Lessons learnt from OneLab Facility
the first opened federation of heterogeneous testbeds

Loïc Baron, UPMC Sorbonne University & CNRS

Serge Fdida, Timur Friedman
Main Objective
A playground for the future Internet

**Federation** empowers to run **services (and tests)** using resources provided by **autonomous** networks.
How to federate?
The issue with testbed isolation

 Authorities

 Users

 Tools

 Testbed resources
Experimenters and tools

- **User from an authority**
  - Must be trusted among federated authorities
  - Should get access to federated resources
  - Need to execute an experiment across testbeds

- **Tools**
  - Have to enable these functionalities
  - Should provide a common interface for heterogeneous resources
Heterogeneous Resources

Federation of heterogeneous testbeds needs to

- **Expose the diversity of resources to users**
  - Description of the characteristics and capabilities of resources
  - Visualization and configuration of resources

- **Provide a unified way to interact with resources**
  - Discovering
  - Reserving
  - Configuring
  - Experimenting
Experiment Lifecycle

1. User account & slice creation
2. Authentication
3. Resource discovery
4. Resource reservation & scheduling
5. Configuration/instrumentation
6. Execution
7. Repatriation of results
8. Resource release
Experiment Lifecycle

1. User account & slice creation
2. Authentication
3. Resource discovery
4. Resource reservation & scheduling
5. Configuration/instrumentation
6. Execution
7. Repatriation of results
8. Resource release

Loïc Baron et al., Seoul, October 14th 2014
Experiment Lifecycle

1. User account & slice creation
2. Authentication
3. Resource discovery
4. Resource reservation & scheduling
5. Configuration/instrumentation
6. Execution
7. Repatriation of results
8. Resource release

SFA / MySlice
OMF / scripts
SFA / MySlice

Loïc Baron et al., Seoul, October 14th 2014
Software components
For Federation
Slice-Based Facility Architecture (SFA)

- A **secure and distributed thin waist** to enable a global federation:
  - **Naming**: uniquely identifies objects; links; requires sharing of namespace;
  - **Identity / Authentication**: X509 certificates;
  - **Authorization**: Non standardized credentials;
  - **Control plane API**: Manipulate objects and their associations; authorization + policies;
  - **Data model**: Resource description; Independent from SFA.

Loïc Baron et al., Seoul, October 14th 2014
OneLab Legal Framework

governors

+150 affiliates

Loïc Baron et al., Seoul, October 14th 2014
OneLab Authorities

UTH  UPMC  iMinds  TUB  INRIA  ...

governor  governor  governor  governor  governor

+150 affiliates
OneLab SFA Authorities

governor  governor  governor  governor  governor  +150 affiliates

UTH  UPMC  iMinds  TUB  INRIA  ...

OneLab Authority

SFA Registry

Loïc Baron et al., Seoul, October 14th 2014
SFA authentication of users

+150 affiliates

UTH          UPMC           iMinds          TUB           INRIA           ...

governor  governor  governor  governor  governor

OneLab Authority

Cred xml

SFA Registry
SFA access to resources

Cred
xml

SFA AM
INRIA

SFA AM
UPMC

SFA AM
UTH

SFA AM
TUB

SFA AM
iMinds

Loïc Baron et al., Seoul, October 14th 2014
SFAWrap - http://www.sfawrap.info

- Federate your testbed with the SFA community
  
  - Handles most of the complexity (crypto, etc.)
  
  - Testbeds focus on their specificities
    - Wrap an existing testbed
    - A base to build a new testbed

- Open community development model
  - Free software - Mutualized developments
Federate Heterogeneous Resources

SFA provides a common API for diverse resources

Heterogeneity of resources is expressed in RSpecs (xml files)

MySlice provides a single point of access to federated testbeds. It allows to browse, filter and reserve resources over these heterogeneous testbeds

OMF provides a common framework to describe, orchestrate, run and retrieve results of an experiment using heterogeneous resources
ONELAB PORTAL
UI : The MySlice portal

A **portal** integrates the various tools and services

- organize and visualize data
- Designed to support the full **experimental lifecycle**
- Tight integration with **monitoring**
MySlice access to resources
OneLab Portal

- Access resources through a Portal
OneLab Portal in Federation

- Authenticate users
- Aggregate data
- Browse resources
- Reserve resources

MySlice Architecture

Plugins

Web interface

Core

API

Other sources ...

Measurement tool

Gateways

SFA

Testbed A

Testbed B

Loïc Baron et al., Seoul, October 14th 2014
OneLab Portal: resources

<table>
<thead>
<tr>
<th>Resource name</th>
<th>Type</th>
<th>Testbed</th>
<th>Facility</th>
</tr>
</thead>
<tbody>
<tr>
<td>planetlab1.jcp-consult.net</td>
<td>node</td>
<td>PLE</td>
<td>PlanetLab</td>
</tr>
<tr>
<td>m3-315.devgnoble.lot-lab.info</td>
<td>node</td>
<td>Grenoble (dev)</td>
<td>IoT LAB</td>
</tr>
<tr>
<td>a8-65.rocquencourt.lot-lab.info</td>
<td>node</td>
<td>Rocquencourt</td>
<td>IoT LAB</td>
</tr>
<tr>
<td>a8-116.devgnoble.lot-lab.info</td>
<td>node</td>
<td>Grenoble (dev)</td>
<td>IoT LAB</td>
</tr>
<tr>
<td>a8-106.rocquencourt.lot-lab.info</td>
<td>node</td>
<td>Rocquencourt</td>
<td>IoT LAB</td>
</tr>
<tr>
<td>a8-146.devgnoble.lot-lab.info</td>
<td>node</td>
<td>Grenoble (dev)</td>
<td>IoT LAB</td>
</tr>
<tr>
<td>a8-228.devgnoble.lot-lab.info</td>
<td>node</td>
<td>Grenoble (dev)</td>
<td>IoT LAB</td>
</tr>
<tr>
<td>wsn430-24.rocquencourt.lot-lab.info</td>
<td>node</td>
<td>Rocquencourt</td>
<td>IoT LAB</td>
</tr>
<tr>
<td>planetlab-1.hfi-fokus.de</td>
<td>node</td>
<td>PLE</td>
<td>PlanetLab</td>
</tr>
<tr>
<td>a8-166.rocquencourt.lot-lab.info</td>
<td>node</td>
<td>Rocquencourt</td>
<td>IoT LAB</td>
</tr>
<tr>
<td>wsn430-98.rocquencourt.lot-lab.info</td>
<td>node</td>
<td>Rocquencourt</td>
<td>IoT LAB</td>
</tr>
</tbody>
</table>
THE ONELAB EXPERIMENTAL FACILITY
The OneLab NOC
OneLab governance
OneLab Legal Framework

Loïc Baron et al., Seoul, October 14th 2014
Usage
LESSONS LEARNED
Lessons learned

• Understanding what is nice to have and must have, for the architecture and components was achieved mostly by doing, and was therefore a stepwise process,

• Elaborating a consensus de facto standard was a hard and tedious process but has finally been successful thanks to the effort of the community,

• Phasing the different developments to be able to demonstrate some values at each phase was instrumental but created a difficult coordination process among all activities,

• Convincing various communities about the benefit of the federation approach and incentivizing them to develop their own compatibility with the SFA architecture was time consuming

• Having to face different questions, that we understand, related to serving all needs, including industry, SMEs, having a clear business model in mind with well identified revenues, disseminating towards all communities from researchers to public agencies is a hard task for a project that, at the end, has to deliver a service.
감사합니다

Thank you
Questions?

Your Easy Access to Computer Networking Testbeds:
A wide variety of world class testbeds available through your one account

Loïc Baron et al., Seoul, October 14th 2014

www.onelab.eu contact@onelab.eu