



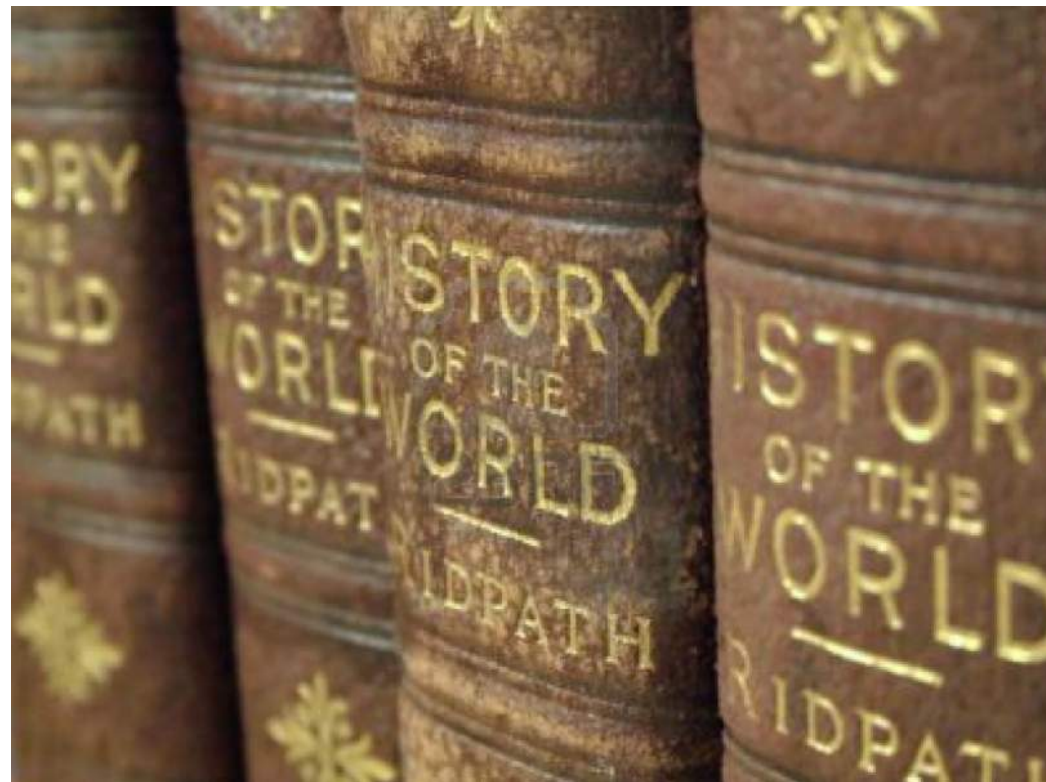
Experimentation on federated testbeds in Fed4FIRE

Brecht Vermeulen

imec

Porto Roadshow

Porto, Feb. 18, 2020



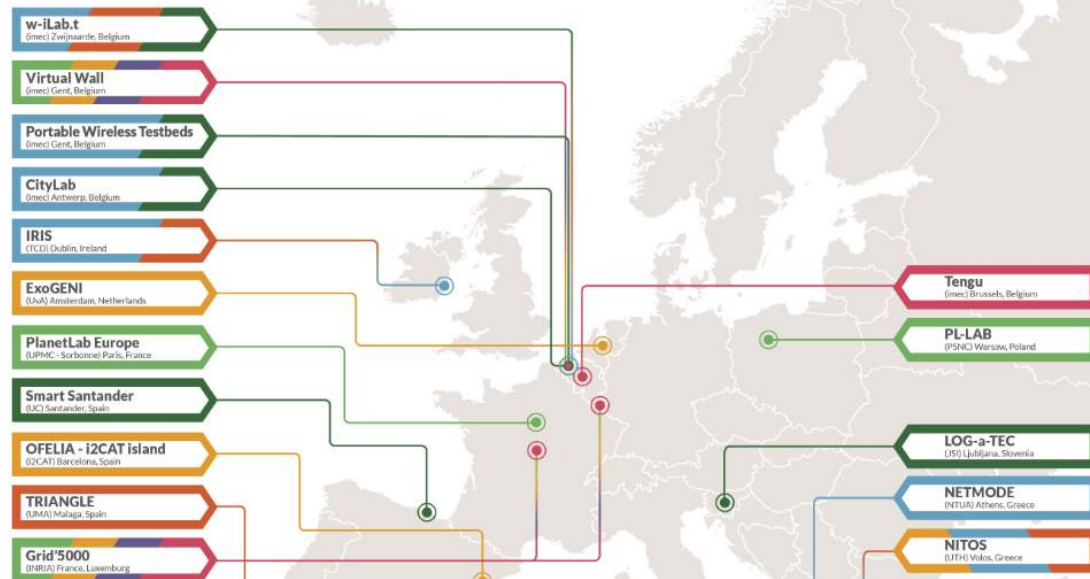
Fed4FIRE Federation for FIRE

(Future Internet Research & Experimentation)

2012-2016

**Fed4FIRE+
2017-2021**

Fed4FIRE assets – facilities (doc.fed4fire.eu)



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

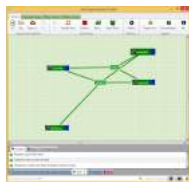
- To scale up
- To use/combine special resources (e.g. wireless robots)
- Redundancy (e.g. testbed in maintenance)
- To re-use experiments (class exercises, scientifically, ...)
- To compare environments (e.g. wireless, openflow hardware, ...)

Design principles



Downloaded from [@fed4fire](#). Content not owned by the testbed. Uploaded by [@fed4fire](#) on 01/04/2014.

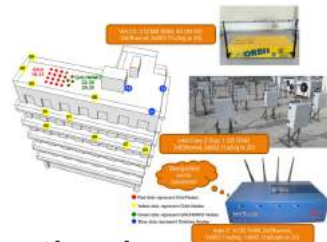
Multiple identity providers



Standardized APIs

Testbeds trust IdPs in federation

Multiple tools

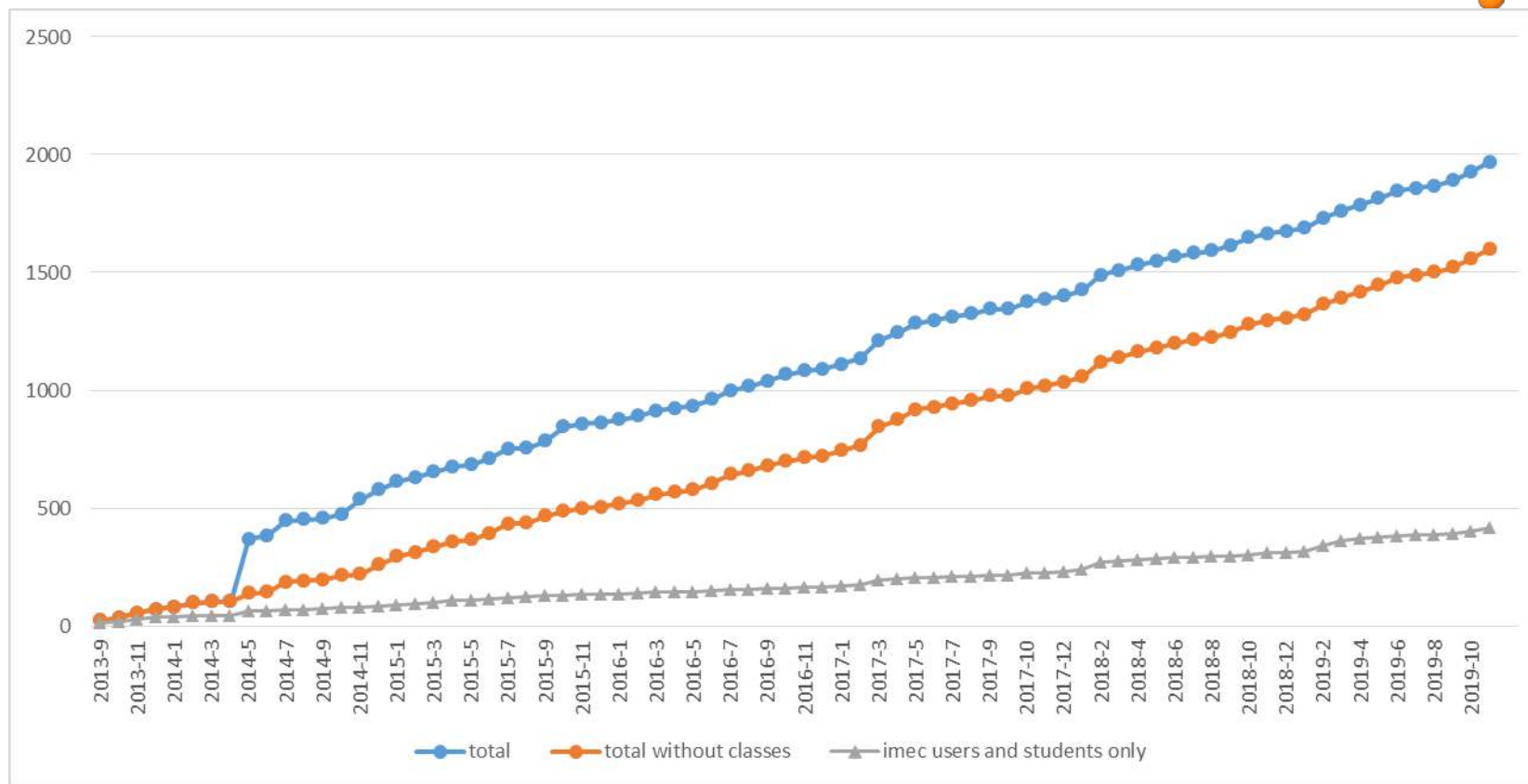


Multiple testbeds

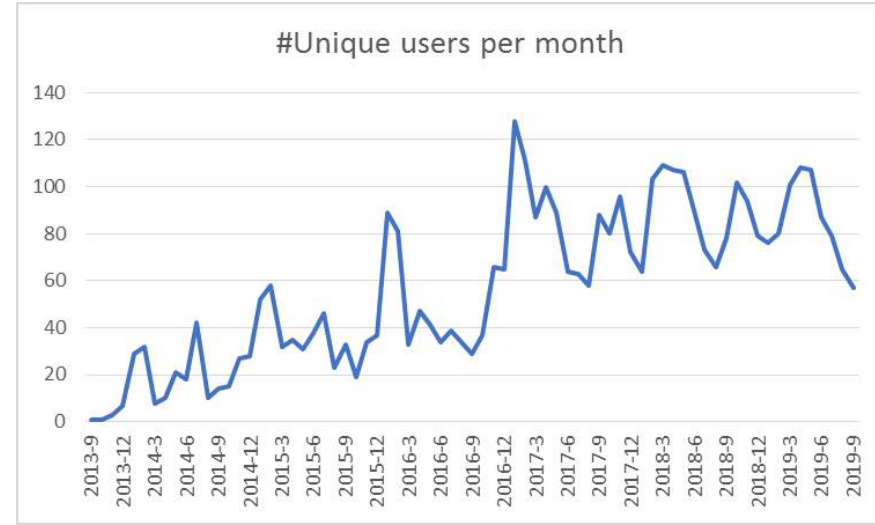
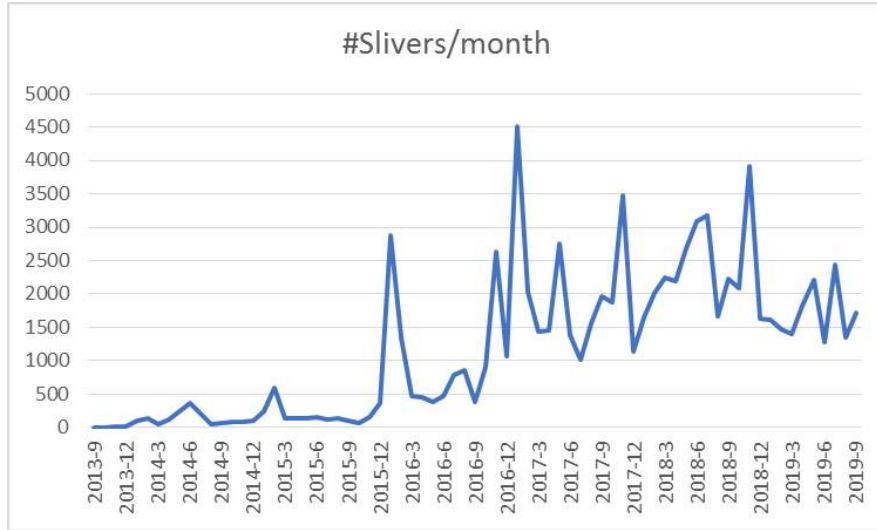
Users



FIRE



Monthly usage: #slivers, #users



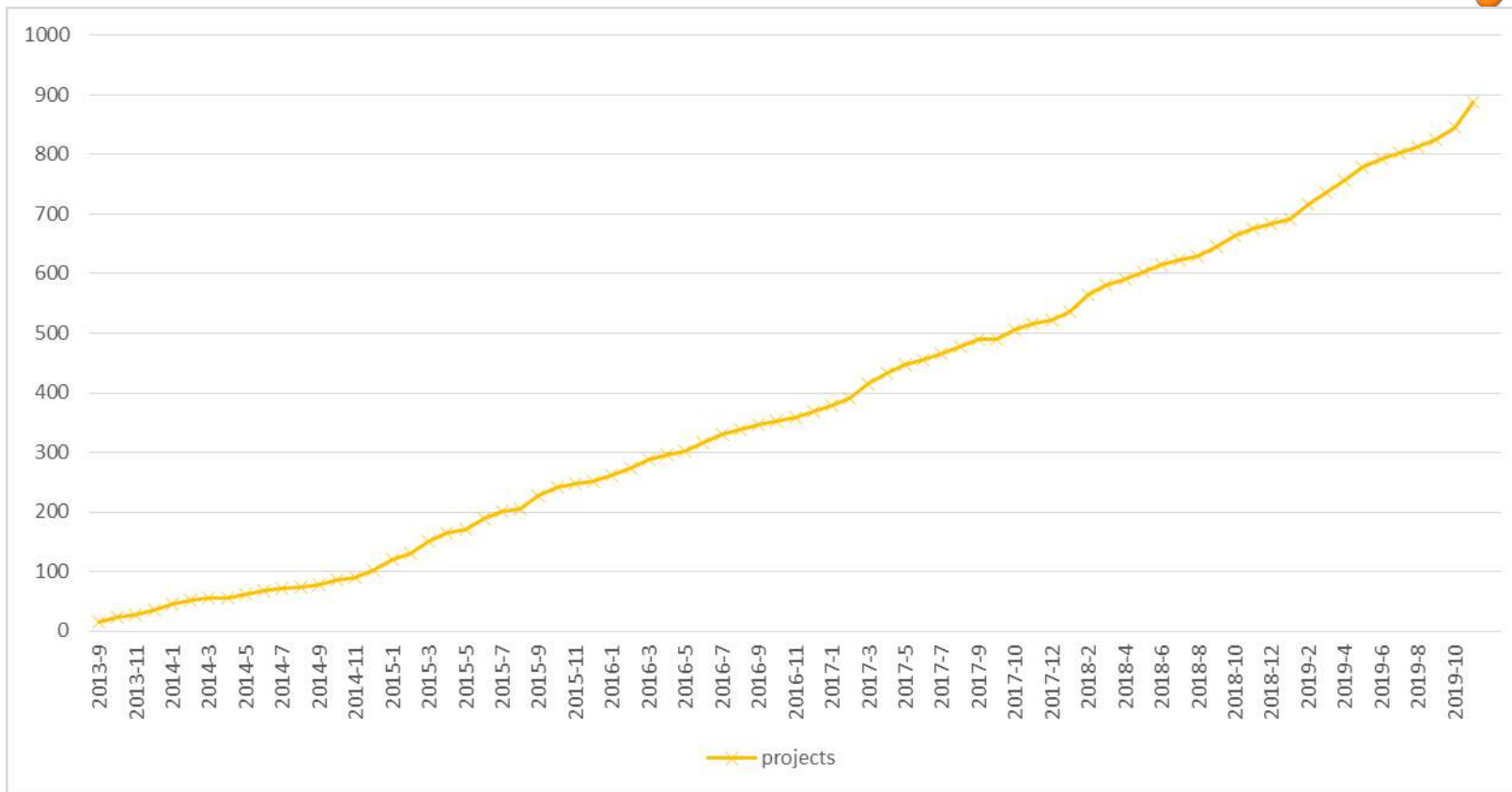
Sliver: depends on testbed, multiple nodes typically

#unique users April 2019-September 2019: 234

#unique users October 2018-September 2019: 340

Average sliver duration: 96 hours

Projects (1 project = set of experiment runs)



#Testbeds usable with Fed4FIRE account: +65 <https://fedmon.fed4fire.eu> (October 2019)



Monitoring federation is key (<https://fedmon.fed4fire.eu>)

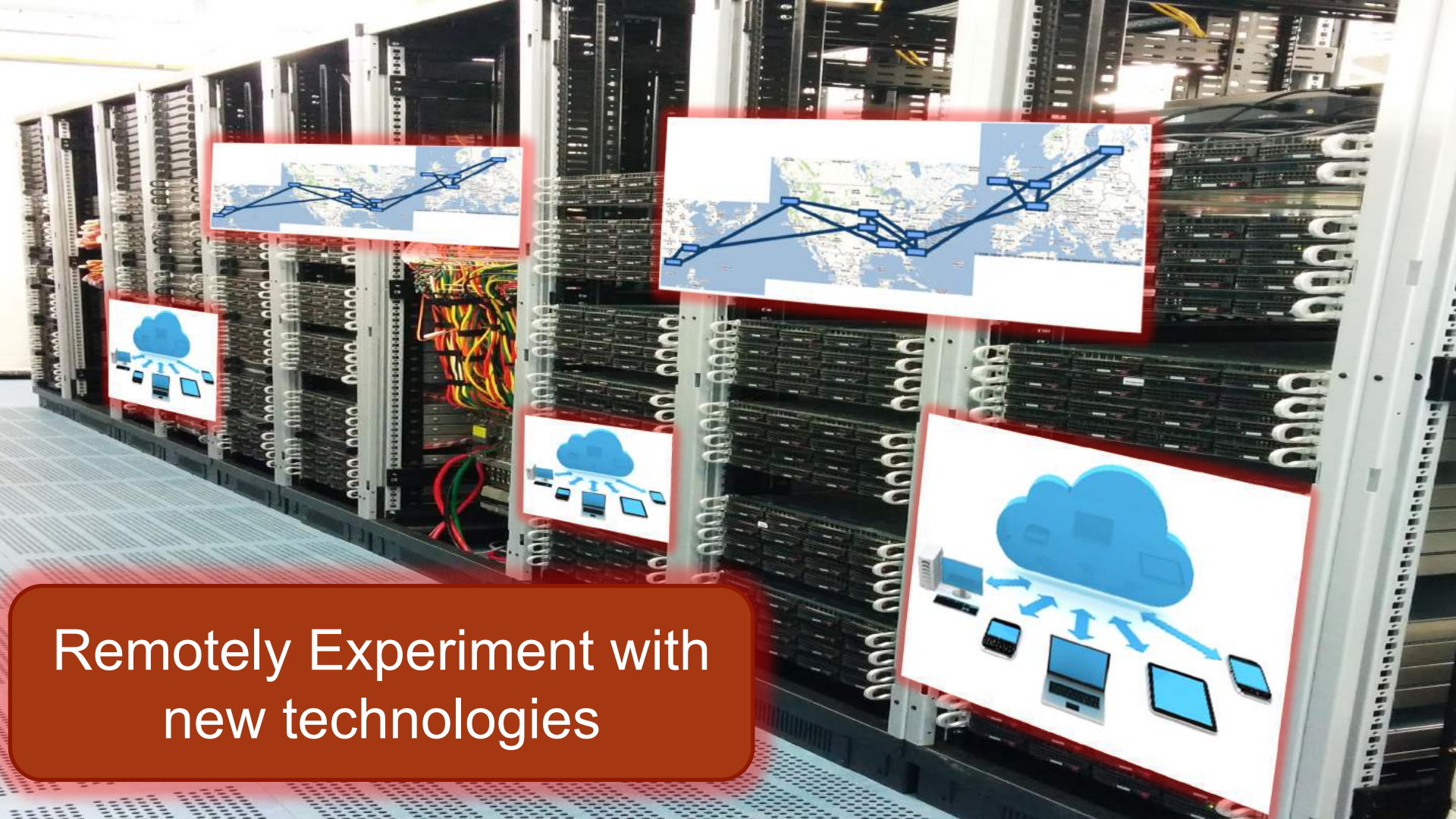


Category	Item	Status	Details	Details	Details	Details
Wind Testbeds	Wind Testbed 1	OK	...	...	...	...
	Wind Testbed 2	OK	...	...	...	...
	Wind Testbed 3	OK	...	...	...	...
	Wind Testbed 4	OK	...	...	...	...
Windows Testbeds	Windows Testbed 1	OK	...	...	...	...
	Windows Testbed 2	OK	...	...	...	...
	Windows Testbed 3	OK	...	...	...	...
	Windows Testbed 4	OK	...	...	...	...
OpenFlas Testbeds	OpenFlas Testbed 1	OK	...	...	...	...
	OpenFlas Testbed 2	OK	...	...	...	...
	OpenFlas Testbed 3	OK	...	...	...	...
	OpenFlas Testbed 4	OK	...	...	...	...
Cloud Testbeds	Cloud Testbed 1	OK	...	...	...	...
	Cloud Testbed 2	OK	...	...	...	...
	Cloud Testbed 3	OK	...	...	...	...
	Cloud Testbed 4	OK	...	...	...	...
F4FIRE Testbeds	F4FIRE Testbed 1	OK	...	...	...	...
	F4FIRE Testbed 2	OK	...	...	...	...
	F4FIRE Testbed 3	OK	...	...	...	...
	F4FIRE Testbed 4	OK	...	...	...	...
Testbeds licensed with F4FIRE	Testbed 1	OK	...	...	...	...
	Testbed 2	OK	...	...	...	...
	Testbed 3	OK	...	...	...	...
	Testbed 4	OK	...	...	...	...
ParaODIN Testbeds	ParaODIN Testbed 1	OK	...	...	...	...
	ParaODIN Testbed 2	OK	...	...	...	...
	ParaODIN Testbed 3	OK	...	...	...	...
	ParaODIN Testbed 4	OK	...	...	...	...
EuroODIN Testbeds	EuroODIN Testbed 1	OK	...	...	...	...
	EuroODIN Testbed 2	OK	...	...	...	...
	EuroODIN Testbed 3	OK	...	...	...	...
	EuroODIN Testbed 4	OK	...	...	...	...
Eucaliptus Testbeds	Eucaliptus Testbed 1	OK	...	...	...	...
	Eucaliptus Testbed 2	OK	...	...	...	...
	Eucaliptus Testbed 3	OK	...	...	...	...
	Eucaliptus Testbed 4	OK	...	...	...	...
CloudB Testbeds	CloudB Testbed 1	OK	...	...	...	...
	CloudB Testbed 2	OK	...	...	...	...
	CloudB Testbed 3	OK	...	...	...	...
	CloudB Testbed 4	OK	...	...	...	...
F4in Testbeds	F4in Testbed 1	OK	...	...	...	...
	F4in Testbed 2	OK	...	...	...	...
	F4in Testbed 3	OK	...	...	...	...
	F4in Testbed 4	OK	...	...	...	...
Internationally federated testbeds	Testbed 1	OK	...	...	...	...
	Testbed 2	OK	...	...	...	...
	Testbed 3	OK	...	...	...	...
	Testbed 4	OK	...	...	...	...



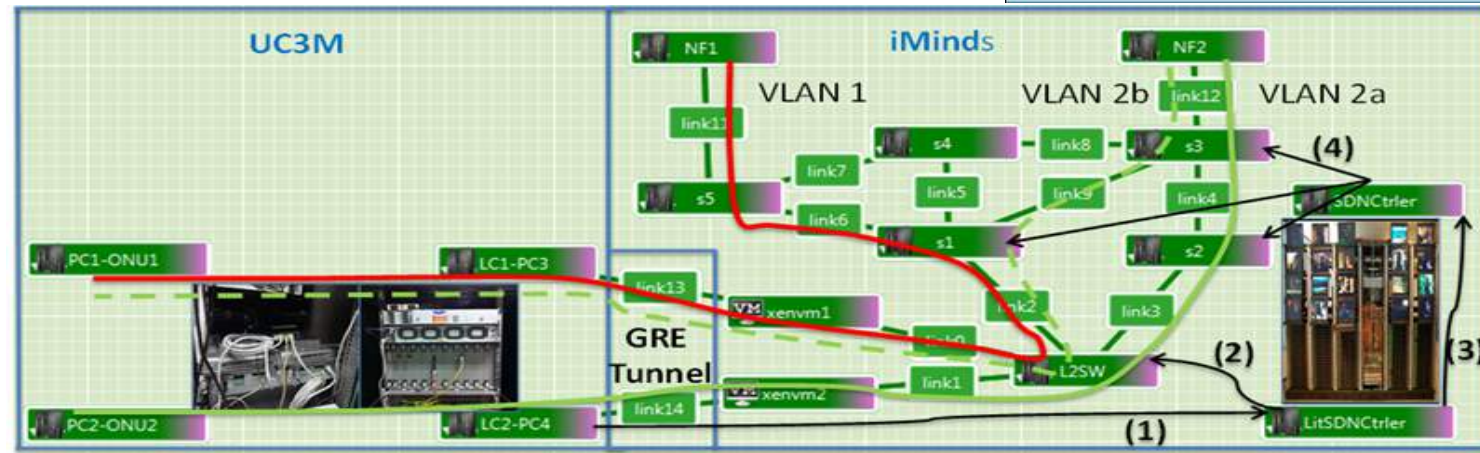
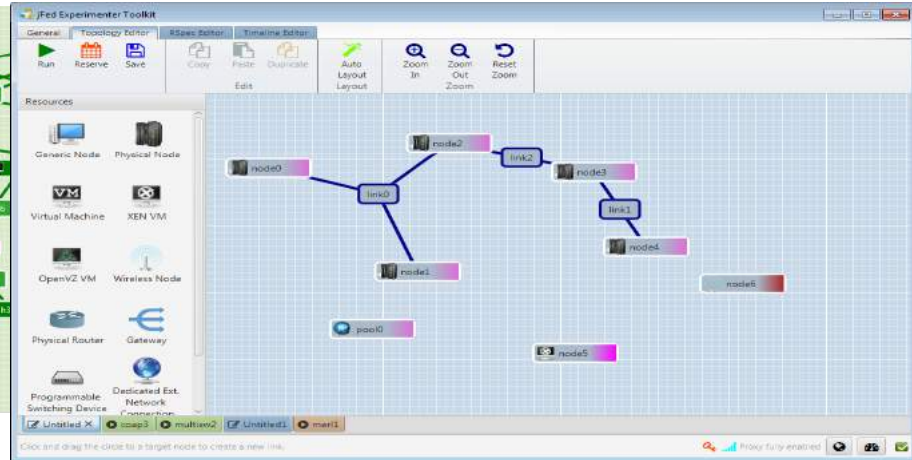
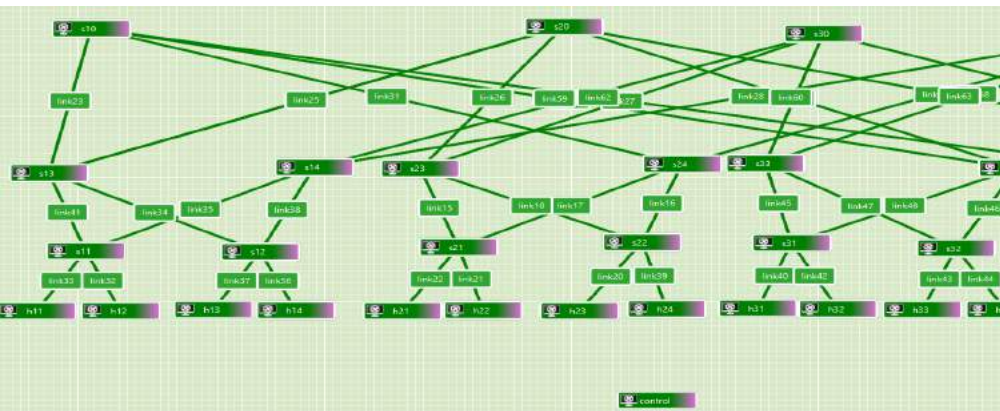


Fed4FIRE as a meta-testbed



Remotely Experiment with
new technologies

jFed tool: easy access for testbeds (jfed.ilabt.imec.be)



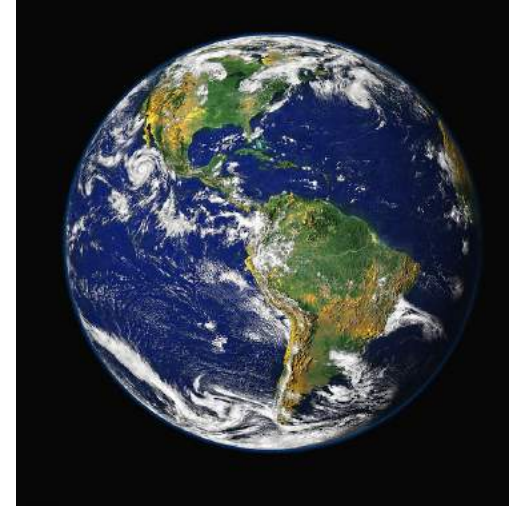
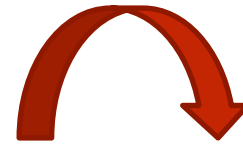
Fed4FIRE as Meta-testbed



Enables all kind of experimentation because of bare metal hardware of all kinds of equipment

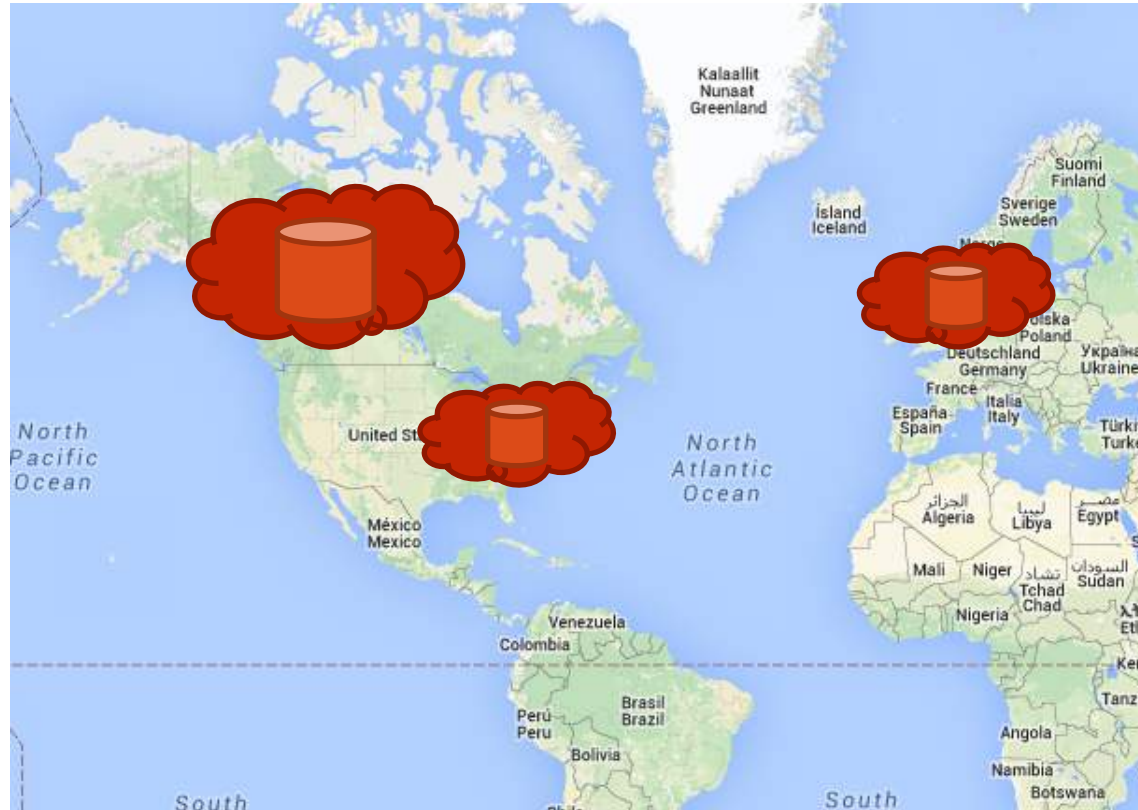
Including creation of new platforms, testbeds, ...

Company wants to deliver global video service

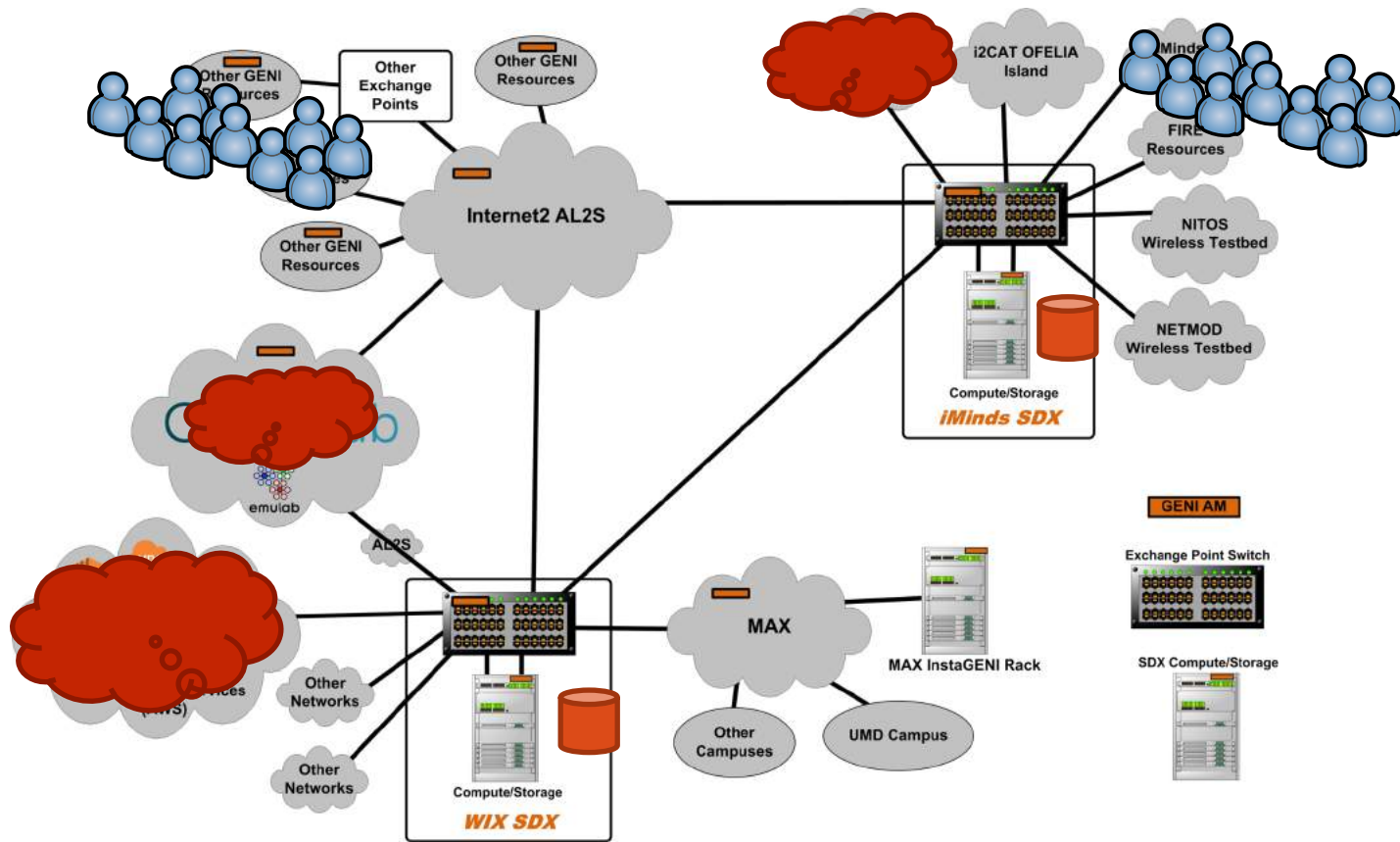


- Cost efficient
- Redundant

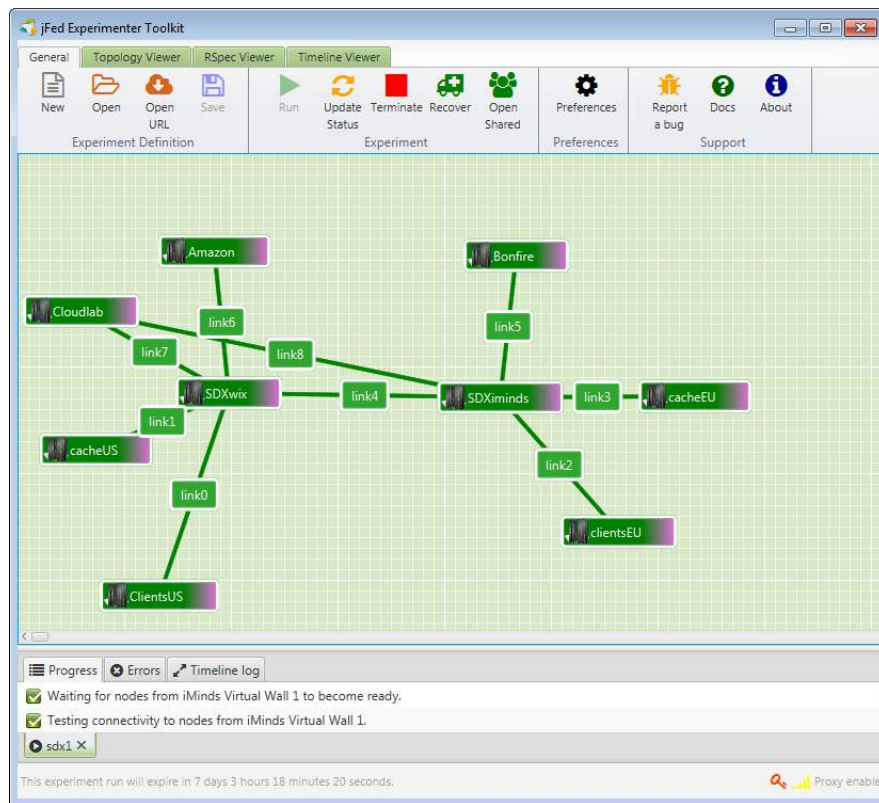
Design: start with US and EU users



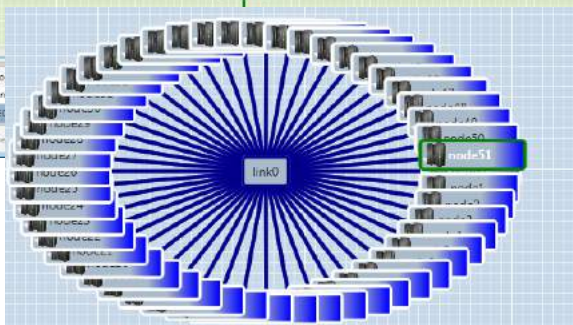
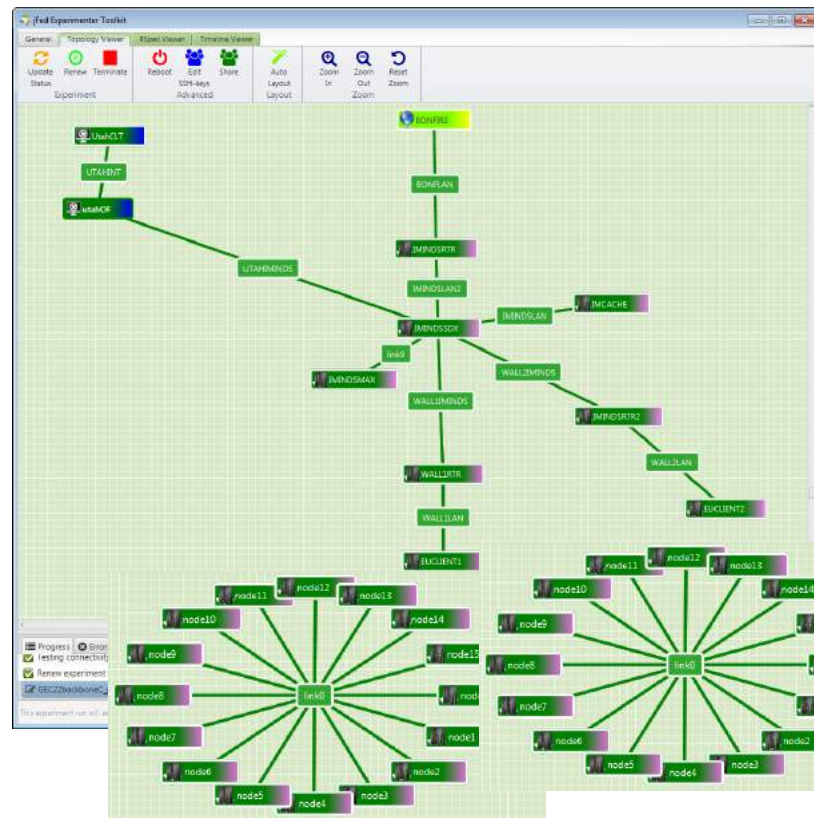
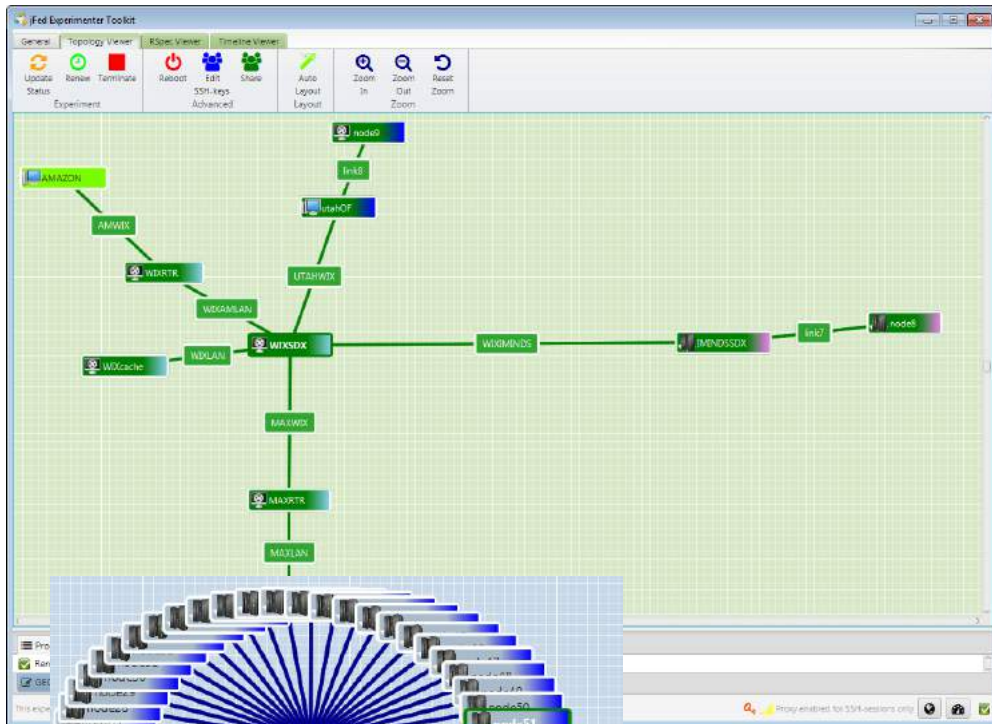
Demo Deployment

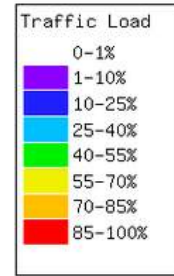
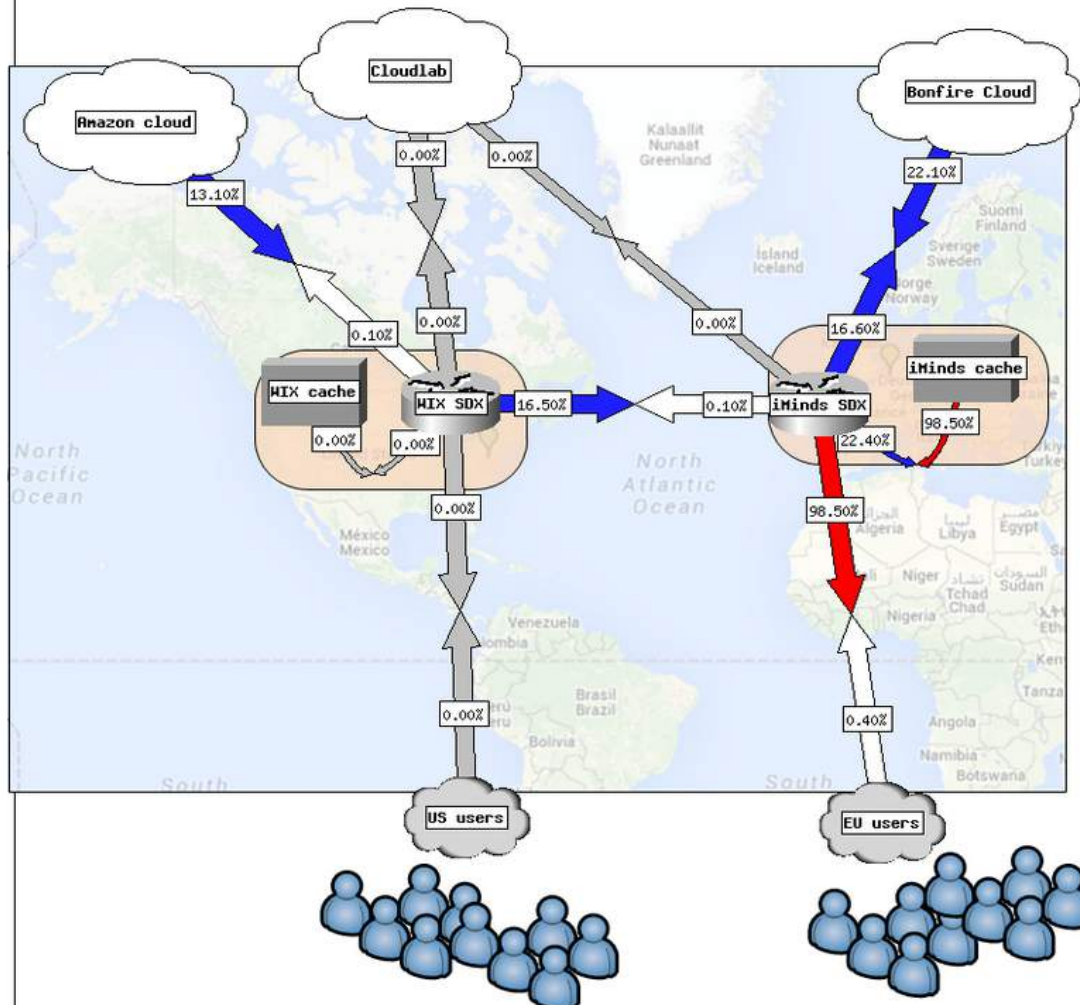


Single testbed prototype



Upscaling





Day night emulation



LabWiki by NICTA

Prepare Execute

gdc22demo1.oedl
system:oced:gdc22demo1.oedl

```
114
115 after t1 do
116   prop.redirector_config = redirect_day1
117   info! "----- Day 1: Configure Web Redirector!"
118   group 'redirector_group'.startApplication('web_redirector_config.oedl')
119   after 5 do
120     info! "----- Day 1: Start Web Redirector!"
121     group('redirector_group').startApplication('web_redirector_ext.oedl')
122   end
123 end
124
125 after t2 do
126   info! "----- Day 1: Start All Player Region 1 + Some Player Region 2"
127   group('all_players_group').startApplications()
128   group('some_player_group').startApplications()
129 end
130
131 after t3 do
132   info! "----- Day 1: Stop All Player Region 1 + Some Player Region 2"
133   group('all_players_group').stopApplications()
134   group('some_player_group').stopApplications()
135 end
136
137 after t3 do
138   prop.redirector_config = redirect_day2
139   info! "----- Day 2: Configure Web Redirector!"
140   group 'redirector_group'.startApplication('web_redirector_config.oedl')
141   after 5 do
142     info! "----- Day 2: Start Web Redirector!"
143     group('redirector_group').startApplication('web_redirector_ext.oedl')
144   end
145 end
146
147 after t4 do
148   info! "----- Day 2: Start All Player Region 1 + Some Player Region 2"
149   group('all_players_group').startApplications()
150   group('some_player_group').startApplications()
151 end
152
153 after t4 do
154   info! "----- Day 2: Stop All Player Region 1 + Some Player Region 2"
155   group('all_players_group').stopApplications()
156   group('some_player_group').stopApplications()
157 end
158
159 after t5 do
160   prop.redirector_config = redirect_day1
161   info! "----- Day 3: Configure Web Redirector!"
162   group 'redirector_group'.startApplication('web_redirector_config.oedl')
163   after 5 do
164     info! "----- Day 3: Start Web Redirector!"
165     group('redirector_group').startApplication('web_redirector_ext.oedl')
166   end
167 end
168
169 after t6 do
170   info! "----- Day 3: Start All Player Region 1 + Some Player Region 2"
171   group('all_players_group').startApplications()
172   group('some_player_group').startApplications()
173 end
174
175 after t6 do
```

bob-2015-03-21T12-50-55

▼ Graphs

Figure: DASH Selected Rate

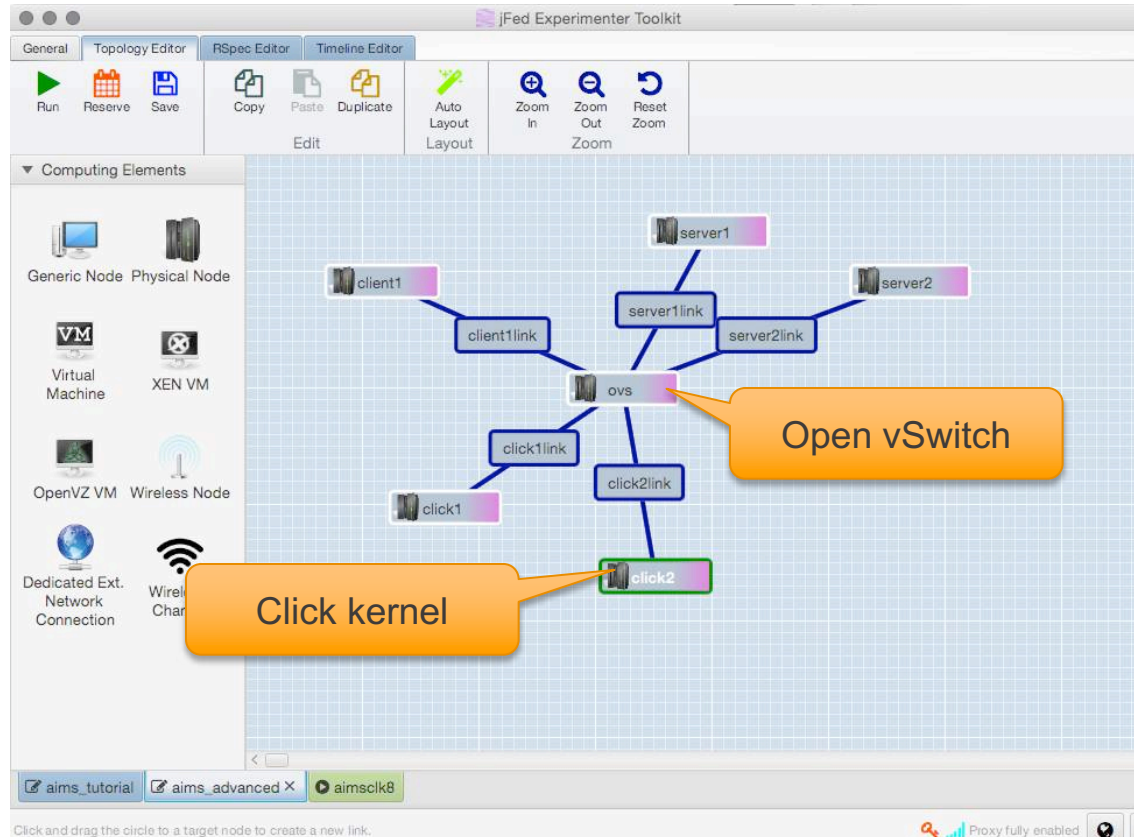
Figure: DASH Buffer Percentage

Figure: DASH Selected Rate (%)

Network Function Virtualization experiments on Fed4FIRE



Virtual Network Infrastructure Topology





Automating with Experiment Specification (eSpec)

What is an Experiment Specification?

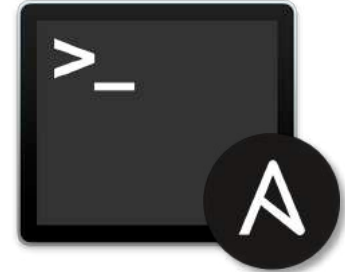
Spec bundles:



Resource
Specification



Files to be
uploaded



ANSIBLE
Commands
to be executed



Fed4FIRE as meta-testbed



Combine computing, networking and storage for all your needs
(SDN/NFV/SDX/5G/machine learning/IoT/cloud)

13:30	HANDS-ON INTRODUCTION: HOW TO USE FED4FIRE+ TOOLS AND TESTBEDS	
	Brecht Vermeulen, IMEC - Ghent University	
14:15	Hands-on training for specific topics:	
	TRACK 1: Wireless experimentation	TRACK 2: Cloud and wired networking
15:15	Coffee break	
15:30	Hands-on training for specific topics:	
	TRACK 3: IoT experimentation	TRACK 4: Big data and machine learning

Tutorials today



INDUCTION: HOW TO USE FED4FIRE+ TOOL

Brecht Vermeulen, IMEC - Ghent University

Hands-on training for specific topics:

TRACK 1: Wireless experimentation

TRACK 2: Cloud and wired networking

15:15

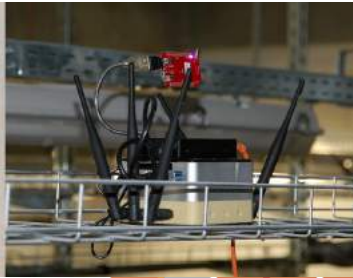
Coffee break

15:30

Hands-on training for specific topics:

TRACK 3: IoT experimentation

TRACK 4: Big data and machine learning





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European Union



Co-funded by the
Swiss Confederation

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QUESTIONS ?

WWW.FED4FIRE.EU