EGI-Engage

First release of the EGI Service Registry and Marketplace prototype

D3.7

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Abstract

This document details the work done to release the first demonstrator of the EGI Service Registry and Marketplace, a tool that has the ambition of becoming the platform where an ecosystem of EGI-related services can be promoted, discovered, shared and accessed. The realization of the demonstrator included various activities like the comparison of different technical solutions for the realization of the on-line platform, the definition of the business processes underpinning the operations of the prototype and the design of various reference EGI services to test the rendering on these. All these activities, which are reported in this document, allowed us to fine tune the initial requirements defined during PY1.

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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

Contents

Executive summary

This document details the work done to release the first demonstrator of the EGI Service Registry and Marketplace. The EGI marketplace has the ambition of becoming the platform where an ecosystem of EGI-related services, delivered by EGI providers and partners, can be promoted, discovered, shared and accessed, including EGI offered services as well as discipline and community-specific tools and services enabled by EGI and/or provided by third parties under defined agreements.

As follow-up of existing solutions' analysis, the assessment of technologies to implement the EGI marketplace has been further refined taking into account the originally defined criteria[1] as well as the requirements generated by the definition of the EGI service catalogue, which is one of the outcomes of the EGI Integrated Service Management framework[2].

As outcome of this activity, this documents describes the set-up of two distinct marketplace prototypes aiming at comparing the features of two different solutions, one based on PrestaShop[3] and the second on Open IRIS[4]. The latter was identified during the first evaluation as the most promising solution to fully fulfil the marketplace requirements[5]. In comparison, PrestaShop is a free, open source e-commerce solution largely adopted in the commercial world with a wide community behind it, offering the support of commercial transactions when accessing a service and offering community support thanks to its large user base.

As part of the prototype delivery, the data model for the marketplace was defined. 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.

A subset of such data model was implemented in the two marketplace prototypes, based on PrestaShop – using the free open source version – and Open IRIS, to assess the capabilities they offer. The outcome of such evaluation demonstrated that both technologies present different limitations that prevent all requirements to be satisfied without additional customization effort. PrestaShop is a very powerful tool to implement an on-line shop but needs customization via additional plugins and ad-hoc developments to properly act as EGI marketplace.

In order to proceed with the selection of one technology, the assessment of the costs of development, maintenance and operations will be conducted in both cases. Costs of ownerships

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[1] D3.2 Design of the EGI Service Registry and Marketplace: https://documents.egi.eu/document/2658
[2] http://go.egi.eu/ServiceCatalogue
[3] https://www.prestashop.com/en/
[4] http://egi.science-it.ch
[5] D2.4 Concept of EGI Marketplace: https://documents.egi.eu/document/2535

will be complemented by an analysis of software licenses and software packaging, as in selecting a given technology, EGI needs to ensure the selected on-line platform can be easily operated by a given provider if necessary. In parallel to this, other solutions will be examined such as the WordPress ecommerce plugin from WPMUDEV.org[6]

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. This lead to a re-design of the expected relationship between the marketplace itself, e-Grant as system to manage service access including SLAs and OLAs, and the Long Tail of Science (LToS) platform, which will be re-designed to move a set of features to the marketplace once in production. The analysis of the interfaces with the other tools will start in the next months after the first evaluation of the two prototypes will be completed.

For the purpose of the prototype implementation, services from the EGI service catalogue were considered. However, as the marketplace is meant to be open to EGI partners for publishing services that do not belong to the EGI catalogue, capabilities around the possibility of enabling multiple independent providers in a single marketplace were part of our evaluation.

Drafting of the marketplace Terms and Conditions, defining the policies for publishing and accessing services has started. In addition, the marketplace data model should be sufficiently flexible to accommodate third-party services with minimal effort. Work on the data model for thematic service providers has started and the initial results are presented in this deliverable.

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[6] https://premium.wpmudev.org/project/e-commerce

1 Introduction

This deliverable describes the work done to implement the two marketplace demonstrators based on PrestaShop and Open IRIS platforms. EGI-Engage funding supported the deployment of these tools, their customization to meet a number of requirements and provides effort for the integration of the selected platform with the EGI tool ecosystem; in both cases software development is conducted externally.

PrestaShop is a free, open source e-commerce solution. The software is published under the Open Software License (OSL). It is written in the PHP programming language with support for MySQL database. PrestaShop is currently used by 250,000 shops worldwide and is available in 60 different languages. PrestaShop has its strength in being like a traditional online store that most people are already familiar with. It gives an attractive and simple to use interface, as well as a set of functionality that is immediately useful, like the support of commercial transactions when building products and services. The adoption of PrestaShop could reduce the cost EGI will incur to maintain a solution such us Open IRIS and, in addition, could help on designing a marketplace ready to attract commercial actors, such as SMEs.

Open IRIS (Integrated Resource and Information System) is a platform that was originally developed as a Swiss wide project to facilitate sharing of research resources of many different types within Switzerland. In the course of the evaluating the requirements for the EGI marketplace the opportunity was taken to work with a variety of organizations outside of Switzerland to validate the different marketplace concepts as well as drive the direction of the development of the system to broaden its features and to increase adoption[7]. This has resulted in Open IRIS now being used in several other countries by hundreds of researchers daily. Historically Open IRIS has been focused on instrumentation and lab services, but the objective is to be a single point where researchers can find and use all forms of resources needed to conduct their research. This includes resources within their organization, including those of the researchers, as well as resources from other organizations or commercial providers. Open IRIS is tailored for the research world, so it looked promising to be easily adapted to the EGI world.

The selected service registry and marketplace will be paramount in order to make EGI services more easily discoverable and accessible.

The document is structured as follows:

- Section 2: Introduces the EGI service catalogue and its relationship with the marketplace. It also covers the first analysis of the interfaces between the marketplace and the other EGI tools.
- Section 3: Gives information on the architecture of the demonstrators.
- Section 4: Details the defined data model and reports a first evaluation of the demonstrators.

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[7] Production instance at Institut Curie, http://iris.curie.fr.

- Section 5: Describes the outcome of the first study to publish in the marketplace services not in the EGI service catalogue focusing on the thematic platforms.

The document is completed by the release notes, the feedback on satisfaction, a draft dissemination and exploitation plan and future plans.

Tool name	EGI Marketplace
Tool url	PrestaShop based demonstrator: http://vps302866.ovh.net Open IRIS based demonstrator: http://egi.science-it.ch
Tool wiki page	N.A.
Description	The EGI Marketplace demonstrators show and promote EGI services. End users can discover the services and request access to them by specifying a set of options.
Value proposition	The EGI Marketplace will facilitate the discovery and the access to the EGI services.
Customer of the tool	EGI Foundation, NGIs, RIs, service providers, academic organizations
User of the service	Prospective EGI users: research groups, individual researcher, site admins, academic organizations, SMEs, etc.
User Documentation	N.A.
Technical Documentation	N.A.
Product team	N.A.
License	N.A.
Source code	N.A.

2 EGI Service Catalogue

2.1 Overview

While the marketplace should be broader than the EGI service catalogue, we agreed that for the sake of prototyping activities and revision of requirements, the services of the external EGI service catalogue would be used as reference.

The service portfolio is an internal list that details all the services offered by a service provider, including those in preparation, live and discontinued. It is a base for service catalogue, customer-facing list of all live services offered along with relevant information about these services.

The first edition of the EGI service portfolio was developed during 2013 to improve service orientation and clarify the unique offering that current and potential beneficiaries can request. This first version focused mainly on services internal to EGI as essential to enable the federation to work together and serve international research communities.

This work was initiated in the context of improving the maturity in managing services by developing and implementing best practices for ensuring clarity of service offering and warranties and meeting the expectations of beneficiaries.

Later, in July 2015, EGI Foundation proposed the establishment of the Services and Solutions Board (SSB) as a new body responsible for managing the portfolio of services and solutions regarding EGI.eu and the EGI federated services, ensuring transparency across functions, and advising the EGI Council[8]. For more information about SSB please see Appendix III.

Following the creation of the SSB, the group worked extensively to implement the service portfolio management process (SPM) from FitSM[9], to define the templates and to update the EGI service portfolio. This lead to Improved maturity in designing and delivering services, and an update to the EGI service portfolio was finally approved at the EGI Council in November 2015[10]. This version includes both services that are internal to the EGI and services that EGI collectively delivers to the beneficiaries (researchers and SMEs/Industries).

According to the established practice, each service is described in a Service Design and Transition Package (SDTP) document[11] composed of the following sections:

- Value proposition
- Business case
- Service design
- Service transition plan

The definition of a service portfolio brought several benefits such as:

- Improved service orientation
- Improved capabilities to promote EGI services and their value
- Improved management of services
- Helped to clarify the alignment with the EGI strategy
- Facilitate management interoperability in federated environments
- Better understanding of all the components, dependencies and processes behind service delivery

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[8] https://documents.egi.eu/document/2374
[9] http://fitsm.itemo.org/
[10] https://indico.egi.eu/indico/event/2720/
[11] https://documents.egi.eu/document/2550

In order to improve the clarity on the difference between the services that EGI as a federation offers to potential customers versus the services that are developed internally for EGI to efficiently operate as a federation, the portfolio has been separated into:

- **EGI service portfolio**: containing the services that EGI offers as a federation to potential requesting customers.

- **EGI internal service portfolio**: containing the services that are organised within the federation to enable EGI resource providers to operate together.

Services in the EGI service portfolio could be promoted, discovered, shared and accessed through the EGI marketplace. Instead, services in the internal portfolio will not be published in the marketplace.

A short description of the EGI service portfolio and catalogue is available in the next section.

2.2 EGI Service Portfolio and Catalogue

The following figure represents a summary view of the services that EGI as a federation offers for research and innovation.

Services are classified in six categories/areas: Compute, Storage, Data, Security, Operations and Training, as shown below. For more information on the EGI Service Portfolio see Appendix I.

Appendix II complements the Service Portfolio definition with information on the requirements met by the Service Portfolio Management process adopted in the EGI Integrated Service Management framework. The Service Portfolio is one of the main outputs of the process.

Figure 1 - The EGI Service Portfolio including service states. Services in the catalogue are those in Production and Beta status. The external service catalogue is published on the EGI web site[12].

Each service can be in a different phase; stages are defined as follows:

• Discovery: researching user's needs, exploring technological or policy constraints.
• Alpha: prototype available for closed set of users.
• Beta: service being developed while available for testing publicly.
• Production: service available in the live environment meeting security/performance requirements.
• Retired: the service is not anymore offered.

The EGI service catalogue(s) is composed of live services, which are services that are either in beta or production phase. The following table describes the current EGI service catalogue.

Table 1. The EGI Service Catalogue

Service	Service Area	Description
Cloud Compute	Compute	Run virtual machines on demand with complete control over computing resources
Cloud Container Compute	Compute	Run Docker containers in a lightweight virtualised environment
High-Throughput Compute	Compute	Execute thousands of computational tasks to analyse large datasets
Online Storage	Storage	Store, share and access your files and their metadata on a global scale
Archive Storage	Storage	Back-up your data for the long term and future use in a secure environment
Data Transfer	Data	Transfer large sets of data from one place to another
FitSM Training	Training	Learn how to manage IT services with a pragmatic and lightweight standard
Training Infrastructure	Training	Dedicated computing and storage for training and education

More information about the EGI service portfolio and the related management process and procedures are included in the Appendix I, Appendix II and Appendix III.

2.3 Access request management

The EGI marketplace will facilitate the access to the EGI services. It business logic will comply with the EGI Integrated Service Management framework, and in particular with the workflows defined to manage service access. This section shortly describes the three ISM processes concerned by access request management.

- Business Development & Stakeholder (BDS) - this process supports the identification of new (potential) business opportunities and partnerships and to effectively manage stakeholder expectations and requirements. In the context of the access request management, it defines a

prioritized list of stakeholders that provide input for the outreach activities. These stakeholders are those allowed to access the services through the marketplace, and hence access policies need to be clearly outlined in the marketplace. In addition, the marketplace needs to be integrated so that customers generating requests are properly recorded and profiled. This is an input to the following process.

- Customer Relationship Management (CRM) - this process has four goals that need to be achieved to properly manage an access:

    1. Mobilising services, resources and support from the EGI community for customers who are interested in becoming active EGI users; (these customers are handed over to CRM from the BDS process);
    2. Defining and carrying out software/service integration and deployment activities (to turn interested customers into active users);
    3. Supporting the customers in reaching long-term operational setups at EGI resource providers;
    4. Maintaining a relationship with active customers.

    The EGI Marketplace should support CRM in activity (3) and (4) in the list above.

- Service Level Management (SLM) - the primary purpose of this process is to maintain a service catalogue, and to define, agree and monitor service levels with customers by establishing meaningful service level agreements (SLAs), supportive operation level agreements (OLAs) and underpinning agreements (UA). It is involved in the access request management when the CRM process completes the software/service integration in the infrastructure and the assessment of the customer requirements. The marketplace should support SLA/OLA tracking by providing a personal dashboard where relevant documentation and reports relevant to the requested services, is available to the customer.

The following picture describes how a request to access services is managed in EGI and highlights the role of each involved process.
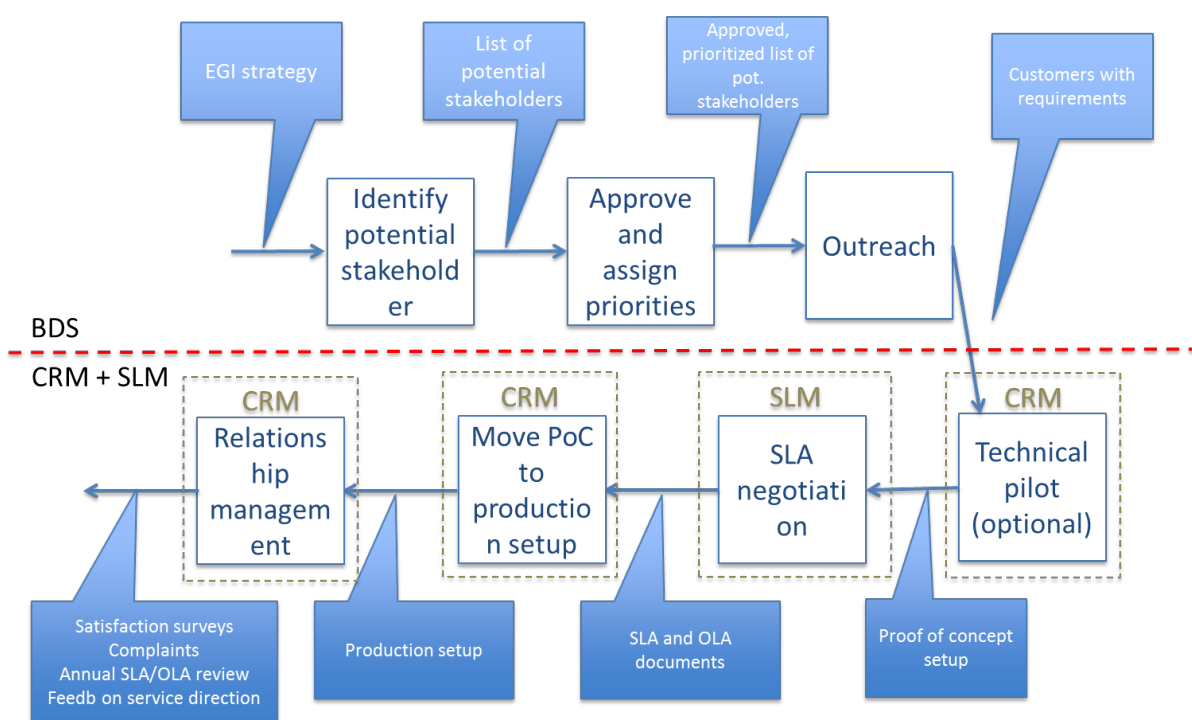
Figure 2 - Workflow to manage a request to access services in EGI.

2.4 Relationship between the EGI Service Catalogue and the marketplace

When operational, the marketplace will become the main tool to advertise the services of the EGI Service Catalogue. It will expose all the live EGI services following the same structure of the service catalogue (services classified in six categories and areas). Service options will be defined to facilitate the access to the services.

Furthermore, the marketplace will partially automate the access request management described in the previous section implementing procedures to handle the customers' requests and acting as an orchestrator of the several EGI tools involved in such processes.

2.4.1 EGI tools and relationship with catalogue processes

The analysis of how the future EGI marketplace will be integrated with the tools of the EGI infrastructure is still a work in progress. Now, a first study has been done to define the implementation guidelines of the service access workflow in the marketplace, analysing the impact on the other EGI tools involved in this process: e-Grant and access.egi.eu, the platform to facilitating the access to the EGI infrastructure for the Long Tail of Science (LToS).

The driving concept of this analysis is that the EGI marketplace will become the unique place where a new user could discover a service (or group of services), get information about it by browsing the service catalogue, and request an access, specifying quantity, quality and duration.

This has an impact on e-Grant and access.egi.eu, indeed these features are already partially exposed in these tools. For example, now through e-Grant, users can specify the service profile they need and submit a request (for a subset of the service in the EGI catalogue), while access.egi.eu partially implements a service discovery and a user profiling features. 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).

To remove these redundancies and implement the proposed workflow, e-Grant will be converted to a backend service that will take care of the service request management, and it will implement the business logic that specifically applies to EGI services. Furthermore, it will be probably extended to cover more services of the EGI service catalogue. Instead, access.egi.eu will entirely rely on the marketplace for the user profiling and exposing service attributes. In this way the marketplace will include a complete set of services, and will properly qualify those which are only accessible to single users or small research groups (the so-called Long Tail of Science).

In this context, the marketplace will be also integrated with the EGI AAI check-in service delegating to it the whole process to register, authenticate, authorise and profile the end-users. The service access workflow will implement different branches according to the various identified user profiles: single user, research infrastructure, projects, etc.

The analysis of the relationship between the EGI marketplace and the other EGI tools will start in the next months after the first evaluation of the two prototypes is completed. Particular attention will be devoted to the definition of the interfaces with the AppDB and GOCDB and if and how services published on these two tools should be presented in the marketplace.

A full list of tools that should be integrated with the marketplace is reported in the following table.

Table 2 - EGI Tools to be integrated with the Marketplace.

Tool	Relation	Description
Operation Portal	**Workflow**: service access management **Activities**: - user community and Virtual Organization registration (triggered by marketplace interaction) - monitoring of data centres serving a given user group (marketplace user dashboard)	The Operations Portal provides a view, based on the role of the viewer, to information about the status of EGI resources and services. The portal provides following tools: VO registration, VO management, VO dashboard, COD dashboard, Operation dashboard, Security dashboard, broadcast and downtime notification mechanism.
Service registry (GOCDB)	**Workflow:** supply and federation member management **Activity**: - expose information about providers in	The GOCDB is the central input system for recording e-infrastructure topology information. This includes the resource providers that contribute to the production infrastructure, their associated Service Endpoints, service

	the marketplace Provides a list of resource providers that can be listed in the marketplace.	downtime information and contact details for participants who maintain the infrastructure. It is accessed by all project actors (end-users, site managers, NGI managers, support teams, VO managers), by other tools and by third party middleware in order to fetch the infrastructure topology and its status.
Helpdesk (GGUS)	Incident management system for EGI related services in the marketplace.	The GGUS system is the primary means by which users request support when they are using the EGI infrastructure. The GGUS system creates a trouble ticket to record the request and tracks the ticket from creation through to solve.
Application DB	**Workflow:** manage access to cloud service **Activity**: - manage Virtual Machine images (relevant to provide access to cloud services after activation) Provides a list of software packages and VMs, along with information to resource providers hosting them. Moreover, it provides a collection of dashboards for VM operations and VM image management.	The EGI Applications Database (AppDB) is a central service that stores and provides to the public, information about software solutions in the form of native software products and/or virtual appliances, the programmers and the scientists who are involved, and publications derived from the registered solutions. From an operational point of view, the AppDB offers a dashboard to the VO managers in order to manage the images that will be available to resource providers which are supporting their VOs, whereas another dashboard available to the end-users for performing VM operations to the EGI Cloud infrastructure.
e-Grant	**Workflow:** manage access to cloud service **Activity**: - allow for Compute/Storage allocations Users can requests allocations of resources from participating resources providers.	e-Grant is a tool supporting Resource Allocation process. It allows researchers to request an amount of compute and storage resources for a given amount of time. e-Grant handles all activities involved in RA Process which leads to SLA signing.
access.egi.eu	**Workflow:** manage access to services accessible to the long tail of science **Activity**: - user registration and authorization User will access this service through the marketplace.	Easy-to-use platform for researchers to access compute, storage and application services.

3 Service architecture

The EGI marketplace prototype has been implemented adopting technologies developed by third parties. In particular, two demonstrators have been set up, one based on PrestaShop and the other based on Open IRIS.

3.1 High-Level Service architecture

For the high-level service architecture of the two demonstrators, refer to the PrestaShop[13] and Open IRIS[14] documentation.

3.2 Integration and dependencies

Currently, the marketplace demonstrators are not integrated with the EGI tool ecosystem; they are simple instances of the two chosen technologies (PrestaShop and Open IRIS). This provided more flexibility and simplicity during the testing phase. Integration activities will only take place with the selected technical platforms.

4 Marketplace prototype

4.1 Data model of the prototype

The data model implemented in the marketplace prototype defines how services are their options are presented. It is of paramount importance as it influences the end-user experience, an needs to reflect the EGI service catalogue structure[15]. 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 themselves (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, need to reflect the real capabilities that can be offered by the suppliers, and purchased by customers in the marketplace.

The first two levels of the hierarchy are described in the table below. In the following part of the section detailed information per service is provided.

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[13] https://www.prestashop.com/en/documentation
[14] http://iris.science-it.ch
[15] https://www.egi.eu/services & https://www.egi.eu/internal-services

Table 3 - EGI Service Catalogue - first and second levels.

Service area	Services included in the area
Compute	Cloud Compute, Cloud Container Compute and High-Throughput Compute
Storage	Online Storage, Archive Storage
Data	Data transfer
Training	Training Infrastructure, FitSM

For five of the services, Cloud Compute, High-Throughput Compute, Online Storage, Training Infrastructure and FitSM, were represented in the prototype together with their options, which are described in the following.

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

- Service areas (category in the marketplace)
- Services (sub-category in the marketplace)
- Service options (products in the marketplace)

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

4.1.1   Service areas (category in the marketplace)

Each category in the marketplace will be described with the attributes showed in the table below.

Table 4 - Service areas represented in the marketplace prototype

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

4.1.2 Services (sub-categories in the marketplace)

The EGI marketplace will 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.

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: Persistent identifier in a standard format; 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

Attribute	Definition	Notes
		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

4.1.3 Service options (products in the marketplace)

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

Common service options	Description
Description of the research activity	Information on the research activity that needs to access the EGI services. In particular, relevant when access for

Common service options	Description
	free is requested.
Access type	Reserved or opportunistic (does not apply to the training and to some Cloud Computing options).
Start and end dates	Specify the period in which users will access the services. The period can also be undefined.

4.1.3.1 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 pre-configured virtual appliances (e.g. CPU, memory, disk, operating system or software) from a catalogue replicated across all EGI cloud providers. Service options below need to be updated periodically according to the capabilities that can be offered by the providers.

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 Ideal 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	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

	• Reserved instances Ideal for: • Batch computing • High-performance applications and web services • Distributed analysis • Video encoding	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.

4.1.3.2 Compute/High-throughput Compute

Service description: with High Throughput Compute you can 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.

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

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]

4.1.3.3 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.

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. Or you can detach your block storage	Storage capacity [TB]: [1, 5, 10, other] Special requirements (e.g. performance, close to the computational resources, etc.): [text]

Service option	Description	Attributes
	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.	
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]

4.1.3.4   Training/Training Infrastructure

Service description: 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.

Service option	Description	Attributes
Cloud Training Infrastructure	The Training Infrastructure offers cloud compute and online storage for training activities. It can host onsite tutorials and online training courses (incl. webinars) and can also serve as a platform for self-paced learning (e.g. MOOCs).	Location: [text] Aim of the training event: [text] Number of concurrent trainees: [number] Number of CPU cores:

Service option	Description	Attributes
	Trainers can deploy any software on the training infrastructure for students. The software must be deployed in the form of Virtual Machine images and/or Docker containers. A library of existing virtual machines images is offered by EGI and trainers 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 computing and storage environment that EGI provides to researchers as the 'cloud compute' service.	[number] Amount of RAM (GB): [number] Online storage size (GB): [number] Special requirements (e.g. VM images/apps available in the training infra, big instances, etc.): [text]

4.1.3.5   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.

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	Number of students: [number] Location: [text]

	relationship to other standards • Process framework underlying FitSM • Requirements defined in FitSM-1	
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 man • agement, 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).	Number of students: [number] Location: [text]

	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)	
Consultancy	Advise on how to manage IT services with a pragmatic and lightweight standard.	Description of the consultancy: [text]

4.1.4 Service providers

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

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

4.2 Reporting of PrestaShop prototype

The PrestaShop basic release offers a set of functionalities that could be enriched with several add-ons available within its community. Usually, the add-ons are not for free. Many of these plugins are published in the PrestaShop marketplace[16]. Furthermore, PrestaShop can be customised to satisfy the needs of a customer with ad hoc developments.

The evaluation of the EGI marketplace demonstrator based on PrestaShop confirmed the appealing of the professional interface provided by the tool. The creation of the three-level hierarchy EGI catalogue was done in a few steps through the PrestaShop back office. However, some limitations of the basic release did not allow to fully satisfying the EGI requirements. The main hindrances identified are related to:

- Service request workflow: It cannot be customised. EGI needs a custom workflow for each service category since different products may require different delivery processes.
- Attribute management: Only attributes with a limited range of options can be defined. There is no way to define dates or free text/numerical attributes.
- Shipping: Only subsets of EGI services are so far accessible via pay as you policy, so shipping and billing are not applicable by default to all services. This is possible only for virtual products but these cannot have associated attributes.
- Supplier management: Suppliers cannot be listed into the product descriptions.

An analysis was performed to identify possible plugins that could overcome these issues. Add-ons have been identified to partially fix the attribute and supplier management and the shipping issues

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[16] http://addons.prestashop.com/

but not to create custom service request workflow to cope with the heterogeneity of EGI services. For this reason, ad hoc developments are also needed to fulfil all the EGI needs.

The conclusion of this study is that PrestaShop is a very powerful tool to implement an on-line shop, but it needs customization with additional plugins and possibly ad-hoc developments to properly act as EGI marketplace. An assessment of the costs EGI would incur to customise PrestaShop will be carried out in the coming weeks.

4.3 Reporting of Open Iris prototype

After the first assessment done early this year, Open IRIS seemed promising as tool to implement the EGI marketplace. Indeed, among the examined tools, it had the better match with the EGI requirements and already offers many of the marketplace features envisaged (see D3.2)[17] as it is meant by design to be able to host services from different providers. In addition, it is more tailored for the research world. The further analysis on the Open IRIS terms of use and the trial of a live instance of Open IRIS highlighted some issues that will need to be resolved. The most important are described below:

- Licensing: Open IRIS is offered primarily as a free SaaS platform by partner institutions[18]. The partners have the objective of creating a sustainable consortium model, where members pay to support the long-term operation and development of the platform in a similar model to the SBGrid consortium at Harvard[19]. Currently, the SaaS platform is developed and operated by an SME based in Ireland, CodeFirst[20]. Access to the SaaS platform and source code is guaranteed after the payment of annual fee and only for the duration of the agreement. The annual fee includes 1 PM of development support for customization of the product to the benefit of the partner and the community of users. It is planned to make the Open IRIS code open source with Apache License 2.0. As there is currently not an open source license model defined it conflicts with the licensing model in the EGI-Engage requirements on licensing defined in the consortium agreement (see Page 21, https://documents.egi.eu/document/2533). As the marketplace will manage personal information, compliance to European General Data Privacy Regulations need to be checked, as well as the terms of use for providers and customers.
- Category management: Open IRIS offers a minimal support for category management that does not allow implementing the three-level hierarchy EGI catalogue defined above.
- Rough user interface: The looks and feel of the user interface needs improvements to make it attractive for EGI potential users.
- Terminology and entity model: They are more oriented to devices management and need customisations (e.g. adding/removing attributes, rephrasing labels, etc.) to be compliant with the EGI ecosystem.

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[17] https://documents.egi.eu/document/2658
[18] http://iris.science-it.ch
[19] https://sbgrid.org
[20] http://www.codefirst.IE

- Support to billing and shipping functions was not available for assessment. Service access was enabled via e-mail interaction with the provider.

As conclusion of this evaluation, Open IRIS could be adopted as tool to implement the EGI marketplace only if both the licensing and technical issues can be overcome in 2016 QR4 AND 2017 QR1.

5 Publishing of thematic platforms

After this first phase, where only EGI services will be published in the marketplace, this new tool will be opened to the whole EGI collaboration and partners.

For example, the marketplace could 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 and are discipline-specific by offering specific computing pipelines, research data and analytics tools.

An analysis to understand how to include the thematic platforms in the set of services published in the marketplace already started and two possible collaboration models have been envisaged, each underpinned by a different business model for EGI.

- Thematic Service Partner: this options leaves the ownership and funding of the service to the organization developing and operating it, but gives the possibility of 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. EGI provides component services to the thematic service, like compute and storage.
- Thematic Service Supplier: this option allows for introducing community platforms in the form of scientific applications/VREs in the EGI service catalogue. EGI financially supports the operations of the service. If the supplier is also a technology provider, the supplier retains IP of the software produced. EGI and the supplier agree on how to maintain and further develop the service (new features).

These models are currently under discussion and will be refined in the next months.

In addition, thematic platforms that will be published in the marketplace will need to meet the terms of access and use of the marketplace. The terms for the providers will include: (1) provisioning of minimum quality of service guarantees, (2) compliance to EU regulations and EGI minimum security policies. The definition of the Terms of access and use is work in progress and is a milestone that will need to be completed before rolling the marketplace to production.

6 Release notes

6.1 Requirements covered in the release

The main aim of the first release of the EGI Service Registry and Marketplace was the further evaluation of two technologies that could be adopted to implement it: PrestaShop and Open IRIS.

In the first release of the two demonstrators, a subset of the data model defined in section 4 has been implemented according to the capabilities of the two tools.

7 Feedback on satisfaction

The two demonstrators have been reviewed by the persons directly involved in the task JRA1.2 and personnel from the EGI Foundation.

The involved parties agreed that both the assessed solutions required further customisation to be able to serve as frameworks for the EGI Service Registry and Marketplace. Details on the gathered feedback are available in sections 4.2 and 4.3.

8 Dissemination and exploitation plan

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. Considering this fundamental role, it will be operated directly by a partner of the EGI Community and will be fully integrated with the EGI tool ecosystem. The solution – once successfully evaluated – has the potential to become part of the EGI Core Activities and Services[21], subject to positive evaluation of the EGI Council. EGI annual fees from EGI participants and in-kind contributions from EGI partners currently sustain EGI Core Activities and Services.

When operational, the marketplace will be linked/embedded to/in the EGI web site and customers will be redirected there to navigate into the EGI service catalogue and request access to one or more services. Existing of this new "door" to easily access the EGI services will be advertised using all the available EGI communication channels.

A marketplace that is capable of hosting services from different initiatives can be jointly maintained and operated with other European initiatives. This provisioning option will be negotiated with EGI partners. In this context, the future inclusion of thematic providers and the eventual marketing of partner services will continuously expand the marketplace over time.

Effectiveness of this new tool will be simply 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.

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[21] https://wiki.egi.eu/wiki/EGI_Core_Activities_Bidding

9 Future plans

Several activities related to the marketplace have been planned for the next months. First of all, the IMS procedures described in section 2 will be extended/updated to take into account the existence of this new tool. In addition, the current access request management will be carefully analysed to identify steps that could be automated within the marketplace. In this context, clear interfaces towards all the other EGI tools involved in the access request management will be defined and, in particular, user-facing tools, such as e-Grant and the Long Tail of Science platform, will be integrated with the marketplace to offer a unique user experience to the customers. Main outcome of this activity will be a marked simplification of the customer's procedures to access the EGI services.

In parallel with this design activity, the assessment of the technologies to implement the marketplace will continue. Both the analysed technologies, PrestaShop and Open IRIS, present different kinds of limitations that prevent them to fully satisfy all the EGI requirements. EGI will complete the analysis taking into account additional customizations delivered through external development (Open IRIS) and plug-ins (PrestShop). The cost of ownership of the service will be also considered by comparing two different models: maintenance and operations run by EGI partners versus access to the marketplace as SaaS service.

Another option already identified is the WordPress ecommerce plugin from WPMUDEV.org adopted by UberCloud to implement its marketplace[22]. Other technologies will be also evaluated including specific cloud marketplace tools such as AppCara, App Marketplace, Juju, Alien4Cloud and Cloudify. The assessment will be completed by the end of PY2. The next version of the prototype (D3.13, M26) will be developed with be based on the chosen platform.

Finally, the data model described in this document will be completed with the definition of the service options for all the EGI services. Service design activities will be extended to properly represent other service categories from EGI partners, such as the thematic community platforms. The Terms of Access and Use of the marketplace will be also defined in parallel to this. Finally, criteria to on board and monitor services in the marketplace will be defined to guarantee an adequate quality to the EGI customers.

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[22] https://www.theubercloud.com/store/

Appendix I.   The EGI service portfolio

Table 5 - The EGI service portfolio

Category	Service name	Description	Benefits	Phase
Compute	Cloud Compute	Run virtual machines on-demand with complete control over the computing resources	• On-demand provisioning • Full control over computing resources • Standard interface to deploy on multiple service providers	Production
	Cloud Container Compute	Run Docker containers within isolated user-space with no overhead	• Accessible through different interfaces • Interoperable and transparent	Beta
	High-Throughput Compute	Analyse large datasets by executing large numbers (thousands) of computational tasks	• Access large amounts of processing capacity over long periods of time • Achieve faster results • Shared resources among users, enabling collaborative research	Production
Storage	Online Storage	Store and retrieve files, their metadata and assign global identifiers on a large scale	• Highly scalable storage system accessible from anywhere • Easily share data • Access through different interfaces	Production
	Archive Storage	Archive files and preserve them for future use in a secure environment	• Stores large amounts of data • Long-term retention • Reliable and interoperable	Production
Data	Data Transfer	Transfer asynchronously large sets of files from one storage endpoint to another	• Ideal for very large files • Able to handle large amounts of files • Transfer process with automatic retrying	Production
	Content Distribution	Deliver content with scalable, reliable and low maintenance	• Manage centrally the software to distribute across	Production

		software and data delivery system available as user-space read-only file system	• federated environments • Make content available as a read-only file system that efficiently downloads and caches files on demand	
	Federated Data Manager	Share, discover, and process data federated from different sources	• Single virtual storage that maps virtual paths to physical file paths • Users can store their data across multiple sites, and can run their applications directly as if the files are local	Alpha
	Data Hub	Access selected public datasets and efficiently consume them from EGI compute services	• Easy access to selected large-scale datasets • Easy and efficient access	Discovery
Security	Attribute Management	Manage community membership and expose trusted information	• Easy and trusted way to manage Virtual Organization membership	Production
	Identity Provider Proxy	Handle transparent Single Sign-On from multiple heterogeneous identity providers	• Easy single sign-on from multiple heterogeneous identify providers	Alpha
Operations	Configuration Database	Manage the configuration information of a federated e-infrastructure including the provided service instances and staff contacts	• Ready-to-use solution • Improves the operation of a distributed infrastructure • Hierarchical management with roles and capabilities	Production
	Service Monitoring	Monitor a wide range of platforms and provide operational and business insight for a wide range of built-in and user defined key performance indicators	• Repository of information and solutions • Progress tracking	Production
	Helpdesk	Handle service requests and incidents for distributed support	• Reduced cost for setting up the monitoring services, minimal development effort	Production

		teams	• Ready-to-use user interfaces and flexible availability calculating flexible tools • Automated reporting tools	
Training	FitSM	Learn how to manage IT services with a pragmatic, lightweight and achievable standard	• Increase your expertise in managing IT services • Increase professional profile by a recognized certification	Production
	Training Infrastructure	Handle online training courses and learning activities in a dedicated resource pool	• Allows easy deployment, predictability and repeatability of courses • Customizable virtual machine images on the training infrastructure can be deployed before the course	Production

Appendix II. EGI Service Portfolio Management process and related procedures

The goal of the EGI Service Portfolio Management (SPM) process is to manage the service portfolio to ensure not only the review of the current portfolio, but how new or changed services are aligned with business decisions as part of the overall organization strategy.

This process has to satisfy the following requirements:

1. A service portfolio shall be maintained. All services shall be specified as part of the service portfolio.
2. Design and transition of new or changed services shall be planned.
3. Plans for the design and transition of new or changed services shall consider timescales, responsibilities, new or changed technology, communication and service acceptance criteria.
4. The organizational structure supporting the delivery of services shall be identified, including a potential federation structure as well as contact points for all parties involved.
5. Three procedures have been defined to implement this process as described in the below table.

Table 6 - Procedures of the EGI Service Portfolio Management process

Title	Statement
SPM1: **Add, Change, Retire a service in the service portfolio**	This procedure describes the steps to add/remove/change a service in either EGI Service Portfolios
SPM2: **Review the service portfolio**	This procedure describes the steps to review the EGI Service Portfolios
SPM3: **Create, update the organisational structure involved in delivering services**	This procedure describes the steps to create or update the organisational structure involved in delivering services

Appendix III. Service and Solutions Board

The Services and Solutions Board (SSB) is responsible for managing the portfolio of services and solutions regarding the EGI foundation and the EGI federated services. This includes all services and solutions that are planned, active or to be retired. To support this goal, the SSB will carry out the following activities:

- Advise the EGI management on the priorities for evolving the services and solutions portfolio.
- Conduct regularly scheduled management reviews of both services and solutions portfolios and related ITSM processes (see below).
- Implement the recommendations from the EGI Strategy and Innovation Board (SIB) that have been endorsed by the EGI Council.
- Interface with the UCB (User Community Board) concerning the services and solutions for the research communities.
- Interface with the TCB (Technology Coordination Board) concerning the evolution of technology and how this can affect services and solutions.
- Interface with the OMB (Operations Management Board) concerning the services and solutions for resource providers.
- Steer the creation, review and approval of service/solution design packages including descriptions and specifications alongside any information to be added to the service portfolio.
- Plan the design and transition of new or changed services considering timescales, responsibilities, new or changed technology and communication.

The SSB Terms of Reference (TOR) is available at https://documents.egi.eu/document/2374.