

# Future Internet Assembly (FIA) Stockholm report

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## Introduction

The FIRE cluster organised two cross-topic sessions as well as a FIRE plenary session:

Cross-topic session: Methodology – How to apply experimentally driven research

Cross-topic session: Deploying on FIRE

Plenary session: Usage of facilities

## Session: Methodology – How to apply experimentally driven research

### Background and Rationale

The Internet has been the ICT success story for many decades, having great impact in everyday life as well. Economical as well as societal aspects have been greatly affected by the emergence and proliferation of the Internet technologies. The support of Internet communication and the great number of novel services over heterogeneous systems has boosted new forms of communication schemes, collaboration possibilities, services, education, knowledge and information propagation as well as innovation. The fast grow of the Internet, points to the need for broader experimentation capabilities for future technologies.

Theoretical models in the context of future internet, emerging communications and services, are usually validated through dedicated prototyping activities. The test beds used in these activities are usually focused in terms of testing capabilities and fragmented in terms of validation capabilities. Therefore, the need to evolve the test beds into coherent experimentation facilities, enabling broader scope experimentation and validation of theoretical approaches, becomes apparent. This will engage the federation of multi scope platforms under a common framework.

### Scope

The experimentally driven research, based on large scale federated experimental infrastructures is quite a challenge. The mere benefits appear to be the engagement in a validation and assessment loop early in the R&D process. In this way in complex systems, experimentation could be the key for discovery and validation throughout the research process. There is a lot of value in putting end users participating as active testers at an early stage of the R&D cycle. They could become key indicators of several metrics related to the realization of theoretical approaches in tangible real life scenarios. Indicative metrics that could be assessed would be the scalability of solutions, performance, usability, robustness and security of the tested functionality. Reduced time to market of tested products could be the imminent outcome of the whole process.

Relevant topics to be addressed:

- Experimentation as a methodology to achieve concrete results: where, how, when?
- The experimentation facilities as a service offered to R&D
- What are the metrics relevant to experimentations?
- The impact to standardization
- Large scale experimentation: requirements and limitations

### Presentations ([link](#))

- Introduction on Experimentation methodology, Nancy Alonistioti, Univ. of Athens
- Necessity for experimentation from the PPP point of view, Didier Bourse, Alcatel-Lucent
- Presentation on the methodology issues and how to experiment, Martin May, Thomson
- How the methodology could facilitate the shorter time to product development, Vania Conan, Thales

- Experimentation as a methodology to achieve concrete results: where, how, when, Dimitri Papadimitriou, Alcatel-Lucent

## **Panel**

During a panel discussion the following topics were discussed:

- A structure of FI research which may be too strict and inhibit research (forced division in many areas). Need for a frequent interaction between the areas and harmonization and cross-validation of activities/ideas.
- Experimentation is a mandatory step in the validation of new ideas. FIRE facilities offer the bridge between tests in a lab and in a very large scale
- Migration strategies and coexistence testing are as much important as models validation. FIRE facilities offer also such capabilities.
- International collaboration and concertation, also at the technical level is of utmost importance. In particular standardization.

## **Conclusions and action points**

- There is a need to pin down the fundamentals
  - Definitions
  - Concepts
  - Nomenclature
  - Characterisation and classification of use cases
- Segments of users and how the FIRE area relates to User Driven Innovation and Living Labs
- How to generally do performance monitoring and how does a monitoring framework relate to the experimental facilities and the experimental driven research
- Start developing a document that may need several versions or iterations
- **Action point** to draft a table of contents for the paper

# **Session: Deploying on the FIRE facilities**

## **Background and rationale**

To date several EC and national projects are offering and further deploying facilities for supporting research and experimentation for the future Internet. The so called FIRE cluster (Future Internet Research and Experimentation) in the past Future Internet Assemblies provided information and demonstrated the possibilities of using the FIRE facilities for research experimentation and testing.

For example at the FIA Madrid, the FIRE cluster collected use cases that illustrated how the facilities are being used or how potential users of the facilities intend or plan to use them. Likewise at the FIA Prague the FIRE cluster exhibited a number of facilities and provided live demonstrations of how these facilities can be used and what features were available.

In this context not only the main projects like Onelab2, PII, Federica, Wisebed and Vital++ should be seen, but also activities that fall in the area of the Living Labs and focus on the user experience and user driven innovation.

The logical evolution of the current state of affairs is to discuss directly with the potential users of the facilities in concrete terms how to deploy service platforms, services and applications on the available facilities. Thus the FIA Stockholm will be used by the FIRE facilities providers to discuss with the prospective users the details of "how to deploy on FIRE".

## **Context**

The FIRE experimental facilities let us explore whether Future Internet systems operating at scale exhibit the properties and behaviours that we intended when we designed them and tested in the lab, whether systems constructed independently can be integrated together and whether they function as we expect when they are integrated. If we are able to make facilities available for others to use we can also look for emergent properties and emergent usage of systems (e.g. creative use of facilities by users who discover different

ways. A fuller treatment of the role of experimental facilities has been explored by the working group on modular federation of FIRE facilities<sup>1</sup>.

### **1<sup>st</sup> Specific focus on Trust and Identity**

At the Prague FIA meeting some of the experimental approaches to Trust in Future Internet were explored. These can be broadly characterised as:

- Observing and monitoring attacks on systems in the public internet (e.g. Honeynets)
- Experimental work with 'real' end users (e.g. living labs)
- Provision of 'trust services' e.g. eID on which more trustworthy services can be constructed
- Experimental identification of technical vulnerabilities in systems

**Provide quarantine areas of the testbed.** There will be vulnerabilities at all levels in the systems and components of the future Internet. Can we create isolated (quarantined) experimental facilities in which one could run experiments that explore the robustness of systems and components against attack? For example, can we launch a distributed denial of service attacks on services without bringing down the whole FIRE facility or even worse impacting the entire internet?

**Provide e-Identity facilities.** Can FIRE provide a comprehensive electronic ID facility as a FIRE offering, so that it is used by all experimental activities using FIRE? How do FIRE users access and use such systems?

### **2<sup>nd</sup> Specific focus on Software and Services**

In support of some of the ongoing project in the area of services and software it is proposed to explore the installation and deployment of Open Nebula/Reservoir solutions for managing clouds onto of the current FIRE facilities. The intention is to explore the application of the Infrastructure as a Service (IaaS) cloud paradigm on the FIRE testbeds. This undertaking requires a discussion on how the Open Nebula/Reservoir stack can be deployed in some of the current FIRE facilities.

#### **Presentations ([Link](#))**

- Introduction, Anastasius Gavras, Eurescom GmbH
- Deploying Service Experiments on FIRE: A OpenNebula / RESERVOIR Perspective, Philippe Massonet, CETIC
- Federated Clouds, Sebastian Wahle, Fraunhofer FOKUS
- Provide quarantine areas of the testbed, Nick Wainwright, HP Labs
- Deploying isolated testbeds, Mauro Campanella, GARR

#### **Conclusions and action points**

There is a need to kick-off working groups or task forces to elaborate and possibly agree among the FIRE projects on:

- A common language for resource descriptions
- A common language to describe experiments
- A common language to describe results
- Standardized APIs to access resources
- Single sign-on / one-stop shop - i.e., a common approach for managing user credentials
- **Action point** to kick-off one or more of the above working groups

## **Session: Usage of facilities**

The objective of this session was to understand the results and conclusions of the cross-topic sessions held on 23 November and to develop a roadmap for further work in the area of "Usage of FIRE facilities and experimentally driven research" group.

#### **Presentations ([Link](#))**

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<sup>1</sup> [http://www.ict-fireworks.eu/fileadmin/documents/Wise-men\\_final.pdf](http://www.ict-fireworks.eu/fileadmin/documents/Wise-men_final.pdf)

- Introduction and conclusions from session “Deploying on FIRE”, Anastasius Gavras, Eurescom GmbH
- Doing experimentally-driven research on WISEBED – preparations, deployment, evaluation, Mesut Günes, Freie Universität Berlin
- Future P2P systems and experiments, Charalabos Skianis, Aegean Univ.
- Conclusions from session “What does it mean to conduct experimentally driven research?”, Nancy Alonistioti, Univ. of Athens
- Experimentation experiences in N4C, Maria Uden, Lulea University of Technology, Sweden
- Towards being Always Best Connected – the PERIMETER way, Markus Fiedler, Blekinge Institute of Technology, Sweden
- Experimentation process for the assessment of Self-management behaviour in FI, Nancy Alonistioti, Univ. of Athens
- Experimentation driven traffic monitoring and engineering research, Amir Krifa, INRIA

### **Conclusions and action points**

FIRE had two cross-topic sessions:

- Methodology – How to apply experimentally driven research?
- Deploying on the FIRE facilities?

### **General outcome**

- Action to draft a paper elaborating on the fundamentals of the methodology and its benefits
  - The terms used for the methodology formulation should be elaborated and clearly specified – contribute to the experimentation vocabulary
  - The user selection process for the involvement in the experimentation should be addressed per use case class
  - The methodology will encompass several iterations
  - The methodology will be complementary to e.g., benchmarking, prototyping etc.
  - Develop a position paper to reach consensus on the above
- Action for creating necessary specifications to satisfy deployment requirements on FIRE facilities
  - A common language for resource descriptions
  - A common language to describe experiments
  - A common language to describe results
  - Standardized APIs to access resources
  - Single sign-on / one-stop shop – i.e., a common approach for managing user credentials

The session concluded with the identification of topics and session formats for the next FIA to be held in April 2010 in Valencia, Spain.

### **Recommendations for issues**

- Cross-topic on virtualisation
- Create European market for testing and experimentation facilities
- Organise a cross-project test session

### **General observations**

- Too little time for discussion
- Too many sessions