A Pre-Commercial Procurement proposal submitted to H2020 call ICT 8a.

Abstract

Over the coming 10-15 years the generation of vast amounts of data created by scientific research domains will create enormous challenges for capturing, managing and processing of this data. Tests have been made but today commercial cloud services do not play a significant role in the production computing environments for the publicly funded research sector in Europe. Stimulated by the Pre-Commercial Procurement (PCP) commitment of leading research organisations from 7 countries, HNSciCloud will pull together commercial cloud service providers, publicly funded e-Infrastructures and the buyers' in-house resources to build a hybrid cloud platform on top of which a competitive marketplace of European cloud players can develop their own services for a wider range of users. This project will bring Europe's technical development, policy and procurement activities together to remove fragmentation and maximise exploitation. The alignment of commercial and public (regional, national, and European) strategies will increase the rate of innovation. Through a competitive series of design, prototype and pilot steps, HNSciCloud will contract suppliers to deliver a 5% scale deployment of a hybrid cloud platform that can address the extreme needs of world class scientific research, including:

- Catalog of secure and interoperable services from multiple suppliers that have successfully passed an internationally recognised certification process
- Agile procurement process suitable for the dynamic cloud services market and tailored to the needs of the public research sector
- Development of monitoring frameworks to ensure compliance with international security and interoperability standards, performance criteria and financial benchmarking against global market leaders.

The resulting common platform will be evaluated by end-users and exploited as the incubator for new businesses and scientific activities engaging a growing number of buyers, suppliers & users.

Consortium

Participant No	Participant acronym	Participant organisation full name	Country
1 (coordinator)	CERN	European Organization for Nuclear Research	IEIO*
2	INFN	Istituto Nazionale di Fisica Nucleare	IT
3	DESY	Deutsches Elektronen-Synchrotron	DE
4	CNRS	Centre National de la Recherche Scientifique	FR
5	TRUST-IT	Trust-IT Services Ltd.	UK
6	KIT	Karlsruher Insttitut für Technologie	DE
7	SURFsara	SURFsara	NL
8	STFC	Science and Technology Facilities Council	UK
9	EGI.eu	European Grid Infrastructure	NL
10	EMBL-EBI	European Molecular Biology Laboratory	IEIO*
11	IFAE	Institut de Física d'Altes Energies	ES

The project would start in January 2016 and run for 30 months. The requested EC funding of the proposal is approximately 4.7M euros.

Executive Summary

Over the coming 10-15 years the generation of vast amounts of data created by fundamental research domains together with a growing range of public services such as culture, tourism, education, health care as well as businesses and cross-border intergovernmental systems, will create significant challenges for capturing, managing and processing of this data.

Cloud computing has already proven it can deliver lower IT costs, reduce infrastructure complexity, enhance flexibility and deliver high-quality new services. As this technology advances into the mainstream, organizations are starting to recognize cloud computing can lower barriers to their innovation ambitions. The current market offers *on-demand* lease services to any user community and the possibility to scale them elastically and on short notice on a *pay-as-you-go* basis. Forrester Research forecasts that the global market for cloud computing services will soar from $40.7 billion in 2011 to more than $241 billion in 2020[1]. The European Commission documented and published a strategy "Unleashing the Potential of Cloud Computing in Europe"[2]. The document outlines actions to obtain a net gain of 2.5 million new jobs in Europe, and an annual boost of €160 billion to the European Union GDP (around 1%) by 2020.

The recent Cloud for Europe project[3] has shown that uptake of cloud services – in terms of demand and procurement of IT services - by European Public Administrations, is still very fragmented. The resulting lack of integrated markets in Europe is slowing down the development of European Cloud services industries and limits the rewards for taking investment risk in the necessary infrastructure. The main Cloud service providers are all US based and do not satisfy European and global users' demands, especially in terms of interoperability, applicable law, data portability, privacy and confidentiality[4]. If European cloud stakeholders can capture this unmet demand, they have the potential of becoming leaders in this global market.

The currently running Helix Nebula[5] initiative has already demonstrated the potential of a hybrid model in which service providers, research organisations, data providers and publicly funded e-infrastructures are brought together to support and transform publicly funded research into data driven knowledge which is of value to the wider research community and downstream industries. The stakeholders in that initiative have combined their efforts and resources which allowed a sub-set of the service providers to develop a first product called HNX[6] which is now being marketed to a range of business sectors. Helix Nebula is now fast becoming a central forum for the *supply-side* and the *demand-side* in Cloud services, where issues of common interest (such as procurement models, contractual frameworks, service platforms etc.) can be successfully addressed. Helix Nebula has made demonstrable progress in the deployment of flagship use cases, addressing interoperability challenges of publicly funded e-Infrastructures such as GÉANT[7] and EGI[8], as well as the definition of suitable business models. But despite these efforts, the lack of a production environment offering a comprehensive set of services is holding back actual innovation. This is mainly due to the lack of a single digital market[9] in Europe, which is slowing down the uptake of the cloud based services industries and therefore not fully exploiting the potential of these markets, as well as limiting the rewards for taking the risk to invest in the infrastructure.

With this Pre-Commercial Procurement project, the Helix Nebula Science Cloud (HNSciCloud) will take the next step in increasing the uptake of innovative smart cloud-based solutions by a wide range of public services. The HNSciCloud will pull together publicly funded e-Infrastructures using open source solutions, to build a hybrid Infrastructure as a Service (IaaS) platform on top of which a competitive marketplace of European cloud players can develop their own services for a wider range of users beyond research and science. This project will bring Europe's technical development, policy and procurement activities together to remove fragmentation and ensure the results of each activity are fully exploited. The close alignment of these industrial and public (regional, national, and European) strategies will thus increase the rate of innovation.

The HNSciCloud will deliver an extended but coherent set of services and tools, organised into layers, which must be available to meet the specific needs of each community and integrated via Open Standard interfaces. This common platform will also act as the incubator for new businesses and scientific activities. It is essential that European industry engages with the scientific community in building and providing such services as part of a hybrid cloud model, but it is also important that the user community has a strong voice in its governance. In short, the HNSciCloud should and will become a cornerstone of what the e-Infrastructure Reflection Group (e-IRG) in its 2012 Roadmap paper[10] refers to as the *single e-Infrastructure Commons*.

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[1] Forrester Research, Inc., Sizing the Cloud, April 2011
[2] European Commission Communication "Unleashing the Potential of Cloud Computing in Europe" - http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2012:0529:FIN:EN:PDF
[3] http://www.cloudforeurope.eu/downloads
[4] http://ec.europa.eu/information_society/activities/cloudcomputing/docs/quantitative_estimates.pdf
[5] http://www.helix-nebula.eu/
[6] http://hnx.helix-nebula.eu/
[7] http://www.geant.net/About/Pages/home.aspx
[8] http://www.egi.eu/
[9] http://ec.europa.eu/priorities/digital-single-market/index_en.htm
[10] http://e-irg.eu/documents/10920/12353/e-irg_roadmap_2012-final.pdf

A key challenge in setting up the HNSciCloud cloud platform is to ensure the performance, security and management aspects of a hybrid cloud infrastructure, including: procurement, technical standards and legal terms of reference, risk of lock-in etc. By combining and integrating private and public cloud infrastructures, organisations will be able to use the hybrid model to leverage in-house and off-site resources. The hybrid model allows organisations to:

- Rely on cost-effective public cloud for non-sensitive operations and on the private cloud for critical and sensitive operations. This will enhance the organisation's ability to easily move applications between in-house and off-site resources taking into account aspects of policy, cost, security and availability.
- Leverage the richness in the diversity of European suppliers and to match it with the expertise available in production e-Infrastructures. This will demonstrate the technical feasibility of interoperability between these players.
- Commit to offer an open, secure and trusted Cloud Computing Infrastructure for European science, businesses and society, and to allow European service providers to become market leaders in a highly competitive global market.

The HNSciCloud will bring together the stakeholders, Research Infrastructures and organisations, European e-Infrastructures *(GEANT, EGI, PRACE*[11]*, EUDAT*[12]*, OpenAIRE*[13]*),* with commercial cloud service providers *as well as the e*nd-users including the *long-tail of science,* to deliver a federated platform corresponding to a 5% scale implementation of an open science cloud for Europe. The activities will include:

- Design of a technical architecture for the hybrid cloud that can build on existing public and commercial developments;
- Agreement on a security model compatible with EU data protection legislation;
- Assembly and deployment of a 5% scale prototype;
- Verification of the business model to ensure the hybrid cloud is economically sustainable beyond the PCP phase;
- Set-up of an inclusive governance structure where all stakeholders are represented, thus avoiding a monopoly of any supplier or research group;
- Development of a roadmap for full-scale implementation.

[11] http://www.geant.net/About/Pages/home.aspx
[12] http://www.eudat.eu/
[13] https://www.openaire.eu/