An Overview on FIRE and its approaches towards federation and collaboration

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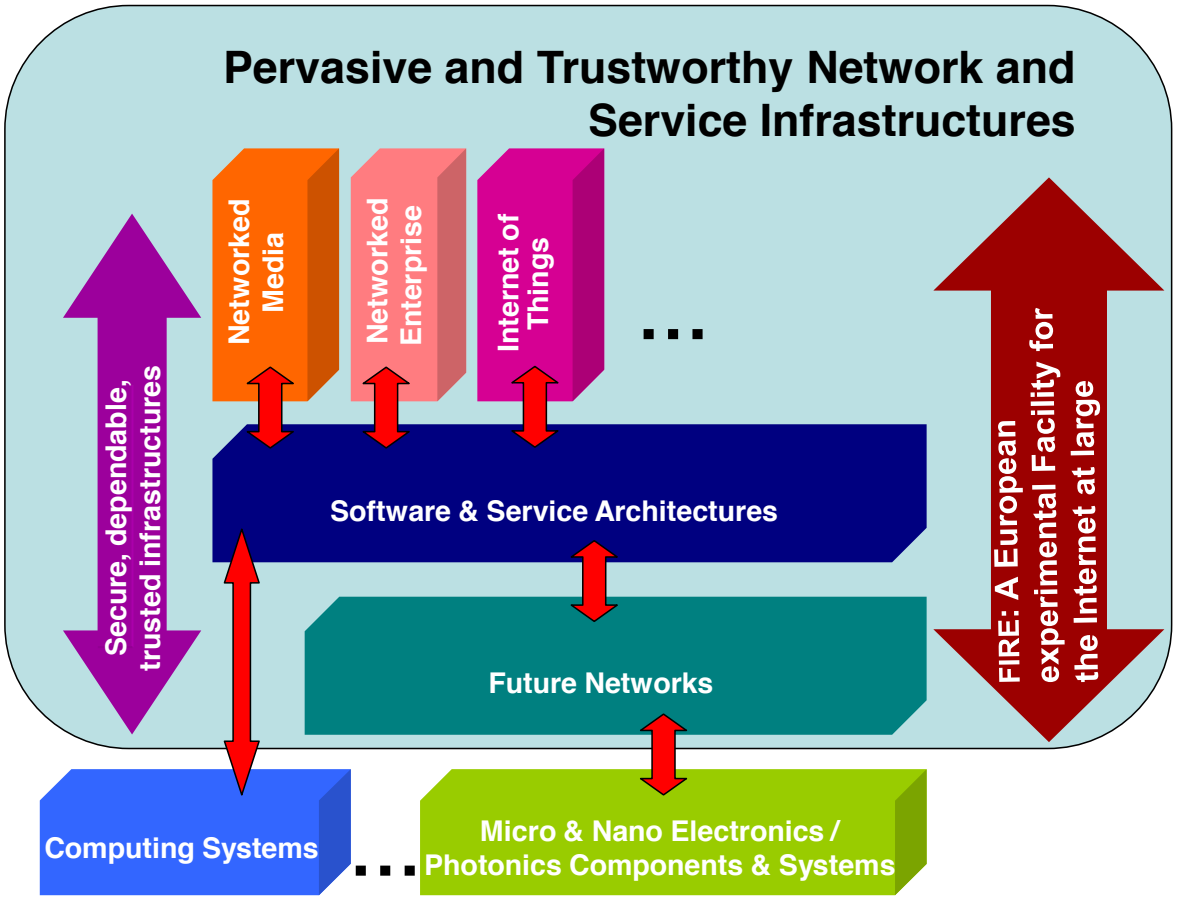
"The views expressed in this presentation are those of the author and do not necessarily reflect the views of the European Commission"

FIRE: Future Internet Research and Experimentation

FIRE has two related dimensions:

- **Experimentally-driven long-term, visionary research on new paradigms and networking concepts and architectures for the future internet**
- **Building large-scale experimentation facilities** to support both medium- and long- term research on networks and services by gradually federating existing and new testbeds for emerging or future internet technologies

The position of FIRE in “Challenge 1”



FIRE Projects

FIRE experimental Facilities:

- PlanetLab (OneLab2)
- Cognitive radio (CREW)
- Open Flow (OFELIA)
- IMS (PII)
- Services on Clouds/Grids (BonFIRE, TEFIS)
- Sensors (SmartSantander)
- Core network (FEDERICA)

Multi-hop wireless — OPNEX

Cognitive routing — ECODE

User centric — PERIMETER

N4C — DTN

Smart-Net — Smart Antennas

Self-Net — Self Mngt.

P2P / IMS — Vital ++

Network Resilience — Resume-Net

Edge Infrastructure — Nanodatacenters

LAWA — Large-scale data

CONECT — Flexible radio

CONVERGENCE — Content centric

Routing — EULER

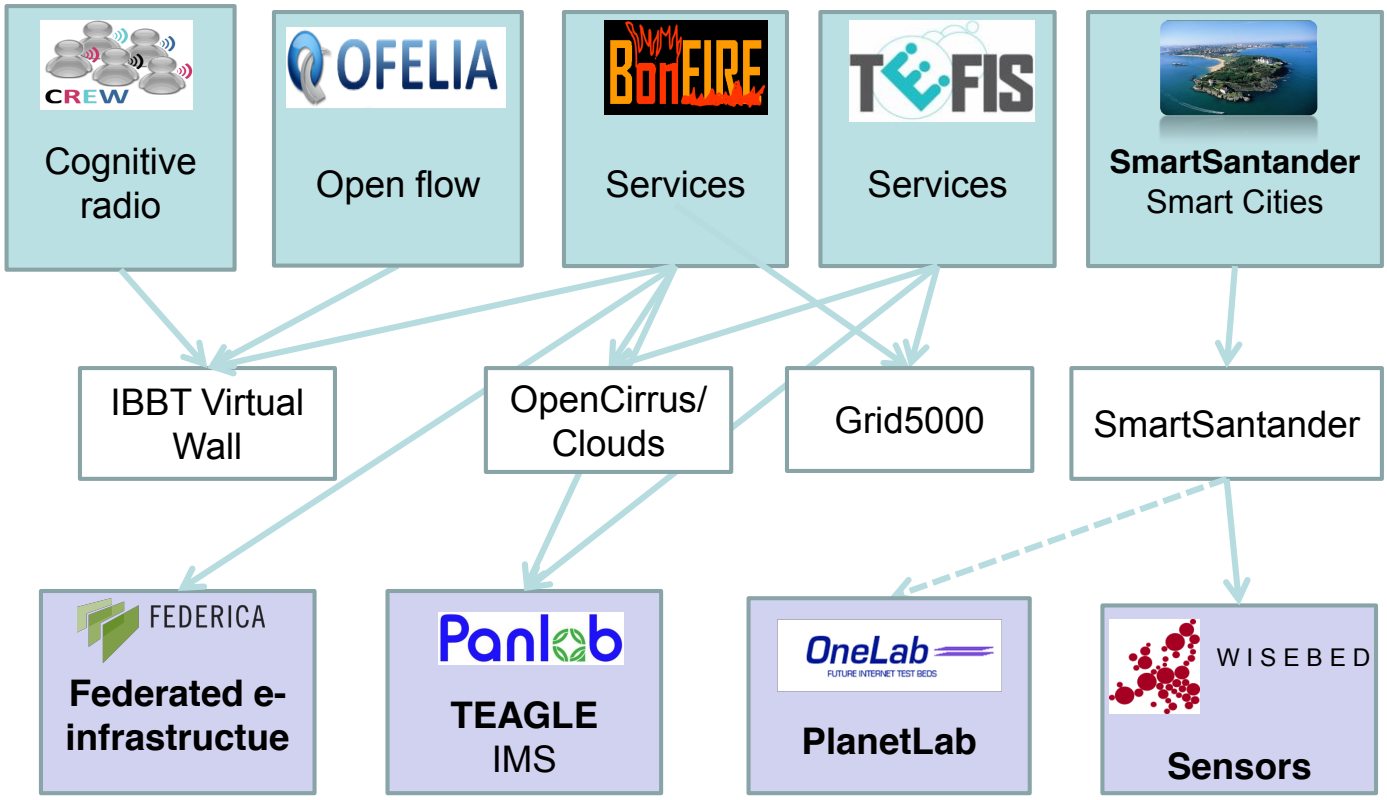
Smart buildings — HOBNET

NOVI — Virtual infra. struct.

SCAMPI — Services on opport. networks

SPITFIRE — Internet of things

Facility projects in FIRE



Pan-European Laboratory Infrastructure Implementation

Objectives:

PanLab - PII manages the **interconnection of different distributed testbeds** to provide services to customers for various kind of testing

PanLab - PII has a **repository** that stores testbed descriptions and testing results

PanLab - PII has a **search and composition engine "Teagle"** for mapping user requests to testbed resources and is being enhanced to automatically configure network resources in accordance with user requests

www.panlab.net

Federated E-infrastructure Dedicated to European Researchers Innovating in Computing network Architectures

Objectives:

FEDERICA provides a versatile technology-agnostic network infrastructure that runs over **GÉANT and National Research and Education Networks (NRENs)**

FEDERICA is comprised of **Gigabit Ethernet circuits, Layer 2 and Layer 3 switching, and servers** (V-Nodes) supporting virtualization

Virtual "slices" of FEDERICA's infrastructure (virtual circuits (up to 1Gb/s) and V-Nodes) are allocated to researchers to conduct potentially **disruptive experiments** within a **large production-quality** substrate. These "slices" can include: Layer2 circuits or Layer3 IP configured circuits (IPv4, IPv6 unicast and multicast) and/or virtual system(s) and/or virtual routers

www.fp7-federica.eu

An open federated laboratory supporting network research for the future Internet

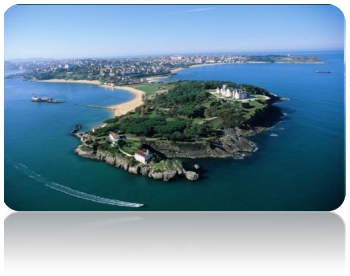
Objectives:

OneLab2 partners operate **PlanetLab Europe** (PLE), extend the PlanetLab service across Europe, and federate with other PlanetLab infrastructures worldwide. Their **federation model** enables PLE to be the basis for a future highly heterogeneous communications environment

The project provides an open, general-purpose, shared experimental facility, which is both **large-scale and sustainable**. It allows European industry and academia to innovate and assess the performance of their solutions

The project also integrates new features and technologies into the system. In particular, a **network monitoring service** that supports experiments

www.onelab.eu



Smart Santander

Objectives:

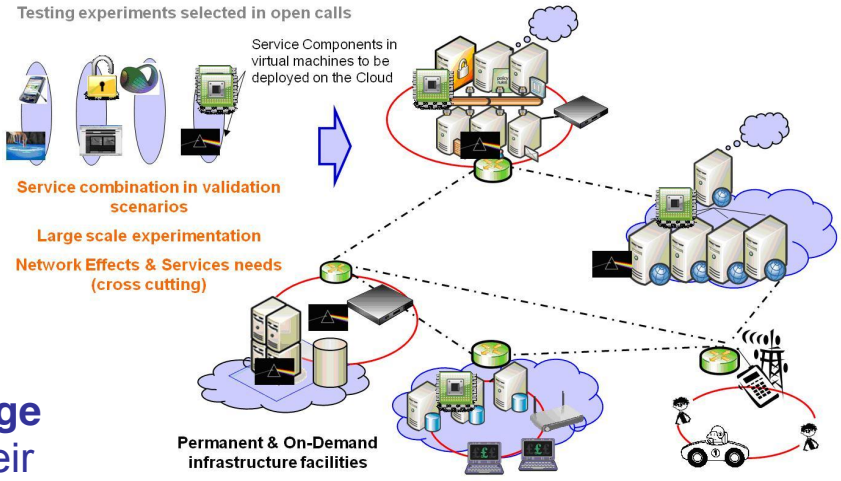
- To build a **unique-in-the-world city-scale experimental research facility** in support of typical applications and services for a Smart City
- More than **20,000 sensors** based on a **real life Internet of Things deployment** in an urban setting

www.smartsantander.eu

Building *service* testbeds for Future Internet Research and Experimentation

Objectives:

- To build a **multi site cloud facility** to support **applications, services and systems research**, targeting the future **Internet of Services**
- To give **researchers** access to a facility which enables **large scale experimentation** of their systems and applications



- To evaluate the **cross-cutting effects** of **converged service and network infrastructures**

Testbed for Future Internet Services

Objectives:

- To build a **multi site cloud open platform** able to integrate existing and next generation testing and experimental facilities
- To develop a **connector model** that enables facilities to be accessed and used in a **unified manner** using **Web services**
- The TEFIS platform integrates **7 complementary experimental facilities,** including **network and software testing facilities**, and **user-oriented living labs**

www.tefis.hu

OpenFlow in Europe – Linking Infrastructure and Applications

Objectives:

- To create a **unique experimental facility** that allows researchers to not only experiment on a test network but to **control the network itself precisely and dynamically**
- The OFELIA facility is based on **OpenFlow**, a currently emerging networking technology that allows to **virtualize and control the network environment** through **secure and standardized interfaces**

www.fp7-ofelia.eu

Cognitive Radio Experimentation World

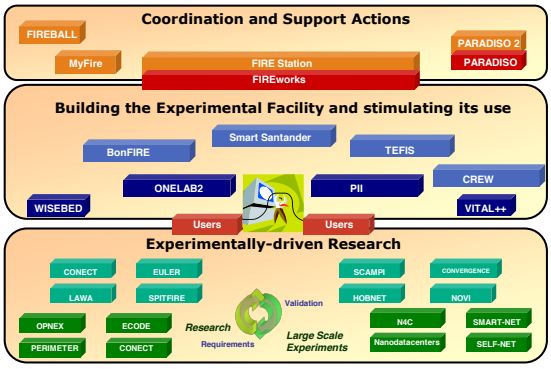
Objectives:

- To build an **open federated platform** for experimentally-driven **research on advanced spectrum sensing**, **cognitive radio and cognitive networking strategies** in view of horizontal and vertical spectrum sharing in licensed and unlicensed bands
- The CREW facility will **incorporate 4 individual wireless testbeds incorporating diverse wireless technologies** (heterogeneous ISM, heterogeneous licensed, cellular, wireless sensor) augmented with state-of-the-art cognitive sensing platforms

www.crew-project.eu

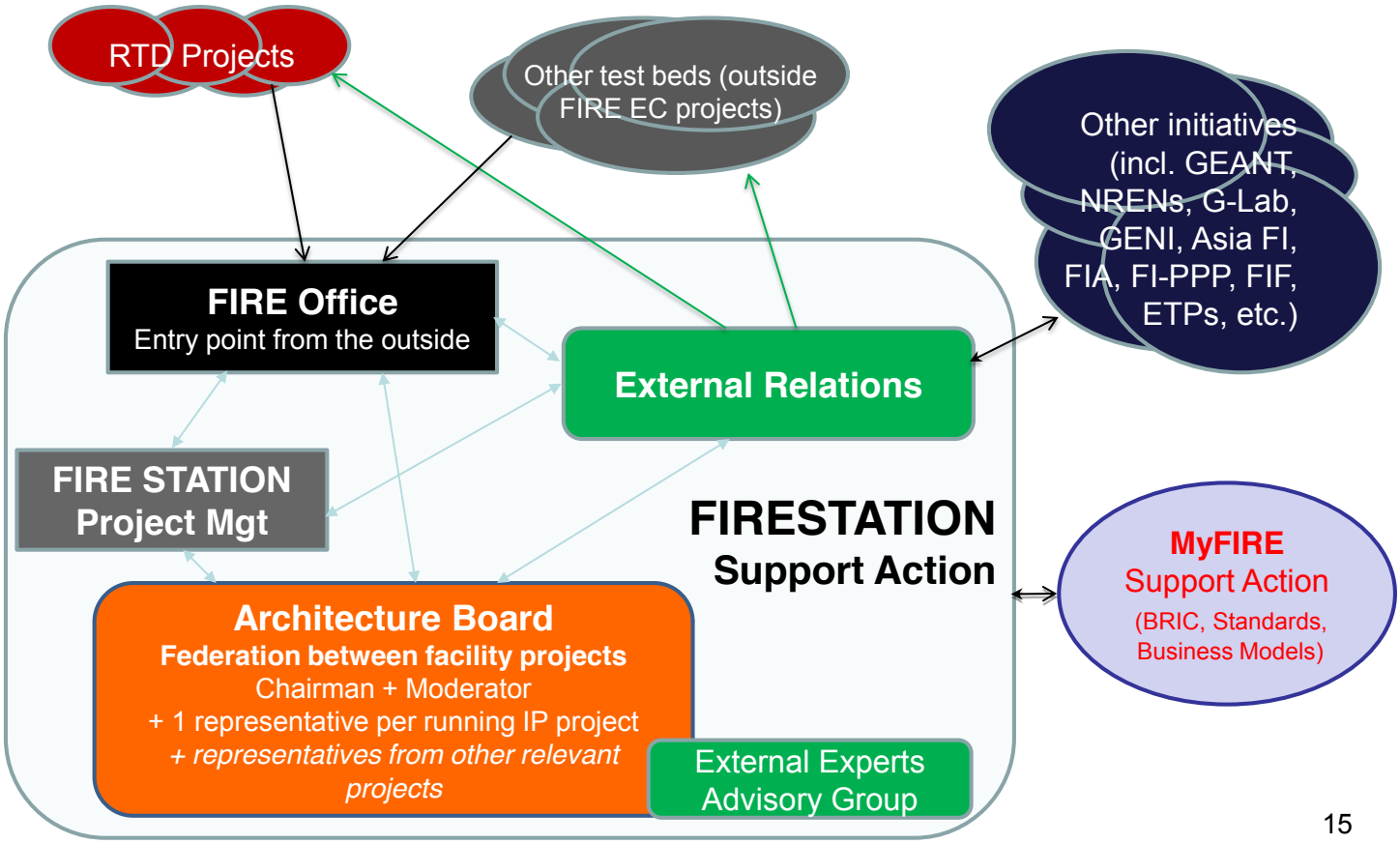
What is new in second wave FIRE projects

- Expanded scope related to networking and beyond:
  - Service architectures and clouds
  - Sensor networks
  - New networking issues:
    - Cognitive radio,
    - OpenFlow

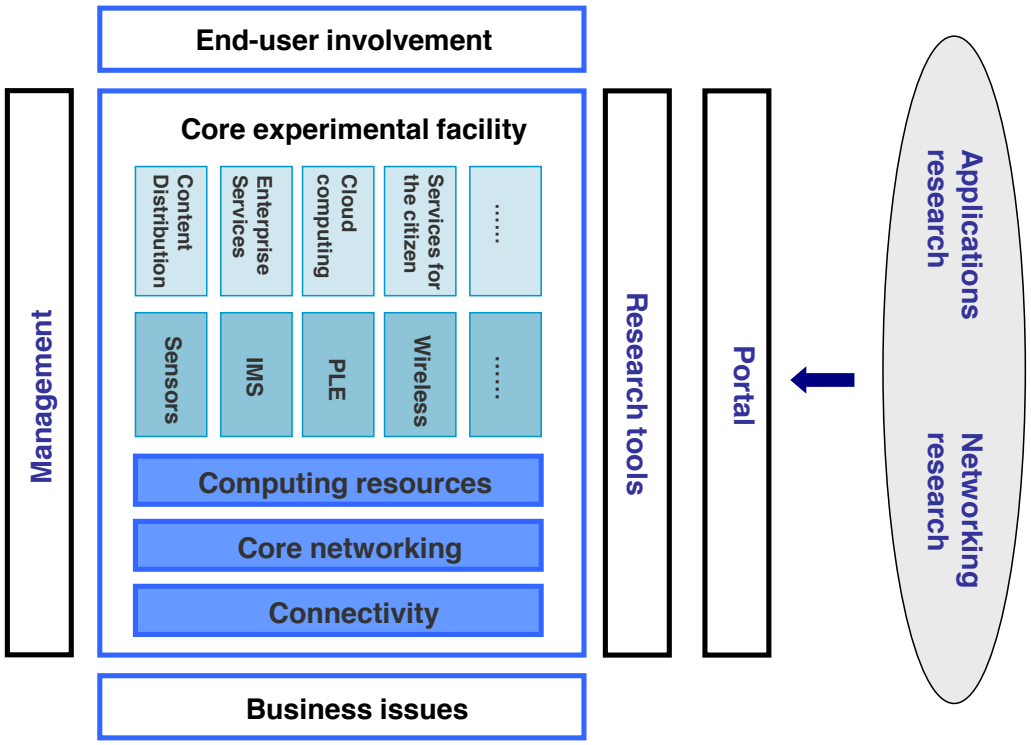


- Increased emphasis on system level
  - Some FIRE research projects focus on system-level testing
- Support for demand-driven open federation of facilities
  - Joint Architecture Board moderated by FIRESTATION
  - 20% of budget in each new facility project reserved for federation between facilities

The FIRESTATION Support Action

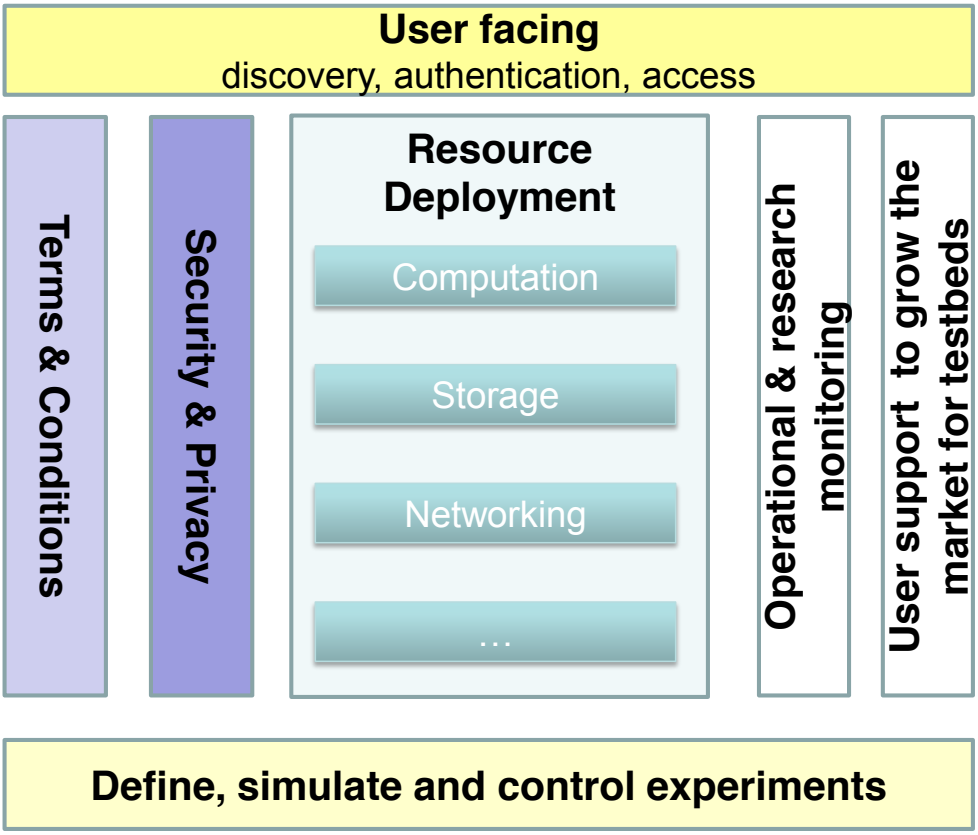


Towards a collaboration and high-level federation structure for the FIRE Facility



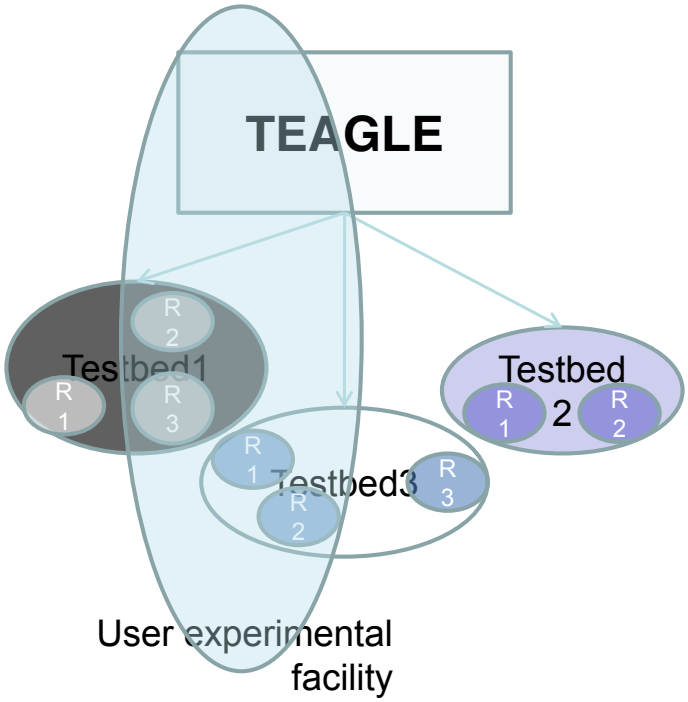
Published in July 2009 by the Working Group on modular federation of FIRE Facilities

Facility evolution

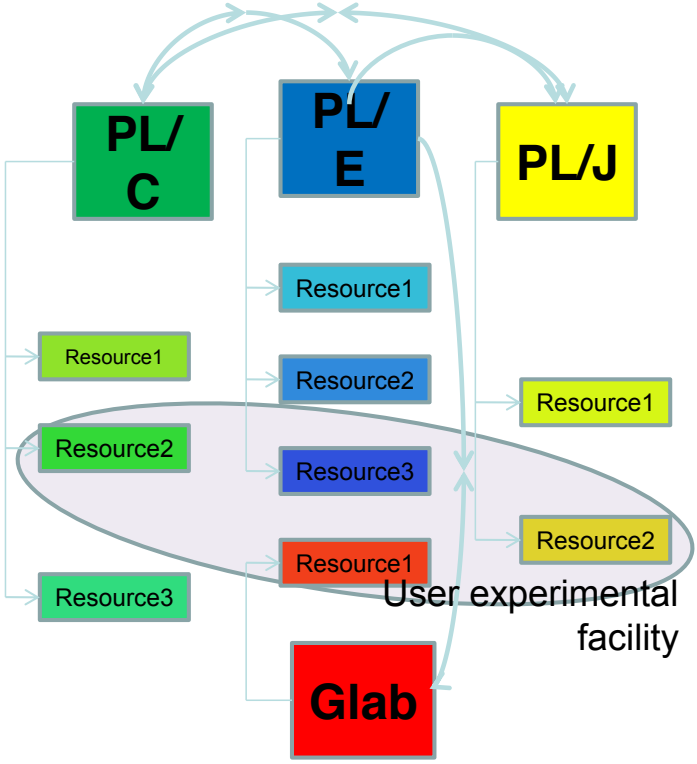


Federation models

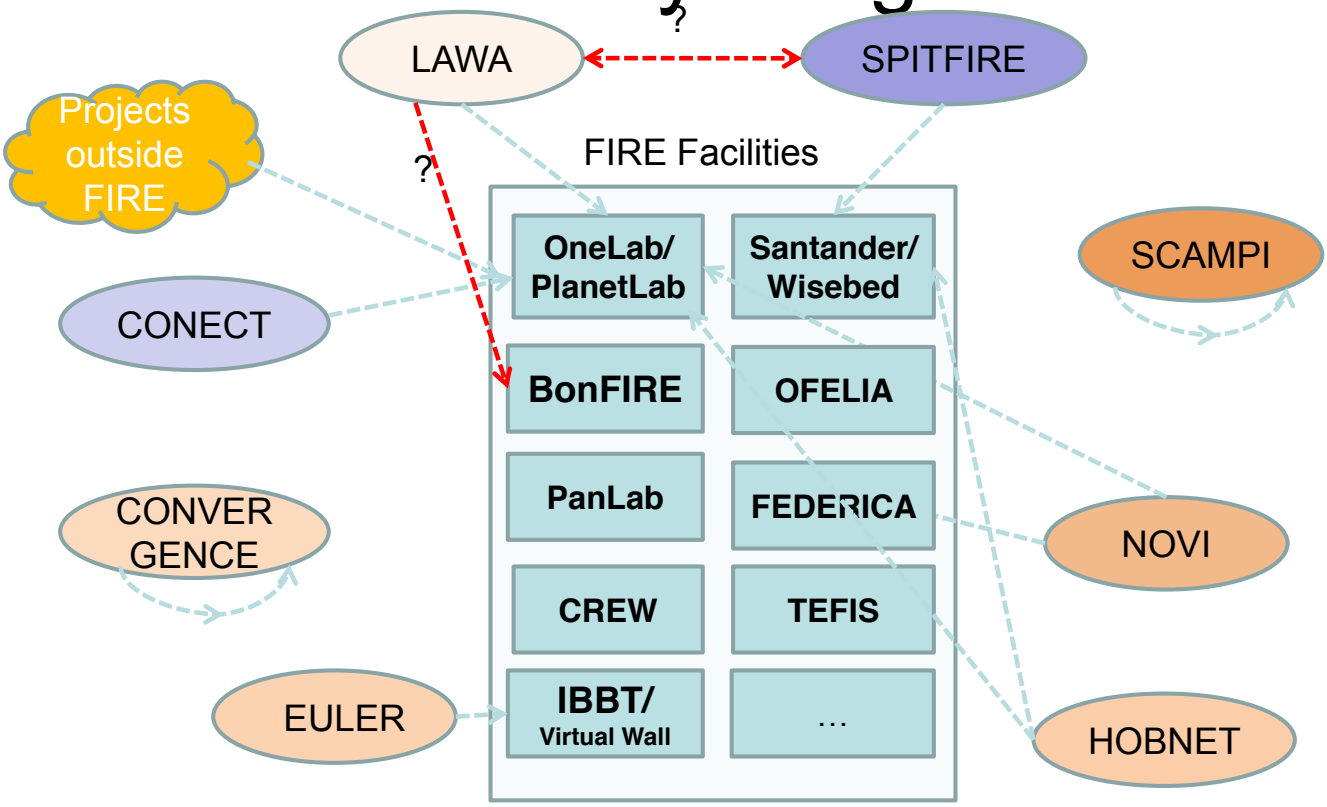
PanLab Model



SFA/PlanetLab Model



Research projects and facility usage



Further information will appear on

www.ict-fire.eu