

EGI Pay-for-Use Proof of Concept Final Report 2014

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 provides a final record of activities over 2014 and will ultimately serve as the starting point for future actions in 2015.

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1 Snapshot Summary

The Pay-for-Use Proof of Concept group¹ launched in January 2014 on a best effort basis with formal funding activities starting in May 2014 as a dedicated tasks within EGI-InSPIRE PY5 NA5 WP. This activity was also closely linked to TNA5.1 Strategy, Policy and Business Development; SA5.2: Federated Cloud and JRA2 Tool development.

Overall, the group consisted of more than 40 Members and Observers from EGI.eu (Lead), Resource Centers, NGI NILs, and Commercial Companies. In total, 16 regularly scheduled phone conferences were held² with formal minutes produced³ as well as two dedicated sessions at the EGI Community Forum in Helsinki⁴ and the EGI Big Data workshop in Amsterdam (Sept)⁵.

The following sections provide a high-level view of the main activities, results achieved, and recommendations moving forward. Further details of each are provided throughout the rest of the document.

1.1 Main Achievements

- Complete business processes defined and system tested and approved by resource providers:
 - Providers to publish pricing information; customers to discovery services and prices; request submission; negotiation and SLA; VO set-up; accounting of consumed resources; invoicing (Section 3).
- Tools adaptation
 - GOCDDB extensions added to set pricing: cloud compute and storage, grid compute and storage, VAT.
 - Accounting Portal extended for price information accounting.
 - e-GRANT developed to offer both a user-facing interface and enable providers to receive requests, negotiate the service and price and allocate resources.
- Sites Publishing Pricing Information
 - 20 Organisations across 13 Countries
 - 20 Grid Sites: Belarus; Bulgaria; Germany; Greece; Italy; Latvia; Poland; Spain; Switzerland; Turkey
 - 10 Cloud Sites: Finland; Greece; Italy; Poland; Slovakia; Spain; Turkey; UK
 - 15 Storage sites: Bulgaria; Greece; Italy; Spain
- Price Ranges (incl. support)
 - Grid (HEPSPEC/hr): €0.01-€0.15 (Avg. €0.05; Median €0.05)
 - Cloud (wallclock/hr): €0.03-€0.11 (Avg. €0.05; Median €0.05)
 - Storage (€/GB/month): €0.01-€0.14 (Avg. €0.04; Median €0.04)
 - +/- VAT 8%-24% (where applicable)
 - Taxation report available at⁶
 - Prices to be valid for one year once in production
- Assurance of service management best practices based on FitSM (Section 3)

¹ https://wiki.egi.eu/wiki/EGI_Pay-for-Use_PoC

² https://wiki.egi.eu/wiki/EGI_Pay-for-Use_PoC:Meetings

³ <https://documents.egi.eu/document/2088>

⁴ <https://indico.egi.eu/indico/sessionDisplay.py?sessionId=29&confId=1994#20140521>

⁵ <https://indico.egi.eu/indico/sessionDisplay.py?sessionId=2&confId=2160#20140925>

⁶ <https://documents.egi.eu/document/1391>

- Links to EGI's overall ITSM service management system.
- Reuse of agreements: SLAs, OLAs
- Development of a proposed Service Catalogue Record defining provider service offerings and capabilities.
- Business models and pricing schemes defined: selling of physical resources (pay-per-use; packaged), joint development projects, and consultancy. (Section 4)
 - Legal and Policy solutions emerging for institutions not fully able to engage in commercial activities: e.g. research-only purpose statements; charging for human services with resources offered for free (however, monetary value of those services is now able to be calculated).
- Business opportunities being explored (Section 5).
 - Helix Nebula Marketplace (HNX); Engineering SpA (Large Italian IT company); European Space Agency; Pre-commercial procurement (PCP) / Public procurement of innovative solutions (PPI) (e.g. Cloud for Europe; PICSE - Procurement Innovation for Cloud Services in Europe); 100% IT (UK SME cloud provider); Charity Engine (UK Desktop Computing Company); Arctur (Slovenian SME HPC/Cloud provider); Zenotech (UK SME Marketplace).
 - Others being explored through formal Business Engagement Programme (Section 5).
- National exposure and initiatives underway and there are already examples of success stories with various levels of pay-for-use capabilities (Section 6).
 - Ready for production (8): CEGSA (ES), IFCA-CSIC (ES), 100% IT (UK), Albert Einstein Center Univ. of Bern (outside CH users only), MASTER-UP (IT) (limited capacity); TUBITAK (TR); II SAS (BG); INFN-Bari (IT).
 - Ability through joint development projects (1): GRNET (GR).
 - In development (2): CSC (FI) (organisationally ready, finalising FedCloud testing), UIIP-NASB (BY)
 - Internal decisions on-going (4): Bulgaria Grid; PL-Grid (for outside PL users only); Fraunhofer SCAI/LRZ (DE); Latvia Grid.

1.2 Future Recommendations

- User-facing graphical interface – all technical development is complete and a design mock-up created (screenshot in Section 3) – will be ready by end of Jan 2015 (based on e-GRANT).
- Increase automation of varying pricing schemes beyond pay-for-use and packaged services (e-GRANT terminology of “pools”).
- Integrate an automated billing function
- Mature EGI.eu's role as a full central broker
 - Contractually: EGI.eu currently does not have a VAT number and potentially needs a separate business entity
 - Pricing model: Registration fee, % of transaction, etc.
- Align closely with future 'Marketplace' activities, which have a very large crossover with the P4U PoC.

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 based on usage, along with the more traditional procurement of resources to be managed and offered for free to the owners.

This approach also allows researchers, resource providers and funding agencies to better understand the costs of accessing 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 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.

2.4 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.

However, regarding pay-for-use activities EGI.eu will initially serve as a "facilitator" with each contract running directly through the resource providers. The investment made presents to main opportunities 1.) offer value to resource providers for membership fees paid and support provider sustainability 2.) add a potential future revenue stream to support the sustainability of EGI.eu.

2.5 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 or Microsoft Azure. 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.

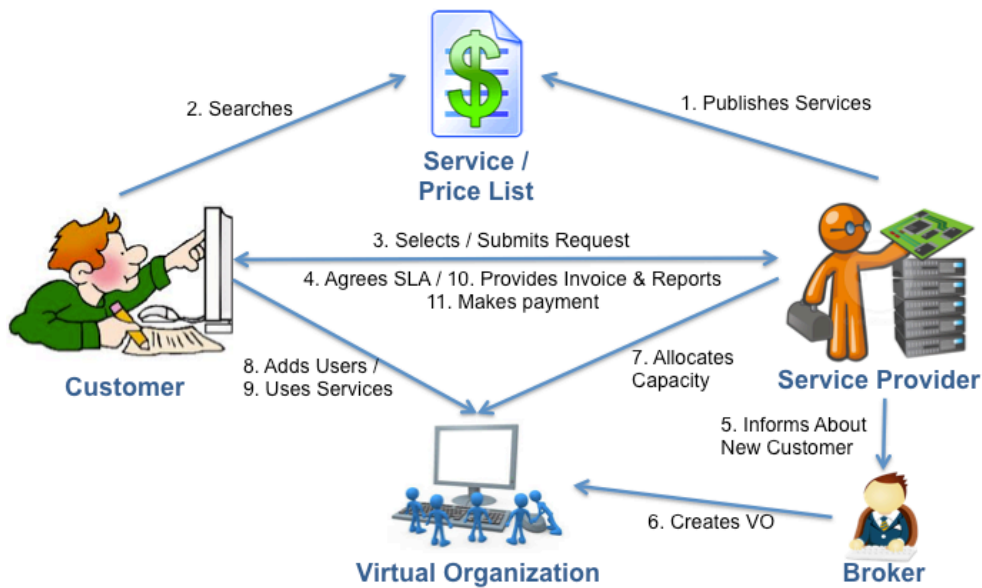
1. Focus on research and development activities.
2. Support pre-commercial applications and innovation.
3. Offer dedicated consultancy (e.g. application porting) and high-levels of support rather than bare bones cloud.
4. Ensure competitive pricing to avoid undercutting market.

The vast number of Resource Centres have 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 and the funding agencies who support them. Hence the core value proposition is:

Access to on-demand IT resources with tailored research support and consultancy to accelerate scientific results.

3 Business Processes

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.



In the future, as the broker model matures, it will take a more central role in this process.

3.1 Steps/Instructions

3.1.1 Publish pricing information per service (Provider)

GOCDB is the EGI component that stores semi-static information about sites and services. Among other things, it acts as a simplified configuration database (CMDB in service management terms) 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 (see table 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 published 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.

Charge Type	Key Name	Pricing
Grid CPU	P4U_Pilot_Grid_CPU	Euros/HEPSPEC06 Hour
Cloud CPU	P4U_Pilot_Cloud_Wall	Euros/Hour
Storage	P4U_Pilot_Storage_Use	Euros/GB*month
Cloud Storage	P4U_Pilot_Storage_Use_Cloud	Euros/GB*month
VAT	P4U_Pilot_VAT	Optional VAT rate to be applied to above

Instructions for Providers:

If you do not have access rights to change features of your site please ask the site manager or a site admin to do it for you.

1. Go to GOCDDB <https://goc.egi.eu>;
2. Navigate to your site. (My Sites) at the top of the left hand sidebar.
3. Just above the list of Services you should see a new box called 'Site Extension Properties'
4. At the bottom of this box there is a big green plus titled 'Add Properties' – click on it
5. This should show a window with two fields 'Property Name' and 'Property Value'
6. For 'Property Name' insert the 'Key Name' according to your desired 'Charge Type' (see table above) e.g. P4U_Pilot_Grid_CPU
7. For 'Property Value' insert a real number, which will be interpreted as shown in the Price Calculation column in the table above, e.g. Euros per HEPSPEC06 Hour.
8. Click the button 'Add Site Property'
9. If you go back to the site view you will see the 'Key Name' listed. You can edit or delete it.
10. Then add other properties from the table above as appropriate for your site.

Once you have done this we will query GOCDDB to pull the values for the pilot sites and the accounting portal will join them with usage data to produce a charging report.

GOCDDB 5.2

Site: BG01-IPP
Institute for Parallel Processing, Bulgarian Academy of Sciences

Contact

E-Mail	emanouil@parallel.bas.bg
Telephone	359-2-9796793
Emergency Telephone	359-2-9796625
CSIRT Telephone	359-2-9796609
CSIRT E-Mail	egee-security@parallel.bas.bg
Emergency E-Mail	
Helpdesk E-Mail	

Project Data

NGI/ROC	NGI_BG
Infrastructure	Production
Certification Status	Certified Change
Scope(s)	EGI

Networking

Home URL	http://www.bas.bg/dpa/
GIIS URL	ldap://sbdii.ipp.acad.bg:2170/Mds-vo-name=BG01-IPP,o=grid
IP Range	
IP v6 Range	
Domain	grid.bas.bg

Location

Country	Bulgaria
Latitude	42.67
Longitude	23.37
Time Zone	Europe/Sofia
Location	Sofia

Site Extension Properties

Name	Value	Edit	Remove
P4U_Pilot_Grid_CPU	0.07		
P4U_Pilot_VAT	20		
P4U_Pilot_Storage_Use	0.04		

[+ Add Properties](#)

3.1.2 Customer service discovery

e-GRANT is a service that simplifies managing capacities for providers and enables negotiation of SLAs both for customers and providers. Currently, within 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 – it is a tool for EGI Resource Allocation Process. 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.

When creating a system for Pay-for-Use Activity, many of the functionalities developed for the Resource Allocation Process were used with slight modifications in the P4U system to maintain compliance between the two processes.

Implementing the Pay-for-Use process in e-GRANT started with engaging Pay-for-Use resource providers in the creation of resource pools. According to its definition a Resource Pool is the specific resource capacity available for allocation. Every pool needs to be described in detail so the resources requested by Customer can be matched properly to capacities available.

To achieve this, the Pay-for-Use Resource Provider logs in to the system, enters the 'Pools' section and starts the 'Create Pool' action by clicking on the green button. This initiates a form where the provider should describe the newly created pool.

The first step requires defining general information about pool management:

1. Enabled/Disabled

Provider decides if a Pool is available for the Customer at the moment.

2. Quality of service:

For computing resources a Resource Provider can offer different types of access to resources according to its local policies and the user requirements:

- [Level C1: Opportunistic](#). Resources are not guaranteed and are subject to local availability.
- [Level C2: Time allocation](#). Resources are available in fair share-like mode for a fixed time period.
- [Level C3: Reserved allocation](#). Resources are exclusively reserved to the VO and the job will be executed immediately after submission.

3. Pool Types:

For the resources offered to the EGI Pool, the Resource Provider can play different roles in the resource brokerage process according to its local requirements.

- **Free hands:** the broker, responsible for matching demand and offer, is free to allocate the resources from one RP Pool according to local criteria which aim to optimize usage of available resources and user demand. The Resource Provider delegates the responsibility of accepting a proposed resource allocation to the Broker.
- **Right to revoke:** the broker matches demand and offer and defines a resource allocation proposal. The RP Pool Manager is responsible of accepting or rejecting the resource allocation proposal of the Broker (EGI.eu), in case of no reply to a Broker's proposal after a default time, the resource allocation proposal is considered to have been accepted.
- **Negotiation:** the broker matches demand and offer and defines a resource allocation proposal. The RP Pool Manager is responsible of accepting or rejecting the resource allocation proposal of the Broker (EGI.eu) and to explicitly accept or reject

4. Local policies:

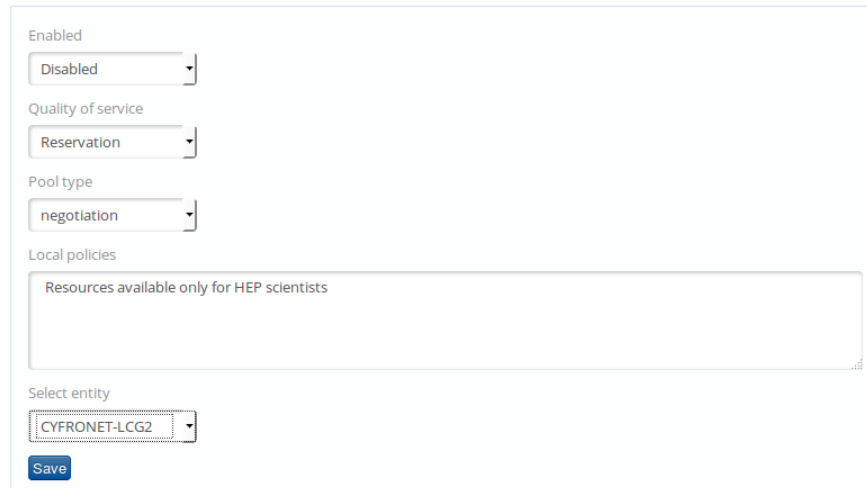
Provider describes any additional requirements/ capabilities (e.g. information about accepting only particular VOs)

5. Select Entity:

Provider chooses a site, from the list available for him, which will deliver resources.

New resource pool

Documentation



The screenshot shows a web form for configuring a new resource pool. It includes several dropdown menus and a text area. The 'Enabled' dropdown is set to 'Disabled'. The 'Quality of service' dropdown is set to 'Reservation'. The 'Pool type' dropdown is set to 'negotiation'. The 'Local policies' text area contains the text 'Resources available only for HEP scientists'. The 'Select entity' dropdown is set to 'CYFRONET-LCG2'. A 'Save' button is located at the bottom left of the form.

The second step involves resource description. The provider declares which resources will be available for Pay-for-Use Customer along with their technical specification and price for a specific resource type. Default pricing is taken from GOCDDB, where providers specify fixed prices for resource types using the 'extensions' feature. However, the Provider can choose to change it regarding special offers for customers that qualify for them or prices that are subject to individual negotiation. Prices for resources defined in the Pool description will be used for creating an offer for the customer's Resource Allocation Request.

Every resource kind can be described with a set of dedicated metrics. Every metric has a detailed description to help the Provider in engaging a new resource pool.

The resource types supported by e-GRANT are:

- HTC Computing
- HTC Storage
- EGI FedCloud Computing
- EGI FedCloud Storage

The full list of resource metrics with descriptions is available on the EGI wiki page: https://wiki.egi.eu/wiki/Resource_Allocation_Metrics_Description

Basic info

Start date * 2

End date *

[+ Add resources and metrics](#)

[HTC] Computing

Total computing time [HEPSPEC-hours] *

Supported middlewares *

Price for HTC computing [EUR] *

VAT [%] *

[HTC] Storage

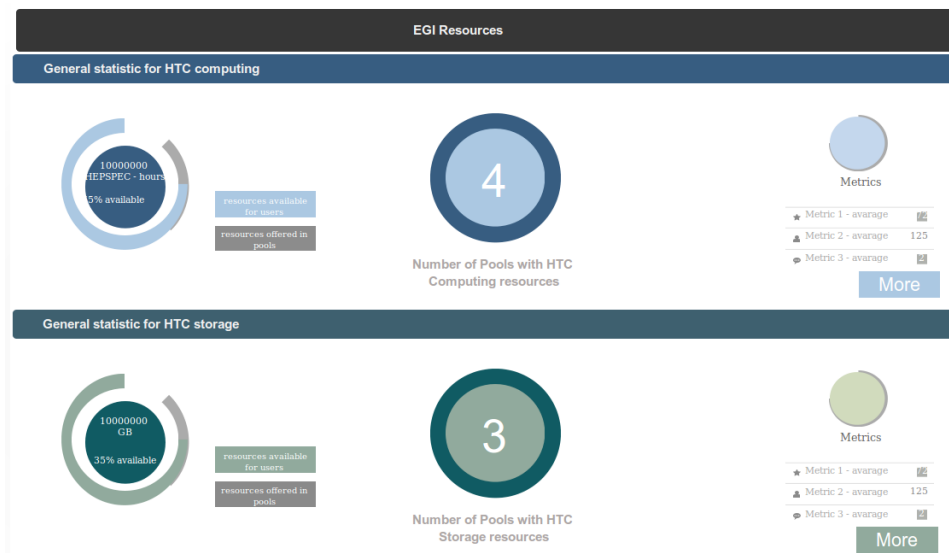
Total storage capacity [GB] *

Price for HTC Storage [EUR] *

VAT [%] *

Filling in all required information (red boxes) enables the provider to save the Pool and make it visible for Pay-for-Use Customers (the 'Enabled' option must be set).

Enabled resources offered by Pay-for-Use providers are presented to the Customer on their dashboard. The Customer discovers the services, which are categorized by resource types offered (example shown for 2 types of resources: HTC Computing and HTC Storage).



For a specific resource type, the Customer finds out the following general information:

- Total amount of resources offered in EGI
- Amount of resources available for customers at the moment
- Number of pools supporting given resource type
- Average numbers for metrics describing given resource type

For more information, the Customer clicks on 'More' button, which directs them to a separate Pool view (also available from 'Pools' tab). From this point the Customer can investigate specific pools available for a resource type that Customer is interested in.



Clicking on a specific Pool box enables them to see detailed information about the Pool:

- Period when the Pool is available for Customers and Users
- Metrics describing the resources offered by the Pool (different set for every resource type)
- Information on pool management (Quality of Service, Pool Type, Local policies)
- Graphs for resources already allocated for this Pool (Pool capacity)



After service discovery the Customer is ready to prepare a Resource Allocation Request, which will include specification for the resources sought by the Customer.

3.1.3 Customer service selection and request submission

Submitting a request for resources is a simple procedure that the Customer needs to follow in order to start the process of Pay-for-Use resources negotiation.

Actions to be taken are congenial to steps required in Pool creation.

The Customer clicks on a 'Create new RA Request' button, which initiates Resource Allocation Request form. The form is divided into 2 parts:

1. First, 'Basic Info' specifies the general information about the request and the Customer (period for requested resources, name of the VO that Customer is affiliated with, name of the Project that will use allocated resources, what kind of computations will be performed).
2. Second, 'Resources and Metrics' contains the technical description of the requested resources. Metrics that the Customer needs to fill in are either adequate to those specified in Resource Pool or have their equivalents.

The screenshot displays a web form for creating a Resource Allocation Request. It is divided into two main sections: 'Basic info' and 'Resources and Metrics'.

Basic info section:

- Start date * ⓘ: Text input field.
- End date * ⓘ: Text input field.
- User Community/Project * ⓘ: Large text input field.
- VO * ⓘ: Text input field.
- Description of the activity * ⓘ: Large text input field.
- Buttons: 'Add resources and metrics' (with a plus icon) and a dropdown arrow.

[HTC] Storage section:

- Total storage capacity [GB] * ⓘ: Text input field.

[HTC] Computing section:

- Total computing time [HEPSPEC-hours] * ⓘ: Text input field.

[Cloud] Storage section:

- Capacity [GB] * ⓘ: Text input field.
- High availability levels * ⓘ: Dropdown menu with 'No' selected.

[Cloud] Computing section:

- VMs (maximum) * ⓘ: Section header.
- Small ⓘ: Text input field with value '0'.
- Medium ⓘ: Text input field with value '0'.
- Large ⓘ: Text input field with value '0'.
- Other ⓘ: Text input field with value '0'.
- CPU ⓘ: Text input field with value '0'.
- RAM ⓘ: Text input field with value '0'.
- Scratch/ephemeral storage ⓘ: Text input field with value '0'.
- Level of utilization * ⓘ: Dropdown menu with 'Light' selected.

After completing the form Customer can:

- Send it to the EGI Broker, who will look for resources available for Customer's RA Request,
- Use the 'Find Pools' function, which will show Resource Pools Adequate for specified resources.

The second option allows Customer to browse Pools available for his RA Request, assess their adequacy as there is numeric indicator (Score) showing compatibility of a Pool with the given Request and choose the Pools which will contribute to Customer's RA Request.

The numeric indicator takes into account if the resource parameters in the Pools match the metrics specified in the RA Request and the calculated price for requested resources. Better offers will rank higher in the Pool list. Maximum value for a Pool score is 1.

id	provider	type	other spec.	Total computing time	Min physical memory per core	score
<input checked="" type="checkbox"/>	2	Site B	negotiation show	<input type="range" value="2500"/>	<input type="range" value="0"/>	1
<input checked="" type="checkbox"/>	1	Site A	free hand show	<input type="range" value="2500"/>	<input type="range" value="0"/>	0.5
<input type="checkbox"/>	28	UNI-PERUGIA	negotiation show	<input type="range" value="0"/>	<input type="range" value="0"/>	0.5

Selecting a Pool creates an OLA with the Resource Provider containing the specified parameters for requested resources and the total price for them.

After the Customer chooses the appropriate Pools, he can send an RA Request with underpinned initial OLAs to the EGI Broker to start negotiation process.

3.1.4 Customer agrees and signs an SLA

Negotiating and agreeing on resources involves all three stakeholders (Customer, Broker, Provider). Negotiation includes the amount of resources to be allocated, their technical parameters and price setting which might vary according to defined by Provider different resource offers. After agreeing on resource specification and price, the SLA can be signed. The Pay-for-Use negotiation process is consistent with the negotiations taking place in Resource Allocation Process.

The SLA is based on the FitSM service management standard. See Annex 3 – SLA template.

The whole process is supported by relevant e-mail notifications.

3.1.5 Broker creates a VO per contract

A Virtual Organisation is a group of people (e.g. scientists, researchers) with common interests and requirements, who need to work collaboratively and/or share resources (e.g. data, software, expertise, CPU, storage space) regardless of geographical location. They join a VO in order to access resources to meet these needs, after agreeing to a set of rules, Policies and SLAs that govern their access and security rights (to users, resources and data). The Broker will create one or more Virtual Organisations (VOs) in a primary and a backup VO management system, according to the requirements specified by the customer. The procedure to create and deploy a VO in the EGI infrastructure is described in Proc14⁷.

Regarding pay-for-use, we envisage two different scenarios depending on the requirements of the customer.

⁷ <https://wiki.egi.eu/wiki/PROC14>

- **Scenario A:** The broker may create a VO per contract when the contract covers all the associated Resource Providers. Different levels of SLAs may be supported as needed by using VO groups associated with different priority queues and/or quotas.
- **Scenario B:** The broker may create a VO per customer or use case when the customer creates one contract per resource provider. In this case, the Broker will create one VO for the customer that may cover more than one contract with Resource Providers.

3.1.6 Allocating capacity

On the basis of the signed OLA, the Provider receives notification that between given dates, machines needs to be appropriately reconfigured. Reconfiguration will consist of enabling a specific VO to access the machines and allocate resources accordingly to the signed OLA (resource metrics) and local policies. Provider can manage allocation using system notifications, a list of currently binding OLAs (which will tell Provider about specific OLAs, their parameters and dates for allocation so adequate changes of enabling or disabling access to machines can be made) or Pool information view. From the Pool, one can discover what resource capacity is left for allocation for the Customers at that moment, how future allocations will look (based on signed OLAs) and how many resources were used by the customers in the past.

3.1.7 Customer adds/enables users

The Customer should appoint a contact person and deputy that will be allocated the VO manager role in the corresponding VOs in order to manage the user registration/deregistration using the VO management system (VOMS). The VO manager may create one more VO groups in order to allocate users into different SLA Levels.

3.1.8 Customer usage and accounting

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).

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 were 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, GB/month (for storage) and the current applicable VAT. This data is pulled from the GOCDDB 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.

EGI ACCOUNTING PORTAL

GLOBAL View | VO MANAGER View | VO MEMBER View | SITE ADMIN View | REPORTS | METRICS PORTAL | LINKS

Tier1
 Tier2
 Countries
 EGI

AfricaArabia
 AsiaPacific
 CERN
 EGI.eu
 NGL_AEGIS
 NGL_AL
 NGL_ARMGRID
 NGL_BA
 NGL_BG
 NGL_BY
 NGL_CH
 NGL_CYGRID
 NGL_CZ
 NGL_DE
 NGL_FI
 NGL_FRANCE
 NGL_GE
 NGL_GRIDNET
 NGL_HR
 NGL_HU
 NGL_IBERGRID
 NGL_IT
 NGL_MARGE
 NGL_MD

Data to graph: Computation Monetary Cost
 Period: Start year: 2013, Start month: 4, End year: 2014, End month: 3
 Groupings: Show data for: REGION as a function of: VO
 VO Groups: LHC, TOP 10, ALL, Custom
 Chart: Type: GROUP BAR, Scale: LINEAR
 Stream VO: Exclude stream and ops VOs jobs information
 Local Jobs: Grid Jobs Only, Grid Jobs and Local Jobs, Local Jobs Only

Refresh

by REGION and VO.
TOP10 VOs, April 2013 - March 2014.

The following table shows the distribution of grouped by REGION and VO (only information about TOP 10 -ordered by CPU time- VOs is returned).

REGION	alice	atlas	auger	blomed	cms	compchem	fb	hcb	lhophys	vo.cta.in2p3.fr	Total	%
NGL_BG	0	0	0	84,020K	4,366K	0	0	4,466K	0	0	92,852K	0.85%
NGL_CH	0	1,514,976K	0	0	0	0	0	0	0	0	1,514,976K	10.87%
NGL_DE	0	0	0	16,166K	0	0	0	0	0	0	16,166K	0.11%
NGL_GRIDNET	0	74K	0	105,819K	5K	210,349K	0	0	0	21K	316,269K	2.23%
NGL_IBERGRID	0	0	89,759K	97,745K	442,794K	81,259K	0	0	0	0	671,557K	4.73%
NGL_IT	1,702,727K	0	0	388,876K	3,744,939K	305,817K	0	0	7,967K	0	6,149,309K	43.30%
NGL_TR	0	0	0	0	0	0	0	0	0	0	0K	0.00%
NGL_UK	486,201K	2,813,629K	0	23,044K	694,477K	0	27,831K	1,392,690K	0	0	5,438,669K	38.31%
Total	2,196,928K	4,328,673K	89,759K	715,479K	4,886,589K	377,264K	27,831K	1,397,155K	7,967K	21K	14,200,550K	
Percentage	15.43%	30.48%	0.63%	5.04%	34.41%	2.66%	0.19%	9.84%	0.05%	0.00%		

[Click here for a CSV dump of this table](#)
[Click here for a Extended CSV dump of this table](#)

SLA reporting will be part of e-GRANT. If needed, regular accounting reports can be generated based on the agreed SLA.

3.1.9 Customer receives an invoice and pays

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

Initially, the customer will directly pay the service provider(s). Future work will be on describing a more integrated Broker role with EGI.eu serving as an intermediary between customers and providers to reduce many-to-many relationships, with an associated business model e.g. percentage of transactions, per contract fee. See section 4.2.

This work will be part of 2015 activities.

3.2 IT Service Management

3.2.1 FitSM Standard

In order to deliver services to the quality and level of professionalism required for paid use, some form of formal management approach is required. EGI selected the FitSM standard, created by the FP7 FedSM project (in which EGI.eu is a partner). FitSM 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. It is 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.

Participating in FedSM also provided EGI.eu with consultancy on how to introduce formal service management, which benefitted the Pay-for-Use PoC, especially as key partner Cyfronet (who develop the e-GRANT tool) are also implementing FitSM and are part of the FedSM project. Consultancy 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.

Pay-for-use implementation will re-use EGI's overall ITSM processes and procedures, only revising as necessary e.g. SLAs, OLAs (see following section).

3.2.2 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 implement better business practices and to understand the types of agreements between the various providers. Also, the individual content of the current SLAs were reviewed to ensure appropriate language is included regarding liabilities. A new user SLA has been developed and is provided as part of Annex 3.

Contracts are still handled on an individual provider level according to the organization terms and conditions. An EGI.eu broker contract will be created as the business model develops in 2015.

3.2.3 Service Catalogue Record

A Service Catalogue Record (SCR) was produced for specifying the minimum required information any resource provider will need to provide for being included in pay-for-use service provision that includes the organisation general information, service offering and service level capabilities. The structure takes input from fields required in e-GRANT, information provided by the Helix Nebula Marketplace, and common technical requirement requests from external organisations looking to partner with EGI (e.g. Engineering, Zenotech). This can be completed by current or new providers through an easy to use Google Form, which automatically collates information within a Google Spreadsheet. The SCR template is provided in Annex 4.

4 Business Models

4.1 Pricing Schemes

The EGI pay-for-use activity started to look at pricing starting with 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 (see table), however pricing schemes and service packages are not unlimited, as it will depend on the technical functionality and capabilities to account for the usage.

The GOCDDB 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. Pricing schemes can also be handled directly through e-GRANT.

Variables	Description
Subscription	Pay for X number of resources from the price calculated from the GOCDDB, which is already associated to a resource type for a given time. Billing can be done at end of cycle to adjust for unused resources or can be stimulated as “use or lose” as you had to reserve the resources.
Usage	Usage Volume 1: First X amount is Y; anything over N decreases to Z. Usage Volume 2: Up to X amount is Y based on availability; anything over N increases to Z to lean on a third party supplier.
Freemium	First X amount is free; anything over N decreases to Z (probably more for storage).
Overage	Price changes if exceeding the original allotted amount.
Pay-you-go	No or minimum limitations are given on the number of resources that can be consumed. Billing is done on a periodic basis (e.g. monthly) based on actual consumption. Probably not until later or with only trusted users.

Other option being explored is the concept of “Flavours”, which is being used in the EGI Federated Cloud as well as at CSC. This potentially presents the easiest implementation option moving forward. However, even if it allows providers flexibility to apply prices to specific customer and potentially increases customer appreciation with tailored pricing, it also requires more understanding of specific customer needs (overhead) and results in less automation (difficulty for long-tail).

EGI FedCloud				CSC					
Type	CPU/#	Mem (GB)	Storage (GB)		Cores	Mem (GB)	Disk (Tot)	Mem/ Core	Billing Units/h
Small	1	4	1 x 20						
Medium	2	8	1 x 40	Tiny	1	1	120	1	2
Large	4	15	2 x 80	Small	4	15	230	4	8
Other	>2	>7.5	n x >40	Med	8	30	450	4	16
				Large	12	45	670	4	24
				Full	16	60	910	4	32

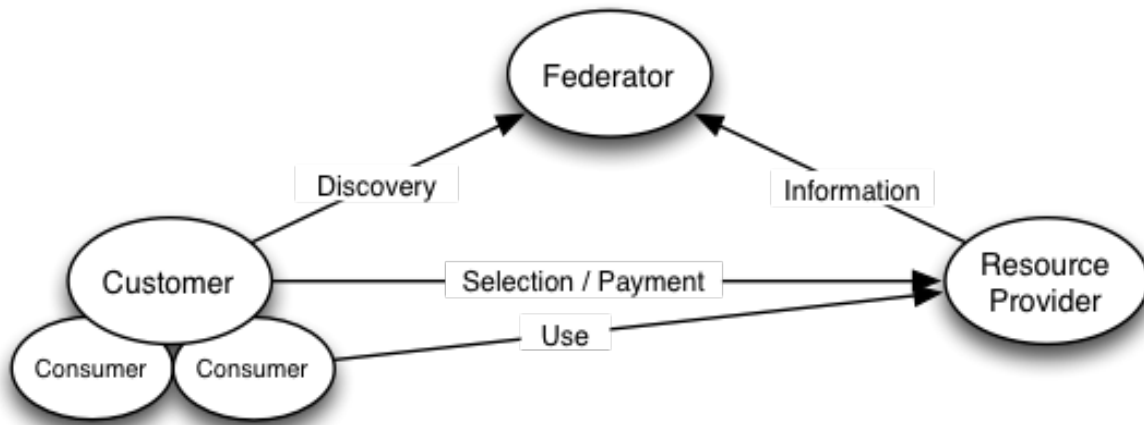
4.2 Broker Models

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.

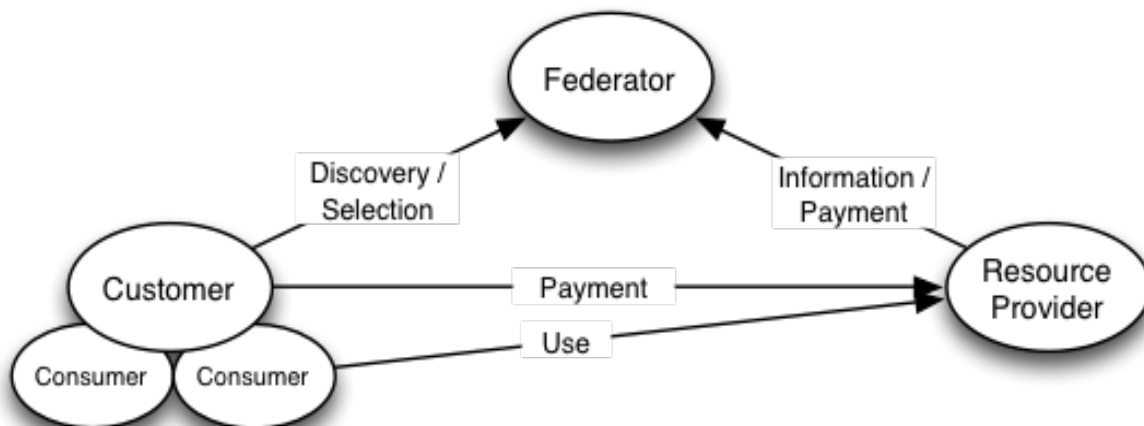
Three main models were presented that could apply within the EGI ecosystem: The 'Independent Advisor' model, the 'Matchmaker' model and the 'One Stop Shop' model. In the 'Independent Advisor' model, the federator provides a general listing of services, facilitates relationships between customers, consumers 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



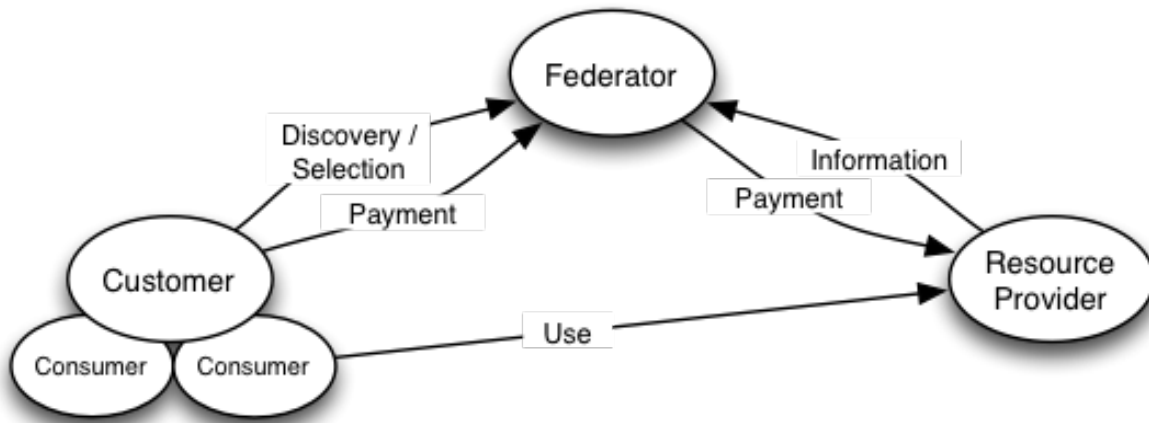
In the 'Matchmaker' model, the resource allocation is managed by the federator. The customer discusses requirements and receives a resource allocation from the federator with a resource provider. The contractual agreement is established by the federator with the customer on behalf of the resource provider 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'



Currently, the 'Matchmaker' model will be used, which has been given the name of 'Trusted Third Party' in a finer grain business model overview (see table below). This includes all the characteristics of the One-Stop-Shop except for the invoicing, which could be implemented by a few members that have shown interest in a longer term 2015-2016.

Model	Certification	API	Consultancy	Allocation	Single SLA	Accounting Reports	Invoicing
Invisible Federator	✓	✓					
Advisor	✓	✓	✓				
Matchmaker	✓	✓	✓	✓	✓		
Trusted Third Party	✓	✓	✓	✓	✓	✓	
One Stop Shop	✓	✓	✓	✓	✓	✓	✓

EGI.eu does/can fulfill most models, however several question need to be answered moving forward:

- Do current legal structures support a one-stop shop?
 - VAT required; legal status to support commercial activities
- Need to define pricing scheme and price for service
 - % of transaction; Subscription from providers within marketplace?
 - Ensure model does not distort market (e.g. en/discourages providers changing customer pricing)
- Can EGI realistically serve both indirect and direct payment models?
 - Clear process needed to define when and where applied (e.g. user location; provider preference)

4.3 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.

4.4 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 reasons 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”. These activities are already embedded in EGI.eu and NGI service portfolios.

5 Business Engagement

Additionally, several real world business opportunities 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 understanding what additional information needs to be understood and provided or technical work to be developed.

5.1 Collaborations

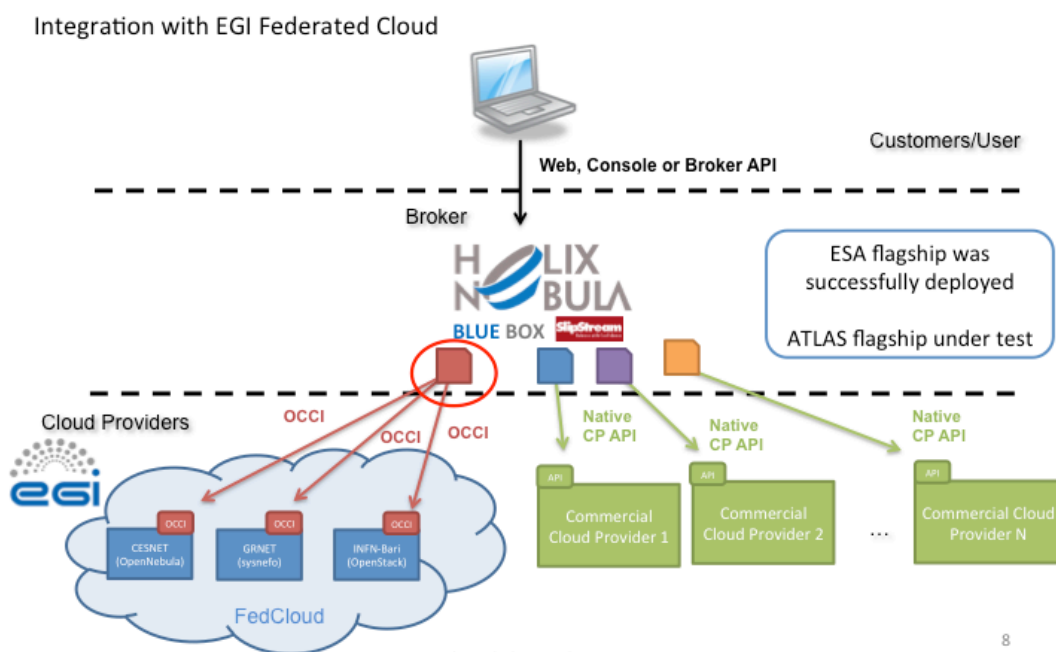
5.1.1 Helix Nebula Marketplace (HNX)

The Helix Nebula Marketplace (HNX) was launched in May 2014 and represents an opportunity for EGI resource centres to offer their resources through the marketplace. The technical integration of the EGI Federated Cloud sites is an on-going process with 5 EGI cloud sites tested or is under testing (CESGA; CESNET; GRNET; IFCA; INFN-Bari). This relies on the development of an OCCI connector for the SlipStream broker technology that has been funded by the EGI-InSPIRE project and released as open source.

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 needs 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 on-going as to whether resource providers within the EGI Federated Cloud are requested to sign the Helix Nebula Marketplace (HNX) Memorandum of Understanding. The marketplace operator is transitioning after CGI decided to quit this role. At the moment, HNX is managed by a consortium of commercial providers that signed the MoU and a new setting will be discussed in early 2015 to have an operator that is independent from the suppliers.



In order for a Service Provider to join HNX, the following steps are needed:

- Complete the HNX service catalogue record
- Integrate with SlipStream connector
- Sign a commercial contract agreement with the Marketplace Operator
- Integrate with the support structure of the Marketplace Operator

5.1.2 100% IT

100% IT is a UK based SME Resource Provider that has been participating within the EGI Federated Cloud. The EGI pay-for-use proof of concept allows 100% 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. The development of a consistent Service Level Agreement allows 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, they 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. They 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.

5.1.3 IFCA-CSIC Industrial Use Cases

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).

User /Customer	Project	Resources required
R&D in Small SME	Complete Model of a Water Reservoir	Applications (Delft3D) running on Cloud , eventually HPC
(Small) R&D Section of a Multinational	Optimization of gas burners	ANSYS running on HPC OpenFoam running on HPC
R&D Division of a Company	Design of pieces for nuclear reactors	ANSYS running on HPC
R&D Project of multinational	Tests of Future Internet software	Infrastructure as a Service (using OpenStack on “normal” servers)
R&D of SME multinational	Particle diffusion in atmosphere	Applications running in Windows with HPC resources

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**
 - They only work for R&D (& innovation)
 - They 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
- **They do not believe on business cases and sustainability analysis**
 - If it makes sense, let’s do it.

This last point is that within their 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 their 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”**
 - They inform clearly about this, they do not offer such services
 - But we keep a high level of support (and information)
- **R&D services are yet services**
 - Yes, they are part of the University Research Services

- **User support**
 - They 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 they 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 and Make them be proud of the collaboration
- **So, avoid commenting details, problems, etc. both in public and privately**

5.2 Opportunities

5.2.1 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, complete 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.

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

The Cloud for Europe project⁸ 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 Cloud for Europe tender for the joint PCP of research and development on cloud computing services, launched 15 Dec 2014. The purpose of the tender is to research and demonstrate solutions to overcome obstacles for the adoption of cloud computing by the public sector.

Public Universities and Public Research Institutions are eligible to participate to the tender as individually or collectively suitable economic operators. Economic operators are entitled to submit offers either individually or by way of a consortium or association comprising several Tenderers or Groups of economic operators. For each Phase, at least the 70% of Research and Development services shall be performed within the European Member States.

The entire PCP procedure will be carried out under Italian law, see 1.4 of the Tender Regulation document⁹.

The main contact point for the tendering process is the lead procurer in the Cloud for Europe project – Agenzia per l'Italia Digitale (Italy), acting on behalf of the project's other procurement partners –

⁸ <http://www.cloudforeurope.eu>

⁹ http://www.agid.gov.it/sites/default/files/documentazione/tender_regulation_09_12_2014_11_00_publish_ega_0.pdf

Ministerie van Financiën Directoraat-generaal Belastingdienst (the Netherlands), Entidade de Serviços Partilhados da Administração Pública (Portugal), The National Institute for Research & Development in Informatics - Ministry for Information Society (Romania), and Ministry of Finance of the Slovak Republic (Slovakia).

The PCP procedure is divided into 3 (three) lots and each lot will provide a Framework Agreement for the realization of research and development services:

- LOT 1: "Federated Certified Service Brokerage (FCSB)"
- LOT 2: "Secure, Legislation-Aware Storage (SLAS)"
- LOT 3: "Legislation Execution (LE)"

The Tenderer of each lot will provide:

- Phase I -> the solution design (2 months);
- Phase II -> the development and integration of a prototype (7 months);
- Phase III -> the original development of a limited volume of first products or services in the form of a test series (5 months).

Each Tenderer can participate in one, two or all the three lots for which it meets the requested requirements. The maximum overall amount available for the realization of the project is equal to 4 million euro:

- Lot1: € 40.000 for Phase I; € 197.333 for Phase II; € 333.000 for Phase III;
- Lot2: € 40.000 for Phase I; € 197.333 for Phase II; € 333.000 for Phase III;
- Lot3: € 30.000 for Phase I; € 138.667 for Phase II; € 234.000 for Phase III.

For each lot, several bids will be awarded a framework agreement. After each phase, results will be evaluated and bids will compete with each other for assignments in the subsequent phase.

The challenges the C4U wants to address through the Tender are described here¹⁰ (see especially 1.2).

The tenderer must submit strictly by no later than the 20th of February 2015.

For further information including the tender specifications, please refer here¹¹ and to the tender web page¹².

Within EGI, Cloud Resource Centres indeed can be interested in having the public sector as a particular customer; the PCP gives the opportunity to the industry (large corporations, SMEs and non-profit organisations) to offer they services to develop brand new solutions to address the PA use case.

Also, 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.

Given the publication date of 15 Dec 2014, further activities will be carried out during 2015.

5.2.3 Others

In addition each of the previously mentioned area, EGI has also been in discussion with several other organisations to explore potential areas of collaboration. The following table summarizes these:

¹⁰http://www.agid.gov.it/sites/default/files/documentazione/annex_iv_a_-_challenges_and_general_requirements_v103_publish_0.pdf

¹¹ <http://ted.europa.eu/udl?uri=TED:NOTICE:424518-2014:TEXT:EN:HTML&src=0>

¹² <http://www.agid.gov.it/cloudforeurope>

Company	Collaboration Area/Opportunity	Website
Engineering SpA	Looking for resource providers to support large contract for processing research data.	www.eng.it
Charity Engine	Desktop computing (BOINC) - revenue sharing model (1/3 provider, 1/3 charity, 1/3 company); Broker agreement available for € based on users brought.	www.charityengine.com
Arctur	Provides cloud and HPC services; Already serving Alice LHC. Interested in joining the EGI "marketplace" as a provider.	www.arctur.si
Zenotech	Runs a marketplace via their "Epic" product for aerospace, automotive, civil engineering and renewables – contacted EGI to have providers visible in marketplace to serve their customers.	www.zenotech.com

Several others are coming through the newly defined, but not yet published/marketted EGI Business Engagement Programme (see Section 5.4 below).

5.3 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. This has been recently strengthened by the requests of many user communities to know the rules of the future pay-for-use EGI Federated Cloud.

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 10 cloud sites).
2. Agree on common resource templates across federated Cloud providers (e.g. SCR).
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 on-going 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.

In the last months, the EGI Federated Cloud Task Force analysed these points and relevant steps forward were made in the following areas:

1. A first version of common resource templates across the FedCloud was defined. This version is currently under review to improve its flexibility. Final templates should be agreed in early 2015.

2. The accounting usage record was revised to include additional parameters that could change the resource prices (e.g. number of IP addresses assigned to a VM). The new usage record will be rolled-out to production during the first quarter of 2015.
3. The accounting portal is now able to compute a cost according to the usage of cloud resources applying a billing function.
4. The e-GRANT resource allocation process was extended to fully support cloud resources. The next e-GRANT, release, foreseen for the end of January 2015, will allow associating a price to the cloud resources. Furthermore, users will be able to consult a catalogue listing all cloud resources available.

The pay-for-use model is considered critical for the future sustainability of the EGI Federated Cloud and much effort will be devoted to have this model up and running in a near future.

5.4 EGI Business Engagement Programme

The Business Engagement VT was launched in April the 1st as an additional effort of the EGI-InSPIRE project due to in order to strengthen the collaboration and knowledge transfer between EGI and industry. 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, and have been put in the lead for the delivery of innovation to the market. EGI recognises that the collaboration with industry is essential for enhancing its own performance and sustainability.

The objective was to define a suitable Business Engagement Programme for SMEs, and identify a number of companies with interest to start collaborating with EGI. The VT recognised the complexity of the EGI environment and diversity of the legal status and strategic objectives of the Resource Providers and NGIs integrating EGI. Much effort and discussion time have gone to identify these issues and in creating a document with a proposal that would avoid potential conflicts.

The main output of the VT was the delivery of the aforementioned document, which proposes a suitable framework for engagement, while respecting the strategic, legal, and organisational issues identified. This document can be found in the EGI DocDB¹³. It outlines the opportunities and benefits for a wide type of private organisations to work with EGI and defines the varying levels of collaboration, proposing a three-layer structure for engagement. The first one would have a low barrier of entry to facilitate the engagement; the other ones would allow the creation of tailored agreements for collaboration.

According to the observations done by the Business Engagement VT, not all the SMEs should be targeted for the pay-for-use activities, but only those that can benefit most from the use of computational and data resources. Targeting a broader segment would simply not be cost-effective. The targeted SME can be characterised as local but with high internationalisation potential, highly technical and innovative. The segmentation is still a matter of discussion, but a first approach identifies a few, which are described as follows:

- a) SMEs running or planning to run computational jobs for their commercial activity.
- b) SMEs providing and or facilitating computational services.
- c) SMEs that can and will in the future develop added value information services based on scientific data produced by research infrastructures.

The first is a consumer of relatively small volume, punctual in time, of computing capacity. They also typically need technical on-boarding for access. They are consulting and engineering companies that develop algorithms, or produce simulations for design and manufacture their own products, or as technical services for third parties.

¹³ <https://documents.egi.eu/document/2339>

The second are the enablers. This category includes those companies offering added value services for accessing computational services. They can offer to their own clients a specific PaaS for specific industry sector or discipline. Eventually this category could also include resellers or brokers for this EGI capacity that is willingly offered on a pay-for-use basis. They need specific technical support that on a professional, business-to-business basis, and a privileged channel of access and communication.

The third category is the most underdeveloped so far, but it also has the biggest potential. They are those companies that (will) offer specialised data services. They would made use of the data from research infrastructures, which is made available to them, and process it to offer to other parties for further processing or direct consumers (public institutions, researchers, broader public).

A marketing strategy including product packages, adequate pricing, well-developed distribution channels and promotion activity to well defined segments is needed for a successful launching of the pay-for-use activities.

6 NGIs and Resource Centres: Pay-for-Use Status Overview

One of 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 activities happening within your own country and institution resulting from participating in the Pay-for-Use PoC?
- Are you in a position to be “in production” regarding pay-for-use service provision? If not, remaining issues need to be solved?
- What are your plans beyond this initial Proof of Concept?

The individual responses can be found in Annex 2 of this document. Below is a summary of the responses.

NGI/Resource Centre	Production Ready	In dev.	Internal discussions	Comment
100% IT	X			Commercial organisation (also involved in the EGI Federated Cloud)
AEC UoB	X			Outside CH users only
CESGA	X			Also submitted SCR for HNX Marketplace
CSC	X			State owned private organisation
GRNET	X			Within joint development projects only
IFCA-CSIC	X			5 local use cases of working with industry
II SAS	X			Customer specific
Master-Up	X			Limited capacity
NGI_IT	X			Cloud resources
TUBITAK	X			Already have experience in running pay-for-use offerings for Turkish projects
UIIP-NASB		X		During next 2 years, P4U will be integrated into national system of project funding for supercomputing and grid infrastructure
Bulgaria NGI			X	Non-profit organization; national regulations hinder direct payment for computing time
Cyfronet			X	Policy and legal aspects in discussion, but if anything, will probably be for non-Polish based users
Fraunhofer SCAI/LRZ			X	German policy and laws restricting publicly funded/procured resources (being reviewed)
Latvia Grid			X	Lack of demand/interest, focus on free delivery, but want to be prepared for future policy changes and increased demand

7 Conclusions and Future Recommendations

The Pay-for-Use Proof of Concept group and its more than 40 Members and Observers have been actively engaged over the last year of activities, which has led to the number of results achieved. However, there is recognition that there are still areas of further development to which each participant is committed to continuing into 2015. This report serves as a snapshot of activities carried out and will be used as the starting point for kicking off activities in the new year.

The main areas to focus on can be summarized as:

- User-facing graphical interface – all technical development is complete and a design mock-up created (screenshot in Section 3) – will be ready by end of Jan 2015 (based on e-GRANT)
- Increase automation of varying pricing schemes beyond pay-for-use and packaged services (e-GRANT terminology of “pools”)
- Integrate an automated billing function
- Mature EGI.eu's role as a full central broker
 - Contractually: EGI.eu currently does not have a VAT number and potentially needs a separate business entity
 - Pricing model: Registration fee, % of transaction, etc.
- Align closely with future ‘Marketplace’ activities, which have a very large crossover with the P4U PoC.