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D2.11: Federation operations, tools and support – Final version

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Abstract	This deliverable describes the federation operation and support statistics for the first 48 months and the current state of the operational tools.
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V3	15/03/2022	Submitted version	Peter Van Daele (imec)

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Project co-funded by the European Commission in the H2020 Programme		
Nature of the deliverable:		R
Dissemination Level		
PU	Public, fully open, e.g. web	X
CL	Classified, information as referred to in Commission Decision 2001/844/EC	
CO	Confidential to FED4FIRE+ project and Commission Services	

** R: Document, report (excluding the periodic and final reports)*

DEM: Demonstrator, pilot, prototype, plan designs

DEC: Websites, patents filing, press & media actions, videos, etc.

OTHER: Software, technical diagram, etc.

EXECUTIVE SUMMARY

This deliverable is the 3rd deliverable in a series describing the operations, tools, and support in the Fed4FIRE+ federation. It provides an overview of the operational usage of the federation since the start of the Fed4FIRE+ project as well as details on statistics of usage, testbeds reachable for the users. A specific section is included which provides an insight on the organization of the support from the user point-of-view through a wizard, as well as in the backend. Statistics on support tickets are also provided. The deliverable also refers to the overview/tutorial/manual of the jFed user tool features.

The information reported in this deliverable covers the whole Fed4FIRE+ duration, apart from the section 6, which provides an update on the new features in jFed with respect to the previous deliverable in this series i.e. deliverable D2.07 *Federation operations, tools and support – Update 1*.

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1 INTRODUCTION

This deliverable is the 3rd deliverable in a series of deliverables describing the operations, tools, and support for running the Fed4FIRE+ federation. This document illustrates these different features and provides an inside view on how the Fed4FIRE+ is run and supported.

Section 2 of this document provides some statistics on both the number of users as well as the number of experiments ran on the Fed4FIRE+ federation. As a new portal was launched, this information is provided for both operational portals. In addition, some specific remarks are made with respect to Cross Testbed Security based on some previous issues.

Section 3 presents the users' request process through the jFed tool which is used to support the federation. This request for support runs through a wizard. This section also provides an insight on how the requests for support are dealt with in the backend.

Section 4 provides a graphical overview of the available testbeds and is followed by section 5 which shows how to access the Fed4FIRE+ documentation.

Finally, section 6 provides an overview of the latest jFed features which have been implemented since the publication of deliverable D2.07 *Federation operations, tools, and support – Update 1*. This also includes specific features added for the Grid 5000 and IRIS testbeds.

This deliverable is the final one in this series.

2 STATISTICS ON USERS AND EXPERIMENTS

2.1 USERS

The Figure 1 below shows the cumulative number of accounts in the federation since September 2013. The previous project Fed4FIRE and the current Fed4FIRE+ project are indicated. In total, more than 1800 users accounts have been created and additional 350 accounts have been set up for classes - typically reused each year.

The increase of the accounts slowly starts from beginning 2020, when the new portal (<https://portal.fed4fire.eu/>) was launched. All new experiments/projects were advised to be created on the new portal while existing projects/experiments were kept on the. By the end of 2021 no new users appear on the old portal.

Figure 2 shows the cumulative number of accounts on the new portal since beginning of 2020. The portal is run by imec and as such we make a clear distinction, when the accounts are created, between imec internal users and Fed4FIRE+ users. At the end of 2021 about 365 Fed4FIRE+ users were registered on the new portal, while about 650 imec users were registered.

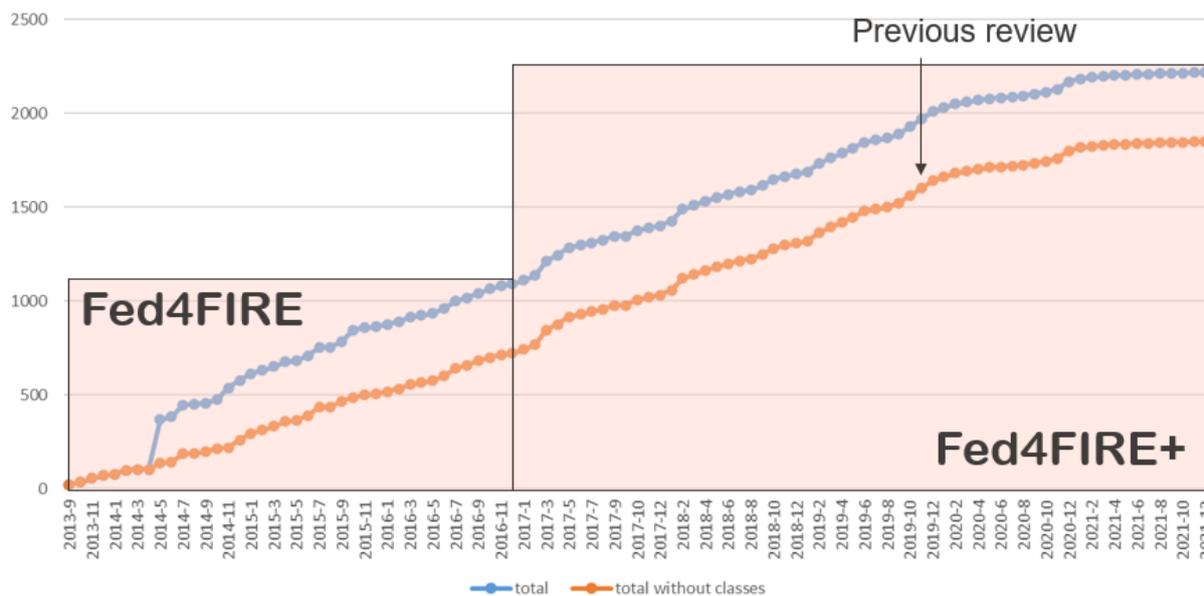


Figure 1: Cumulative accounts over time on the first Fed4FIRE portal (in use since 2013)

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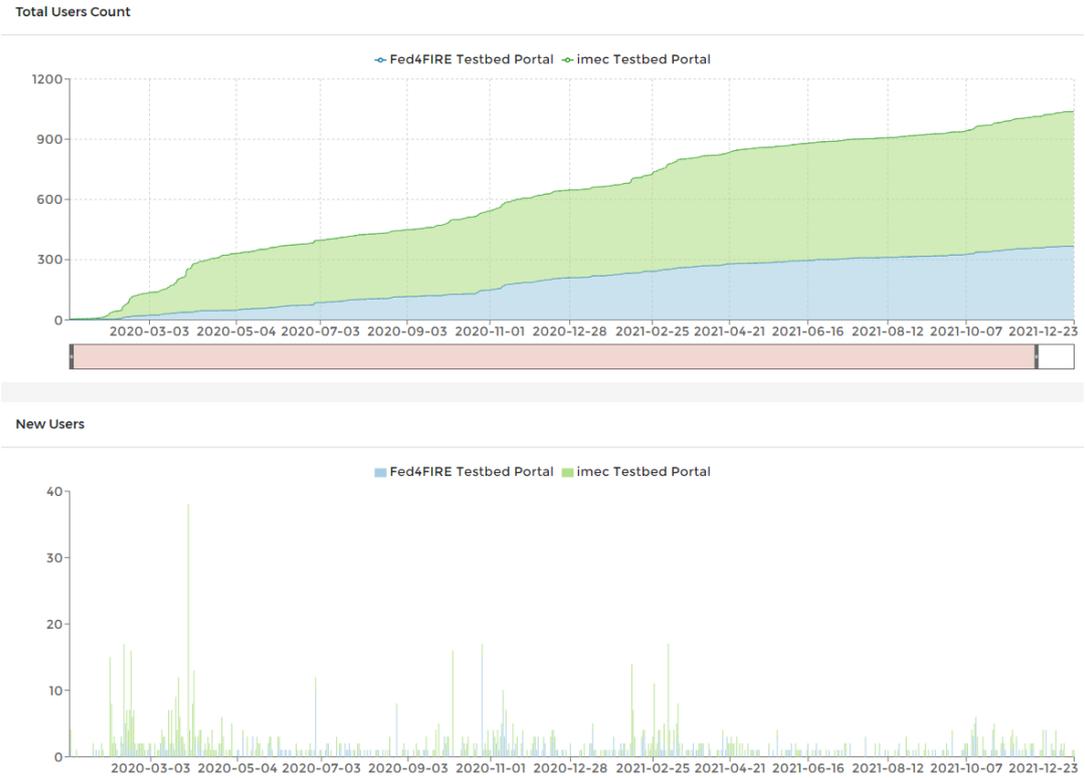


Figure 2: Top: Cumulative accounts over time on the new Fed4FIRE+ portal (in use since 2020). Bottom: Number of new accounts per day

2.2 EXPERIMENTS

The graphs below give an overview of the number of experiments performed. For this, we have the concept of a ‘project’ in the Fed4FIRE+ authority. A project is requested by a PI (Principal Investigator) and can contain multiple people. Examples of projects are e.g. a PhD, a master student thesis, a research project, an open call experiment. It is clear that within such a project (e.g. a PhD over multiple years) multiple tests/setup are run on the same topic. From September 2013 until now, about 1000 projects have been created on the original Fed4FIRE portal (Figure 3).

Since 2020, on the new portal (**Error! Reference source not found.**) about 180 new Fed4FIRE projects/experiments were created, 400 of which were imec internal projects.

Interesting to note is that during Fed4FIRE 46 Open Call experiments were run, and during Fed4FIRE+ till now about 150. It shows that this is a minority compared to all other experiments. This illustrates that the majority of the projects run on the federation is either through open access or internal projects.

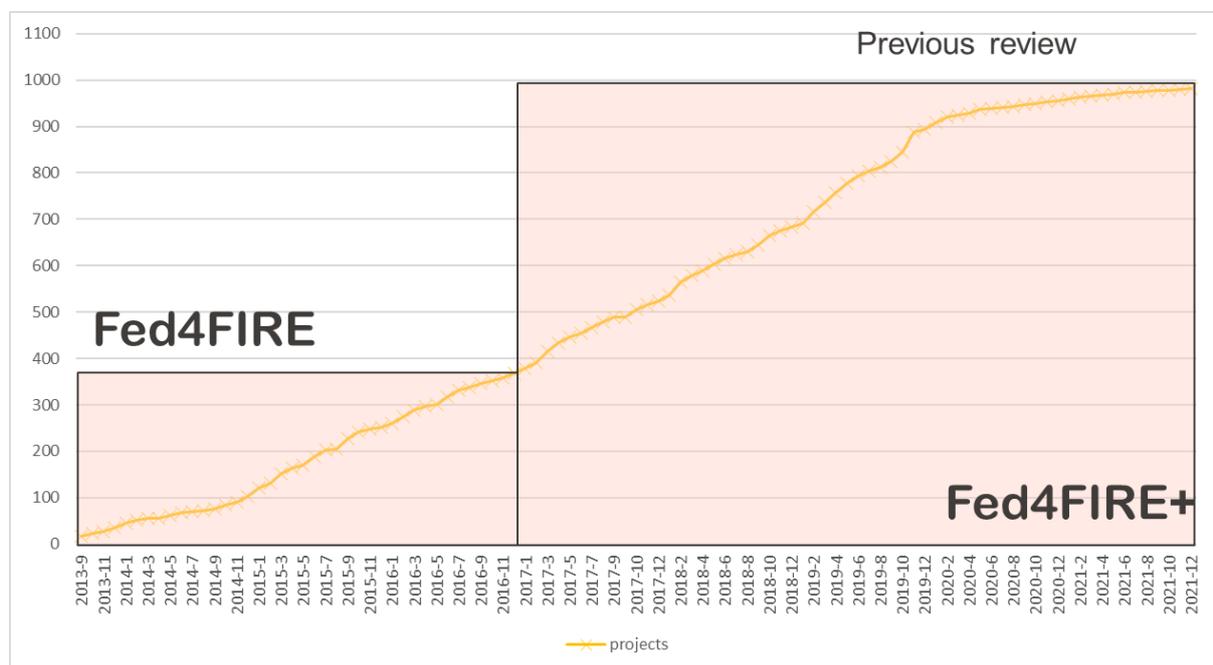


Figure 3: Number of projects in the federation on the first Fed4FIRE portal (in use since 2013)

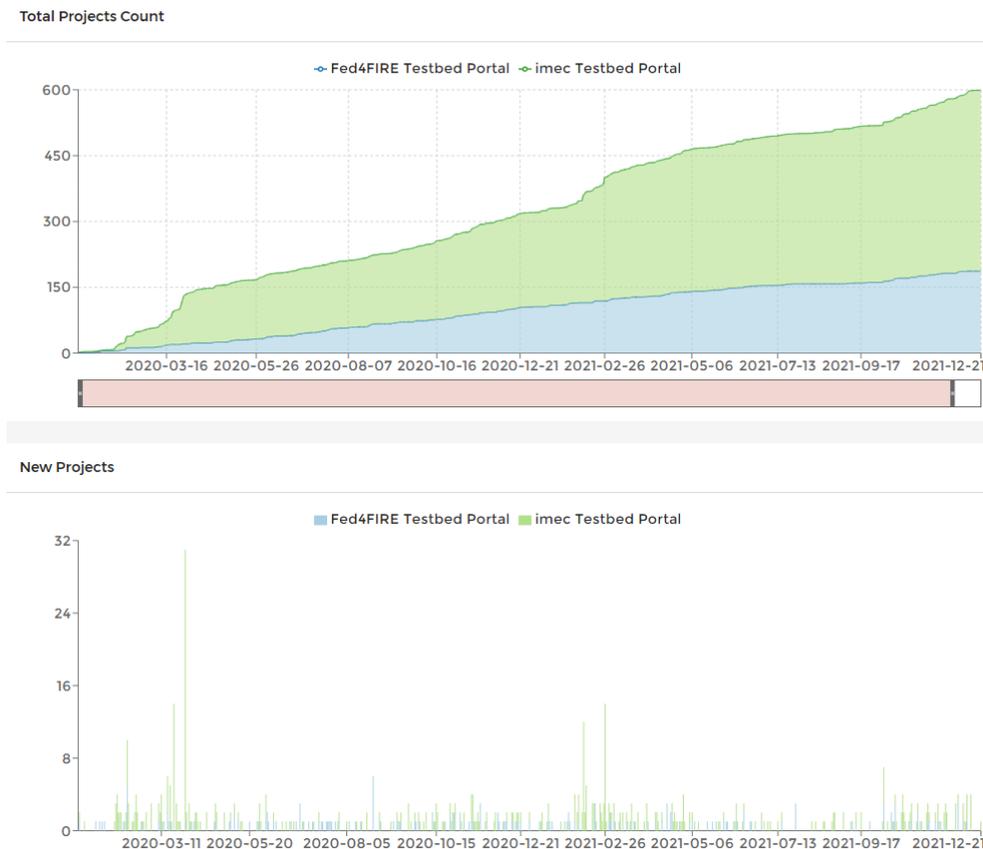


Figure 4: Number of projects created on the new Fed4FIRE+ authority (from 2020 onwards). The portal is run by imec, and a clear distinction is made for imec users and projects and external Fed4FIRE+ projects. The below graph shows the number of new projects created per day.

2.3 CROSS TESTBED SECURITY

In the previous reporting period, Fed4FIRE+ was invited by US testbeds (cloudlab, fabric, exogeni, emulab, geni) on a cross-testbed-security channel.

Some users tried to use the testbed resources for bitcoin mining getting an account on all testbeds. Despite the matches between Fed4FIRE+ and US testbeds requests, these accounts were not approved on Fed4FIRE+ due to a lack of detailed information.

Even if the channel was not that active anymore, the basic human check on project creation proved to be very useful and needed. For example, users were asked to provide details on the experiments they wanted to run and when the replies were not sufficient, some accounts were not approved

With the launch of the new portal, the projects end dates have been added based on the input provided (e.g. only use for a couple of weeks or months).

3 SUPPORT FROM WITHIN JFED TOOL

3.1 SUPPORT WIZARD IN JFED

Starting from jFed 5.7.2, which was released on March 22nd, 2017, the jFed Experimenter GUI contains an advanced support wizard. This wizard allows the user to contact the Fed4FIRE+ support team at imec for assistance when they run into problems while using one or more testbed resources.

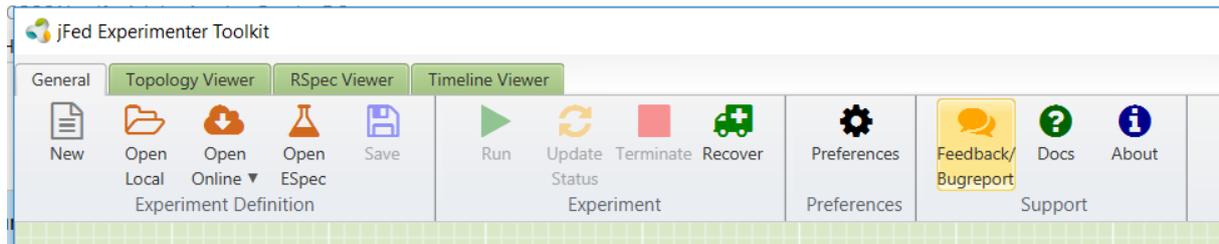


Figure 5: jFed Feedback/Bugreport button

The first page of the wizard allows the user to select the category for the question he/she wants to pose:

- Question: any question about jFed, a testbed or anything else
- jFed Feature Request: for reporting missing functionality in the jFed GUI
- Problem or Bug Report: for reporting unexpected behaviour of the jFed GUI or a testbed
- Connectivity issue: for when the user is unable to connect to a testbed API endpoint or a testbed resource
- Other: any other feedback

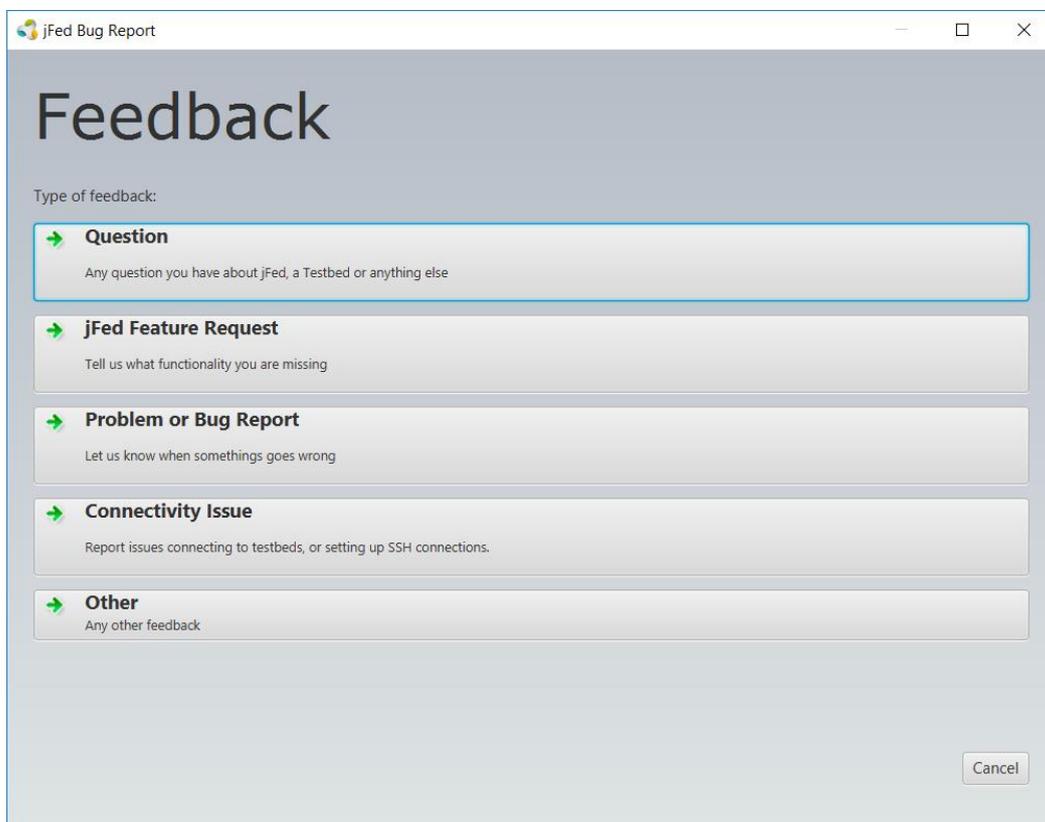


Figure 6: Start screen of the Feedback wizard

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Depending on the chosen category, the user has the option to further specify the type of support request. Figures 7 and 8 show the follow-up pages when a user selects the category 'Question'. The first follow-up question allows to specify whether the question deals with the jFed GUI and/or a testbed that he/she wants to use. When the user selects the latter, a second follow-up question allows to choose the specific testbeds. For ease of use, the testbeds currently used in a running experiment are put on top of the list in bold

By asking these questions, it is possible to do a first triage when the support request is submitted. This allows the support backend to automatically forward the request to the correct testbed support contact.

A screenshot of the 'jFed Bug Report' application window. The title bar reads 'jFed Bug Report'. The main content area has a large heading 'Question'. Below it, the text 'This is related to:' is followed by three selectable options, each with a green arrow icon on the left and a description on the right:

- The jFed GUI**: The jFed experimenter GUI you are now using
- A Testbed**: Testbeds in general or related to a specific testbed
- Both/Neither/Other**: The other options are not applicable

At the bottom right of the window is a 'Cancel' button.

Figure 7: Specifying what the question is about

A screenshot of the 'jFed Bug Report' application window. The title bar reads 'jFed Bug Report'. The main content area has a large heading 'Question'. Below it, the text 'Choose the related testbed(s) (optional):' is followed by a list of testbeds, each with a checkbox on the left. The first three items are bolded:

- iMinds Virtual Wall 1**
- iMinds Virtual Wall 2**
- iMinds WILab 1**
- BonFIRE (Development AM)
- City of Things Antwerp
- clab
- Cloudlab Utah
- Developement Server University Bristol
- emulab.kreonet.net
- ESAT MM Testbed
- ExoGENI BBN
- ExoGENI CIENA
- ExoGENI CIENA HQ
- ExoGENI Duke
- ExoGENI ExoSM

At the bottom left is an 'OK' button and at the bottom right is a 'Cancel' button.

Figure 8: Specifying which testbed the question is about

When appropriate, the question can also be posted on the public Fed4FIRE+ experimenters mailing list. This feature encourages users to share their problems with other experimenters and creates a publicly accessible list of frequently asked questions and their respective solutions.

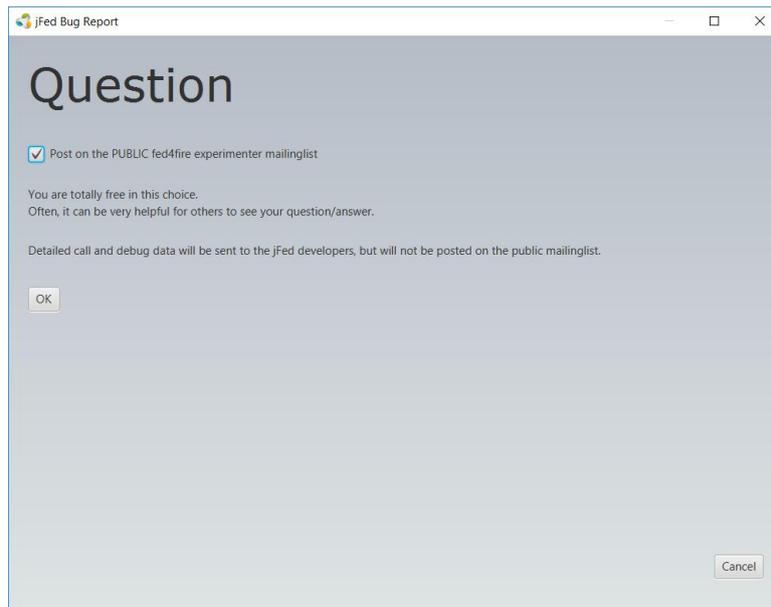


Figure 9: Asking if the support request may be posted on a public mailing list

The last screen of the wizard allows the user to enter his/her question and shows which information will be included in the support request. This information always contains:

- ➔ An unique ID of the experimenter “reporter credential”
- ➔ The email address on which the experimenter can be reached
- ➔ The jFed version used to submit the support request
- ➔ The environment in which jFed runs (OS and Java version)
- ➔ All API calls made by jFed up until that point (request and responses)

Optionally the user can also include a screenshot to help explain his support request.

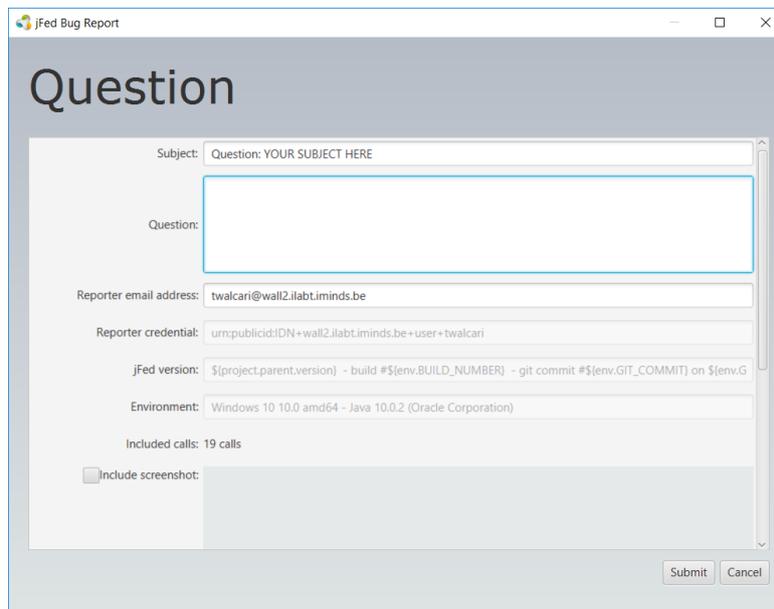
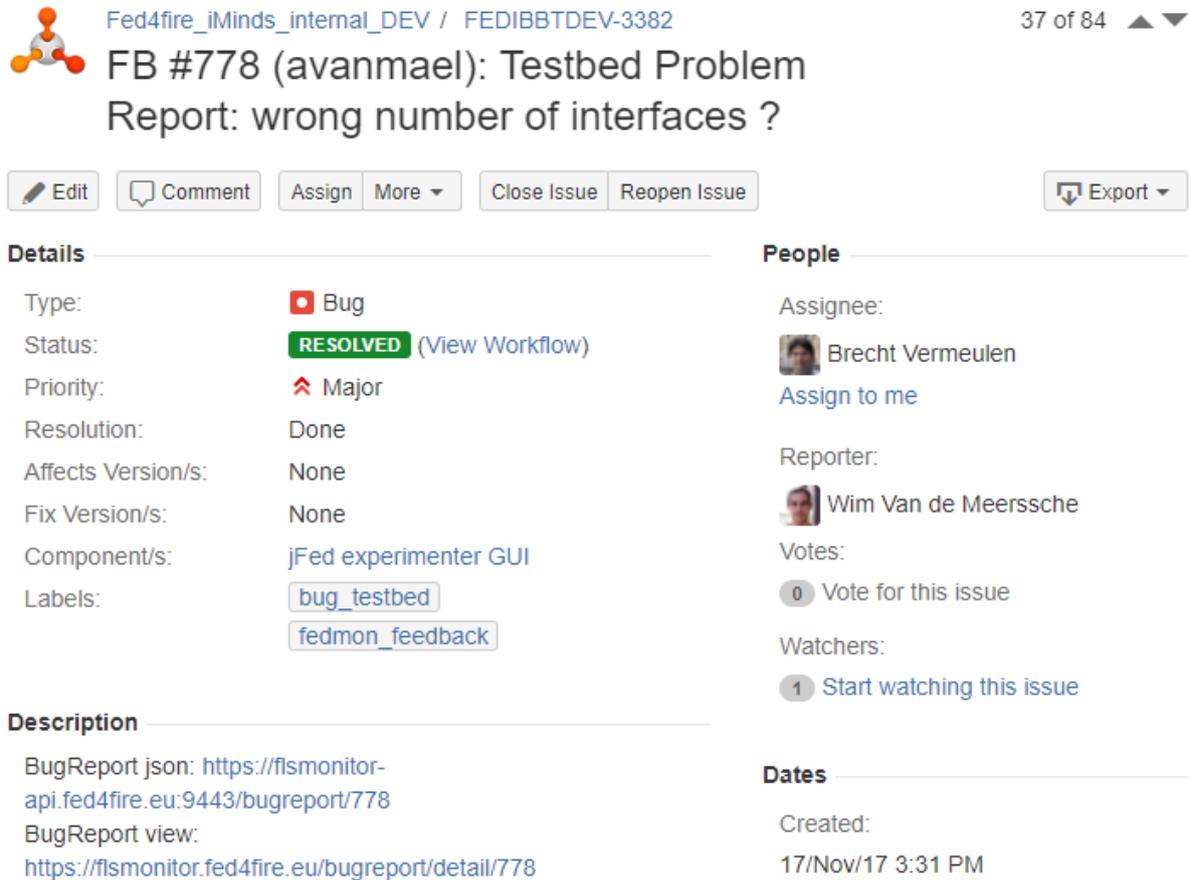


Figure 10: Support request details form

3.2 SUPPORT REQUESTS BACKEND

The submitted support requests automatically create a ticket in a JIRA issue tracker, sending, at the same time, also a mail to the Fed4FIRE+ support team in imec.



Fed4fire_iMinds_internal_DEV / FEDIBBTDEV-3382 37 of 84 ▲ ▼

FB #778 (avanmael): Testbed Problem Report: wrong number of interfaces ?

Edit Comment Assign More Close Issue Reopen Issue Export

Details

Type: Bug
Status: **RESOLVED** (View Workflow)
Priority: Major
Resolution: Done
Affects Version/s: None
Fix Version/s: None
Component/s: JFed experimenter GUI
Labels: bug_testbed, fedmon_feedback

People

Assignee: Brecht Vermeulen
Assign to me
Reporter: Wim Van de Meerssche
Votes: 0 Vote for this issue
Watchers: 1 Start watching this issue

Description

BugReport json: <https://flsmonitor-api.fed4fire.eu:9443/bugreport/778>
BugReport view: <https://flsmonitor.fed4fire.eu/bugreport/detail/778>

Dates

Created: 17/Nov/17 3:31 PM

Figure 11: Example JIRA ticket of a support request

The description of the support request contains (links to) all the info the user provided.

Description

BugReport json: <https://flsmonitor-api.fed4fire.eu:9443/bugreport/771>

BugReport view: <https://flsmonitor.fed4fire.eu/bugreport/detail/771>

User email: avanmael@wall2.ilabt.iminds.be✉

User URN: urn:publicid:IDN+wall2.ilabt.iminds.be+user+avanmael (Wall2 Users)

Feedback:

- Type: Bug Report
- About: Testbed(s)
- Related testbeds:
 - urn:publicid:IDN+wall1.ilabt.iminds.be+authority+cm
- Description:

on node n0710-10.wall1.ilabt.iminds.be, eth5 doesn't seem to be connected to the LAN as it cannot ping any other node
- jFed Version: 5.8.0 - build #4 - git commit #05fa10136faf211b90d49d0eb2e92bc03df36a5a on HEAD
- jFed Environment: Windows 7 6.1 amd64 - Java 1.8.0_144 (Oracle Corporation)
- Send to mailinglist: — No
- Included calls: 65
- Includes screenshot: No

Figure 12: Description in JIRA of a support request

The description also contains links to a more detailed bugreport-view which exposes – amongst others – all API requests and responses done by the jFed GUI, the results of a connectivity test, and the last 2048 log lines generated by the jFed software:

Details:

ID:	771
Reporter Urn:	urn:publicid:IDN+wall2.ilabt.iminds.be+user+avanmael
Date:	2017-11-16T11:54:07Z
reportType:	BUG
reportTarget:	TESTBED
relatedTestbeds:	urn:publicid:IDN+wall1.ilabt.iminds.be+authority+cm
subject:	Testbed Problem Report: issue on interface
postOnPublicList:	false
Description:	on node n0710-10.wall1.ilabt.iminds.be, eth5 doesn't seem to be connected to the LAN as it cannot ping any other node
screenshot:	None
jFed Version:	5.8.0 - build #4 - git commit #05fa10136faf211b90d49d0eb2e92bc03df36a5a on HEAD
User Info:	(Click to show)
Email Address:	avanmael@wall2.ilabt.iminds.be
preferences:	(Click to show)
API Calls:	(Click to show 65 Api Call URIs)
connectivityTestResults:	(Click to show 191 connectivity test results)
logLines:	(Click to show 2048 loglines)
Slices:	(Click to show 19 slices)
stitchingJobReports:	

Figure 13: Details-view of a support request

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BugReport 778 call 13

SUCCESS

BugReport 778 call 13

duration 18.0s from 2017-11-17 15:26:41.000 +01(2017-11-17T14:26:41Z) to 2017-11-17 15:26:59.000 +01(2017-11-17T14:26:59Z)

Api Call 1: [Hide/Show](#) (Describe @ urn:publicid:IDN+wall1.ilabt.iminds.be+authority+cm)

API Name: Geni Aggregate Manager API v3
Authority HRN: iMinds Virtual Wall 1
Authority URN: urn:publicid:IDN+wall1.ilabt.iminds.be+authority+cm
Start Time: 2017-11-17 15:26:41.000 +01(2017-11-17T14:26:41Z)
Stop Time: 2017-11-17 15:26:59.000 +01(2017-11-17T14:26:59Z)
API Method Name: Describe
Java Method Name: Describe
Server URL: https://www.wall1.ilabt.iminds.be:12369/protogeni/xmlrpc/am/3.0
Connection User URN: urn:publicid:IDN+wall2.ilabt.iminds.be+user+avanmael
Proxy: }FedConnection.SshProxyInfo{hostname='bastion.test.iminds.be', port=22, username=, sshKeyInfo=HIDDEN, hostKey=}

Connection User certificates: [Hide/Show](#)

Connection Proxy Settings: }FedConnection.SshProxyInfo{hostname='bastion.test.iminds.be', port=22, username=, sshKeyInfo=HIDDEN, hostKey=}

Request:

HTTP [raw](#) [pretty](#)

XML-RPC [raw](#)

```
[
  {
    "urn:publicid:IDN+wall2.ilabt.iminds.be:comnetlab+slice+group14"
  },
  {
    {
      "geni_type": "geni_sfa",
      "geni_version": "3",
      "geni_value": "<?xml version='1.0' encoding='UTF-8' standalone='no'>\n<signed-credential xmlns:xsi="
    },
    {
      "geni_rspec_version": {
        "type": "geni",
        "version": "3"
      },
      "geni_compressed": true
    }
  }
]
```

Reply:

HTTP [raw](#) [pretty](#)

XML-RPC [raw](#)

Geni Value [raw](#) (click a format to show the data)

RSpec [raw](#) [pretty](#)

Figure 14: Detailed overview of a single API call

All subsequent actions taken for processing the support request are logged into the JIRA-ticket. This way the Fed4FIRE+ support team at imec can follow-up and ensure a timely and thorough solution to experimenters.

3.3 OVERVIEW OF SUPPORT REQUESTS

Since the release of jFed 5.7.2 on March 22nd, 2017, 762 support requests were received via the form (the uncaught exceptions are automatically sent by jFed, so no user-initiated support request). About 2600 issues were reported by 330 different users (of which 10 US GENI users which reported issues). Of these 2600, about 1750 are uncaught exceptions which are automatically reported by jFed after approval by the user. This helped us to improve jFed. Since 2021 these kinds of requests are now handled automatically and do not appear anymore as per **Error! Reference source not found.**. The 762 support requests are initiated by humans (Figure 15). After manually verifying the contents of these support requests and removing the uncaught exceptions, it was possible to outline 5 categories. Most of the reported issues were bugs:

- ➔ **connectivity**: the user is experiencing a network problem which prevented to reach one or more Fed4FIRE+ testbed API endpoints and/or resources on a testbed
- ➔ **Question**:
 - **question_jfed**: the user has a problem using jFed which was resolved by explaining a jFed feature and/or directing him/her to the relevant jFed documentation
 - **question_testbed**: the user has a problem using a testbed which was resolved by explaining how a testbed functions and/or by directing him/her to the relevant testbed documentation
- ➔ **feature_request**: a request for a new feature in the jFed GUI
- ➔ **Bug**:
 - **bug_jfed**: the user experienced unexpected behaviour by the jFed GUI, which had to be resolved with a bugfix in jFed
 - **bug_testbed**: the user experienced unexpected behaviour by a testbed, which had to be resolved by the testbed support operator
 - **bug_user**: the user experienced unexpected behaviour because of an error at the end-user end (wrong PC-clock, incorrect RSpec, broken Java setup, ...)
- ➔ **Other**: this was identified only at the beginning of the project when there were less categories. This was not reported in since 2018.

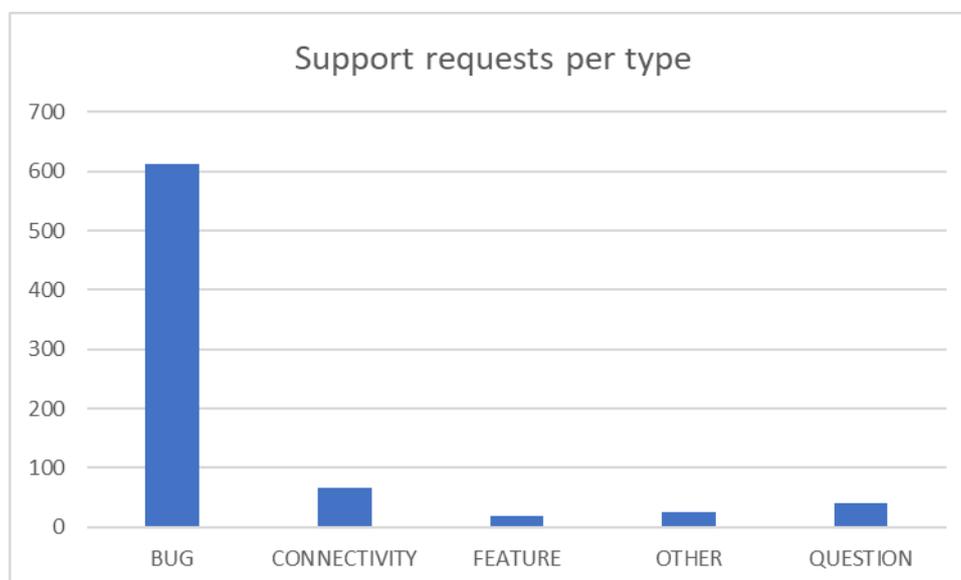


Figure 15 Support requests by type

To conclude, **Error! Reference source not found.** gives an overview of the support requests and shows the distribution of usage and support requests over time.

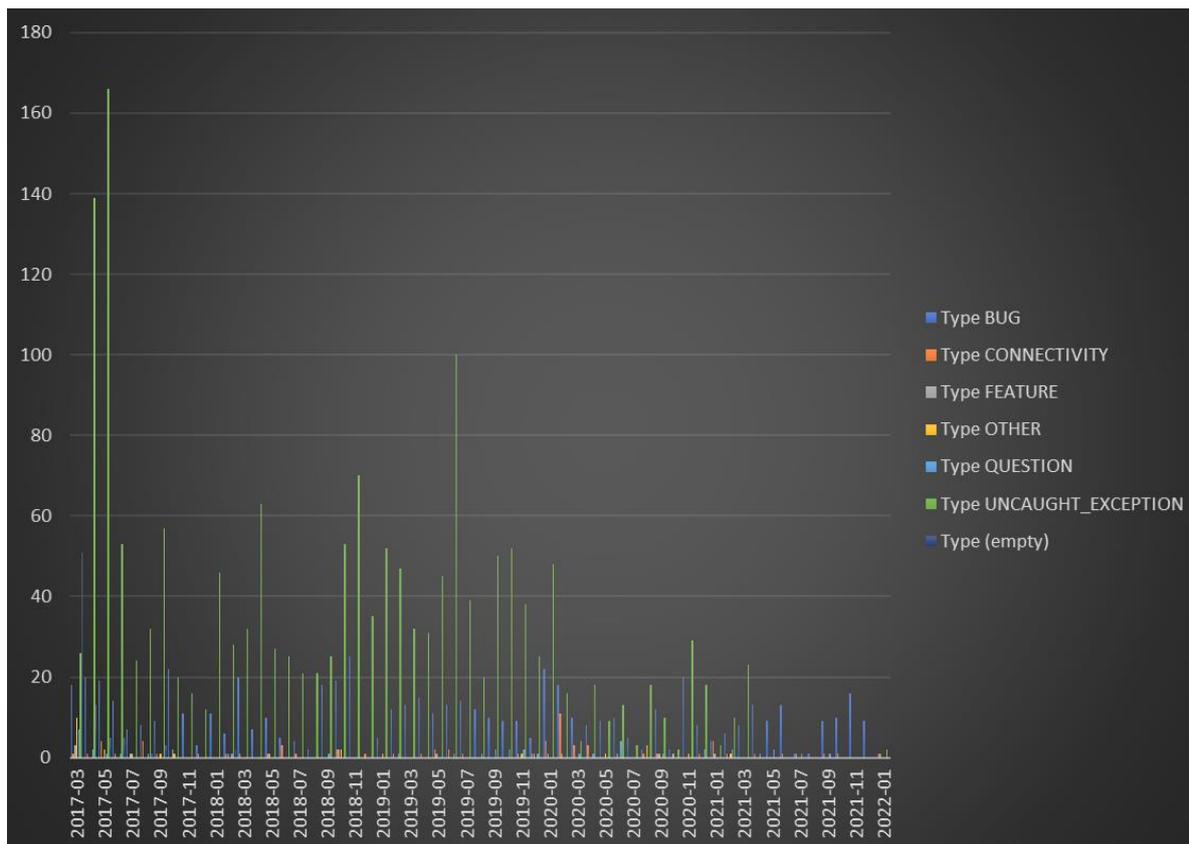


Figure 16: Support requests by type and over time

3.3.1 'connectivity' support requests

These requests related to connectivity issues between the experimenter and the testbeds. Main issues encountered were lack of IPv6-support, corporate firewalls blocking non-standard ports (Fed4FIRE+ testbed API's also use non-standard ports like 12369), unstable WiFi-connections.

Most of these connectivity-issues were resolved by asking the user to enable the built-in proxy of jFed. This way, we have changed the default behaviour and now the use of the proxy became standard.

3.3.2 'question_jfed' support requests

These requests were solved by providing more explanations about the jFed functionality. When the relevant information was not included in the documentation, it was subsequently added to clarify the issue to future users.

An example question concerned the list of 'available nodes' which is available in the GUI. A better explanation was provided, describing that the information for populating this list was cached, which means that it can be out-of-date for a few minutes, and does not reflect recently started/ended experiments.

3.3.3 'question_testbed' support requests

These requests were solved by explaining testbed functionality or error messages. Most of the error messages concerned insufficient available resources; the inability to extend an experiment because of future reservations and invalid configuration of a testbed resource request.

3.3.4 'feature_request' support requests

These requests concerned feature requests for new functionality in the jFed GUI.

Sample feature requests covered: better warning dialog layout, exposing more information about the reserved testbed resources to the experimenter or displaying the information in another format.

3.3.5 'bug_jfed' support requests

These requests concerned unexpected behaviour of jFed due to bugs in the software.

These requests were then converted into a ticket in the jFed software issue tracker.

3.3.6 'bug_testbed' support requests

These requests concerned unexpected behaviour of a testbed due to operational problems in the testbed.

These requests were then forwarded to the testbed support team to be resolved.

3.3.7 'bug_user' support requests

These requests were resolved by fixing configuration-errors in the environment in which jFed was run.

Most notably, errors of the user's PC-clock brought to these requests using timestamps fail as they are set in the past/too far in the future.

Another error involved a Java-version which was incorrectly configured and made the use of high-quality encryption mechanisms impossible

4 USABLE TESTBEDS

The two screenshots below (Figure 17 and Figure 18) show the number and locations of the testbeds that can be used with a Fed4FIRE account and the jFed tool.



Figure 17: Overview of available testbeds from the Federation monitor view (<https://fedmon.fed4fire.eu/map>)

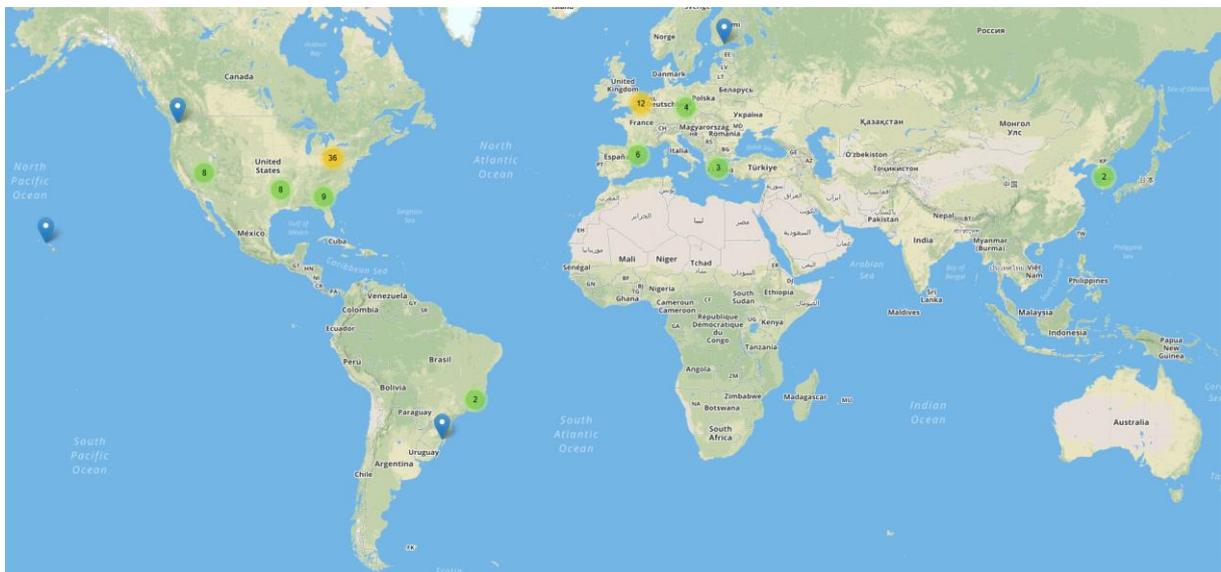
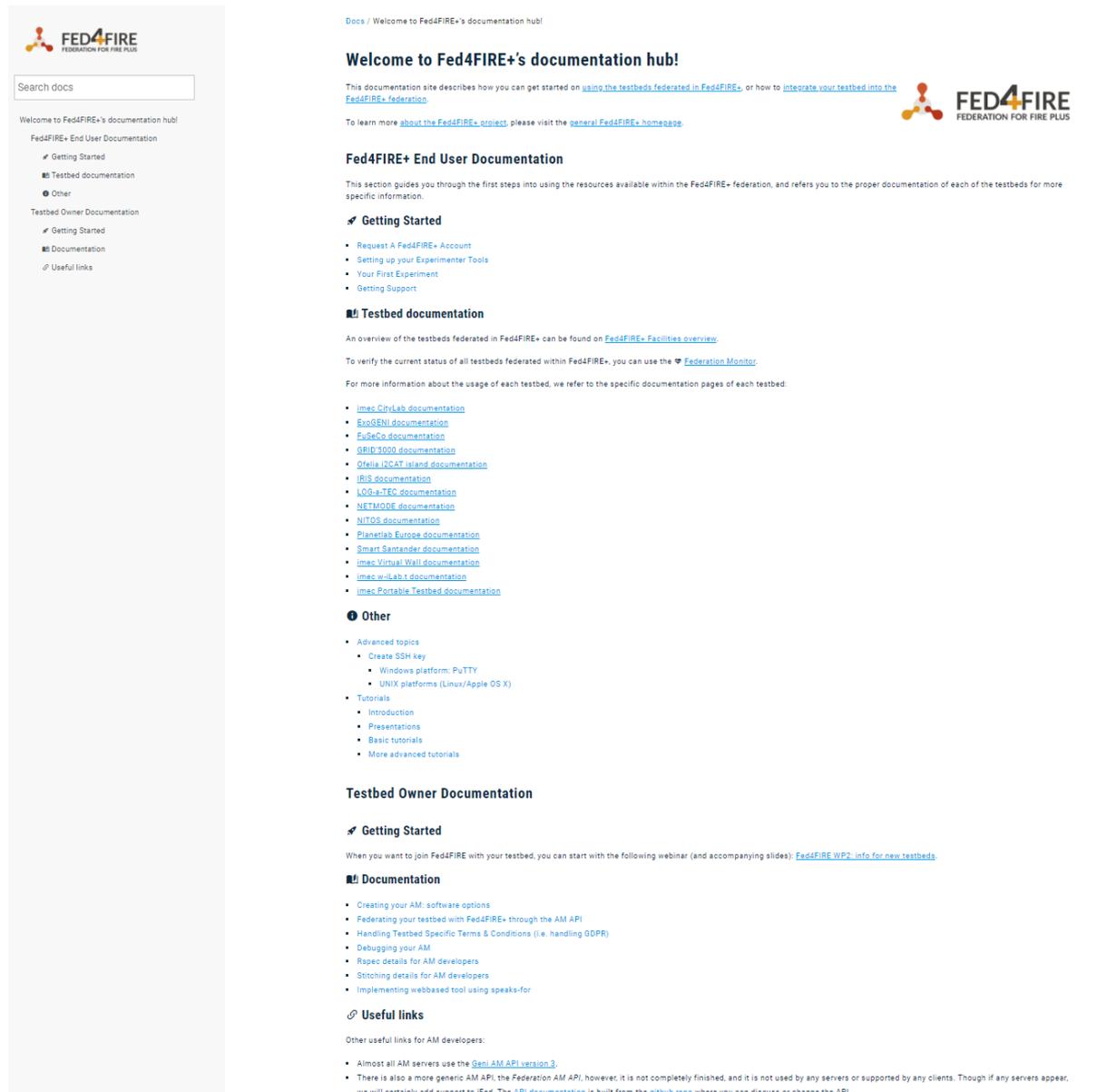


Figure 18: Overview of the available testbeds from the jFed view

5 FED4FIRE DOCUMENTATION

The Fed4FIRE+ documentation website (<https://doc.fed4fire.eu>) was refreshed in the previous cycle and now regularly maintained and updated. Particular attention was provided to the testbed owner documentation due to the last Open Call for new testbeds functionality.



The screenshot shows the Fed4FIRE+ documentation website. On the left is a sidebar with a search bar and navigation links for 'Fed4FIRE+ End User Documentation', 'Testbed Owner Documentation', and 'Useful links'. The main content area is titled 'Welcome to Fed4FIRE+' and includes sections for 'Getting Started', 'Testbed documentation', and 'Testbed Owner Documentation'. The 'Getting Started' section lists steps like 'Request A Fed4FIRE+ Account' and 'Setting up your Experimenter Tools'. The 'Testbed documentation' section provides an overview and a list of testbeds with links to their specific documentation pages. The 'Testbed Owner Documentation' section includes 'Getting Started' and 'Documentation' for AM developers.

Figure 19: Fed4FIRE+ documentation website (<https://doc.fed4fire.eu>)

6 OVERVIEW NEWEST JFED FEATURES

This section highlights a number of important new features that were added to jFed in Fed4FIRE+ since D2.07. The most important new feature was the support for the new portal (<https://portal.fed4fire.eu>, described in D3.04). The portal was launched in February 2020 and following versions of jFed (<https://jfed.ilabt.imec.be>) were launched subsequently: 6.3.0 (February 2020), 6.3.1 (February 2020), 6.3.2 (March 2020), 6.4.0 (December 2020), 6.4.1 (May 2021) with 210 code commits in total.

6.1 SUPPORT FOR NEW PORTAL LOGIN

Figure 20 shows the current jFed login screen. The previous Fed4FIRE portal is now supported as ‘legacy Fed4FIRE’ while two new options appeared: Login via Fed4FIRE+ - the new portal -, and login via imec which is to be used by imec local people.



Figure 20: jFed Login screen

As the new portal also supports Edugain¹ logins, when the user clicks ‘Login via Fed4FIRE’, it is possible to choose an Edugain identity provider, or a local Fed4FIRE+ account (e.g. industry typically has no access to Edugain).

¹ The eduGAIN interederation (<https://edugain.org/>) service connects identity federations around the world, simplifying access to content, services and resources for the global research and education community. eduGAIN comprises over 70 participant federations connecting more than 8,000 Identity and Service Providers.

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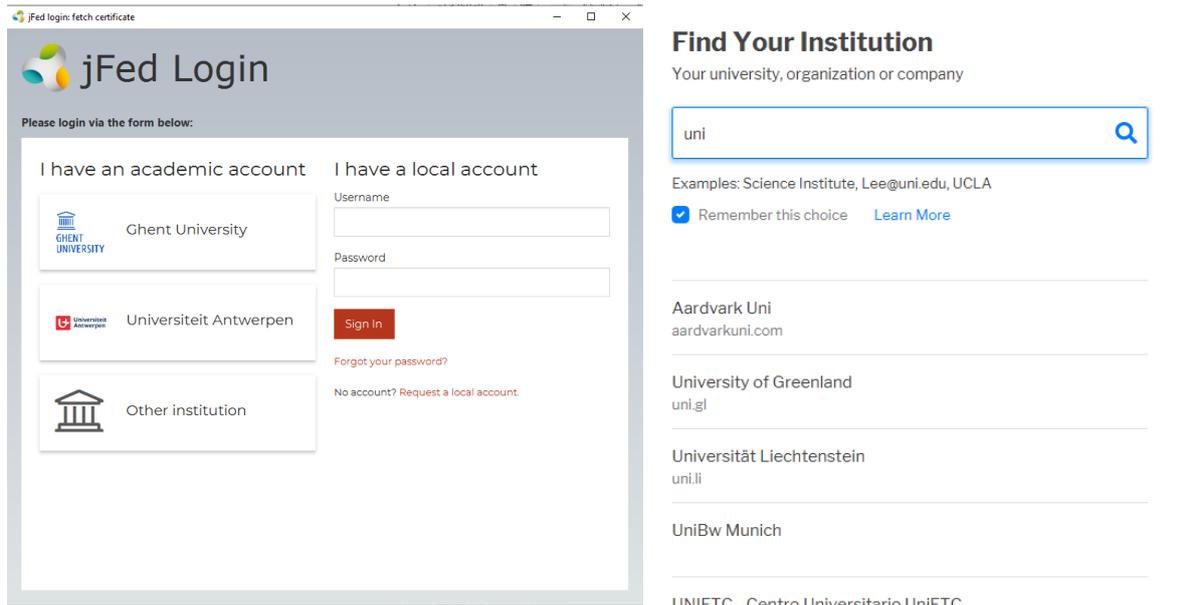


Figure 21: Login screen with the option to choose an Edugain identity provider, or a local Fed4FIRE account (e.g. industry typically has no access to Edugain).

After choosing the right institute, the user is redirected to the institute login page, still in the jFed login environment (depending on the institute, this can also be a 2 factor authentication).

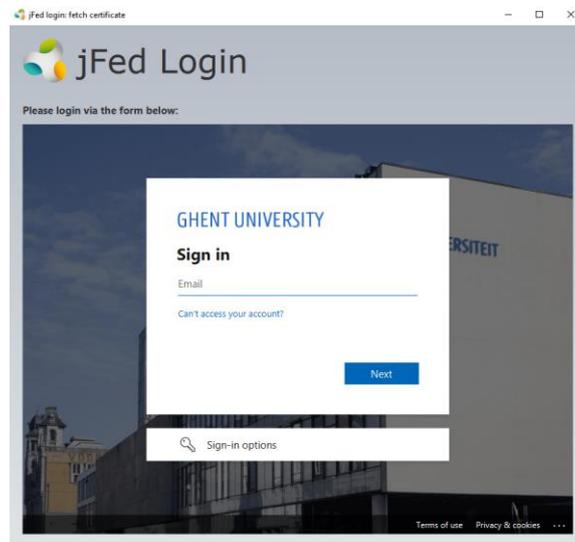


Figure 22: Redirection to the institute login page

6.2 MORE INFO IN THE NODE PROPERTIES BOX

While running an experiment, experimenters might need to look up network or operating system image information, and that is now clearly shown when right clicking a node and asking for 'show info' properties:

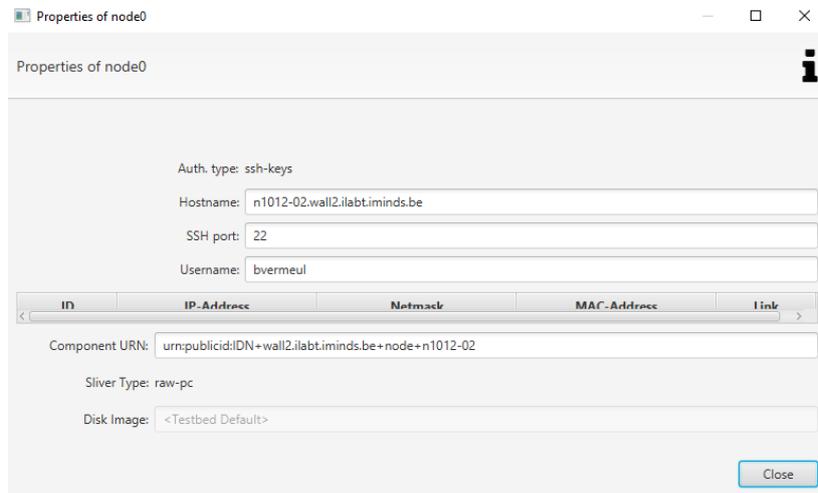


Figure 23: Information screen asking for 'show info' properties looking up network or operating system image information

6.3 SPECIFIC ADDITIONS FOR GRID5000

The Inria Grid 5000 testbed is a complex testbed with multiple locations in France. This complexity led to add extra logic to jFed in order to enable users to choose the right location or hardware type of nodes, depending on their type of experiment. Figure 24 shows the users' selection process.

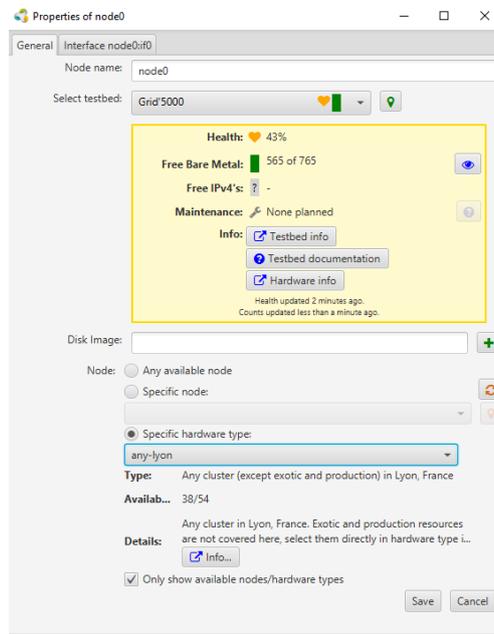


Figure 24: Screenshot showing the option to select the location of the hardware in Grid 5000

Figure 25 shows the selection process of more specific hardware (also the available nodes are shown).

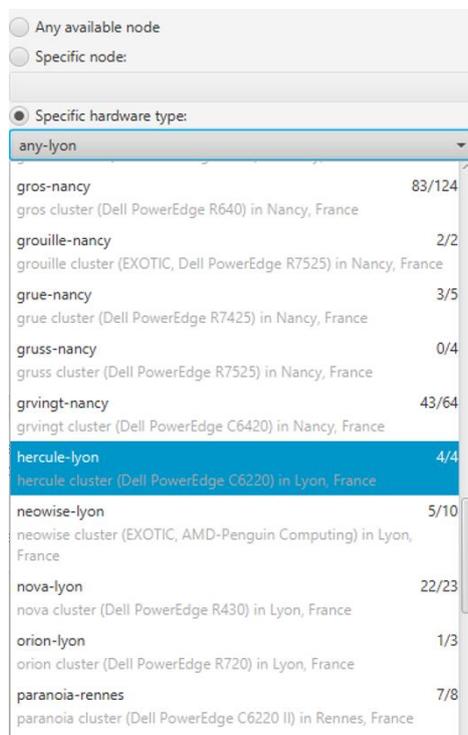


Figure 25: Screenshot illustrating the possibility to select more specific hardware in the Grid 5000 Testbed

6.4 SPECIFIC ADDITIONS FOR THE IRIS TESTBED

For the openstack-based Iris testbed it is possible to choose the flavour of the virtual machine to be used. To this end, the node properties were added, as shown in the below Figure 26.

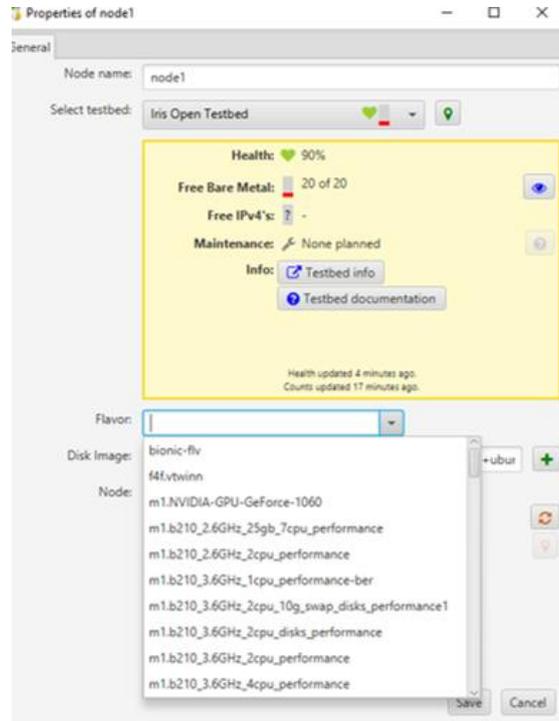


Figure 26: Screenshot of the options for the Iris testbed to choose the flavour of the virtual machine to be used

6.5 MAKE IT MORE DIFFICULT TO DELETE ACCIDENTLY A RUNNING EXPERIMENT

A complaint was once reported when a long running experiment (typically used by multiple people) disappeared. By accident someone clicked terminate e.g. This led to the implementation of additional extra warnings before the cancellation of an experiment. To not burden the users, this is not done for short living experiments (<2 days), as the complaints typically were for long running experiments only (as most work is lost then).

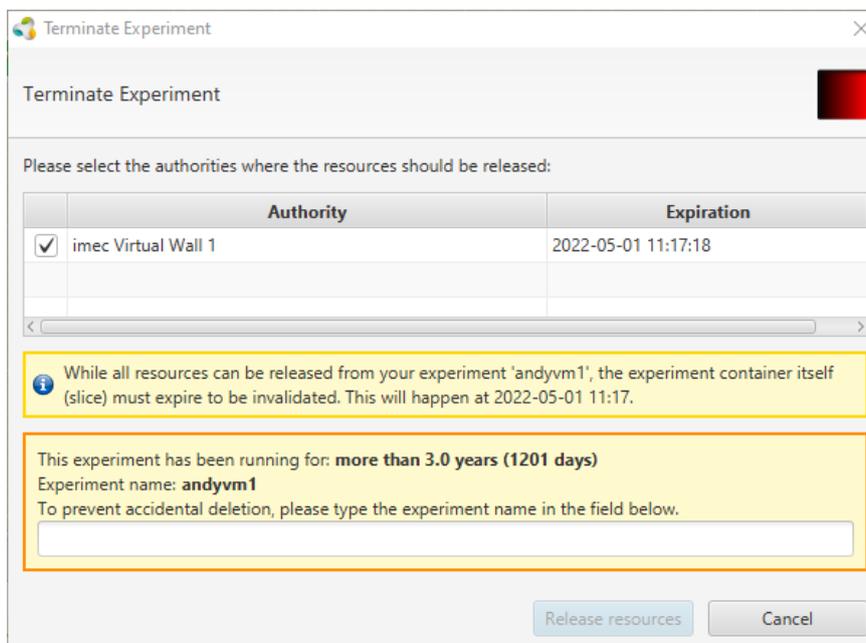


Figure 27: Screenshot of the warning message before an experiment can be deleted

6.6 IMPROVED THE ESPEC USAGE IN THE JFED GUI

Now it is possible to rerun part of the ESPEC (experiment specification) from a certain step (instead of rerunning everything). This is useful if something failed only at the end of the ESPEC execution.

6.7 NEW 'FIX SSH' BUTTON

When users change their password or when their X.509 certificate is expired, their internal ssh key based on the X.509 certificate changes as well. That means that the public ssh key needs to be updated on the nodes of a longer running experiment. Before this could be done by the edit ssh keys button, but for some users this was not obvious, so now we added a simple 'fix ssh' button for this.



Figure 28: Addition of an "Fix ssh" button

6.8 OTHER NEW FEATURES AND BUG FIXES

The other big new feature is a new command line version of jFed: jFed CLI 2, but this is discussed in D3.4 (as it is related to ESspecs and experiment reproducibility).

This graph (Figure 29) shows the commits over time from 2020 and 2021 (more than 200 commits were done):

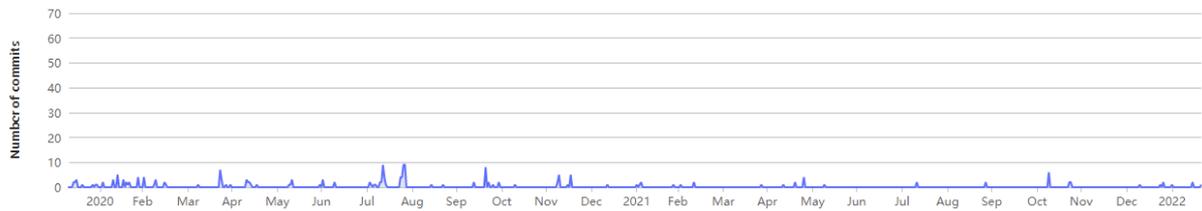


Figure 29: Commits during the reporting period 2020 - 2021

Figure 30 presents examples of typical bug fixes and commits:

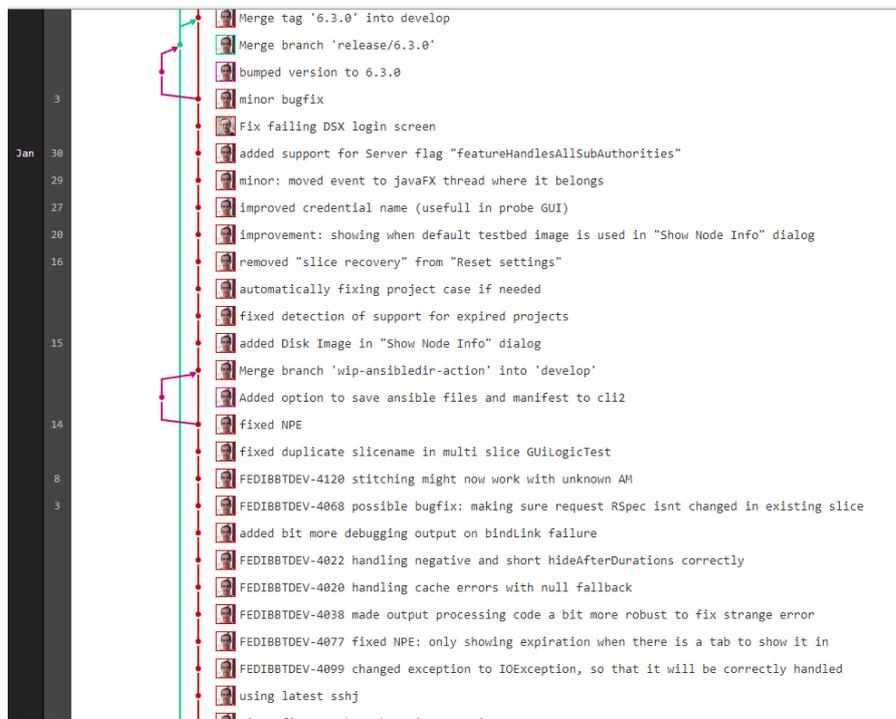


Figure 30: Screenshot of examples of typical bug fixes and commits

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Figure 31: Screenshot of examples of typical bug fixes and commits

7 APPENDIX: JFED FEATURES, USAGE AND USER MANUAL

This is the manual that appears online at <http://jfed.ilabt.imec.be>, more specifically at <https://doc.ilabt.imec.be/jfed-documentation/>. It highlights the features of jFed and how to use them. This is continuously updated (and versioned as can be seen at: <https://doc.ilabt.imec.be/jfed-documentation/>). The documentation was copied in D2.2. For the updates we refer to the online documentation which is always up to date.

8 CONCLUSIONS

This deliverable provides a complete overview from the point of view of the testbeds on the requirements, developments, and integrations. This implies different parts and types of work to be done. The work described here covers the whole period of the project and is therefore a final version of the series of deliverables D2.04, D2.09 D2.13.

The document provided an overview of the testbeds which have joined the federation since the start of the project. Most of them are external testbeds, but some of the testbeds are new testbeds at Fed4FIRE+ partners or further integrations of the testbeds at the Fed4FIRE+ partners.

All of the testbeds at the Fed4FIRE+ partners provided feedback on how Fed4FIRE+ and belonging to the federation meant added value to them. But the testbeds also “listen” to their users and suggestions / comments made by individual experiments from the Open Calls which triggered specific actions / modifications / updates at the testbeds are also provided in detail.

A large amount of work was dedicated to set up a proper and fluent process to federate new testbeds into the Fed4FIRE+ federation. Information on this is provided and described in detail in this document and with a process, codes and links to supporting information on how to join the federation.

This document and process is now going to be used for the new testbeds joining as a result of the Open Call on new testbeds.