

Cloud Computing as seen from CERN

A position paper for the Cloud Computing Expert Meeting "RESEARCH ROADMAPPING IN CLOUD COMPUTING" October 29-30, 2012, Brussels

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The previous expert group cloud paper (Advances in Clouds by CLOUD Computing Expert Working Group) stated that the cloud services market in Europe is characterised as follows:

"First of all it must thereby be noted that the European market is differently structured, with much more small(er) and diversified players, and a general focus towards B2B - the European telecommunication industry is a major exception to these cases though. This setup demands for much more work on integration, federation and interoperation to build up a European wide Cloud Ecosystem that incorporates and exploits this diversification for richer service provisioning."

This is confirmed by the initial findings of the Helix Nebula initiative which brings together a number of research organisations and commercial cloud service providers. The Helix Nebula initiative's strategy paper (<http://cdsweb.cern.ch/record/1374172/files/CERN-OPEN-2011-036.pdf>) proposes to establish a federated cloud service across Europe.

A key point is the development of the federated services necessary to provide orchestrated services across multiple suppliers. There are basic services available but these will need to be further development if they are to offer the range of services, quality and security and policy assurances needed for the future. The scientific research sector, with its extreme computing needs, can be used to kick-start such a market in Europe by providing exciting and ambitious use cases that can test such developments.

There is a barrier to adoption linked to passing the hurdle from prototype to production services linked to the business models. The cloud services suppliers see the potential benefit of such services but also fear the lack of opportunity to differentiate themselves and show added-value by operating behind such services. Hence they do not want to fund the development of these services unless they are assured of a clear return on investment in terms of business generated. The cloud services consumers also want the federated services because they will help make a more efficient market, reduce prices and provide independence from individual suppliers. Similarly the consumers are reluctant to pay for the development and maintenance of the services and prefer to focus their money on paying for the consumption of such services. There is also a reluctance to make a long-term commitment to purchasing services because the market is evolving so quickly.

We suggest that providing seed money via H2020 to ensure such federated services come to market would be a means of reducing the risk for the stakeholders and creating a vibrant cloud market in Europe. Such funding we see as being separate from R&D of the services which we consider to be a more upstream and speculative but equally necessary activity. This seed money could take the form similar to pre-procurement where by the cost of implementing and purchasing such services for the providers and consumers can be reduced for a limited period of time.

There are a growing number of open source cloud software stacks now appearing. A number of these projects, such as OpenStack, are attracting active participation from industry and academia. With significant commercial funding, these projects and related eco-systems are evolving rapidly to cover many of the requirements from the research sector.

Learning from the experiences of grid systems over the last decade, Europe's cloud research should be encouraged to contribute to such open source projects rather than developing new alternatives from scratch. This will ensure a wider impact of their work, a reduced development cycle and offer a better means of sustainability beyond the end of any specific development projects by allowing a large body of contributors to continue to support the software. The mainstream skills developed in these areas are highly attractive to European industry and will further encourage production cloud adoption.

The work of Helix Nebula and its recent architecture model (<http://cdsweb.cern.ch/record/1478364/files/HelixNebula-NOTE-2012-001.pdf>) has shown that it is technically feasible to allow publicly funded infrastructures, such as EGI and GEANT, to interoperate with commercial cloud services. Such hybrid systems are in the interest of the existing users of publicly funded infrastructures and government and diverse private users because they will provide “freedom of choice” over the source of resources to be consumed and the manner in which they can be obtained. This integration should be encouraged also because it will allow the public infrastructure users to progressively migrate applications between public and private resources depending on questions of policy and cost.

Initial investigations about the potential impact of cloud services in the research community suggest that the commercial public cloud services are likely to be most cost effective for the “long tail of science” conducted by researchers that do not have access to significant in-house computing resources and skills. Efforts must be made to simplify access to commercial cloud services for such groups that may not have extraordinary requirements and frequently do not have sufficient in-house IT expertise to manage and operate their own computing resources. Conversely, it will require further reduction in costs for large research users with important in-house computing capacity to find public commercial cloud services as financially attractive as is the case for small scale users. As one industry representative put it “*why would I hire a car on a daily basis if I know in advance I will to use it every day for 3 years – it will be cheaper to buy my own*”. There is evidence that commercial cloud suppliers may be willing to adapt their business models in order to attract large research users. Exploration of these innovative business models should be encouraged because the large research users can help Europe’s cloud suppliers produce next generation cloud services which would help put Europe in a leadership position.

Several key points have already been identified by Helix Nebula that need to be put in place for a federated cloud, including:

- A standard set of APIs for suppliers and consumers
- A federated identity management system
- A means of automatically converting virtual images between the varying popular formats

The report entitled “Quantitative Estimates of the Demand for Cloud Computing in Europe and the Likely Barriers to Up-take” from 13th July 2012 makes a number of recommendations. While we find all the recommendations sensible, two in particular are consistent with the position outlined above, notably:

“The European Commission should create the pre-conditions so that the principle of data access and portability between cloud vendors is widely accepted and the risk of lock-in of users in proprietary systems is prevented.”

“The European Commission should promote common standards and interoperability of public cloud systems, to maximise economies of scale across the EU and create the preconditions for portability between cloud vendors”

This last recommendation should be interpreted not only in a technical sense. We imagine a market of cloud service providers and a customer base that will have choice and not be artificially (technically) locked into individual providers. This will encourage innovation on behalf of the service providers and give the users, in our case the scientific communities, the ability to use state of the art services for their science. What we need to see are the frameworks, regulatory and legal that will enable this market to be created. Just as the telecom operators have become used to the concept of “churn” we should be able to avoid going through the same monopolistic practices that dogged the telecoms industry for many years, and implement, from the start, the frameworks that will allow the users choice and the ability to change providers. The federation of services is a vital technical component, but the EU must make regulatory frameworks that encourage the creation of the cloud services marketplace from the beginning.