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|-----------------|---|
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## D2.2 – First integration and testing roadmap

|                  |  |
|------------------|--|
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| Task             | T2.2   |
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|          |  |
|----------|--|
| Abstract | This first deliverable of task 2.2 in the WP2 architecture work package defines the integration and testing roadmap for the first cycle of the Fed4FIRE project. |
| Keywords | Federation, Integration, Testing   |

|                           |    |  |   |
|---------------------------|----|--|---|
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|                           | P  | Prototype  |   |
|                           | D  | Demonstrator   |   |
|                           | O  | Other  |   |
| Dissemination level       | PU | Public   | X |
|                           | PP | Restricted to other programme participants (including the Commission)        |   |
|                           | RE | Restricted to a group specified by the consortium (including the Commission) |   |
|                           | CO | Confidential, only for members of the consortium (including the Commission)  |   |

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## Executive Summary

This deliverable defines the first testing and integration roadmap of Fed4FIRE, targeting the first cycle of the project. We have further refined this cycle in a phase 1 (M5-M9) and phase 2 (M10-M14). A detailed planning for phase 1 is created and the evaluation of the progress and tests in this phase will serve as an input for the detailed planning of phase 2, which will be created in May 2013 (M8). This deliverable will then be updated.

At the end of phase 1 of cycle 1 all testbeds (Nicta Norbit, iMinds Virtual Wall, iMinds w-iLab.t, UPMC & Inria Planetlab Europe, Fokus FuSeCo, NTUA Netmode, UTH Nitos, NIA Koren, Ofelia (i2CAT, UBristol, iMinds), except Bonfire and UC Smart Santander, will have a compliant SFA interface. For the Bonfire testbeds (Inria Grid5000, EPCC, iMinds) and Smart Santander (UC) testbeds, the adaptation is not that straight forward and is targeted for phase 2 of cycle 1.

At the end of phase 1 of cycle 1, the experiment control framework OMF version 6 will be deployed on Norbit, Virtual Wall, w-iLab.t, Netmode and Nitos. The control framework NEPI will be deployed on these same testbeds as it shares a communication channel (FRCP, Federated Resource Control Protocol) with OMF 6.

Testing will be done in the following way: iMinds is developing a Fed4FIRE test suite in Java which will be used first for manual testing each API function call of a testbed, followed by automatic nightly testing. The Java client side code will also serve as a reference implementation. Of course, the test suite will evolve during testing, integration and the new Fed4FIRE features (e.g. planned ontology based RSpecs), and in the appendix of this deliverable a preliminary overview of the current version of the test suite is shown. The reason to develop a Fed4FIRE test suite and not reusing an existing test suite (only the GENI Aggregate Manager API Acceptance Tests seems to exist) is tackled in the deliverable, but the most important reasons are that it will more easy to add specific Fed4FIRE functionality and APIs and that it is written in Java which makes it easy to develop a cross-platform graphical user interface, both for the test suite itself, and for developing compliant experimenter tools.

For the testing and production versions of testbeds, they should evolve by the end of cycle 1 towards three stages/deployments: an internal development platform, an integration platform for testing the next release of APIs (accessible by Fed4FIRE developers) and a production platform ready to be used by experimenters (with current version of APIs).

## Acronyms and Abbreviations

|         |   |
|---------|---|
| AM      | Aggregate Manager   |
| API     | Application Programming Interface   |
| DoW     | Description of Work (official document describing the Fed4FIRE project)         |
| FRCP    | Federated Resource Control Protocol   |
| GENI    | Global Environment for Network Innovations                                      |
| NEPI    | Network Experimentation Programming Interface [5]                               |
| OMF     | cOntrol and Management Framework [6]  |
| PLE     | PlanetLab Europe  |
| RSpec   | Resource Specification  |
| SFA     | Slice-based Federation Architecture   |
| Testbed | Combination of testbed resources (e.g. servers) and testbed management software |

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## 2 Refinement of timing

During the first months of the project, we have further refined the original timing of the DoW and because of the complexity and multitude of components have decided to break down further the alpha testing period and go already through beta and interoperability testing and deployment with some of the testbeds and components before end of month 9.

Original planning:

- Implementation and alfa-testing: M6-M12
- Beta- and interoperability testing: M13-M14

New planning:

- Implementation, integration and testing (phase 1): M5-M9
- Implementation, integration and testing (phase 2): M10-14

We call this the first phase (M5-M9) of cycle 1 which is followed by a second phase (M10-M14). In this way, there will be already a first set of testbeds and components tested on interoperability and deployed by the beginning of month 10. In this way, integration problems can be tackled earlier on.

Further on in this document one can find a detailed planning per testbed/component.



## 3 Basic approach and test suite

### 3.1 Testing and integration steps

The implementation, testing and integration phases are made up out of the following steps:

1. Detailed functional description
2. Development
3. First manual testing per testbed with test suite
4. Automatic nightly testing of testbeds with test suite
5. Cross and integration testing between tools and testbeds

The first two are driven by WP3-7, while 3) and 4) are driven from WP2 with a high interaction with WP3-7. The last step is driven by the tool makers (WP5-WP7) and supported by WP2. Based on the output of deliverables D5.1, D6.1 and D7.1 ('Detailed specifications for first cycle' of WP5/6/7, month 5) and milestones M3.1/M4.1 ('First design specification for facilities', month 6) a matrix will be built of which tool will work and will be tested against which testbed in cycle 1 (e.g. the experiment control framework NEPI [5] will work on testbed A,B,C and D, the graphical front-end for resource control Flack [3] will work on testbed D and E, the portal will be compatible with all testbeds, ...). This matrix will be built by WP2 in May 2013 (M8), together with the detailed planning for phase 2 of cycle 1, and will be added as an appendix to this deliverable.

### 3.2 Test suite

#### 3.2.1 Rationale

iMinds is currently developing a test suite for aiding steps 3) and 4) of the previous section.

This test suite is developed in Java and targets 3 goals:

- Make it possible to do manual compliance testing of the testbeds. Based on the outputs of milestones M3.1 and M4.1 ('First design specification for facilities'), the compliance will be defined (e.g. SFA functions compliance, APIs for the identity providers, ...).
- When the manual compliance testing is successful, do an automatic nightly testing on each testbed, to assure continuous compliance
- Provide a reference implementation in Java of the client side of the APIs (GENI Aggregate Manager (AM) APIv3 [1], identity providers, ...)
- The test suite will focus on logical tests (all steps in the experiment workflow) and add specific interface tests and negative testing (are things breakable ?) where needed. There will e.g. also be an ssh login on the nodes to verify that the node itself is accessible and runs the right image.
- The automatic tests will be run from Jenkins [4] and will post the test reports on a website and send emails in case of problems
- The roll-out will be based on the timing further on given per testbed and component
- The test suite will be open source and a framework based on plugins so that tests can be easily added

### 3.2.2 Comparison to other test suites

We are aware of one similar test suite, the 'GENI AM API Acceptance Tests' [2] which is built around the omni framework. The differences with the Fed4FIRE test suite are:

- The GENI test suite is written in python just as most AM applications. By developing the Fed4FIRE test suite in java, we can also test cross-language compatibility and as far as we know it is the first Java implementation of the SFA client side, which is very attractive to develop Java based graphical user interfaces/experimenter tools.
- The GENI test suite covers at this moment only the AM API, while in Fed4FIRE we will test also the other components (identity providers, testbed directories, ...)
- When new functionality will be added in the testbeds of Fed4FIRE (e.g. ontology based RSpecs) the test suite will be extended with this and this is not yet available in the GENI test suite
- For doing manual testing, a graphical user interface in the test suite makes it very convenient to inspect the problems (cf. the details that Flack [3] can show about RSpecs and function calls)
- Of course, for the functions covered by the GENI AM API Acceptance Tests, we will also use the GENI test suite as a cross check.

### 3.2.3 Current state

In Appendix A, some screenshots and information is shown of the current version of the test suite. The test suite is currently being developed and validated against iMinds' Virtual Wall which is an emulab instantiation. The test suite will be continuously refined and adapted based on cycle 1, 2 and 3 developments and testing.

## 4 Detailed planning

### 4.1 Basic scenario

The following basic scenario is targeted in cycle 1 on all testbeds:

1. A new experimenter (e.g. of an open call experiment) comes in and registers on the portal (portal should support experimenters accessing the portal with Windows, Linux and Mac operating system)
2. The experimenter is admitted to the federation by first level support if he fulfills all necessary requirements
3. The experimenter can browse resources on all testbeds
4. The experimenter can check the central facility monitoring to see if all testbeds are up and running
5. The experimenter creates a slice/experiment on multiple testbeds
6. The experimenter logs in on nodes on the testbeds through IPv4 or IPv6 (IPv6 is depending on availability, at least iMinds' testbeds will support IPv6 for the node control interfaces in cycle 1).
7. The experimenter uses experiment control to run a detailed experiment scenario: run a traceroute between nodes and do an iperf test for available bandwidth between the nodes.

### 4.2 Detailed planning of phase 1 of cycle 1

As described earlier, we plan a phase 1 of testing, integration and deployment for the first cycle between M5 and M9, and then a 2nd phase from M10-M14.

For this first phase, a detailed planning is made up and shown on the next page.

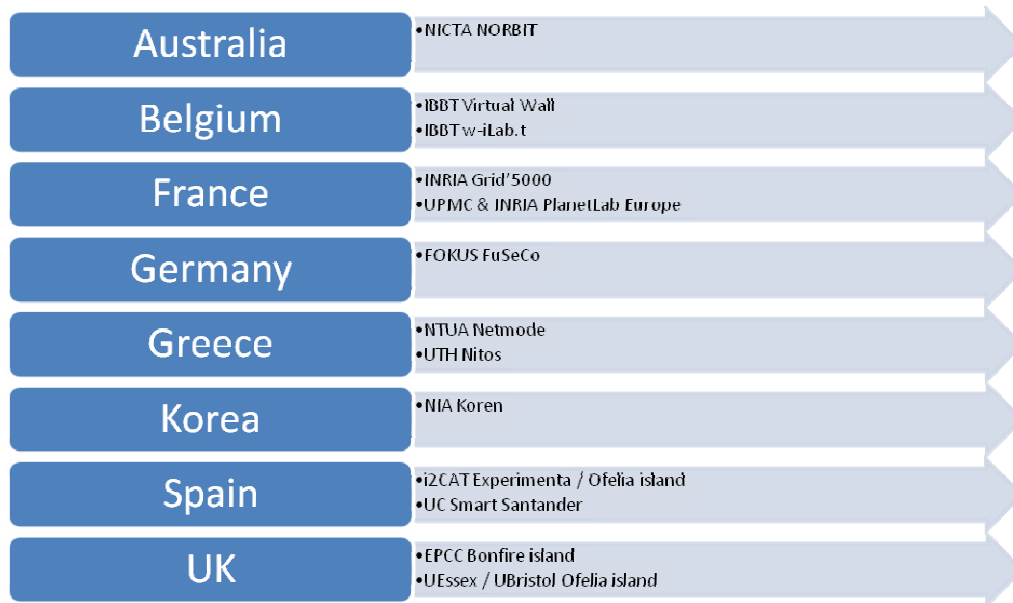
More information on this planning (the planning and testing coordination is done in WP2, the implementation, deployments and testing itself are done in WP3-WP7):

- For AM PLE (PlanetLab Europe) and AM w-iLab.t/Virtual Wall only testing is listed, as they are already deployed
- The other items show 'Deploy', but this includes also a test cycle (hence e.g. one week for deployment and two weeks for testing)
- Bonfire approach: this is needed to research on how Bonfire will be integrated in Fed4FIRE (this work is done in WP4)
- The green area lists two weeks of buffer for deployments and testing
- The orange area has five weeks of cross testing all testbeds and tools. Before this period (yellow areas), testbeds will be tested with the test suite (first manual tests, followed by nightly automatic tests). For this, a matrix of which tools will be tested against which testbeds will be created based on the outputs of D5.1, D6.1, D7.1, M3.1 and M4.1 and will be published as an extra appendix in this deliverable in May 2013 (M8).

|   |                    |            |            |                             |                                    |             |            |            |           |                |            |            |            |           |            |            |            |   |
|---|--------------------|------------|------------|-----------------------------|------------------------------------|-------------|------------|------------|-----------|----------------|------------|------------|------------|-----------|------------|------------|------------|---|
| Testing AM/PLE  | 4/02/2013          | 11/02/2013 | 18/02/2013 | 25/02/2013                  | 4/03/2013                          | 11/03/2013  | 18/03/2013 | 25/03/2013 | 1/04/2013 | 8/04/2013      | 15/04/2013 | 22/04/2013 | 29/04/2013 | 6/05/2013 | 13/05/2013 | 20/05/2013 | 27/05/2013 | 3/06/2013-8/07/2013                               |
| Testing AM w-lab.t+Virtual Wall                           | iMinds + Inria PLE | iMinds     | UPMC       | inria+UPMC<br>iMinds<br>UTH | Fokus/TUB (AM with FuSeCo testbed) | i2CAT/UBRIS | Nicta      | Nicta      | Nicta     | NTUA<br>iMinds | NIA        |            |            |           |            |            |            | cross testing<br>tools and testbeds<br>bug fixing |
| Deploy portal   |                    |            |            |                             |                                    |             |            |            |           |                |            |            |            |           |            |            |            |   |
| Deploy registry at portal                                 |                    |            |            |                             |                                    |             |            |            |           |                |            |            |            |           |            |            |            |   |
| Deploy automatic test suite                               |                    |            |            |                             |                                    |             |            |            |           |                |            |            |            |           |            |            |            |   |
| Deploy AM Broker (OMF) on NITOS with scheduling interface |                    |            |            |                             |                                    |             |            |            |           |                |            |            |            |           |            |            |            |   |
| Deploy AM FuSeCo  |                    |            |            |                             |                                    |             |            |            |           |                |            |            |            |           |            |            |            |   |
| Deploy Ofelia AM  |                    |            |            |                             |                                    |             |            |            |           |                |            |            |            |           |            |            |            |   |
| Deploy Openflow AM user interface                         |                    |            |            |                             |                                    |             |            |            |           |                |            |            |            |           |            |            |            |   |
| Deploy OMF 6 NORBIT                                       |                    |            |            |                             |                                    |             |            |            |           |                |            |            |            |           |            |            |            |   |
| Deploy OMF 6 NITOS  |                    |            |            |                             |                                    |             |            |            |           |                |            |            |            |           |            |            |            |   |
| Deploy OMF 6 Netmode                                      |                    |            |            |                             |                                    |             |            |            |           |                |            |            |            |           |            |            |            |   |
| Deploy OMF 6 w-lab.t+Virtual Wall                         |                    |            |            |                             |                                    |             |            |            |           |                |            |            |            |           |            |            |            |   |
| Deploy Koren AM (FOAM 0.8.2)                              |                    |            |            |                             |                                    |             |            |            |           |                |            |            |            |           |            |            |            |   |
| Bonfire approach  |                    |            |            |                             |                                    |             |            |            |           |                |            |            |            |           |            |            |            |   |
| Deploy NEPI   |                    |            |            |                             |                                    |             |            |            |           |                |            |            |            |           |            |            |            |   |
| Deploy facility monitoring on all testbeds                |                    |            |            |                             |                                    |             |            |            |           |                |            |            |            |           |            |            |            |   |
| Deploy FLS ticket system                                  |                    |            |            |                             |                                    |             |            |            |           |                |            |            |            |           |            |            |            |   |
| FLS ticket system interaction with testbed ticket system  |                    |            |            |                             |                                    |             |            |            |           |                |            |            |            |           |            |            |            |   |
| Deploy FLS facility monitoring visualisation in portal    |                    |            |            |                             |                                    |             |            |            |           |                |            |            |            |           |            |            |            |   |
| Deploy certificate directory                              |                    |            |            |                             |                                    |             |            |            |           |                |            |            |            |           |            |            |            |   |
| Certificate creation guidance                             |                    |            |            |                             |                                    |             |            |            |           |                |            |            |            |           |            |            |            |   |

If we compare this first phase with the overview of all testbeds below, then we see the following:

- The testbeds INRIA Grid5000 and EPCC Bonfire island are bundled under the hood of Bonfire
- The Ofelia islands of i2CAT and UBristol are bundled under the hood of Ofelia
- The Smart Santander testbed of UC is very different of the other testbeds and as such needs more work to integrate, and is targeted in phase 2 of cycle 1, and thus not listed yet in the planning above for phase 1.



### 4.3 Phase 2 of cycle 1

In the 2<sup>nd</sup> phase of cycle 1, the following tools and components will be deployed and tested:

- Facility monitoring on all testbeds which could not make it in phase 1 of cycle 1 (especially for those not running Zabbix (WP6 is currently making an overview) or who do not want to deploy collectd)
- Broker for future reservations (running as a service on a central location)
- First prototype of ontology based RSpec
- NEPI with more supported RSpecs/ontology based RSpec
- First prototype of rules based authorization
- Smart Santander testbed integration

The detailed planning of this phase will be made in May 2013 (M8), when it will be clear how phase 1 of cycle 1 evolves. It will be included in an update of D2.2.

## 5 Available Testbed platforms for testing

For testing the APIs of the testbeds the test suite will be used in two steps:

- Together with the testbed administrators and developers, iMinds will first manually test all functions of the API with the test suite and some logical scenarios from the experiment workflow (e.g. as the scenario in 4.1)
- If these manual tests are successful, then the test suite will do the same tests automatically every night, from then on, run from Jenkins [4] and publishing the tests reports on a webserver while sending emails in case of problems.

Regarding the testbeds, towards the end of cycle 1 a testbed should have three stages/deployments for the following purposes:

- A testbed and API for **internal development** (probably not reachable from outside), which is not relevant for integration testing
- **Integration platform** for testing next release: this testbed and API can be used by other developers to test tools of the following development cycle. As such it should be reachable from outside, but of course the number of resources in the testbed will be limited or even dummy resources
- **Production platform** with current stable release of testbed and API software, which can be used by experimenters.

The nightly tests by the test suite will be deployed against the latter two. The test suite will then of course be deployed two times with different API tests (current production version and next release version).

## 6 Conclusion

This deliverable defines the first testing and integration roadmap of Fed4FIRE, targeting the first cycle of the project. We have further refined this cycle in a phase 1 (M5-M9) and phase 2 (M10-M14). A detailed planning for phase 1 is created and the evaluation of the progress and tests in this phase will serve as an input for the detailed planning of phase 2, which will be created in May 2013 (M8). This deliverable will then be updated.

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## References

- [1] GENI AM API v3, [http://groups.geni.net/geni/wiki/GAPI\\_AM\\_API\\_V3](http://groups.geni.net/geni/wiki/GAPI_AM_API_V3)
- [2] GENI AM API Acceptance Tests, <http://trac.gpolab.bbn.com/gcf/wiki/AmApiAcceptanceTests>
- [3] Flack, GENI experimenter tool, <http://www.protogeni.net/wiki/Flack>
- [4] Jenkins, continuous integration server, <http://jenkins-ci.org/>
- [5] NEPI, the Network Experimentation Programming Interface, <http://nepi.inria.fr>
- [6] OMF, cOntrol and Management Framework), <http://omf.mytestbed.net/>



## Appendix A: current version of the test suite

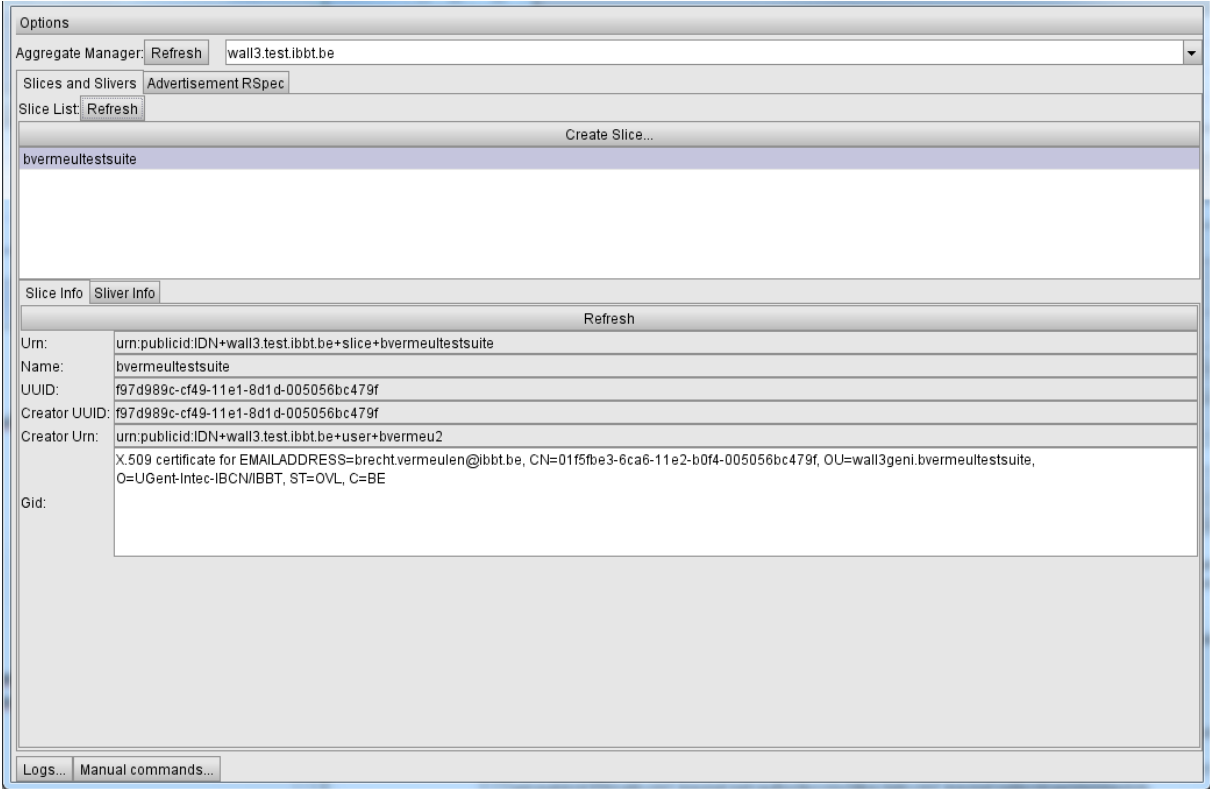
This appendix shows preliminary information as an illustration about the test suite as it will be refined continuously during cycle 1,2 and 3 developments. In the next deliverable D2.5 about integration and testing, the test suite will be described in detail according its version at the end of cycle 1.

As can be seen in the following two screenshots, a detailed view on the RSpecs and slice/sliver information can be analyzed during testing.

```

Options
Aggregate Manager: Refresh wall3.test.ibbt.be
Slices and Slivers Advertisement RSpec Refresh
<?xml version="1.0" encoding="UTF-8"?>
<rspec expires="2013-02-01T19:29:09Z" generated="2013-02-01T19:29:09Z"
type="advertisement" xmlns="http://www.geni.net/resources/rspec/3"
xmlns:emulab="http://www.protogeni.net/resources/rspec/ext/emulab/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/ad.xsd
http://www.protogeni.net/resources/rspec/ext/emulab/1 http://www.protogeni.net/resources/rspec/ext/emulab/1/ptop_extension.xsd">
<node component_id="urn:publicid:IDN+wall3.test.ibbt.be+node+c300b"
component_manager_id="urn:publicid:IDN+wall3.test.ibbt.be+authority+cm"
component_name="c300b" exclusive="true">
<hardware_type name="switch">
<emulab:node_type type_slots="1"/>
</hardware_type>
<hardware_type name="lan">
<emulab:node_type static="true" type_slots="unlimited"/>
</hardware_type>
<available now="true"/>
<location country="BE" latitude="51.036145" longitude="3.734761"/>
<interface component_id="urn:publicid:IDN+wall3.test.ibbt.be+interface+c300b:(null)">
<emulab:interface name="(null)"/>
</interface>
<emulab:fd name="real-switch" weight="0"/>
</node>
<node component_id="urn:publicid:IDN+wall3.test.ibbt.be+node+n095-06b"
component_manager_id="urn:publicid:IDN+wall3.test.ibbt.be+authority+cm"
component_name="n095-06b" exclusive="true">
<hardware_type name="pcgen03-1p">
<emulab:node_type type_slots="1"/>
</hardware_type>
<sliver_type name="raw-pc">
<disk_image default="true" description="Debian 6.0 Squeeze 64-bit"
name="urn:publicid:IDN+wall3.test.ibbt.be+image+emulab-ops:DEB60_64-STD"
os="Linux" version="6"/>
<disk_image default="true" description="Debian 6.0 Squeeze 64-bit"
name="urn:publicid:IDN+wall3.test.ibbt.be+image+emulab-ops:DEB60_64-STD"
os="Linux" version="6"/>
</sliver_type>
</node>
</rspec>

```



In the following screenshots we can see the manual API calls that can be executed for the Slice Authority, Aggregate Manager and GENI Clearing House.

The screenshot shows a window titled "Manual SFA Commands". At the top, there are tabs for "SliceAuthority", "AggregateManager2", and "ClearingHouse1". Below this, the "API methods:" section contains a grid of buttons: bindToSlice, register, getVersion, getCredential, getKeys, remove, getSliceCredential, renewSlice, resolveSlice, resolveUser, and shutdown. The "getVersion" button is selected, and the window title changes to "Geni Clearing House API v1 - GetVersion (getVersion)".

The "Result" section shows "HTTP Details" and a "Save to file..." button. The main content area displays a JSON array of URIs:

```
[
  peers => {urn:publicid:IDN+emulab.larc.usp.br+authority+cm=https://www.emulab.larc.usp.br:12369/protogeni/xmlrpc/cm,
urn:publicid:IDN+instageni.northwestern.edu+authority+cm=https://boss.instageni.northwestern.edu:12369/protogeni/xmlrpc/cm,
urn:publicid:IDN+emulab.net+authority+cm=https://www.emulab.net:12369/protogeni/xmlrpc/cm,
urn:publicid:IDN+cron.loni.org+authority+cm=https://www.cron.loni.org/protogeni/xmlrpc/cm,
urn:publicid:IDN+pgeni3.gpolab.bbn.com+authority+cm=https://www.pgeni3.gpolab.bbn.com:12369/protogeni/xmlrpc/cm,
urn:publicid:IDN+umlab.net+authority+cm=https://boss.umlab.net/protogeni/xmlrpc/cm,
urn:publicid:IDN+maxpl+authority+sa=http://max-myplc.dragon.maxgigapop.net:12346,
urn:publicid:IDN+etri-cm2.kreonet.net+authority+cm=https://etri-cm2.kreonet.net/protogeni/xmlrpc/cm,
urn:publicid:IDN+pni.umlab.edu+authority+cm=https://pni.umlab.edu/protogeni/xmlrpc/cm,
urn:publicid:IDN+vwall.ilabt.iminds.be+authority+cm=https://www.vwall.ilabt.iminds.be:12369/protogeni/xmlrpc/cm,
urn:publicid:IDN+attcm.net+authority+cm=https://localhost.localdomain/protogeni/xmlrpc/cm,
urn:publicid:IDN+xen-leelab.testbed.emulab.net+authority+cm=https://myboss.xen-leelab.testbed.emulab.net:12369/protogeni/xmlrpc/cm,
urn:publicid:IDN+etri-cm1.kreonet.net+authority+cm=https://etri-cm1.kreonet.net/protogeni/xmlrpc/cm,
urn:publicid:IDN+plc+authority+sa=https://planet-lab.org:12346,
urn:publicid:IDN+geelab.geni.emulab.net+authority+cm=https://myboss.geelab.geni.emulab.net:12369/protogeni/xmlrpc/cm,
urn:publicid:IDN+elabinelab.geni.emulab.net+authority+cm=https://myboss.elabinelab.geni.emulab.net/protogeni/xmlrpc/cm,
urn:publicid:IDN+pgeni.gpolab.bbn.com+authority+cm=https://www.pgeni.gpolab.bbn.com:12369/protogeni/xmlrpc/cm,
urn:publicid:IDN+chi.itesm.mx+authority+cm=https://boss.chi.itesm.mx/protogeni/xmlrpc/cm,
urn:publicid:IDN+genicloud.hplabs+authority+sa=https://opencirrus-07501.hpl.hp.com:12346/,
urn:publicid:IDN+sparta.com+authority+cm=https://host.referencecm.amp.emulab.net/protogeni/xmlrpc/cm,
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urn:publicid:IDN+ionpl+authority+sa=http://alpha.east.isi.edu:12346,
urn:publicid:IDN+wall3.test.ibbt.be+authority+cm=https://www.wall3.test.ibbt.be:12369/protogeni/xmlrpc/cm,
urn:publicid:IDN+shadownet.uky.emulab.net+authority+cm=https://shadownet.uky.emulab.net/protogeni/xmlrpc/cm,
urn:publicid:IDN+schooner.wail.wisc.edu+authority+cm=https://www.schooner.wail.wisc.edu/protogeni/xmlrpc/cm,
urn:publicid:IDN+gims.wail.wisc.edu+authority+cm=https://gims.wail.wisc.edu/protogeni/xmlrpc/cm,
}
```

Server:

SliceAuthority AggregateManager2 ClearingHouse1

API methods:

deleteSliver createSliver getVersion renewSliver sliverStatus

listResources shutdown

Geni Clearing House API v1 - GetVersion (getVersion)

ProtoGeni Slice Authority API - GetCredential (getCredential)

Geni Aggregate Manager API v2 - ListResources (listResources)

ProtoGeni Slice Authority API - Resolve (resolveUser)

ProtoGeni Slice Authority API - Register (register)

ProtoGeni Slice Authority API - Register (register)

ProtoGeni Slice Authority API - Resolve (resolveSlice)

Geni Aggregate Manager API v2 - ListResources (listResources)

Geni Clearing House API v1 - GetVersion (getVersion)

Geni Clearing House API v1 - GetCredential (getCredential)

Geni Clearing House API v1 - ListComponents (listComponents)

Geni Clearing House API v1 - GetVersion (getVersion)

urn:publicid:IDN+wwall.ilabt.iminds.be+authority+cm=https://www.wwall.ilabt.iminds.be:12369/protogeni/xmlrpc/cm,

urn:publicid:IDN+attcm.net+authority+cm=https://localhost.localdomain/protogeni/xmlrpc/cm,

urn:publicid:IDN+xen-leelab.testbed.emulab.net+authority+cm=https://myboss.xen-leelab.testbed.emulab.net:12369/protogeni/xmlrpc/cm,

urn:publicid:IDN+etri-cm1.kreonet.net+authority+cm=https://etri-cm1.kreonet.net/protogeni/xmlrpc/cm,

urn:publicid:IDN+plc+authority+sa=https://planet-lab.org:12346,

urn:publicid:IDN+geelab.geni.emulab.net+authority+cm=https://myboss.geelab.geni.emulab.net:12369/protogeni/xmlrpc/cm,

urn:publicid:IDN+elabelab.geni.emulab.net+authority+cm=https://myboss.elabelab.geni.emulab.net/protogeni/xmlrpc/cm,

urn:publicid:IDN+pgeni.gpolab.bbn.com+authority+cm=https://www.pgeni.gpolab.bbn.com:12369/protogeni/xmlrpc/cm,

urn:publicid:IDN+chi.itesm.mx+authority+cm=https://boss.chi.itesm.mx/protogeni/xmlrpc/cm,

urn:publicid:IDN+genicloud:hplabs+authority+sa=https://opencirrus-07501.hpl.hp.com:12346/,

urn:publicid:IDN+sparta.com+authority+cm=https://host.referencecm.amp.emulab.net/protogeni/xmlrpc/cm,

urn:publicid:IDN+example.org+authority+cm=https://host.linux.geni.emulab.net/protogeni/xmlrpc/cm,

urn:publicid:IDN+instageni.gpolab.bbn.com+authority+cm=https://boss.instageni.gpolab.bbn.com:12369/protogeni/xmlrpc/cm,

urn:publicid:IDN+utah.geniracks.net+authority+cm=https://boss.utah.geniracks.net:12369/protogeni/xmlrpc/cm,

urn:publicid:IDN+pgeni1.gpolab.bbn.com+authority+cm=https://www.pgeni1.gpolab.bbn.com:12369/protogeni/xmlrpc/cm,

urn:publicid:IDN+cmcl.cs.cmu.edu+authority+cm=https://boss.cmcl.cs.cmu.edu/protogeni/xmlrpc/cm,

urn:publicid:IDN+ionpl+authority+sa=http://alpha.east.isi.edu:12346,

urn:publicid:IDN+wall3.test.ibbt.be+authority+cm=https://www.wall3.test.ibbt.be:12369/protogeni/xmlrpc/cm,

urn:publicid:IDN+shadownet.uky.emulab.net+authority+cm=https://shadownet.uky.emulab.net/protogeni/xmlrpc/cm,

urn:publicid:IDN+schooner.wail.wisc.edu+authority+cm=https://www.schooner.wail.wisc.edu/protogeni/xmlrpc/cm,

urn:publicid:IDN+gims.wail.wisc.edu+authority+cm=https://gims.wail.wisc.edu/protogeni/xmlrpc/cm,

Manual SFA Commands

Server: SliceAuthority | AggregateManager2 | ClearingHouse1

API methods:

Geni Clearing House API v1 - GetVersion (getVersion)

Result HTTP Details

Result:

```
[
  peers => {urn:publicid:IDN+emulab.larc.usp.br+authority+cm=https://www.emulab.larc.usp.br:12369/protogeni/xmlrpc/cm,
urn:publicid:IDN+instageni.northwestern.edu+authority+cm=https://boss.instageni.northwestern.edu:12369/protogeni/xmlrpc/cm,
urn:publicid:IDN+emulab.net+authority+cm=https://www.emulab.net:12369/protogeni/xmlrpc/cm,
urn:publicid:IDN+cron.loni.org+authority+cm=https://www.cron.loni.org/protogeni/xmlrpc/cm,
urn:publicid:IDN+pgeni3.gpolab.bbn.com+authority+cm=https://www.pgeni3.gpolab.bbn.com:12369/protogeni/xmlrpc/cm,
urn:publicid:IDN+uml.emulab.net+authority+cm=https://boss.uml.emulab.net/protogeni/xmlrpc/cm,
urn:publicid:IDN+maxpl+authority+sa=http://max-myplc.dragon.maxgigapop.net:12346,
urn:publicid:IDN+etri-cm2.kreonet.net+authority+cm=https://etri-cm2.kreonet.net/protogeni/xmlrpc/cm,
urn:publicid:IDN+pni.uml.edu+authority+cm=https://pni.uml.edu/protogeni/xmlrpc/cm,
urn:publicid:IDN+vwall.ilabt.iminds.be+authority+cm=https://www.vwall.ilabt.iminds.be:12369/protogeni/xmlrpc/cm,
urn:publicid:IDN+attcm.net+authority+cm=https://localhost.localdomain/protogeni/xmlrpc/cm,
urn:publicid:IDN+xen-leelab.testbed.emulab.net+authority+cm=https://myboss.xen-leelab.testbed.emulab.net:12369/protogeni/xmlrpc/cm,
urn:publicid:IDN+etri-cm1.kreonet.net+authority+cm=https://etri-cm1.kreonet.net/protogeni/xmlrpc/cm,
urn:publicid:IDN+plc+authority+sa=https://planet-lab.org:12346,
urn:publicid:IDN+geelab.geni.emulab.net+authority+cm=https://myboss.geelab.geni.emulab.net:12369/protogeni/xmlrpc/cm,
urn:publicid:IDN+elabelab.geni.emulab.net+authority+cm=https://myboss.elabelab.geni.emulab.net/protogeni/xmlrpc/cm,
urn:publicid:IDN+pgeni.gpolab.bbn.com+authority+cm=https://www.pgeni.gpolab.bbn.com:12369/protogeni/xmlrpc/cm,
urn:publicid:IDN+chi.itesm.mx+authority+cm=https://boss.chi.itesm.mx/protogeni/xmlrpc/cm,
urn:publicid:IDN+genicloud.hplabs+authority+sa=https://opencirrus-07501.hpl.hp.com:12346/,
urn:publicid:IDN+sparta.com+authority+cm=https://host.referencecm.amp.emulab.net/protogeni/xmlrpc/cm,
urn:publicid:IDN+example.org+authority+cm=https://host.linux.geni.emulab.net/protogeni/xmlrpc/cm,
urn:publicid:IDN+instageni.gpolab.bbn.com+authority+cm=https://boss.instageni.gpolab.bbn.com:12369/protogeni/xmlrpc/cm,
urn:publicid:IDN+utah.geniracks.net+authority+cm=https://boss.utah.geniracks.net:12369/protogeni/xmlrpc/cm,
urn:publicid:IDN+pgeni1.gpolab.bbn.com+authority+cm=https://www.pgeni1.gpolab.bbn.com:12369/protogeni/xmlrpc/cm,
urn:publicid:IDN+cmcl.cs.cmu.edu+authority+cm=https://boss.cmcl.cs.cmu.edu/protogeni/xmlrpc/cm,
urn:publicid:IDN+ionpl+authority+sa=http://alpha.east.isi.edu:12346,
urn:publicid:IDN+wall3.test.ibbt.be+authority+cm=https://www.wall3.test.ibbt.be:12369/protogeni/xmlrpc/cm,
urn:publicid:IDN+shadownet.uky.emulab.net+authority+cm=https://shadownet.uky.emulab.net/protogeni/xmlrpc/cm,
urn:publicid:IDN+schooner.wail.wisc.edu+authority+cm=https://www.schooner.wail.wisc.edu/protogeni/xmlrpc/cm,
urn:publicid:IDN+gims.wail.wisc.edu+authority+cm=https://gims.wail.wisc.edu/protogeni/xmlrpc/cm,
```