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Integrating experiments and facilities in FIRE+

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The standards and innovations accelerating tool

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Abstract

This deliverable is a public description of the F-Interop project in terms of main objectives, technical approach, key issues and expected impact. It is intended for use in publications of the European Commission and the project.

F-INTEROP - FIRE+ online interoperability and performance test tools to support emerging technologies from research to standardization and market launch. The standards and innovations accelerating tool

F-Interop

FIRE+ online interoperability and performance test tools to support emerging technologies from research to standardization and market launch.

The standards and innovations accelerating tool

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Duration: *36 months from November 2015 to October 2018*

Type of Action: *Research and Innovation*

Total Cost: *€ 3'897'885*

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Main Objectives

By 2020, the Internet of Things (IoT) is expected to connect 50 to 100 Billion smart things and objects. In order to be widely adopted, new technologies, products and solutions go through several steps:

1. **Standardization**: stakeholders discuss and align their views on a common standard.
2. **Conformance & Interop.**: test and validate that an implementation conforms to the standard.
3. **Optimization**: in terms of Quality of Service, scalability, energy consumption, etc.
4. **Market Launch**: the solution is ready for roll-out into the market.

Each phase requires extensive testing, where different vendors meet face-to-face to test interoperability by going through an exhaustive list of "interoperability tests". The consequence is that:

- The current process is extremely labor-intensive, as engineers travel across the globe often only to find out what they need to make a minor fix;
- The cost associated with engineering time and travel expenses is often too high for SMEs;
- Time-to-market is unnecessarily stretched, giving vendors who want to adopt emerging standards a disadvantage compared to vendors who come to market with entirely proprietary solutions.

This process often scares vendors away from standards based solutions. End-users are therefore often and unnecessarily locked into proprietary solutions, as standards-based products haven't hit the market when they buy their first product.

F-Interop proposes to extend FIRE+ with *online and remote* interoperability and performance test tools supporting emerging technologies from research to standardization and to market launch. The outcome will be a set of tools enabling:

- **Standardization communities to save time and resources, to be more inclusive with partners who cannot afford travelling, and to accelerate standardization processes**;
- **SMEs and companies to develop standards-based interoperable products with a time-to-market cut by 6-12 months, and significantly lowered engineering/financial overhead**.

F-Interop will position FIRE+ as an accelerator for new standards and innovations.

Technical approach and outcomes

The goal of F-Interop is to extend FIRE+ with online interoperability and performance test tools supporting emerging IoT-related technologies from research to standardization and to market launch for the benefit of researchers, product development by SME, and standardization processes. Specifically, F-Interop will:

Integrate and extend several FIRE+ testbeds federations with a shared "Testbed as a Service"

F-Interop will mutualize 3 testbed federations and facilities, bringing together over 32 testbeds and 4755 nodes by bringing together:

- **Fed4FIRE**, which federates 24 FIRE+ testbeds, bringing together cloud, IoT, wireless, wireless mobile, LTE, cognitive radio, 5G, openflow, SDN, NFV and network emulation technologies.
- **OneLab**, which federates testbeds for the future Internet, including IoT, cognitive radio, wireless and overlay network technologies
- **IoT Lab**, which federates crowdsourcing and crowd-sensing testbeds, including smart campus, smart building and smart office testbed.

F-Interop will research and extend the Fed4FIRE architecture model with a new layer enabling shared services among several testbed federations. It will design a common reference architecture model for on-line test and standardization support in close collaboration with Standards Development Organizations. It will develop a "Testbed as a Service" (TBaaS) enabling remote access and interaction with the experimental platform.

Extend FIRE+ through research and development of online testing tools for the IoT, including:

- Interoperability testing tools;
- Conformance testing tools;
- Scalability testing tools;
- Quality of Service (QoS) testing tools;
- Quality of Experience (QoE) testing tools;
- Energy efficiency testing tools.

Support IoT standardization and enable closer cooperation with the industry

F-Interop will work in close collaboration with standardization bodies, directly contributing to three global emerging IoT standards: oneM2M, IETF 6TiSCH and Web of Things (W3C). It will also explore the possibility to support and enable new online certification and labelling mechanisms such as the IPv6 Ready logo. More generally, F-Interop intends to enable an easier participation of researchers and industry in the standardization process. It will also run an open call for SMEs and developers, inviting them to use and enrich the developed testing platform with additional modules and extensions.

Expected Impact

The F-Interop intends to provide an accelerator for new standards and innovations. It will provide online interoperability and performance test tools supporting emerging technologies from research to standardization and to market launch. It will permit research and development teams to test their products development and implementations remotely and at any time. It will directly support:

- **Standardization communities**, by enabling them to save time and resources, to be more inclusive with partners who cannot afford travelling, and to accelerate standardization processes;
- **SMEs and companies**, by enabling them to develop standards-based interoperable products with an estimated time-to-market cut by 6-12 months, and significantly lowered engineering and financial overhead.
- **Academic community,** by providing a new set of online tools to support their own research and development, as well as by reducing the financial barrier to their participation in standardization processes.

F-Interop will provide standardization support to several emerging IoT standards at ETSI (with a focus on 6TiSCH), IETF (with a focus on oneM2M) and W3C (with a focus on Web of Things). The F-Interop architecture will be design to be easily extensible and to enable new standards to be added to the available test plans. Standards and test plans will be developed side-by-side resulting in faster publication of better standards. This can also support certification and labeling processes for those standards.

More generally, faster availability of standards-based products is expected to result in wider adopt standards and a larger portion of interoperable products. F-Interop is also expected to contribute to improving European support and influence on global standardization processes.

Consortium

The consortium includes the coordinators of the 3 targeted FIRE+ testbeds (Fed4Fire, OneLab, IoT lab). Its members bring expertise from complementary research projects and have strong links with standardization bodies and international fora. This will ensure the alignment of the research with the industry needs, and an effective exploitation and transfer of F-Interop results into standards, products and services.