

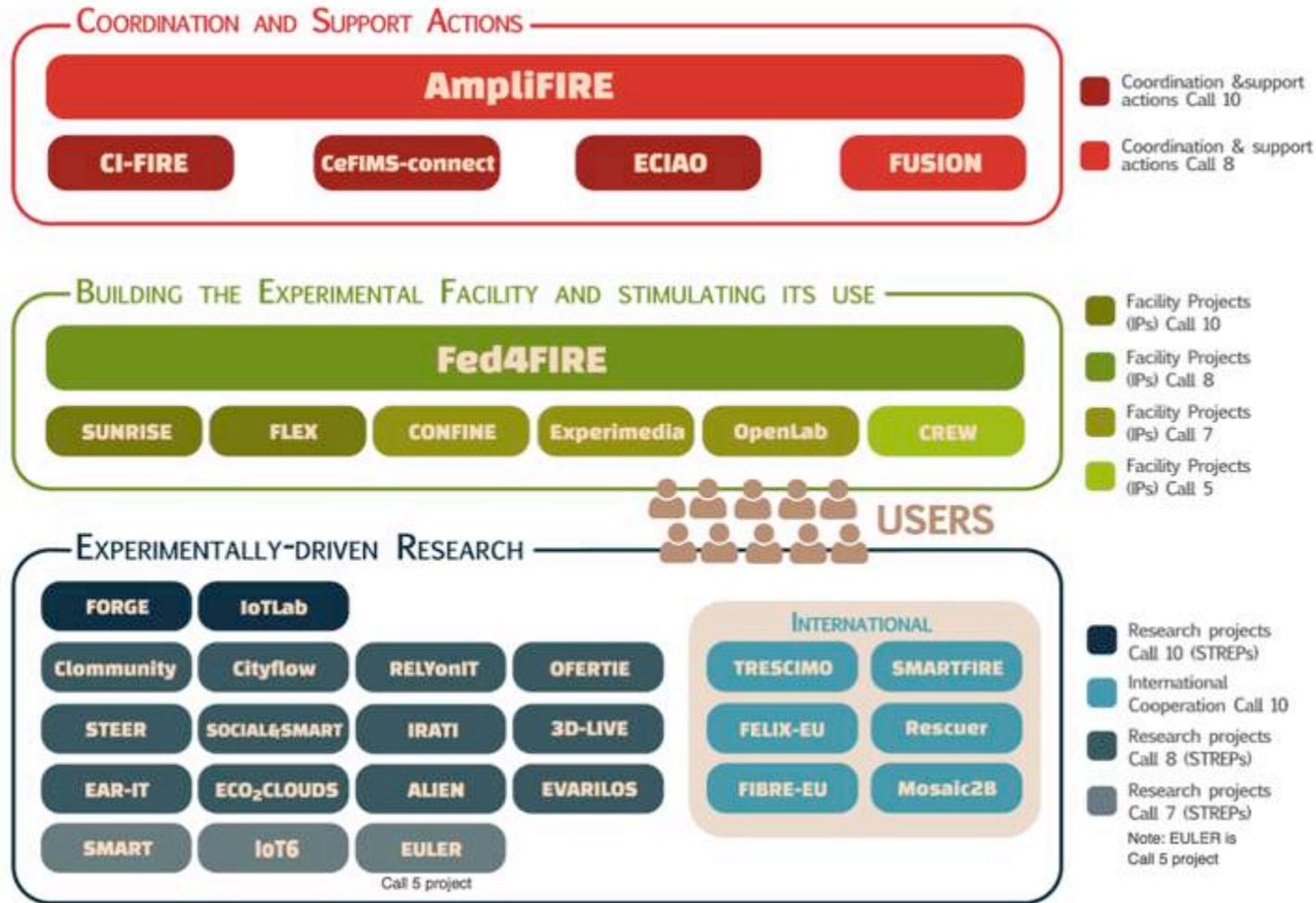
FED4FIRE

Workshop Fed4FIRE Federation of Testbeds



Brecht Vermeulen, Fed4FIRE architect
Brecht.vermeulen@iminds.be

Fed4FIRE's role in European FIRE framework



Fed4FIRE – general info

- IP project coordinated by iMinds
- Total budget: 7.75 MEUR
- 10/2012 - 9/2016
- 28 partners

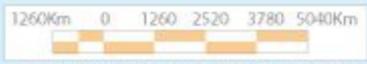


WORLD MAP



Belgium

1. Nether
2. Belgiu
3. Luxem
4. Switze
5. Sloven
6. Croati
7. Bosnia
8. Czech
9. Slovak



iMinds research institute

- Flanders' digital research center and business incubator
 - Flanders = Dutch speaking part of Belgium
- Building on the strength of 850+ researchers in 5 Flemish universities
- Digital expertise for 6 key markets
 - ICT, Media, Health, Energy, Smart Cities and Manufacturing
- Work with research partners to convert digital know-how into real-life products and services that change people's lives for the better
- Guide researchers, young entrepreneurs and start-ups in the successful market introduction of their ideas
- www.iminds.be

iMinds testbeds

Virtual Wall: 320 physical servers



Wireless: 70 wireless nodes + 15 robots



Brecht Vermeulen

- PhD in 2004 about Quality of Service in the Future internet
- Technical responsible for iMinds' testbeds and testlab
- Leading architecture work package in Fed4FIRE project

Current testbeds in Fed4FIRE



Fed4FIRE testbeds

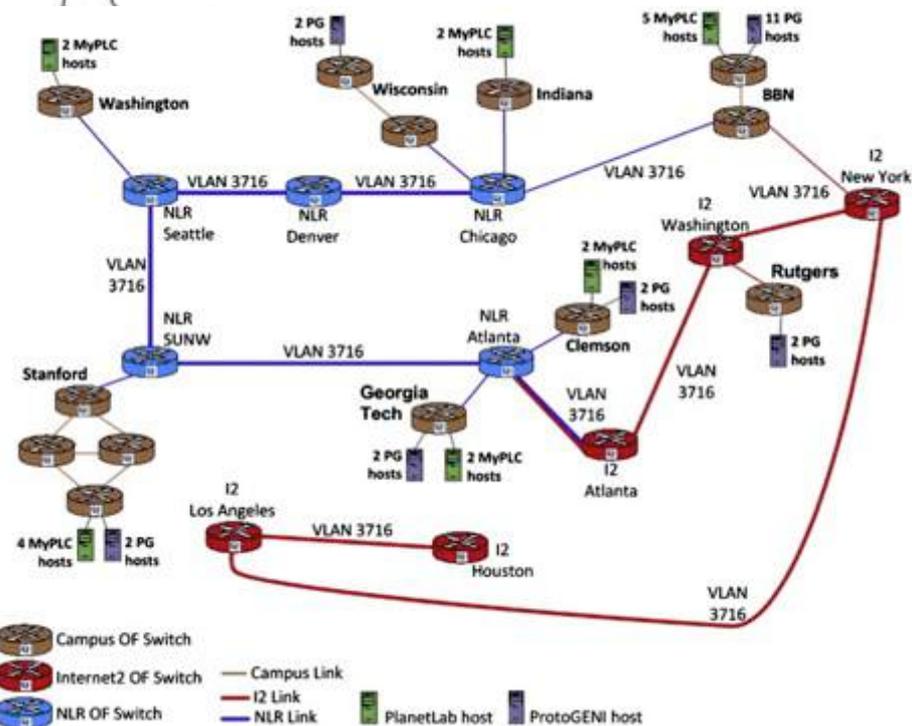
- Diverse technologies
- Diverse implementation stacks

US GENI federation

- Fixed sites
- Regional networks



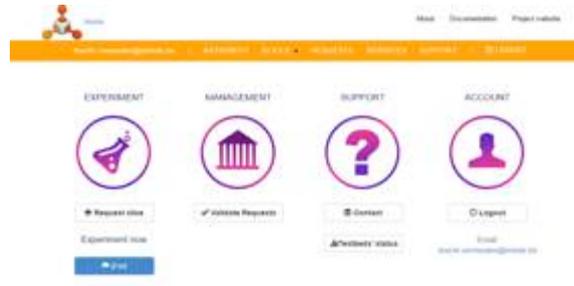
More testbeds
 More uniformity of testbeds
 Better connectivity
 Designed GENI AM API
 (instageni rack, exogeni rack, Openflow, Wimax)
 GEC = Geni Engineering Conference



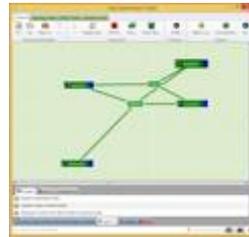
Goals of federation

- Make it easy for experimenters to use multiple testbeds
 - Single account
 - Single (or small number) of tools
- Multiple testbeds
 - To scale up
 - To use/combine special resources (e.g. wireless robots)
 - Redundancy (e.g. testbed in maintenance)
 - To re-use experiments (class exercises, scientifically, ...)
 - To compare environments (e.g. wireless)

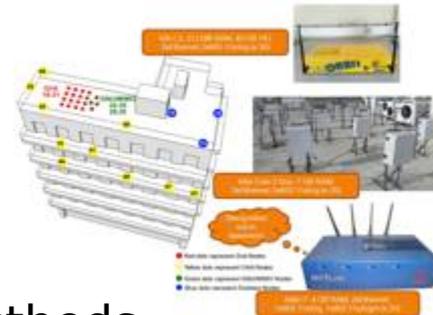
Design principles



Multiple identity provider



Multiple tools



Multiple testbeds

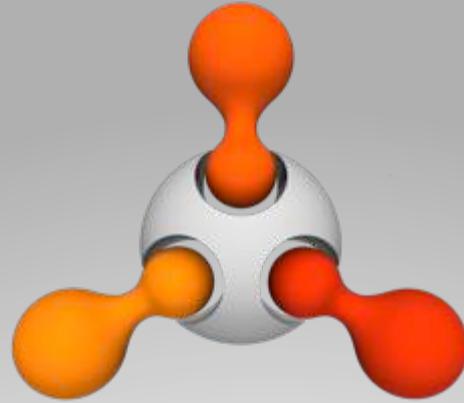
All of them can appear and disappear !

Testbeds trust IdPs in federation



Agenda

- Experiment workflow
 - Overview Fed4FIRE (<http://doc.fed4fire.eu>)
 - Technical workflow between components
 - Monitoring
 - Connectivity
 - Proxy
 - International federation and connectivity
 - Tools beyond resource provisioning
- Workflow adding testbed to the federation
 - jFed toolkit
- International collaboration
 - GENI-FIRE summer class
 - GENI-FIRE API definitions
- Use cases
 - Class exercise by Forge project
 - Belgian SME (outside of open calls)
 - Geocloud (opencall experiment)
 - Services on top: Xifi cloud node, hadoop/openstack on demand
 - US Cloudlab
- Federation membership models



FED4FIRE

Experiment workflow



Experiment workflow



Create Account



Documentation
<http://doc.fed4fire.eu>

Federation policy:
experimenter can run
tutorial experiments
to learn testbeds



Do more experiments and tutorials:
Provision resources, control resources
(ask more quota to testbeds if needed as testbeds
can have different policies)

From account creation to first experiment (tutorial with client-server & emulated link)

The screenshot displays the jFed Experimenter Toolkit interface. The main window is titled "jFed Experimenter Toolkit" and features a toolbar with various controls. The toolbar is divided into sections: "Experiment" (Update Status, Renew, Terminate), "Advanced" (Reboot, Edit ssh-keys, Share), "Layout" (Auto Layout), and "Zoom" (Zoom In, Zoom Out, Reset Zoom). Below the toolbar, a network topology is shown on a green grid background. It consists of three nodes: "server", "link0", and "client", connected in a line. Below the topology, there are two other nodes: "VM Bonfire" and "node3".

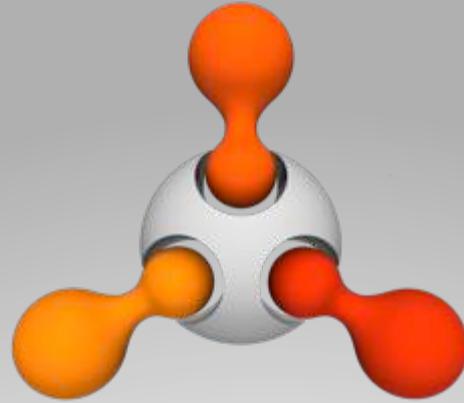
The bottom section of the interface shows a "Progress" tab with a list of tasks, all of which are checked:

- Initialize nodes at iMinds Virtual Wall 2
- Waiting for nodes from BonFire to become ready.
- Waiting for nodes from iMinds Virtual Wall 2 to become ready.
- Waiting for nodes from iMinds Virtual Wall 1 to become ready.
- Testing connectivity to nodes from BonFire.
- Testing connectivity to nodes from iMinds Virtual Wall 2.
- Testing connectivity to nodes from iMinds Virtual Wall 1.

At the bottom of the interface, there is a status bar that reads: "This experiment run will expire in 1 hour, 41 minutes and 39 seconds."

In the foreground, a terminal window titled "n143-01b.wall1.ilabt.iminds.be - PuTTY" is open. The terminal shows the following output:

```
bvermeul@server:~$ ping client
PING client-link0 (192.168.0.2) 56(84) bytes of data:
64 bytes from client-link0 (192.168.0.2): icmp_req=1 ttl=64 time=200 ms
64 bytes from client-link0 (192.168.0.2): icmp_req=2 ttl=64 time=200 ms
64 bytes from client-link0 (192.168.0.2): icmp_req=3 ttl=64 time=200 ms
64 bytes from client-link0 (192.168.0.2): icmp_req=4 ttl=64 time=200 ms
64 bytes from client-link0 (192.168.0.2): icmp_req=5 ttl=64 time=200 ms
^C
--- client-link0 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4005ms
rtt min/avg/max/mdev = 200.259/200.271/200.276/0.400 ms
bvermeul@server:~$
```



FED4FIRE

Technical workflow between components



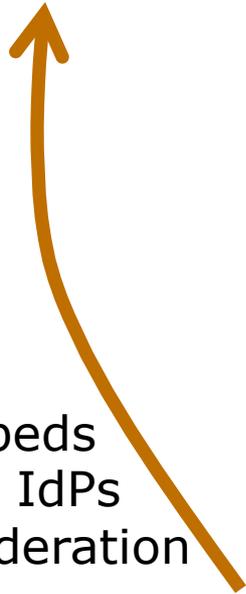
Workflow



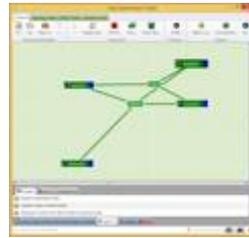
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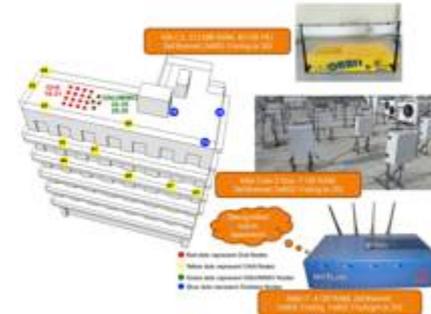
Signed X.509 certificate of **an** identity provider



Testbeds trust IdPs in federation



Use **a** tool



Use **one or more** testbeds

Fed4FIRE Identity providers



Home Documentation **iMinds Authority** Sign Up

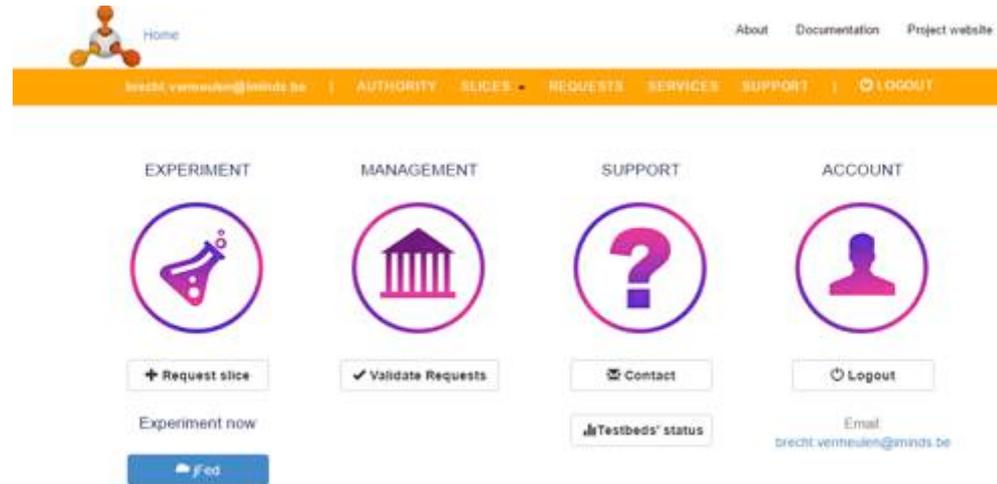
What is the iMinds Authority? >

Login

Username

Password

[Forgot Password?](#) [Sign Up](#) [Login](#)



Home About Documentation Project website

brecht.venteuken@iminds.be | AUTHORITY SLICES REQUESTS SERVICES SUPPORT | LOGOUT

EXPERIMENT MANAGEMENT SUPPORT ACCOUNT

[Request slice](#) [Validate Requests](#) [Contact](#) [Logout](#)

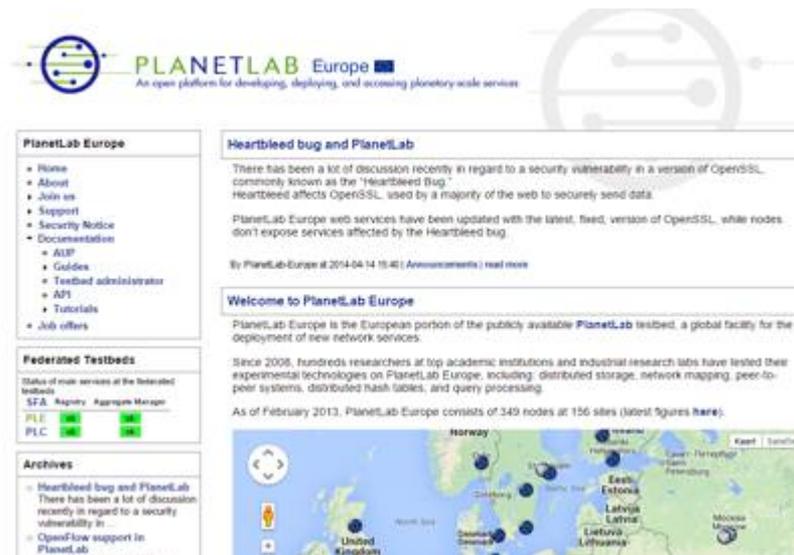
Experiment now [Fed](#)

[Testbeds' status](#) Email: brecht.venteuken@iminds.be

Powered by  Question or comment? Join the Help Forum Supported by iMinds and the EC © 2014 iMinds Lab

<https://authority.ilabt.iminds.be>

Portal: <https://portal.fed4fire.eu>



PLANETLAB Europe
An open platform for developing, deploying, and accessing planetary-scale services

PlanetLab Europe

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- Documentation
 - AUP
 - Guides
 - Testbed administrator
 - API
 - Tutorials
- Job offers

Federated Testbeds

Status of main services at the federated testbeds:

| SFA | Registry | Aggregate Manager |
|---|---------------------------------------|---------------------------------------|
| PLE OK | OK | OK |
| PLC OK | OK | OK |

Archives

- Heartbleed bug and PlanetLab
- There has been a lot of discussion recently in regard to a security vulnerability in...
- OpenFlow support in PlanetLab

Heartbleed bug and PlanetLab

There has been a lot of discussion recently in regard to a security vulnerability in a version of OpenSSL, commonly known as the "Heartbleed Bug". Heartbleed affects OpenSSL, used by a majority of the web to securely send data.

PlanetLab Europe web services have been updated with the latest, fixed, version of OpenSSL, while nodes don't expose services affected by the Heartbleed bug.

By PlanetLab Europe at 2014-04-14 15:42 | [Announcements](#) | [read more](#)

Welcome to PlanetLab Europe

PlanetLab Europe is the European portion of the publicly available PlanetLab testbed, a global facility for the deployment of new network services.

Since 2005, hundreds of researchers at top academic institutions and industrial research labs have tested their experimental technologies on PlanetLab Europe, including: distributed storage, network mapping, peer-to-peer systems, distributed hash tables, and query processing.

As of February 2013, PlanetLab Europe consists of 349 nodes at 156 sites ([latest figures here](#)).



Planetlab Europe, <http://www.planet-lab.eu/>



Workflow (protocol: XMLRPC over SSL)



Slice Authority API

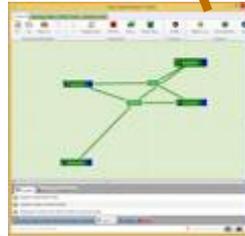
Member Authority API

Create Account and get certificate

3. Create slice/get credential (signed XML)

2. Get credential (signed XML)

1. Use signed certificate in tool

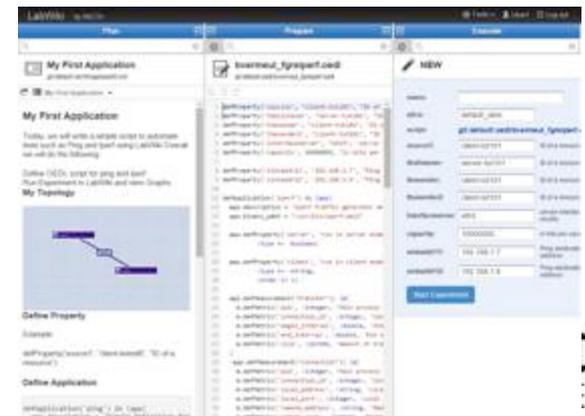


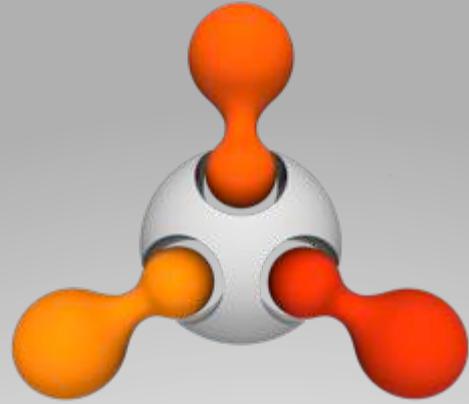
4. Provision resources

Aggregate Manager API



5. Control resources





FED4FIRE

Monitoring



jFed testing and monitoring

<https://flsmonitor.fed4fire.eu>

<http://monitor.ilabt.iminds.be>

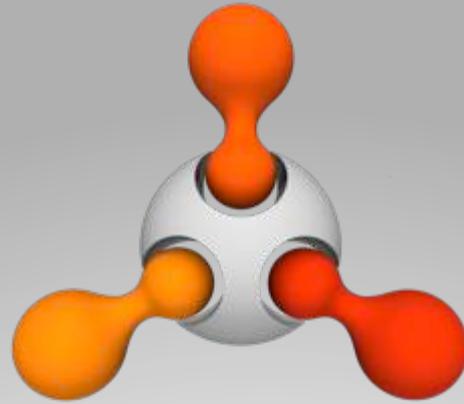
API testing

| Testbed Name | Ping latency (ms) | GetVersion Status | Free Resources | Internal testbed monitoring status | Last chec |
|---------------------------|-------------------|-------------------|----------------|------------------------------------|-----------|
| BonFIRE | 31.17 | N/A | N/A | ok | 2014-12-0 |
| C-Lab | 52.15 | ok | 113 | ok | 2014-12-0 |
| FUSECO | 15.77 | ok | 19 | ok | 2014-12-0 |
| Koren | 280.88 | ok | 3 | N/A | N/A |
| NETMODE | 61.02 | ok | 20 | ok | 2014-12-0 |
| NITOS Broker | 68.11 | ok | 38 | ok | 2014-12-0 |
| NITOS SFAWrap | 30.34 | ok | 111 | ok | 2014-12-0 |
| Norbit | N/A | N/A | N/A | ok | 2014-12-0 |
| Ofelia (Bristol openflow) | 16.94 | ok | 48 | ok | 2014-12-0 |
| Ofelia (Bristol vtam) | 16.92 | ok | 2 | ok | 2014-12-0 |
| Ofelia (i2CAT openflow) | 16.92 | ok | 5 | ok | 2014-12-0 |
| Ofelia (i2CAT vtam) | 16.98 | ok | 6 | ok | 2014-12-0 |
| Planetlab Europe | 30.36 | ok | 273 | ok | 2014-12-0 |
| SmartSantander | 58.9 | ok | 0 | ok | 2014-12-0 |
| Virtual Wall 1 | 0.1 | ok | 70 | N/A | N/A |
| Virtual Wall 2 | 0.12 | ok | 64 | ok | 2014-12-0 |
| Virtual Wall 2 (openflow) | 0.55 | ok | 2 | ok | 2014-12-0 |
| w-iLab.t 2 | 4.71 | ok | 61 | ok | 2014-12-0 |

- ✓ setUp
- ✓ getVersion
- ✓ getTestUserCredential
- ✓ getTestUserInfo
- ✓ retrieveCredentialSomehow
- ✗ createProject
- ✓ createSlice
- ✗ lookupProjectsByUrnNoFilter
- ✗ lookupProjectsByNameNoFilter
- ✓ getSliceCredentials

- ✗ updateProject
- ✓ lookupSlicesNoFilter
- ✗ lookupProjectsNoFilterAfterUpdate
- ✓ updateSlice
- ✗ lookupProjectMembers
- ✗ lookupProjectsForMember
- ✓ lookupSlicesNoFilterAfterUpdate
- ✓ lookupSliceMembers

| Test Name | Last Test Start Time (CET) | Last Test Duration | Last Partial Success | Last Full Success | Time since last Failure | Last Log | History |
|------------------|----------------------------|---------------------------|----------------------|-------------------|-------------------------|----------|---------|
| Confine | 2014-12-01 21:05:03 | 10 minutes and 38 seconds | SUCCESS | SUCCESS | 4 days and 11 hours | log | history |
| Fuseco | 2014-12-01 21:27:02 | 27 seconds | FAILURE | FAILURE | | log | history |
| NETMODE | 2014-12-01 22:36:37 | 1 minute and 40 seconds | SUCCESS | FAILURE | | log | history |
| Nitos Broker | 2014-12-01 22:38:18 | 1 minute and 18 seconds | SUCCESS | FAILURE | | log | history |
| Nitos SFAWrap | 2014-12-01 22:39:37 | 14 seconds | FAILURE | FAILURE | | log | history |
| Planetlab Europe | 2014-12-02 03:43:26 | 10 minutes and 49 seconds | SUCCESS | SUCCESS | 6 days and 21 hours | log | history |
| Virtual Wall | 2014-12-02 03:39:06 | 2 minutes and 51 seconds | SUCCESS | SUCCESS | 3 days and 22 hours | log | history |
| Virtual Wall | 2014-12-02 03:36:25 | 2 minutes and 40 seconds | SUCCESS | SUCCESS | 3 days and 22 hours | log | history |
| Virtual Wall 1 | 2014-12-02 03:32:11 | 4 minutes and 12 seconds | SUCCESS | SUCCESS | 3 days and 22 hours | log | history |
| Virtual Wall 1 | 2014-12-02 03:29:14 | 2 minutes and 56 seconds | SUCCESS | SUCCESS | 3 days and 22 hours | log | history |
| Wilab.t | 2014-12-02 03:42:42 | 44 seconds | WARN | WARN | | log | history |
| Wilab.t | 2014-12-02 03:41:58 | 44 seconds | WARN | WARN | | log | history |



FED4FIRE

Connectivity: proxy



Connectivity test (also in bug report)

The screenshot shows a window titled "jFed Connectivity Tester" with a "Restart tests" button in the top right. The main heading is "Connectivity Tester". Below this is a list of test items, each with a status icon (checkmark or X) and a right-pointing arrow:

- ▶ Check for IPv4-address
- ▶ Check for IPv6-address
- ▶ Ping to IPv4-host 'ipv4.google.com'
- ▶ Ping to IPv6-host 'ipv6.google.com'

The fourth item is highlighted in blue. Below the list is a red box containing the following text:

✖ Status: Failed

Message: Unable to reach ipv6.google.com

Below the red box is another list of test items:

- ▶ [Flack] Flack
- ▶ [Flack] Portal
- ▶ [Flack] For Flack
- ▶ [GEMINI] GENi Desktop
- ▶ [GEMINI] GENi Desktop
- ▶ [GIMI] Labwiki
- ▶ [GIMI] Labwiki
- ▶ [Misc] install scripts/example rspecs
- ▶ [Stitching] stitching service
- ▶ [iRods] iRods web interface
- ▶ [iRods] iDrop interface
- ▶ [iRods] icommands
- ▶ [SSL] SSL handshake @ wall2

TCP ports and firewalls

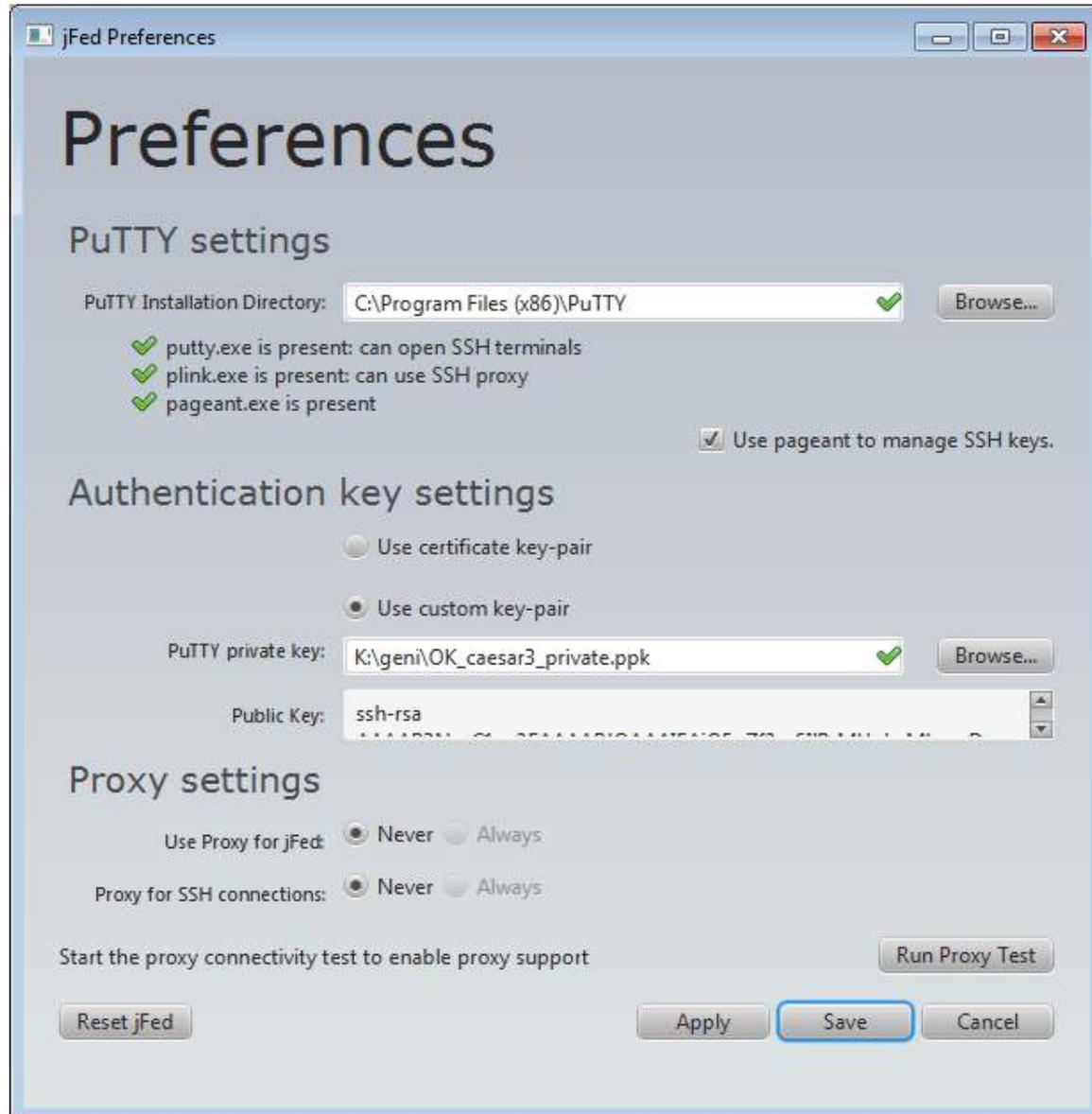
- 12369, 12346, 11443, 8081, ...
- IPv6 for node access

= problems

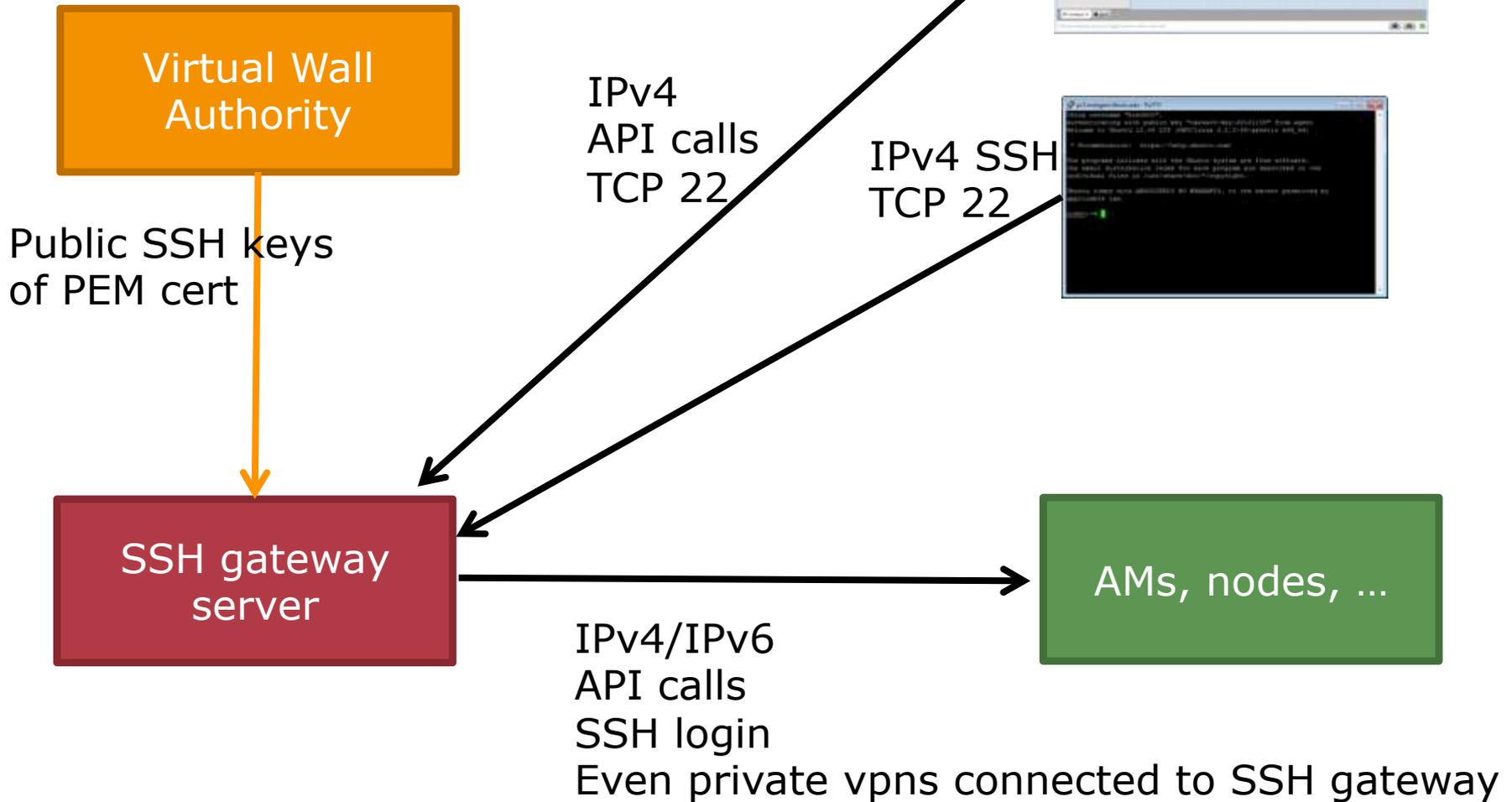
- First step: Detection (connectivity tester)
- Second step: work around -> SSH proxy

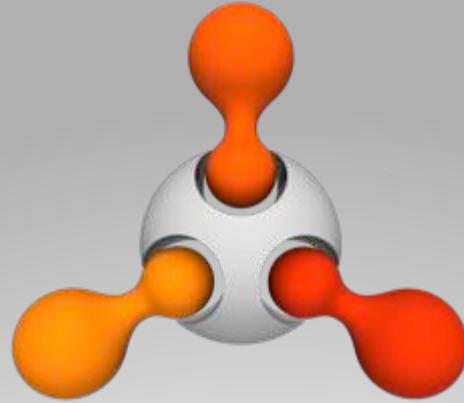
SSH proxy (optional !)

- For API calls
- For SSH login
- Automatic SSH agent for extra comfort



SSH proxy: only TCP 22



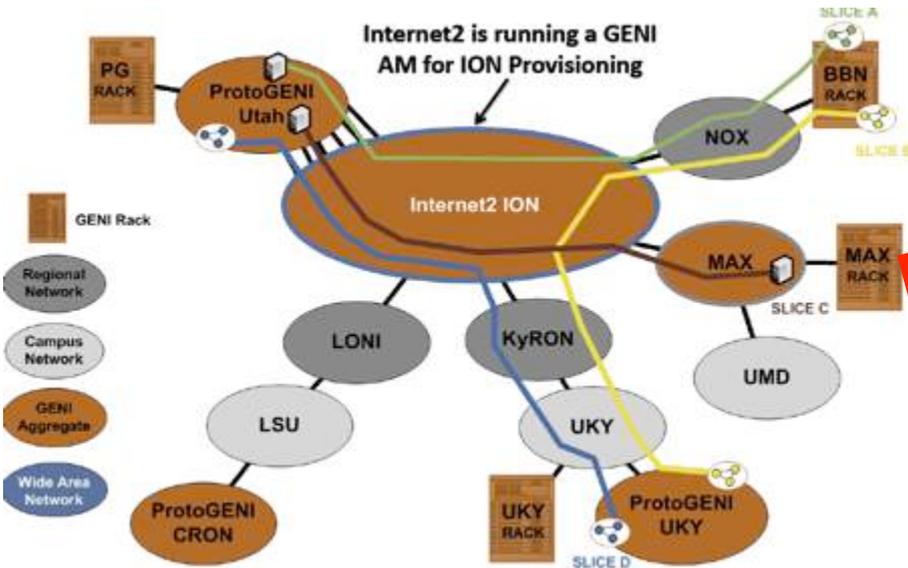


FED4FIRE

International federation and connectivity



Layer 2 connectivity = stitching VLANs



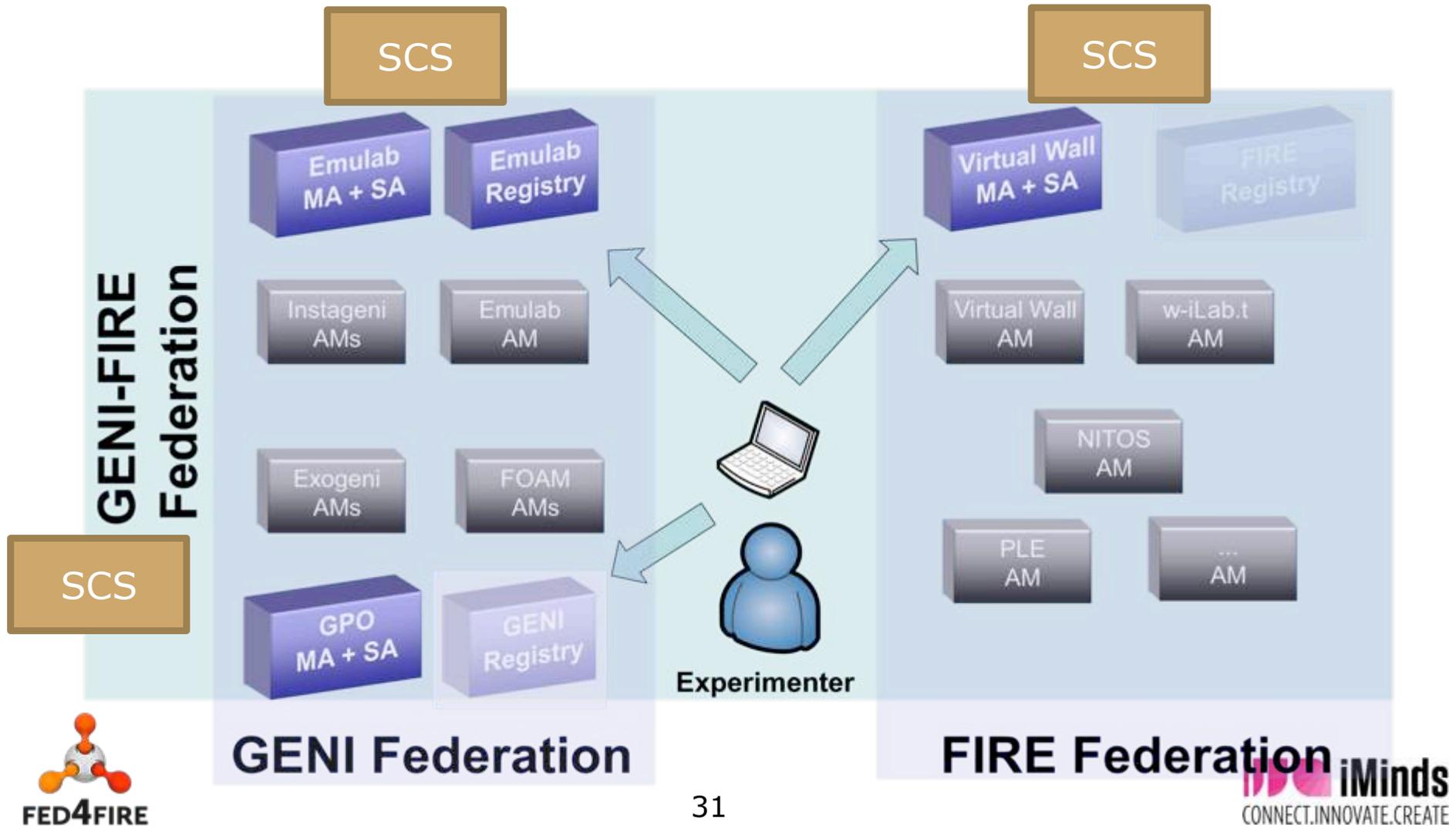
Meshed L2 connections possible

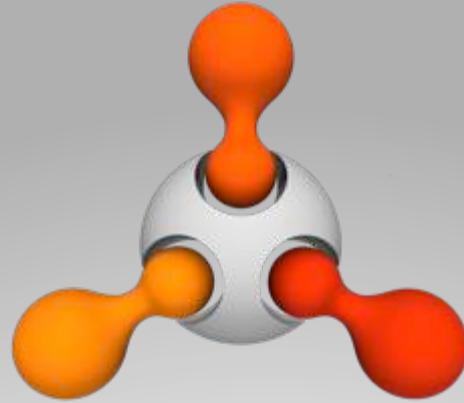
SDX = software defined exchange

eases connectivity (=exchange)

VLAN translation needed + SDN functionality

SCS per federation





FED4FIRE

Tools beyond provisioning: experiment control



jFed: timebased experiment control

The screenshot displays the jFed Experimenter Toolkit interface. The window title is "jFed Experimenter Toolkit". The interface is divided into several sections:

- General Viewers:** Includes tabs for "General", "Topology Viewer", "RSpec Viewer", and "Timeline Viewer".
- Control Panel:** Contains buttons for "Update Status", "Renew", "Terminate", "Start", "Pause", "Stop", "Time", "Instant", "Save results", "Add Command", "Add barrier", "Zoom In", "Zoom Out", and "Reset Zoom".
- Timeline View:** Shows a horizontal timeline from 0:00 to 00:05:00. The left side shows the "Experiment" view with a list of components: "server", "client", "Bonfire", and "node3". The right side shows the "Definition" view with a similar timeline. A red vertical bar is positioned at approximately 00:03:30.
- Terminal:** Displays the output of a command run on "node3". The output shows a successful connection to the server and a bandwidth measurement of 944 Mbits/sec.
- Taskbar:** Shows several open windows: "Untitled", "Untitled1", "wal1", "ovs", and "wal2".
- Status Bar:** At the bottom, it indicates "This experiment run will expire in 1 hour, 54 minutes and 14 seconds." and "Proxy fully enabled".

```
09:32:27: Your command has started.
09:32:27: -----
09:32:27: Client connecting to server, TCP port 5001
09:32:27: TCP window size: 23.5 KByte (default)
09:32:27: -----
09:32:27: --
09:32:27: [ 3] local 192.168.0.2 port 48699 connected with 192.168.0.1 port 5001
09:32:37: [ID] Interval  Transfer  Bandwidth
09:32:37: [ 3] 0.0-10.0 sec 1.10 GBytes 944 Mbits/sec
09:32:37: Your command has finished.
```

Labwiki experiment control (OMF/OML)

LabWiki by NICTA

Tools User1 Log out

Plan Prepare Execute

My First Application
git.default:wiki/firegenpart0.md

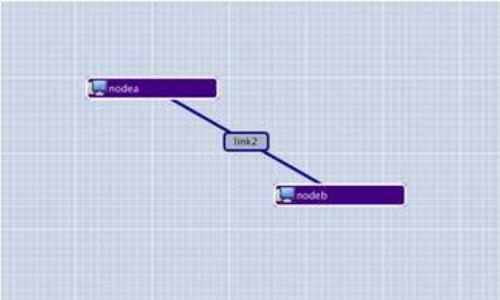
My First Application

My First Application

Today, we will write a simple script to automate tests such as Ping and Iperf using LabWiki Overall we will do the following:

Define OEDL script for ping and Iperf
Run Experiment in LabWiki and view Graphs

My Topology



Define Property

Example:

```
defProperty('source1', "client-lwtest", "ID of a resource")
```

Define Application

```
defApplication('ping') do [app]
  app.description = 'Simple Definition for ping'
```

bvermeul_fgriperf.oedl
git.default:oedl/bvermeul_fgriperf.oedl

```
1 defProperty('source1', "client-tut101", "ID of
2 defProperty('thelister', "server-tut101", "ID
3 defProperty('thesender', "client-tut101", "ID o
4 defProperty('thesender2', "client-tut101", "ID
5 defProperty('interfaceServer', "eth3", 'server
6 defProperty('capacity', 10000000, 'in bits per
7
8 defProperty('sinkaddr11', '192.168.1.7', "Ping
9 defProperty('sinkaddr12', '192.168.1.6', "Ping
10
11 defApplication('iperf') do [app]
12   app.description = 'Iperf traffic generator an
13   app.binary_path = "/usr/bin/iperf-oml2"
14
15   app.defProperty('server', 'run in server mode
16     :type => :boolean)
17
18   app.defProperty('client', 'run in client mode
19     :type => :string,
20     :order => 1)
21
22   app.defMeasurement("transfer"){ |m|
23     m.defMetric('pid', :integer, 'Main process
24     m.defMetric('connection_id', :integer, 'Con
25     m.defMetric('begin_interval', :double, 'Sta
26
27   app.defMeasurement("connection"){ |m|
28     m.defMetric('pid', :integer, 'Main process
29     m.defMetric('connection_id', :integer, 'Con
30     m.defMetric('local_address', :string, 'Loca
31     m.defMetric('local_port', :integer, 'Local
32     m.defMetric('remote_address', :string, 'Rem
33     m.defMetric('remote port', :integer, 'Remot
```

NEW

name:

slice:

script: git.default:oedl/bvermeul_fgriperf.oedl

source1: ID of a resource

thelister: ID of a resource

thesender: ID of a resource

thesender2: ID of a resource

interfaceserver: server interface modify

capacity: in bits per second

sinkaddr11: Ping destination address

sinkaddr12: Ping destination address

Start Experiment

<http://labwiki.test.atlantis.ugent.be:4000>

Minds
WATE.CREATE

NEPI experiment control

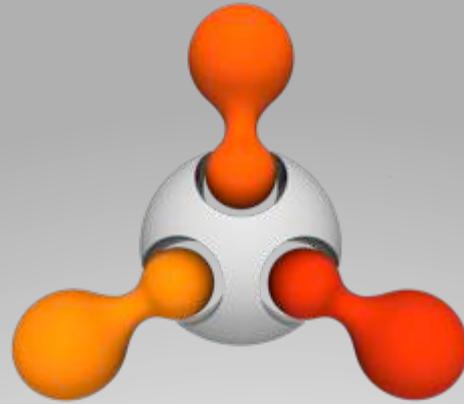
- <http://doc.fed4fire.eu/nepi.html>

```
r096-09b.wall2.ilabt.iminds.be - PuTTY
sc:~$ pico -w ping.py
sc:~$ python ping.py
2014-02-25 19:23:39,989 LinuxNode INFO   guid 1 - host n095-26.wall2.ilabt.iminds.be - Deploying node
2014-02-25 19:23:42,070 LinuxNode INFO   guid 1 - host n095-26.wall2.ilabt.iminds.be - Cleaning up processes
2014-02-25 19:23:42,085 LinuxNode INFO   guid 1 - host n095-26.wall2.ilabt.iminds.be - Cleaning up home
2014-02-25 19:23:42,991 LinuxApplication INFO   guid 2 - host n095-26.wall2.ilabt.iminds.be - Deploying command 'ping -c3 node2'
2014-02-25 19:23:43,007 LinuxApplication INFO   guid 2 - host n095-26.wall2.ilabt.iminds.be - Uploading command 'ping -c3 node2'
2014-02-25 19:23:44,246 LinuxApplication INFO   guid 2 - host n095-26.wall2.ilabt.iminds.be - Provisioning finished
2014-02-25 19:23:44,992 LinuxApplication INFO   guid 2 - host n095-26.wall2.ilabt.iminds.be - Starting command 'ping -c3 node2'
2014-02-25 19:23:47,152 LinuxApplication INFO   guid 2 - host n095-26.wall2.ilabt.iminds.be - Retrieving 'stdout' trace all
PING node2-link3 (10.10.1.1) 56(84) bytes of data:
64 bytes from node2-link3 (10.10.1.1): icmp_req=1 ttl=64 time=0.574 ms
64 bytes from node2-link3 (10.10.1.1): icmp_req=2 ttl=64 time=0.207 ms
64 bytes from node2-link3 (10.10.1.1): icmp_req=3 ttl=64 time=0.214 ms

--- node2-link3 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.207/0.331/0.574/0.172 ms
2014-02-25 19:23:47,186 LinuxApplication INFO   guid 2 - host n095-26.wall2.ilabt.iminds.be - Releasing resource
sc:~$ █
```

Agenda

- Experiment workflow
 - Overview Fed4FIRE (<http://doc.fed4fire.eu>)
 - Technical workflow between components
 - Monitoring
 - Connectivity
 - Proxy
 - International federation and connectivity
 - Tools beyond resource provisioning
- Workflow adding testbed to the federation
 - jFed toolkit
- International collaboration
 - GENI-FIRE summer class
 - GENI-FIRE API definitions
- Use cases
 - Class exercise by Forge project
 - Belgian SME (outside of open calls)
 - Geocloud (opencall experiment)
 - Services on top: Xifi cloud node, hadoop/openstack on demand
 - US Cloudlab
- Federation membership models



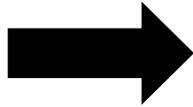
FED4FIRE

**Workflow adding a testbed
to the federation**

Adding a testbed to the federation



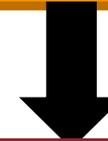
doc.fed4fire.eu



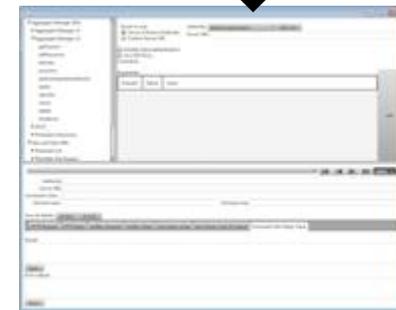
AM API doc



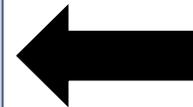
Design RSpecs



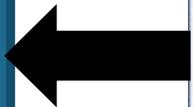
Implement AM API on top of testbed



Test with jFed probe



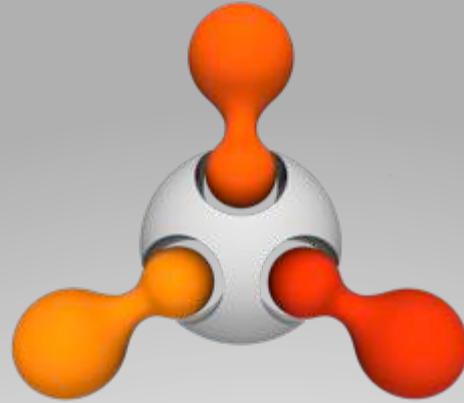
Dashboard and nightly testing (+internal testbed monitoring)



Document testbed



Add testbed in Experimenters tools



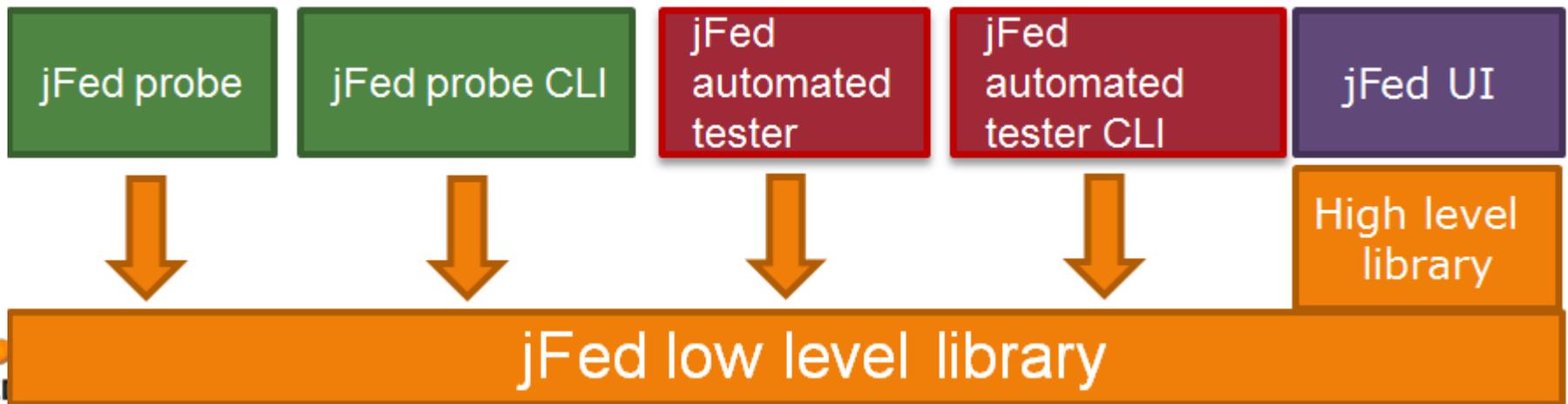
FED4FIRE

jFed toolkit



jFed toolkit

- <http://jfed.iminds.be>, current release 5.3.2
- Speaks AM API, Federation (CH) APIs, SCS, ...
- Written in Java(FX)
- MIT license
- Experimenter tool, test and monitor federation



Philosophy: jFed experimenter GUI

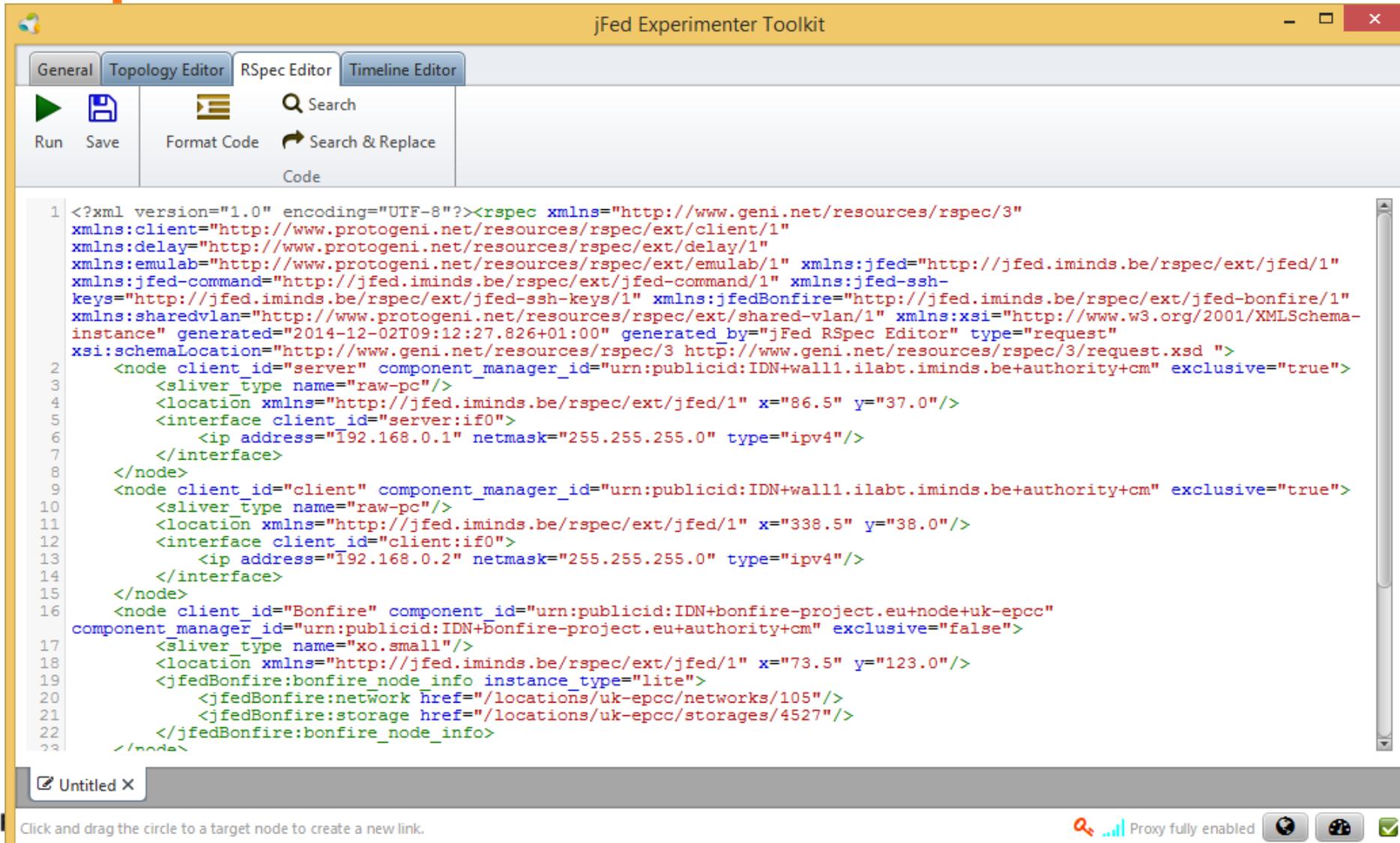
- Leverages APIs from jFed Probe testing
- Can be used by a new experimenter (abstract things !)
- Full power when needed
 - raw Rspec
 - API call insight
- Debug and support
 - Leverage API call analysis from jFed probe
 - For support: send all those calls to support !
- Can work around firewall port blocking stuff through SSH proxy
- Cross platform: Windows, OS X, Linux
- Saves and reads RSpecs

Abstract resources

The screenshot displays the jFed Experimenter Toolkit interface. The main window is titled "jFed Experimenter Toolkit" and features a menu bar with "General", "Topology Editor", "RSpec Editor", and "Timeline Editor". Below the menu bar is a toolbar with icons for Run, Save, Copy, Paste, Duplicate, Auto Layout, Zoom In, Zoom Out, and Reset Zoom. The main workspace is a grid-based area where a network diagram is being constructed. The diagram shows a "server" node connected to a "link0" node, which is connected to a "client" node. A "node3" node is highlighted with a green border. A "Properties of node3" dialog box is open, showing the "General" tab. The dialog box has tabs for "General", "Xen Options", "Routable Control IP", and "Boot scripts". Under "Optional Xen VM requirements:", there are three checked options: "Number of CPU Cores: 1", "Memory (MB): 512", and "Disk Capacity (GB): 8". Below these options is a link to "More information in the ilab.t documentation". The left sidebar contains a "Computing Elements" panel with icons for Virtual Machine, Wireless Node, Physical Node, XEN VM, Generic Node, Dedicated Ext. Network Connection, and OpenVZ VM. The bottom status bar shows "Click and drag the circle to a target node to create a new link." and "Proxy fully enabled".

Raw RSpec editing: “support everything”

RSpec = Resource Specification: describes experiment



The screenshot shows the jFed Experimenter Toolkit interface, specifically the RSpec Editor tab. The toolbar includes icons for Run, Save, Format Code, Search, and Search & Replace. The main text area contains XML code for an RSpec document, which defines a network topology with nodes and interfaces.

```
1 <?xml version="1.0" encoding="UTF-8"?><rspec xmlns="http://www.geni.net/resources/rspec/3"
  xmlns:client="http://www.protogeni.net/resources/rspec/ext/client/1"
  xmlns:delay="http://www.protogeni.net/resources/rspec/ext/delay/1"
  xmlns:emulab="http://www.protogeni.net/resources/rspec/ext/emulab/1" xmlns:jfed="http://jfed.iminds.be/rspec/ext/jfed/1"
  xmlns:jfed-command="http://jfed.iminds.be/rspec/ext/jfed-command/1" xmlns:jfed-ssh-
  keys="http://jfed.iminds.be/rspec/ext/jfed-ssh-keys/1" xmlns:jfedBonfire="http://jfed.iminds.be/rspec/ext/jfed-bonfire/1"
  xmlns:sharedvlan="http://www.protogeni.net/resources/rspec/ext/shared-vlan/1" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
  instance" generated="2014-12-02T09:12:27.826+01:00" generated_by="jFed RSpec Editor" type="request"
  xsi:schemaLocation="http://www.geni.net/resources/rspec/3 http://www.geni.net/resources/rspec/3/request.xsd ">
2   <node client_id="server" component_manager_id="urn:publicid:IDN+wall1.ilabt.iminds.be+authority+cm" exclusive="true">
3     <sliver type name="raw-pc"/>
4     <location xmlns="http://jfed.iminds.be/rspec/ext/jfed/1" x="86.5" y="37.0"/>
5     <interface client_id="server:if0">
6       <ip address="192.168.0.1" netmask="255.255.255.0" type="ipv4"/>
7     </interface>
8   </node>
9   <node client_id="client" component_manager_id="urn:publicid:IDN+wall1.ilabt.iminds.be+authority+cm" exclusive="true">
10    <sliver type name="raw-pc"/>
11    <location xmlns="http://jfed.iminds.be/rspec/ext/jfed/1" x="338.5" y="38.0"/>
12    <interface client_id="client:if0">
13      <ip address="192.168.0.2" netmask="255.255.255.0" type="ipv4"/>
14    </interface>
15  </node>
16  <node client_id="Bonfire" component_id="urn:publicid:IDN+bonfire-project.eu+node+uk-epcc"
  component_manager_id="urn:publicid:IDN+bonfire-project.eu+authority+cm" exclusive="false">
17    <sliver type name="xo.small"/>
18    <location xmlns="http://jfed.iminds.be/rspec/ext/jfed/1" x="73.5" y="123.0"/>
19    <jfedBonfire:bonfire_node_info instance_type="lite">
20      <jfedBonfire:network href="/locations/uk-epcc/networks/105"/>
21      <jfedBonfire:storage href="/locations/uk-epcc/storages/4527"/>
22    </jfedBonfire:bonfire_node_info>
23  </node>
```

At the bottom of the window, there is a status bar with the text "Click and drag the circle to a target node to create a new link." and a "Proxy fully enabled" indicator.

Debug by looking into API calls

The screenshot displays the 'jFed Calls Overview' application interface. On the left, a task list is shown with 16 items, where item 4, 'Fetch OCCl storages for location uk-epcc', is highlighted in pink. The main area is divided into 'Task details' and 'Task calls'.

Task details:

- Name: Create Sliver @ urn:publicid:IDN+wall1.ilabt.iminds.be+authority+cm
- State: SUCCESS
- Start Time: Tue Dec 02 09:13:54 CET 2014
- Stop Time: Tue Dec 02 09:14:24 CET 2014
- Duration: 28 seconds and 258 milliseconds

Task dependencies:

- This task depends on:
 - 8 Get Slice Credential urn:publicid:IDN+wall2.ilabt.iminds.be+authority+cm
 - 9 Get User SSH Keys
- Tasks depending on this task: (empty)

Task calls:

Geni Aggregate Manager API v3 - Allocate

Save all details: as text... as xml... Request size (byte): 9386 Reply size(byte): 3124

Connection HTTP Request HTTP Reply XmlRpc Request XmlRpc Reply Geni Reply Value Geni Reply Code & Output Processed Geni Reply Value ProtoGr

XmlRpc HashTable Received:

```
{
  "output": "",
  "code": {
    "protogeni_error_url": "https://www.wall1.ilabt.iminds.be/spewlogfile.php?logfile=16496d1f6e46b4d21f6f1fb3674236c0",
    "protogeni_error_log": "urn:publicid:IDN+wall1.ilabt.iminds.be+log+16496d1f6e46b4d21f6f1fb3674236c0",
    "am_type": "protogeni",
    "geni_code": 0,
    "am_code": 0
  },
  "value": {
    "geni_slivers": [
      {
        "geni_sliver_urn": "urn:publicid:IDN+wall1.ilabt.iminds.be+sliver+28295",
        "geni_allocation_status": "geni_allocated",
        "geni_expires": "2014-12-02T08:24:07Z"
      }
    ],
    "geni_rspec": "<rspec xmlns='http://www.geni.net/resources/rspec/3/' xmlns:emulab='http://www.protogeni.net/resources/rspec/ext/emulab/1/' xmlns:client='http://www.geni.net/resources/rspec/ext/client/1/'>
<node client_id='node0' exclusive='true' component_manager_id='urn:publicid:IDN+wall1.ilabt.iminds.be+authority+cm' component_id='urn:publicid:IDN+wall1.ilabt.iminds.be+component+1'>
<sliver_type name='raw-pc'/>
<location xmlns='http://jfed.iminds.be/rspec/ext/jfed/1' x='104.0' y='105.0'/>
<emulab:vnode name='n142-07a'/></node>
</rspec>"
  }
}
```

Bug reports and support

The screenshot displays the jFed Experimenter Toolkit interface. The main window shows a network diagram with components: server, link0, client, VM Bonfire, and node3. Below the diagram is a progress log with several steps marked as complete. A 'jFed Bug Report' dialog is open in the foreground, containing the following information:

- Bug description:** everything seems okay
- jFed version:** 5.3.1-SNAPSHOT (rev. #2179 at 2014-11-08 23:53:06) - build #5
- Environment:** Windows 8 6.2 x86 - Java 1.7.0_71 (Oracle Corporation)
- Reporter credential:** urn:publicid:IDN+wall2.ilabt.iminds.be+user+bvermeul
- Reporter email address:** bvermeul@wall2.ilabt.iminds.be
- Included calls:** 55 calls

The 'Included calls' field is circled in blue. The dialog also features 'Submit' and 'Cancel' buttons at the bottom right.

RSpec and tutorial/classes world

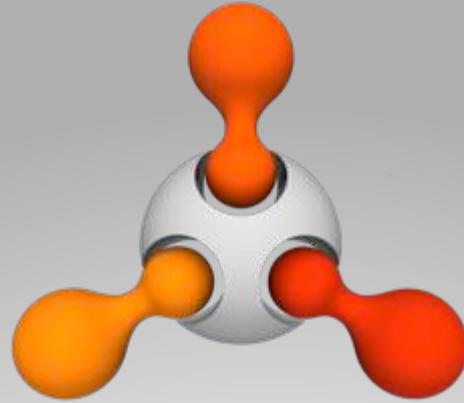
The image shows the jFed Experimenter Toolkit interface. The window title is "jFed Experimenter Toolkit". The interface is divided into several sections:

- General Tab:** Contains tabs for "General", "Topology Editor", "RSpec Editor", and "Timeline Editor".
- Experiment Definition:** Includes icons for "New", "Open", "Open URL", and "Save".
- Experiment:** Includes icons for "Run", "Update Status", "Terminate", "Recover", and "Open Shared".
- Support:** Includes icons for "Preferences", "Report a bug", "Documentation", and "About".
- Computing Elements:** A sidebar on the left with icons for "Virtual Machine", "Wireless Node", "Physical Node", "XEN VM", "Generic Node", "Dedicated Ext. Network Connection", and "OpenVZ VM".
- Topology Diagram:** A central area showing a network topology with nodes (node0, node1, node2, node3) and links (link4, link5, link6). Node0 is connected to link4, link5, and link6. Link4 connects to node1. Link5 connects to node2. Link6 connects to node3.
- Open Experiment Definition Dialog:** A modal dialog box with the title "Open Experiment Definition". It contains a text input field with the URL "http://jfed.iminds.be/ovs.rspec" and "OK" and "Cancel" buttons.

The bottom status bar shows "Proxy fully enabled" and system tray icons.

Agenda

- Experiment workflow
 - Overview Fed4FIRE (<http://doc.fed4fire.eu>)
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 - Proxy
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 - US Cloudlab
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FED4FIRE

How does the AM work

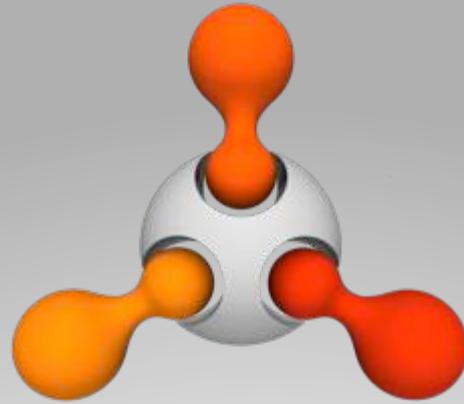


AM

- AM v2
 - http://groups.geni.net/geni/wiki/GAPI_AM_API_V2
- AM v3
 - http://groups.geni.net/geni/wiki/GAPI_AM_API_V3
- Upcoming AM, but can help in understanding it better (does not differ much from AM v3):
 - <https://fed4fire-testbeds.ilabt.iminds.be/asciidoc/federation-am-api.html>
 - <https://github.com/open-multinet/federation-am-api>
 - (on github you can request for clarifications, report problems on the standard API description)

Workflow

- 3 types of Rspecs: advertisement, request, manifest
- Getversion: informative
- Listresources: advertisement RSpec
- Createsliver (v2) vs allocate/provision/
performoperationalaction (v3): send request, receive
manifest
- SliverStatus (v2) vs Status (v3): check
- Listresources (v2) vs Describe (v3): get overview
- Renew: to extend duration
- DeleteSliver (v2) vs Delete (v3)



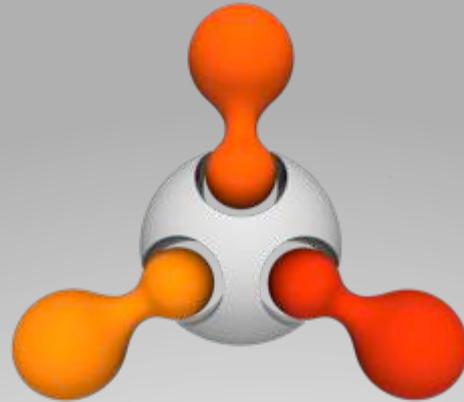
FED4FIRE

How to implement the AM



Possibilities for AM implementation

- If you have only hardware, no mgmt software for your testbed, pick testbed software which has an AM implementation and which is closest to your HW
 - Emulab (contact iMinds for more information)
 - Nitos Broker with OMF (contact University of Thessaly for more information)
 - Foam (openflow + flowvisor) (contact iMinds for more information)
 - GRAM (works with Openstack) (contact Inria Grid 5000 if you want more information)
- If you have software for managing your testbed, you can wrap it with the AM API:
 - SFAwrap (python) – contact UPMC/Inria Sophia Antipolis
 - Fiteagle (java) – contact TU Berlin
 - Geni Control Framework (GCF) – GENI BBN - <http://trac.gpolab.bbn.com/gcf>
- Implement yourself the AM API on top of an existing testbed
- Choice depends on what you have and what you want



FED4FIRE

**FIRE GENI Research
Experiment Summit
July 7th – July 11th, Gent**



Overview

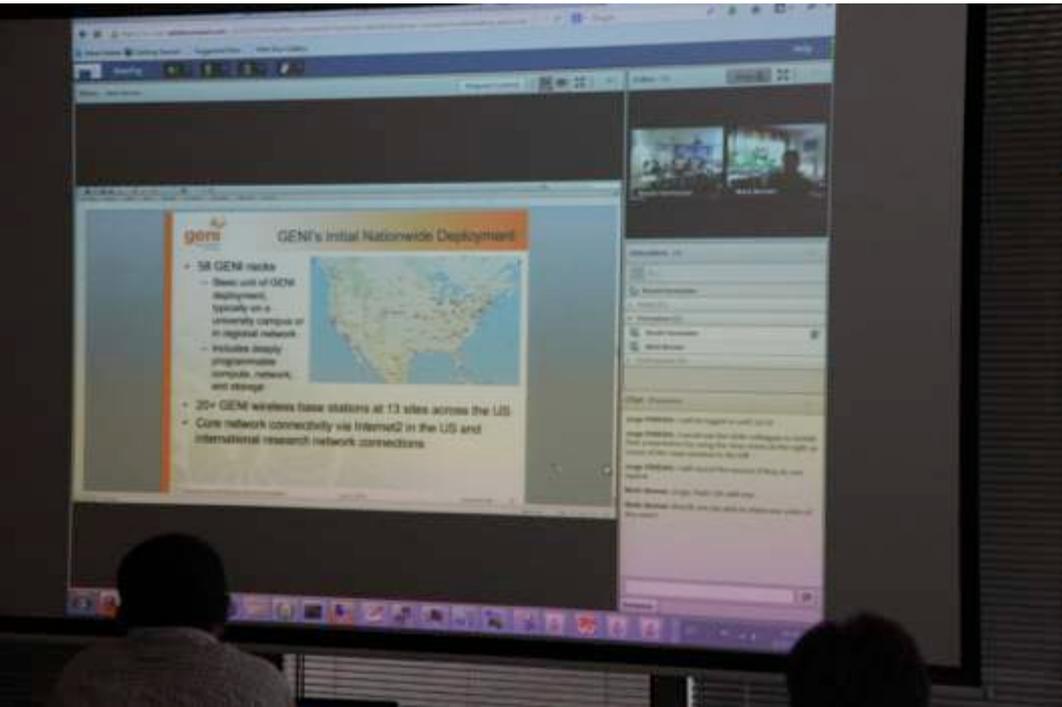
- 35 participants:
 - 10 US
 - 25 EU
 - 21 took part in the project (all US, and 11 of EU)
 - 15 tutors (US + EU)
- Exchange of people, tools and testbeds with same tutorials



Agenda

| | Monday | Tuesday | Wednesday | Thursday | Friday |
|-------------|--|--|--|------------------------|--|
| 8:30-10 | Welcome and Introduction to GENI-FIRE | 8:30-9:45 Short overview all tutorials/demos 9:45-10 Break 10-12 Tutorials(I) | 8:30-10:30 Tutorials(III) 1)OMF/OML (Atari) 2) openflow (Bebox) | The team-based project | Continue the project presentation preparation |
| 10:30-12:30 | Getting started with GENI and Fed4FIRE (I) – hands-on | 1) Genidesktop (2.30) 2)NEPI (Bebox) 3)Sensor (Atari) 12-12:30 Keynote Jorge Pereira (EU Commission) | 10:30-11 Break 11-12:30 Presentations | The team-based project | One-on-one meeting with GPO and Fed4FIRE |
| 12:30-13:30 | Lunch | | | | |
| 13:30-15:30 | Getting started with GENI and Fed4FIRE (II) – hands-on | Parallel tutorials (II) 1)Emulation/cloud (Bebox) 2)Wireless (Atari) | The team-based project | The team-based project | Team project presentation, and post-evaluation |
| 16:00-17:30 | Introduction to team projects and team formation | 16-16:30 Keynote Chip Elliott/Mark Berman (US Geni Project Office) 16:30-17:30 Labwiki introduction | The team-based project | Boat-Tour | |
| Evening | | Social event (18:45) | Lab visit (17:30-18:00) | | |

Keynotes: Mark Berman/Jorge Pereira



Talks

Laurent Vanbever:

SDX: A Software Defined Internet Exchange

Sachin Sharma and Sahel Sahhaf

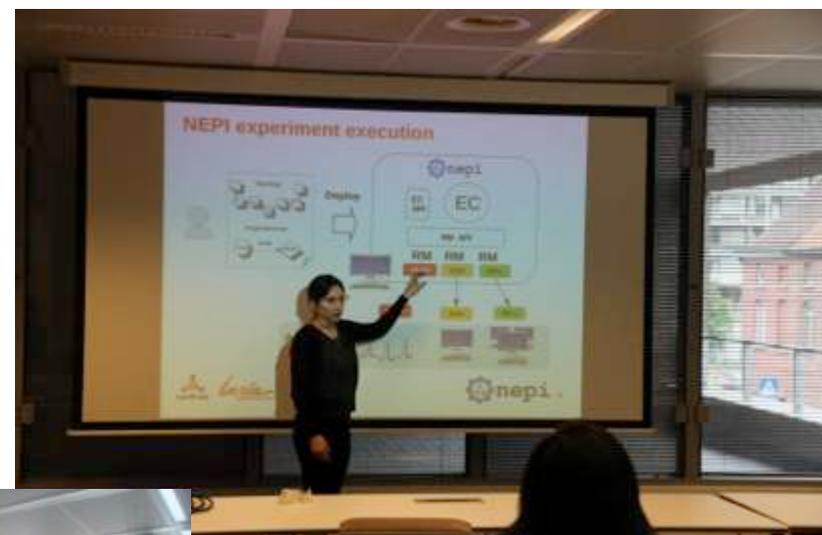
Experimentation on the Virtual Wall

Hellen Maziku

Network Aware VM Migration In Cloud Data Centers

Gerard Marin and Mennan Selimi

Community-Lab testbed and experiments



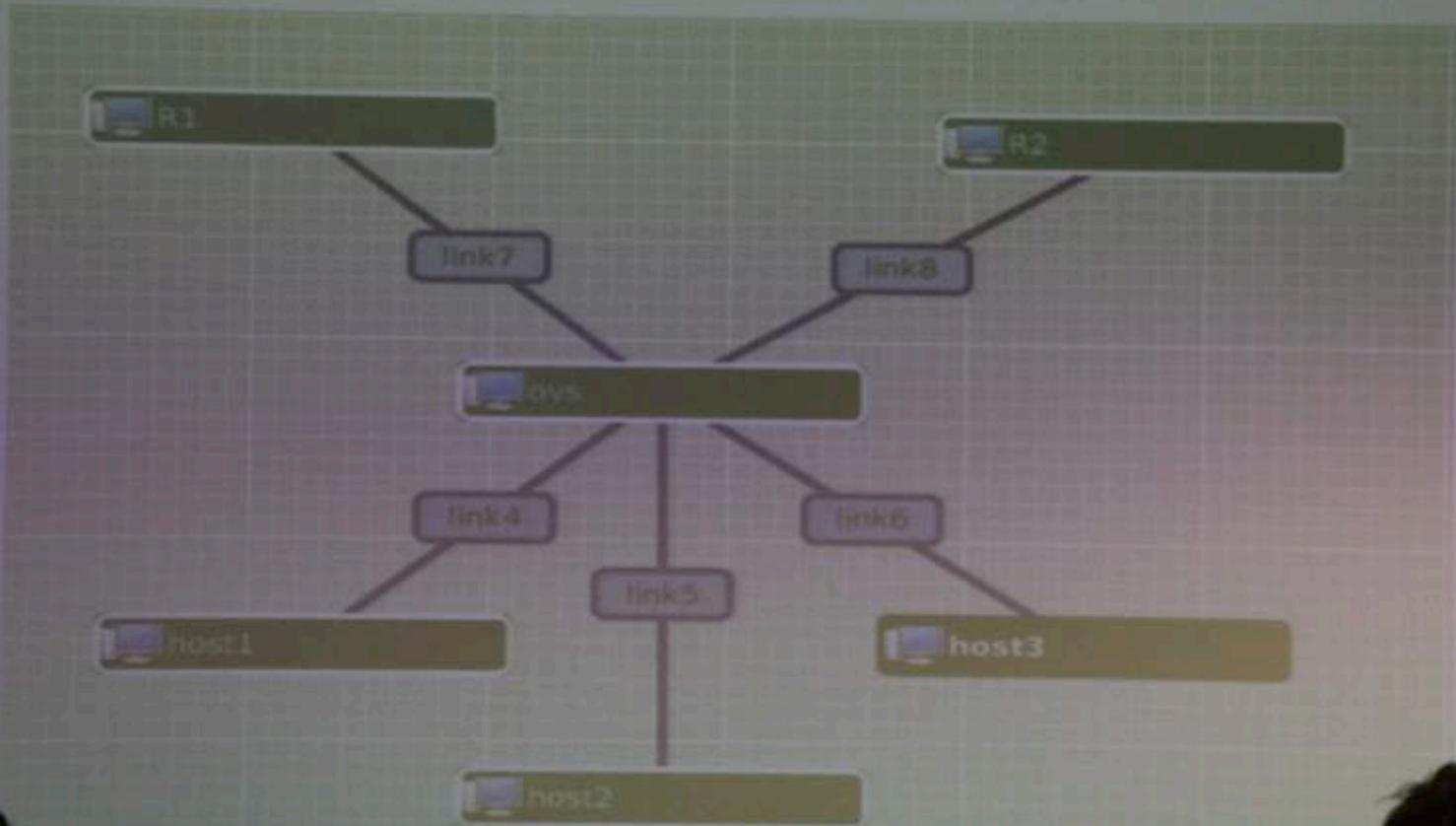
Tutorials/summer schools: stress testing

| Time execution (CET) | duration | Status | log | resultHtml | result-overviewXml |
|-----------------------|----------|-------------------|-----|-------------|--------------------|
| 05/05/2014 - 03:16:45 | 09:39 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:16:10 | 09:34 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:16:09 | 09:15 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:16:09 | 09:20 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:16:07 | 09:20 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:16:05 | 09:12 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:16:02 | 09:24 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:16:00 | 09:15 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:15:59 | 08:51 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:15:56 | 09:30 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:15:56 | 09:50 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:15:56 | 08:45 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:15:55 | 09:25 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:15:55 | 09:13 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:15:55 | 08:57 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:15:51 | 08:49 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:15:47 | 08:51 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:15:41 | 08:37 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:14:51 | 08:38 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:14:51 | 08:28 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:14:51 | 09:12 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:14:51 | 08:25 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:14:50 | 08:58 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:14:50 | 09:00 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:14:50 | 08:29 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:14:50 | 08:39 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
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| 05/05/2014 - 03:14:49 | 09:03 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:14:46 | 08:44 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:14:46 | 08:58 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:14:45 | 08:12 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:14:41 | 08:01 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:14:40 | 07:39 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:13:58 | 07:40 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:13:57 | 07:28 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:13:53 | 08:13 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:13:50 | 07:41 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:13:48 | 07:13 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:13:11 | 07:37 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:13:07 | 07:07 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:13:00 | 07:28 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:12:56 | 07:14 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:11:52 | 05:58 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:11:51 | 05:35 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:11:51 | 05:53 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:11:51 | 06:07 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
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| 05/05/2014 - 03:11:48 | 05:34 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:11:42 | 05:38 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |
| 05/05/2014 - 03:10:50 | 05:14 | 0 1 2 3 4 5 6 7 8 | log | resultsHtml | overview |

Project 1: Cloud Service provider chooses network connectivity with SDN



Topology



Project 2: DDoS detection



G.E.D.D.I (read: Jedi)

GENI Enabled DDoS Detection International

Tommy Chin, Rochester Institute of Technology

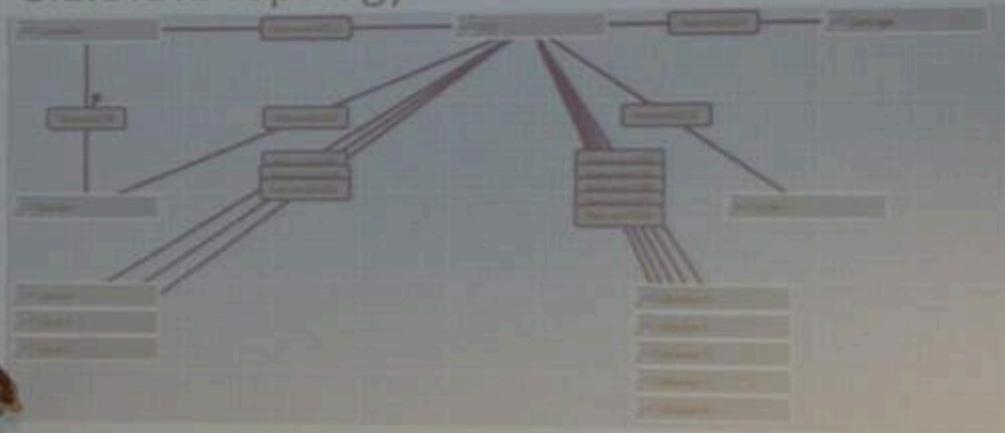
Costas Yiotis, National University of Athens

Aggelos Kapoukakis, National University of Athens

Xiangyang Li, Johns Hopkins University

Xenia Mountroudou, Jacksonville University

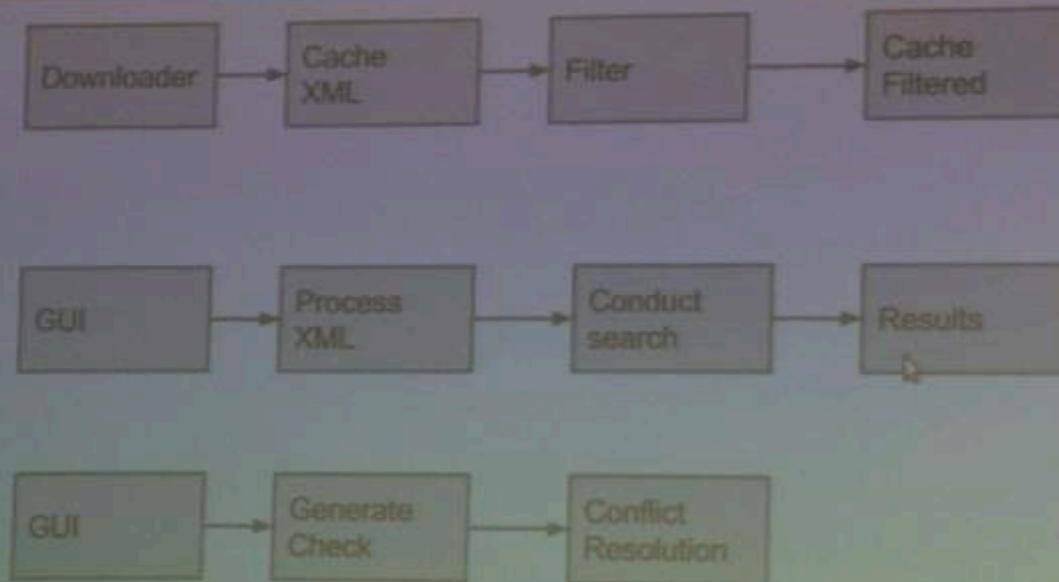
G.E.D.D.I. Topology



Attackers, victims, garbage collectors can be easily scaled up

Project 3: improve testbed resource selection with Xquery/Xtools

General architecture pipeline



Project 4: Localization based on RSSI measurements

FGRE Summit 2014

TEAM PROJECT:

Localization based on RSSI measurements

Nikos Makris

Aris Dadoukis

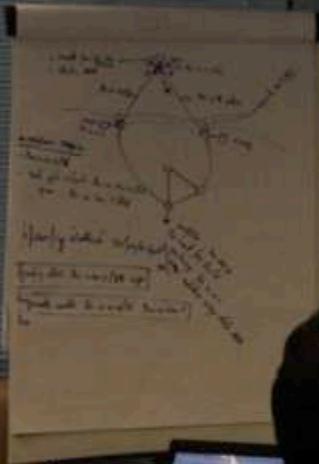
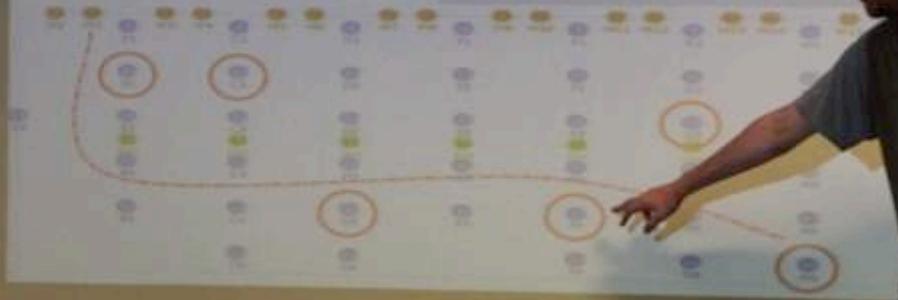
Stavros Ioannidis

Bertold Van den Bergh

Special Thanks to: Christos Zarafetas
Fraida Fund

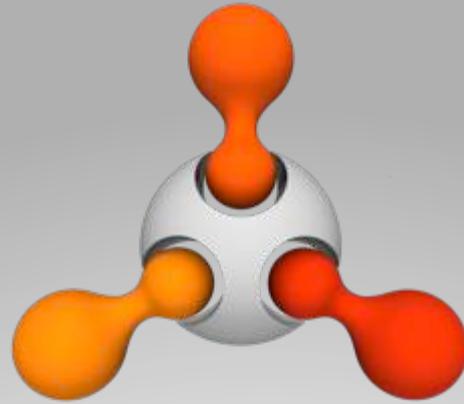
FGRE Summit 2014

- Topology:
 - 6 static wireless nodes,
 - also used to retrieve measurements
 - 1 mobile node



Conclusion

- Nice number of participants
- US-EU collaboration works: tools/testbeds/tutorials/tutors are interoperable
- IPv6 works transparent
- Idea of organizing a 2nd workshop in 2015
 - Probably adding technical discussion sessions



FED4FIRE

International collaboration: APIs

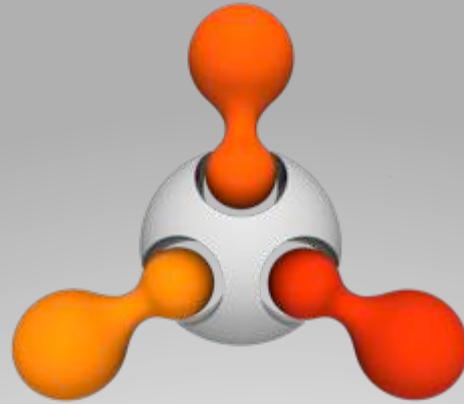


APIs

- Member and Slice authority API
 - <http://groups.geni.net/geni/wiki/CommonFederationAPIv2>
- Aggregate Manager API
 - <https://fed4fire-testbeds.ilabt.iminds.be/asciidoc/federation-am-api.html>
- Discussion and API changes are done through github:
 - accessible for everyone and neutral
 - <https://github.com/open-multinet>

Agenda

- Experiment workflow
 - Overview Fed4FIRE (<http://doc.fed4fire.eu>)
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 - GENI-FIRE API definitions
- Use cases
 - Class exercise by Forge project
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- Federation membership models



FED4FIRE

Use cases



Forge: lab in Greece using iMinds testbed

- 200 students in 4 sessions



Example: SME does scalability testing

The screenshot displays the jFed Experimenter Toolkit interface. The top window title is "jFed Experimenter Toolkit". Below the title bar are four tabs: "General", "Topology Viewer", "RSpec Viewer", and "Timeline Viewer". The "Topology Viewer" tab is active, showing a network diagram on a green grid background. The diagram consists of several components: a central "MS" node at the top, two database nodes "DB1" and "DB2" on the left, and two large clusters of nodes. The left cluster is connected to "link1" and "link2", which are connected to "link0". The right cluster is connected to "link0". The right cluster includes nodes "node0" through "node13", with "node13" highlighted in green. The interface includes a toolbar with icons for "Update Status", "Renew", "Terminate", "Reboot", "Edit ssh-keys", "Share", "Auto Layout", "Zoom In", "Zoom Out", and "Reset Zoom". Below the toolbar are three buttons: "Progress", "Errors", and "Timeline log". The "Progress" button is selected, showing a list of tasks: "Restore manifest from iMinds Virtual Wall 2", "Waiting for nodes from iMinds Virtual Wall 2 to become ready.", and "Testing connectivity to nodes from iMinds Virtual Wall 2.", all with green checkmarks. At the bottom left, there is a "zapp1 X" button. At the bottom right, there is a status bar with the text "This experiment run will expire in 3 days, 3 hours, 25 minutes and 38 seconds." and a "Proxy fully enabled" indicator.

jFed Experimenter Toolkit

General Topology Viewer RSpec Viewer Timeline Viewer

Update Status Renew Terminate Experiment

Reboot Edit ssh-keys Advanced

Share Auto Layout Layout

Zoom In Zoom Out Reset Zoom Zoom

MS

DB1

DB2

node5 node6 node7 node8 node9 node10 node11 node12 node13 node0 node1 node2 node3 node4 node5 node6 node7 node8 node9 node10 node11 node12 node13

link1 link2 link0

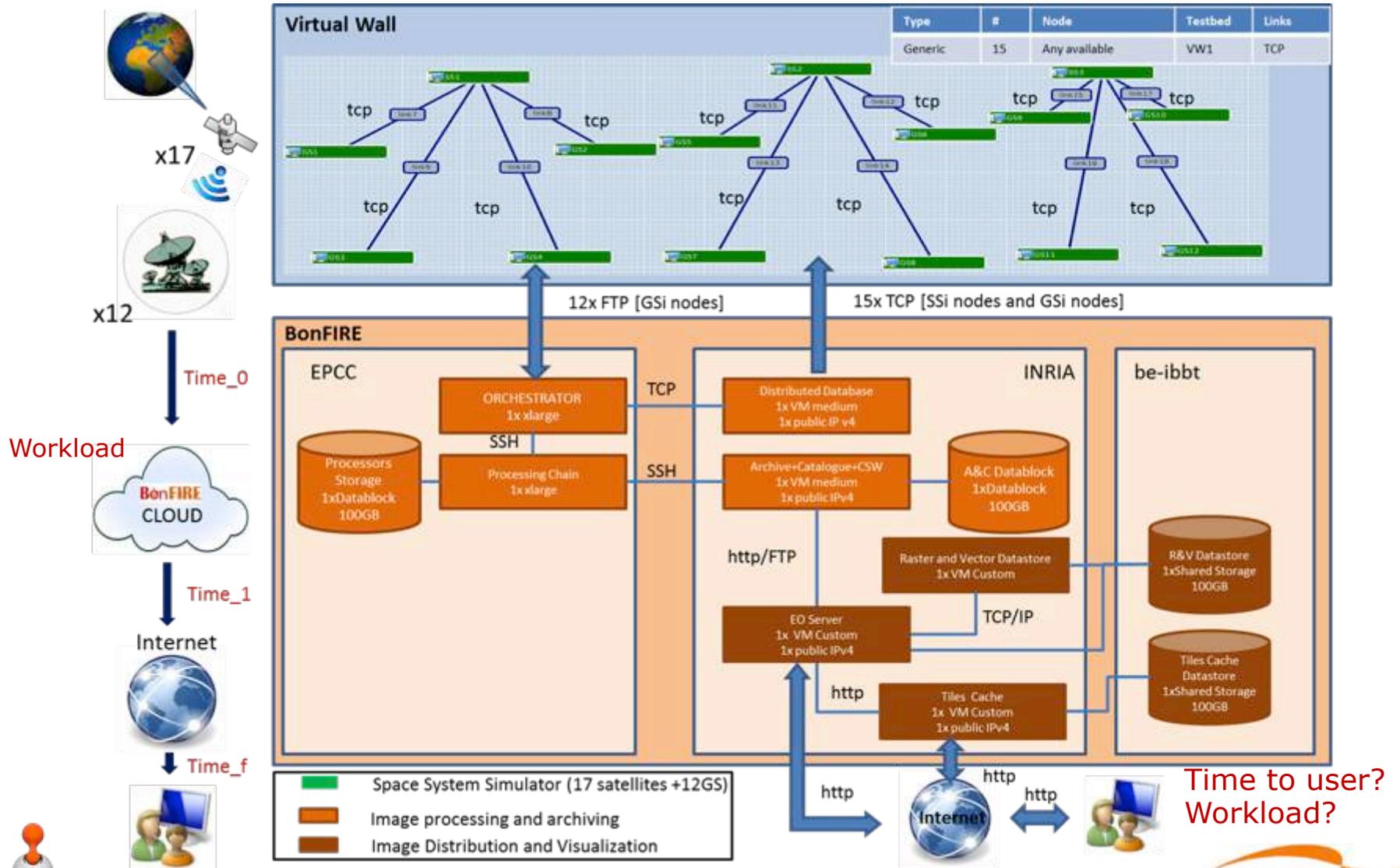
Progress Errors Timeline log

- ✓ Restore manifest from iMinds Virtual Wall 2
- ✓ Waiting for nodes from iMinds Virtual Wall 2 to become ready.
- ✓ Testing connectivity to nodes from iMinds Virtual Wall 2.

zapp1 X

This experiment run will expire in 3 days, 3 hours, 25 minutes and 38 seconds. Proxy fully enabled

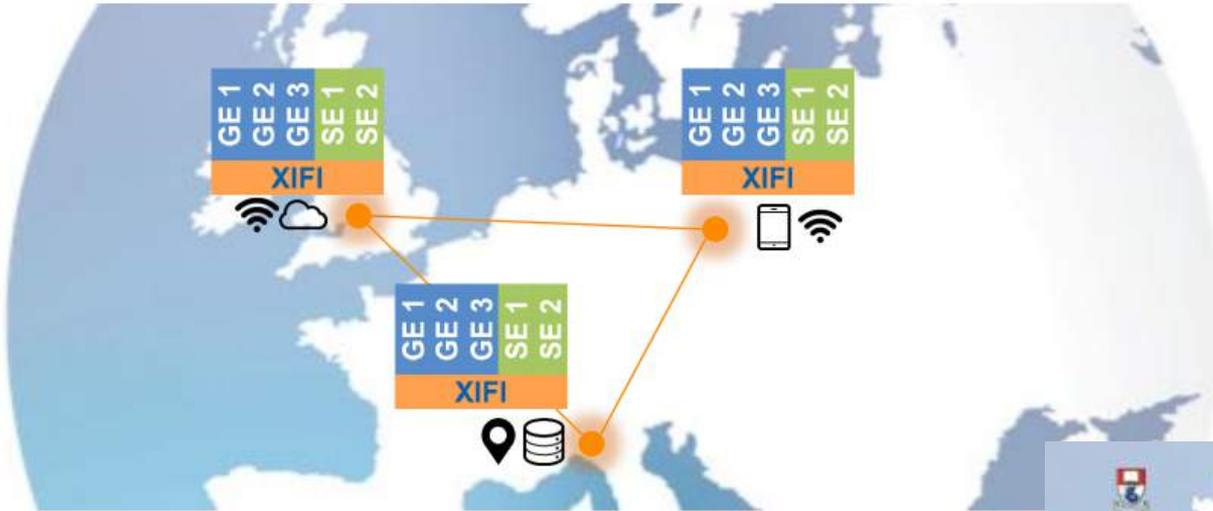
The GEO-Cloud Experiment Resources and Architecture



Time to user?
Workload?

Xifi project in EU FI-PPP

- XIFI platform is the community cloud for European FI-PPP developers enabled by advanced FI infrastructures in Europe

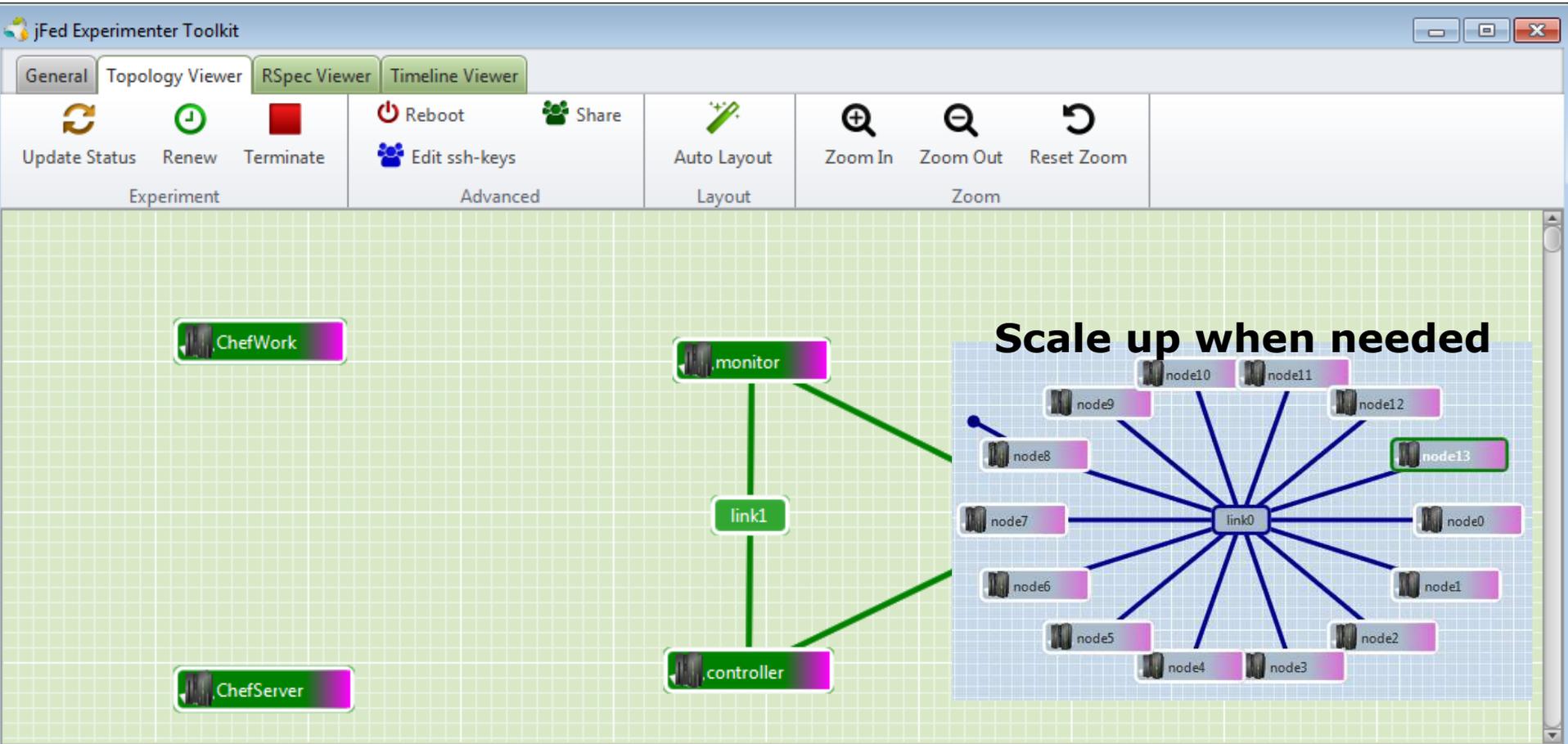


- XIFI, as part of the overall vision of FI-PPP and follow principle “eat your own dog food”, is based on FI-PPP technologies delivered by FI-WARE

10 additional infrastructure



Xifi node runs on FIRE testbed (Virtual Wall) @ iMinds: openstack RSpec



**Experimenters can use exactly the same for own private clouds
"cloud-on-demand" service (with size as they want)
Including all other testbeds and connectivity of the F4F federation**

Openstack instance



All Instances

Instances

| <input type="checkbox"/> | Project | Host | Name | IP Address | Size | Status |
|--------------------------|--------------|--|--|----------------|--|--------|
| <input type="checkbox"/> | bvermeulproj | compute9.osextra1.wall2-ilabt-iminds-be.wall2.ilabt.iminds.be | bvermeul3-6bdba527-105b-4cea-af2-d237b43d1359 | 192.168.100.19 | m1.medium 4GB RAM 2 VCPU 40GB Disk | Active |
| <input type="checkbox"/> | bvermeulproj | compute16.osextra1.wall2-ilabt-iminds-be.wall2.ilabt.iminds.be | bvermeul3-e70f201b-d5b2-481a-8365-76ade4e9c57c | 192.168.100.16 | m1.medium 4GB RAM 2 VCPU 40GB Disk | Active |
| <input type="checkbox"/> | bvermeulproj | compute8.osextra1.wall2-ilabt-iminds-be.wall2.ilabt.iminds.be | bvermeul3-ef7d5c20-6005-40e4-8125-d7c4cbbdd7d6 | 192.168.100.12 | m1.medium 4GB RAM 2 VCPU 40GB Disk | Active |
| <input type="checkbox"/> | bvermeulproj | compute9.osextra1.wall2-ilabt-iminds-be.wall2.ilabt.iminds.be | bvermeul3-e174f116-5e00-4f4a-9367-c042645e1033 | 192.168.100.11 | m1.medium 4GB RAM 2 VCPU 40GB Disk | Active |
| <input type="checkbox"/> | bvermeulproj | compute16.osextra1.wall2-ilabt-iminds-be.wall2.ilabt.iminds.be | bvermeul3-86ff41d1-d845-4951-ae7e-d0eea96b487c | 192.168.100.14 | m1.medium 4GB RAM 2 VCPU 40GB Disk | Active |
| <input type="checkbox"/> | bvermeulproj | compute8.osextra1.wall2-ilabt-iminds-be.wall2.ilabt.iminds.be | bvermeul3-bdf91fb0-4e49-4c80-b8ee-aaba7cee9927 | 192.168.100.15 | m1.medium 4GB RAM 2 VCPU 40GB Disk | Active |
| <input type="checkbox"/> | bvermeulproj | compute9.osextra1.wall2-ilabt-iminds-be.wall2.ilabt.iminds.be | bvermeul3-aea96173-599d-4419-9167-79c6b3a0354e | 192.168.100.18 | m1.medium 4GB RAM 2 VCPU 40GB Disk | Active |
| <input type="checkbox"/> | bvermeulproj | compute16.osextra1.wall2-ilabt-iminds-be.wall2.ilabt.iminds.be | bvermeul3-71fe8f54-c47a-40e3-b71e-0addd98ba63f | 192.168.100.9 | m1.medium 4GB RAM 2 VCPU 40GB Disk | Active |
| <input type="checkbox"/> | bvermeulproj | compute8.osextra1.wall2-ilabt-iminds-be.wall2.ilabt.iminds.be | bvermeul3-a6d4c0a5-fe34-48f3-8918-7714501ba611 | 192.168.100.7 | m1.medium 4GB RAM 2 VCPU 40GB Disk | Active |
| <input type="checkbox"/> | bvermeulproj | compute9.osextra1.wall2-ilabt-iminds-be.wall2.ilabt.iminds.be | bvermeul3-49157d6f-c30b-42d0-879d-1cf1b892b2ca | 192.168.100.17 | m1.medium 4GB RAM 2 VCPU 40GB Disk | Active |
| <input type="checkbox"/> | admin | compute2.oscore6.wall2-ilabt-iminds-be.wall2.ilabt.iminds.be | bvermeul2-223ce879-9808-4d82-b66a-e44a1869ef0e | 192.168.100.6 | m1.medium 4GB RAM 2 VCPU 40GB Disk | Active |
| <input type="checkbox"/> | admin | compute1.oscore6.wall2-ilabt-iminds-be.wall2.ilabt.iminds.be | bvermeul2-83a3aeaf-d86f-4e20-9615-99cf7aac7171 | 192.168.100.4 | m1.medium 4GB RAM 2 VCPU 40GB Disk | Active |
| <input type="checkbox"/> | admin | compute2.oscore6.wall2-ilabt-iminds-be.wall2.ilabt.iminds.be | bvermeul1 | 192.168.100.2 | m1.tiny 512MB RAM 1 VCPU 0 Disk | Active |

Displaying 13 items

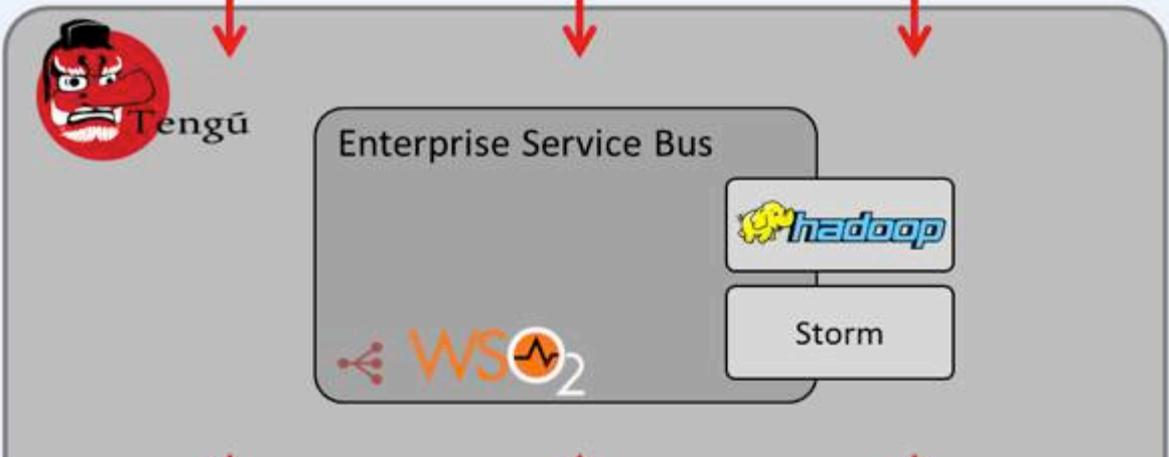
iMinds' Tengū platform – Fed4FIRE services

Create services on top of testbeds

Cloud-on-demand



Hadoop/Storm/Lambda
-on-demand



```
POST /tengu/{type}?nodes={nr}&testbed={urn}&project{str}
```

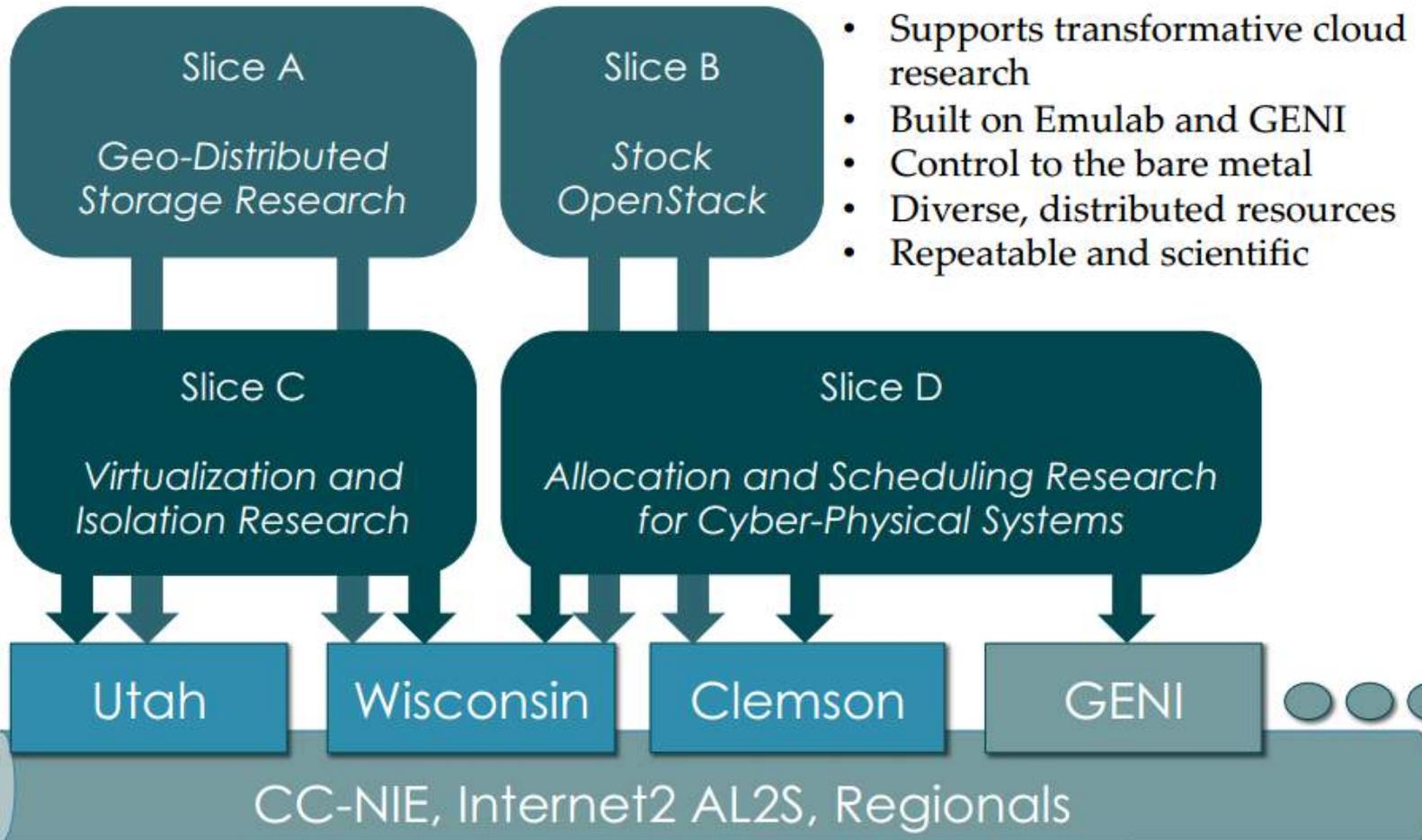
Powered by RSpec
and Chef



30/01/
2015

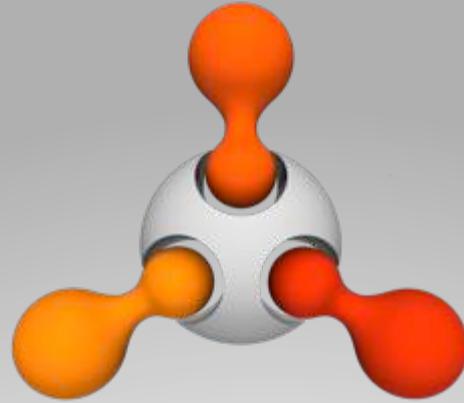


What Is CloudLab?



Agenda

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FED4FIRE

Federation membership

technical requirements



Note

- This is about technical requirements
- There is also need for policy decisions (can a testbed join or not) – to be discussed in the sustainability task/federator (board) work
 - Although a testbed joining the federation is different from their users joining (their authority is not automatically allowed on existing testbeds, only vice versa: F4F experimenters can use the new testbed)

What is a testbed (that can be federated)?

- Testbed = hardware + management software
- ‘Ssh/FRCP controlled resource’ testbeds
 - Ability to share resources between different users
 - Shared over time or in parallel (multiplexing, slicing)
 - Concept of credentials and dedicated access (e.g. ssh)
- ‘API only’ testbeds
 - A service with an API (proprietary or standard)
 - Concept of credentials
- *** better naming for these types needed, but the idea should be clear (infrastructure versus service is confusing)

What types of federation

- Light federation
- Advanced federation
- Associated testbeds

Advanced federation: min. requirements

- Support for AMv2 or AMv3 (or later versions)
 - Authentication, authorization: X.509 certificates, slice and user credentials, accepting root certificates of the main F4F authorities
 - Resource description and discovery: RSpec definition
 - Provisioning (instant): through the AM API
 - Control: through SSH with ssh public/private keys put in the API calls, FRCP control or openflow: point a controller for a switch
- Documentation (on a webpage maintained by the testbed)
 - Testbed description
 - RSpec description
 - URLs of the AM API
 - A basic experiment showing the testbed (and with a F4F tool), described as a tutorial
- Policies: everyone with a valid F4F certificate can execute the basic experiment without extra approval
- Facility monitoring
 - AM API tested from central location, if testbed has internal monitoring, send a summary through OML to the central OML server
- Connectivity: public IPv4 for AM, public IPv4 or IPv6 for ssh login (exceptions for VPN can be granted, but then the ssh gateway of the F4F federation will be a permanent client of the VPN)
- Testbed has to provide basic support on the testbed functionalities towards experimenters

Advanced federation: options

- Infrastructure monitoring
- Advanced reservation
- SLA
- Reputation
- Permanent storage
- Experiment control
 - FRCP enabled images
 - AMQP server
 - PDP
- Layer 2 connectivity between testbeds
 - VLAN stitching (federation runs stitching computation engine)
 - Tunnels (egre or gre option in RSpec link)

Advanced federation: what does the federation offer ?

- Testing tools for the AM API, test credentials, ...
- Nightly testing when federated
- Central monitor dashboard
- Min. 1 client tool having support for all federated infrastructure testbeds
- At least 1 authority to provide credentials
- Ssh gateway (to bridge e.g. to IPv6, VPNs, ...)
- Central documentation linking to all testbeds
- Central support (google group, NOC) for first help and single point of contact

Light federation: min. requirements

- Support for Fed4FIRE credentials in client based SSL API
 - X.509 certificates, e.g. derived PKCS12 version which can be loaded in a webbrowser or other HTTPS tool
 - API is not the AM API
- Documentation (on a webpage maintained by the testbed)
 - Testbed description
 - Documentation on the specific API
 - URLs of the API
 - A basic experiment showing the testbed, in a tutorial format
- Policies: everyone with a valid F4F certificate can execute the basic experiment without extra approval
- Facility monitoring
 - API tested from central location, if testbed has internal monitoring, send a summary through OML to the central OML server
- Connectivity: public IPv4 for the API server

Light federation: what does the federation offer ?

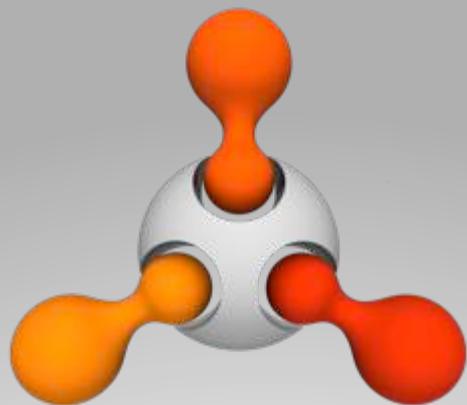
- Test credentials
- Information on enabling PKCS12 authentication
- Central monitor dashboard
- Min. 1 client tool exporting PKCS12 credentials from the X.509 certificate
- At least 1 authority to provide credentials
- Central documentation linking to all testbeds
- Central support (google group, NOC) for first help and single point of contact

Associated testbeds

- No real federation (e.g. no credential exchange, no testing, ...)
- Only mentioning the testbed and linking to the testbed specific documentation
- Testbed has to organise its own support

Matrix of possibilities

- ‘SSH/FRCP/openflow controllable testbeds’
 - Light federation (e.g. use Bonfire API with F4F credentials)
 - Advanced federation (e.g. Bonfire with an AM, use F4F tool)
 - Associated tested
- ‘API only testbed’
 - Only Light federation possible (e.g. hadoop on demand service with F4F credentials)
 - Associated testbed
- Reason to make this clear: an ‘API only testbed’ can never do Tight federation, so it is not federated ‘less’, just at the moment, this is the maximum federation that is possible. (and that is demanded from experimenter view as far as we see)



FED4FIRE

Thank you

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www.fed4fire.eu

