

# HORIZON 2020

## H2020 - INFRAIA-2020-1

### D2.2 SLICES-SC initial portal for accessing the RI

Acronym	SLICES-SC
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Reviewers	All partners



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## Executive summary

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In this deliverable, we described the initial version of the portal (online at <https://portal.slices-sc.eu>) to access the SLICES-SC infrastructure. We listed the requirements we used to develop the portal and gave a detailed portal walkthrough. The portal also supports OAuth (where the portal acts as an identity provider), so it's easy to integrate with web-based user interfaces to infrastructures. Finally, we also briefly touched about all APIs available in the portal. At this initial stage, those are based on earlier work in [GENI](#) and [Fed4FIRE](#).



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## Acronyms

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AM	Aggregate Manager
API	Application Programming Interface
Fed4FIRE	FEDeration for Future Internet Research and Experimentation
GDPR	General Data Protection Regulation
GENI	Global Environment for Network Innovations
HTTP	HyperText Transfer Protocol
jFed	Java-based framework for testbed FEDeration
MA	Member Authority
OAuth	Open Authorization
PEM	Privacy Enhanced Mail
PI	Principal Investigator
Rspec	Resource Specification
SA	Slice Authority
URN	Uniform Resource Name

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## 1. Introduction

For using the SLICES-SC research infrastructure a portal has been envisioned to make it easy for the experimenters to use the infrastructure. The target is for the portal to be the main means of accessing the SLICES-SC infrastructure for the Open Calls that will be organized by the project. This document describes the initial portal, starting with some requirements which were listed and followed by a description of the initial implementation of the portal which is online at <https://portal.slices-sc.eu>.

## 2. Portal requirements

We started with defining some requirements for the portal that are needed to have a good initial entry point for using the infrastructure.

- SLICES-SC branding and look&feel. For this we started from the look&feel of the SLICES-SC website (<https://slices-sc.eu>), using similar coloring schemes and navigation experience;

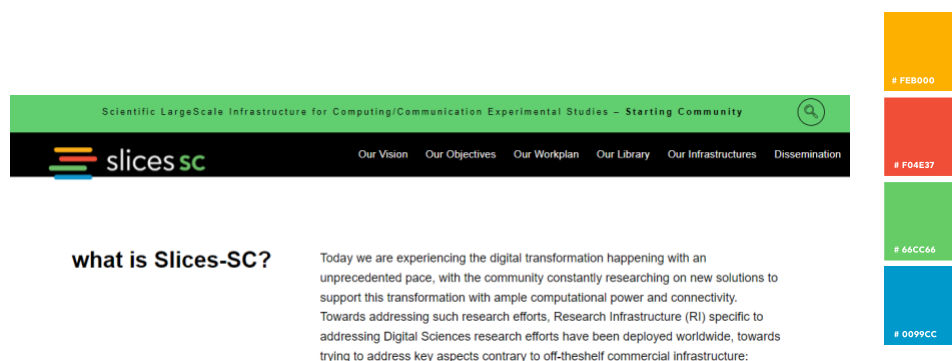


Figure 1: SLICES-SC website look and feel and color palette on the right

- User friendly portal (e.g., easy to invite people to a project or for student classes);
- Clear flow for approval of terms and conditions and GDPR terms;
- Possibility to use eduGAIN<sup>1</sup> login for academics (=university home account);
- Information is gathered for the user accounts and is put in the user credential to make it possible for testbeds to allow more fine-grained access;
- Concept of users and projects, so multiple experimenters can join the same project and use the same experiments;
- Logging for auditing;
- Statistics on number of accounts and projects;
- OAuth API to make it easy for other (web-based) services to use the same account base.

## 3. Portal walkthrough

The user portal for the user accounts and project registration has been brought online at <https://portal.slices-sc.eu> (Figure 1). The top right shows the Login and Sign-Up links.

<sup>1</sup> eduGAIN website, <https://edugain.org/>, [Last accessed 23 March 2022].

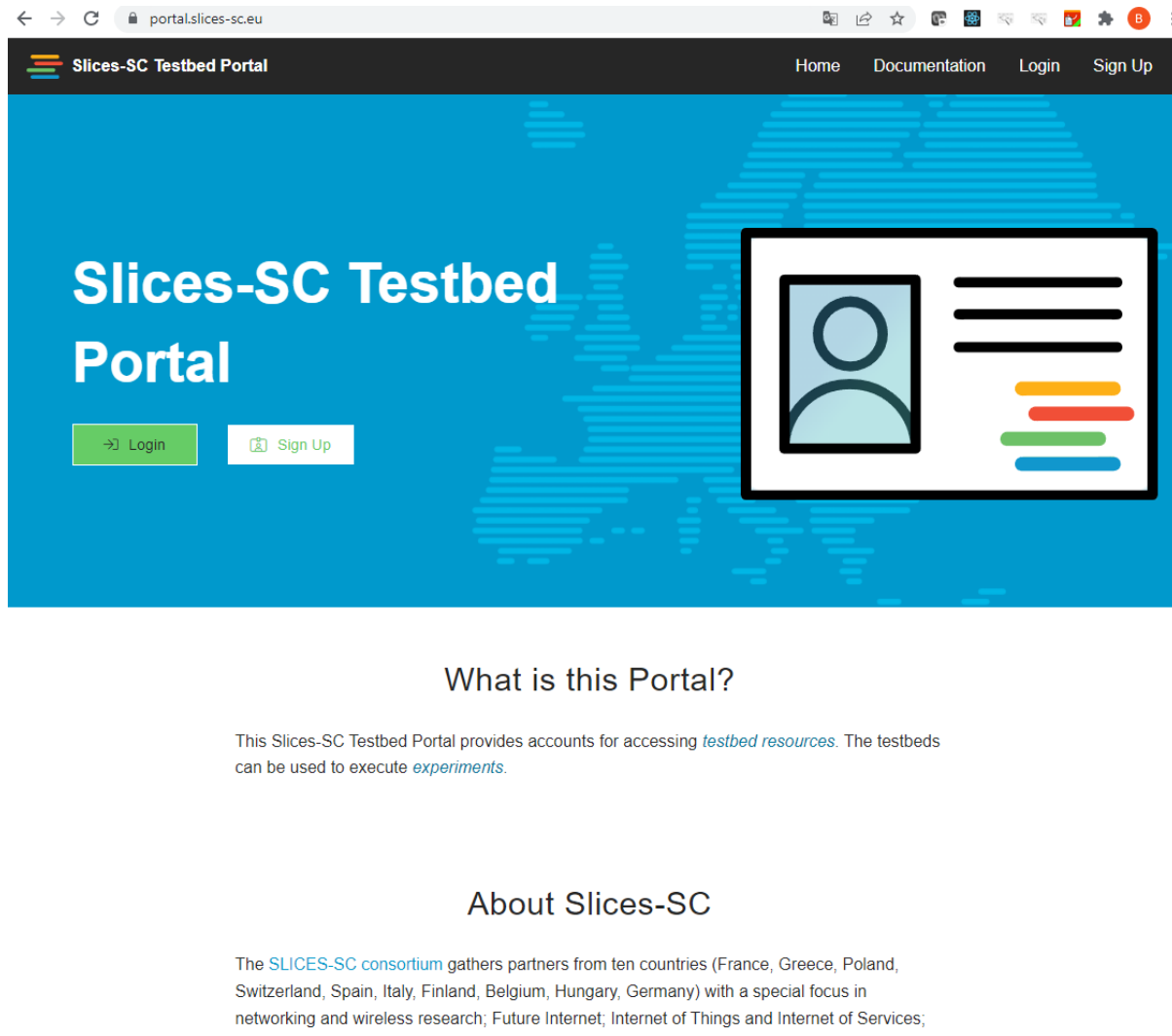



Figure 2: Front page <https://portal.slices-sc.eu> portal





### 3.1. User friendliness and clear flow when signing up for an account

When signing up for a new account (Figure 3), the steps are clearly shown at the top and it is also clearly shown that you can use your academic login or create a local account. We do ask also extra information on the user type (Student, Academic researcher, industrial researcher) (Figure 4) as this can make a difference for testbeds to accept experiments of these users (e.g., academic research can use more resources than a student, industrial researches are limited in resource use for free, etc.).


Note that the EduGAIN accounts (Figure 5) are only used for authentication. Also, people with an EduGAIN account have to register first for a SLICES-SC account (where they can use their EduGAIN credentials) and as such have to run through the same steps. Of course, their information such as e-mail and name and institute are retrieved from EduGAIN, so it goes faster.

 Slices-SC Testbed Portal
 Home Documentation Login Sign Up

## Sign Up


 Create a User Account
  Terms and Conditions
  Create or Join Project
  Wait for Approval


### Use my academic account



 Access to **imec iLab.t**

#### Choose Your Institution

Recent institutions

 **Ghent University**  
UGent.be

 **Belnet**  
belnet.be

 Add another institution
  Edit

### Create a new account

Username

Password

Repeat Password

E-mail

First Name

Last Name

I'm a:

- ☐ Student (towards a master grade)
- ☐ Academic Researcher (PhD, academic projects, etc.)
- ☐ Industrial Researcher

Company or Institution

City

Country

Create an account

Figure 3: Sign up page. Note the flow that is indicated at the top and the choice between using an EduGAIN account (at the left) and a local account at the right

- I'm a:
- ☒ Student (towards a master grade)
  - ☐ Academic Researcher (PhD, academic projects, etc.)
  - ☐ Industrial Researcher

You probably don't need to create a separate account!

If you have an account at an academic institution, you can [login directly with your academic credentials](#).

Figure 4: When selecting the academic user type for a local account, it is suggested to use the EduGAIN login



Use my academic account

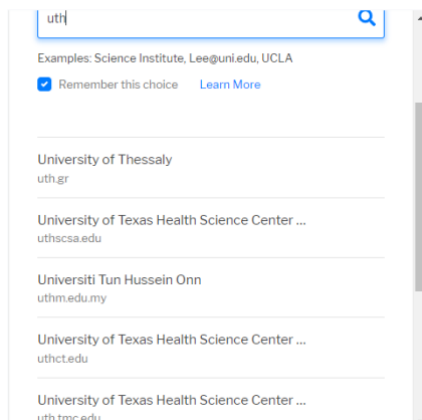


Figure 5: EduGAIN institute selector

### 3.2. Terms and conditions and privacy

The sign-up procedure has also a clear overview of the terms, conditions and privacy policy, which are clearly defined in D3.1<sup>2</sup>. A placeholder is foreseen in this sign-up flow.

As SLICES(-SC) has no legal entity at this moment (but will have in the future of course), and this portal runs in the imec datacentre in Ghent, Belgium, the imec privacy policy is used (<https://www.imec-int.com/en/privacy-statement>). Moreover, the testbeds access is aligned with the data policy and DPO of SLICES-SC.

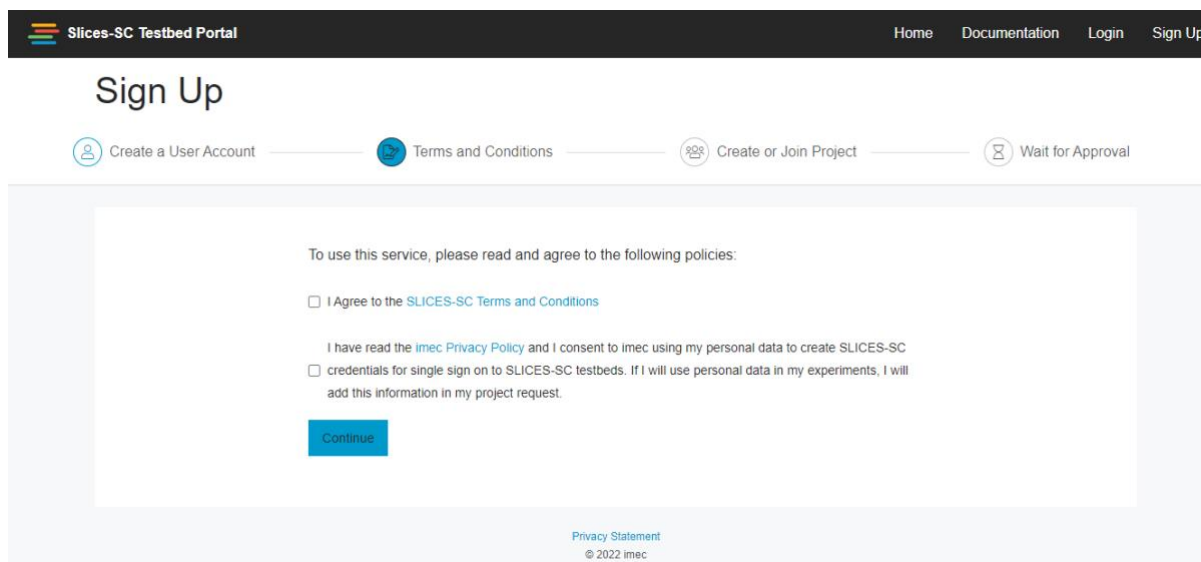


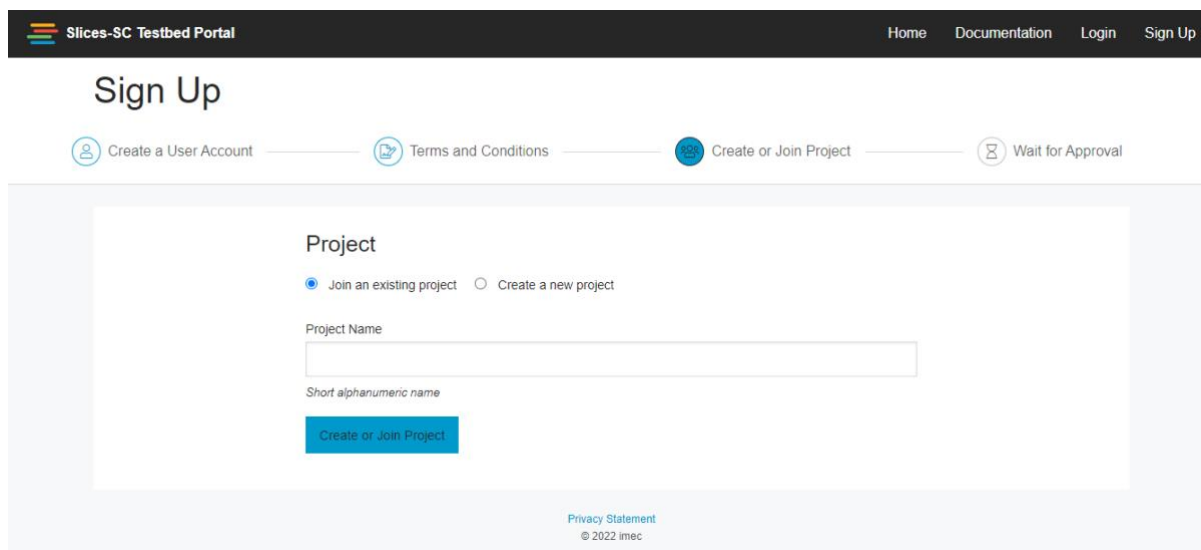
Figure 6: Clear overview of terms and conditions and privacy policy

<sup>2</sup> SLICES-SC Deliverable D3.1 “SLICES-SC data management Plan”

### 3.3. New project request or join an existing project

When creating an account, experimenters can either join an existing project led by someone else (Figure 7) or create a new project (Figure 8).

If people ask for a new project, we do ask extra information: which testbeds they want to use (so we can inform the right testbed owners) and how they heard about SLICES-SC. New projects always need to be manually approved by a portal administrator. Even if the account comes from an EduGAIN institute, we still verify the project request manually.



The screenshot shows the 'Sign Up' page of the 'Slices-SC Testbed Portal'. The page has a dark header with the portal name and navigation links: Home, Documentation, Login, and Sign Up. Below the header, a progress bar indicates four steps: 'Create a User Account', 'Terms and Conditions', 'Create or Join Project' (which is the current step and highlighted with a blue circle), and 'Wait for Approval'. The main content area is titled 'Project' and contains two radio buttons: 'Join an existing project' (selected) and 'Create a new project'. Below these is a text input field for 'Project Name' with a placeholder 'Short alphanumeric name'. A blue button labeled 'Create or Join Project' is positioned below the input field. At the bottom of the form area, there is a link for 'Privacy Statement' and a copyright notice '© 2022 imec'.

Figure 7: Join an existing project



Slices-SC Testbed Portal Home Documentation Login Sign Up

## Sign Up

Create a User Account Terms and Conditions Create or Join Project Wait for Approval

### Project

☐ Join an existing project ☒ Create a new project

Project Name

Short alphanumeric name

Description

Please give some background information on your project: what experiments you intend to perform, the intended duration of the project, amount of resources needed, etc.

Which testbeds do you intend to use?

If unsure, please have a look at our [overview of testbeds](#). If still unsure, please mention what type of hardware you need for your experiment. The more info we get, the faster we can approve your account.

How did you hear about us?

Create or Join Project

Figure 8: New project request form asking which testbeds they want to use and how they heard about SLICES

### 3.4. Project approval

The portal administrators approve manually the PIs (Principal Investigators)/new project requests. After that, the PIs of the project are responsible for approving users in their projects.

Slices-SC Testbed Portal Home Documentation Login Sign Up

## Success

Your registration was successfully processed.

Please verify your email address 'brecht.vermeulen@iminds.be' by clicking on the link in the verification mail.

After clicking on the verification link, your request for a new project 'bvslices' will be processed manually. This typically takes 1-2 business days.

If you don't receive your verification email within 15 minutes, please contact us at [helpdesk@ilabt.imac.be](mailto:helpdesk@ilabt.imac.be) for assistance.

Return to the homepage

Privacy Statement  
© 2022 imac

Figure 9: Final step: approving email confirmation and waiting for administrator approval

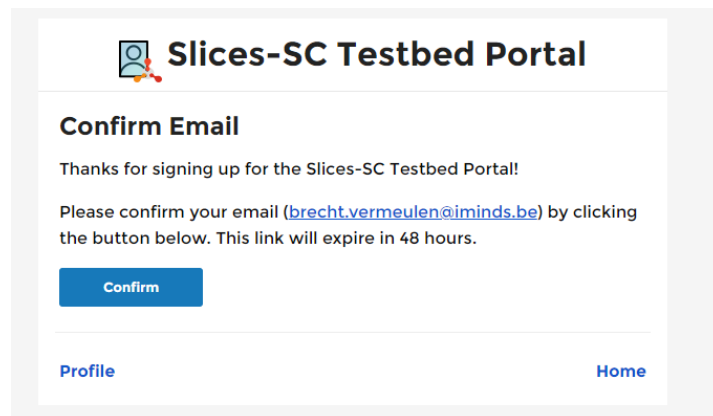


Figure 10: Confirmation email

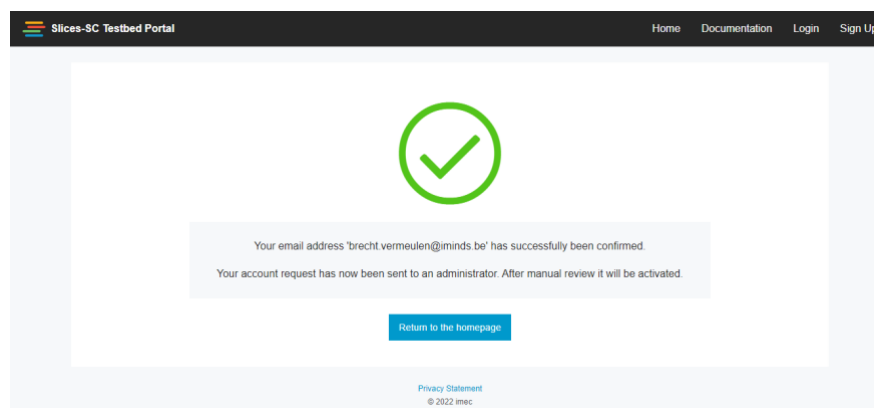


Figure 11: Email confirmed

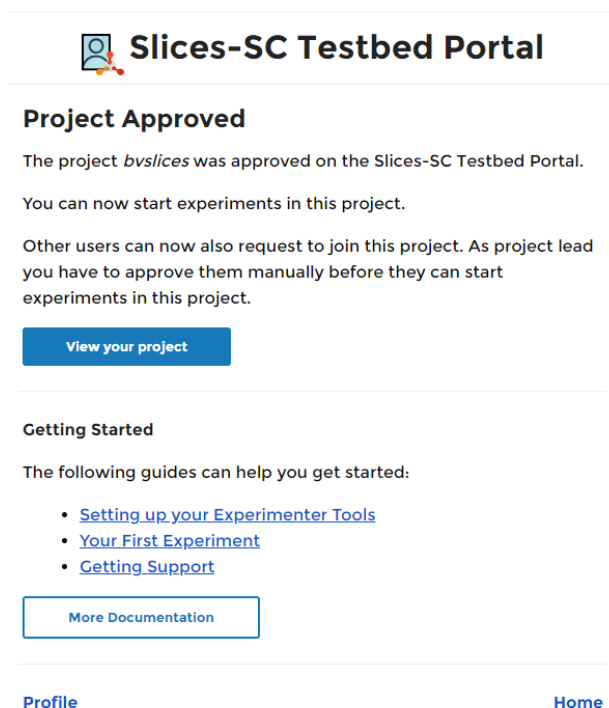


Figure 12: Project approval email

### 3.5. Portal dashboard

The screenshot below shows the dashboard a user sees after login. It is a quick overview of the projects the user is member of, the user profile, the last experiments and the possibility to download the PEM certificate for use in other tools.

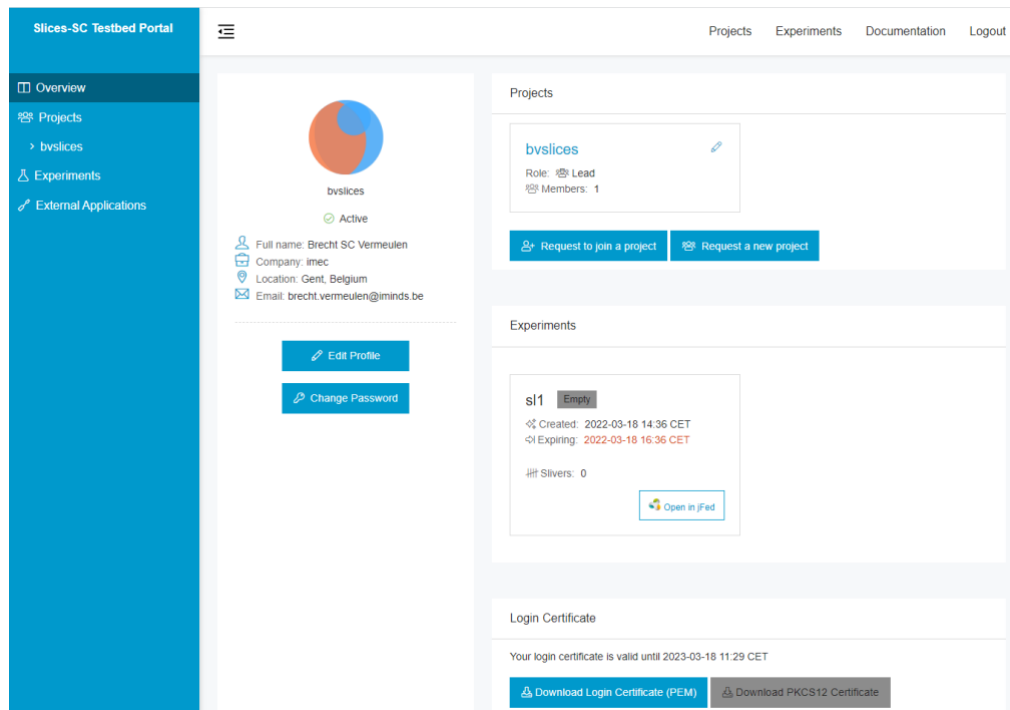


Figure 13: Dashboard after login

### 3.6. Dashboard per project functionality

The dashboard shows per project the current members and their role (lead, admin, member) and the number of experiments in that project.

It contains also an invite URL to easily invite other users and it is possible to change this in an auto-approval (random) URL, e.g., for class exercises where you expect many students at once.

**Slices-SC Testbed Portal**

- Overview
- Projects
  - > bvslices
- Experiments
- External Applications

Projects
Experiments
Documentation
Logout

### Project *bvslices*

Description: Demo project for SLICES-SC

Lead: Brecht SC Vermeulen (bvslices)

Created: Not set

Expiration: Not set

Members

Active members

1

Pending members

0

Username	Name	Role	Actions
bvslices	Brecht SC Vermeulen	Lead	No actions available

Experiments

Active Experiments

1

Expired Experiments

0

Last expiring experiment

18 March 2022

Show experiments list

Project Settings

Invite URL

https://portal.slices-sc.eu/invite/bvslices

☐ Auto-approve members registering through invite URL

Figure 14: Per project functionality in the dashboard

### 3.7. Dashboard experiment overview

In the below screenshot you can see how the user sees the list of expired and running experiments and the following functionality is present:

- Possibility to download request and manifest RSpec (to rerun an old experiment e.g.);
- Easy filter, sort and search functionality.

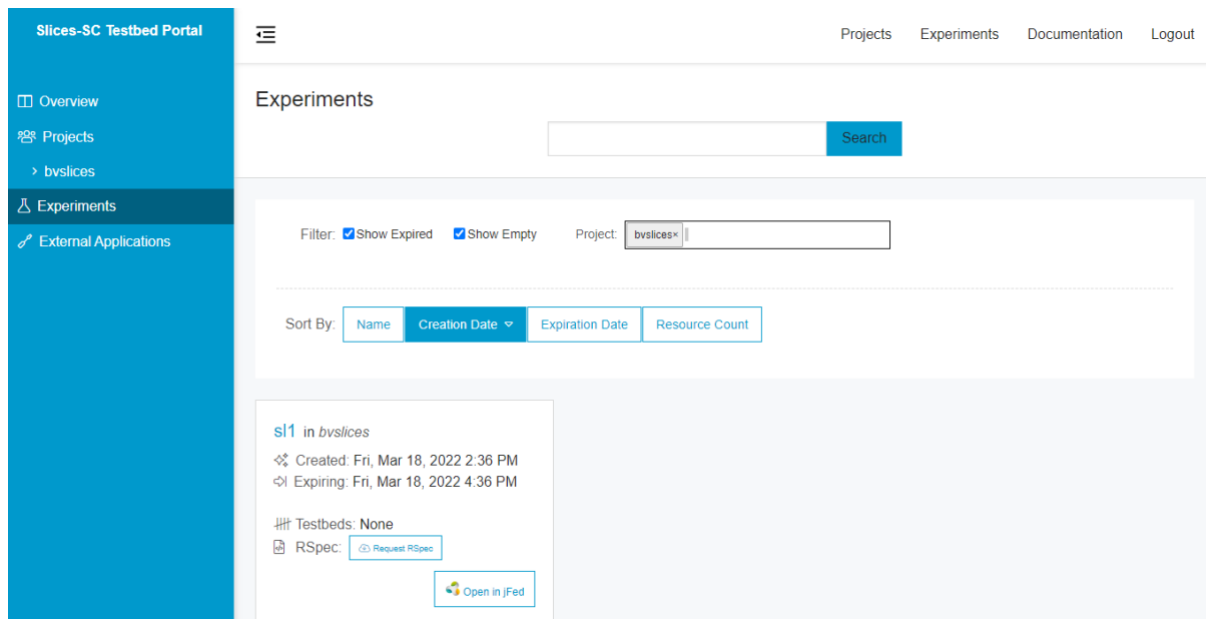


Figure 15: Dashboard showing expired and running experiments

### 3.8. Admin view

The portal administrators have access to admin pages in the portal to view users, projects and experiments.

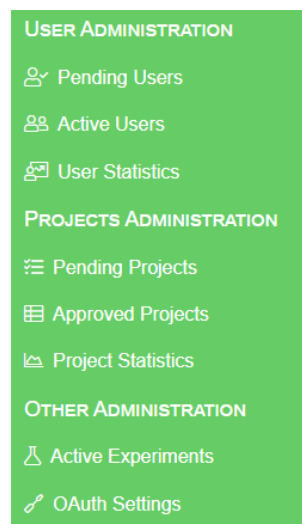


Figure 16: Admin functionality of the portal

### 3.9. Logging for auditing

In the portal we also have logging of all actions so we can use it for auditing purposes. See the example below:



User *bvslices*

General info

**Name:** Brecht SC Vermeulen

**Email:** [brecht.vermeulen@iminds.be](mailto:brecht.vermeulen@iminds.be)

**Affiliation:** ACADEMIC at imec

**Portal Home:** slices

**Enabled:** ☒ Yes

Internal ID's

**UID:** 6aaf9f66-4a44-45c5-848b-597700a8b400

**URN:** urn:publicid:IDN+ilabt.imec.be+user+bvslices

**EPPN:** bvslices@imec.portal

Projects

Project	Role
<a href="#">bvslices</a>	LEAD

Slices

Slice name	Project	Owner?	Created	Expiration
<a href="#">sl1</a>	<a href="#">bvslices</a>	Yes	2022-03-18 14:36 CET	2022-03-18 16:36 CET

Logs

Timestamp	Message
2022-03-18 11:29 CET	Created project bvslices with lead Brecht SC Vermeulen
2022-03-18 11:29 CET	Activated GENI user : Brecht SC Vermeulen (urn:publicid:IDN+ilabt.imec.be+user+bvslices)

Figure 17: Information per user, including logs for auditing purposes

## 4. OAuth support in the portal

An important feature of the portal is the OAuth functionality. OAuth is an open standard for access delegation, commonly used as a way for Internet users to grant websites or applications access to their information on other websites but without giving them the passwords.

Generally, OAuth provides to clients a "secure delegated access" to server resources on behalf of a resource owner. It specifies a process for resource owners to authorize third-party access to their server resources without sharing their credentials. Designed specifically to work with Hypertext Transfer Protocol (HTTP), OAuth essentially allows access tokens to be issued to third-party clients by an authorization server, with the approval of the resource owner. The third party then uses the access token to access the protected resources hosted by the resource server.

The SLICES-SC portal also acts as an identity provider supporting the OAuth protocol to make it possible for research infrastructures to authorize easily SLICES-SC experimenters.

Technically, SLICES-SC supports the OpenID Connect layer on top of the OAuth protocol (<https://openid.net/connect/>) and this gives an idea of the metadata to be supported for the



integration of the SLICES-SC identity provider through OAuth (<https://portal.slices-sc.eu/.well-known/openid-configuration>).

```
{
  "authorization_endpoint": "https://portal.slices-sc.eu/oauth/authorize",
  "id_token_signing_alg_values_supported": [
    "none",
    "RS512"
  ],
  "introspection_endpoint": "https://portal.slices-sc.eu/oauth/introspect",
  "issuer": "https://account.ilabt.imec.be",
  "jwks_uri": "https://portal.slices-sc.eu/.well-known/jwks.json",
  "response_types_supported": [
    "code",
    "id_token",
    "token id_token"
  ],
  "scopes_supported": [
    "openid",
    "userinfo",
    "privatekey",
    "slice_authority",
    "member_authority"
  ],
  "token_endpoint": "https://portal.slices-sc.eu/oauth/token",
  "token_endpoint_auth_methods_supported": [
    "client_secret_basic",
    "client_secret_post"
  ],
  "userinfo_endpoint": "https://portal.slices-sc.eu/api/userinfo"
}
```

## 5. APIs specific to the portal

In this phase of the SLICES-SC project for this initial portal, we build further on the concepts and APIs defined by earlier projects such as GENI and Fed4FIRE.

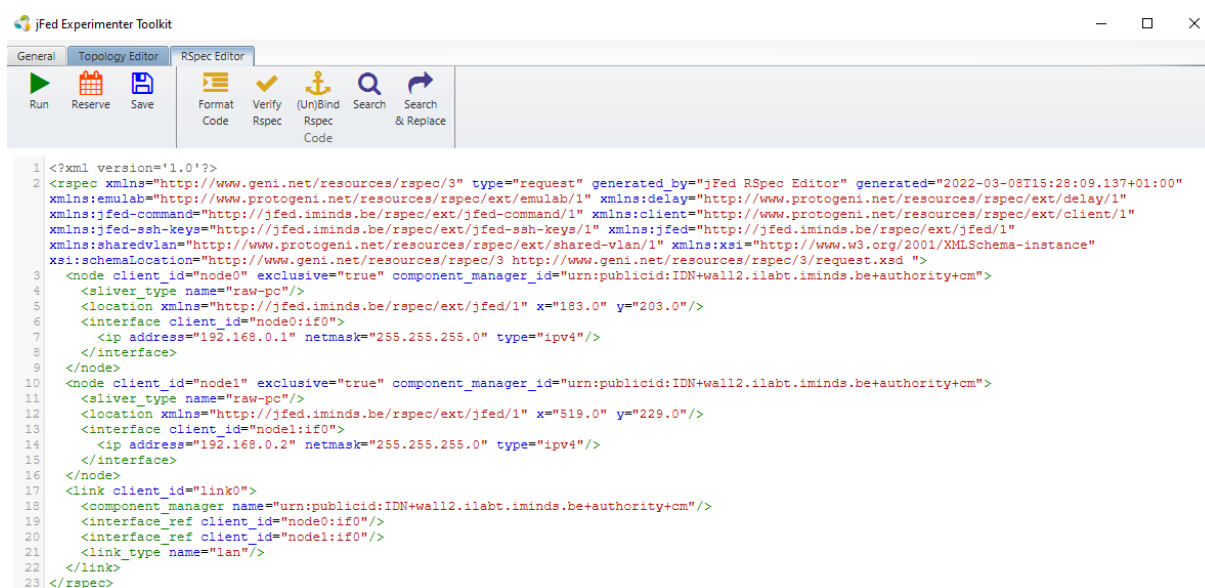
We add here a brief overview of the APIs and concepts used in the federation with pointers to more extensive documentation:

- Slice and slivers: a slice contains slivers. Think of a slice as your experiment which contains resources (slivers). Those slivers can be in different testbeds;
- Member Authority API (MA API): this API is used to interact with the authority/portal about users and projects information and authentication. This API is based on XMLRPC over HTTPS. See also <https://geni-nsf.github.io/CommonFederationAPI/CommonFederationAPIv2.html>;
- Slice Authority API (SA API): this API is used to interact with the authority/portal about slice (experiment) information. This API is based on XMLRPC over HTTPS. See also <https://geni-nsf.github.io/CommonFederationAPI/CommonFederationAPIv2.html>;
- Aggregate Manager API (AM API, <https://fed4fire-testbeds.ilabt.iminds.be/asciidoc/federation-am-api.html>): this API is used to interact with the testbed. This API is based on XMLRPC over HTTPS. See also <https://fed4fire-testbeds.ilabt.iminds.be/asciidoc/federation-am-api.html>;
- Resource Specifications (RSpecs, <https://fed4fire-testbeds.ilabt.iminds.be/asciidoc/rspec.html>) describe the resources to be reserved/provisioned. They are defined in XML and come in 3 flavours:
  - Advertisement RSpec: can be retrieved from the testbed through the AM API and describes all available resources on a testbed;

- Reservation RSpec: This describes the resources a user wants to reserve;
- Manifest RSpec: this resembles the Reservation RSpec, and is the RSpec that the testbed returns when a reservation is made. It contains e.g., information to access the reserved nodes.
- Some naming and identification concepts are defined as well, see some examples in the table below (URN = uniform resource name) (further information on this can be found at <https://fed4fire-testbeds.ilabt.iminds.be/asciidoc/general.html>):

Resource	ZZZZ Identifier
User cviecco at the planetlab namespace	urn:publicid:IDN+planet-lab.org+user+cviecco
Planetlab node: pl2.ucs.indiana.edu	urn:publicid:IDN+planet-lab.org+node+pl2.ucs.indiana.edu
Interface eth0 in planetlab node pl1.ucs.indiana.edu	urn:publicid:IDN+planet-lab.org+interface+pl1.ucs.indiana.edu:eth0
Slice mytestslice in the Utah Emulab slice authority	urn:publicid:IDN+emulab.net+slice+mytestslice
The Utah Emulab slice authority	urn:publicid:IDN+emulab.net+authority+sa
Sliver 123 in the Utah Emulab aggregate manager	urn:publicid:IDN+emulab.net+sliver+123

All these things can be easily verified and learned through the jFed user tool developed in the Fed4FIRE project (<https://jfed.ilabt.imec.be>).



```

1 <?xml version='1.0'?>
2 <rspec xmlns="http://www.geni.net/resources/rspec/3" type="request" generated_by="jFed RSpec Editor" generated="2022-03-08T15:28:09.137+01:00"
  xmlns:emulab="http://www.protonet.net/resources/rspec/ext/emulab/1" xmlns:delay="http://www.protonet.net/resources/rspec/ext/delay/1"
  xmlns:jfed-command="http://jfed.iminds.be/rspec/ext/jfed-command/1" xmlns:client="http://www.protonet.net/resources/rspec/ext/client/1"
  xmlns:jfed-ssh-keys="http://jfed.iminds.be/rspec/ext/jfed-ssh-keys/1" xmlns:jfed="http://jfed.iminds.be/rspec/ext/jfed/1"
  xmlns:sharedvlan="http://www.protonet.net/resources/rspec/ext/shared-vlan/1" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://www.geni.net/resources/rspec/3 http://www.geni.net/resources/rspec/3/request.xsd">
3   <node client_id="node0" exclusive="true" component_manager_id="urn:publicid:IDN+wall2.ilabt.iminds.be+authority+cm">
4     <sliver_type name="raw-pc"/>
5     <location xmlns="http://jfed.iminds.be/rspec/ext/jfed/1" x="183.0" y="203.0"/>
6     <interface client_id="node0:if0">
7       <ip address="192.168.0.1" netmask="255.255.255.0" type="ipv4"/>
8     </interface>
9   </node>
10  <node client_id="node1" exclusive="true" component_manager_id="urn:publicid:IDN+wall2.ilabt.iminds.be+authority+cm">
11    <sliver_type name="raw-pc"/>
12    <location xmlns="http://jfed.iminds.be/rspec/ext/jfed/1" x="519.0" y="229.0"/>
13    <interface client_id="node1:if0">
14      <ip address="192.168.0.2" netmask="255.255.255.0" type="ipv4"/>
15    </interface>
16  </node>
17  <link client_id="link0">
18    <component_manager name="urn:publicid:IDN+wall2.ilabt.iminds.be+authority+cm"/>
19    <interface_ref client_id="node0:if0"/>
20    <interface_ref client_id="node1:if0"/>
21    <link_type name="lan"/>
22  </link>
23 </rspec>

```

Figure 18: Reservation RSpec in jFed

jFed Experimenter Toolkit

General | **Topology Viewer** | RSpec Viewer

Update Status | Renew | Terminate | Reboot | Fix SSH | Edit SSH-keys | Share | Unshare | Test Links | (Re)run ESpec | Multi Command | Save Manifest | Export As | Export

### Slice

Name	Project	Experiment ID	Expiration time
demo2	bvermeul	urn:publicid:IDN+ilabt.iminds.be+bvermeul+slice+demo2	2022-05-16 14:06:28

### Slivers

Sliver Testbed	Sliver ID	Expiration time	Status
imec Virtual Wall 2	urn:publicid:IDN+wall2.ilabt.iminds.be+sliver+298434	2022-05-16 14:06:28	UNALLOCATED
imec Virtual Wall 2	urn:publicid:IDN+wall2.ilabt.iminds.be+sliver+298435	2022-05-16 14:06:28	UNALLOCATED
imec Virtual Wall 2	urn:publicid:IDN+wall2.ilabt.iminds.be+sliver+298437	2022-05-16 14:06:28	UNALLOCATED

### Node login information

Node name	Hostname	Port	Username	Login
node0	n1112-01.wall2.ilabt.iminds.be	22	bvermeul	<a href="#">Login</a>
node1	n1113-05.wall2.ilabt.iminds.be	22	bvermeul	<a href="#">Login</a>

### Manifest RSpec

Choose which manifest RSpec you want to view: Combined Manifest RSpec Save...

```

1 <?xml version="1.0" encoding="UTF-8"?>
2 <rspec xmlns="http://www.geni.net/resources/rspec/3" type="manifest" expires="2022-03-08T13:06:27Z" generated_by="jFed RSpec Editor"
3   generated="2022-03-08T12:07:46.311+01:00" xmlns:emulab="http://www.protonet.net/resources/rspec/ext/emulab/1"
4   xmlns:delay="http://www.protonet.net/resources/rspec/ext/delay/1" xmlns:jfed-command="http://jfed.iminds.be/rspec/ext/jfed-command/1"
5   xmlns:client="http://www.protonet.net/resources/rspec/ext/client/1" xmlns:jfed-ssh-keys="http://jfed.iminds.be/rspec/ext/jfed-ssh-
6   keys/1" xmlns:jfed="http://jfed.iminds.be/rspec/ext/jfed/1" xmlns:sharedvlan="http://www.protonet.net/resources/rspec/ext/shared-vlan/1"
7   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://www.geni.net/resources/rspec/3
8   http://www.geni.net/resources/rspec/3/request.xsd">
9
10   <node client_id="node0" exclusive="true" component_manager_id="urn:publicid:IDN+wall2.ilabt.iminds.be+authority+cm"
11   component_id="urn:publicid:IDN+wall2.ilabt.iminds.be+node+n1112-01" sliver_id="urn:publicid:IDN+wall2.ilabt.iminds.be+sliver+298434">
12
13     <sliver_type name="raw-pc"/>
14
15     <services>
16       <login authentication="ssh-keys" hostname="n1112-01.wall2.ilabt.iminds.be" port="22" username="bvermeul"/>
17     </services>
18
19     <location xmlns="http://jfed.iminds.be/rspec/ext/jfed/1" x="183.0" y="203.0"/>
20
21     <interface client_id="node0:if0" sliver_id="urn:publicid:IDN+wall2.ilabt.iminds.be+sliver+298438"
22   component_id="urn:publicid:IDN+wall2.ilabt.iminds.be+interface+n1112-01:eth0" mac_address="00133b2fdd79">
23       <ip address="192.168.0.1" netmask="255.255.255.0" type="ipv4"/>
24     </interface>
25   </node>
26 </rspec>
  
```

Figure 19: Manifest RSpec in jFed

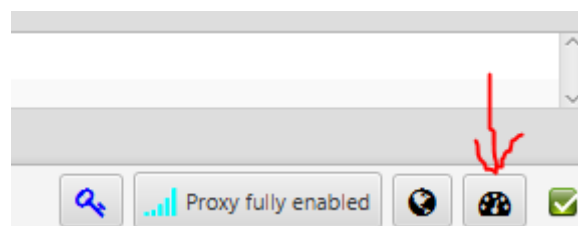


Figure 20: Use the call information button in the right bottom of jFed to access all API calls

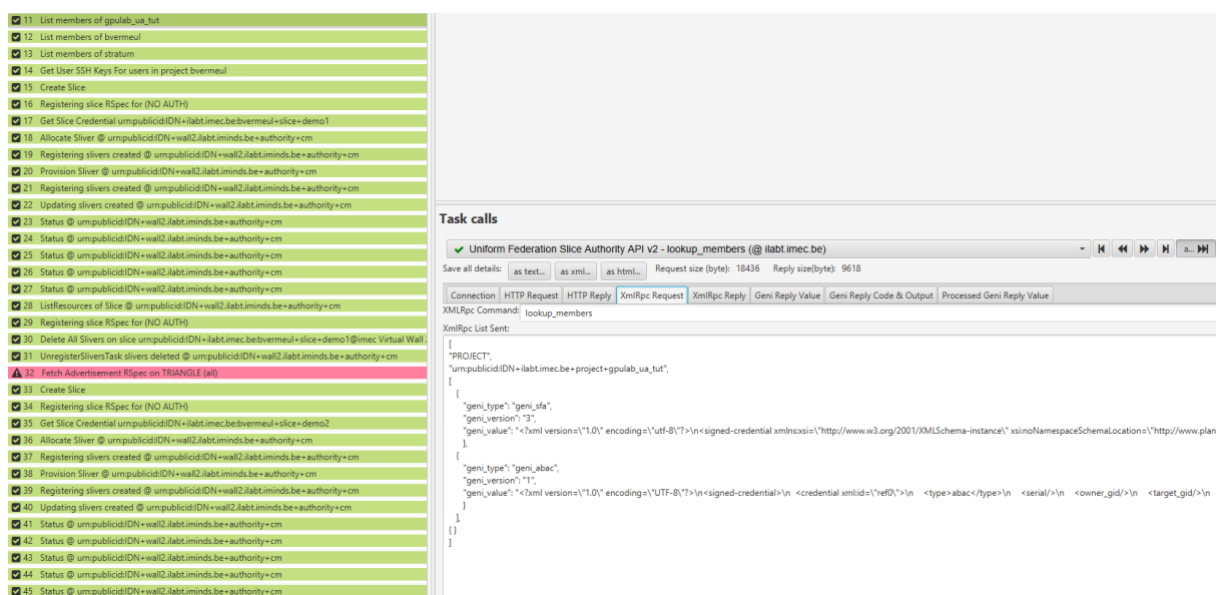


Figure 21: Example of API call in jFed (left shows all calls done, right shows specifically the lookup\_members call). The calls can be verified at <http> and <xmlrpc> level

## 6. Conclusion

In this deliverable, an initial version of the SLICES-SC portal for accessing the SLICES-SC infrastructure was presented and detailed for its operation. This initial portal will be used for providing access during the first round of open calls in the SLICES-SC project. The portal supports a user-friendly interface for booking testbed resources and scheduling experiments with them, offering fine grained control over the experimental components. The portal has been designed to act as an identity provider, thus easing the integration of new testbeds in the infrastructure. The different APIs that the portal is providing are based on prior work and well-established interfaces, extended where appropriate to match the SLICES-SC goals and heterogenous resources.

