

**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.

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# Summary of Key Points and Actions

## 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

## 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

# Introduction

## 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,

## 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.

## 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.

# Approach

## 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

## 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.

# 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.

# 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.***

# NGI and Resource Centre Participants

## 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?

### 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.

### 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.

### 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.

### 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.

### 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.

### 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.

### 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.

### 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.

### 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.

### 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.

### 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.

### 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.

### 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.

## Services and Prices

The following table provides an overview of the technical details of the resource and technology providers for the PoC.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| NGI/RC | Service Type | Services and Resources | Preferred Payment Direct/Indirect | Grid Compute Price[HEPSPEC06/hr.] | Cloud Compute Price[Wallclock/hr.] | Storage Price[€/GB/Month] | VAT[%] |
| Albert Einstein Center, Univ. of Bern | Batch via CENTOS 5/6 ARC CE | * 500 cores (approx. 2 months in 2013) on highest priority;
* Consumption preferably in one go, but distributed in time also possible
* 10-20 TB disk on local SE for consumption period via DPM SRM interface plus two weeks
 | Both | €0.03/hr. | N/A | Free for PoC Other TBD | 8% |
| NGI\_BG | Batch & Grid: EMI-2/EMI-3 Cloud: OpenStack - FedCloud | * 16 NVIDIA Tesla M2090 6 GB + 48 core Intel Xeon E5679 @ 2.53GHz with 4 GB of RAM per core
* 576 cores Intel Xeon X5560 @ 2.8GHz with 1.5 GB of RAM per core
* 200 cores Intel Xeon E5430 @ 2.66GHz with 2 GB of RAM per core
* MPI jobs
* Non-blocking Infiniband interconnect
* 140 TB of storage provisioned through Lustre FS (/home and /scratch systems), EMI dCache, EMI DPM, OpenStack Swift and OpenStack Cinder
 | Both | * €1.00/GPU/hr. + VAT (GPU-enabled servers)
* €0.07/core/hr. + VAT (CPU only Intel Xeon X5560-based cluster)
* €0.05/core/hr. + VAT (CPU only Intel Xeon E5430-based cluster)
 | N/A | TBD | 20% |
| CESGA-IBERGRID | Batch + Cloud | * 720 cores (Batch) AMD Opteron(tm) Processor 6174 2.2Ghz
* 240 cores (Cloud) Intel(R) Xeon(R) CPU E5520 2.27GHz
* MPI jobs
* RAM from 1GB to 32GB per core
 | Direct | €0.02/core/HEPSPEC06 hr. | €0.04/core+2GB RAM/hour (+VAT) Example:* small: 1 core & 2GB €0.04/hour
* medium: 2 cores & 4GB €0.08/hour
* large: 4 cores & 8GB €0.16/hour
 | €0.055/GB/month (+VAT) | 21% |
| IFCA-IBERGRID | Batch (SLURM, SGE) + Cloud | * Batch via CREAM CE
* Cloud via OpenStack
* Up to 2500 cores in servers with 4, 8, 16, 40 physical cores
* Infiniband access to other nodes and storage possible for MPI jobs
* RAM from 4GB to 256GB per core (max 1TB)
 | Both, Direct preferred | * €0.05/core/hr. for usual instances, <0.01/core/HS06 hour (+ VAT)
* €0.04/core/hr. for multicore use (>128 cores)
 | €0.03 | Minimal storage free, requests up to 100 TB high performance storage possible | 21% |
| Institute of Informatics of the Slovak Academy of Sciences (II SAS) | Cloud (OpenStack) | * 120 cores (Cloud) Intel(R) Xeon(R) CPU E5570 2.93GHz
* 1, 2, 4, 8 cores VMs
* RAM up to 4GB per core
 | Both | N/A | ﻿€0.06/core/h +VAT | TBD | 20% |
| Latvian Grid | Cloud: OpenStack, GRID: ARC + SLURM | * CPU: Up to 256 cores, RAM up to 4GB per core
 | TBC | €0.07/core/hr. + VAT | N/A | TBD | 21% |
| MASTER-UP Srl | EMI1/2, CEs, WNs, SE | * EMI1 middleware (phasing to EMI2) - CE's, WN's and SE.
* 10 nodes to start (Intel 4core, Ethernet connection)
* Long experience in Molecular Science and Comp Chem, can provide support for such innovative applications and in the field of R&D for combustion, energy and material science.
* Managing a computer farm of 200 cores and 4TB of storage part of those resources are supporting EGI.
 | Direct | €0.05/hr. + VAT | N/A | TBD | 22% |
| NGI\_GRNET | Cloud and Grid | * TBC
 | TBC | €0.05/hr. + VAT | €0.05 + VAT | TBD | 23% |
| NGI-IT | EMI, OpenStack | * gLite MW stack: Cream CE, LFC, Storm SE, WMS+LB, BDII.
* Cloud: OpenStack
 | TBD | €0.07/hr. + VAT | €0.05 + VAT | TBD | 22% |
| 100 Percent IT | Cloud (OpenStack) | * Intel Xeon X5670 @ 2.93GHz
* Cloud via OpenStack
 | Both | N/A | €0.07 + VAT | TBD | 20% |
| PL-Grid | Cloud + Batch via Cream / EMI | * Computing power, storage, and human support
* Batch processing via Cream CE/EMI
* Cloud access
* Non-grid, local access to queue system
 | Both | €0.03 + VAT | €0.04 + VAT | TBD | 23% |
| TUBITAK ULAKBIM | Cloud + Batch | * Batch processing via Cream CE
* VM Management using OpenNebula/OCCI
* Infiniband connected Linux computing resources
 | Both | €0.15/hr. 8 core 24 GB instance | TBC | TBD | 18% |
| UIIP NASB | Cloud + Batch | * Batch processing via UNICORE or Cream CE
* Intel Xeon E5472 (3,0 GHz, 4 Cores) 50 nodes / 100 physical CPUs
* 400 virtual CPUs
* 400 Gb memory
* 8TB Disk storage – 9-12TB Storage servers
* Infiniband DDR 20Gbit/sec]
 | Indirect | $0.077/hr. (TBD) 1 Core | N/A | TBD | 20% |
| Fraunhofer SCAI | Cloud (OpenStack) + Grid (gLite) | Cloud:* Intel Xeon X5570 @ 2.93GHz
* Non-blocking QDR Infiniband interconnect (40GBps)

Grid:* AMD Opteron
* DDR Infiniband
 | TBC | €0.02/hr. | TBC | TBD | 19% |

### Price Summary

Publishing Pricing Information

* 21 Organizations across 12 Countries
* 19 Grid Sites (CPU)
	+ Belarus; Bulgaria; Germany; Greece; Italy; Latvia; Poland; Spain; Switzerland; Turkey
* 7 Cloud Sites
	+ Greece; Italy; Poland; Slovakia; Spain; UK (Turkey to be added)

Price Ranges (incl. support)

* Grid (HEPSPEC/hr.): €0.01-€0.07 (Avg. €0.04; Median €0.05)
* Cloud (Wallclock/hr.): €0.03-€0.07 (Avg. €0.05; Median €0.05)
* +/- VAT 8%-23% (where applicable)
* Storage in progress: €/GB/month

# Business Scenarios

The following processes were defined to understand the basic workflow that pay-for-use options present in order to understand what information, tools and management processes would need to be put in place.

1. Each **provider** is able to specify the price for each of the services on a central tool
2. The **customer** is able to search for all the providers that support pay-for-use services
3. The **customer** decides from which provider to buy services and submits a request
4. The **customer** agrees and signs an SLA
5. The **broker** creates a VO for the contract
6. Each **provider** allocates the contracted capacity to the VO and attaches the associated price to the “user” or “user group” for consumption and provides certificate information
7. The **customer** adds all the users that should be enabled to consume resources for the contract through the VOMS interface
8. The **consumer** uses the services and receives a monthly usage report. However, users will have access to the accounting portal for their VO (updated once a day).
9. The **customer** receives an invoice and pays directly the service provider(s)



Future work will be on describing a more integrated Broker role. See section 10.2.

# Tools

## Accounting

### GOCDB

GOCDB is the EGI service that stores semi-static information about sites and services. Among other things, it is a configuration database that other tools can use to gather information about sites and services.

In order to gather the prices that sites were charging, a new feature in GOCDB V5 was used. This is called ‘extensions’. Any number of arbitrary key-value pairs can be added to a site or service. GOCDB has a subsidiarity access control model where control of the database is devolved to the appropriate level. For sites, this is the set of sys admins defined within the GOCDB. So, charging rates are a ‘folksonomy’ bottom up definition by consenting sites. No central control, just an agreement within the pilot. The sites define their charging rates and other tools like the accounting portal (below) can pull the information and apply it.

An initial set of keys was defined. Once proven in the pilot, the set can be extended indefinitely to cover a richer set of charging/pricing schemes. The only limitation is that what one is charging for must be recorded or measured and publishing in the accounting.

The values are real numbers with the meaning shown below. Sites defining these keys and values are de facto members of the pilot.

|  |  |  |
| --- | --- | --- |
| Type | Key | Semantics |
| Grid | **P4U\_Pilot\_Grid\_CPU** | **Euros/HEPSPEC06 Hour** |
| Cloud | **P4U\_Pilot\_Cloud\_Wall** | **Euros/Wallclock Hour** |
| Storage | **P4U\_Pilot\_Storage\_Use** | **Euros/GB\*month** |
| VAT | **P4U\_Pilot\_VAT** | **Optional VAT rate to be applied to above** |



### Accounting Portal

The Accounting Portal is the central tool to visualize the computation time and jobs that are run in the infrastructure, their site, VO, date, efficiency, etc. The portal has many specialized views and reports. For the pay-for-use activity, the general, cloud and restricted user data views where supplemented with a new Computation Cost metric. This metric estimates the cost incurred in computations.

In order to do these computations, the Portal needs to know the price in euros for normalized HEPSPEC06 hour (for Grid jobs) or euros per Wall clock hour (for Cloud jobs) for each site, and the current applicable VAT. These data are pulled from the GOCDB extension data for each site in the PoC. With this, the portal can convert normalized or wall hours to estimated prices in euros. Sites can also formulate special prices for individual users.



## e-GRANT

e-GRANT is a service that simplifies managing capacities for providers and enables negotiation of SLAs both for customers and providers. Currently, in EGI, e-GRANT is used for brokering offers from NGIs and sites in order to compose satisfactory allocation (element of customer SLA) based on the customer request and available resources. Offers from providers, called resource pools, are collected and managed. Each pool description contains the offered capacity, common technical specification of resources, model of allocation, levels of guarantee and customer acceptance policies. From the customers perspective e-GRANT is a single point of contact for allocation of resources.

Introducing pay-per-use in the process of resource allocation means essentially adding a price tag to the negotiated allocation contract (SLA). Several models of billing might be possible, including pay-as-you-go and fixed amount for contract. In both cases, e-GRANT can be a helpful tool to integrate it.

Below we discuss how specific activities in pay-per-use process (from Section 7.1) can be realised with support of e-GRANT.

1. Each provider is able to specify the price for each of the services on a central tool

Currently, the prices for resources are stored in GOCDB, as the current model considers fixed, publically known price for a computing unit or storage space. In case the model was extended to consider e.g. special offers for customers that qualify for them or prices that are subject to individual negotiation, those special options would be stored in e-GRANT as extension for a resource pool description. Default pricing can be still taken from GOCDB using already existing interfaces.

1. The customer is able to search for all the providers that support pay-for-use services

In the current version of e-GRANT, browsing through providers offers (resources pools) are reserved to the broker role. In addition to this, the broker has the functionality to automatically match the request (set of requirements for resources) with an available pool.

To implement this step in e-GRANT, the above-mentioned functionalities should be made available for customer or even publically. This might be done with little effort, as the functionality required already exists.

1. The customer decides from which provider to buy services and submits a request

Submitting a request for resources is already developed in e-GRANT. This feature is available with full configuration of a required and optional fields, so adding the elements related to pay-for-use is a matter of configuration of the service. Enabling to customers the existing broker functionality of matching and choosing pools would make this step handled fully in e-GRANT.

1. The customer agrees and signs an SLA

Negotiating and agreeing on resources involving all three stakeholders (Customer, Broker, Provider) is a core of e-GRANT functionality. Negotiation would include support parts related to price of a service. Electronic way of signing SLA between relevant sides is also implemented. The whole process is supported by relevant e-mail notifications.

1. The consumer uses the services and receives a monthly usage report. However, users will have access to the accounting portal for their VO (updated once a day).

Currently, SLA reporting is not implemented, as there was an assumption that customer can use EGI Accounting Portal for this. If needed, regular accounting reports can be generated based on accounting services. It might make sense for presenting in the e-GRANT, as it would remain single point of contact for customers for matters related to SLAs.

1. The customer receives an invoice and pays directly the service provider(s)

The advantage of integrating invoicing with e-GRANT is that SLA may contain information about valid final price. For example, SLA can have data on active allocation period or level of guaranties or fixed/special price for contract. Additionally, pricing scheme needs to be implemented in e-GRANT to give at least estimate of the price for customer before SLA is signed. Generated e-invoices can be available in e-GRANT together with all other documents related to SLA.

## Development

One of the main evolutions foreseen in the near future regarding EGI tools is the introduction of a new user-oriented tool, the EGI User Portal. This portal will become the main entry point to the EGI infrastructure for new and experienced users. Having this unique entry point will make it easier for the users to exploit the EGI infrastructure capabilities and, furthermore, will give new potential users a clear and complete picture of the services offered and of the procedures to access these services.

A first analysis has been already completed to understand what kind of features should be exposed by the portal and how to integrate it inside the EGI tool ecosystem.

As an output of this analysis, we identified the main actors involved and the user stories capturing what a user does or needs to do as part of his/her function.

The roles identified are:

* User: Individual that primarily benefits from and uses a service
	+ Needs to access large-scale data processing services for its own research
	+ Needs to access large-scale data processing services for a small group of researchers
* Customer: The organisation or part of an organisation that negotiates the level of services and commissions the service provider, doing so on behalf of a number of users
* VO Manager: The person that is responsible for managing the memberships into the virtual organisation that he/she is responsible for
* Service Provider: Organisation or federation or part of an organisation or federation    that manages and delivers a service or services to customer

Furthermore, starting from the user story list identified, we extracted those relevant for the Pay-for-Use PoC:

* As a customer, I want a list of available services within EGI and related detailed information (e.g., pricing model free vs. paid, how to access, etc.)
	+ How is the list of services differentiated
* As a customer, I want to request authorisation to access one or more services
	+ Describe what is the purpose
	+ Describe the capacity (if it applies; each service to have its own metrics for capacity allocation)
* As a customer, I want to manage my service access requests
* As a customer, I want to list all the users enabled to use my allocations
* As a customer, I want to check the usage information for each authorised service (possibly with details per user)
* As a user, I want to check personal usage information for each authorised service
* As a customer/user, I want to list/search the available applications (e.g., backend integrated with AppDB)
* As a customer/user, I want to list/search the virtual appliances (e.g., backend integrated with AppDB)
* As a customer, I want to contact the service provider
	+ Will be connected to who provides the SLA
* As a service provider, I want to apply for offering my resources to EGI
* As a service provider, I want to list how my resources are visible to EGI users

One possible approach to implement the EGI User Portal we are taking into consideration is to retrieve the information from the current EGI tools to provide users with a unique interface. Each tool that provides functionalities to the portal should expose an API and a common authentication mechanism; the portal would interact with the various tools and retrieve the data and present as a mash-up using a uniform interface.

The future development roadmap of the EGI tools will be defined taking in account this new service that will be introduced in the tool ecosystem. The user stories listed above highlight the need to introduce new features, currently not provided by any tool, as a:

* Service catalogue: listing all the services provided by EGI with associate information about the pricing;
* Marketplace: implementing the business model(s) adopted;
* Billing module: creating invoices according to the usage information collected by the EGI accounting system.

Some of these new features will be provided by the User Portal, instead some other will be implement as extension of the current tools.

This analysis will be completed associating each features identified from the user stories to a specific tool and, so, defining the development roadmap for each tool including the new interfaces that should be implemented. Final output of this analysis will be the new complete EGI tool ecosystem that will be implement in the future EGI projects.

# IT Service Management

## FitSM Standard

The FedSM project[[1]](#footnote-1) was set up to help introduce professional IT service management (ITSM) in Federated e-Infrastructures by adapting existing standards and best practices to fit the special situations and circumstances experienced by EGI and other e-Infrastructures. This approach is based on the international standard, ISO/IEC 20,000 and takes input from other approaches such as the ITIL best practice framework and COBIT governance framework.

From this background, the FedSM project created "FitSM", a standards family offering the basic requirements for a managed IT service as well as concrete support for implementation including documents, templates and management tools. FitSM supports both federated models and other situations where ITSM is not well established and existing approaches are too heavyweight or make invalid assumptions. This standard was co-developed with e-Infrastructure organisations, including EGI.eu, and is being adopted by a wide range of organisation in the e-Infrastructure sector.

FedSM also includes consultancy for project partners, including EGI.eu and two NGIs that are part of the EGI community. It provides active support to help EGI.eu support transit of the EGI community from a research mode to a service delivery model based on a clear idea of customer needs and value delivered, and so supported EGI sustainability efforts.

The EGI Pay-for-Use Proof of Concepts will used the processes outlined by the FitSM standard in the design phase to build it service management framework linking to existing ITSM processes already used by EGI.

The 14 key processes are summarized as:

1. Service portfolio management (SPM)
2. Service level management (SLM)
3. Service reporting management (SR)
4. Service continuity & availability management (SCAM)
5. Capacity management (CapM)
6. Information security management (ISM)
7. Customer relationship management (CRM)
8. Supplier relationship management (SRM)
9. Incident & service request management (ISRM)
10. Problem management (PM)
11. Configuration management (ConfM)
12. Change management (ChM)
13. Release & deployment management (RDM)
14. Continual service improvement management (CSI)

## SLAs, OLAs, and Contracts

EGI has been working over the last year to restructure its SLA and OLA framework with a service-oriented approach using FitSM to understand the types of agreements between the various providers. Also, the individual content of the current SLAs will need to be reviewed to ensure appropriate language is included regarding liabilities. Support is also being provided by our commercial partner, 100%IT. A sample SLA has been provided in Annex 1.



See template in Annex 1

## Service Catalogue Record

The formal template will be produced in the form of a “service catalogue record” for specifying the minimum required information any resource provider will need to provide for being included in pay-for-use service provision. An initial template structure was provided by the Helix Nebula Marketplace and will be tailored to EGI as tool functionality and final processes are put in place external participants. For now, the wikipage is used for hosting the information of the PoC resource providers[[2]](#footnote-2).

# Business Models

## Pricing Schemes

The EGI pay-for-use activity started to look at pricing based on HEPSPEC/hr. (Grid), Wallclock/hr. (Cloud) and GB\*month (Storage). However, it will be important to offer flexibility to resource providers to create service packages. There are a number of pricing schemes available such as a “freemium” model where X is offered for free, and then anything over Y is Z amount. These pricing schemes and service packages are not unlimited, as it will depend on the technical functionality and capabilities to account for the usage.

The GOCDB offers a flexible solution in that, extensions are almost unlimited and various columns can be added and formulas created that could allow any service provider to dictate their own pricing and service packages. This will be covered as part of Phase 2 activities.

## Broker Models

As EGI operates in a distributed environment, services are provided by a variety of different organisations spread across Europe and beyond, it considered and proposed different roles, models and plans for applying those within EGI. EGI.eu could play 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 could also play a similar role on a national level.

Three main models were presented that could apply within the EGI ecosystem: The ‘Independent Advisor’ model, the ‘Matchmaker’ model and the ‘One Stop Shop’ model. In the ‘Independent Advisor’ model, the federator provides a general listing of services, facilitates relationships between customers, consumers and resource providers while playing only a support role if required during the service lifecycle. Through the federator, resource providers can promote their services to customers, while retaining the direct dialogue concerning the resource allocation, contracts and financial transactions. This model requires the customer to interact within individual (potentially multiple) resource providers to obtain the services it requires. Therefore, interactions are decentralised leading to higher overheads for the number of relationships that customers/resource providers must maintain. The federator is able to fund the services it provides through a membership model, which restricts the customers and resource providers that can use them. This is the current model used by EGI.eu.

Figure 1 - The Independent Advisor model



In the ‘Matchmaker’ model, the resource allocation is managed by the federator. The customer discusses requirements and receives a resource allocation from the federator with a resource provider. The contractual agreement is established by the federator with the customer on behalf of the resource provider but any financial transaction is handled directly between the customer and resource provider with the resource provider paying the federator for establishing the contractual agreement. This model is more suitable for customers who need access to many resource providers.

Figure 2 - The 'Matchmaker' Model



The ‘One Stop Shop’ model fully relies on the federator to handle the service publication, matchmaking, contract and agreement negotiation, as well as financial transactions. The resource provider receives payment for the resources used by the consumer collected by the federator from the customer. Reliance on such a service reduces organisation overhead on both customers and resource providers by offering them a single point-of-contact to many independent counter-parts.

Figure 3 - The ‘One Stop Shop’



The estimations by now are that the ‘Matchmaker’ model could realistically be implemented by December 2014 by at least few of EGI members. Other models, such as the One-Stop-Shop or another, which has been given the name of ‘Trusted Third Party’ and which includes all the characteristics of the One-Stop-Shop except for the invoicing, could be implemented by a few members that have shown interest in a longer term 2015-2016.

## Joint Development Projects

Some of the participants indicated that they have a non-for-profit legal status and as such they are not able to issue invoices for the consumption of resources. One of the ideas that was proposed to circumvent this issue was to formulate joint development projects where shareholders participate equally in the project and the Resource providers offer the required resources. Within this model, it would be possible to exchange services including monetary support, whether for the consultancy (human) effort and/or resources provided. Investigation on a national level will be conducted to understand if this is country specific or a potential mechanism to be exploited by others.

## Consultancy

In a typical business model, services are offered to customers with a price imposed by the market, as is the case of major private resource providers. On top of that, additional limitations imposed by the private resource providers are related to:

* Limitation of liability
* No guaranteed services
* Loss of product property

They do not offer a capillary user support aimed at achieving the particular requirements and needs addressed continuously by the research communities EGI is dealing with.

For such reason EGI provides not only a privileged channel with the computational resources providers and a set of dedicated user support services for the already consolidated Grid users but also consultancy, application porting and training support for new users and new communities that would like to exploit the Grid and Cloud infrastructure. User Support activities are carried out in close collaboration with the support teams of the National Grid initiatives that, operating locally, can address needs and requests of the users.

The vast expertise from the community to support potential customers is a high added value that should not be underestimated when considering pay-for-use mechanisms and look to diversify revenue streams beyond “€/CPU”.

# Business Use Cases

Additionally, several real world business use cases have presented or will present themselves over the next year. These specific cases are allowing the group to answer specific questions when it comes to

## Helix Nebula Marketplace (HNX)

The Helix Nebula Marketplace (HNX) was launched in May 2014. EGI is a founding member and there are opportunities for EGI resource centres to offer their resources through the marketplace.

The technical integration of the EGI Federated Cloud sites is an ongoing process with 3 EGI cloud sites is under testing (INFN-Bari; IFCA; CESGA), all member of the EGI Pay-for-Use PoC. From the organizational viewpoint, two main business models have been identified:

1. Private integration of owned resources for free access: the EGI providers would be enabled and visible from the marketplace only to those user communities who have received a grant for the use of EGI resources free of charge and whom have made an explicit request to HNX to reach commercial providers; EGI.eu in collaboration with the EGI providers need to define an agreement with the Helix Nebula Marketplace operator on the business model for access to EGI resources (e.g., free for the volume of activities on the EGI sites if the revenue from the commercial providers exceed a certain threshold; fixed fee)
2. Public integration of resources for paid access: the EGI providers that aim to offer paid services through HNX will sign the commercial agreement with the marketplace operator and are allowed to list their resources on the service catalogue for all potential customers.

Discussion is ongoing as to whether resource providers within the EGI Federated Cloud are requested to sign the Helix Nebula Marketplace (HNX) Memorandum of Understanding. These aspects will be addressed at the 4th Helix Nebula Interoperability workshop [19].



The steps to follow are:

* Service Provider completes service catalogue record
* Service Provider integrates with SlipStream connector
* Service Provider signs a commercial contract agreement with CGI (the Marketplace Operator)
* Service Provider integrates with the support structure of CGI

## European Space Agency

The European Space Agency (ESA) is an international organisation spread across 20 Member States. It has a mission to “shape the development of Europe’s space capability”.

It has a dedicated procurement department that prepares Invitations-To-Tender (ITT), Requests-For-Quotation (RFQ), Contracts and Purchase Orders and then manages contracts with successful applicants.

All contracts must be transparent and fair to all parties and not cause any distortion of competition in relation to private economic operators. They must be the most economic and effective use of the Agency’s resources and must distribute work among the Member States.

Tendering is an open, completive process as standard. Procurements are open to all Economic Operators with some exceptions to the rules such as limitations aimed at supporting SME and R&D entities. Any ITT will have precise details on the rules that apply to that procurement. The ESA Industrial Ombudsman acts to guarantee that ESA procurements are transparent, impartial and non-discriminatory.

The ESA has an online portal allowing potential bidders to review upcoming ESA procurements. This system is known as EMITS (Electronic Mail Invitation to Tender System) and can be accessed at http://emits.esa.int/emits/owa/emits.main The EMITS system provides a brief overview of intended ITTs which issued at the beginning of the year and subsequently updated at least once per month. Full tender details can only be viewed by registered users. Registration to obtain these details is compulsory but just involves a simple questionnaire and agreement to their standard terms and conditions. The ESA will manually check that the applicant qualifies as a potential ESA supplier and then provides their username and password.

Procurement is designed to achieve the best possible trade-off between the objectives of technical excellence, economy and the ESA’s industrial policy. It tries to ensure that tenders will be evaluated impartially and fairly and consists of the following phases:

1. The Planning and Preparatory Phase
2. The Initiation Phase
3. Preparation of the Invitation to Tender / Request for Quotation (ITT/RFQ)
4. Distribution of ITT/RFQ
5. The Tendering Phase: Preparation and Submission of an Offer
6. Admission and Evaluation of Offers
7. Award and Placing of Contracts
8. Debriefing of unsuccessful Tenderers
9. Control of the execution of the contract
10. Closure of the contract

Full details of phases 1-8 can be viewed in the Tender Evaluation Manual on EMITS.

ITTs are often very demanding in terms of requirements for international co-operation due to industrial policy and geographical distribution requirements. The SME initiative encourages tenders from consortia, which include SMEs. As such this represents a significant opportunity for the EGI resource centres who, by definition, are widely geographically distributed and include SME organisations.

The pricing model for tenders frequently request either a Firm Fixed Price or a Maximum Ceiling Price. Where the ESA foresees a multitude of similar procurements being placed with a company or group of companies, the ESA sets up a “Frame Contract”, which acts as a global agreement outlining the standard contract terms, management and financial conditions to allow each individual action to be contracted with little paperwork e.g. via a work order. This again works well with the EGI model as the EGI could negotiate the Frame Contract and act as a broker distributing smaller individual work orders to the Resource Centres.

## Cloud for Europe pre-commercial procurement (PCP) tender

The Cloud for Europe project aims to "enable public sector cloud adoption in open dialogue between public sector and industry". It started in June 2013 and runs until November 2016. It is co-funded by the European Commission under the Framework Programme for Research and Innovation (FP7).

The public sector is supposed to provide industry with the list of cloud services that don't fit their requirements coming from data protection, security and legal issues and contractual aspects. Industry should use those find innovative solutions for cloud services to overcome those obstacles.

PCP (Pre-Commercial Procurement) is one particular approach for procuring R&D services only, which enables public procurers to develop common solutions towards concrete public sector needs. The tender will be launched in August. It is not clear if public institutions can participate as providers.

The main reference of the project is:

http://www.cloudforeurope.eu

Two profiles are available to join the stakeholder group:

* Public authorities, to act as customers;
* Industry/SMEs, to act as providers.

There are no clues in the documentation provided on the C4U site that the EGI cloud providers can be considered providers in the C4U context, but apparently this is not explicitly forbidden.

There are cloud resources belonging to the FedCloud and participating in the P4U that are based on technologies specifically developed with (Italian) PA in mind. In principle, sharing the lessons learned as "PA solution providers for PA customers" could represent a plus for the C4U project.

From a RC perspective, cloud Resource Centres indeed can be interested in having the public sector as a particular customer. It might be worth asking the C4U project if there is any obstacle in letting EGI join as provider of cloud resources.

There is no specific restriction preventing non-profit organisations to participate, BUT it requires the bidder can produce and invoice with an assigned bank account. If the bidder is a consortium the invoice can be split into several invoices. PCP is only for procuring R&D services not of the services themselves.
With this the PCP gives the opportunity to the industry (large corporations, SMEs and non-profit organisations if needed) to offer they services to develop brand new solutions to address those problems.
The providers of PCP opens a consultation process previous to the tender to discuss the topics and to have a clearer view of the conditions they are going to require in the tender process.

This might be a good opportunity for EGI and/or those EGI members that look for additional sources of income. The main objective is developing new solutions, that is R&D. Later it can also generate commercial benefits through the exploitation of the IPRs, but it can also be negotiated with the procurer to keep the IPRs, if the bidder is not in the position of exploiting them.

## EGI and Industry Partnerships

### CSIC

IFCA data centre at the University of Cantabria in Spain installed new computing resources in 2012 oriented to promote innovation. Since then, pay per use services are offered to researchers in the academy and also in private companies.

The following table lists some of the different initiatives on-going, representative of different use cases (small/large companies, open/licensed software, software as a service/infrastructure as a service, Windows/Linux based framework).



Some of the basic facts that our group has learned are the following:

* **Publicity is a key first step**
	+ Most companies do not know this service is feasible
	+ Transparency (public fares) is appreciated
* **Not all projects are feasible**
	+ We only work for R&D (& innovation)
	+ We did not support a company addressing bitcoin generation
* **It is not so easy to engage/convince everybody**
* **Communication is the key factor**
* **Administrative problems can be solved**
	+ Publication of fares is a good first step
	+ Direct Billing is a bit more flexible than Contracting
* **We do not believe on business cases and sustainability analysis**
	+ If it makes sense, let’s do it.

This last point deserves a comment. The point is that within our limited experience many times the success of collaboration in research/innovation projects, even if under a pay for use umbrella, is based on the interest and competence of both sides, as this defines the potential impact of the project and finally the business results.

Regarding the structure required to support this effort in our site:

* **A support team is key**
	+ An excellent team means simply that you will offer excellent solutions
	+ Combine R&D and service or it will not work
* **Infrastructure for R&D is not for “critical services”**
	+ We inform clearly about this, we do not offer such services
	+ But we keep a high level of support (and information)
* **R&D services are yet services**
	+ **Yes, we are part of the University Research Services**
* **User support**
	+ We use the same ticket service than for Academy/EGI
* **Infrastructure/Middleware configuration must be flexible**
	+ Users ask for dedicated large machines, for Windows images...
	+ Want “Dropbox” like, TeamViewer, do not use certificates...

It must be clear since the start to both sides that we do not aim to make “money”, but to collaborate on innovation/research, with adequate funding, which should cover all costs.

Finally, some very clear messages that we have learnt:

* **You should care about your customers**
	+ Know them!
	+ Learn what they may want
	+ Offer extra support when possible
	+ Participate in joint meetings, workshops, initiatives
* **They have put their confidence on you**
	+ Be proud
	+ Make them be proud of the collaboration
* **So, avoid commenting details, problems, etc. both in public and privately.**

### EGI Business Engagement Virtual Team

There are more than 20 million SMEs in the EU representing 99% of businesses. SMEs are considered one of the key drivers for economic growth, innovation, and employment. The European Commission has made them one of the focuses in the Horizon 2020 with the aim of putting SMEs in the lead for the delivery of innovation to the market. EGI aims at supporting this policy objective by exploring opportunities for synergies with SMEs (e.g., offering the EGI innovative services for big data analytics).

The goal is to establish a Business Engagement Programme for developing relationships with SMEs and bringing them into the EGI ecosystem to create mutual value. By entering into the programme companies can identify their own business opportunities, advertise their services, and/or conduct R&D activities in collaboration with the public research sector using the capabilities that EGI makes available for them.

SMEs are welcome to propose their ideas for collaboration and, if deemed appropriate, have the opportunity to participate in the development of the infrastructure, for example by creating specific user interfaces for data and infrastructure management. They could also access large scale computational capacity for developing prototypes/proof of concepts and bringing them to production, perform pre-competitive research, publish articles, and/or get access to potential clients by sponsoring/participating EGI events. The main constraints in using the EGI infrastructure is that services and applications should not have a commercial purpose, nevertheless EGI can act as a catalyst and when applications/services reach maturity for commercial exploitation, they could move the commercial market.

With the creation of this virtual team we also want to create the basis for future, broader actions by identifying SMEs potentially willing to collaborate with EGI in these activities and establishing active strategic partnerships. SMEs participating in the program may also be part of future Horizon 2020 proposals.

Output

The final output of this VT is a well-defined Business Engagement program for SMEs that is validated with a number of initial companies. The VT will also produce a list (or database) of suitable SMEs across Europe potentially willing to collaborate with EGI and able to do so (NGIs’ representatives will be crucial to identify them).

* SME Business Engagement Program describing target organisations, rules of engagement, value proposition
* List of potential candidate SMEs
* Initial list of SMEs that engage with the program and provide feedback about it

The general work plan is as follows:

* Define an SME Business Engagement Program
* Define the desired profile of the SMEs to be integrated
* Identify potential opportunities - technical and non-technical
* Create an SME/Business database of contacts across Europe (KPI: number of leads, 200 entries with contact details)
* Make contact - either F2F or virtually (KPI: 40 contacts documented)
* Gather feedback on experience and potential requirements
* Establish formal relationship (KPI: 3)

## EGI Federated Cloud Task Force

The EGI Federated Cloud recognises and supports the requirement of providing Cloud resources in a pay-for-use relationship with its users/customers. The FedCloud team has not yet identified users and collaborations that would be eligible for pay-for-use Cloud resources, however dedicated discussions have started to take place between the two groups to refine a general strategy and approach as these use cases present themselves. One specific use case has expedited this necessity in the area of RNA-sequencing.

Future activities will understand whether the default model for Cloud resources might be or should be free at the point of use, pay-for-use or any combination (e.g. Freemium model).

The technical roadmap foreseen for integrating Cloud resources into pay-for-use business-relationships is, broadly speaking:

1. Settle on a definitive set of resources that are or will be accounted for (current set of accounted resources is not conclusive) with resource providers publishing pricing information (currently 7 cloud sites).
2. Agree on common resource templates across federated Cloud providers (e.g. Service Catalogue Record).
3. Define whether pricing will be per resource type (e.g. CPU, RAM), per template, both or a mixed model (e.g. the price for resources consumed per template would be discounted from the mere sum of the individual resource prices).
4. Extend accounting model and infrastructure to accommodate pricing requirements defined through the pay-for-use group.
5. Align ongoing activities within e-Grant to properly allow reservation/allocation of Cloud resources according to defined resource and template model.
6. Integrate with a yet to be conceived billing infrastructure.

# Future Topics

**Payment types and Pricing Scheme**

* Investigate different payment types beyond invoice/bank transfer such as credit card, tokens, Bitcoins, …

**Cost Examples**

* Draft the costs of using real examples (e.g. I need to compute this electronic configurations with this and that parameters, so the total cost is XX euro). Such examples can help users to estimate what are the figures involved.

**VAT/Taxation**

* Initial report available[[3]](#footnote-3).

**Legal and Policy Aspects**

* Analyse legal issues or considerations need to be made such as procurement requirements, public funding limitations, etc.

**Procurement Regulations**

* Procurement legal framework may need to be required/followed.

**IPR**

* Reoccurring issue has come up more than once and needs to be explored

**Working with external organisations (e.g. specific example ongoing with a start-up company)**

* How it relates to and how they may contribute to, or hamper with cost recovery strategies. (e.g. specific example in a new EC project)

**Licencing**

* Users with commercial applications running in third party.

**Other**

* Customers not in same country as service provider
* User rejection policies.

# Annex 1 – SLA Template

**General**

This agreement is made between [customer name], represented by [customer representative] and [service provider name], represented by [service provider representative] to cover the provision and support of the service as described hereafter.

This SLA is valid from [date] to [date].

**Scope & description of the service**

This SLA applies to the following service:

[Name of the service plus references to the service catalogue]

[Brief description of the service that is subject to the scope of this SLA, e.g. based on information in the service catalogue]

**Service hours & exceptions**

The service operates during the following hours:

[Service hours]

The following exceptions apply:

[Any exceptions from the regular service hours such as maintenance windows or other planned interruptions]

**Service components & dependencies**

The service covered by this SLA is made up of the following (technical and logical) service components:

[List and description of relevant service components at appropriate level of detail]

**Support**

The services covered by the scope of this SLA are provided with the following level of support:

[Details on support contact points and their hours of operation]

**Incident handling**

Disruptions to the agreed service functionality or quality will be handled according to an appropriate priority based on the impact and urgency of the incident. In this context, the following priority guidelines apply:

[Specific prioritization guidelines]

Response and resolution times are provided as service level targets (see section 5).

**Fulfilment of service requests**

In addition to resolving incidents, the following standard service requests are defined and will be fulfilled through the defined support channels:

[List of defined standard service requests]

Response and fulfilment times are provided as service level targets (see section 5).

**Service level targets**

The following are the agreed service level targets for [name of the service]:

Service level parameter Target

Overall service availability [Overall availability target]

[Parameter] [Target}

**Limitations & constraints**

The provisioning of the service under the agreed service level targets is subject to the following limitations and constraints:

* [Workload limits]
* [Other limitations]

**Communication, reporting & escalation**

***General communication***

The following contacts will be generally used for communications related to the service in the scope of this SLA:

Customer contact for the service provider [Contact details]

Service provider contact for the customer [Contact details]

Service provider contact for service users According to defined support channels

***Regular reporting***

As part of the fulfilment of this SLA and provisioning of the service, the following reports will be provided:

Report title Contents Frequency Delivery

[Title] [Brief specification of the contents] [Frequency] [Addressee and method of delivery]

***SLA violations***

The service provider commits to inform the customer, if this SLA is violated or violation is anticipated. The following rules are agreed for communication in the event of SLA violation:

[Rules for dealing with SLA violations]

***Escalation & complaints***

For escalation and complaints, the defined service provider contact point shall be used, and the following rules apply:

[Rules for escalation and complaints]

**Information security & data protection**

The following rules for information security and data protection apply:

[Rules for information security and data protection]

**Additional responsibilities of the service provider**

[List and specification of any additional responsibilities or liabilities of the service provider]

**Customer responsibilities**

[List and specification of any specific customer responsibilities]

**Review**

There will be reviews of the service performance against service level targets and of this SLA at planned intervals with the customer according to the following rules:

[Rules (including frequency) for service reviews with the customer]

# Annex 2 – SCR Template

The following template was provided by the Helix Nebula Marketplace and will be tailored to EGI as tool functionality and final processes are put in place for external participants. For now, the wikipage is used for hosting the information of the PoC resource providers[[4]](#footnote-4).

[This should be completed by resource providers within the EGI federation to participate in pay-for-use service provision. The fields are defined by the minimum information required for the various tools supporting pay-for-use functionality.

Once this document is completed it should be returned to pay-for-use@egi.eu for that the values to be populated. Once this action is completed the values should be checked and approved by each resource provider for their own site.]

**General**

|  |  |
| --- | --- |
| **Company Name** | <organisation full name> <organisation acronym> |
| **Completed By** | <Authorised Name> |
| **Version** | <v1> |
| **Date** | <# 3 letter month abbreviation YYYY> |

**Capacity**

[This indicates the overall scale (currently) available within (the relevant part of) the supplier’s IaaS environment.]

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | Nature | Value Type | Explanation | Value |
| **CPU/cores** | The number of CPU cores (currently) available within (the relevant part of) the supplier’s IaaS environment | An integer, and possibly approximate, number, e.g. 1,000; | To give an indication of the scale of the environment available for use. |  |
| **RAM** | The amount of random-access memory in total | Expressed in relevant terms, e.g. 10 TB; | The amount of memory available across the installation as a whole. See below for what is available on any one system. |  |
| **Storage** | The amount of persistent storage (e.g. SSD, disk, tape) available within that supplier’s environment | Expressed in relevant terms, e.g. 10 PB; | Possibly multiple values, e.g. per technology type |  |

**Single VM Capacity**

The capacity that is available on any one virtual machine within that supplier’s environment.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | Nature | Value Type | Explanation | Value |
| **Size of CPU core** | An indication of the speed of the processor | A number in GHz | There is no one single measure of processor capacity or speed, but GHz is a reasonable indication |  |
| Type of CPU | An indication of the processor manufacturer | Manufacturer name (e.g. Intel or AMD generally) and CPU generation (e.g. 63XX, E5YY, etc.); | Applications may be written to take advantage of facilities incorporated by a particular manufacturer at some stage of their product development |  |
| Minimum CPU/Cores | The minimum number of CPU cores with which this supplier’s VMs can be configured | An integer number, e.g. 1 | To give an indication of the minimum configurable environment |  |
| Maximum CPU/Cores | The maximum number of CPU cores with which this supplier’s VMs can be configured | An integer number, e.g. 8 | To give an indication of the maximum configurable environment |  |
| Minimum RAM | The minimum amount of random-access memory (currently) available within VMs | Expressed in relevant terms, e.g. 128 GB | The minimum amount of memory available to any one VM within the supplier’s IaaS environment |  |
| Maximum RAM | The maximum amount of random-access memory (currently) available within VMs | Expressed in relevant terms, e.g. 128 GB | The amount of memory available to any one VM within the supplier’s IaaS environment |  |
| Volatile Storage | The amount of volatile, typically locally-attached disk, storage available locally to that VM | Expressed in relevant terms, e.g. 500 GB | The amount of “scratch” space, which could be used, e.g. to extend the random access memory of a VM. Local disk space is typically slower than ram but faster than persistent storage space |  |
| Persistent Storage | The amount of persistent storage (e.g. SSD, disk, tape) available to that VM, of a given storage access method (e.g. local or network) and storage type (e.g. block device or network mount) and resilience level or equivalent, (e.g. RAID6, RAID5, etc.); | Expressed in relevant terms, e.g. 10 TB per drive/block device | Possibly multiple values, e.g. per technology type. This presumes that storage is associated with a particular VM, i.e. it is locally attached or via a restricted network. Otherwise, it could be up to the total figure, as above. |  |

**Availability**

[An indication of the normal, single-system availability offered as a service level within that supplier’s IaaS environment. This does not allow for special arrangements, e.g. customer-specific system clustering.

Note that suppliers may differ in their approach to offering levels of availability and granting penalties if they are not met.]

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | Nature | Value Type | Explanation | Value |
| **Availability Offerings** | Whether one or more availability offerings are made | The level designation(s), e.g.: bronze, silver, gold | These could vary per supplier, as there is no standard designation. Work from the EC, the ODCA or Deutsche Boerse could be used to derive such a standard, at least for comparative purposes, in the future |  |
| **Availability Levels** | The actual values of availability offered | The level as a percentage, e.g. 99.9%, etc. | To be comparable, service elements must be expressed and measured in a consistent way (e.g. as defined within ITIL) |  |

**Price**

An indication of the normal, non-discounted pricing for use of that supplier’s IaaS environment. This does not allow for, e.g. customer-specific or volume discounts.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | Nature | Value Type | Explanation | Value |
| **Charging Unit** | The unit used for charging | The pricing unit, e.g. GHz, portion of CPU chip, etc. | This could vary per supplier, as there is no standard unit. Work from the EC, the ODCA or Deutsche Boerse could be used to derive such a standard, at least for comparative purposes, in the future |  |
| **Charging Period** | The period used for charging | The pricing period, e.g. hour, month | This could vary per resource, e.g. CPU per hour, storage per month |  |
| **CPU/Cores/Hour** | The price for use of a unit of processing per period, e.g. hour | The price in euros, e.g. €0.05 | CPU is shown as being priced per hour, but in practice that may differ per supplier and environment |  |
| **RAM/Hour** | The price for use of a unit (e.g. 1 GB) of memory per hour | The price in euros, e.g. €0.05 | Typically, the RAM is associated with the CPU, above |  |
| **Storage/Month** | The price for use of a unit (e.g. 1 GB) of (e.g. disk) storage per month | The price in euros, e.g. €0.20 (20 cents) | Storage is shown as being priced per month, but in practice that may differ per supplier and environment. Note that is possible that storage is either associated with a particular VM or as a generally-available resource |  |
| **Network/GB** | The price for transmitting a unit (e.g. 1 GB) in or out of the environment | The price in euros, e.g. €0.30 | The supplier may charge, at differing rates, for data transmission in and out of the environment. Note that for customers making use of the GEANT connection to their cloud supplier, there is currently no charge from the supplier for that part of the connection |  |
| **iops/GB** | The price for a unit of data (e.g. 1 GB) to or from the storage environment; | Provisioned IOPS (e.g. at €0.125 per GB of allocated storage per month);Explanation: (do we split read and write?) |  |  |

**Locations**

The customer may need assurance as to the geographical location(s) of the supplier and/or in which the environment is housed, e.g. for data protection legislation reasons. This can be by country, and/or whether it is ‘within Europe'.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | Nature | Value Type | Explanation | Value |
| **Location** | Geographical location of relevant data centre(s) and/or operational company (this can be different from the physical cloud location) | ISO-standard country code and name for cloud location and/or operational company location, e.g. NL The Netherlands | Currently, data protection legislation differs per country, and for some legislations the data owner is obliged to ensure the location for some types of data (e.g. personal data) |  |

**Supplier’s Catalogue**

Source of further information to users of a supplier’s other offerings.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | Nature | Value Type | Explanation | Value |
| **Catalogue Location** | URL of web site with further details | Value: e.g. <https://aws.amazon.com/> | N/A |  |

1. http://www.fedsm.eu/ [↑](#footnote-ref-1)
2. https://wiki.egi.eu/wiki/EGI\_Pay-for-Use\_PoC:Technical\_Details [↑](#footnote-ref-2)
3. https://documents.egi.eu/public/RetrieveFile?docid=1391&version=4&filename=EGI-PfU-VAT-Taxation-Issues-Vfinal.pdf [↑](#footnote-ref-3)
4. https://wiki.egi.eu/wiki/EGI\_Pay-for-Use\_PoC:Technical\_Details [↑](#footnote-ref-4)