

Public Consultation on Cloud Computing

<http://ec.europa.eu/yourvoice/ipm/forms/dispatch?form=cloudcomputing>

Deadline for Submission: 31 Aug 2011

The purpose of this questionnaire 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>.

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 and protect 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] 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-](http://www.informationweek.in/Cloud_Computing/10-06-22/Global_cloud_services_market_to_surpass_USD_68_billion_in_2010.aspx)

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

Questionnaire

Your Profile

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

Yes	No
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5 Are you a Public Administration?* (compulsory)

Yes	No
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9 If you are not a company nor a public administration, are you...* (compulsory)

Academic Individual Other

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

Non-profit organisation

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

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

N/A

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)

The main reason is lack of adopted standards, hence, there is a danger of lock-in.
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13 If you are a **provider** of cloud services: Please describe your offer.

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

N/A

14 If you are not a user, nor a potential user, nor a provider:

Please describe your interest in this topic and the source of your knowledge. (optional) (between 1 and 2000 characters)

EGI.eu's principal mission is to coordinate and facilitate the creation and maintenance of a pan-European Grid Infrastructure (EGI) enabling sharing of digital resources for computing, storage, and data, as well as facilitating research across diverse scientific communities. In order to meet the demand of new user communities with diverse requirements, EGI needs to improve the flexibility and efficiency of the infrastructure and empower virtual research communities with direct control of the service environments they offer to their end-users.
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EGI sees virtualisation technology as an enabler to achieve this vision and cloud computing as the operational model for delivering it. The question now for EGI is to understand how the adoption of virtualisation technology within its current infrastructure composed of federated resource providers should deliver a cloud computing environment for its users, and how it implements such an environment.

Through a number of measures, EGI.eu is defining a Roadmap towards innovating EGI to provide these virtualised services for its current and new user communities. An EGI Cloud Profile (<https://documents.egi.eu/document/435>) is being produced defining a minimal set of usage scenarios which, when supported, will provide key functionality for end-users wishing to utilise 'cloud' interfaces provided as part of EGI. From these scenarios a number of functional areas are defined and a set of standards and specifications identified that will define interaction across this functional areas.

Within the UMD Roadmap (<https://documents.egi.eu/document/612>), Virtualisation Capabilities were stated as becoming critical for EGI's sustainability as they allow for extremely flexible support of various different user communities. Reducing the necessity for each resource administrator to develop expertise in every application or service that is deployed in the production infrastructure, is essential in order to support more diverse user communities. Managing the utilisation of the concrete resources (often referred to as the 'bare metal') irrespective of the actual software (potentially domain-specific) contained within the Virtual Machines (VM) then becomes possible on a uniform level through generic software available for VM Management Virtual Machine Management in particular, and general data centre management. While aspiring to use general-purpose software for VM Management, EGI must not introduce custom-made or incompatible VM Image formats or infrastructure for VM Image Distribution.

Commercially available public clouds have been designed to satisfy general computing requirements such as e-commerce and transactional communications that are typically less sensitive to bandwidth and latency. As clouds become more mature, however, it is anticipated that clouds of different 'flavours' will be deployed to meet the requirements of different user communities such as those that are currently dependent on EGI (e.g. research computing). Therefore, while all of the potential benefits and issues of general cloud computing are relevant to the research computing community, their needs will not always be met by commercial cloud providers. The notion of science clouds will force an emphasis on specific benefits and issues for these user communities that are not provided or available commercially.

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 responsibilities of both user and provider are clear? (optional)

Yes	No
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2 Please comment.
(optional) (between 1 and 2000 characters)

It is important for EGI to understand how the adoption of virtualisation technology within its current infrastructure (composed of federated resource providers) should deliver a cloud computing environment for its users, and how it implements such an environment and define rights and responsibilities in a clear manner. The notion of science clouds will force an emphasis on specific rights and responsibilities for these user communities that are not provided or available commercially.

From the EGI perspective, a potential provider of cloud services needs to ensure security rights and responsibilities. Current issues in this area consist of data ownership and interoperability. Furthermore, concepts of data controller and data processor are not clear, transfer of data outside EEA should be more clearly defined while reassuring guarantees and adequate level of protection of data subject rights. In addition, the rights and responsibilities can be better defined with improved Service Level Agreements.

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? (optional)

Yes	No
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4 Is there an alternative approach to the determination of jurisdiction that may work better both for users and providers? (optional)

Yes	No	Don't know
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6 Please comment. (optional) (between 1 and 2000 characters)

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

Yes	No
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8 Why? (optional) (between 1 and 2000 characters)

<p>The Internet is borderless, but online markets (the resource infrastructure providers within EGI), both globally and in the EU, are still separated by multiple barriers that inhibit collaboration.</p> <p>Cloud computing, while removing many of the barriers to accessing resources, offers a separate set of issues. Removing ‘borders’ or crossing national or continental territories means that the physical location of your data becomes a concern. If a dispute arises, what will be the place of jurisdiction? Other issues, such as responsibility of data, liability coverage for breach of privacy such as the data centre getting hacked, intellectual property rights, third party access, etc. follow on from this concern.</p> <p>Also, many of the problems are humanistic. Individual countries are concerned with safeguarding national sovereignty in order to conserve knowledge and technological competence as well as protecting data privacy and sensitive industrial information - fear of losing jobs, as developing locally based IT infrastructure will avoid workers having to relocate elsewhere and avoiding the under-utilisation of existing local data centres and rendering them obsolete.</p> <p>EGI has historically overcome some of these issues through the spirit of collaboration and minimalistic policies governing usage, accounting and authentication.</p>
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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? (optional)

Yes	No
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2 Please comment. (optional) (between 1 and 2000 characters)

<p>EGI.eu acknowledges the EC effort to improve the EU Data Protection Directive through clarifying the following aspects:</p> <ul style="list-style-type: none">• Criteria on the applicable law (which law is applicable when several

member states are concerned in order to enhance legal certainty and avoid potential conflicts between overlapping data protection laws)

- Harmonisation within the EU/EEA countries
- Implication of international data transfers
- Concepts of data controller and data processor.

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? (optional)

Yes	No	Don't know
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4 Please comment. (optional) (between 1 and 2000 characters)

N/A

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? (optional)

Yes	No
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Embracing interoperability -

1 Please describe interoperability or (data) portability issues you have encountered when using/providing cloud services or are otherwise aware of. (optional) (between 1 and 2000 characters)

In the context of EGI, we focus on the federation of cloud service providers, therefore, interoperability across different organisations/systems is an essential requirement. At the technical level, there are some standards issues:

- Accounting interface and data format.
- Billing.
- Authentication/authorisation.
- Monitoring.
- Security auditing.
- Discovery of available resources.
- Virtual Machine management (provision, contextualisation, de-provision).
- Data management and access

2 Which existing or emerging standards support interoperability across clouds and portability of data (from one cloud to another)? Please list and describe.(optional) (between 1 and 2000 characters)

For managing tasks in the cloud:

- OGF OCCI.
- TCloud submitted to DMTF for standardisation - http://claudia.morfeo-project.org/wiki/index.php/TCloud_API.

For managing data elements: DMTF CDMI.

For portability of VM images: DMTF OVF.

For security auditing: work in progress from DMTF Cloud Auditing Data.

Federation Working Group (CADF).

3 Which are the most important standards that are currently missing but which you feel are necessary to ensure interoperability and portability? Please describe in detail the aspects they should cover. (optional) (between 1 and 2000 characters)

The most important missing standards concern networking services, i.e. standards for describing the networking environment of a virtual machine like firewalls and VLANs.

About the accounting functionality, there is the need for a common way to describe the usage of cloud services in order to automatically exchange usage record information.

Furthermore, to better support dynamic service selection, a common way to describe the available services and resources in the cloud would also be useful.

Public sector clouds

1 What can the public sector do as a cloud user to support the emergence of best practices? (optional) (between 1 and 2000 characters)

Promote use cases. Use cases are one of the most sought out aspects of any technological debate, but are the most difficult to find. As a unbiased user, the public sector could have a profound impact through the publication of use cases scarce in the private sector. This could also lead to the documentation of solutions for the promotion of best practices.

Pilot projects. The offering of pilot projects could allow a variety of entities to 'try out' the technology with limited risk or substantial investment.

International cooperation. A variety of initiatives are being carried out all over the world, on a regional, national, and global scale. Cloud initiatives from other governments (e.g. NIST Cloud in the US) could provide a significant opportunity

to leverage existing technical developments, knowledge and experience.

2 Please elaborate in particular on public procurement of cloud services.
(optional) (between 1 and 2000 characters)

During the initial analysis phase, the public sector has opportunities through its buying power as procurement decisions have a broader impact on the economy which purchasing agencies may take into account. This is due to the amount in which the public sector spends can influence the broader market, the same as which it has effects through regulation, taxes, etc. This could reinforce the desirability of a strategic approach to procurement at major turning points such as cloud computing.

Once the decision is taken, the next phase is getting started. Just like any technology, cloud computing will evolve over time not only in the commercial sector but in the public sector as well. Agencies could think of starting with some cloud apps working alongside legacy services to balance and minimise risks and benefits. An additional measure could also be through using cloud platforms that allow the possibility to restrict data transfer whether it be nationally, within Europe or regionally to start off.

In deciding which cloud provider to choose, such as through a tender process, public administrations could consider a few best practices such as defining SLA templates, setting minimum targets that should be required, obtaining minimum guarantees, outlining responsibilities, clarifying liabilities, and ensuring specific exit strategies (e.g. to reduce problems with long-term legacy contracts), and understanding the stability of companies (e.g. to avoid those who can disappear at some point), etc.

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

(optional) (between 1 and 2000 characters)

Yes. Like most things, there is never a one size fits all. Technology is no different. Cloud computing is not necessary for everyone, which is why cloud resources need to be fully integrated alongside other resources (e.g. clusters, HPC etc.) into an integrated environment. Therefore, just because the public sector adopts cloud computing, does not mean that it will apply to all use cases, sectors, or domains. However, the adoption of infrastructures by the public sector can provide an endorsement for others to follow suit as sometimes it takes one to influence others and the public sector can easily provide this domino effect. They can complement the other types of resources available.

4 Please list Member State initiatives in the area of Cloud Computing that you are aware of. (optional) (between 1 and 2000 characters)

Large support from the EGI community towards the implementation of virtualisation and cloud services has come in part by regional activities already taking place. A few of these (non-exhaustive list) comprise: BigGrid (NL) with a dedicated HPC cloud computing initiative; University of Amsterdam (NL) Grid on Demand Project; INFN (IT) Worker Nodes on Demand Service; CERN (CH) Batch and Server Virtualisation and Cloud Integration activities; NGS (UK) cloud service; Meta Centrum (CZ) VirtCloud; FedCloud (USA) enabling federal agencies to procure on-demand infrastructure services; NIST (USA) Cloud Computing Programs; JISC (UK) cloud-based services for UK education and research; FI (<http://www.cloudsoftwareprogram.org/>)

5 Do you think they are: (optional)

adequate	go too far	not far enough
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6 Please elaborate. (optional) (between 1 and 2000 characters)

A lot of these projects have planted the seeds for larger-scale or integration activities to take place in the near future. It is always an encouraging sign to see activities initiated on a national level that could then influence the European and/or Global arena. All projects in the area of new technologies is positive, which serves to investigate how, where and even why not certain technologies are to be adopted. Therefore, the current initiatives are definitely a good starting point, but only just the beginning.

7 How can Member States best cooperate to create interoperable solutions and shared best practices? (optional) (between 1 and 2000 characters)

Through existing organisations. For EGI, this could be done through its coordination role to facilitate the knowledge exchange of best practices across the NGIs. Technical work can be carried out through working groups in standards

bodies such as OGF and policy matters through EGI policy groups, e-IRG, IPG (Infrastructure Policy Group), etc.

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. (optional) (between 1 and 2000 characters)

There are ongoing efforts within the standards organisations regarding standards development and interoperation (previously highlighted). EGI is specifically working on implementing virtualisation, first on a testbed, then eventual deployment on the production infrastructure. Current technologies being evaluated that are in use throughout the EGI community comprise: OpenNebula; StratusLab; VMware; Azure; Hyper-V; Platform ISF; Eucalyptus; OpenStack; and KVM. A variety of technical aspects are also being covered on the national level (also previously highlight) and in EU funded projects such as Venus-C (a cloud computing service for research and industry in Europe offering a service-oriented platform based on virtualisation technologies for a range of research fields to easy deploy their end-user services) and StratusLab (cloud technologies to simplify and optimise the use and operation of DCIs such as the EGI).

2 Beyond these, do you see technical problems/limitations of current cloud service offerings that will require further research in the coming years? (optional)

Yes

No

3 Please elaborate. (optional) (between 1 and 2000 characters)

From an EGI perspective, some of the technical issues that have been encountered and will encounter as it integrates cloud and virtualisation into the European production infrastructure are:

- Accounting (significant additional technical work for cloud metering services).
- Service provisioning
- VM contextualisation
- Application redesign may be needed to exploit full potential of the new cloud services.
- Data Access, Portability and Interoperability between clouds.

- Performance Management: Abstraction vs. Control (Virtualisation layer and beyond - e.g., network and storage).
- Security (e.g. Loss of ownership, control, availability, guarantees and 100% user responsibility, VM attacks & malicious hypervisor).

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

Yes	No
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5 Please elaborate. (optional) (between 1 and 2000 characters)

Yes, if it is meant to fund projects on cloud software development that provide software components no available on the market. Funding should be targeted at innovating current e-Infrastructures and not on creating new ones.

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. (optional) (between 1 and 2000 characters)

- Legal aspects: data privacy and protection, jurisdictions, rights and responsibilities; they are cross-cutting issues and need the involvement of the European Commission.
- Technical aspects: standards and best practices.
- Operational aspects: policies and procedures - in order to enable a federated usage of different cloud providers, operational processes need to be interoperable.

2 Which would be the right fora/approaches to tackle them?

Please expand. (optional) (between 1 and 2000 characters)

There is a need for strong support for standards bodies and workshops to tackle these issues.