters)

4.2 Clouds for users

1. Do you feel that in the cloud services you are currently using or have been evaluating (or are providing), the rights and responsabilities of both user and provider are clear?

    In general, yes.

2. Please comment.

    We must distinguish between services offered to organizations and services offered to the public.

    Big companies have legal departments or at least advisors, so contracts are treated with more carefulness. Moreover, in private cloud computing the provider is part of the organization, so responsabilities are fairly clear.

    However, in the market oriented to particular users, providers use to have standard contractual conditions and users rarely read these conditions before consuming the services. So conditions are established but a piori unknown by the consumers.

3. Are you aware of the applicable jurisdiction in different types of disputes that could arise during your provision or use (or potential future use) of specific cloud offerings?

   Yes, we have legal advisors.

4. Is there an alternative approach to the determination of jurisdiction that may work better both for users and providers?

   Yes

   No

   Don't know

5. If yes, please comment.

6. Please comment.

7. Do you feel that the question of liability in cross-border situations is clear for cloud users and cloud providers?

   No.

8. Why?

   Borders are part of the legal establishment, every country has its own laws. Even regions in the same country may have particular laws. When the user and the provider are in different places, the question is which legislation to apply. International laws exist, but they are sometimes difficult to enforce, specially in the Internet.

   Again, the European Union is an umbrella which makes this matter easier. The Union gives more guarantees to providers and consumers. When the provider is outside the Union's borders, consumers usually are less protected.

4.3 Legislative Framework

1. Do you think there are updates to the current EU Data Protection Directive that could further facilitate Cloud Computing while preserving the level of protection?

   Yes

   No

2. If yes, please describe.

3. Are you aware of specificities in Member State data protection rules, or other legislation, that prevent you from using/providing cloud services within the EU?

   Yes

   No

   Don't know

4. If yes, please detail.

5. From your perspective, would it be useful if model Service Level Agreements or End User Agreements existed for cloud services so that certain basic terms and conditions could easily be incorporated into the contractual agreements?

   Perhaps. Sometimes.

6. If no, why not?

   Many cloud providers don't offer SLAs at this moment, specially in public clouds.

   In fact, SLAs contradict cloud philosophy somehow. Cloud computing is not the same as outsourcing. Pure cloud computing implies dynamism, automation, self-service, facility to change the provider. In fact, the idea of transiency hides behind cloud computing. So complex, elaborated SLAs may not have much sense in some environments like public clouds where cost and flexibility are more important than quality of service. A service may be simply consumed "as is", with few expectations about time response, availability and other parameters of quality.

7. If yes, further thoughts about how this might/should work.

   Service-level agreements. SLAs record a common understanding about services, priorities, responsibilities and guarantees between the cloud provider and the users.

   Cloud computing is sometimes referred to as "outsourcing low-cost". The more SLAs, the closer to outsourcing.

   Companies usually demand more quality that particular users. Besides, big companies are used to SLAs since many years ago. Therefore, as larger enterprises with stricter requirements begin to leverage cloud computing, the trend will be for cloud computing

providers to offer formal SLAs, but likely they will do so by passing the cost of the risk down to the cloud consumer.

4.4 Embracing interoperability

1. Please describe interoperability or (data) portability issues you have encountered when using/providing cloud services or are otherwise aware of.

   Interoperability is not a specific issue of cloud computing, but a matter almost as old as computer science.

   Many cloud platforms are proprietary in nature. Once the user has written his/her system using the provider's language and architecture, he/she may find that moving the system to other cloud providers or back into the enterprise is cost prohibitive.

   For instance, particular data formats and specific branded databases are drawbacks to get portability. If you want to migrate from Oracle to DB2 or vice versa some procedures must be executed, and even require manual intervention.

   The big push right now is around interoperability among cloud providers, or the notion of cloud providers offering built-in communications to one another and application and data portability among providers. Some authors called this INTERCLOUD. Although this is one of those new topics that is widely defined, the Intercloud is really the concept of allowing cloud providers to exchange information, state and behaviour in support of those who use the cloud. Like IP protocol in the Internet, it seems desirable for cloud users to have standard protocols to connect different things together for the next reasons:

   1. It puts the responsibility for communication among providers on the providers side, not in the users.

   2. It provides a foundation for interoperability that, to date, has been pretty ad hoc.

   3. It may reduce the price point of cloud computing.

   Many cloud providers could think that this standarization is not good for their interests, of course they would love to have the customers locked in. However, they also could find that, paradoxically, providing interoperability gets many enterprises off the fence and moving towards the clouds.

2. Which existing or emerging standards support interoperability across clouds and portability of data (from one cloud to another)?

   Cloud computing can leverage some well-known standards like SOAP (Simple Object Access Protocol) and Web Services to accomplish the interoperability objective.

SOA (Service Oriented Architecture) and Cloud Computing make a good couple.

3 Which are the most important standars that are currently missing but which you feel are necessary to ensure interoperability and portability? Please describe in detail the aspects they should cover.

When talking about cloud computing, we can establish a layer model similar to the famous OSI model in the data communications world. The most known layers are IaaS (Infraestructure as a Service), PaaS (Platform as a Service) and SaaS (Software as a Service), but more layers "as a service" may be considered.

The layer model let act in a different way in every layer. For instance, it is possible to deploy a proprietary grid or SOA architecture over several sites in pay per use: custom software over commodity IaaS hardware.

When considering data portability, some aspects that should be covered are the following:

- Raw data (bits). Data is often viewed as the lowest level of abstraction from which information and knowledge are created. This question also has to do with storage compatibility. Storage as a Service is the ability to leverage storage that physically exists remotely but it is logically a local storage resource to any application that requires it. This facility may imply the adaptation of traditional storage standars like SCSI to the TCP/IP world (iSCSI).

- Information: A pattern of data that is meaningful. Information as a Service refers to the ability to consume any type of remotely hosted information (like stock price, address validation, credit reporting, etc.) through a well-defined interface such as an API (Application Programming Interface). While they tipically serve information using standard Web Services APIs, some use proprietary interfaces.

- Application semantics. The different ways in which data are represented within different applications.

- Metadata. Data about data. How data are described, owned, secured, governed, and so on, by many different systems.

- Ontology. Formal representation of a set of concepts within a domain and the relationships between those concepts.

- Schema. In a relational database, the schema is described as attributes or columns, tables and rows.

- Data dictionary. Centralized repository of information about data such as meaning, relationships to other data, origin, usage and format.

- Data catalog. It's about formalizing the gathered information, including the data dictionary. The difference is that the data dictionary is normally local to a single system or application, whereas the data catalog spans all systems in the problem domain.

- Information model. It is best to think of the data catalog as the list of potential solutions to an architecture problem and to think of the information model as the architecture solution. Spanning the entire architecture, on-premise and cloud computing based, the information model is a master data model that depicts all major entities within the problem domain and how those entities are, or should be, related.

Some other layers that be considered in cloud computing and so, demand standars establishment, are the following:

- Database as a Service
- Process as a Service
- Application as a Service
- Security as a Service
- Management/Governance as a Service
- Testing as a Service
- IP Telephony as a Service

4.5 Public sector clouds

1. What can the public sector do as a cloud user to support the emergence of best practices?

Best practices are a controversial matter somehow. As technology matures and standards emerge, the way it is used becomes standardized as well. Best practices come to be widely understood and emulated and therefore individual competitive advantage vanishes. This fact may be good for society in general, if the objective is building a public infraestructure, but perhaps it's not good for competition among companies.

Anyway, it seems that the promotion of interoperability standars stands more on the side of users demand. Many solutions and services continue to be proprietary because of cost and latency in adopting standards. Here the public sector may play a key role by demanding its providers the compliance of particular standards.

2. Please elaborate in particular on public procurement of cloud services.

There is an important question to answer about this matter: is the public sector going to become a cloud provider for offering services to the citizens? If yes, what kind of services?

Moreover, if public administrations are going to provide cloud services by contracting them to third parties, personal data of the citizens may be stored in private infraestructures. This requires, among other many things, the establishment of security protocols.

3. In particular, can the deployment of eGovernment and eScience infrastructures by the public sector act as an example for other sectors?

Yes, it can.

States already offer many services available through the Internet at this moment. These services may include mechanisms to enhance the political participation of the citizens. This "distributed management" may be applied in other organizations, even companies.

4. Please list Member State initiatives in the area of Cloud Computing that you are aware of.

5. Do you think they are:

adequate

go too far

not far enough

6. Please elaborate.

7. How can Member States best cooperate to create interoperable solutions and shared best practices?

Best practices are disseminated by themselves: articles in journals, lectures, symposia, professional societies, etc. Moreover, consultants and contractors carry ideas from client to client constantly.

If the objective is that all the citizens that live in the European Union receive similar services from public administrations, then some coordination mechanism has to be implemented. For instance, the creation of an European agency dedicated to receive and send recommendations for the participating countries. Then these recommendations should be followed by regional and local administrations.

Collaboration with universities may also be important.

4.6 Future Research and Innovation programmes

1. Which are the most important technical aspects of cloud computing that researchers are currently working on?

   Please explain the importance of each concrete example.

   - Interoperability between different cloud providers.
   - Elastic adaptation to demand fluctuations.
   - Pay-per-use mechanisms.
   - Self-service platforms.
   - Automated resources provision in the provider side.

2. Beyond these, do you see technical problems/limitations of current cloud services offerings that will require research in the coming years?

   Yes.

   For instance, cloud providers have to deal with the "load factor" of their infraestructure. The higher the load factor, the more money the provider makes. But this wish may collide with elastic adaptation, which by definition has uncertainty in the course of time. If cloud users can't get this adaptation they will complain and the business may be adversely affected.

3. Please elaborate.

   To be able to calculate the optimal occupation percentage of a cloud infraestructure is a real challenge because it has to be shared among several clients to be considered real cloud. We have to remember that cloud computing is not the same as outsourcing, multi-tenancy is an important feature of this new IT exploitation model.

4. Should public R&I funding be used to establish prototypes of new cloud infrastructures?

   It is difficult to answer this question because it has an ideological component.

5. If yes, please describe types of projects/prototypes you would see as useful, and explain why.

4.7 Global solutions for global problems

1. What are the most important Cloud Computing problems that have to be discussed at global level? Please list and explain.

   Likely, security. The technical possibility of uploading a virtual Trojan Horse to a remote provider anonymously, with the only requirement of a credit card, may have huge security consequences.

   Moreover, many Western companies have already shifted large chunks of their computing operations to remote countries, sometimes putting critical assets and processes under the management of foreign companies and workers.

   As computing becomes more of a utility, corporations and even governments will begin to give up not only the management but the ownership of their computing assets. It's not hard to imagine that much of a country's commercial infraestructure could end up scattered throughout the world, under foreign jurisdiction. That raise new and difficult questions about national security and even national sovereignty.

   Will countries be comfortable with the idea of giving up direct control over the machines and software that their economies run on? Do they trust foreign governments, some of which may be unstable or even unfriendly, to safeguard sensitive data about the operations of their companies and the lives of their citizens?

2. Which would be the right for a/apporaches to tackle them? Please expand.

   Many IT assets will naturally move to where they can be maintained and operated at the lower cost. It is very difficult, or even impossible, to stop this trend for private companies. Perhaps States may follow some "border policies" to prevent the scattering of sensitive data.

4.8 Background documents

Report on "The Future of Cloud Computing" conference

26/01/2010: http://cordis.europa.eu/fp7/ict/ssai/events-20100126-cloud-computing_en.html