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**Abstract**

This document covers the availability in the Portal of different tools for TEFIS users.

The document presents a list of user tools available through the TEFIS platform as well as a set of recommended tools the users could find useful to support their experiments.



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## TABLE OF CONTENT

List of Acronyms .....	7
Executive Summary .....	8
1. User tools implementation.....	9
1.1 Experiment Manager Interface .....	9
1.1.1 Experiment Designer .....	10
1.1.2 Experiment Planner .....	12
1.1.3 Experiment Workflow Manager .....	15
1.2 Experimental Data Interface .....	16
1.3 Definition of resources and directory interface - Portal .....	22
1.3.1 Roles .....	22
1.3.2 Functionality .....	23
1.3.2.1 Pages accessible without a TEFIS account.....	23
1.3.2.2 User Management.....	23
1.3.2.3 Resource Management .....	25
1.3.2.4 Domain Management.....	28
2. External User tools .....	31
2.1 PlanetLab external tools.....	31
2.2 PACA Grid external tools .....	32
2.3 ETICS external tools.....	33
2.4 IMS external tools.....	34
2.5 BOTNIA external tools .....	35
2.6 KyaTera external tools.....	36
References.....	37

**INDEX OF FIGURES**

Figure 1: Experiment Home page.....	9
Figure 2: Test type selection .....	10
Figure 3: Domain selection .....	11
Figure 4: Keyword selection .....	11
Figure 5: Availability of resources.....	12
Figure 6: Task management.....	13
Figure 7: Resource instance selection .....	14
Figure 8: Selected resource instances .....	14
Figure 9: Task definition .....	14
Figure 10: Task ordering.....	15
Figure 11: Testrun definition .....	16
Figure 12: Overview of the Experimental Data Interface (Mock up).....	17
Figure 13: EDI Navigation (Mock up) .....	18
Figure 14: EDI Registration Dialogue.....	19
Figure 15: EDI Experiment Request Dialogue .....	20
Figure 16: EDI Experiment Monitoring & Review Dialogue .....	21
Figure 17: EDI Experiment Publication Dialogue .....	22
Figure 18: Account creation.....	24
Figure 19: Account approval.....	24
Figure 20: Resource Registration.....	25
Figure 21: Details of a Resource Type.....	26
Figure 22: Adding a Configuration Parameter.....	27
Figure 23: Configuration Parameters and Keywords .....	28
Figure 24: Domain Registration .....	29
Figure 25: Domain Details .....	30
Figure 26: PiMan monitoring .....	32
Figure 27 Design tool for PACAGrid workflows .....	33



## List of Acronyms

EDI	Experimental Data Interface
PTM	Domain Manager Entry in Teagle Repository
SIP	Session Initiation Protocol
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
IP	Internet Protocol
TLS	Transport Layer Security
XML	Extensible Markup Language

## Executive Summary

This document presents the different tools that the TEFIS user (both experimenters and testbed providers) shall have available on the TEFIS portal. These tools will be implemented and added to the portal with the aim of developing a single and unified access point for those kinds of users, providing considerable usability and power to perform any of the functionalities that TEFIS platform provides.

After a deep study of the different blocks that are part of TEFIS, it came up the necessity of offering and showing some of them as tools for the final user, besides maintaining the business logic as a part of the core of TEFIS.

Those tools are the ones that could be referred as “integrated” tools. Inside this group, the Experiment Manager, the Experimental Data Interface and the Portal itself are considered. The Experiment Manager is the main tool used to define and execute an experiment, and will be useful for expert and inexperienced users, as it provides an advanced experiment configuration manager and a guided, free text search based, assistant. The Experimental Data Interface will offer the users a way to search among their experiments, to get information or results from, or to add descriptions to their files. Finally, the Portal itself will be the main entry point to the whole platform, and will provide different capabilities depending on the user’s profile. TEFIS administrators will have access to resource, users and domain management, while TEFIS final users shall find there every other tool intended for them. These integrated tools will present a common user interface, and will be accessible in the TEFIS portal, as they will be common tools for all the existing testbeds or use-cases that could be part of TEFIS in the future.

On the other hand, a set of external user tools is reviewed. Those tools will complement the Portal with enhanced capabilities, some of which not directly oriented to experiments definition or configuration, and some others needed for the execution of certain use cases. The integration of these tools into the portal, maintaining a common user-interface and being available for any testbed, has not been considered for the reason mentioned above. The high dependency of those with the testbeds they belong to, makes it not feasible to deal with a deeper integration.

Finally, thanks to the high flexibility and easy scalability provided by the portal, new user tools are suitable to be added with minor effort if needed in the future, when new requirements or functionalities are required by the users.



## 1. User tools implementation

At this point, it's described some available tools for TEFIS users. This tool list is integrated into the TEFIS portal.

### 1.1 Experiment Manager Interface

Experiment Manager Interface is the main web based tool that allows the experimenter the management of the experiments. In the following screenshots, there are shown different steps of the Experiment Manager process as an example of what the user shall find during the specification of the experiment.

The first screenshot presents the main menu with the basic options the user has at his/her disposal to define the experiment, test plan and test runs.

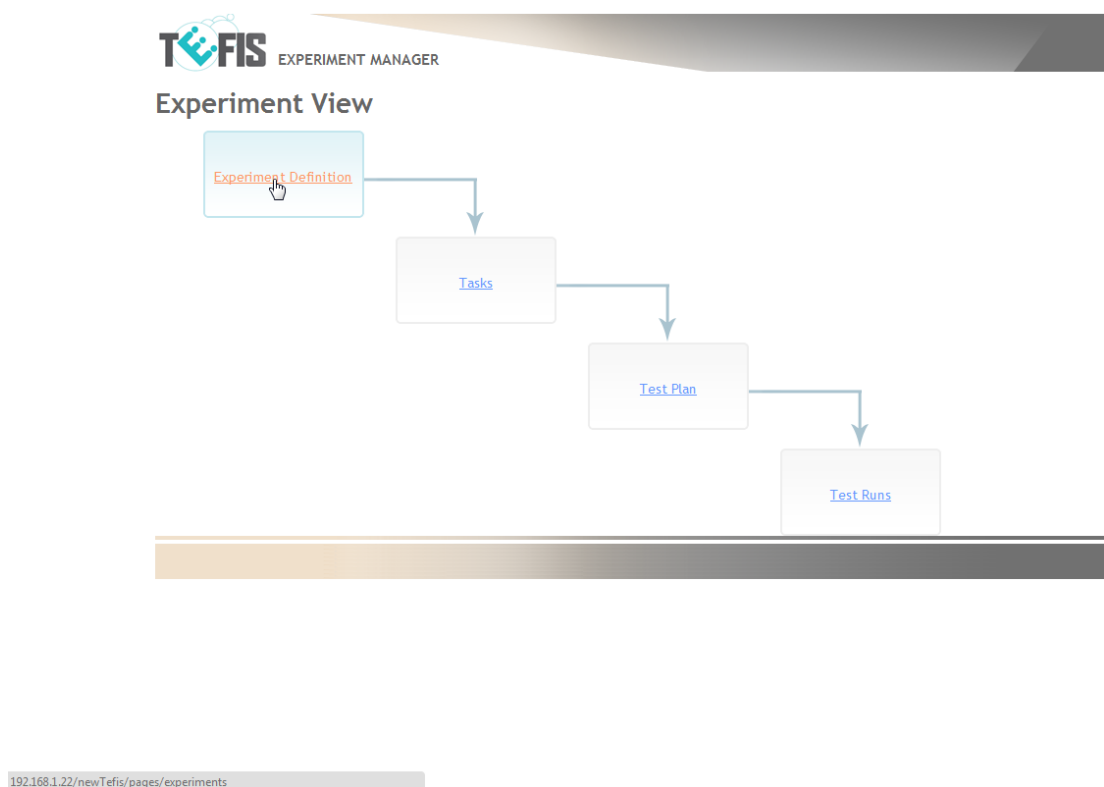


Figure 1: Experiment Home page

### 1.1.1 Experiment Designer

Experiment Designer is the first step of the Experiment Manager Interface. It will provide three ways of configuring an experiment.

The Basic Experiment Designer will offer to the user a simple and user-friendly free-text search box to discover some default test types preconfigured in the system. This service will be loaded from Experiments Data Manager.

As the result of the search, the Experiment Manager will propose a set of past experiments or experiment templates, along with their description and related information. The selection of one of them will give the user the chance of modifying selected experiment, or create a new testrun derived from it.

Another way for the user to select an experiment will be by the selection of one of their experiments. This makes it possible to modify the selected experiment or to select an existing (or create new) testrun, in order to execute it.

Finally, the third method of designing a new experiment will be addressed to advanced users, as they will have to define each aspect of the experiment from the beginning. This last case is illustrated in the next screenshots, where the user will be able to design a new experiment. Figure 2 shows the user selecting the necessary test types he/she is interested in. Also the experiment name is required.

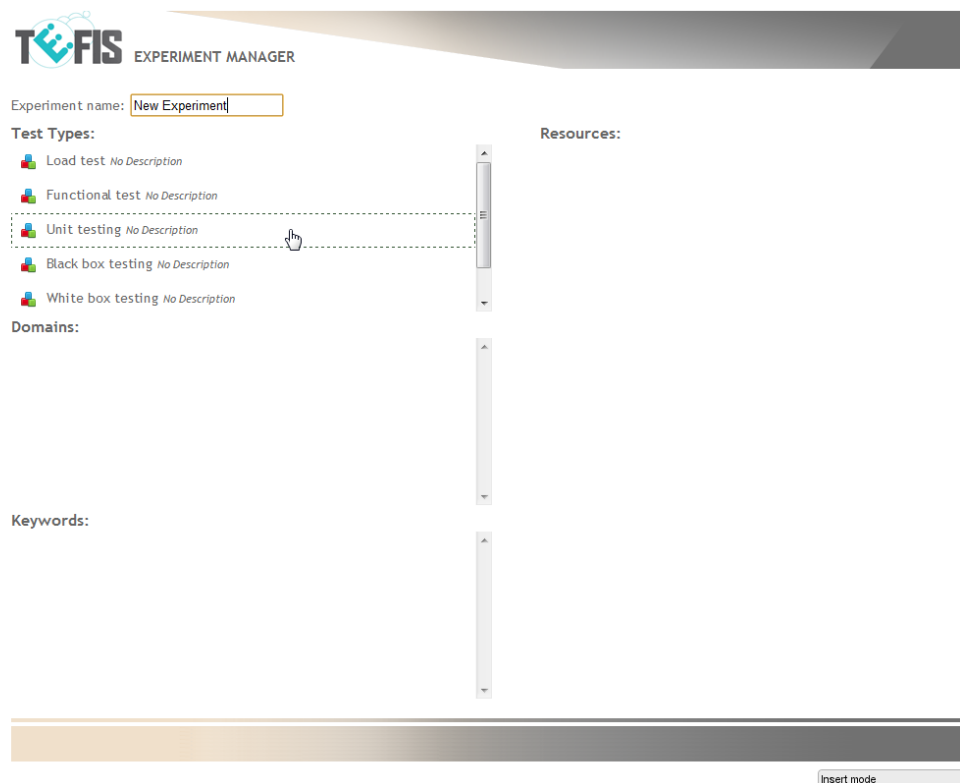


Figure 2: Test type selection

Depending on the selection, different domains shall load automatically from Teagle Repository. Figure 3 shows domain selection.

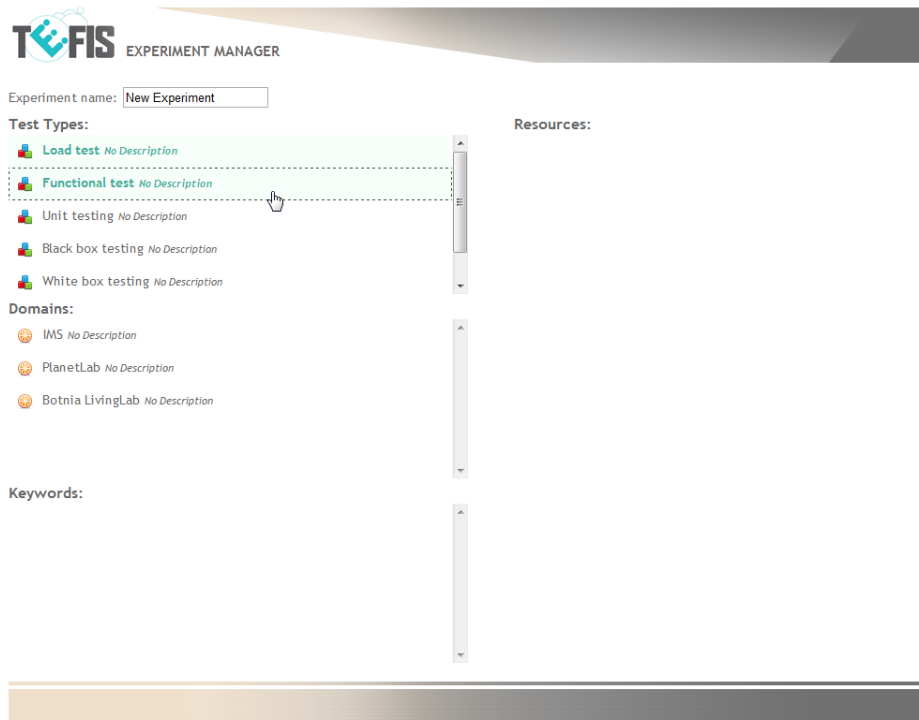


Figure 3: Domain selection

In the same way, domain selection will show available keywords that are related to the domains chosen.

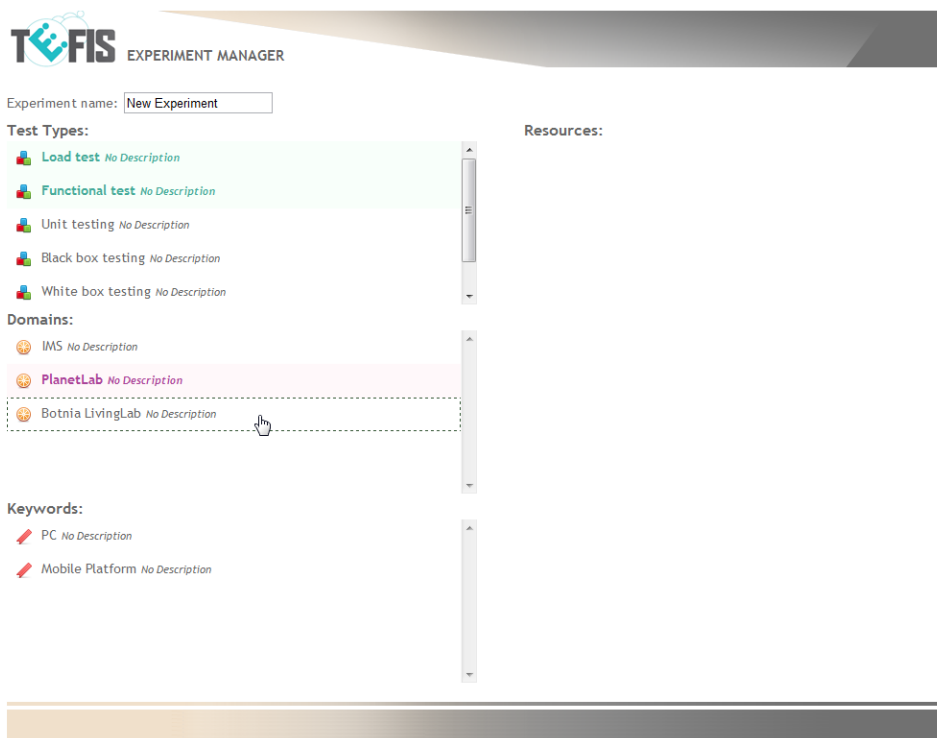


Figure 4: Keyword selection

As seem, the first approximation of the user's needs is made with the specification of the test types, domains and keywords. This selection will lead the user to a set of available resource types chosen by the Experiment Manager according to the previous criteria. Those resources are presented to the experimenter that, eventually, will be able to select necessary resource types, defining a new strategy (experiment, task and resource association).

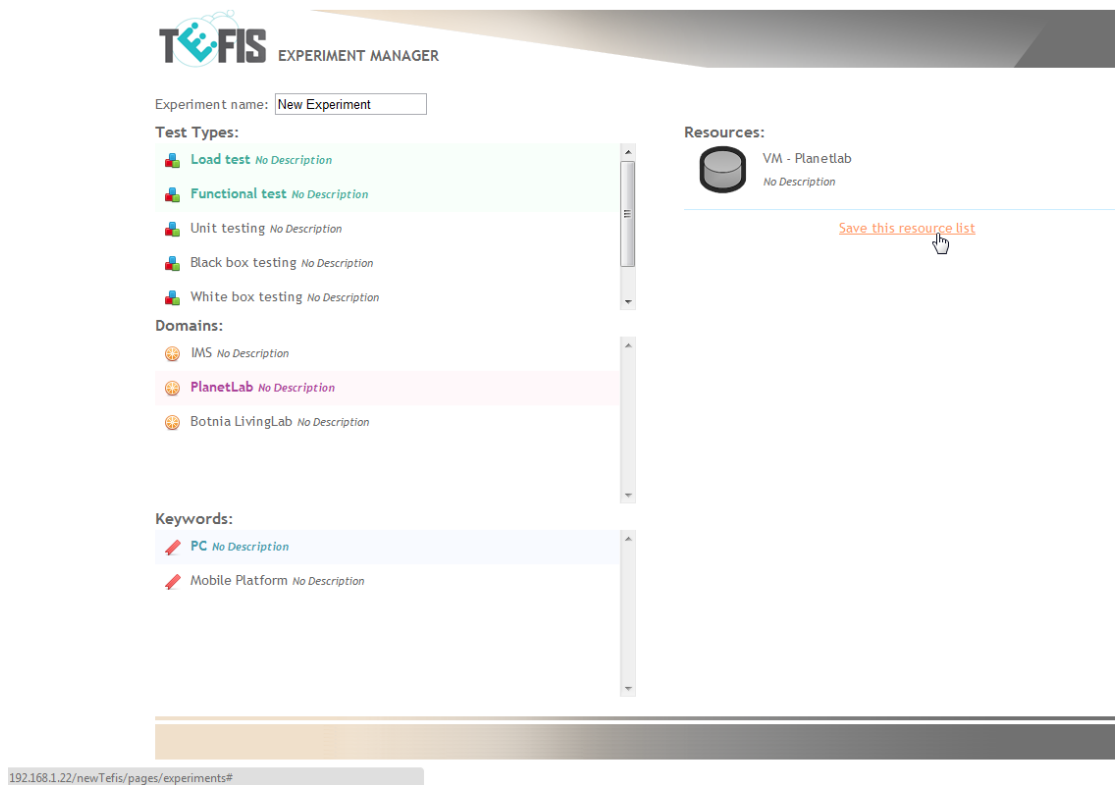
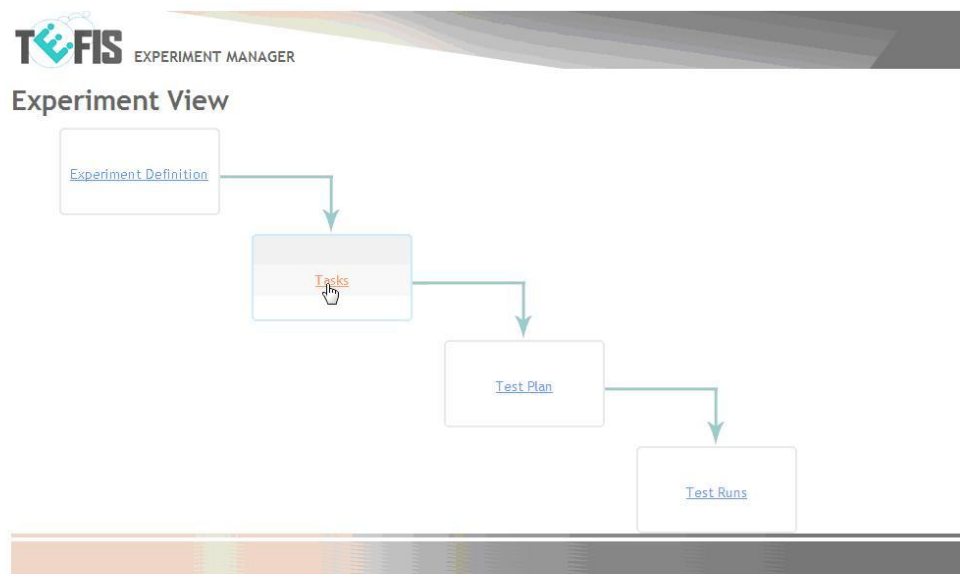


Figure 5: Availability of resources

### 1.1.2 Experiment Planner

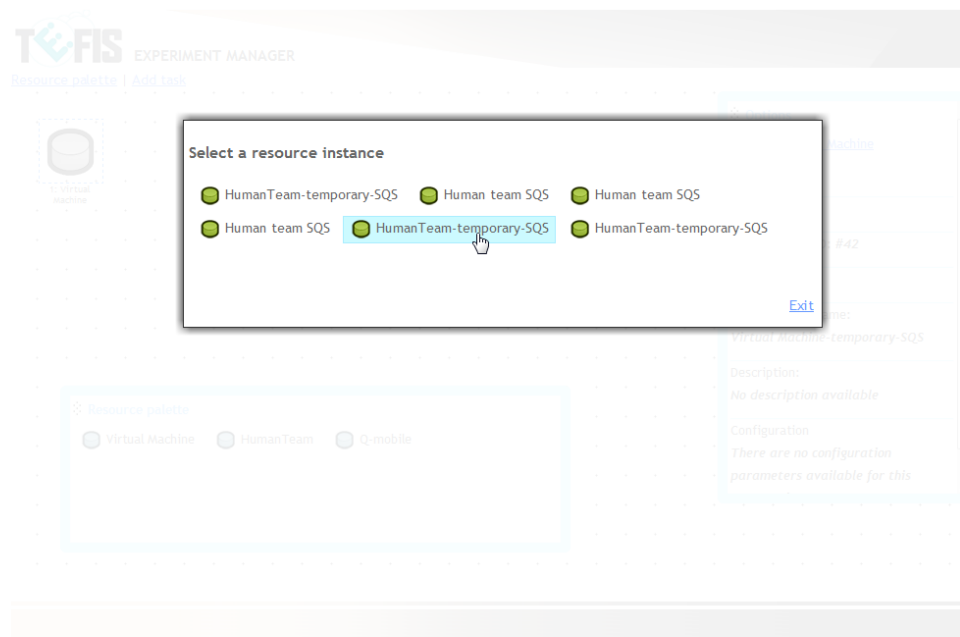
The main goal of Experiment Planner is the tasks and test plan management. Figure 6 shows task management selection.



192.168.1.22/newTefis/pages/experiments

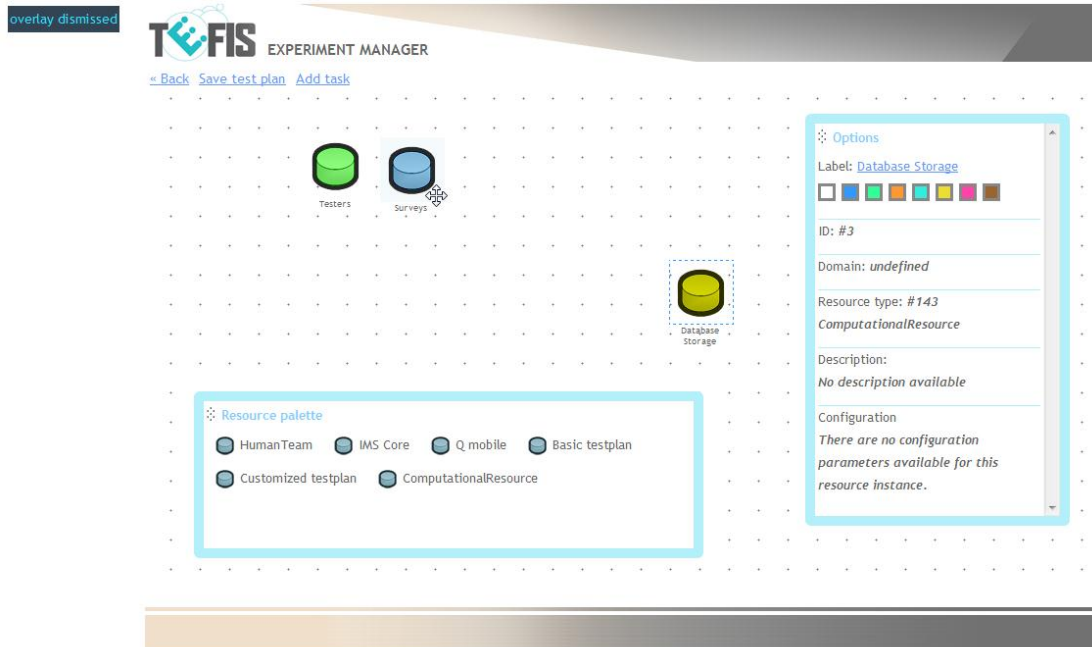
**Figure 6: Task management**

In this new step, the user will be able to select resource instances of previously selected resource types. Figure 7 shows resource instance selection. The small window loads all available resource instances related to selected resource type. The user is able to select one of them.

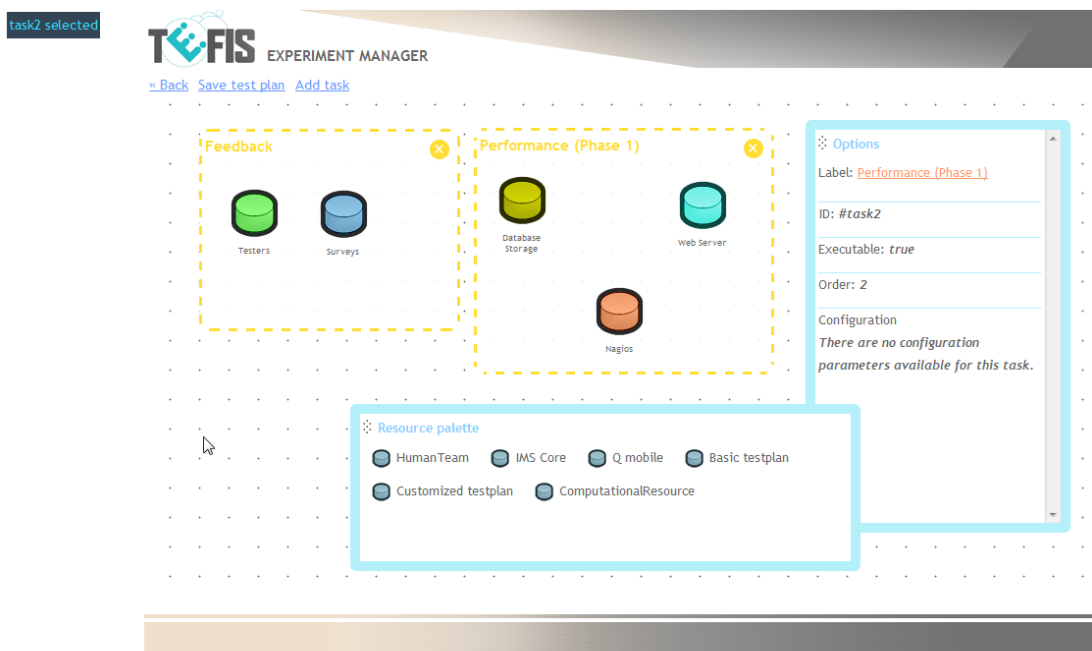


**Figure 7: Resource instance selection**

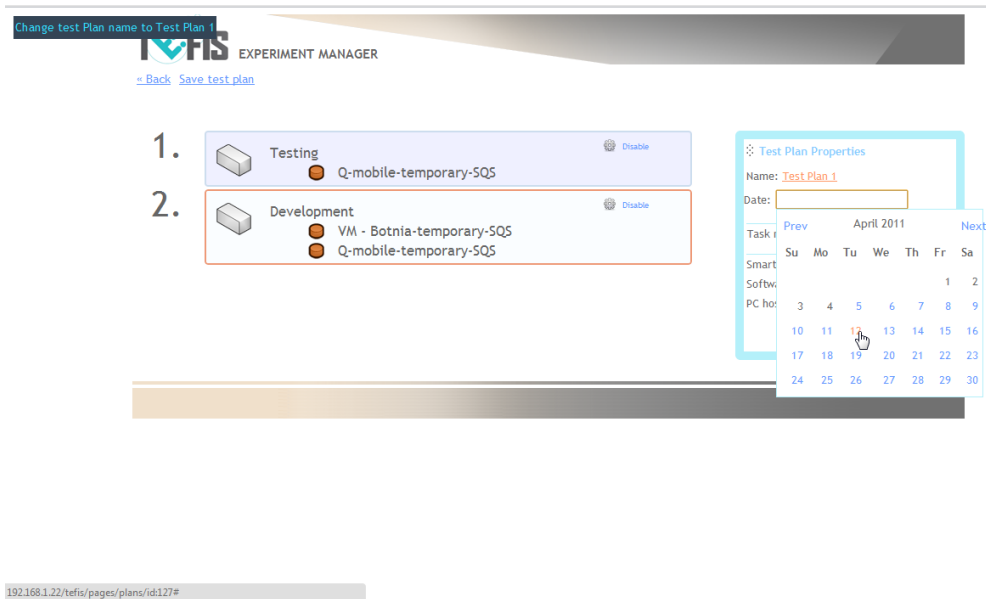
Figure 8 shows all selected resource instances. The user is able to drag them around the screen. The configuration of currently selected resource is showed in the right box.

**Figure 8: Selected resource instances**

At this point, the user could add new task using *Add task* menu button. Figure 9 shows task definition. Each yellow box represents one task. The user is able to drag selected resource instances into yellow boxes. In this way, the user could define new tasks appointing resources needed for its execution. Finally, a new test plan could be saved using *Save test plan* button.

**Figure 9: Task definition**

To finish the tasks configuration, it is necessary to establish their order inside the job. To do so, the following screen is available:



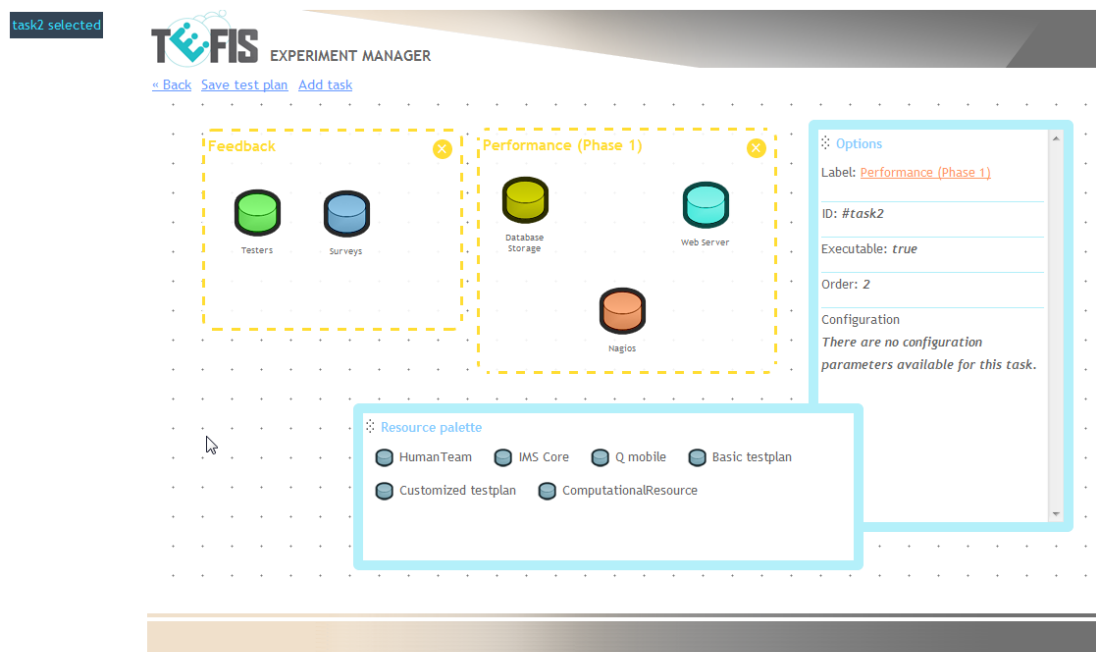
**Figure 10: Task ordering**

Here, the user can set an order to all of the tasks. Therefore, the execution workflow will be linear and the tasks will be executed one after each other.

### 1.1.3 Experiment Workflow Manager

After completing an experiment definition, the experimenter will have to define new testruns, which are particular instances of a general testplan, where the configuration of the latter can be modified in order to adapt the same experiment with different parameters.

Basically, a new testrun will have the same structure as its original testplan. Only resources and tasks configuration can be changed, but not their selection or number. To do so, the testrun information will be loaded in the Experiment Manager main screen:



**Figure 11: Testrun definition**

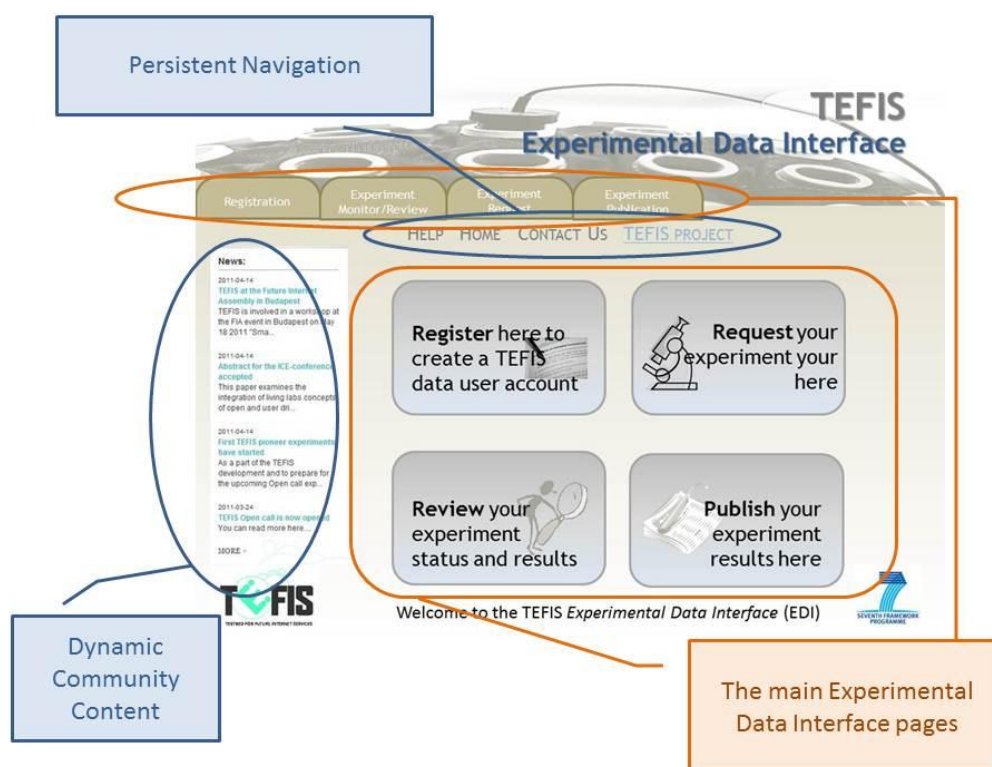
By the use of the screen, the user will be able to modify certain configuration parameters of both resource instances and tasks. However, the option to add/delete any of them will be deactivated. Besides, this screen will include the *execute* button, from where the user can request to run a testrun.

From that point on, any further modification of a running testrun will not be possible, and a new one should be created. In order to inform the user about the experiment status, the experimenter will be notified via e-mail of any change on it. When the experiment finishes, all the results will be available in the Experimental Data Interface.

## 1.2 Experimental Data Interface

In this section, we provide a brief overview of the conceptual design for the Experimental Data Interface with the TEFIS Portal. As the part of the user interface for the TEFIS platform, it is important that this component have the same look and feel as other portal elements. The layout of the mock-ups below may, therefore, change to align with other user interface views. For now, however, we provide the basic functional blocks of the Experimental Data Interface.





**Figure 12: Overview of the Experimental Data Interface (Mock up)**

The general layout and content of the Experimental Data Interface (EDI) is shown in Figure 12. The page provides persistent navigation to central and generalised locations: the TEFIS help content, the TEFIS Portal home page, a *Contact Us* option to be able to send eMail to the TEFIS portal administrator, and finally a link back to the TEFIS project external web page. The destination for each of these links is outside the scope of the EDI specifically, and is assumed to be provided and maintained by the TEFIS Portal and TEFIS project as a whole.

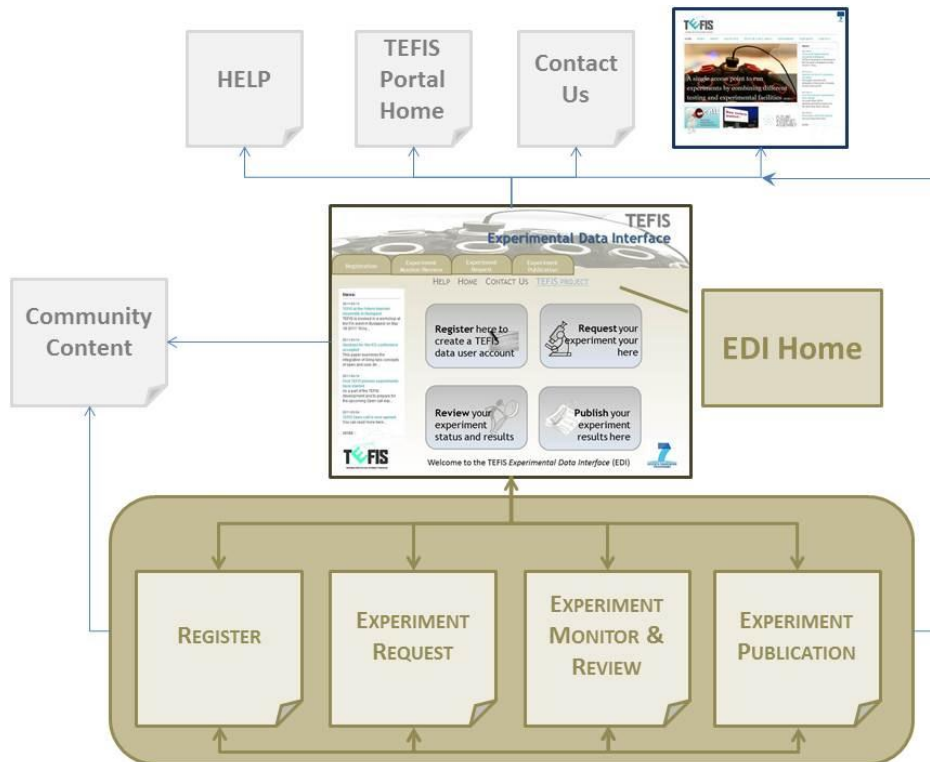
In addition to the persistent navigation offered from the EDI home page, like the TEFIS project page there is a dynamic content section which provides links to items of interest and relevance to the TEFIS user community. Once again, this is assumed to be available and supported by the TEFIS Portal as well as the TEFIS project. For both this dynamic content and the persistent navigation links, the EDI assumes function to be available from the portal which it simply exploits as a component integrated into the Portal environment.

The main EDI links are provided within the EDI home page itself as shown, as well as folder tabs at the bottom of the page banner. The four areas accessed include:

- **Registration:** (*Register*) for the experimenter to add general information (upload files) and a text description to an experiment;
- **Experiment Request:** (*Request*) to search for related experiments; and to upload experiment- or run-specific data files;

- **Experiment Monitoring & Review:** (*Review*) to check the running status of an experiment and examine any output;
- **Experiment Publication:** (*Publish*) to set access permissions on the folders associated with the experiment, as well as request data to be transferred to another location.

These four basic functions are described more fully in other documents **Error! Reference source not found., Error! Reference source not found..**



**Figure 13: EDI Navigation (Mock up)**

Navigational links between these basic pages are summarised in Figure 13. From the EDI home page, as previously indicated, it is possible to navigate out to TEFIS Help content, the TEFIS Portal Home and the TEFIS Project website, as well as to send eMail to the TEFIS platform administrator. In addition, it is possible to navigate out to any community content. As shown, the main links for the EDI are to and from the four basic areas. From each of these section pages (Register, Request, Review and Publish), it is possible to navigate directly to any of the persistent navigational targets as well as the community content. Further, direct navigation between any of the EDI sections and EDI home is supported.

The figures below summarise each of the four main dialogues which result from selecting the main operation from the EDI home page. In Figure 14, the user has a number of fields:

- Filename/Experiment/Testrun: refers to
  - *Filename*: the file local to the user to be uploaded to TEFIS;
  - *Experiment/Testrun*: the identifier of the experiment or testrun owned by the user

- Destination: refers to the TEFIS Data Services folder that the *Filename* file is to be uploaded to.
- Text Description: a free form text block, which will be added as metadata to the *Experiment* or *Testrun* specified.

TEFIS Experimental Data Interface

Registration Experiment Monitor/Review Experiment Request Experiment Publication

HELP HOME CONTACT Us TEFIS PROJECT

Register here to create a TEFIS data user account

Filename/Experiment/Testrun Browse

Destination Browse

Text Description

Submit

Welcome to the TEFIS Experimental Data Interface (EDI)

TEFIS

SEVENTH FRAMEWORK PROGRAMME

News:

2011-04-14  
TEFIS at the Future Internet Assembly in Budapest  
TEFIS is involved in a workshop at the FIA event in Budapest on May 18 2011 'Sma...

2011-04-14  
Abstract for the ICE-conference accepted  
This paper examines the integration of living labs concepts of open and user dr...

2011-04-14  
First TEFIS pioneer experiments have started  
As a part of the TEFIS development and to prepare for the upcoming Open call exp...

2011-03-24  
TEFIS Open call is now opened  
You can read more here...

**Figure 14: EDI Registration Dialogue**

For the *Filename/Experiment/Testrun* and *Destination* fields, support is provided to assist the requester in finding the file or resource required. If a *Filename* and TEFIS Data Service *Destination* are provided, then the file is uploaded to TEFIS. If an *Experiment/Testrun* and *Text Description* are provided, then the text is added as metadata to the Experiment or Testrun folder as appropriate. Any text description appended to a folder is processed internally by the Data Services to generate a content-rich version of the text which is used during searching (during the *Request* dialogue below).

**TEFIS**  
**Experimental Data Interface**

Registration Experiment Monitor/Review Experiment Request Experiment Publication

HELP HOME CONTACT US [TEFIS PROJECT](#)

**Request your experiment your here**

**News:**

2011-04-14  
[TEFIS at the Future Internet Assembly in Budapest](#)  
TEFIS is involved in a workshop at the FIA event in Budapest on May 18 2011 "Sma..."

2011-04-14  
[Abstract for the ICE-conference accepted](#)  
This paper examines the integration of living labs concepts of open and user dri...

2011-04-14  
[First TEFIS pioneer experiments have started](#)  
As a part of the TEFIS development and to prepare for the upcoming Open call exp...

2011-03-24  
[TEFIS Open call is now opened](#)  
You can read more here...

SHARE >

**TEFIS**  
TESTING FOR FUTURE INTERNET SERVICES

Filename Browse

Destination Browse

Text to find

Submit

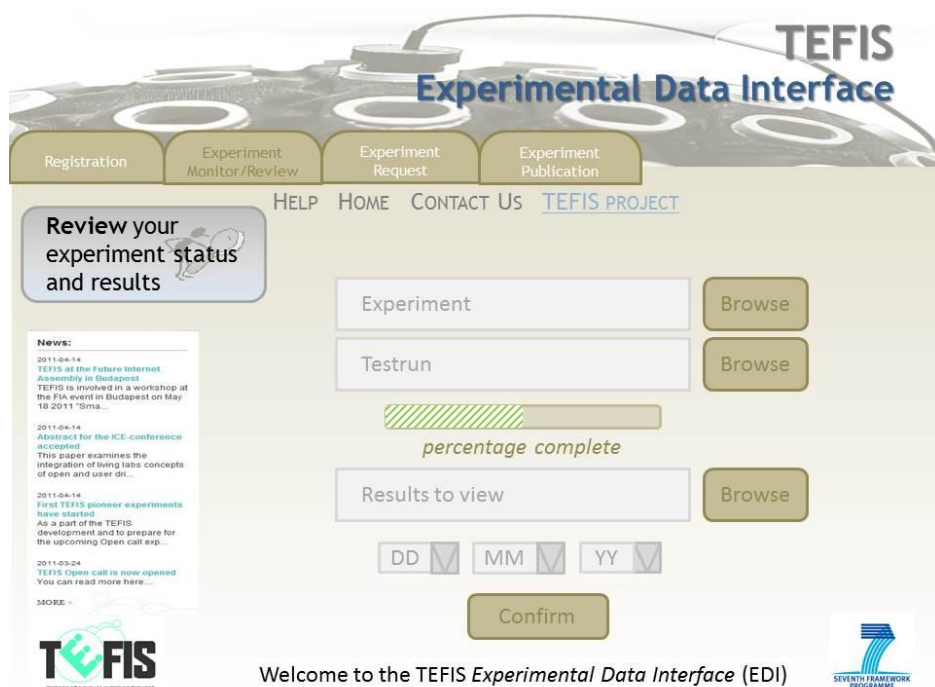
Welcome to the TEFIS Experimental Data Interface (EDI)

SEVENTH FRAMEWORK PROGRAMME

**Figure 15: EDI Experiment Request Dialogue**

The *Experiment Request* dialogue in Figure 15 also provides the user with a way to upload files to their experiment. For this, the *Filename* and *Destination* fields must be completed. The *Filename* can only be a local file within the user's environment. If neither field – *Filename* and *Destination* – are filled in, then the user can specify free form text in the *Text to find* field. This is then used as a search string to match against the content-rich version of the text descriptions added to experiments. In this latter case, all experiments accessible to the user can be searched<sup>1</sup>.

<sup>1</sup> In a subsequent version, it may be possible to provide other details – such as the experimenter's eMail address – for an experiment which cannot be viewed by the current user but which nevertheless matches the search string.



**Figure 16: EDI Experiment Monitoring & Review Dialogue**

Once running or complete, then data will be available for the user to review. The *Experiment Monitoring & Review* view (Figure 16) allows the experimenter to interact with those data. Depending on what information is made available by the testbeds during the execution of a given workflow, a *status bar* for the testrun identified can be displayed<sup>2</sup> as shown. With suitable metadata on the workflow steps or the whole testrun, it would also be able to provide an overall indicator of completion state<sup>3</sup>.

The main functions of the *Experiment Monitoring & Review* interface include the browsing of result files, including monitoring reports, and the submission of a retention period for which file or files are known to the TEFIS data services<sup>4</sup>. To browse a file, the user must identify the file (in the *Results to view* field). For simple formats, such as text and comma delimited files, then the data are simply displayed in a browse only window. To edit or otherwise analyse the data, the file must be transferred to a 3<sup>rd</sup> party location.

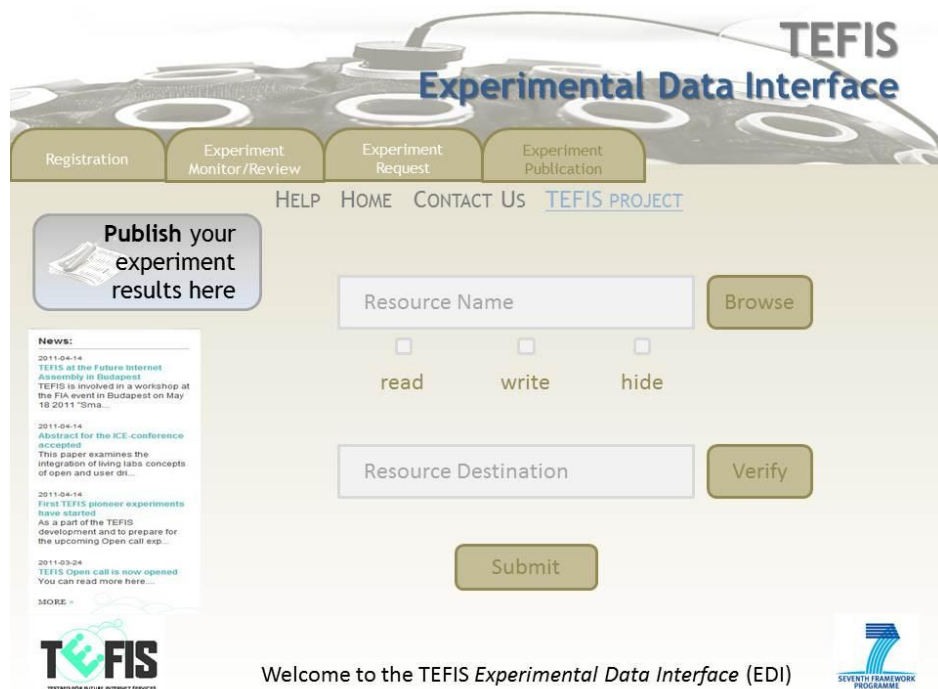
The final part of the EDI is the *Experiment Publication* view. From here, the experimenter may change access permissions associated with given resources as well as transfer the resource (such as a file) to another location. For the initial implementation, the access permissions supported include *read* and *write* access (ie. to allow other TEFIS users to look at and change the file respectively), and an option to

<sup>2</sup> There would need to be some status information provided for instance for each individual process or workflow step. As each step completes, a simple calculation would be made  $[(\text{number of processes completed})/(\text{total number of processes}) \times 100]$  to give the percentage complete measure.

<sup>3</sup> Again this is dependent on the information from the *Connectors*. A status flag might be set to indicate basic classes such as *pending*, *in progress*, *completed\_with\_errors* and so forth. This is the responsibility of other components and on what the testbeds provide back to TEFIS via the TCL.

<sup>4</sup> Files stored on a testbed may be retained and managed there. This would be part of a separate agreement between the experimenter and the testbed provider.

*hide* the file (ie. keep the file private, viewable only by the owner and the TEFIS administrator). Future extensions to include access control at the level of user group may also be considered.



**Figure 17: EDI Experiment Publication Dialogue**

In this section, we have considered the various options available to the TEFIS user or experimenter to interact with the data and data services. They functionally fall into four basic categories of operation as described above and in connection with user interface mock ups which illustrate the basic functions to be provided to the user.

### 1.3 Definition of resources and directory interface - Portal

The TEFIS Portal offers both experimenters as well as domain owners a graphical interface to the capabilities of the TEFIS platform. Apart from providing administrative functions like user management, it also allows for domain owners to specify information about their domains and the resources they support. It has a view of the experimenter's data, the running experiments, the available platform capabilities (list of sites), etc. In the future it will furthermore integrate the frontends of the TEFIS Experiment Manager and the TEFIS Data Manager as well as specific user interfaces that certain domains might offer.

#### 1.3.1 Roles

The TEFIS portal acknowledges the following roles when dealing with users accessing the functionalities of the website:

- Unregistered user: an anonymous user who does not possess a TEFIS account or has at least not yet provided his login credentials.



- User: Every user that has a TEFIS account and has provided his login information towards the TEFIS portal
- Domain owner: A representative of one of the experimental facilities that TEFIS federates.
- Administrator: A person who is allowed to alter the contents of the TEFIS platform itself or to manage entries in the user database.

### **1.3.2 Functionality**

As mentioned above, the functions that are currently exposed by the TEFIS portal can roughly be divided in three areas: User management, Resource Management and Domain Management. Additionally some informational pages exist which are accessible to non-registered users.

#### **1.3.2.1 Pages accessible without a TEFIS account**

- News: The latest news from the Project.
- FAQ: Frequently asked Questions
- Contact: Information on how to get in touch with members of the project to request further information
- Register: Allows for unregistered users to apply for an account. This process is described in more detail below.

#### **1.3.2.2 User Management**

Since apart from some informational pages most of the offerings on the TEFIS platform require user authentication, user management is an important aspect of the portals functionalities. For this matter, users can apply for an account. The interface for this is shown in Figure 18:

## Hello Stranger !

*First Name*

Martina

*Last Name*

Mustermann

*Email Address*

a@bc.de

*Organisation*

Fraunhofer FOKUS

*Desired Username*

mmu

*Password*

●●●●●●

*Repeat Password*

●●●●●●

**Figure 18: Account creation**

Accounts are not created automatically, but each account application has to be approved by an administrator. At this stage, the administrator also needs to correlate the organization the user has specified to an organization from the TEFIS database. This scheme has been chosen – in contrast to a scheme where simply all existing organizations are shown to the user upon registration – in order to on the one hand allow the user to enter an organization which is not yet present in the TEFIS database and on the other hand to expose as little information as necessary to unregistered users. The interface administrators used to approve or deny user accounts is shown in Figure 19.

## Approve Users

Username	Full Name	Email	Organisation	choose Organisation	action
mmu	Martina Mustermann	a@bc.de	Fraunhofer FOKUS	<input type="text"/>	<input type="button" value="Approve"/> <input type="button" value="Kick"/>

**Figure 19: Account approval**

Additionally the portal includes functionality for administrators to edit existing user's profiles and for users to edit their own data.



### 1.3.2.3 Resource Management

All registered users can use the pages below this menu point to retrieve information about the resource types which are present in the TEAGLE framework that is employed by TEFIS to facilitate testbed provisioning.

Domain owners can additionally create new resource types and specify the configuration parameters they expose. Figure 20 shows the interface for creating a new resource types.

The screenshot shows a web form titled "Add ResourceSpec" in a teal font. It contains several input fields with labels above them: "Name" with the value "VirtualMachine", "Description" with the value "a virtualized computing resource", "Cost" (in red text) with a sub-label "Amount" and the value "100", and "Denominator" with the value "Euro". At the bottom of the form is a blue "Submit" button.

**Figure 20: Resource Registration**

After creating a resource type the domain owner who created it is redirected to the information page detailing the new type. Resource types can expose a number of configuration parameters and can furthermore be tied to a number of keywords. Initially, when creating a resource type it exposes neither configuration parameters or is tied to any keywords as shown in figure 21.

### Details For Resource Type VirtualMachine

**name** VirtualMachine  
**description** a virtualized computing resource  
**cost** 100Euro  
[Edit This Resource Type](#)

#### Configuration Parameters

- no elements


[Add A New Configuration Parameter](#)

#### Keywords

- no elements

[Add A New Keyword](#)

[Add An Existing Keyword](#)

Computing 

[Submit](#)

---

[Return To List Of Resource Type Instances](#)

**Figure 21: Details of a Resource Type**

At this point the creator of the type will typically want to populate the type with these kinds of information. The controls for doing so are conveniently displayed in line with other information about the resource type. For keywords, the domain owner has the choice to either add an existing keyword or directly create a new one that will be added. There is no option to choose existing configuration parameters since configuration parameters are not shared among several resource types. As an example, figure 22 shows the interface for creating a configuration parameter.

## Add Configuration Parameter

Name	<input type="text" value="num_cpus"/>
Description	<input type="text" value="number of available cpu cores"/>
Type	<input type="text" value="Integer"/>
Default Value	<input type="text" value="2"/>
<input type="button" value="Submit"/>	

**Figure 22: Adding a Configuration Parameter**

Finally, figure 23 shows the resource type information page after it has been populated with some information. Note that editing a resource type is only possible as long as it is unused – meaning that no instantiations of the type exist.

Configuration Parameters

- **name** memory  
**description** amount of memory in MiByte  
**type** integer  
**default value** 1024  
[Edit Member](#) [Remove Member](#)
- **name** num\_cpus  
**description** number of available cpu cores  
**type** integer  
**default value** 2  
[Edit Member](#) [Remove Member](#)

[Add A New Configuration Parameter](#)

Keywords

- **name** Computing  
**description** can compute things  
**type** Physical/Virtual  
[Edit Member](#) [Remove Member](#)

[Add A New Keyword](#)

[Add An Existing Keyword](#)

Storage

[Submit](#)

Figure 23: Configuration Parameters and Keywords

### 1.3.2.4 Domain Management

Generally, the domain management functions exposed by the TEFIS portal follow along the same lines as the resource management pages. All registered users are allowed to retrieve information about existing items while domain owners are allowed to create new entries in the database. Figure 24 shows the interface for creating a new domain manager entry – dubbed PTM in TEAGLE terminology.

## Add Ptm

Name

fokusptm

Description

The domain manager provided by Fraunhofer FOKUS

Url

http://ptm.fokus.fraunhofer.de:8000/rest

Submit

**Figure 24: Domain Registration**

Upon creation the new domain manager instance is automatically tied to the creating user's organization. Only domain owners from the same organization are allowed to edit the entry from this point on. Additionally it is now possible to specify which resource types are supported by this particular domain manager. Again, the controls for doing so are placed in line with the actual information page to enable a convenient overview about all information. Figure 25 shows the information page of a domain manager (PTM).

### Details For Ptm Fokusptm

**name** fokusptm  
**description** The domain manager provided by Fraunhofer FOKUS  
**url** http://ptm.fokus.fraunhofer.de:8000/rest  
**owner** mmu - Martina Mustermann  
**provider** FOKUS

[Edit This Ptm](#)

#### Supported Resources

- no elements

[Add A New Resource Type](#)

[Add An Existing ResourceSpec](#)

VirtualMachine

[Add](#)

[Return To List Of Ptm Instances](#)

**Figure 25: Domain Details**

Again, to indicate support for a particular resource the domain owner can choose to either add an existing resource type or create a new one. Creating a new resource type triggers the process described in the previous section with the exception that the new type will directly be added to the supported resources of the current domains.

## 2. External User tools

It is planned that the TEFIS portal will make external tools available to its experimenters. These external tools are provided by the individual testbeds that are federated by the TEFIS platform and which may offer some domain specific mechanisms that are beyond the more generic functions exposed by the TEFIS platform and the TEAGLE framework it employs.

Generally, whether such an external tool is integrated into the portal or not is highly dependent on the nature of the specific tool – both functional and technical. For some tools –especially web based ones – it might make sense to integrate them directly to provide a seamless user experience, probably via means of an iFrame element. Some standalone tools might be provided as a software download. Other tools might simply be referred to from the portal so the user is directed to a place where he can find more information.

### 2.1 PlanetLab external tools

Here, there are described some open source useful tools that will help the users in specifying and executing experiments and PlanetLab. Among all the available tools at **Error! Reference source not found.**, the following are the most popular today:

- PiMan [4] from *University of Washington*. PlanetLab Experiment Manager is designed to simplify the deployment, execution and monitoring of your PlanetLab experiment. The application presents a simple GUI to perform common tasks such as:
  - Selecting nodes for your slice.
  - Choosing nodes for your experiment based on CoMon information about the nodes.
  - Reliably deploying you experiment files.
  - Executing commands / sets of commands on every node in parallel.
  - Monitoring the progress of the experiment as a whole, as well as viewing console output from the nodes.

The screenshot shows the 'PL experiment manager' window. It has a menu bar with 'File', 'View', 'Transfer', and 'Help'. Below the menu is a tab labeled 'Overview'. The main area contains a table with the following columns: Site, Hostname, Exec comman, Exit statu, Time, Progress, and Last line. The table lists various sites and their connection status. Below this table is a command log table with columns: #, Command, Exit status, and Completed hosts. The log shows three commands: '#connect', 'sleep 10', and 'ls -l'. At the bottom right, there is a button labeled 'Add 10 sites'.

Site	Hostname	Exec comman	Exit statu	Time	Progress	Last line
Brown	venus.cs.brown.edu	ls -l	0	0.3		total 0
EPFL	lsirextpc02.epfl.ch	ls -l		0.5		total 0
ICS-Forth	planet2.ics.forth.gr	ls -l		0.5		ls -l
Illinois Institut	server1.planetlab.iit-tech.ne	#connect	3 'conn tir	15.2		The connect() operation on the socket timed
Illinois Institut	server2.planetlab.iit-tech.ne	#connect		8.5		#connect
NAIST	planetlab-03.naist.jp	ls -l	0	0.5		drwxr-xr-x 3 uw_if slices 4096 Nov 21 18:26
Nebraska	planetlab1.unl.edu	#connect	1 'auth fail	1.6		auth failed
Nebraska	planetlab2.unl.edu	ls -l	0	0.3		total 0
NEU	planetlabtwo.ccs.neu.edu	#connect	1 'auth fail	2.4		auth failed
NEU	planetlabone.ccs.neu.edu	ls -l	0	0.4		total 0
University of C	planetlab-1.cs.ucy.ac.cy	#connect	3 'conn tir	15.3		The connect() operation on the socket timed
University of C	planetlab-2.cs.ucy.ac.cy	#connect		9.1		#connect
University of S	ait05.us.es	ls -l		0.0		ls -l
Vrije	planetlab2.cs.vu.nl	ls -l	0	0.5		total 0

#	Command	Exit status	Completed hosts
0	#connect	0:8, 1:2, 3:2,	
1	sleep 10	0:8,	
2	ls -l	0:7,	

Add 10 sites

Figure 26: PiMan monitoring

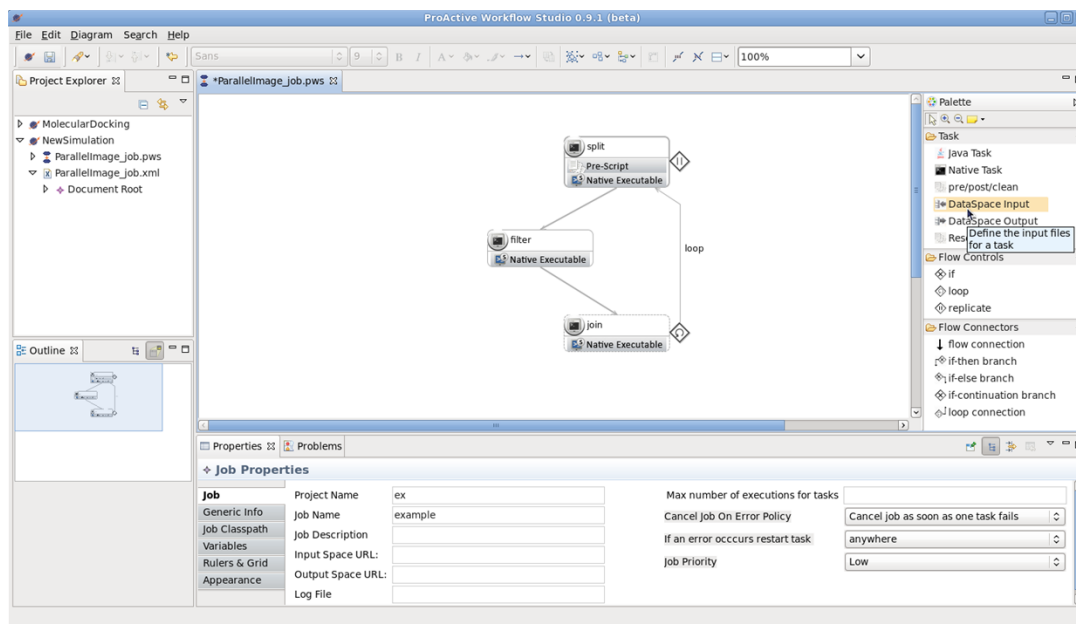
- AppManager [5] from *Intel Research Berkeley*. PlanetLab Application Manager is designed to help deploy, monitor, and run applications on PlanetLab. The package gives you the ability to centrally manage, install, upgrade, start, stop, and monitor of applications on a PlanetLab slice. This application is similar to PiMan but provides a web based interface.
- Nixes [6] from *AquaLab at Northwestern*. A set of bash scripts to install, maintain, control and monitor applications on PlanetLab. This software is similar to the previous ones, but based on shell scripts.
- The CoMon [7] functionality provides a monitoring statistics for PlanetLab at both a node level and a slice (experiment) level. It can be used to see what is affecting the performance of nodes, and to examine the resource profiles of individual experiments.
- PlanetFlow [8] functionality provides network traffic monitoring. It can be used to associate a packet to a slice.

## 2.2 PACA Grid external tools

PACAGrid testbed is a grid of machines that can be leveraged by experimenters requiring many computing resources. The computations on PACAGrid can be submitted providing an XML file describing the combination of tasks, their dependencies and control statements that define parallel computations to be executed on the grid. The experimenter has to provide this flow of tasks for PACAGrid so he must design the flow and write his own XML file. On the PACAGrid web site [9] several example are available.



The Workflow Studio is a graphical environment for constructing, validating, customizing and documenting PACAGrid workflows. Instead of manually creating a workflow xml file the experimenter can easily design it with a tool palette provided by the tool. The picture below shows a screenshot of the tool.



**Figure 27 Design tool for PACAGrid workflows**

The main features of the tool are the graphical workflow design, generation of workflow XML files, import of existing workflows, workflow validation, on line help and design tooltips.

Obviously this tool is used by the PACAGrid experimenter during the design phase of the experiment. Normally the users design the flow and then they interact directly with PACAGrid via its Graphical User Interface in order to submit the flow for the execution and to follow the execution. In TEFIS, the interaction with PACAGrid is managed by the TEFIS platform, but the users have still to provide the appropriate input for PACAGrid, so they have to design the flow to be submitted for the execution by TEFIS. So the Workflow Studio can be used during the design phase of the part of the experiment that will go on PACAGrid testbed for execution.

## 2.3 ETICS external tools

The main external tool that ETICS provides to TEFIS users is the ETICS Portal, available at [10]. In fact, the ETICS Portal is the main access point to all ETICS functionalities and may be useful, though not necessary, to experimenters to perform a fine grain tuning of configuration for their experiments. The ETICS connector will covers all ETICS' functionalities requested by the most of build and test scenarios, but if the experimenter wants more control on ETICS configuration (e.g. have several versions of the source code configured in ETICS at the same time), he/she will have the possibility of accessing the ETICS Portal directly.

ETICS Portal can be useful also for a deep evaluation of the experiment. In fact, depending on the specific configuration of the project, only a subset (defined by the experimenter) of reports, logs and packages generated by ETICS will be transferred in the TEFIS Data Repository and, hence, accessible to the experimenter through the TEFIS Portal. Having access to the other data will be still possible using the ETICS Portal. It is worth noting that all reports generated by ETICS are HTML pages and, therefore, do not necessitate any specific tool to be inspected. A web browser is enough. No additional tools are required in this case.

Moreover, a number of resources are available in Internet to help developers to understand how to model their project in ETICS and guide them through the writing of build and test commands for their project. In particular, it is worth to note:

- The online official ETICS documentation at [11].
- A tutorial structured in 14 videos available on YouTube at [12]
- The ETICS homepage at [13]

Those links can be referred in the TEFIS portal as ETICS' documentation.

## **2.4 IMS external tools**

The IMS testbed provides a set of services and resources to the users which includes among others an IMS or IP Multimedia Subsystem architecture. An architecture that standardizes end-to-end communications applications such as VoIP, multimedia conferencing, instant communication, presence, etc., both for fixed and mobile access.

This infrastructure implemented in the Testbed is based on a reference architecture that includes functional blocks as proxies, subscriber data, and application servers, as well as protocols for communicating these blocks, protocols like SIP. SIP is as a core protocol for Internet communications, and a cornerstone for this framework, that has an essential role in the development of networks and service operators as well as user applications in the Testbed.

In this context, and as support for the execution of the experiments, the users can benefit from SIP when they need to communicate with other users. When the users want to establish a communication by phone, instant messaging or email, they probably shall require the better interactive experience, and before achieving this, the mutual availability should be checked.

SIP is an Internet standard that enables such scenario where the users want to check the "presence" of another user, avoiding the reception of a busy signal or no answer from other devices. And with the appropriate tools communications could be established to a voice call, and then possibly share documents as texts, presentations and photos, go to a video session, or invite another person to the session.

To support the experiments of the users the following tools shall be recommended to the users via the TEFIS Portal:

- SIPp that could be obtained in [14].

It is a test tool / traffic generator for the SIP protocol. It includes a few basic user agent scenarios and establishes and releases multiple calls. It features the dynamic display of statistics about running tests, or TCP and UDP over multiple sockets.

Finally it also includes advanced features for IPv6, TLS, SIP authentication, conditional scenarios, UDP retransmissions, error robustness, etc, and can also send media traffic that can be audio or audio and video.

While optimized for traffic, stress and performance testing, the tool can be used to run one single call and exit, providing a passed/failed verdict.

- Pjsip-perf [15]

This is a SIP transaction and call performance measurement tool. It is then a SIP stack that supports many SIP extensions/features for building embedded/non-embedded VoIP applications.

The difference between this tool and the previous one, SIPp, is that pjsip-perf is geared more towards finding the performance of an endpoint by flooding the endpoint with some requests and time the completion of the requests.

- SIPr [16]

It is a complete SIP application testing framework suited for feature, interop, regression, acceptance and field simulation, so it is a development framework to develop, deploy and maintain SIP applications and tests.

- Wireshark at [17]

This tool, previously known as Ethereal, is a protocol analyser used for analysis and solving problems of network communications for software development and protocols, and as a teaching tool for education. It has all the standard features of a protocol analyser.

The tool shall allow the user to examine the network device interface or a file saved to disk. It is also possible to analyse the information captured through the details, and summaries for each package.

Finally, the tool includes a complete language to filter what we see and the ability to display the reconstructed stream of a TCP session.

## **2.5 BOTNIA external tools**

The tools that could be useful for TEFIS users for running their Future Internet experiments involving end-users in the work are as follows:

- Webbased Questionnaire tools and blogs

There are different kinds of open source tools available for setting up webbased questionnaires and logs like SurveyMonkey [18] or Blogger **Error! Reference source not found.**

- CMS to create webpages to set up information pages for end-users

CMS for creating webpages, provisioning of end-users and to communicate with them are for example, Joomla [20], Wordpress [21] or Drupal [21].

- Tools for communication and interacting with end-users and for end-user collaboration
  - a. Community tools: Convofy, Podio and Facebook.
  - b. Forums: phpBB, Innojam
  - c. Tools for synchronous communication: Megaconference system for example DVTS communication, Skype.
  - d. Chat/Instant messaging: Jabber/XMPP instant messaging server, java jabber client
- Open source tools for data analysis of results

For making analysis of data tools normally used are not open source (eg SPSS, MExcel) but probably other tools like Open office and Star office could be used.

For specification of experiments we have no suggestions for external tools other than special made forms, word-documents, ppt-slides. Emails, telco/Skype etc, and some of the tools mentioned above.

## 2.6 KyaTera external tools

All execution and specification of an experiment, on TEFIS portal, that will use the KyaTera testbed will be done in the portal itself, since all the necessary features will be provided by the KyaTera connector into the platform.

Thereby all the measurements can be done just entering in the portal and specifying the desired measurements. On the other hand, users can use some external tools, if they want to do more detailed studies on the network, e.g. analysis of packages. The experimenter can use the Wireshark program [www.wireshark.org](http://www.wireshark.org).

Another example is if the experimenter wants to generate internet traffic to do a network stress test, instead of using his application, he can use the Traffic program, that can be found at [32].

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