EGI Pay-for-Use Proof of Concept
Report

Abstract:

The purpose of this document is to describe all information related to implementing pay-for-use mechanisms in to EGI resulting from the dedicated EGI Pay-for-Use Proof of Concept. The contents of this document will evolve as the activities progress with each iteration serving as a snapshot of activities until a final version is produced in December 2014 and included in the last EGI-InSPIRE Periodic Report.

Table of Contents:

1   Summary of Key Points and Actions

1.1   Current Results

- Processes in initial business scenario defined and implemented (basic ability to provide pricing, accounting and charging mechanisms)
- Tools adaptation
    - GOCDB extensions added to set pricing (e.g. compute, storage, VAT)
    - Accounting Portal extended for price information accounting
    - Links with e-GRANT for federated resource allocation
- Providers: 26 Sites publishing pricing information (19 Grid, 7 Cloud) - 21 Organizations across 12 Countries
- Legal and Policy solutions emerging e.g. research-only purpose statements; Joint Development Projects
- Initial Business Cases being explored
    - Helix Nebula, European Space Agency, Cloud for Europe

1.2   Future

- Explore the role of EGI.eu as financial broker
- Develop richer pricing schemes and service packages
- Expand business cases
- Analyse individual Resource Centre feedback on policy and legal issues and solutions
- Run a test with select user group, provide usage report, produce invoice (virtual bill)
- Try out campaign
- Produce Final Report

2   Introduction

2.1   Motivation

EGI currently operates within a publicly funded research and academic environment providing services free at point of delivery with resources bought from grants dedicated to certain groups or disciplines either by direct allocation or by peer review. With the advent of cloud computing, business models and user expectations are shifting towards on-demand and pay-per-use service provision increasing flexibility and agility. This new paradigm provides motivation for EGI to explore new service definitions by enabling the possibility to provide ICT services that can be paid for the use, along with the more traditional procurement of resources to be managed and offered for free to the owners.

This approach also allows researchers and resource providers to better understand costs to access individual services and would enable the creation of innovative business models and pricing schemes (e.g. pay-per-use) and adds potential revenue stream capabilities to EGI for increasing sustainability,

2.2   Mandate

In early 2013, the EGI Council approved a policy to explore business models for pay-for-use service delivery to couple together with the traditional method of free-at-point-of-use. The goal of this activity is to support the implementation of this policy in collaboration with NGIs through the definition and execution of proof of concepts. The mandate of the group is to create a proof of concept pay-for-use prototype.

2.3　Objectives

The objectives are the group are to:

1. Articulate appropriate business and responsibility models through defined business cases
2. Define prices for services from the participating sites (both compute and storage)
3. Define agreements and service management processes and procedures
4. Identify the tools required and necessary development to facilitate pay-for-use service provisioning (e.g. billing function)
5. Analyse the changes within a pre-production environment that would be needed to support and roll out the new functionalities in the production environment
6. Evaluate legal, policy, and organisational issues around the full implementation of the pay-for-use model
7. Submit a report covering the overall activities and final output as part of the final EGI-InSPIRE periodic report.

This activity is closely linked to TNA5.1 Strategy, Policy and Business Development; SA5.2: Federated Cloud; and JRA2.2 Accounting.

3　Approach

3.1　Activity Planning

Activities were split in 2 main phases:
- Phase 1 (Jan-June 2014): Set up and implement minimum/basic requirements/functionality to present progress at the EC review and obtain feedback
- Phase 2 (July-Oct 2014): Expand with pricing schemes and service packages, increase automated functionality and integrate EC review recommendations
- Report (Nov-Dec 2014): Publish a stand alone, easy to read report published and officially include as part of EGI-InSPIRE Final Periodic Report

3.2　Methodology

1. Identify business cases to be solved through the development of "User Stories" from the base ability to charge for services to the addition of automated processes, pricing schemes and service packages.
2. Use real-world use cases to answer specific questions.

4　Roles and Functions

Within a pay-for-use business model, it is important to distinguish between who is consuming the service, who is paying for the service and who is providing the service. Upon clarifying these definitions then the required relationship and supporting services can be defined.

A 'consumer' is the person actually using the service (user). A 'customer' is the person or entity that negotiates the level of services and commissions the service provider or broker and may pay, doing so on behalf of a number of consumers (users). Although these two actors need to be treated the same from an IT service point a view, it is important to distinguish these two roles. A 'service provider' is an organisation supplying services to one or more consumers. In our scenario, we distinguish two main types of service providers: a 'resource provider' that is an organisation offering access to ICT resources through service abstractions (e.g., computing power, storage) and a 'broker' that is an organisation

facilitating or arranging transactions and agreements between a customer and one or more resource providers.

As EGI operates in a distributed environment, services are provided by a variety of different organisations spread across Europe and beyond. Within this environment, EGI.eu is playing the role of a 'federator', providing the necessary technology, processes and governance to enable users to access an integrated set of services from autonomous organisations. The NGIs play a similar role on a national level.

5   Value Proposition

One of the most important aspects when looking at adding pay-for-use mechanisms is to understand the value proposition and determine the differentiating factors from current market solutions. It is clear that there are a number of commercial cloud offerings available such as Amazon Web Services. In fact, the goal of EGI pay-for-use is not to be a replica of current solutions and in direct competition. However, in order to do so, it is essential to outline the value provided.

1.   Research activities only; pre-commercial applications
2.   Dedicated consultancy (e.g. application porting) and high-levels of support
3.   Competitive pricing

The vast number of Resource Centres has years of experience in supporting researchers to run distributed computing applications and a mandate to do so. Whether or not individual prices are higher or lower, by coupling tailored research support and consultancy with the access to high-quality IT resources through flexible open-source interfaces, EGI can easily differentiate itself and demonstrate the value for researchers who receive funds to purchase services.

Access to high quality IT resources with tailored research support and consultancy to accelerate scientific results.

6   NGI and Resource Centre Participants

6.1   Motivation and Feedback

One the main activities of the Pay-for-Use Proof of Concept is to evaluate legal, policy, and organisational issues around the full implementation of the pay-for-use model. As initial input, each provider described the following:

- What is the motivation for participating?
- What are the main issues you see for your own country and institution?
- How are you trying to solve these issues?
- What is the best case scenario for you beyond the Proof of Concept?

6.1.1   Albert Einstein Center, Univ. of Bern

The Albert Einstein Center for Fundamental Physics (AEC) has been founded in 2011. Its aim is to foster high-level research and teaching in fundamental physics at the University of Bern. The main focus is on experimental and theoretical particle physics and its applications (e.g. medical physics), as well as on the related spinoff and outreach activities.

The motivation for participating is to investigate the possibility of easily getting reimbursed by research partners or research projects we would like to support with usage of our resources and the possibility of alternative hardware financing.

One issues is that resources are dedicated due to research grant funding or allocations subject to scientific review models not foreseeing payment and there are currently no customers able to pay for usage of resources.

One mechanism to solve this issue is to establish experience and facts by offering moderate AEC resources as pay for usage, i.e. participate in this project.

The best case scenario by the end of the PoC would be a broker (EGI.eu) bringing customers interested in paying for using our resources in contact with us. The interest is based on information from GOCDB and other sources the broker has available.

6.1.2   Bulgaria NGI

The Institute of Information and Communication Technologies of Bulgarian Academy of Sciences (IICT-BAS), who lead the Bulgarian NGI, is oriented towards development, deployment and support of advanced scientific applications that run efficiently on high performance computing resources. Those applications that require medium-size clusters run on our own resources or on the EGI Grid and Cloud resources.

One of the IICT-BAS priorities is the improvement of existing research infrastructure by upgrading the systems for high-performance and distributed computations and the development of "smart" peripherals to them. Our main investments are in heterogeneous systems using accelerators like GPUs or Xeon Phi, interconnected with Infiniband, which are expensive for acquisition and maintain.

This is why we have interests in participating in the EGI Pay-for-Use activity. As a result, we obtain new knowledge and abilities for efficient and sustainable utilization of our computer and storage resources.

Due to the energy efficiency requirements we acquire systems with high density of computational and storage resources, e.g., servers with 8 GPU cards, servers with 8 Xeon Phi cards, storage systems with large HDD. We invest in the training of researchers and Ph.D. students to use and operate these systems effectively. The aim is to use the Cloud as a means to distribute resources among their users in efficient way. By involving these resources in the EGI infrastructure we aim to increase the peak capacity that is subjectively available to the Bulgarian researchers, when they need to accomplish high amount of computations in short time period.

IICT-BAS is a non-profit organization. The national regulations hinder the direct payment for computing time. We are interested in the correct and objective measurement of used resources that should enable the sharing and exchange of resources with other centres, which would enable researchers from our institute and from Bulgaria to use efficiently resources in other countries when necessary.

6.1.3   CESGA-IBERGRID

The CESGA-IBERGRID site offers Grid services for some communities in the Ibergrid context, including Computational Chemistry and Argos. These communities are supported by universities and the government branches, which in a regional basis consign some of their budget to support our HPC services.

CESGA also virtualized many of its internal and local services, and developed important technical competences. This was realized, for example, in the software verification testbed for EGI.eu that supports the reliable and repeatable testing of the middleware and utilities. This testbed is part of a contract with EGI.eu, so it is another example of a specialized pay-for-use scenario.

In that spirit, our participation is included on an interest to enter collaborations with scientific or business ventures that are mutually beneficial.

We have a cloud capabilities in the order of ~320 cores with 16GB of memory, so we can support many use cases, but perhaps not some very specialized ones.

Our best case scenario would be to have new long lasting relationships with users of our computing capabilities and technical expertise.

6.1.4 IFCA-IBERGRID

We want to support research and innovation with SME research teams and other companies. We have top of line infrastructure that can be very useful, but overall excellent IT experts that can help to develop new results.

The main issue is the lack of a culture for collaboration with industry within our basic research context and the administrative and legal issues that we may find. Support personnel are very hard to keep given the salaries we can pay, so we have a high risk that they could move to industry. But that possibility can be also considered a social benefit.

We have full support for the academic authorities, and a strong position at national and international level, which makes us credible. Our experience starts to get us in a more comfortable position.

We are already offering pay-for-use services and would very much like to be able to participate in larger initiatives within Europe with the help of EGI.

6.1.5 Institute of Informatics of the Slovak Academy of Sciences (II SAS)

The main motivation of IISAS in participating on pay-for-use proof of concept taskforce is to strengthen collaboration with industry in the cloud computing areas. We are strongly interested in provide services and supports for applications from all areas, partly for dissemination and exploitation of our work in cloud computing area and partly for getting additional funds for further research and developments. Collaboration with industry is especially attractive from both perspectives and is considered at strong complement to (national, European) research grants. The taskforce would help us to make clear legal and technical framework for providing services and also popularize our services to larger extend.

There are some minor issues: some parts of resources are funded by national grants and could not be the subject of charge for use directly. That could be solved by providing complex solutions with value-added services and supports for customers or establishing joint-research projects. If this solution is not possible for some customers, we are able to transfer requests from these customers to the part of resources where we can charge.

The best scenarios could be providing platform/software as a service. By that we can distinguish our services from already crowded IaaS service market and provide clearly value-added services for customers beside the hardware.

6.1.6 Latvian Grid

Our mission in participating in the pay-for-use proof of concept is based on the belief that grid computing should always be available to our scientists even in times when there is no huge immediate demand for it. The Pay-for-Use PoC seemed like an interesting activity to participate and to look into this idea.

The main issue currently is the lack of strong demand for grid resources from our local scientific group. Therefore, it could prove to be quite hard to implement pay-for-use mechanisms. However, this can be solved by trying to attract more scientists by showing them what could be done using grid resources and how it can benefit their research.

We would be glad to always offer computing resources for scientists free of charge. If someday it won't be possible anymore then pay-for-use could prove to be viable solution for continuing to provide it and we would therefore like to be ready.

6.1.7 MASTER-UP Srl.

MASTER-UP is a University spin-off (Italy) dealing with advanced computer science activities aimed at designing products and services for technological innovation. These services are mainly linked to

molecular modelling simulations and computing calculations thanks to in-house experts, technologies (software and computing resources) and connections with other SMEs as well as research centres.

Within the activities of MASTER-UP there is also the building of innovative solutions in molecular and materials research, education and technology training and definition of proper communication strategies aimed at attracting more users into a common endeavour offering the possibility of assembling higher level of complexity applications and services.

As service provider, MASTER-UP is providing technical consultancy for HW and SW purchasing, web services development, education and training courses and editorial work.

MASTER-UP is also supporting research and innovation in the field of Grid computing and participating to this PoC is an opportunity to collaborate with other SMEs and institutions and be part of large computing initiatives across Europe.

One of the main issues is to attract new users and user communities and for such reason a proper point-of-contact with the final users is needed in order to address their requirements.

6.1.8   NGI_GRNET

The Greek Research and Technology Network (GRNET) is leading the Greek NGI and with the cooperation of our partners/stakeholders striving to provide added value services to a plethora of user communities. As GRNET is the national research and educational network we have the task to support all Greek users communities irrespective of their size. Since 2003, GRNET, through the Hellasgrid project and extra resources offered by individual Greek universities, has set the seed in order to create a cooperative infrastructure in order to assist research. GRNET is currently planning to double the capacity of the Infrastructure-as-a-Service "~Okeanos" (IaaS). It has been operating since 2010 via large data centres (22 racks, 400+ servers, 8500 Virtual Machines active, 4 Petabytes of storage), and is involved in a number of core pan-European cloud projects such as StratusLab, CELAR, etc. Our interest in the pay-per-use proof of concept is to investigate the possible scenarios that may help reduce our operating cost or enhance/evolve the shared resources paradigm via a token exchange system. As GRNET is a non-for-profit organisation we are quite limited on the type of invoices we can issue thus through this task force we expect to exchange know-how and discuss concepts and business scenarios that will help us elevate possible legal barriers.

6.1.9   NGI-IT

The Italian NGI is interested in offering the resources available in our new cloud infrastructure following the Pay-For-Use model with no major issues at the moment. The most important factor will be having a clear recipe to sell our cloud services (both computing and storage) by the end of the PoC.

6.1.10   100 Percent IT

As an SME Resource Provider, participating the in the EGI pay-for-use proof of concept allows 100 Percent IT to collaborate on the development of sustainable business models that are both suitable for, and easy to understand by the range of publicly funded research and academic groups who act as consumers while also being commercially viable. Development of a consistent Service Level Agreement will allow consumers to more easily compare the offerings from multiple suppliers. This in turn has the potential to increase the size of the marketplace by making it easier for consumers to purchase from European suppliers.

As a commercial supplier, we are comfortable with the concept of pay-for-use as it has been widely accepted by commercial customers and is now seen by them as the preferred billing model. This change has not occurred to the same extent in publicly funded research groups. We have seen issues around taxation when working with public groups that cross international borders and have also seen that some consumers currently have organisational difficulty paying for resources on a per-hour basis as opposed

to paying a fixed capital cost for a resource. Developing best practices in the pay-for-use models and encouraging them to be widely used by providers and consumers will help to highlight any potential issues and allow them to be avoided. Increasing uptake of pay-per-use as a way of obtaining infrastructure will also streamline organisational payment mechanisms.

The best case scenario beyond the end of the proof of concept is the creation of a lasting competitive marketplace with academic consumers easily able to access resources elastically to meet their changing needs.

6.1.11 TUBITAK ULAKBIM

TRUBA (Turkish Science e-Infrastructure) is operated and coordinated by TUBITAK ULAKBIM since 2003. It is one of the two high-performance computing centres in Turkey, which is supported by the Ministry of Development. The ministry expects not only leveraging the research but also significant income or national financial benefit from these two centres. Although the Ministry of Development is providing the hardware budget, personnel support is provided by TUBITAK.

TRUBA resources are committed to the national research communities except collaborated projects. Due to the researchers or projects that would like to have privileged or dedicated services, TUBITAK ULAKBIM is performing public pay-per-use method for national projects since 2011.

Although the grid infrastructure of NGI_TR with all regional core services will be supported by TUBITAK ULAKBIM in the next years, operational expenses will not be supported by EC funding. The main motivation of TUBITAK ULAKBIM is providing minimum operational expenses at least by this approach for a sustainable infrastructure.

TUBITAK ULAKBIM is already using per-pay-use methods for national research projects with the model that includes operational, power, cooling and space costs. According to the literature cost model of a data centre must capture the following salient points:

- Cost of space
- Recurring cost of power
- Maintenance, amortization of power delivery, conditioning and generation
- Power required by the cooling resources
- Maintenance and amortization of the cooling resources
- Utilization of critical space

The major drawback is not being able to put every factor in a calculation model due to legal reasons. This can cause problems of commercial competition if any company intends to give similar services in the position of TUBITAK ULAKBIM for public use. In addition to that, VAT is the main problem of pay-per-use in international scene for TUBITAK ULAKBIM.

As a proof of concept, TUBITAK ULAKBIM has signed 15 national contracts with the value of 265.000 Euro with their cost model, which is also used for pay-per-use cost calculation method.

6.1.12 German NGI (LRZ; Fraunhofer SCAI)

Achieving sustainability becomes ever more important, not only in European projects and their follow-up organizations but it is also an important topic for every innovative computing centre that wants to offer modern, additional services to its customers. It is clear that grants are not a viable, long-term means to ensure sustainability. Commercial Cloud providers like Amazon showed by example that a pay-for-use model can support sustainability.

LRZ would like to learn how to successfully implement such a model, which pitfalls exist, and how to avoid them. Such knowledge will prove valuable also outside EGI. Most of the stumbling blocks are likely of a legal nature, as pay-for-use is not (yet) common practice for neither German customers nor service

providers: resources get funded for a specific purpose and their usage time can't be sold. Taxation issues, especially in a multi-national environment, are another source of difficulties.

Fraunhofer SCAI works on computer simulations for product process development in industry and research and provides IT solutions for both. Fraunhofer SCAI is heavily interested in pay-for-use models for Cloud services as a provider and user. One of the missions of SCAI is supporting SMEs and the transition from research results to products, as a cloud service in trusted environments is an important objective today. The participation in the EGI pay-for-use offers an opportunity to work with both SMEs and research where the complex questions of legal aspects are not excluded. Moreover, pay-for-use delivers highly interesting and useful reports and documentation reflecting the experience and knowledge from renowned institutions and companies.

Through participation in the EGI pay-for-use task we can exchange solution strategies with other participants and gain valuable knowledge of obstacles and solutions in other counties. The best case scenario is to have a workable solution that enables us to perform pay-for-use services.

6.1.13 Lithuania NGI

The main motivation for participating is two-fold: resource providers the possibility to sell resources that are not occupied; and for customers (scientists) to use programs for research that is necessary only for some very specific problem resolved (once per carrier) or train research program to know which of them must be bought for own using of NGI community. Indirect benefits include new knowledge and integration of some common services.

The main issues are around bureaucracy and taxation issues, the difference in the legal systems in multi-national environments. To solve these issues, it will be essential to communicate with the scientists, politicians, businessmen and education of new a generation.