

**EGI-Engage**

Final report on EGI Service Registry and Marketplace

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Abstract

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**TERMINOLOGY**

A complete project glossary and acronyms are provided at the following pages:

* <https://wiki.egi.eu/wiki/Glossary>
* <https://wiki.egi.eu/wiki/Acronyms>

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**Executive summary**

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# Introduction

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# Summary of the past activities

This section summarises the main activities on the Marketplace already reported in other deliverables. In particular, it is focused on a short description of the concept of the EGI marketplace, the assessment of the technologies that we carried out before starting the implementation of the prototypes, and the assessment of the two prototypes based on Open IRIS and PrestaShop technologies.

## Concept of EGI Marketplace

In the European Research Area, the emergence of various research infrastructures that will need access to communication, computing, and data infrastructures to perform collaborative compute- and data intensive science is evident. Such research infrastructures would benefit from a shared e-infrastructure that offers the generic capabilities communities need to build their own research platforms. Important elements of this ideal shared e-infrastructure are already present, but further work needs to be done both at the technical level (for greater integration) and at the organisational/governance level (for shared governance, harmonised access policies, and suitable business models that ensure long-term availability).

Even though services are available, it may be difficult for researchers to discover and access them. EGI attempts to address this issue by developing a marketplace as a service concept to deliver research resources. Electronic markets can play a central role on facilitating the exchange of research knowledge, ICT resources, services, as well as payment options along side the traditional free at point of delivery model. This means creating a platform where the availability of services can be advertised together with the related access policies and service levels and a customer can easily order and access them.

In addition, the marketplace can enhance visibility for resource and service providers, raising awareness of what they can provide as well as helping to promote cross-disciplinary research.

In particular, the following potential benefits can be expected from developing a digital marketplace:

* Ensure efficient resource usage at the institutional, national, and international level.
* Allow cost sharing with accounting, billing, and enabling of fair usage of resources.
* Facilitate resource discovery at the institutional and inter-institutional level.
* Facilitate service order and access.
* Allow researchers and institutions to focus on value creation as opposed to maintaining redundant resources.
* Researchers can discover expertise that can be tapped into based on usage of resources registered.
* Remove administrative burdens from technology platforms allowing them to focus on technology delivery.
* Increase competitiveness by providing a low cost of entry to expensive technologies for small academic institutions and businesses.
* Facilitate inter-disciplinary research by providing access to technologies typically considered outside of a particular field.
* Avoid re-developing the same solution (tool duplication).
* Provide opportunities for collaborative improvements of services and resources.
* Possible reduce costs by facilitating complex application implementation and integration (e.g. issuing of persistent identifiers, providing links between resources and services).

The methodology that we adopted to define the concept of the EGI Marketplace included the following activities:

* A survey and several interviews were conducted to get the requirements from researchers and research resource providers.
* In addition, service scenarios for resource usage and resource providers were defined.
* Other related research marketplaces were examined to understand how our activity compares to them.
* A Business Model to describe and classify an EGI marketplace and in an “open science commons” space was defined.

As outcome, detailed requirements and a set of recommendations were defined for both business and technical perspectives.

For more details, please, refer to the D2.3 Concept of EGI Marketplace[[1]](#footnote-1).

## Technology assessment

Before starting the development of the Marketplace prototypes, we analysed existing solutions, open-source tools and extensions to implement the EGI marketplace demonstrator. This analysis was based on the previously defined concept of the EGI marketplace and to the related collected requirements.

Various solutions were considered to identify the most promising to satisfy our needs: AppDB, GOCDB, FIWARE Marketplace Generic Enabler, Open IRIS, PrestaShop and WooCommerce. The list of evaluated technologies included:

1. EGI tools that can be extended to become a marketplace (namely, GOCDB and AppDB)
2. Technologies supported by other initiatives (OpenIRIS and FIWARE)
3. Generic web tools with features suitable to the implementation of marketplaces (WooCommerce, WordPress).

Experts in development, design and operations of user-facing tools and/or a marketplace from various academic organizations, were appointed. The following metrics were taken into consideration by the evaluators:

* adequacy of the solution against requirements
* possible costs in terms of licenses and support
* solution supportable in terms of expertise within the EGI collaboration.

Another important factor that has been identified to assess the sustainability and costs in terms of licenses and support is the size of the user base of each tool. Tools with extensive list of user groups and broad adoption across different sectors have larger chances of receiving community support compared to specific technologies adopted by few communities. On the other hand, in these cases integrating ad-hoc features and maintaining them over time may be expensive if these capabilities are not adopted for upstream release and software is not open source.

As a result of this consultation and analysis, Open IRIS[[2]](#footnote-2), with its increasing user base and the Swiss Federation support, and PrestaShop[[3]](#footnote-3), a free, open source e-commerce solution largely adopted in the commercial world with a wide community behind it were identified as the most promising solution to fully fulfil the marketplace requirements.

Details of this analysis are available in D3.2 Design of the EGI Service Registry and Marketplace[[4]](#footnote-4).

## Development of the Marketplace prototypes

As follow-up of existing solutions’ analysis, the assessment of technologies to implement the EGI marketplace was been further refined taking into account the originally defined criteria in D3.2 as well as the requirements generated by the definition of the EGI service catalogue, which is one of the outcomes of the EGI Integrated Management System framework[[5]](#footnote-5).

As outcome of this activity, we set-up two distinct marketplace prototypes aiming at comparing the features of the two selected solutions, one based on PrestaShop and the second on Open IRIS.

A preliminary task for the development of the prototypes was the definition of the data model for the marketplace. It reflects the EGI service catalogue structure and is made of a three-level hierarchy where the first level contains the EGI service areas (the marketplace service categories) and the second level maps to the EGI services (the marketplace sub-categories). Furthermore, there is an additional level that defines the EGI service options (the marketplace products). The service options represent the products that the end user can discover, request and access via the marketplace.

The deployment of the two EGI marketplace demonstrators required a prior analysis of the relation between the marketplace and the EGI service catalogue with its Integrated Management System (IMS) process and procedures. In the context of this, a first study of the marketplace interfaces was conducted. These interfaces concern other EGI tools that are relevant to complement the marketplace with additional business logic related to the maintenance of service information, and the management of service access including the management of user registration and authorization when required. Such analysis was further enhance in the last months and related results are described later in this document.

The development of the Marketplace prototypes was completed in two phases with the releases of two versions. First version of the prototypes were created using built-in features of Open IRIS and PrestaShop and only a sub-set of the Marketplace data model was implemented. After this phase, it was clear that both technologies needed customisations to answer to EGI needs. Such customisations were implemented before releasing the second version of the prototypes that fully implemented the Marketplace data model and the Marketplace workflows, which were defined in the meantime.



Figure 1. Second release of the EGI Marketplace based on Open IRIS technology.

The two Marketplace demonstrators implemented the required specifications and, after their assessment, both systems adequately covered the current workflows as well as supported the data model, reaching the Alpha service phase according to the EGI Integrated Management System (IMS) and demonstrating that both could be adopted to implement the EGI Marketplace.

Therefore, other factors were considered to choose the technology such as its long-term sustainability, availability of expertise, ready-to-use features that could be helpful in the future. As final decision, PrestaShop were selected since it was considered easy to maintain, thanks to the wide community of developers and the availability of expertise within the EGI collaboration, more attractive for the commercial world and with many ready-to-use features to extend the Marketplace features (e.g. to implement the pay-for-use support). A plan was defined to enhance the PrestaShop based prototype and making it operational, reaching the Beta service phase by the end of the project.



Figure 2. Second release of the EGI Marketplace based on PrestaShop technology.

Details on the two releases of the EGI Marketplace prototypes are available in D3.7 First release of the EGI Service Registry and Marketplace prototype[[6]](#footnote-6) and D3.13 Second release of the EGI Service Registry and Marketplace prototype[[7]](#footnote-7).

# Service architecture

The EGI marketplace prototypes were implemented adopting and customising technologies developed by third parties. The two demonstrators were established leveraging their existing architecture, one based on PrestaShop and the other based on Open IRIS.

## High-Level Service architecture

The high-level service architecture of the two demonstrators is based on the underlying technologies of PrestaShop and Open IRIS, please refer to the PrestaShop[[8]](#footnote-8) and Open IRIS[[9]](#footnote-9) documentation for more details.

A SaaS instance for both technologies were deployed and customised according to the EGI requirements.

This section focuses on the description of the data model and workflows that have been implemented into the two prototypes.

Finally, PrestaShop and Open IRIS customisations needed to fully implement the specifications are described.

### Data Model

The data model of the marketplace reflects the EGI service catalogue structure (<https://www.egi.eu/services>). It is made of a three-level hierarchy where the first level contains the EGI service areas (categories in the marketplace) and the second level maps to the EGI services (sub-categories in the marketplace). Furthermore, an additional level defines the EGI service options (products in the marketplace). The service options represent the products that the end user could access or purchase in the marketplace.

The marketplace data model was already detailed in the D3.7 First release of the EGI Service Registry and Marketplace prototype and D3.13 Second release of the EGI Service Registry and Marketplace prototype. It was further extended recently, introducing a new service category to host thematic services. As first example, service options for the Applications on Demand service (AoDs) were defined.

In the following, the data associated with a customer (customer/user profile) and to a service order (service order profile) are described. The complete data model is described in Appendix I.

#### Customer/User profile

Each customer/user of the EGI marketplace needs to be registered to submit service orders. Customers are required to register during their first login into the marketplace, the registration allows the marketplace to gather enough information to create and store a customer profile in its internal database. Part of the data is retrieved by the EGI CheckIn service, which provides user authentication, and additional data is gathered from the same customers completing a form.

The following table shows the attributes that comprises the customer profile, specifying the source of the information (CheckIn or the Marketplace) and if an attribute is mandatory or optional.

|  |  |  |
| --- | --- | --- |
| Attributes | From | Mandatory/Optional |
| Name | CheckIn service | Mandatory |
| Surname | CheckIn service | Mandatory |
| e-mail | CheckIn service | Mandatory |
| Display name | CheckIn service | Mandatory |
| EGI unique identifier | CheckIn service | Mandatory |
| Country | Marketplace | Mandatory |
| Institution | Marketplace | Mandatory |
| Department | Marketplace | Mandatory |
| Departmental web page | Marketplace | Optional |
| Linkedin profile | Marketplace | Optional |
| ResearchGate profile | Marketplace | Optional |
| Supervisor name | Marketplace | Optional |
| Supervisor profile | Marketplace | Optional |

#### Service order profiling

The EGI marketplace associates to each service order a set of customer information, which is gathered during the Check-Out phase. Such information, complemented with the customer profile and the order details (the service options), enables the marketplace to implement a service order profile, which allows for appropriate service order management, accordingly to the EGI Integrated Management System (IMS) processes and procedures.

The table below shows the customer information that is linked to a service order. Such information can be extended in the future according to emerging needs.

|  |  |  |
| --- | --- | --- |
| Attributes | Value | Note |
| Customer type | Dropdown: single user, research group/community/project, private company | The typical model will be to work within the context of a community/project or a private company. However, the single user case is also supported. |
| Reason to request access to the EGI services | free text | In order to determine if the resources requested are the best for the task. |
| Research group/project/ community or company name (only if the customer represents a research group/ community/project or a private company) | only in cases when not a “single user” | It maps to the VO name. In the case the customers is already using the EGI infrastructure (VO list not empty), the VO name could be chosen from a drop down menu listing all the customer VOs (retrieved during the authentication) plus the option to specify a new VO. |
| Additional Information on the project  (only if the customer represents a research group/ community/project or a private company) | Project name: text  Project web site: URL | To be expanded in the future. In some cases it can be automatically filled in querying the operations portal if the project is already using the EGI infrastructure |

### Workflows

This section describes the procedures or workflows implemented in the two marketplace prototypes. For each procedure, the following information is provided:

* Overview: short description of the workflow
* Trigger: events that start a workflow
* Involved entities: all the entities that play a role in the workflow
* Input: input data
* Output: output data
* Steps: step-by-step description of the workflow
* Integration with other EGI tools: list of the EGI tools involved in the workflow and description of their interfaces with the marketplace

The following workflows are currently implemented:

* **Authentication**: The login procedure including the user registration during the first access.
* **Discover and order services**: Finding and ordering services within the marketplace.
* **Check-Out**: Submitting a service order together with a set of information to profile it.

#### Authentication and user enrolment

**Overview:**

The customer logs into the EGI marketplace through the CheckIn service.

**Trigger:**

* The customer can decide to log in while they are visiting the marketplace.
* The customer starts the checkout process.

**Involved entities**

* Customer
* Marketplace
* CheckIn service

**Input**

* User credentials (federated or social login)

**Output**

* Personal customer information including the unique EGI identifier
* Customer’s VO membership list

**Steps**

|  |  |  |  |
| --- | --- | --- | --- |
| Step | Conditions | Tool | Action |
| 1 | N/A | Marketplace | Redirect the customers to the CheckIn service. Only required to complete the order process. |
| 2 | N/A | CheckIn service | Authenticate the customers and provide the Marketplace with personal customer information (including the unique EGI identifier) and VO membership list. |
| 3 | After successful authentication and during first login | Marketplace | Complements the personal customer information already provided by the CheckIn service. The Marketplace asks the customer to complete a form with the following attributes:   * Country (mandatory) * Institution (mandatory) * Department (mandatory) * Departmental web page (optional) * Linkedin profile (optional) * ResearchGate profile (optional) * Supervisor name (optional) * Supervisor mail (optional)   These additional attributes are stored in the Marketplace and the customer will not be required again to provide them.  Customers can update their profile at any time. |
| 4 | Successful authentication | Marketplace | After the customer has successfully logged in, the Marketplace shows their name on its web interface. |

**Integration with other EGI tools**

|  |  |
| --- | --- |
| Tool | Integration |
| CheckIn service | Perform the customer authentication on behalf of the marketplace and provide it with customer information (including the unique EGI identifier) and VO membership list. |

#### Discover and order services

**Overview:**

The customer navigates via the service catalogue exposed in the EGI Marketplace and selects one or more services. This can be done before or after authentication. The Marketplace exposes services according to the service catalogue structure:

* First level: service categories
* Second level: services
* Third level: service options

**Trigger:**

* The customer accesses directly the marketplace or through the EGI web site.

**Involved entities**

* Customer
* Marketplace

**Input**

* No input

**Output**

* List of services including service options.

**Steps**

|  |  |  |  |
| --- | --- | --- | --- |
| Step | Conditions | Tool | Action |
| 1 | N/A | Marketplace | The customer navigates through the service catalogue published in the marketplace. |
| 2 | N/A | Marketplace | The customer selects one or more services specifying a set of service options. |

**Integration with other EGI tools**

There are no dependencies from the EGI tools.

#### Check-Out

**Overview:**

Define or update the customer profile, and gather information on the user or research community/project/private company willing to exploit the EGI services and common options for the selected services. Forward all the information to a back end system that will take care of managing the service order.

**Trigger:**

* Customer starts the Check-Out process after he has selected one or more services.

**Involved entities**

* Customer
* Marketplace
* CheckIn service
* Operations Portal

**Input**

* Personal customer information including the unique EGI identifier.
* Customer’s VO membership list.
* Service list including options selected by the customers.

**Output**

* Personal customer information including the unique EGI identifier
* Customer type: single user or representing a research group/community/project/private company
* Reason to request access to the EGI services
* Only for customers representing a community:
  + Information on the project
  + VO information
    - New or existing
    - VO name

**Steps**

|  |  |  |  |
| --- | --- | --- | --- |
| Step | Condition | Tool | Action |
| 1 | Only if the customer is not authenticated. | Marketplace  CheckIn | Automatically starts the authentication process redirecting the customers to the CheckIn service. |
| 2 | Successful authentication. | Marketplace | Presents to the customers the selected service options and their profile, as gathered during the authentication process, and requests them to fill in a form with the following fields:   * Customer:   + single user   + representing a research group/community/project   + representing a private company * Reason to request access to the EGI services |
| 3 v1 | Only if the customer represents a research community/project or a private company | Marketplace  Ops Portal | Request to the customer to fill in an additional form with the following fields:   * User group name: It maps to the VO name. In the case the customers is already using the EGI infrastructure (VO list not empty), the VO name could be chosen from a drop down menu listing all the customer VOs (retrieved during the authentication) plus the option to specify a new VO. * Information on the project will be automatically filled in by querying the operations portal if the customer select an existing VO in the User group name field. |
| 3 v2 | Only if the customer is a single user | Marketplace | Check if the amount of resources requested by the customer is less than the threshold defined to access the applications on demand platform:   * If yes, mark the customer as user eligible for the applications on demand platform. * If no, mark the customer as a normal user. |
| 4 |  | Marketplace | Submit/record the service order and the customer profile to a backend system |
| 5 |  | Marketplace | Send a confirmation e-mail to the customers: “your order is being processed…” |

**Integration with other EGI tools**

|  |  |
| --- | --- |
| Tool | Integration |
| CheckIn | Authenticate the customer when needed. |
| Operations Portal | Provide the marketplace with information related to already existing projects (VOs). |
| Marketplace backend | Receive the service request and the customer profile from the marketplace backend. |

### Technology customisation

In order to satisfy the requirements and the specifications above described, both PrestaShop and Open IRIS technologies needed customisations.

This section summarises the changes applied.

#### PrestaShop

The basic PrestaShop tool was enriched with the following plugins to extend its functionalities:

* Additional Product Attributes/Custom Product Fields Module[[10]](#footnote-10): It allowed to add new fields on the product pages. It was essential to implement all the service options as specified in the data model.
* Custom Checkout and Customer and Address Fields manager Module[[11]](#footnote-11): It allowed to easily add new fields on checkout pages and collect more data about the customers with extra fields on the registration form and customer account area. It was needed to implement both the customer and service order profiles.
* Dynamic Product Price Module[[12]](#footnote-12): It allowed to define dynamic prices based on the values that customers defined for the service options. It was needed in order to implement the experimental pay-for-use support.
* Google Accounts login-in module for PrestaShop: It was needed in order to extend the login functionality of PrestaShop.

In addition, ad-hoc customisations were needed to implement the authentication and user enrolment, and the Check-Out workflows. In particular, to retrieve customer information from the CheckIn service, to prevent the service order submission before the customer profile is completed and to profile the service orders. Minor changes were also done to adjust the service options, the service list in the cart and the e-mail templates. All the changes were applied to both the PrestaShop basic code and the extra modules listed above.

#### Open IRIS

The main changes on Open IRIS were related to:

* Integration of the Open IRIS authentication mechanism with the EGI CheckIn service;
* Development of the user enrolment procedure according to the specifications;
* Development of a cart allowing the submission of multiple service orders:
* Implementation of the service hierarchy as described in the specification.

In particular, last point was particularly complex to achieve considering that Open IRIS were designed to show services in a flat mode and categorise them via keywords. The concept of a service hierarchy did not exist in Open IRIS and its introduction requested relevant changes.

## Integration and dependencies

Both prototypes have been integrated with the EGI CheckIn service and have a dependency on it for the user authentication.

# The EGI Marketplace prototype

This section depicts how a customer can access the EGI Marketplace, login, discovery services, select service options and related attributes, and submit orders with illustrative screenshots.

Contents are based on the PrestaShop prototype, as it is the chosen technology to create a production instance of the Marketplace.

A similar content for the Open IRIS prototype is available in the D3.13 Second release of the EGI Service Registry and Marketplace prototype.

## Discover services and submit orders through the EGI Marketplace



Figure 3. Home page of the EGI Marketplace prototype based on PrestaShop technology.

1. After the customer lands on the EGI Marketplace, he/she can easily discovers services navigating on the service tree from the homepage.
2. The customer can log-in from each page of the marketplace. During the first login, he/she is requested to register. Part of the customer information is collected by the CheckIn service, see grey fields in Figure 5, the other attributes are manually provided by the same customer through the following form.



Figure 4. Form to gather the user profile. Fields in grey are filled in with values retrieved by the EGI CheckIn service and cannot be modified.

1. When the customer selects a service category, a new view showing all the services under such category is shown. Figure 6 shows the view for the Compute service category.  
   Now, the customer can then select the service he/she wants to order.



Figure 5. Service category view - Compute

1. After the selection of a service, the customer is redirected to the service page that provides:
   * A short description of the service.
   * Links to the terms of use, the default SLA and to a more detailed description.
   * All the available service options.

Figure 7 and Figure 8 show relevant parts of the Cloud Compute service page. As example, two options for the Cloud Compute service, Compute-intensive instance and High-memory instance, are showed.



Figure 6. Service view - Cloud Compute



Figure 7. Example of service options - Cloud Compute

1. Selecting one service option, the customer is then forwarded to a view that allows the customisation of the service option according to his/her requirements via the definition of additional attributes (see the data model in Appendix I). In addition, the customer can decide to add the option to the Cart to submit an order later. As example, see Figure 9 that shows the page for the Compute-Intensive Instance option of the Cloud Compute service.
2. Customer can repeat this operation for all the service he/she want to order.



Figure 8. View to order a service. Compute-Intensive Instance in Cloud Compute service

1. After the customer has added to the cart all the services he/she wants to order, the Check-Out process can be started by going to the cart. The cart lists all the services and the related options selected, see Figure 10.



Figure 9. List of selected service options in the Cart

In the cart, the customer is asked to provide some additional information that allows the profiling of the service order, see Figure 11.

The order can only be submitted after the acceptance of the terms of service.



Figure 10. Service order profiling in the cart

After the service order is submitted, the customer will be notified by e-mail and could check the status of his/her order through the customer dashboard.

# Marketplace as tool to automate EGI IMS processes

## Relationship between the EGI Service Catalogue and the marketplace

When operational, the EGI marketplace will become the unique place where a new customer could discover a service (or group of services), get information about it by browsing the service catalogue, and submit an order, specifying quantity, quality and duration. It will expose all the live EGI services, following the same structure of the service catalogue, exposing service options to allow customers to properly define their orders.

Furthermore, the marketplace will partially automate the service order management implementing procedures to handle the customers’ requests and triggering related IMS processes. It will act as an orchestrator of the several EGI tools involved in such processes exploiting the customer and service order profile information collected through its workflows.

### Relationship and impact on the EGI tools

The introduction of the Marketplace on the EGI tool ecosystem implies changes on other tools to both remove redundancies and implement new workflows. This is particularly relevant for tools that already offer features related to the service order management, such as e-Grant and the Applications on Demand service (AoDs). E-Grant had been implemented before the service catalogue was defined and since then has been providing a mechanism to support on-demand access to a subset of the services of the catalogue (Compute and Storage), while the AoDs partially implements a service discovery and a user profiling features to identify small research groups (the so-called Long Tail of Science).

Now that the Marketplace has been introduced into the picture, such e-Grant and AoDS features have become redundant. For this reason, we planned to convert e-Grant to a backend service for SLA/OLA management that will be integrated as plugin into the Operations Portal. In this way, it could benefit of already available interfaces towards other EGI tools (e.g. the monitoring system). In addition, e-Grant logic will be extended to cover the whole service catalogue. Also, the AoDs will need significant changes, it will entirely rely on the marketplace for the user profiling and for exposing its service options (the applications) to the customers. Details about the integration of the AoDs with the Marketplace are provided later in the document.

About the relationship with other EGI tools, the marketplace was integrated with the EGI AAI CheckIn service delegating to it the process to register, authenticate, authorise and profile the customers. Customers’ information retrieved by CheckIn could be integrated by the Marketplace as needed during the registration process.

GOCDB could be used by the Marketplace to automatically retrieve information about service instances and service providers.

An analysis is still on going to define the interface between the Marketplace and the AppDB. In particular, to understand how to expose the AppDB VMops dashboard to the EGI customers via the Marketplace. As first step, access to the VMops dashboard will be granted to AoDS users requesting Cloud Compute or Cloud Container Compute services. This will happen when the integration of the VMops dashboard with the AoDs will be completed.

## Service order management through the Marketplace

Once a customer submits an order via the Marketplace, it will be properly pre-processed by the same Marketplace and stored in a Service Order Management tool.

### Service order pre-processing

The pre-processing consists on an analysis of the ordered services. Indeed, a customer could request services of different nature, in terms of both service type (e.g. Cloud Compute and a FitSM training) and amount of resources (few resources or a large set of resources), which needs to be managed in different ways according to the EGI IMS. The Marketplace creates a service order for each sub-set of requested services that could be managed homogeneously (with the same IMS processes and procedures). For example, if a customer orders some Cloud Compute and Online Storage resources and a FitSM training, the marketplace will create two service orders, one for the Cloud Compute and Online Storage services, the other for the FitSM training. In such way, the Service Order Management tool could trigger the right IMS process to deal with the specific customer’s request.

Service orders are grouped as follows:

* Cloud Compute, HTC Compute, Cloud Container Compute, Online Storage, Archive Storage TO CHECK ARCHIVE STORAGE
* Data Transfer
* Training Infrastructure
* FiTSM
* Applications on Demand service: this group includes both Applications on Demand service options and any combination of the service in the first group under the condition that the amount of requested resources are lower than predefined thresholds.

This grouping will be updated when new services will be exposed via the Marketplace.

### Service order management tool

The Marketplace stores the following information in the Service Order Management tool:

* **Customer profile:** information allowing to identify the customer;
* **Service order profile:** information allowing to identify the service order typology (e.g. from a single user, a large community, a private company, a new or existing customer, etc.);
* **Service order:** list of services ordered by the customer.

Currently, the Service Order Management tool was implemented via a dedicated “service order” queue in the EGI ticketing system based on RT technology enriched with a ticket management module that monitor the queue and perform automatic actions when a change is detected (new order/ticket, ticket status updated, etc.). We decided to adopt this technology since it already provides many of the needed features and could be easily extended. Details on the service order-queue are available in the following section.

After a service order is recorded, it will be managed according to the EGI IMS processes with a series of manual and automatic actions. The following picture shows the interactions that happen during the management of a service order between the Marketplace, the Service Order management and the SLA/OLA management tools with the EGI IMS processes and databases.

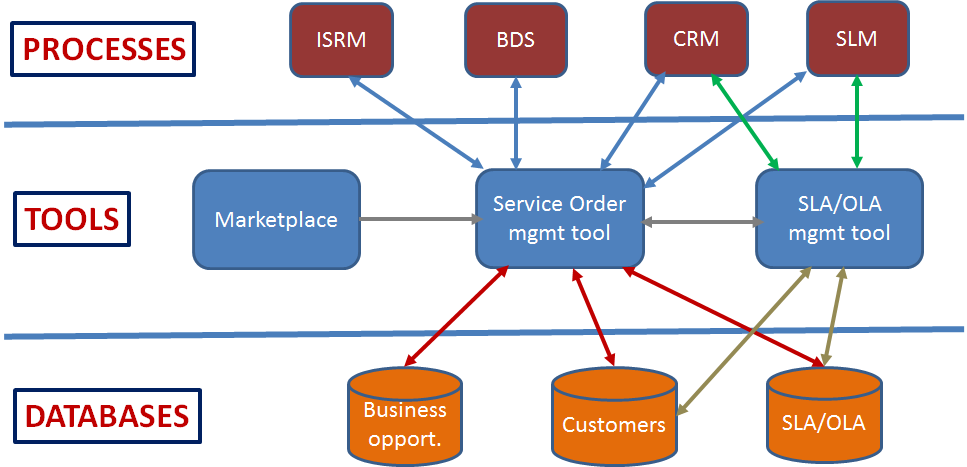


Figure 11. Interactions that happen during the management of a service order between the Marketplace, the Service Order management and the SLA/OLA management tools with the EGI IMS processes and databases.

A detailed description of all the processes and steps to manage a service order according to the EGI IMS is showed in Figure 14. The complexity of such workflow requires the creation of as much automatisms as possible to make the customer support effective. Currently, we already defined and implemented a workflow that, with a minimal human intervention, allows serving orders for the AoDs. It is described later in this section.

Automatisms to serve other order typologies will be defined and implemented gradually. EGI tools will be enriched of new features accordingly. For example, we have already planned to integrate e-Grant as backend system for SLA/OLA management into the Operations Portal, so creating the remaining building block to fully implement the service order management workflow.

#### Service order queue specification and tickets

After the user submits a service order through the marketplace, the Service Order Management tool will create one or more tickets, representing service orders, in the service order queue of the EGI RT ticketing system.

This section describes the structure of such tickets.

* **Ticket subject:** it is a string with the following format:

“Service order, [Customer Name] [Customer Surname], [Service 1], [Service 2], … , [Service N]”

For example:

“Service order, Diego Scardaci, CloudCompute, OnlineStorage”

* **Generic information:** this section contains generic information about the service orders such as an Order reference number, a Request status, etc. The following table lists and describes all the attributes of this section.

|  |  |  |
| --- | --- | --- |
| **Attributes** | **Mandatory/**  **Optional** | **Note** |
| Order reference number | Mandatory | Same value of the Marketplace order reference |
| Order status | Mandatory | Possible values:   * New * Approved * Rejected * Suspended   Default value: “New”. |
| AoDs | Mandatory | Yes/NO. Flag to identify orders that has to be served by the Applications on demand platform. |
| SLA | Optional | The marketplace leaves this attribute empty. It will contain a link to the SLA document (manually provided by an operator) when available.  This attribute is mandatory for “Approved” orders. |

* **Customer/User profile:** information retrieved by the EGI CheckIn service integrated with additional information gathered by the Marketplace during the registration process. The following table lists and describes all the attributes of this section.

|  |  |  |
| --- | --- | --- |
| **Attributes** | **Mandatory/**  **Optional** | **Note** |
| Name | Mandatory |  |
| Surname | Mandatory |  |
| e-mail | Mandatory |  |
| Display name | Mandatory | Human readable username |
| EGI unique identifier | Mandatory | Unique identifier assigned to the customer by CheckIn |
| Country | Mandatory |  |
| Institution | Mandatory |  |
| Department | Mandatory |  |
| Departmental web page | Optional | URL |
| Linkedin profile | Optional | URL |
| ResearchGate profile | Optional | URL |
| Supervisor name | Optional |  |
| Supervisor profile | Optional | URL |

* **Service order profile:** customer information associated to each service order gathered during the Check-Out phase in the Marketplace. Such information enables an appropriate service order management, accordingly to the EGI Integrated Management System (IMS) processes and procedures. The following table lists and describes all the attributes of this section.

|  |  |  |  |
| --- | --- | --- | --- |
| **Attributes** | **Mandatory/**  **Optional** | **Note** | |
| Customer typology | Mandatory | | * single user * representing a research community/project * representing a private company |
| Reason to request access to the EGI services | Mandatory | | Free text |
| User group name | Optional  (**Only if the customer represents a research community/project or a private company, leave empty in the other case)** | | It is a text that maps to the VO name. In the case the customers is already using the EGI infrastructure (VO list not empty), the VO name could be chosen from a drop down menu listing all the customer VOs (retrieved during the authentication) plus the option to specify a new VO. |
| Information on the project | Optional  (**Only if the customer represents a research community/project or a private company, leave empty in the other case)** | | Project name: text  Project web site: URL  To be expanded in the feature. It could be automatically filled in querying the Operations Portal (if the project is already using the EGI infrastructure). |

* **Service orders:** List of strings that contain the service options for each ordered service.

Service orders are represented in the ticket with the following sintax:

*[Service Area]/[Service]/[ServiceOption]?[Attribute1=XX]&[Attribute2=YY]&..&[AttributeN=ZZ]*

For example:

*Compute/CloudCompute/GeneralPurposeInstance?NumberOfCPUCores=2&AmountOfRAMPerCPUCore=2&LocalDisk=10&NumberofVMInstances=5&NumberOfDays=200&StartOfService=20170501&AccessType=Opportunistic*

Standard formats could be adopted in the future (e.g. JSON, XML) to facilitate the automatic processing of the data.

### Serving AoDs orders

A semi-automated workflow to manage AoDS orders has been already defined and is described in this section.

First of all, the Marketplace needs to identify users eligible for the AoDS. This is done during the service-order pre-processing phase.

A customer that submit a service order through the marketplace will be identified as an eligible user for the AoDs if he/she is a single user and one of the following conditions will be respected:

* If he/she directly requests access to one or more applications hosted in the AoDs (service options of the Applications on Demand service);
* If he/she orders one or more of the following services Cloud Compute, HTC Compute, Cloud Container Compute, Online Storage, Archive Storage with an amount of requested resources lower than predefined thresholds and with “Opportunistic” access mode;

In such case, the marketplace marks the service order as an order for the AoDs and store this information in the Service Order Management tool (set the AoDS flag to “yes” in the ticket related to the service order).

Details on the formula to identify users eligible for AoDs are provided in the next section.

The Service Order Management tool notifies AoDs administrators that will review the request and decide to approve or reject it updating the “Order status” attribute. This is the only manual step of the process.

A change on the “Order status” attribute triggers the Service Order Management tool that checks the new value and perform an action accordingly. If the user’s request has been rejected, an e-mail with the motivation is sent to the user. Otherwise, if the order has been approved, the tool contacts the CheckIn service to enable the user as an AoDs user. From a technical point of view, this means that the user will be registered as member of the AoDs VO, vo.access.egi.eu, in CheckIn.

After that, the user is enabled to access the AoDS and will be notified about the outcome. The Service Order Management tool will also provide the user with the information on how to access the requested AoDs applications. Direct links to access such applications are also available in the Marketplace AoDs section that will act as the front-end platform of the service.

The following picture describes the workflow to serve AoDs orders in a graphical format.



Figure 12. Semi-automatic workflow to manage a service order eligible for the Applications on Demand service.

#### Identify orders eligible for the AoDs

This section describes the formula that has been defined to identify orders eligible for the AoDs.

As described above, services ordered by a customer are grouped during the pre-processing performed by the marketplace. Only two service group types can be accessed through the AoDs:

* Groups that include one or more of the following services: Cloud Compute, HTC Compute, Cloud Container Compute, Online Storage, Archive Storage.
* Groups that include only Applications on Demand service and related options (the applications).

While the second group type (Applications on Demand service and related options) is always eligible for the AoDs, the first one can be served via the AoDs only under certain conditions:

* All the resources have been requested with “opportunistic” access mode (not “reserved”);
* The amount of requested resources should be lower than some predefined thresholds.

Currently, we have defined the thresholds described in the two following tables:

|  |  |  |  |
| --- | --- | --- | --- |
| Thresholds | Max value | Involved Services | Description |
| Total number of CPU cores | 20 cores | Cloud Compute and Cloud Container Compute | Include all the ordered cores for the General Purpose Instance options of Cloud Compute and Cloud Container Compute services[[13]](#footnote-13). |
| Total amount of RAM | 40 GB | Cloud Compute and Cloud Container Compute | Consider the total amount of memory ordered for the General Purpose Instance options of Cloud Compute and Cloud Container Compute services[[14]](#footnote-14). |
| Total block storage capacity | 100 GB | Online Storage | Consider the total amount of ordered block storage. |
| Total object storage capacity | 100 GB | Online Storage | Consider the total amount of ordered object storage. |

Figure 13. Cloud - Thresholds per AoDs.

|  |  |  |  |
| --- | --- | --- | --- |
| Thresholds | Max value | Involved Services | Description |
| Total number of CPU hours | 1000 CPU/hour | HTC Compute | Total amount of CPU/hours ordered for Base HTC[[15]](#footnote-15). |
| Amount of RAM per CPU core | 4 GB/core | HTC Compute | All the orders related to HTC compute must require not more than 4 GB per CPU core. |
| Total file storage capacity | 100 GB | Online Storage | Consider the total amount GB per of ordered file storage |

Figure 14. HTC -Thresholds per AoDs.

These thresholds will be validated and fine-tuned in the next months. Changes could be applied to both the “max values” and the threshold set if needed.

If a customer orders services belonging to the two service types eligible per AoDS (e.g. Cloud Compute with opportunistic access type and satisfying the thresholds and an applications of the AoDs), the request will be considered as a single order and only one ticket will be created in the service order queue. Otherwise, the orders will be split as specified in section 6.1.

### Tools to manage service orders

This section shortly describes the main role of each EGI tool in the service order management workflow when it will be fully implemented in the future.

* **CheckIn:** manages customer authentication and authorisation. When a customer is authorised to access a Service, CheckIn will take care to retrieve such information (e.g. VO membership) and provide the service provider with it. Customers authenticated with CheckIn in the Marketplace could access services through the same Marketplace interface without the need to re-do the authentication process.
* **GOCDB:** it will be used to associated service providers to the services published in the Marketplace.
* **Marketplace:** exposes the EGI services to the customers, which could submit orders, and acts as a Frontend (direct access to a service from the Marketplace. e.g. the AoDs case).
* **Service Order Management tool:** takes care of a customer order for all its lifetime, triggering other tools when needed.
* **Operations Portal:** it will create VOs on demand according to the requests coming from the Service Order Management tool.
* **SLA/OLA management tool:** plugin of the Operations Portal that will take care of the SLA/OLA management (creation, renewal, registry, report generations).
* **ARGO (monitoring) and Accounting system:** provides the SLA/OLA management tool with the information to the create the SLA/OLA reports.

Figure 15 shows the interactions between EGI tools in the service order management workflow.

This is a preliminary work that will be further extended in the next future.

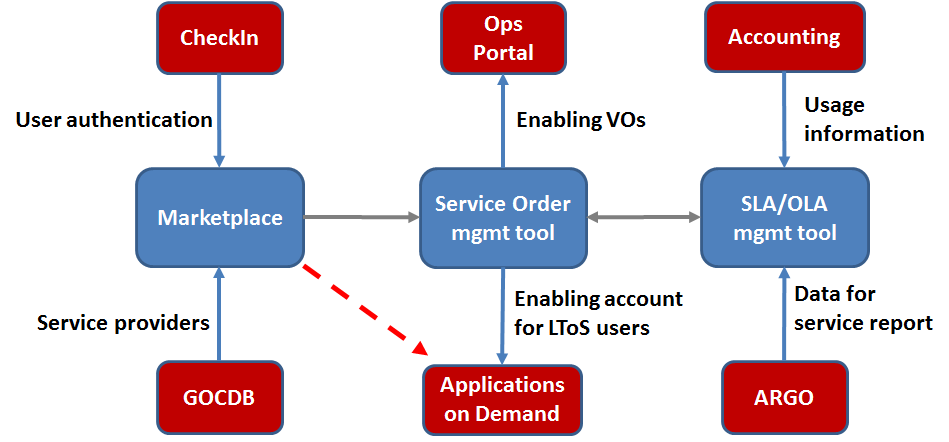


Figure 15. Interactions between EGI tools in the service order management workflow.

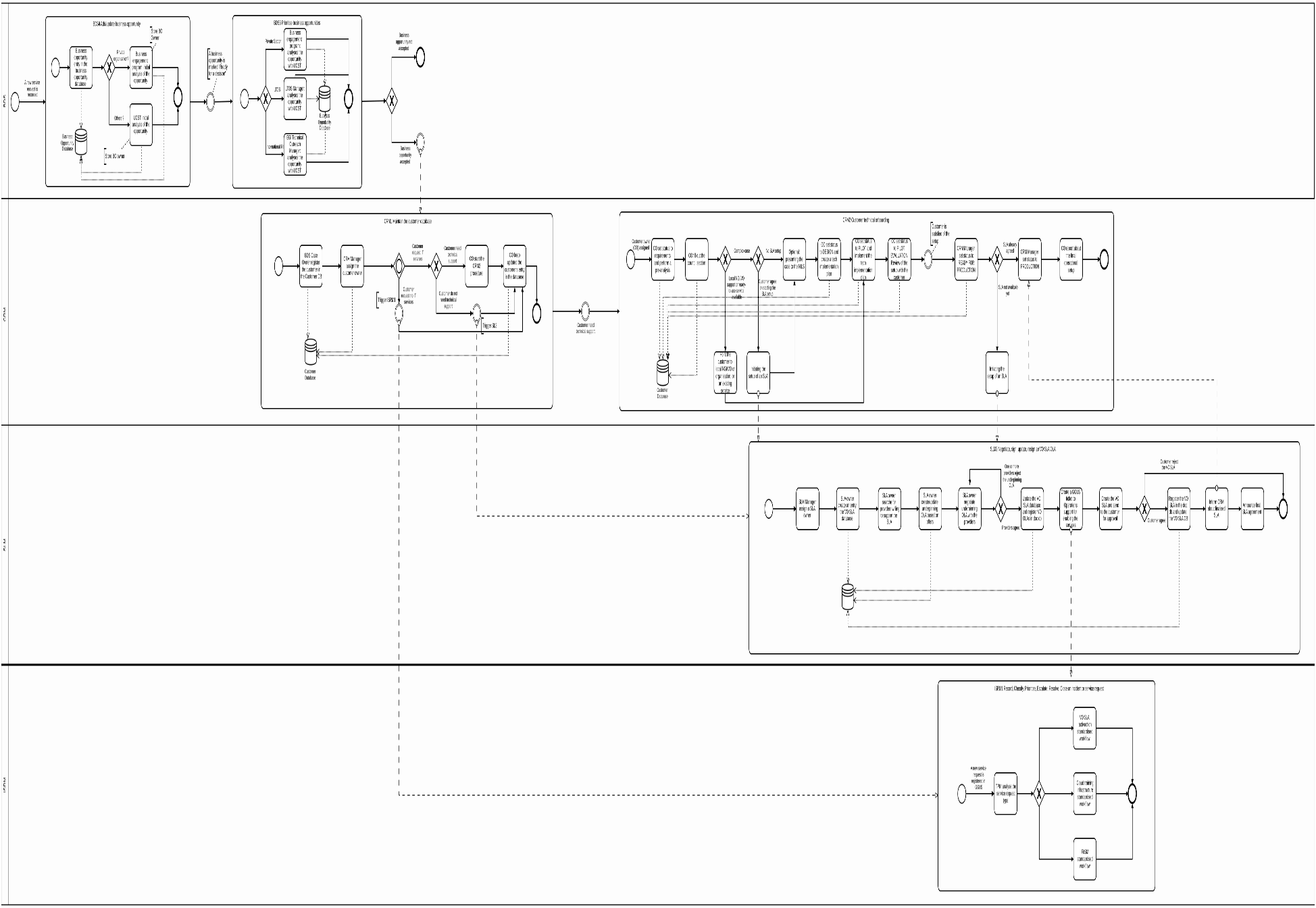


Figure 16. Service Order Management according to the EGI IMS.

# Enabling pay-for-use through the Marketplace

An analysis on how to implement the pay-for-use support in the Marketplace was performed in the last months. As result, three different options were defined.

1. EGI acts as a broker / or individual provider offers listed separate, but aggregated on the service level: under service level, differentiate each option according to the access mode, for free or for pay. Then, e.g., for Cloud Compute service, the Marketplace will expose the options “General purpose instance” and “General purpose instance for pay”, etc.
2. EGI acts as a broker: add the pay-for-use attributes directly in the service options (product in the marketplace). A flag “for pay” will be added as extra attribute. If this option is selected the access policies will change accordingly.
3. Direct contracts between customers and providers: an additional category, related to the pay-for-use providers, will be added in the first level of the data model hierarchy (service categories). Under this category, all the providers will be listed. Under each provider, all its products will be listed.

These options were discussed within the Pay-for-Use working group that decided to adopt the second solution in which is foreseen the role of EGI as a broker.

To implement this option, a flag “for pay” will be included as extra attribute in the Marketplace forms to order service options that could be accessed in pay-for-use mode. A clear explanation of the different access policies (“for free” and “for pay”) will be included in the service option descriptions highlighting the different level of services offered according to the chosen policies.

Furthermore, it will be clarified that access to large resource set “for free” requires agreements with the NGIs correlated with the national research infrastructure roadmap of each country.

The role of EGI as broker will facilitate the meet between the demand and the offer. Thanks to its expertise, EGI could analyse customers’ requirements, provide them with advices and technical support and identify the best providers to satisfy their needs.

The Pay-for-Use mode will be enabled into the Marketplace in the coming months and will be tested in the context of the NextGEOSS project[[16]](#footnote-16) where EGI is a member with exactly these duties, supporting project use cases and identifying the Cloud providers of the EGI Federation that satisfy their needs in the best possible way.

# Moving to production

After the objective to design and the development a prototype of a Service Registry and a Marketplace for the EGI infrastructure was fully achieved with the release of two demonstrators[[17]](#footnote-17), once based on Prestashop and the other based on Open IRIS, a plan was defined to enhance the PrestaShop based prototype and making it operational, reaching the Beta service phase by the end of the project.

As main activities, this plan included:

* The implementation of the service order pre-processing described in section 6.2.1.
* The implementation of the first version of the Service Order Management tool with the recording of the service orders and the related profiling information in the EGI RT[[18]](#footnote-18) system, see section 6.2.2 for details.
* The integration of the Marketplace with the Applications on Demand service.
* The implementation of the semi-automatic workflows to serve orders for AoDs described in section 6.2.3.
* The customisation of the PrestaShop customer dashboard to view/manage orders according to the needs of EGI.
* The integration of the Marketplace with the EGI web site.

All these activities were already completed or planned to be completed by the end of the project. Only the integration of the Marketplace with the EGI web site could be slightly postponed since it was considered more convenient collecting some feedback from our customers before deploying it into production.

Furthermore, according to the EGI IMS, a Service Design and Transition Package (SDTP) for the Marketplace was created in order to ensure proper evaluation, define the necessary pieces of information regarding the service design, delivery and transition planning. The SDTP also lists all the requisites the service has to satisfy to be moved in Beta (e.g. perform the service risks assessment, activate the support through EGI helpdesk, agree OLA/UA with the involved providers, etc.).

Many of the items covered by the plan have been already deeply described in Section 6 “Marketplace as tool to automate EGI IMS processes”. In this section, details will be provided for the other points:

* The integration of the Marketplace with the Applications on Demand service.
* The customisation of the PrestaShop customer dashboard to view/manage orders according to the needs of EGI.
* The integration of the Marketplace with the EGI web site.

## Integration with the Application on Demand service

The Application on Demand service (AoDs) is the EGI’s response to the requirements of researchers, scattered across Europe, without dedicated access to computational and storage resources, as well as other facilities needed to run scientific applications.

Briefly, the Service offers:

* **Applications** that are offered "as a services" through online graphical environments.
* **Portals, science gateways** and **Virtual Research Environments** that offer integrated development environments to port custom applications with High-throughput computing and cloud resources.
* **Cloud** and **High-throughput** compute resources suited for both compute/data intensive applications and for the hosting of scientific services.
* **Online Storage** resources for storing scientific data that serve as input and output for computational jobs.
* A network of **Consultants** and supporters who can provide guidance on the use of the service.

The AoDs operates as an open environment where any provider can integrate and share applications and compute/data components. The following applications/components are already integrated in the service and are available for users to access:

* Thematic applications for supporting Life Sciences disciplines: Galaxy, ClustalW2, Chipster, NAMD and AutoDock Vina;
* Generic utilities: Docker, Apache Tomcat, Hadoop, Marathon, and Chronos;
* Thematic applications for supporting Engineering disciplines: GnuPlot, Octave and the Statistical R for Computing and Jupyter Notebook;
* Thematic applications for supporting Art and Humanities disciplines: the parallel Semantic Search Engine.

Initially, the AoDs was designed including a Frontend, the User Registration Portal, which partially implemented a service discovery and a user profiling features to identify small research groups (the so-called Long Tail of Science). Now that the Marketplace is available, these features have become redundant. The Marketplace already profiles the customers and, in addition, gathers information on service orders allowing the identification of AoDs users. Furthermore, it has been considered more convenient offering to potential customers a unique point of access (frontend) to all the EGI services (the Marketplace).

For such reasons, we decided to integrate the AoDs with the Marketplace for both exploiting its profiling features and exposing its service options (the applications) to the customers. The Marketplace also lists the links to access the applications and, then, can be used as a full frontend for the AoDs.

For this aim, a new service category was introduced in the Marketplace data model, “APPLICATIONS”, and the AoDs was including in such category.

The new main page of the Marketplace is showed in the following image.



Figure 17. Marketplace homepage with the new "APPLICATIONS" service category.

AoDS service options, included in the third level of the Marketplace data model hierarchy, are the same applications offered by the AoDs.

Customers can order such applications together with other EGI services following the usual Marketplace workflows.



Figure 18. Applications on Demand service page in the Marketplace. Customers can order one or more applications together to other EGI services.

When the customer selects one application, he/she is redirected to a page, see Figure 19 and Figure 20, where the following elements are available:

* A form to submit the order allowing only to choose the time period to access the application. All the other attributes are not changeable since AoDs offers to each user a grant, providing a pre-defined quota of resources, for running the applications.
* Description of the application.
* Direct link to access the application after the user is authorised.
* List of service providers supporting the application.

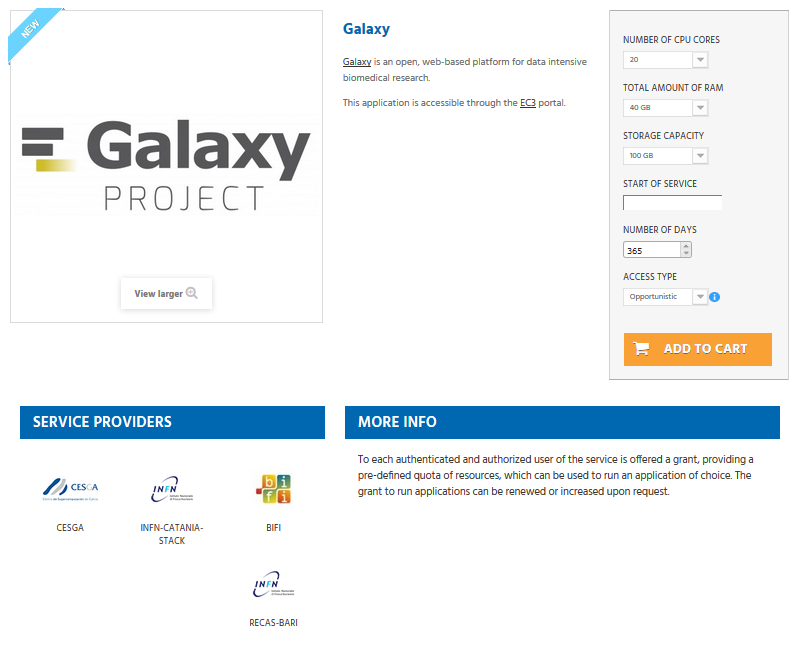


Figure 19. Example of a page allowing to request access to the Galaxy application.

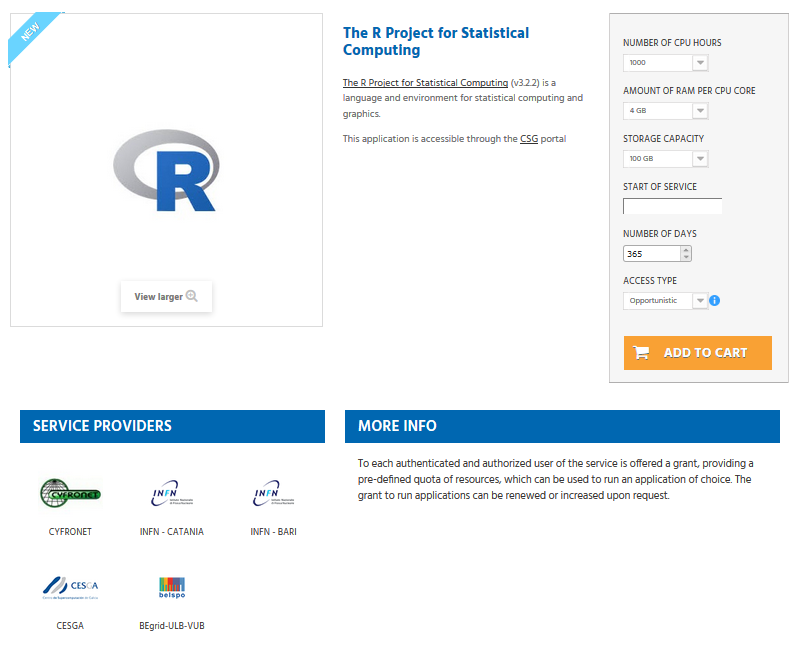


Figure 20. Example of a page allowing to request access to the R application.

Furthermore, since both the Marketplace and AoDs adopted CheckIn for authentication and authorisation, a user authenticated in the Marketplace and already authorised to access the AoDs could access transparently, without re-doing the authentication via CheckIn, to the AoDs applications from the Marketplace following links included in the application descriptions.

## Customer dashboard

After a service order was submitted, a customer needs to be kept informed about its status. For this aim, we decided to customise the built-in PrestaShop customer dashboard.

In particular, we implemented the following changes:

* The Status column shows information about the service order status as reported in the related RT ticket. In case of more tickets were created for one order in Prestashop, status of each request is reported in the “Details” section.
* A new column, SLA, was added. This column report the URL to retrieve the SLA document when an order is approved.

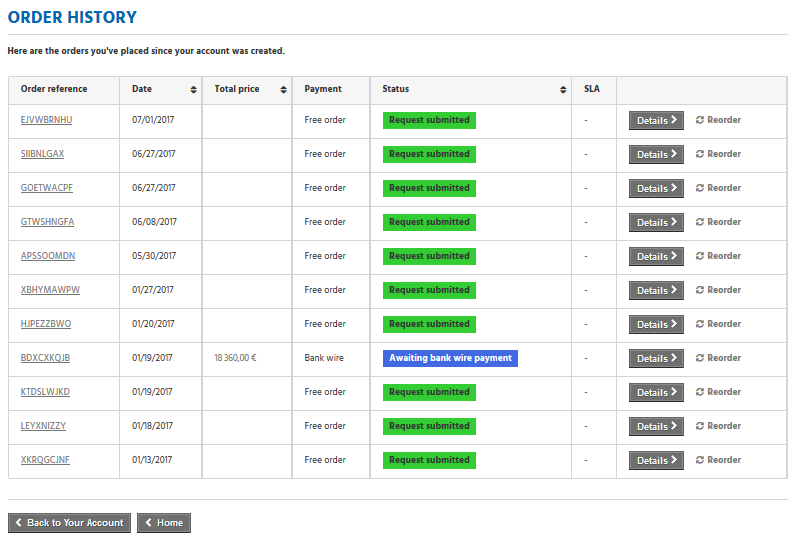


Figure 21. Customised PrestaShop customer dashboard.

## Integration with the EGI web-site

The EGI web site shows the EGI external service catalogue at <https://www.egi.eu/services/>. See the following image.

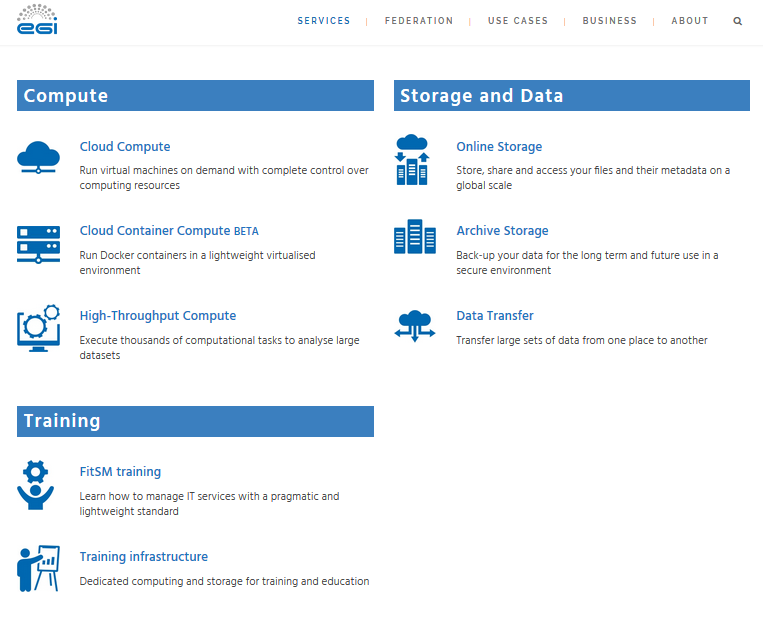


Figure 22. EGI Service Catalogue in the corporate web site.

Customers can retrieve more information about each specific service, visiting the dedicated web page, see the below image showing the Cloud Compute page as example:

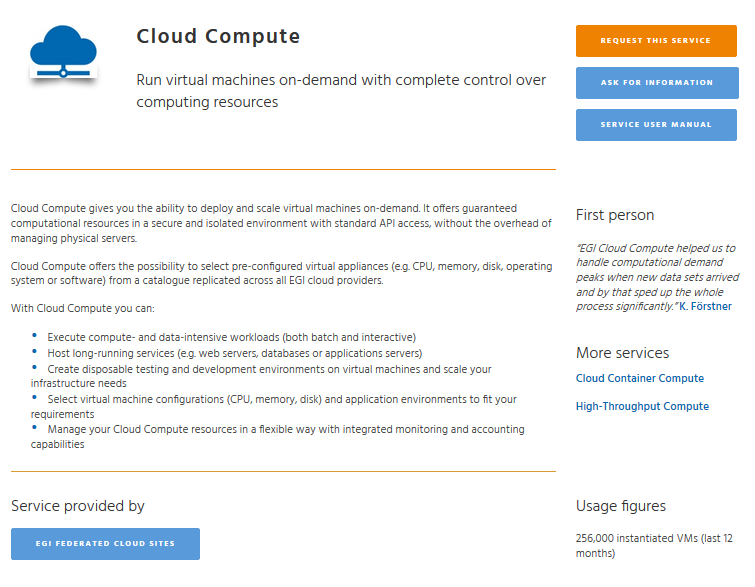


Figure 23. Page in the EGI web-site describing the Cloud Compute service.

Furthermore, customers can request more information about one or more services clicking on the “REQUEST THIS SERVICE” button and filling in a generic form. The form is the same for all the services and customers need to specify which services they are interested to use.

Integration between the EGI web site and Marketplace will be done linking the “REQUEST THIS SERVICE” button to the Marketplace page describing the service the customer is interested. Such page, in addition to the service presentation, lists also all the service options available for the given service facilitating, from one side, the customer on better specifying his/her requirements, and on the other side, EGI as service provider, collecting more and structured information in an order. This is the base for fully implementing the service order automation in the future.

See below, as example, the Marketplace page of the Cloud Compute service.

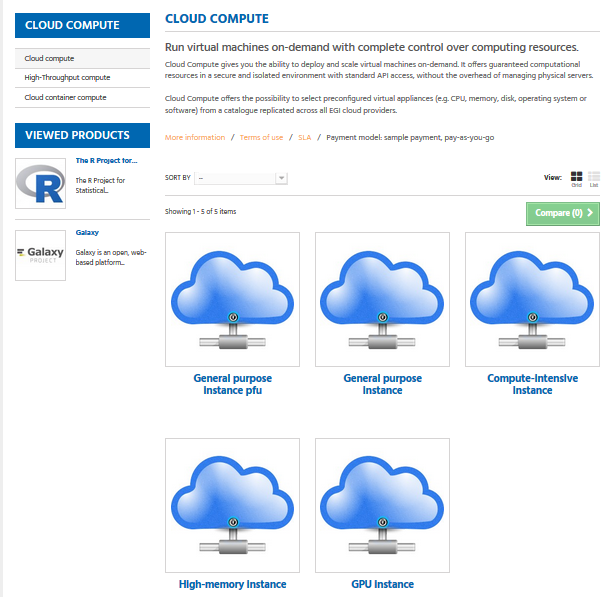


Figure 24. Cloud Compute service in the EGI Marketplace.

In the future, a tighter integration between the web site and the Marketplace could be implemented. The Marketplace could be included in the web-site top menu and all the applications described in the web site could be linked to the related entries into the Marketplace.

# Publishing of thematic services

Now that the marketplace is going to become operational, after a first phase where only EGI services will be published, this new tool will be opened to the whole EGI collaboration and partners.

The marketplace has the potential to become an important instrument to better promote and provide visibility to the thematic community services that are fundamental enablers of research and mediators of access to the EGI services. As thematic community service, we intend all the services and platforms that make use in some form of the EGI services.

The service design activity performed in the last months to integrate the Application on Demand service with the marketplace can be also considered as a driver for the integration of other platforms in the coming months. Indeed, the new “APPLICATIONS” service category was thought as the container for all the thematic platforms that will be exposed through the Marketplace in the future.

When a thematic platform will be integrated into the Marketplace, a new entry for such service will be created under the “APPLICATIONS” category and the related service options will be defined and exposed to the customers. We will also explore the possibility to split such category in sub-categories taking into account the different scientific disciplines served by the EGI infrastructure to facilitate the service discovery.

When possible, as we already did for the AoDs, the Marketplace AAI based on the CheckIn service will be made interoperable with the thematic platform AAI allowing a transparent access to the applications from the Marketplace for authorised customers. In such way, the Marketplace will act as a sort of unique Frontend for accessing the several applications and tools available in the EGI infrastructure (for some examples see https://www.egi.eu/use-cases/scientific-applications-tools/), hugely decreasing the barriers to discover and access them.

## Requirements to expose services in the marketplace

Service that will be published in the marketplace should satisfy some criteria such as guarantee a certain level of quality of the service, being compliance to generic security policies and EC regulations like GDPR, etc.

A preliminary work for the definition of such requirements was already completed and the results are described in this section. The requirement list will be fine-tuned and updated according to the feedback collected and the experience gained during the first phase of service boarding.

Services were classified in two categories:

* **Services in the EGI catalogue:** community platforms, in the form of scientific applications/VREs, that will be introduced in the EGI service catalogue. EGI financially supports the operations of the service. If the supplier is also a technology provider, the supplier retains IPs of the software produced. EGI and the supplier agree on how to maintain and further develop the service (new features).
* **External services:** leaving the ownership and funding of the service to the organization developing and operating it, but promoting the service in the EGI service marketplace as an "EGI powered" community service, operated by a partner, in the context of a partnership agreement.

For each of this category requirements were defined. They are described in the following table.

|  |  |  |
| --- | --- | --- |
| Requirements | Services in the EGI Catalogue | External services (from external partner’s catalogues) |
| Belongs to EGI catalogue | * Yes (EGI is the provider) | * No (Partner is the provider) |
| Published in EGI marketplace | * Yes | * Yes, if requirements in this table are met and if the partner agrees |
| Agreement type | * OLA or UA (underpinning agreement) established | Contract between the EGI Foundation and the Service Provider including:   * Motivation of the collaboration * Acceptance of the requirement list * SLA defining EGI Service Components (where applicable) |
| Readiness | * TRL 8 or higher | * TRL 8 or higher |
| Quality of Service | * Min Availability/Reliability (thresholds defined by EGI) * Service is monitored and registered in GOCDB | * Min Availability/Reliability (thresholds defined by service provider) * Minimal monitoring in place by EGI (where possible) to ensure online services are up and running |
| Support | * Mandatory via the EGI support system (GGUS) | * Mandatory (support channel defined by provider) |
| Acknowledgement policy | * EGI acknowledgement mandatory | * EGI acknowledgement mandatory if service relies on components provided by EGI |
| Annual report on scientific publications and users | * Mandatory for services where it is applicable | * Mandatory if service relies on components provided by EGI |
| Service Performance Report | * Mandatory (requires report from supplier) | * No |
| Interoperation levels:   * Level 1: AAI * Level 2: AAI, accounting, monitoring, service registration | * Level 2 (mandatory) | * Level 1 (mandatory where applicable) |
| Compliance to EGI policies | * Mandatory | * Compliant to generic security policies and EC regulations |
| Terms of use | EGI defined:   * Service: Acceptable Use Policy and Conditions of Use[[19]](#footnote-19) * Content (where applicable): <depends on the service> * Software (where applicable): The service code software is licensed under <depends on the service> and is available upon request. | * Defined by Provider |

# Future plans

In the next future, the marketplace activity will continue with activities in four main areas:

* Technical enhancements on the Marketplace.
* Publishing of thematic services.
* Service order management automation.
* Pay-for-use.

In the first area, work will be done to create interfaces towards external tools. EGI is planning to adopt a Service Portfolio Management tool to manage in a more structured way its Service Portfolio, this tool should feed the Marketplace with information on the EGI live services. Then, service information exposed in the Marketplace should be automatically retrieved with a proper interface. In addition, EGI will publish its service catalogues also in the service registry currently under development within the eInfraCentral project[[20]](#footnote-20). The Marketplace should be able to publish EGI service information in standard format to enable its publication in the eInfraCentral registry.

About the publishing of thematic services, the current prototype solution based on the integration with AoDs will be evaluated and fine-tuned. After that, selected thematic service providers will be contacted to be invited to join the Marketplace. When enough experience will be gained, a structured procedure to involve other providers will be defined. Procedures to delegate the registration and the management of service entries to their providers will be implemented and the criteria to publish services in the Marketplace will be fine-tuned. Furthermore, it will be explored the possibility to create “satellite” Marketplace per NGI o provider linked to EGI central instance.

The work on the service order management automation will continue both in term of design and implementation with the final aim to automate as much as possible the management of all the order types. The RT queue will be extended with information that will allow to identify the IMS processes that should take care of an order in each phase. The SLA/OLA management tool will be implemented enabling the automatic generation of SLA/OLA and related reports.

Finally, pay-for-use entry will be included in the Marketplace as defined in this document and the implementation will be tested with the launch of the first commercial offers.

# Plan for Exploitation and Dissemination

***TO BE UPDATED***

|  |  |
| --- | --- |
| *Name of the result* | EGI Marketplace |
| *DEFINITION* | |
| *Category of result* | Software & service innovation |
| *Description of the result* | The EGI Marketplace will become the main instrument to advertise the EGI services, manage the customer service requests and facilitate access to services as much as possible. |
| *EXPLOITATION* | |
| *Target group(s)* | RIs, international research collaborations, single users, industry/SMEs, service providers, funding agencies and decision/policy makers. |
| *Needs* | There is an increasingly high demand for e-Infrastructure services for researchers. The EGI Marketplace platform provides a portal where researchers can easily discover and gain access to those resources. |
| *How the target groups will use the result?* | Resource providers within the EGI federation who are interested in providing services to internal and external resources can now expose them via the EGI Marketplace. In addition, researchers now have a common location to discover services and resources that they may require for their. The EGI Marketplace can then provide a framework for which e-Infrastructure services are provided to users internal and external to the EGI collaboration. |
| *Benefits* | The primary benefits are efficient sharing of resources and provision or e-Infrastructure services to researchers. Easy discoverability and access to the services. |
| *How will you protect the results?* | The EGI Marketplace prototypes are available to others to use freely. An open-source license (to be defined) will protect the customisations applied to the underlying technologies. |
| *Actions for exploitation* | Both prototypes are developed with a SaaS delivery model. The PrestaShop model offers a full service model, where the EGI Federation provides the services to add services into the store on the behalf of service providers. The goal is for that to transition to a self-service model. Open IRIS already offers a full self-service model where resource providers can login and register a resource provider and offer services via the platform. The creation of satellite marketplaces for service providers is already planned. |
| *URL to project result* | * PrestaShop prototype: <http://marketplace.egi.eu/> * Open IRIS prototype: <http://egi.science-it.ch> |
| *Success criteria* | Effectiveness of the marketplace will be monitored by counting the number of accesses and the service requests performed through it. The latter value will be compared with the number of service requests managed through other traditional channels. |
| *DISSEMINATION* | |
| *Key messages* | Discover and access EGI services with a few clicks. |
| *Channels* | EGI web site, EGI newsletter, participation in conferences |
| *Actions for dissemination* | * Participation to conferences * Article in the newsletter * Promotion in the EGI web site * Marketplace link added to the EGI dissemination material (e.g. leaflet) |
| *Cost* | N.A. |
| *Evaluation* | Number of accesses and the service requests performed through the Marketplace. |

1. EGI Marketplace data model

The data model of the marketplace reflects the EGI service catalogue structure (https://www.egi.eu/services & https://www.egi.eu/internal-services). It is made of a three-level hierarchy where the first level contains the EGI service areas (categories in the marketplace) and the second level maps to the EGI services (sub-categories in the marketplace). Furthermore, an additional level defines the EGI service options (products in the marketplace). The service options represents the products that the end user could access or purchase in the marketplace.

The first two levels of the hierarchy are described in the table below.

Table 1. EGI Service Catalogue - first and second levels

|  |  |
| --- | --- |
| **Service area** | **Services** |
| **Compute** | Cloud Compute, Cloud Container Compute and High-Throughput Compute |
| **Storage** | Online Storage, Archive Storage |
| **Data** | Data transfer, Content Distribution |
| **Operations** | Configuration Database, Service Monitoring |
| **Security** | Check-in, Attribute Management |
| **Training** | Training Infrastructure, FitSM |
| **Applications** | Applications on Demand |

For all the services in the external catalogue, service options have been also defined. They are described in this appendix.

The following subsections describe the attributes that will be shown in the marketplace for each level of the hierarchy:

* Service areas (category in the marketplace)
* Services (sub-category in the marketplace)
* Service options (what the customers can order in the marketplace)

Finally, data to describe service providers in the marketplace are also defined. Each service in the marketplace will be linked to one or more providers.

**Service areas (category in the marketplace):**

Each category in the Marketplace demonstrators is described with the attributes shown in the table below.

Table 2. Service areas

|  |  |  |
| --- | --- | --- |
| **Attribute** | **Definition** | **Notes** |
| **Name** | Name of the category | The first level category maps to the EGI service area:   * Compute * Storage * Data * Operations * Security * Training |
| **Description** | Description of the category | Inspired by the description of the EGI service areas in the service catalogue: short, punchy and expressing the value |

**Service areas in the EGI Marketplace demonstrators:**

The following table lists the four categories that were included in the EGI marketplace demonstrators with the related description.

Table 3. Service areas in the EGI Marketplace demonstrators.

|  |  |
| --- | --- |
| **Service Area** | **Description** |
| **Compute** | Services for processing data supporting different computing models |
| **Storage** | Services for storing/retrieving files |
| **Data** | Services for moving or distributing data |
| **Training** | Services for skills development |

**Services (sub-categories in the marketplace):**

The EGI Marketplace demonstrators present services to the end-users with a set of attributes described in the table below. These attributes are inherited and sometime specialised by the service options.

Table 4. Services (sub-categories in the marketplace).

|  |  |  |
| --- | --- | --- |
| **Attribute** | **Definition** | **Notes** |
| **Name** | Name of a specific service as assigned by the service provider | Format: Free text  Example: Cloud Compute |
| **Unique ID** | Global unique and persistent identifier of a specific service  Note: this allows to map a service to a specific organization/e-Infrastructure | Format: DOI or any other relevant standard; it should contain information about the identifier type and value.  Additional info:  A PID can be used ideally resolvable to a landing page or a machine readable data typed metadata page. It should be assigned by the CoS owner. |
| **Short description** | High-level description of what the service does in terms of functionalities it provides and the resources it enables access to. It may include the value (benefit) to a customer and their users delivered by a service | Format: Free text  Additional info:  It may provide also information related to the offered capacity, number of installations, underlying data that is offered.  Benefits are usually related to alleviating pains (e.g., eliminate undesirable outcomes, obstacles or risks) or producing gains (e.g. increased performance, social gains, positive emotions or cost saving). |
| **Description** | Longer description of what the service does in terms of functionalities it provides and the resources it enables access to the service | Format: Free text |
| **Web page** | URL to a webpage providing more information about the service | Format: URL  Additional info:  This webpage is usually hosted and maintained by the service provider. It contains current and additional information, such as what APIs are supported or links to the documentation. |
| **Service phase** | Phase of the service design selected among:  beta: service being developed while available for testing publicly  production: service available in the live environment meeting security/performance requirements | Source: UK Government Service Design Manual  Format: Closed enumeration |
| **Category** | Link to categories this service belongs to | Format: Closed enumeration |
| **Service condition** | Restrictions that apply to this service | Format: List of sentences, each of them defining a condition |
| **Payment Model** | Supported payment models and restrictions that apply to each of them | Format: List of sentences, each of them stating the type of payment model and the restriction that applies to it.  Additional info:  Example of types of payment models are: free, pay-as-you-go, subscription, membership  Variable pricing for corporate customers, higher education, etc. |
| **Term of use** | URL to a document containing the rules which one must agree to abide by in order to use the service | Format: URL |
| **SLA** | URL to a document containing information about the levels of performance that a service provider is expected to achieve (service level agreement) | Format: List of URLs |

**Services in the second release of the marketplace:**

Services that were included in the second release of the Marketplace classified for service areas.

Table 5. Services in the second release of the marketplace.

|  |  |
| --- | --- |
| **Service area** | **Services** |
| **Compute** | Cloud Compute, Cloud Container Compute and High-Throughput Compute |
| **Storage** | Online Storage, Archive Storage |
| **Data** | Data transfer |
| **Training** | Training Infrastructure, FitSM |

**Service options:**

The service options includes some common options described in the table below.

Table 6. Common service options.

|  |  |  |
| --- | --- | --- |
| **Common service options** | **Description** | **Notes** |
| **Description of the research activity** | Information on the research activity that needs to access the EGI services. In particular, relevant when access for free is requested. | This attribute has to be requested to the customer in the Cart and not in the service option form. |
| **Access type** | Reserved or opportunistic (does not apply to the training and to some Cloud Computing options). | When applicable, this attribute has to be requested in the service option form. |
| **Start and end dates** | Specify the period in which users will access the services. The period can also be undefined. |  |

* **Compute/Cloud Compute**

Service description: Cloud Compute gives you the ability to deploy and scale virtual machines on­-demand. It offers guaranteed computational resources in a secure and isolated environment with standard API access, without the overhead of managing physical servers.

Cloud Compute offers the possibility to select pre­configured virtual appliances (e.g. CPU, memory, disk, operating system or software) from a catalogue replicated across all EGI cloud providers.

Table 7. Cloud Compute service options.

|  |  |  |
| --- | --- | --- |
| **Service option (Instance types)** | **Description** | **Attributes** |
| **General purpose instance** | Base performance instance type.  Features:   * Accessible in opportunistic or reserved ways * CPU cores could be overcommitted   Ideals for:   * Web services * Micro-services * Development environments * Building server * Small database * Test environments | Number of CPU cores: [1,2,4,8]  Amount of RAM per CPU core (GB): [1,2,4]  Local disk (GB): [10,20,40] |
| **Compute-intensive instance** | Optimised instance for computing tasks.  Features:   * High performance CPU cores * Until 64 CPU cores * Real CPU cores (non- overcommitted) * Low latency network * Reserved instances   Ideals for:   * Batch computing * High-performance applications and web services * Distributed analysis * Video encoding | Number of CPU cores: [8,12,16,20,24,28,32,64]  Amount of RAM per CPU core (GB): [2,4,8]  Local disk (GB): [10,20,40]  Note 1: Some CPU cores/RAM per core combinations are not permitted. Maximum total RAM available for 1 instance is 240 GB.  Note 2: Only reserved instances admissible. |
| **High-memory instance** | Optimised instances for tasks that require more memory relative to virtual CPUs.  Features:   * High amount of RAM per CPU core. * Up to 240 GB of RAM in total. * Reserved instances   Ideal for:   * Running in-memory database * Running in-memory stores (e.g. redis,  memcached) * In-memory big data processing engines (e.g. Apache Spark). | Number of CPU Cores: [2,4,8,12,16]  Amount of RAM per CPU core (GB): [16,32,48,64,80,96,112,120]  Local disk (GB): [10,20,40]  Note 1: Some CPU Cores/RAM per core combinations are not permitted. Maximum total RAM available for 1 instance is 240 GB.  Note 2: Only reserved instances admissible. |
| **GPU instance** | GPU-enabled instances.  Features:   * 1 or 2 GPU cores * 8 CPU cores for each GPU core * Large memory   Ideals for:   * graphics and general purpose GPU compute applications | Number of GPU cores: [1,2]  Number of CPU cores per GPU core: [8]  Amount of RAM (GB): [24,50]  Local disk (GB): [280]  Note 1: The amount of RAM will be 24GB with 1 GPU core or 50GB with 2 GPU cores.  Note 2: Only reserved instances admissible. |

* **Compute/Cloud Container Compute**

Service description: Cloud Container Compute (in Beta phase) gives you the ability to deploy and scale Docker containers on-demand. It offers guaranteed computational resources in a secure and isolated environment with standard API access, without the overhead of managing the operating system. The result is improved performance, ideal for development work.

Same options as the Cloud Compute service.

* **Compute/High-throughput Compute**

Service description: High­-throughput Compute allows you to run computational jobs at scale on the EGI infrastructure. It allows you to analyse large datasets and execute thousands of parallel computing tasks.

High­-throughput Compute is provided by a distributed network of computing centres, accessible via a standard interface and membership of a virtual organisation. EGI offers more than 650,000 cores of installed capacity, supporting about 1.6 million computing jobs per day.

This service supports research and innovation at all scales: from individuals to large collaborations.

Table 8. High-throughput Compute service options.

|  |  |  |
| --- | --- | --- |
| **Service option** | **Description** | **Attributes** |
| **Base** | It allows the execution of large numbers of independent or loosely coupled computing tasks. Limited parallel and multi-thread computing can be supported as well. | Number of CPU cores: [1-32]  Amount of RAM per CPU core (GB): [4-8]  Other technical requirements: [text] |
| **MPI** | It allows parallel computing, with support of MPI protocol and libraries. | Number of CPU cores: [1-256]  Amount of RAM per CPU core (GB): [4-8]  Parallelism (Threads): [8-24]  Other technical requirements: [text] |

* **Storage/Online Storage**

Service description: Online Storage allows you to store data in a reliable and high-­quality environment and share it across distributed teams. Your data can be accessed through different standard protocols and can be replicated across different providers to increase fault­-tolerance.

Online Storage gives you complete control over the data you share and with whom.

Table 9. Online Storage service options.

|  |  |  |
| --- | --- | --- |
| **Service option** | **Description** | **Attributes** |
| **Block storage** | Block Storage is a block-level storage solution that allows you to expand the storage capacity of your instances in the EGI Federated Cloud. This means you can increase your storage without increasing the size or capacity of your instance or by provisioning new ones. Once you mount and format your drive, you can use it just like a regular hard drive attached to your server. You can also detach your block storage volume from one server and attach it to another or you can delete your server, keeping your data intact and ready for the next time you need it. | Storage capacity [TB]: [1, 5, 10, other]  Special requirements (e.g. performance, close to the computational resources, etc.): [text] |
| **Object storage** | Object storage manages data as objects. Each object includes the data itself, a variable amount of metadata, and a globally unique identifier. Cloud object storage allows relatively inexpensive, scalable and self-healing retention of massive amounts of unstructured data. | Storage capacity [TB]: [1, 5, 10, other]  Interfaces: [CDMI, POSIX, SWIFT, to be specified by the users]  Special requirements (e.g. performance, close to the computational resources, etc.): [text] |
| **File storage** | Highly scalable storage system accessible from anywhere allowing to easily share data through different standard interfaces. It assigns global identifiers to files and allows to organise your data using a flexible hierarchical structure. | Technology: [DPM, DCache, STORM, …, any]  Special requirements (e.g. performance, close to a specific site, etc.): [text] |

* **Storage/Archive Storage**

Service description: Archive Storage allows you to store large amounts of data in a secure environment freeing up your usual online storage resources.

The data on the Archive Storage can be replicated across several storage sites, thanks to the adoption of interoperable open standards. The service is optimised for infrequent access, which allows it to be delivered at a lower cost.

Table 10. Archive Storage service options.

|  |  |  |
| --- | --- | --- |
| **Service option** | **Description** | **Attributes** |
| **Archive Storage** | Archive Storage allows you to store large amounts of data in a secure environment freeing up your usual online storage resources.  The data on the Archive Storage can be replicated across several storage sites, thanks to the adoption of interoperable open standards. The service is optimised for infrequent access.  Main characteristics:   * Store data for long-term retention * Store large amount of data * Free up your online storage | Amount of data (TB): [number] |

* **Data/Data Transfer**

Service description: Data Transfer allows you to move any type of data files asynchronously from one place to another. The service includes dedicated interfaces to display statistics of on-going transfers and manage network resources.

Data Transfer is ideal to move large amounts of files or very large files. The Data Transfer service has mechanisms to ensure automatic retry in case of failure.

Table 11. Data Transfer service options.

|  |  |  |
| --- | --- | --- |
| **Service option** | **Description** | **Attributes** |
| **Data Transfer** | Data Transfer allows you to move any type of data files asynchronously from one place to another. The service includes dedicated interfaces to display statistics of on-going transfers and manage network resources.  Data Transfer is ideal to move large amounts of files or very large files. The Data Transfer service has mechanisms to ensure automatic retry in case of failure.  Main characteristics:   * Ideal for very large files * Able to handle large amounts of files * Transfer process with automatic retry | Tool: [FTS3, Globus Online] |

* **Training/Training Infrastructure**

Service description: Training Infrastructure offers cloud compute and online storage for training activities. It is useful to organise onsite tutorials or workshops and online training courses or as a platform for self-paced learning.

For example, with the Training Infrastructure trainers can create and deploy any custom virtual machine images for the students. A library of existing virtual machines images is offered so that tutors can customise and use these according to their specific needs. This allows easy deployment, sharing and reuse of course materials.

The Training Infrastructure uses the same high-quality computing and storage environment that EGI provides to researchers.

Table 12. Training Infrastructure service options.

|  |  |  |
| --- | --- | --- |
| **Service option** | **Description** | **Attributes** |
| **Cloud Training Infrastructure** | The Training Infrastructure offers cloud compute and online storage for training activities. It is useful to organise onsite tutorials or workshops and online training courses or as a platform for self­-paced learning.  For example, with the Training Infrastructure trainers can create and deploy any custom virtual machine images for the students. A library of existing virtual machines images is offered so that tutors can customise and use these according to their specific needs. This allows easy deployment, sharing and reuse of course materials.  The Training Infrastructure uses the same high­ quality computing and storage environment that EGI provides to researchers. | Location: [text]  Aim of the training event: [text]  Number of concurrent trainees: [number]  Number of CPU cores (total): [number]  Amount of RAM (total) (GB): [number]  Online storage size (total) (GB): [number]  Special requirements (e.g. VM images/apps available in the training infra, big instances, etc.): [text] |

* **Training/FitSM**

Service description: FitSM is a lightweight standards family aimed at facilitating service management in IT service provision, including federated scenarios. FitSM training aims at providing those involved in operating federated infrastructures with the professional skills they need in order to effectively manage their services.

FitSM professional training is certified by TÜV SÜD, a global leader in standardisation and certification. The qualification programme offers three training levels: Foundation, Advanced and Expert.

Table 13. FitSM service options.

|  |  |  |
| --- | --- | --- |
| **Service option** | **Description** | **Attributes** |
| **Foundation level** | Target audience:   * All individuals involved in the provisioning of (federated) IT services * Candidates who wish to progress to advanced level of the qualification and certification scheme   Contents:   * Basic IT service management concepts and terms (based on FitSM-0) * Purpose and structure of FitSM standards and their relationship to other standards * Process framework underlying FitSM * Requirements defined in FitSM-1 | Number of students: [number]  Location: [text] |
| **Advanced Level in Service Planning and Delivery** | Target audience:   * Individuals aiming to fulfil a coordinating role in the ITSM processes related to the planning and delivery of IT services * Candidates who wish to progress to expert level of the qualification and certification scheme   Contents:   * Repeat the most important foundation knowledge on (lightweight) ITSM * Become familiar with the general aspects of implementing ITSM, the processes required to plan and deliver services effectively (according to the FitSM-1 standard), and important interfaces in a service management system * ITSM processes in focus of this training: Service portfolio management, service level management, service reporting management, service availability and continuity management, capacity management, information security management, customer relationship management, supplier relationship management   Entry requirements:   * Must hold FitSM Foundation Certificate | Number of students: [number]  Location: [text] |
| **Advanced Level in Service Operation and Control** | Target audience:   * Individuals aiming to fulfil a coordinating role in the ITSM processes related to the operation and control of IT services * Candidates who wish to progress to expert level of the qualification and certification scheme   Contents:   * Repeat the most important foundation knowledge on (lightweight) ITSM * Become familiar with the general aspects of implementing ITSM, the processes required to operate and control services effectively (according to the FitSM-1 standard), and important interfaces in a service management system. * ITSM processes in focus of this training: Incident and service request management, problem management, configuration management, change management, release and deployment management, continual service improvement management   Entry requirements:   * Must hold FitSM Foundation Certificate | Number of students: [number]  Location: [text] |
| **Expert level** | Target audience:   * Individuals aiming to fulfil the role of internal or external consultant or auditor in the topic area of IT service management (ITSM).   Contents:   * Repeat the most important advanced level knowledge on (lightweight) ITSM * ITSM-related frameworks and standards * Understanding the organisational context of implementing ITSM (including federation structures and scope setting) * Leadership and governance (including top management responsibilities, governance practices, effective communication and organisational change management) * Planning and implementing ITSM (including service management planning, service design and transition and effective documentation) * Monitoring, reviewing and improving ITSM (including capability & maturity assessment, key performance indicators, managing an audit program and conducting audits)   Entry requirements:   * Must hold both FitSM Advanced Certificates in Service Planning and Delivery (SPD) and Service Operations and Control (SOC) | Number of students: [number]  Location: [text] |
| **Consultancy** | Advise on how to manage IT services with a pragmatic and lightweight standard. | Description of the consultancy: [text] |

**Service Providers:**

The following table defines the attributes that identify the service providers within the EGI marketplace demonstrators.

Table 14. Service providers.

|  |  |  |
| --- | --- | --- |
| **Attribute** | **Definition** | **Notes** |
| **Name** | Organisation or federation or part of an organisation or federation that manages and delivers a service or services to customers | Format: Free text  Additional info:  The entity with whom the customer signs the SLA; this entity will be able to give information about other contributors to the service |
| **Description** | Short description of the organisation or federation or part of an organisation or federation | Format: Free text |
| **Contacts** | Delegate of the organisation | Format: Name and e-mail |
| **Logo** | Organisation logo | Format: Image |
| **Webpage** | URL to the provider website | Format: URL |



1. https://documents.egi.eu/document/2535 [↑](#footnote-ref-1)
2. <http://egi.science-it.ch> [↑](#footnote-ref-2)
3. <https://www.prestashop.com/en/> [↑](#footnote-ref-3)
4. <https://documents.egi.eu/document/2658> [↑](#footnote-ref-4)
5. <http://go.egi.eu/ServiceCatalogue> [↑](#footnote-ref-5)
6. <https://documents.egi.eu/document/2914> [↑](#footnote-ref-6)
7. <https://documents.egi.eu/document/3028> [↑](#footnote-ref-7)
8. <https://www.prestashop.com/en/documentation> [↑](#footnote-ref-8)
9. <http://iris.science-it.ch> [↑](#footnote-ref-9)
10. <http://addons.prestashop.com/en/20201-additional-product-attributes-custom-product-fields.html> [↑](#footnote-ref-10)
11. <http://addons.prestashop.com/en/19736-custom-checkout-and-customer-and-address-fields-manager.html> [↑](#footnote-ref-11)
12. <http://addons.prestashop.com/en/19389-dynamic-product-price.html> [↑](#footnote-ref-12)
13. Other options of the Cloud Compute and Cloud Container Compute services admit only reserved instances then an order including such options cannot be eligible for the AoDs. [↑](#footnote-ref-13)
14. Other options of the Cloud Compute and Cloud Container Compute services admit only reserved instances then an order including such options cannot be eligible for the AoDs. [↑](#footnote-ref-14)
15. MPI HTC service option is not eligible per the AoDs. [↑](#footnote-ref-15)
16. http://nextgeoss.eu/ [↑](#footnote-ref-16)
17. EGI-Engage D3.13 Second release of the EGI Service Registry and Marketplace prototype: <https://documents.egi.eu/document/3028> [↑](#footnote-ref-17)
18. <https://rt.egi.eu/rt/index.html> [↑](#footnote-ref-18)
19. <https://documents.egi.eu/document/2623> [↑](#footnote-ref-19)
20. http://einfracentral.eu/ [↑](#footnote-ref-20)