Fed4FIRE Federation

Brecht Vermeulen
Brecht.vermeulen@iminds.be

Fed4FIRE assets - facilities

- Wired
- Wireless
- Open Flow
- Cloud
- Other

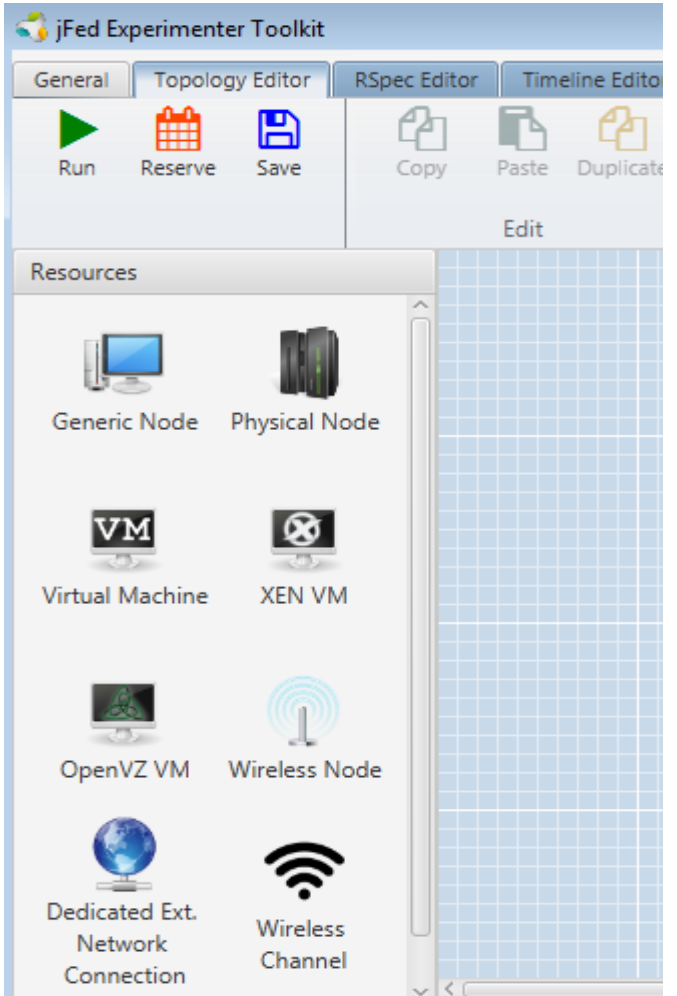
FED4FIRE

iMinds CONNECT.INNOVATE.CREATE

Fed4FIRE facilities

- Diverse technologies
- Diverse implementation stacks

→ Abstract this for the user

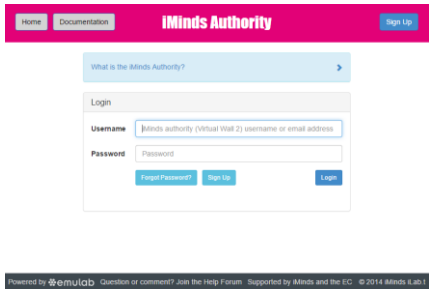


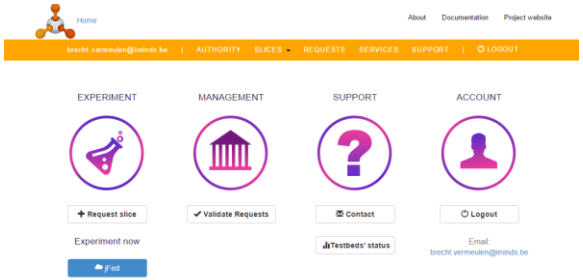
FED4FIRE

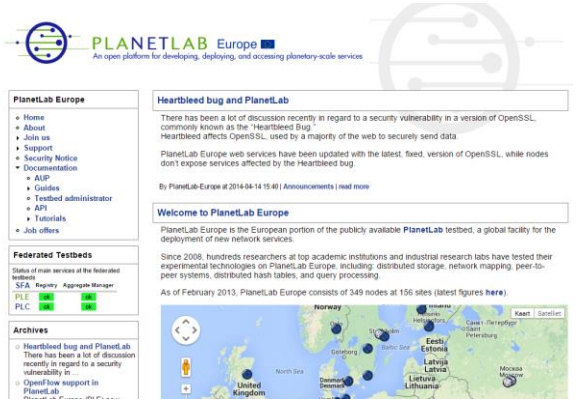
Goals of federation

- Make it easy for experimenters to use multiple testbeds
  - Single account
  - Single (or small number) of tools, choice 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, openflow hardware, …)

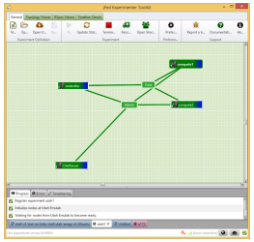
Design principles

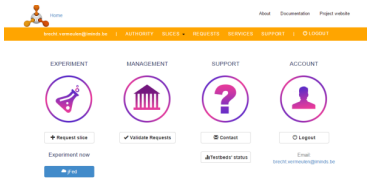






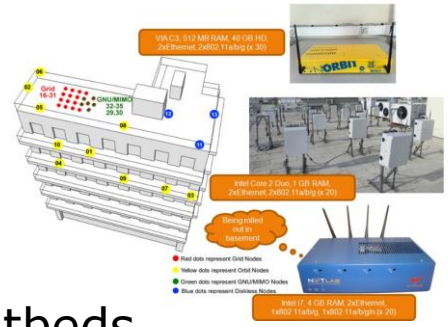
Multiple identity provider





Multiple tools

Testbeds trust IdPs in federation



Multiple testbeds

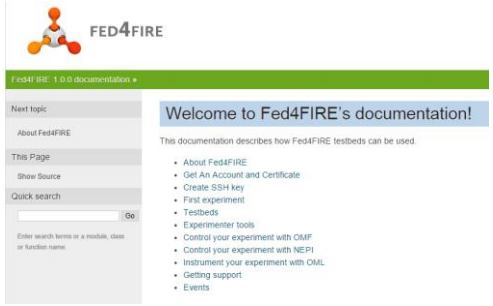
All of them can appear and disappear !

FED4FIRE

iMinds CONNECT.INNOVATE.CREATE

Experiment workflow

Experiment workflow



Documentation
http://doc.fed4fire.eu

Create Account

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)

Monitoring

jFed testing and monitoring

https://flsmonitor.fed4fire.eu

http://monitor.ilabt.iminds.be

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

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

API testing

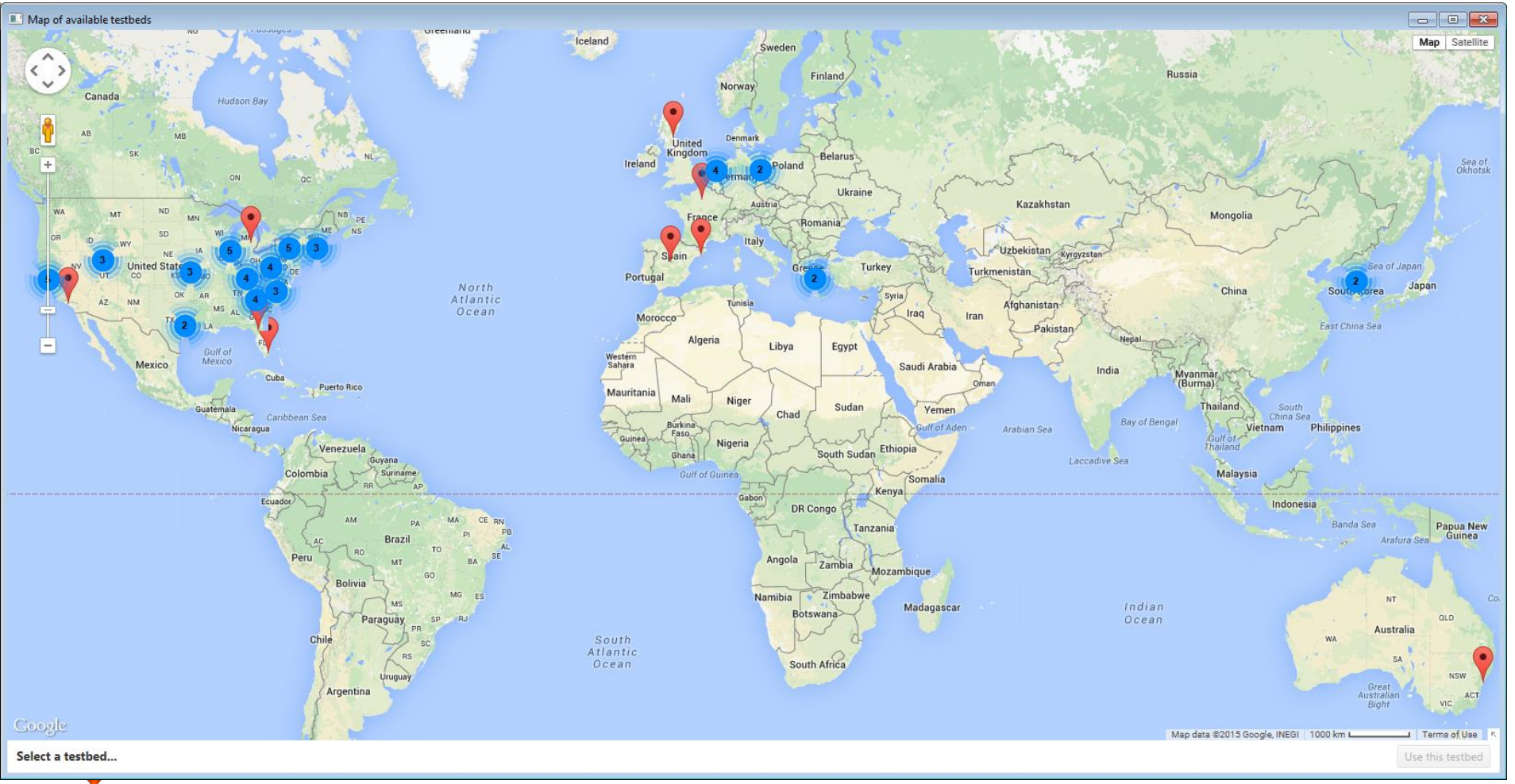
- ✓ setUp
- ✓ getVersion
- ✓ getTestUserCredential
- ✓ getTestUserInfo
- ✓ retrieveCredentialSomehow
- ✗ createProject
- ✓ createSlice
- ✗ lookupProjectsByUrnNoFilter
- ✗ lookupProjectsByNameNoFilter
- ✓ getSliceCredentials
- ✗ updateProject
- ✓ lookupSlicesNoFilter
- ✗ lookupProjectsNoFilterAfterUpdate
- ✓ updateSlice
- ✗ lookupProjectMembers
- ✗ lookupProjectsForMember
- ✓ lookupSlicesNoFilterAfterUpdate
- ✓ lookupSliceMembers

International federation and connectivity

Other compatible initiatives

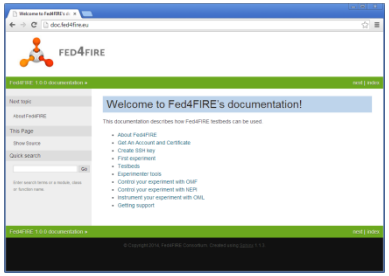
- South-Korea
- Canada
- Japan
- Brazil
- China

Accessible testbeds: single tool and account

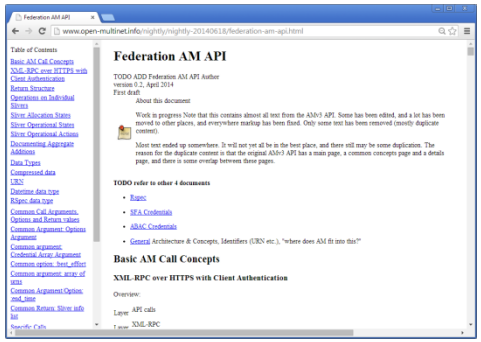


Workflow adding a testbed to the federation

Adding a testbed to the federation



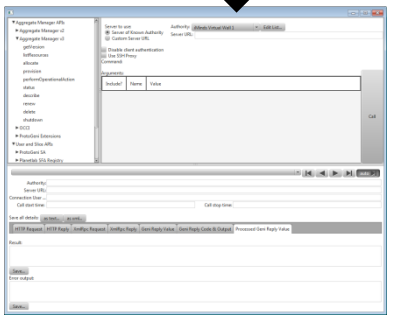
doc.fed4fire.eu



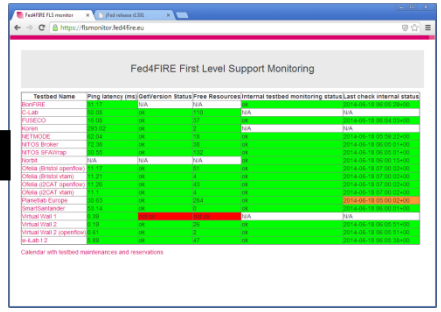
AM API doc

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 Experimenter tools

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

Associated testbeds

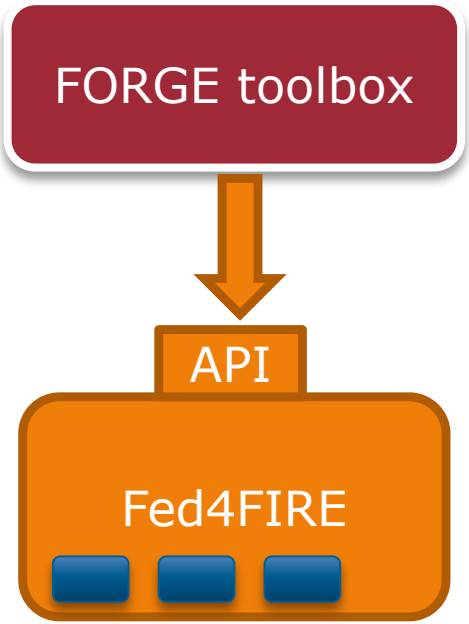
- No real federation (e.g. no credential exchange, no testing, …)
- Only mentioning the testbed and linking to the testbed specific documentation
- Testbed has to organise its own support

Use cases

Forge: lab in Greece using iMinds testbed

- 200 students in 4 sessions

FORGE: online education



http://forge.test.iminds.be/wlan

FED4FIRE

Wireless LAN throughput

In this lab session we'll investigate the different Wi-Fi settings and features which impact the throughput in a WLAN hotspot network. This course is provided by Ghent University and iMinds as part of the FORGE project, Forging Online Education through FIRE.

Learn more about FORGE »

Introduction

You will be using actual hardware (and no simulations) to experiment with different settings and features of Wi-Fi (Wireless Fidelity, based on IEEE 802.11 standards) when deploying a WLAN (Wireless Local Area Network) hotspot network. By using this hardware to solve multiple questions in a set of well-thought-out exercise scenarios, you will gain a better insight in the different aspects which impact the achievable throughput in your WLAN.

Live experimentation

The wireless nodes you will be using are part of the **iMinds w-iLab.t Zwijnaarde** testbed (a.k.a. "wilab2"), which is *physically located at the Zwijnaarde campus in Belgium* but can be configured, managed and tested completely from within the web interface you are currently using. This web interface itself is controlling the wireless nodes and is also dynamically created and hosted at the **iMinds Virtual Wall** testbed, which is *physically located at the Zuiderpoort offices (Ghent) in Belgium*.

These so called *FIRE (Future Internet Research and Experimentation)* testbeds can also be used in research projects to collaborate with industry partners to e.g. study and improve WLAN functionality. However, the configuration and experiments that you will perform during this lab session do not differ from the ones that are also applicable within your own WLAN at home.

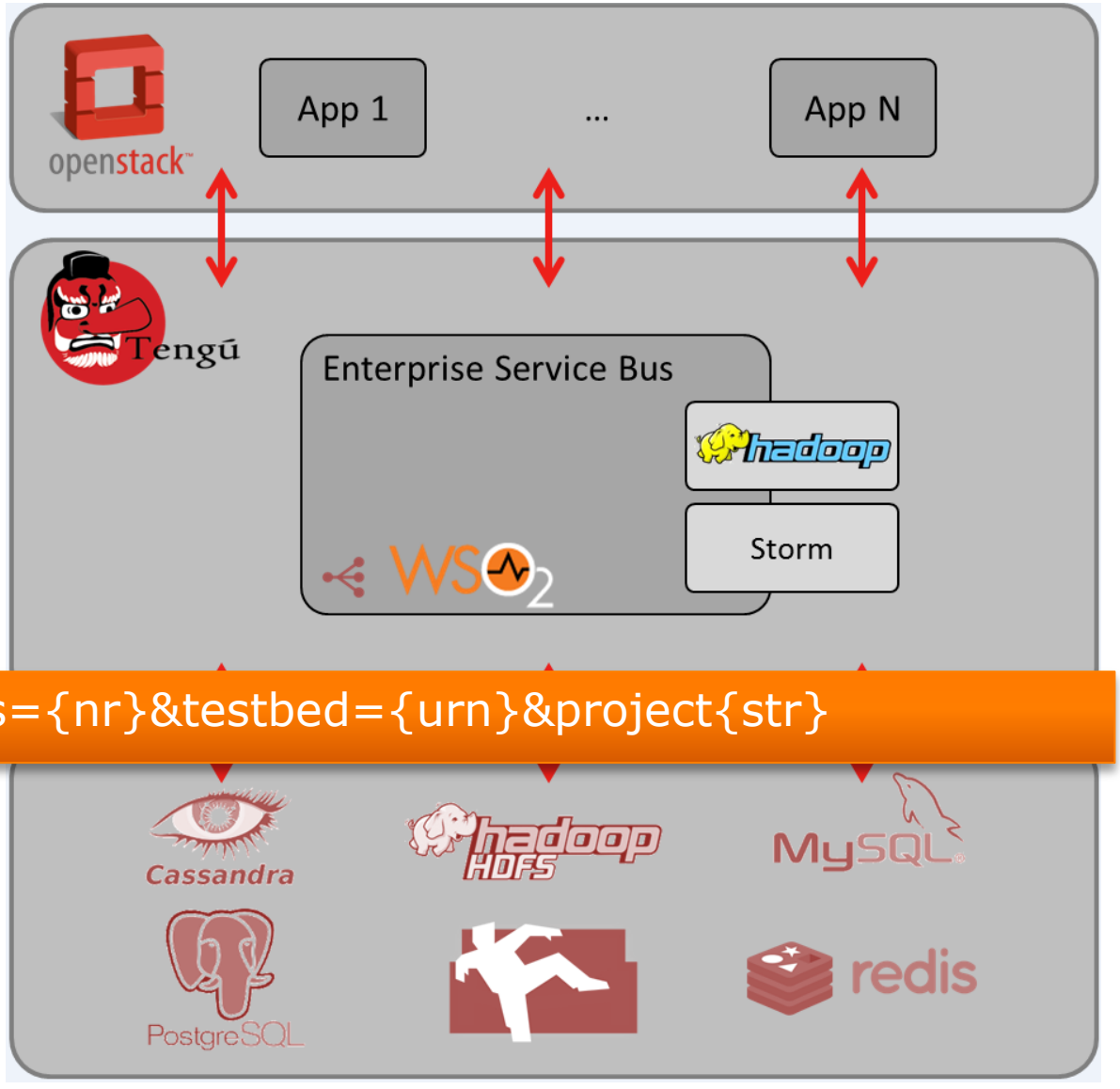
Usage of iMinds iLab.t Virtual Wall and w-iLab.t

Tengu service platform

Cloud-on-demand

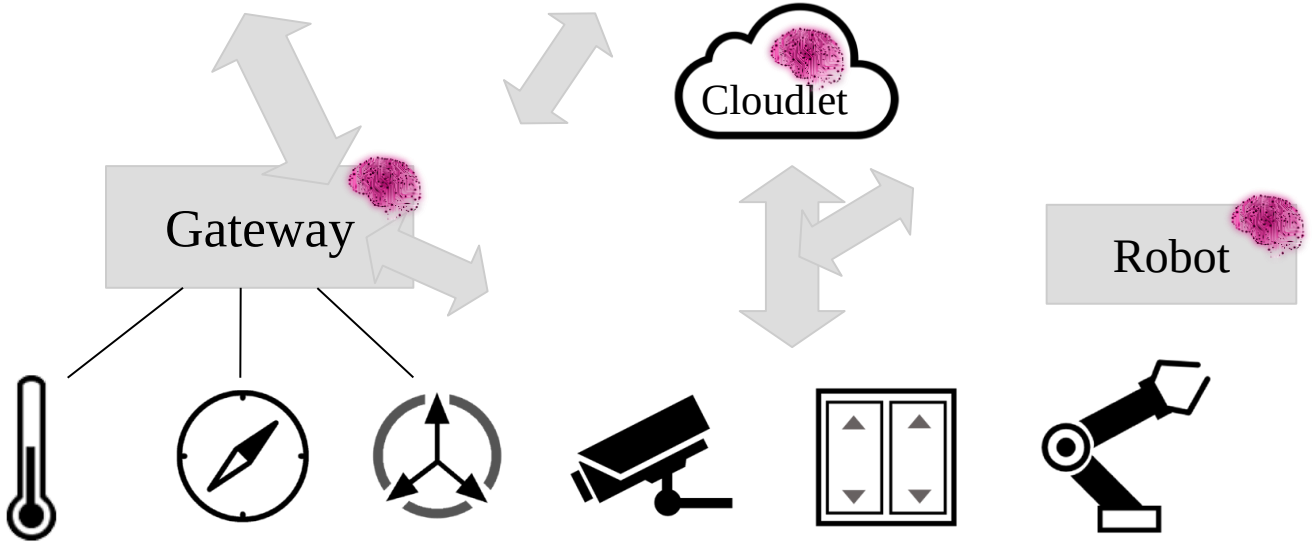
Hadoop/Storm/Lambda
-on-demand

Powered by RSpec
and Chef



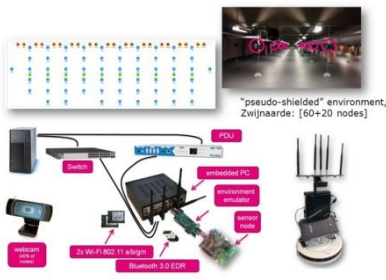
FED4FIRE

IOT EXAMPLE



sensors/
actuators

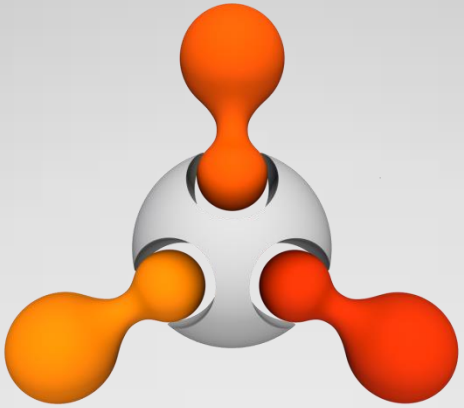
Antwerpen



Succesful federation

- Easy and stable use for experimenters
  - Documentation
  - Tutorials
  - Tools
  - Support
  - Proxy to make things independent of firewalls etc
- Monitoring and testing of federation
- Internal adoption and use of tools
  - Eat your own dogfood

FED4FIRE



FED4FIRE

Thank you

brecht.vermeulen@iminds.be

www.fed4fire.eu