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# D6.04: Fed4FIRE+ Dissemination and Communication Report and Updated Plan

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| Reviewers | Peter Van Daele (imec) |
| Abstract | This deliverable defines and describes the dissemination and communication strategy and set of activities that have been pursued by the Fed4FIRE+ partners in the period (M19- M36) of the project to guarantee broad and effective visibility, promotion and up-take of the project's work and outcomes. It also outlines the activities foreseen for the third period (M37-M60) |
| Keywords | Dissemination, communication, events, impact creation. |

### Document Revision History

| Version | Date | Description of change | List of contributor(s) |
|---|---|---|---|
| V0.1 | 22/11/2019 | TOC | M.C. Campodonico (Martel) |
| V0.2 | 10/12/2019 | Partners Contributions | F4F+ partners |
| V0.3 | 13/12/2019 | First complete version | M. Facca, M.C. Campodonico (Martel) |
| V1.0 | 31/12/2019 | Final version | Peter Van Daele (IMEC) |

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|---|---|---|
| **Nature of the deliverable:** | | **R** |
| **Dissemination Level** | | |
| **PU** | Public, fully open, e.g. web | ☐ |
| **CL** | Classified, information as referred to in Commission Decision 2001/844/EC | |
| **CO** | Confidential to FED4FIRE+ project and Commission Services | |

** R: Document, report (excluding the periodic and final reports)*
*DEM: Demonstrator, pilot, prototype, plan designs*
*DEC: Websites, patents filing, press & media actions, videos, etc.*
*OTHER: Software, technical diagram, etc.*



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# EXECUTIVE SUMMARY

This deliverable presents the various dissemination and communication activities conducted by the Fed4FIRE+ consortium, as well as the actions taken to raise public awareness in the second period of the project (M37-M48). As the project is providing an improvement of the federation of experimentation facilities built in Fed4FIRE, the dissemination has harvested fruitful results since the beginning of the project. Such activities are led by MARTEL Innovate and have been actively contributed by the entire consortium.

The different communication channels and dissemination tools identified at the beginning of the project were used in order to promote the main news, activities and results of the project:

- Fed4FIRE+ specifically organized number six FEC and foresees one in March 2020
- Fed4FIRE+ has participated in more than 20 relevant external events and presented itself to relevant stakeholders
- More than10 scientific publications have been published presenting advances marked by Fed4FIRE+
- Over 5 demonstrations and workshops were conducted in the reporting period
- Standardization activities: The results from the Fed4FIRE+ project during the first period were used through a contribution to the ITU-T Study Group 20 (SG20) on IoT and Smart Cities and Communities. More details are given in the section 3.9 of this document. In addition to these inputs, C01 imec also developed an open source reference stack for WiFi (802.11a/g/n, 802.11ax is under development) running on software defined radios (FPGA based). This was developed within the H2020 ORCA-project but has been implemented on Fed4FIRE+ testbeds at imec.

Altogether, Fed4FIRE+ has widely promoted its results and activities to more than 2,000 users (including subscribers to social media channels, mailing lists and website visitors). Additionally, Fed4FIRE+ has engaged 500s of participants in events.

Based on the results and outcomes from the first year of the project, the strategic view of the Fed4FIRE+ dissemination and communication effort was more strongly exploited to maximize the impact of the Federated testbeds within the communities of target stakeholders. A specific attention was paid on Next Generation Internet (NGI) events/workshops and target stakeholders (SMEs, Startups, Researchers) which may/will need test facilities to be able to test their HW/SW design or prototypes in two ways by using the cascade funding system and by accessing freely to the resources available from the Federated testbeds. Such effort includes:

- Continuation of active promotion of project branding and outputs through different channels
- Extending promotion to NGI events and workshops including a collection of best practices and success stories from SME experimenters
- Development of tutorials and training activities such as students' workshops and tutorial for experimenters
- Publication of scientific articles and presentation in international peer-reviewed journals and conferences
- Contribution to Standardisation and interoperability of experimental facilities.
- Contribution to Exploitation.



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# ABBREVIATIONS

| | |
|---|---|
| **FEC** | Fed4FIRE+ Engineering Conference |
| **FIA** | Future Internet Assembly |
| **FI-PPP** | Future Internet Public Private Partnership |
| **FIRE** | Future Internet Research and Experimentation |
| **GENI** | Global Environment for Network Innovations |
| **NGI** | Next Generation Internet |
| **RTD** | Research and Technical (or Technological**)** |
| **CENI** | EU-China-FIRE project |
| **FIWARE** | Future Internet Core Platform |
| **5GPPP** | 5G Infrastructure Public Private Partnership |



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# 1 INTRODUCTION

**D6.4 is the Dissemination and Exploitation Report for Period 2: July 2018 - December 2019.**

This document provides in detail the dissemination and exploitation activities performed during Period 2 (M19: July 2018- M36: December 2019), as well as presents a series of actions planned for Period 3 (M37: January 2020 to M60: December 2021). The grounding of such activities was clearly defined and guided by both the Description of Action (DoA) and Deliverable (D) 6.2 – Dissemination an exploitation plan; D6.3 - Dissemination and Communication Report and Updated Plan.

The purpose of the current deliverable is therefore two-folded: 1) to report on the Fed4FIRE+ project's dissemination and exploitation activities held from month 19 to month 36, that is an intermediate report covering the Period 2 of the project; and 2) to lay out the plan for Fed4FIRE+'s Period 3 activities related to dissemination and exploitation, ensuring the fulfilment of targets and supporting the successful conclusion of the project.

To further detail the dissemination and communication activities conducted during Period 2 and the plan for Period 3, the remaining part of the document is organised as follows:

- Section 2 focuses on activities undertaken and followed in Period 2 of the project.
- Section 3 foresees planned activities in Period 3 of the project.
- Section 4 briefly summarises the key points of the document and orient towards future tasks.



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# 2 FED4FIRE+ UPDATED DISSEMINATION & PROMOTION STRATEGY

## 2.1 OBJECTIVES

The main objectives of the dissemination, communication and community building strategy and activities are to:

- Reach, stimulate and engage a critical mass of relevant stakeholders. European Industry, represented by large companies and SMEs, and the NGI community, represented by other research projects, are privileged potential users of the experimentation facility.
- Generate broad awareness for European industry and H2020 projects about Fed4FIRE+ work and services, attract them to join the federation, use the offered facilities, and encourage the uptake and reuse of the free open-source tools that the project develops. The open engineering conferences around Europe will help in this.
- Ensure broad visibility of the project's work and disseminate results to the FIRE+ community and beyond. Fed4FIRE+ aims to contribute to and inform the overall scientific community of its results through publication of articles, and through presentations at conferences and workshops. Particular attention will be paid to fostering dialogue with related R&D efforts also at an international scale, by ensuring liaisons and close coordination with initiatives such as GENI, FIWARE Mundus, CENI, etc.
- Contribute to standardisation and interoperability of experimental facilities. By aligning Fed4FIRE+ efforts to relevant standards and open source initiatives, fostering contribution to them as appropriate and relevant to planned exploitation or project's outcomes, will contribute to ensure sustainability and interoperability of the federated experimental infrastructures and technologies Fed4FIRE+ offers.
- The sustainability of the Federation is done in close cooperation with the Task 2.4 as the marketing activities within WP6 are the drivers for an efficient access to the resources made available within Fed4FIRE+ project. To this scope a Marketing strategy has been identified.

These objectives remain at the core of the project's communication strategy for the Period 3 (M37-M60).

## 2.2 REACHING A BROADER AUDIENCE: FED4FIRE+ MARKETING STRATEGY

Direct feedback from experimenters has told us that the Federator offers real benefits to both experimenters and testbeds:

- the Fed4FIRE+ Jfed tool that sets up experiments is easy to use, and once you have learnt it, you can access all the testbeds within Fed4FIRE+. Many experimenters said they would run more experiments beyond their original experiment (without funding), now that they have found out it is so easy. One experimenter said "**just a few clicks and you have an experiment**".
- Having a wide variety of **testbeds available from in one place: the Fed4FIRE+ portal is very useful.**
- The resources provided by the testbeds can be expensive. Experimenters cannot justify buying them, so **being able to use the expensive resources on a temporary basis, free of charge, is great**.



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- The **independence and integrity of the testbeds is great for both academic and commercial** work – there can be no claim that results using the testbeds can be biased by the tester.
- Fed4FIRE+ should stress that the **testbed resources are available to any experimenter FOR FREE!** Just make a request through the website.

This value provides evidence when building a case for continuation funding, which is a key sustainability objective. However, to build a strong case, we need more users coming to Fed4FIRE+, especially via the so-called “open access” model, where experimenters get resources for free, but are not funded for their time.

To achieve this, our perception is that first and foremost we need to disseminate Fed4FIRE+'s value more clearly and more widely than before. The key point is to target people beyond, as well as, the “usual suspects” (meaning people who know about EC projects, FIRE, NGI, etc).

These factors have determined our primary immediate marketing and communication objective, which is to attract more and diverse users: there is therefore a clear need for marketing analysis to determine additional users, their needs and how Fed4FIRE+ can help them coupled with pro-active, targeted, dissemination of Fed4FIRE+ and its benefits to the users. In the Federation Board meeting of 15 Oct 2019, it was decided to look for and if necessary to dedicate specific effort to possible actions to active marketing and associated targeted dissemination of the federation and Federator, with the specific objectives of attracting additional users, especially from outside its usual users, and to build on the existing brand of Fed4FIRE.

The following sections contain recommendations for extending the reach of Fed4FIRE+’s communication activities, all with the objective of reaching new and diverse users. These recommendations should be further discussed within the consortium as some of these might require shifts and transfers of financial means amongst partners and may also result in shifting efforts of some partners in other tasks and activities.

### 2.2.1 TARGETING USERS

A key recommendation is to understand Fed4FIRE+’s “customers”. Who are they and what are their key needs?

It is recommended that user types are identified. A starting point set of target users is:

- Academic researchers
- SMEs - mainly working in ICT sector
- Startups / entrepreneurs – most likely in tech sectors
- Industry
- Specific sectors that Fed4FIRE+ can help with, e.g. computer, internet, automotive, factories etc

For each type of testbeds user, we investigated the following questions.



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- What are their key problems or pressing needs[1]?
- How can Fed4FIRE+ help their problems? What is the key solution that Fed4FIRE+ can provide? What key features of Fed4FIRE+ are of particular benefit to them? (val prop canvas)
- How do we reach them? What websites / mailing lists / places do they go to in order to get information? In each country?

### 2.2.2 WEBSITE

A part of the marketing strategy the project website will be targeted towards users, rather than as a front page for a project.

**Generic Messages**

- Simple description of Fed4FIRE+
  - State-of-the art, highly configurable Cloud computing / Networking / IoT / Wireless / etc experimentation resources are available to run tests or experiments on, all free of charge
  - Easy to use tools – a few clicks and you have an experiment setup
  - Resources are available for free all the time – just request them
  - Help and support is available to run your tests / experiments (to evaluate whether enabling experimenters to pay testbeds for supporting experiments, otherwise basic best effort for open access)
- Funding availability for specific types of experiment
  - Open calls – get funded to run your experiment (funding from €10k to €100k) – focused infrequent calls, high bar for entry, large funding
  - SME lightweight / fast turnaround call – clearly suitable for SMEs / startups (funding from €10k) – quick turnaround, fast start, small funding
- 2-line case studies with pictures and quotes from participants

**User-Specific Messages**

- SME / startups – test your tech product in a realistic environment (e.g. in a realistic noisy wireless internet situation)
- Academics – reliable resources to run research experiments on to generate high-quality, publishable data

### 2.2.3 Primary Dissemination and Promotion Channels

Following the objectives and planned activities as detailed in D6.3, a broad array of dissemination channels is used to effectively reach the targets groups and to maximise awareness of the overall project's work and outcome. The synergy of Fed4FIRE+ dissemination is generated through seamless connected online and offline communication activities. Both online (e.g. website and social media) and offline channels (e.g. events) are

[1] Analytical tools are available to understand "customers" on these websites: https://innovationcanvas.ktn-uk.org/resources/ and https://www.strategyzer.com/canvas



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constantly used to disseminate Fed4FIRE+ related activities and project actions throughout Europe and beyond.

Here after is reported the table of the dissemination channels used to reach each target group.

*Table 1: Dissemination & Promotion Channels per target group*

| Channel/ Target Group | Next Experimenters | Industry/SME/ startups | Innovators & Researchers | Standardization Bodies | General Public |
|---|---|---|---|---|---|
| **Website** | X | X | X | X | X |
| **Social networks** | X | X | X | X | X |
| **Project Newsletter** | X | X | X | | |
| **FEC Conferences** | X | X | X | X | |
| **Third parties events7CONFERENCES** | X | X | X | X | |
| **Scientific Publications** | X | | X | X | |
| **PR materials (e.g. Flyers)** | X | X | X | X | X |
| **National startup accelerators or entrepreneur / innovation support** | X | X | X | X | X |
| **National / local chambers of commerce** | X | X | X | X | X |
| **General Media** | | | | | X |

In Period 3, Fed4FIRE+ partners will adapt and extend their communication efforts to include the newly available channels in the framework of the NGI initiative through the contacts all project partners have within this community.

Fed4FIRE+ orchestrates dissemination messages through multiple, different channels, targeting different user groups, aimed at attracting new experimenters, e.g. by advertising open calls, open access etc, along with the benefits of Fed4FIRE+. As part of this set of dissemination channels a new concept of a Fed4FIRE+ Roadshow will be tried out prior to the next project review so it can be evaluated at that time. This roadshow concept exists of organizing a 1-day event, organized in collaboration with local accelerators, organizations for high-tech entrepreneurs, local chambers of commerce... in an area or region with a high concentration of high-tech companies and start-ups. This event would be focussed on presenting Fed4FIRE+ facilities, the Open Access model, as well as testimonials and hands-on tutorials on how to set up experiments. The idea is inspired by similar events organized by other projects e,.g. the H2020-project ACTPHAST as well as the Hub4NGI-project. Increasing presence at major events within the NGI community will also increase the visibility of the Fed4FIRE+ facilities to those new stakeholders.



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### 2.2.4 FED4FIRE+ MARKETING MANAGER

Fed4FIRE+ considers appointing a Marketing Manager. The appointment may be from within one of the existing partners, but he/she has specific responsibilities additional to standard project dissemination. The key objective is to increase users of Fed4FIRE+ in regular open calls, SME open calls and open access. KPI to measure performance: number of new users in the open calls and open access per month.

Initial discussions have indicated that appointing such a Marketing Manager might require a significant change in budget allocation amongst the partners. The recommendations below have therefore to be considered as very preliminary and a draft to be further discussed within the consortium.

Possible **Fed4FIRE+ Marketing Manager Duties** have been identified

- Determine a marketing strategy for Fed4FIRE+ to be presented to the board
  - Define Fed4FIRE+ marketing objectives, why they are important, KPIs to measure performance against objectives and plan to achieve the objectives
- Undertake a proper, detailed market analysis to understand the value proposition of Fed4FIRE+
  - Which market segments could use Fed4FIRE+? What pains do they have and how does Fed4FIRE+ address them?
  - E.g. use the https://www.strategyzer.com/canvas/value-proposition-canvas
- Maintain a list of channels to advertise Fed4FIRE+ open calls and open access
  - E.g. go round the project partners getting places to advertise from their country
- Seek out new channels beyond the usual channels we always use
- Determine advertising messages and media (e.g. graphics) to attract new users
  - Tune messages to target audience
- Monitor the effectiveness of the advertising message and channels
  - Determine KPIs to measure effectiveness of message and effectiveness of channels

In case the consortium decides to allocate funds to the role of a Marketing Manager, some possible **Fed4FIRE+ Marketing Manager Outputs** that may be included in the final dissemination report D6.05 can include:

- Market analysis of user segments, gains, pains, how Fed4FIRE+ can help
- Database of advertising channels reporting statistics such as new users
- Demographic stats, e.g. where from, discipline etc
- Advertising materials



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# 3 DISSEMINATION ACTIVITIES: M19-M36 (JUL 2018 - DEC 2019)

Fed4FIRE+ has been involved in several dissemination and communication activities, led by CERTH (Leader of WP6) and supported by Martel. During Period 2, the consortium has ensured a fruitful promotion of the Fed4FIRE+ project and its results, mainly including the following:

1. Publishing news items and updated on the Fed4FIRE+ website: www.fed4fire.eu
2. Setting up the project websites for each edition of the Fed4FIRE+ Engineering Conferences (FEC): www.fecN.fed4fire.eu
3. Setting up the website presenting the past and forthcoming editions of the FECs: www.fec.fed4fire.eu
4. Contributing to keeping alive the project Twitter account with relevant news
5. Developing and distributing the newsletter
6. Organising twice a year Engineering Conferences (FECs)
7. Creating promotional materials
8. Publishing/submitting/presenting scientific papers
9. Contributing to Standardisation and interoperability of experimental facilities

It is essential to point out that, Fed4FIRE+ consortium has been dynamic to identify multichannel approaches to maximise the impact of the Dissemination and Communication activities.

## 3.1 COMMUNICATION CHANNELS AND MARKETING MATERIALS

The Fed4FIRE+ project supports impact creation activities through a number of dissemination channels and marketing materials. Presentation of different channels and materials developed was described in detail in D6.1 and includes the project's brand identity, the templates for Word documents, PPT presentation, and the promotional material.

## 3.2 ONLINE COMMUNICATION

### 3.2.1 Official web portal

In summary, by the time of writing this report (December 2019), the website has had from the beginning of the project, after the website was put online (June 2017), **21678 unique visitors**, who generated **a total of 83923 page views**. The average of page view per sessions is approximately 2,27 (pages), with 1,71 session per user for a total of 37028 sessions. Regarding specific pages on the website, the most popular one, after the homepage, is the



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**Opencall** page[2], with a total of 5585 page views and an average time on page of 00:00:55, followed by **Testbeds** page[3], with 4943 page views and an average time on page of 00:01:15.

The following figures reports the main statistics of the project. **Figure 1 (Traffic Overview)**, **Figure 2 (Top Visited Pages)** and **Figure 3 (Visit Devices)**.

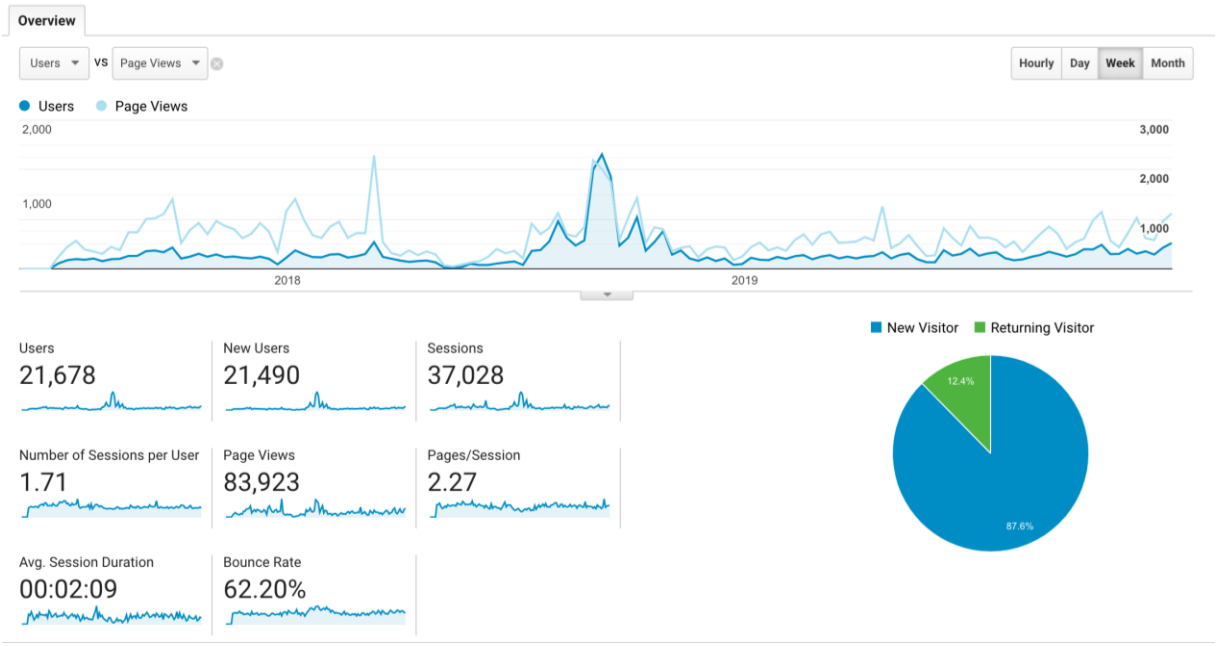


*Figure 1: Traffic Overview – User and Page views*

| Page Title | Page Views | Unique Page Views | Avg. Time on Page | Entrances | Bounce Rate | % Exit |
|---|---|---|---|---|---|---|
| | 83,923 % of Total: 100.00% (83,923) | 69,025 % of Total: 100.00% (69,025) | 00:01:42 Avg for View: 00:01:42 (0.00%) | 37,025 % of Total: 100.00% (37,025) | 62.20% Avg for View: 62.20% (0.00%) | 44.12% Avg for View: 44.12% (0.00%) |
| 1. Home - FED4FIRE+ | **15,561** (18.54%) | 13,757 (19.93%) | 00:01:22 | 12,994 (35.10%) | 61.34% | 56.53% |
| 2. Open calls - FED4FIRE+ | **5,585** (6.65%) | 4,212 (6.10%) | 00:00:55 | 2,309 (6.24%) | 42.88% | 28.72% |
| 3. Testbeds - FED4FIRE+ | **4,943** (5.89%) | 3,342 (4.84%) | 00:01:15 | 1,366 (3.69%) | 47.80% | 25.71% |
| 4. Continuous Call "SME Cascaded Experiments" - FED4FIRE+ | **2,324** (2.77%) | 1,943 (2.81%) | 00:03:06 | 829 (2.24%) | 73.82% | 57.75% |
| 5. Run your Experiment - FED4FIRE+ | **2,294** (2.73%) | 1,933 (2.80%) | 00:01:35 | 549 (1.48%) | 67.40% | 40.85% |
| 6. 3RD FED4FIRE+ OPEN CALL - Experiments - FED4FIRE+ | **1,762** (2.10%) | 1,527 (2.21%) | 00:03:00 | 629 (1.70%) | 74.40% | 59.19% |
| 7. About Fed4Fire+ - FED4FIRE+ | **1,750** (2.09%) | 1,456 (2.11%) | 00:02:19 | 447 (1.21%) | 59.96% | 42.17% |
| 8. 4TH FED4FIRE+ OPEN CALL - Experiments - FED4FIRE+ | **1,647** (1.96%) | 1,403 (2.03%) | 00:03:01 | 872 (2.36%) | 74.11% | 64.97% |
| 9. 6TH FED4FIRE+ OPEN CALL - Medium Experiments - FED4FIRE+ | **1,292** (1.54%) | 1,088 (1.58%) | 00:03:11 | 500 (1.35%) | 72.40% | 60.84% |
| 10. Smart Santander - FED4FIRE+ | **1,197** (1.43%) | 1,026 (1.49%) | 00:02:29 | 625 (1.69%) | 82.40% | 58.15% |

*Figure 2: Top Visited Pages*

[2] www.fed4fire.eu/opencalls/

[3] www.fed4fire.eu/testbeds/



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Finally, 86% of our visitors gained access to our website through their desktop (more traditional means), while the rest used mobile devices (12%). Based on these data, it will be beneficial to continue promoting and including contents that are of interest to the stakeholders, while disseminating project results.

| Device Category | Acquisition | | | Behaviour | | |
|---|---|---|---|---|---|---|
| | Users | New Users | Sessions | Bounce Rate | Pages/Session | Avg. Session Duration |
| | 21,678<br>% of Total: 100.00% (21,678) | 21,498<br>% of Total: 100.04% (21,490) | 37,028<br>% of Total: 100.00% (37,028) | 62.20%<br>Avg for View: 62.20% (0.00%) | 2.27<br>Avg for View: 2.27 (0.00%) | 00:02:09<br>Avg for View: 00:02:09 (0.00%) |
| 1. desktop | **18,609** (86.46%) | 18,567 (86.37%) | 32,607 (88.06%) | 61.78% | 2.32 | 00:02:16 |
| 2. mobile | **2,624** (12.19%) | 2,642 (12.29%) | 4,021 (10.86%) | 65.41% | 1.85 | 00:01:14 |
| 3. tablet | **291** (1.35%) | 289 (1.34%) | 400 (1.08%) | 64.75% | 1.87 | 00:01:06 |

*Figure 3: Visit Devices*

The following Figure 4 shows the current homepage of the project.


*Figure 4: Fed4FIRE+ Homepage*



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### 3.2.2 FEC dedicated pages

*As described in D6.2 to have a more effective dissemination on the Engineering Conference that are foreseen during the 5 years of the project, dedicated websites have been created.*

Each edition of the FEC has specific site inside the fed4fire.eu domain based on this model: **fecN.fed4fire.eu**, with N the edition of the conference.


*Figure 5: FEC6 website screenshot*

### 3.2.3 FECs gallery webpage

The gallery of the past and forthcoming editions of FECs is be available at: **www.fec.fed4fire.eu**


*Figure 6: FEC website screenshot*



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*Figure 7: FECs edition gallery*

### 3.2.4 Intranet

The Fed4FIRE+ private workspace will play an important role as the main internal repository for the project's Consortium as it provides different tools to facilitate project management as the repository, calendars, discussion area and a dedicated wiki. Its structure is flexible, dynamic and easily adaptable to each step of the project and to partners requirements. As a collaborative on-line tool, all partners can add information, discuss different subjects, create new spaces according to the evolution of the project and follow up on the advancement of the Work Plan and deliverables and Report from Open Call participants.
It has been made available by Imec at: https://cloud.ilabt.imec.be/

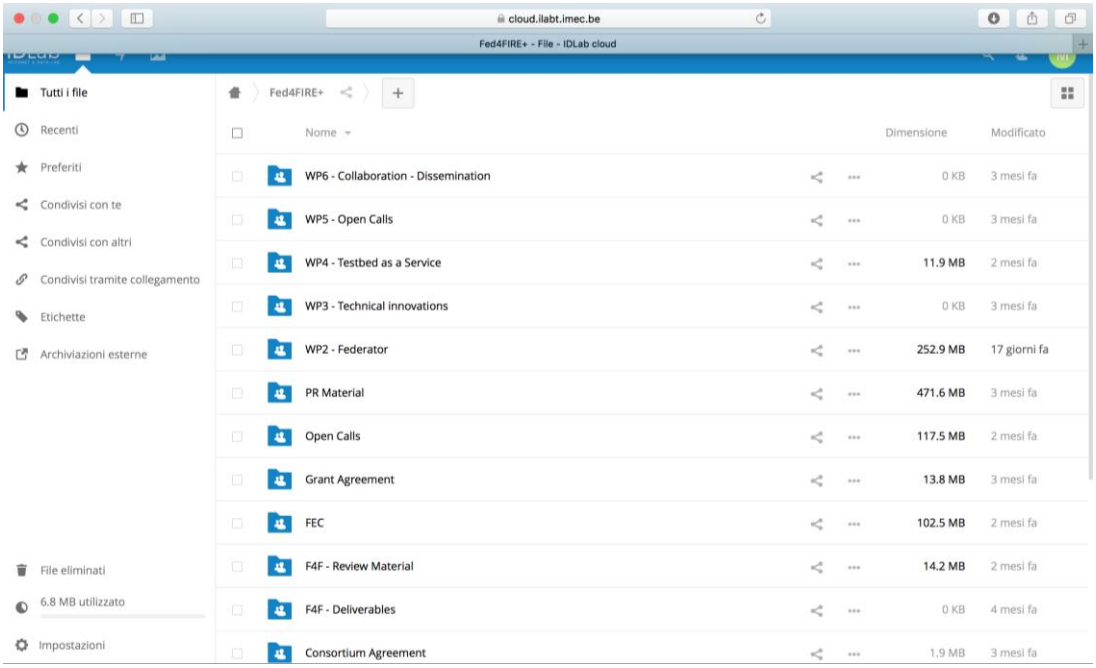


*Figure 8: a screenshot of Fed4FIRE+'s intranet*



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The workspace has proven to be very useful during this first reporting period in maintaining the projects documents and information in a single space accessible to all partners. Since the storage is physically at servers located at imec's premises, it is also easier to maintain.

### 3.2.5 Newsletter

It was agreed among the consortium to have an editions of e-newsletter to be publisher after each FEC describing the results and the topic discussed during the event the evolution of the project framework and announcing interesting news and promoting initiatives but also newsflash are used to announce, promote a specific event/activity. Five editions of the e-newsletters and 4 of e-newsflash have been distributed to stakeholders through Fed4FIRE+'s mailing lists as well as made available on the project website.

So far, **228** stakeholders have subscribed to receive Fed4FiRE+'s e-newsletters. In terms of further analysis on the efficiency of the communication:

- The first e-newsletter was sent to 105 subscribers / 46.6% opens / 16.5% clicks
- The second e-newsletter was sent to 169 subscribers / 45,5% opens / 24,2% clicks
- The third e-newsletter was sent to 217 subscribers / 35,8% opens / 17% clicks
- The fourth e-newsletter was sent to 218 subscribers / 49,8% opens / 13,5% clicks
- The fifth e-newsletter was sent to 228 subscribers / 27,3% opens / 11% clicks

To maximise dissemination impacts, the newsletters and newsflash have also bene distributed through other mailing lists controlled by individual partners, which keeps it more difficult to track. As an example excerpts of the newsletters are also included in newsletters form imec which is distributed worldwide to several thousand addresses.

**E-newsletter 5 (December 2019)**

The last e-newsletter of Fed4FIRE+, published on December 2019, promoted the report on FEC6 and collected all the news published covering the period May -December 2019. The following is the screenshots of the e-newsletter.



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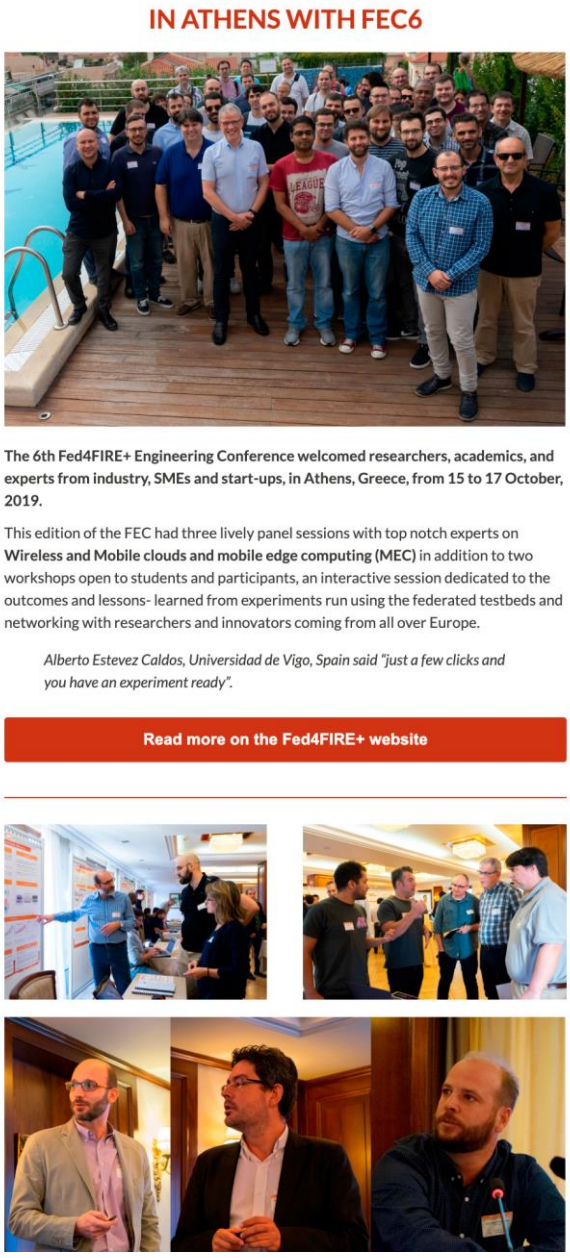


*Figure 9: A screenshot of Fed4FIRE+ e-newsletter 5*

**E-newsflash 4 (December 2019)**

The e-newsflash of Fed4FIRE+, published on December 2019, promoting the 7th Fed44FIRE+ Open Call for Large Experiments, the new opencall dedicated to cloud, big data and machine learning.



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*Figure 10: A screenshot of Fed4FIRE+ e-newsflash 4*

### 3.2.6 Social Media

Social media channels have been widely used to always widen the reach of the audience and to facilitate an interactive dialogue with relevant stakeholders and potential experimenters. Moreover, social media has been chosen to the support to the Open Calls promotion.

As per the D6.2 the social media used are built upon Fed4FIRE ones and are:

- The **Twitter Account**, currently has **401 followers** and has generated **2101 tweets**, https://twitter.com/Fed4Fire
- The **NGI-EXP Linkedin Group** has **682 members** and it been used to promote Fed4FIRE+ Open Calls and Fed4FIRE+ Engineering Conferences, Testbeds functionalities, etc. https://www.linkedin.com/groups/3361373
- The **Fed4FIRE Linkedin** company page has **12 members** and it been used to promote Fed4FIRE+ Open Calls and Fed4FIRE+ Engineering Conferences, Testbeds functionalities, etc. https://www.linkedin.com/company/fed4fireplus
- The **YouTube Channel** (https://www.youtube.com/channel/UCw-qixoqWLJ8qzEEGrRNQUA), with a total of **1794 views**



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### 3.2.7 Online education, tutorial and training materials

Fed4FIRE+ provides and offers online tutorials and training materials to facilitate uptake of the project outcomes to the target stakeholders, in particular small and medium businesses and new constituencies for new types of innovation-driven experimentation. Fed4FIRE+ reuses a number of tools and facilities developed within the Fed4FIRE project, builds upon any relevant outcome of the FIRE FORGE project and coordinates with any training activities planned at programme-level as relevant. The consortium maintains a portal with online documentation focused on how to create a free account, access the various facilities of Fed4FIRE+ and conduct experiments. The online documentation can be found on https://doc.fed4fire.eu/.

**NITOS Testbed Tutorial**

NITOS is heavily used for education in undergrad and graduate level. NITOS has created a full set of labs for several networking classes that are based on hands on experiments that run real time on NITOS. More details can be found at: https://nitlab.inf.uth.gr/NITlab/education

Moreover, NITOS is offering documentation with tutorials and examples focused on wireless and 5G experimentation. New experimenters can access the documentation at http://nitlab.inf.uth.gr/doc/.

**Virtual Wall & w-iLab.t Tutorials**

Besides the availability of the tutorials on the imec testbeds which are on the website (https://doc.ilabt.imec.be/ilabt/index.html), IMEC organizes on a regular basis tutorials in the framework of educational activities and courses. Attendance is typically around 20 to 40 people, with interests in the different imec testbeds available.

*Figure 11. Virtual Wall & w-iLab.t Tutorials*

**eWINE Iris Testbed Video Tutorial**

This tutorial guides experimenters through the process of executing a GNU radio OFDM experiment on the Iris testbed at Trinity College Dublin using the Fed4FIRE+ JFed experimenter toolkit. YouTube: https://youtu.be/ER_inWEip14).



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### SmartSantander Testbed Tutorial

Under the context of Fed4FIRE+, SmartSantander provides access to its sensor observations by using its own proprietary REST API, which is compatible with Fed4FIRE+ credentials. An interactive site to become familiar with this API as well as a detailed tutorial can be found at https://api.smartsantander.eu

### Iris testbed Tutorial Upgrade for Advanced SDR Experimentation

Updated tutorials to reflect the Iris testbed upgrade to support the OpenStack cloud platform. There are videos and supporting documentation supporting advanced experimentation in software defined radio[4].

### PSNC PL-LAB

PL-LAB provides to its users with two tutorials for guiding through the process of executing experiments in the federated testbed:

- The overall introduction to conducting experiments in PL-LAB: http://www.pllab.pl/fed4fire/howto/
- The description of a simple testing scenario: http://www.pllab.pl/fed4fire/tutorial/

### Josef Stephan Institute | LOG-a-TEC

LOG-a-TEC covers a set of diverse testbeds used for research purposes.

Videolectures are available here:

- http://log-a-tec.eu/

### i2CAT OFELIA Testbed Tutorial

i2CAT provides short written tutorial on the testbed details and how to reserve and configure computing and OpenFlow resources. Accessible via http://lab.i2cat.net/testbed-openflow-wired

[4] Iris – The Reconfigurable Radio Testbed, https://iris-open-testbed.connectcentre.ie



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## 3.3 VIDEOS

To widen the reach of the Open Calls for the representatives of the experimenters showcasing a demo at the conference a video has been shot. The interviews have been produced as speeches presenting the results obtained by using Fed4FIRE+ testbeds and the business impact for their companies. The intention is that these videos are on one side an extra promotion for the experimenter, but also a tutorial-type of presentation for newly interested partners and experimenters to showcase the potential of Fed4FIRE+. In the future are planned video interviews on experimenters and their experience using the Fed4FIRE+ testbeds.

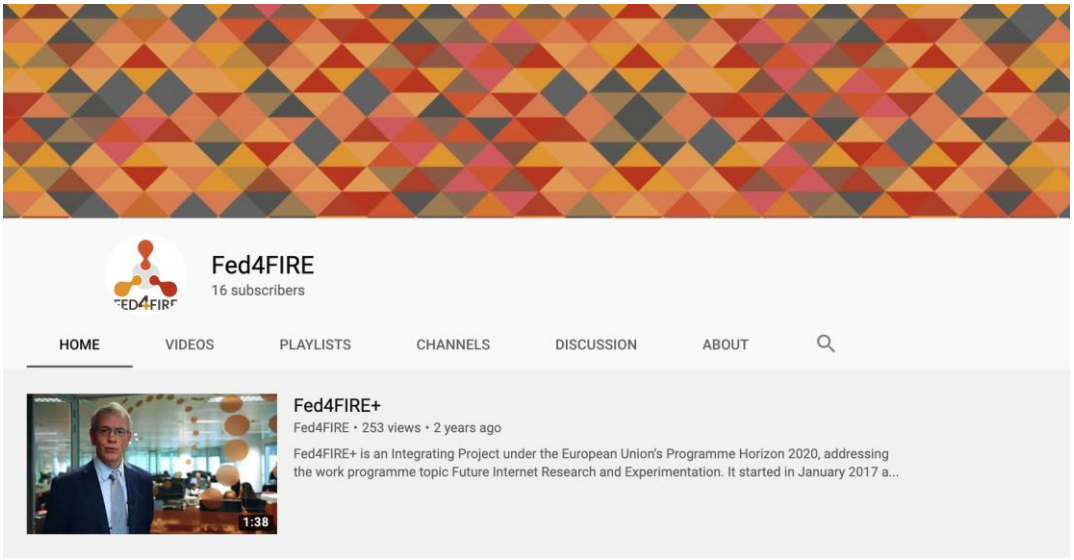


*Figure 12: Fed4FIRE+ Youtube channel*

## 3.4 PROMOTIONAL MATERIALS

The following material has been produced so far:

- A project flyer presenting the project. It has been printed in 1500 copies and already distributed at several events like MWC, EuCNC2018, EuCNC2019, NGI Forum 2018, NGI Forum 2019, ICT Proposers' Day 2018, ICT Proposers' Day 2019.
- Flyers promoting the FECs were printed for some editions. For FEC2 in Volos we printed 100 copies and distributed at EuCNC2017, NGI Forum 2017. For FEC4 in Brughes. 250 copies were printed and distributed at Bilbao IoT Week 2018, EuCNC 2018, Futur.es in Paris, NGI Forum 18 (in September).
- A couple of roll-ups have been designed and used on the occasion of each FEC Conference and re-used for conferences and exhibitions .
- A poster template has been designed and used by experimenters for the Demo exhibitions
- A small card, in the format of a business card has been printed in 500 copies and distributed at MWC 2018, NGI Forum 2018, NGI Forum 2019, ICT Proposers' Day 2018, ICT Proposers' Day 2019 and several other events.



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## 3.5 WORKSHOPS & CONFERENCES

As presented in the dissemination plan Fed4FIRE+ will focus on two types of events to provide major visibility to the project's outcomes:

- **Engagement Events**: Dedicated and active participation in conferences and workshops co-located with major events as a means to engage new Future Internet players and maximize the participation to the Open Calls.
- **Engineering Conferences:** these events serve as a forum at which experiments will showcase their results and provide feedback to Fed4FIRE+ and will serve as a basis to strengthen the community through which experimenters and facility providers interact and exchange information and experiences. These FECs events are organized every 6 months.
- **Summer schools/ Student workshops**: Based on the success initiated in Fed4FIRE project targeting the involvement of students, researchers, SMEs and other companies the of Summer Schools are part of the Engineering Conferences.

**NITOS and CERTH workshops at FEC6**

The FEC6 student workshop gave the opportunity for students to learn how to design and execute experiments utilizing Fed4FIRE+ facilities and tools. The workshop, attended by 28 students from different universities in Athens, took place on Wednesday 16 October, and was divided into the following sessions:

- ***Introduction to F4F testbeds and tools.*** This experiment showcased the capabilities of the Fed4FIRE+ infrastructure through a simple networking setup; the students leased three wireless nodes from the iLab.t testbed, set one of them as a Wireless Access Point, connect the other two on the corresponding WLAN and make them communicate with each other.
- ***Service orchestration over wireless networks using Open Source MANO.*** In this tutorial, the Open Source MANO framework was used to deploy services in the NITOS testbed. As traditionally NITOS is a wireless testbed, an extended version of the framework allowing the experimenters to specify the wireless networks (WiFi, mmWave and LTE) that were used to interconnect the services that they choose to deploy. The NITOS nodes were used as the compute infrastructure and host the Virtual Network Functions (VNFs). During the tutorial, each experimenter got access over three nodes of the testbed, one used as the controller to deploy VNFs (hosting the Open Source MANO installation and the Virtual Infrastructure Manager) and two compute nodes for hosting the VNFs.

Both these sessions were focused on providing a hands-on experience to the participants. Most of the students were not familiar with the topic and the tools presented in this tutorial, even though they managed to complete it and achieve the goals that we have defined for this tutorial. The students proved to be highly interested with the tutorial and they asked questions throughout the tutorial asking for extra information about the capabilities of these tools and if they are able to utilize these tools for their semester projects or thesis.

We considered the feedback received from the participants really positive as at the end of the session, all of them were familiar with using the Fed4FIRE+ tools in order to design and execute experiments on their own.



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### 3.5.1 Engagement Events

The table below presents the third-party events that Fed4FIRE+ took part with a presentation, a paper and/or a demo as part of the engagement activities and international liaisons.

*Table 2: Engagement events*

| Event Name | Date, Place | Type of Audience | Website | Presentation | Leading Partner | Focus and link to Fed4Fire+ |
|---|---|---|---|---|---|---|
| **7th International Conference on Future Internet of Things and Cloud Workshops (FiCloudW)** | Istanbul, Turkey, 26-28 August 2019 | Academia | https://airs.turion.info/#ficloud | presentation | NTUA | OC4 IIoT-Replan Experiment |
| **45th International Conference on Very Large Data Bases (VLDB) "Very Large Internet of Things" (VLIoT) workshop** | Los Angeles (USA) 30 August 2019 | Academia/ Industria | https://www.fed4fire.eu/news/fed4fire-landed-in-los-angeles-at-vldb2019/ | presentation | UC | Overview of the different possible federation paths Fed4FIRE+ offers to heterogeneous testbeds |
| **Computer and Networking Experimental Research using Testbeds** | Paris, F 29 April 2019 | Academia | Computer and Networking Experimental Research using Testbeds | workshop | imec | Fed4FIRE+ presented as an example to facilitate access to the use of testbeds for experimenters |
| **IoT Week 2019** | Aarhus, Denmark, 17-21 June 2019 | All | https://iotweek.org/iot-week-2019-aarhus/ | presentation | MI | Several components of Fed4Fire+, including the data protection part, were showcased. |
| **EMPOWER-PAWR Joint meeting** | 29 April 2019 Paris, France | Academia & Industry | https://www.advancedwireless.eu/ | workshop | SU & imec | Fed4FIRE+ overview presented and indification of possible collaborations & interactions |
| **Global Experimentation for Future Internet (GEFI) 2018 Workshop** | 25-26 October, Tokyo, Japan | Academia | http://indico-memoria.rnp.br/conferenceDisplay.py?confId=260 | workshop | Imec & SU | Fed4FIRE+ testbeds presented, interaction on possible collaborations and participation in mutual programmes |
| **Global Experimentation for Future Internet (GEFI) 2019 Workshop** | 7-8 November 2019, Coimbra Portugal | Academia | https://indico.rnp.br/event/1/ | workshop | SU & imec | Fed4FIRE+ testbeds presented and interaction on possible collaborations and participation in mutual programmes (USA – Brazil – Far east – Europe) |
| **Workshop TILECS**<br>**Towards an Infrastructure for Large-Scale Experimental Computer Science** | 3-4 July 2019 Grenoble, France | Academia & Industry | https://www.silecs.net/tilecs-2019/ | workshop | imec | Fed4FIRE+ presented as an example to facilitate access to the use of testbeds for experimenters |



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| | | | | | | |
|---|---|---|---|---|---|---|
| **8th 5GINFIRE Plenary** | 26-28 July Madrid Spain | Academia and Industry | www.5ginfire.eu | presentation | TCD | We presented the 5GINFIRE integration with the FED4FIRE+ Iris Testbed utilizing the O2CMF framework |
| **11th 5GINFIRE Plenary** | 10-11 September 2019 Patras, GR | Academia and Industry | www.5ginfire.eu | presentation | TCD | We presented the 5GINFIRE integration with the FED4FIRE+ Iris Testbed utilizing the O2CMF framework |
| **ACM ICN 2018** | 21-23 September 2018, Boston,MA | Academia and Industry | https://conferences.sigcomm.org/acm-icn/2018/ | Demo | TCD | Supported the CLONE open call experiment with a demo at ACM ICN 2018 |

### 3.5.2 Engineering Conferences (FEC)

The "FECs" engineering conferences are a series of technical events organised by Fed4FIRE+ with the aim to strengthen the interaction among the different stakeholders involved. Three edition of Engineering Conferences has been organised.

*Table 3: FECs events*

| Event Name | Date, Place | Type of Audience | Topic | Approx size of audience | Leading Partner |
|---|---|---|---|---|---|
| **1st FEC** | March 2017, Ghent (BE) | Experimenters, facilities providers, Fed4FIRE+ partners | Next Generation Internet | 80 | IMEC |
| **2nd FEC** | October 2017, Volos (GR) | Experimenters, facilities providers, Fed4FIRE+ partners | Fed4FIRE+ Testbeds tutorials | 100 | IMEC |
| **3rd FEC** | March 2018, Paris (F) | Experimenters, facilities providers, Fed4FIRE+ partners | SDN | 120 | IMEC |
| **4th FEC** | October 2018, Brugge (B) | Experimenters, facilities providers, Fed4FIRE+ partners | IoT experimentation | 98 | IMEC |
| **5th FEC** | April 2019, Copenhagen (DK) | Experimenters, facilities providers, Fed4FIRE+ partners | Advanced Networking | 50 | IMEC |
| **6th FEC** | October 2019, Athens (GR) | Experimenters, facilities providers, Fed4FIRE+ partners | Wireless and Mobile clouds and mobile edge computing (MEC) | 120 | IMEC |

For each FEC a dedicated web site has been created and where are available all the details about the event such as sessions, speakers, agenda, etc. Finally, the website fec.fed4fire.eu links to all past and upcoming FECs.



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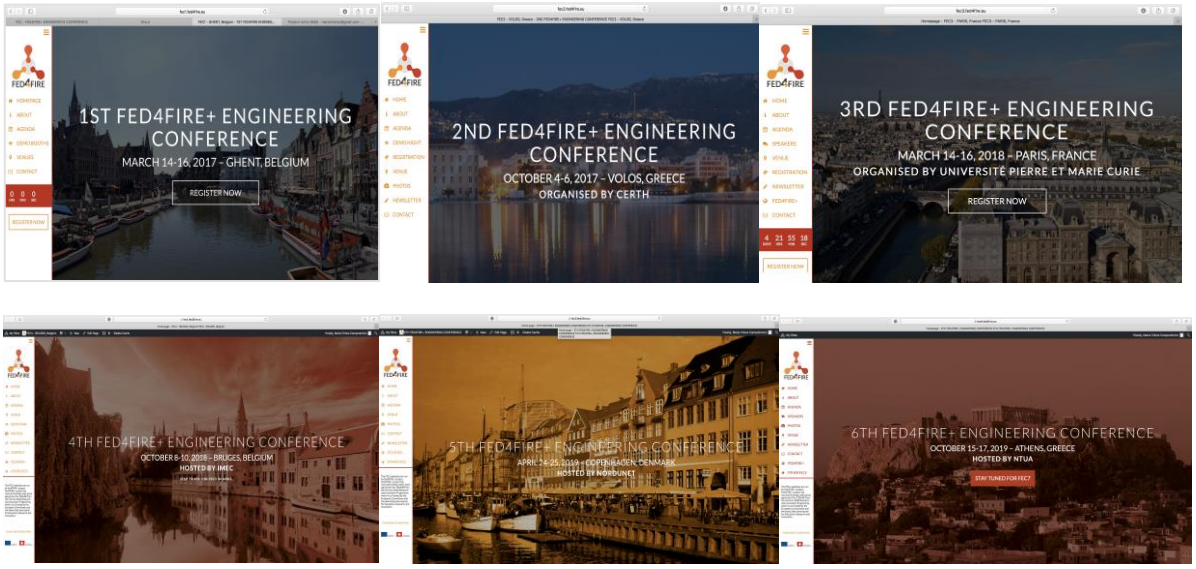


*Figure 13: A screenshot of Fed4FIRE+ FECs Pages*

## 3.6 COOPERATION WITH OTHER PROJECTS/INITIATIVES

The table below presents the projects and initiatives that Fed4FIRE+ is actively cooperating with took part with a presentation, a paper and/or a demo as part of the engagement activities and international liaisons.

*Table 4: cooperation with other projects and initiatives*

| Initiative | Website | Global/ EU | Leading Partner | Focus and link to Fed4Fire+ |
|---|---|---|---|---|
| **NGI** | https://www.ngi.eu | EU | MAR | Promotion of Open calls |
| **5G PPP** | https://5g-ppp.eu | EU | MAR | Promotion of Open calls |
| **Fiware Lab Foundation** | https://www.fiware.org/ | EU | MAR | Promotion of Open calls |
| **AIOTI** | http://aioti.eu | EU | MAR | Promotion of Open calls |
| **TETRA** | https://www.ngi.eu/about/tetra | EU | Imec | Member of Advisory Board - Feedback towards NGI community of Fed4FIRE+ expertise on Open Calls and SME participation |
| **TM Forum** | https://www.tmforum.org/ | Global | MI | Liaison with telco operators |
| **SyncroniCity** | https://synchronicity-iot.eu/ | Global | MI/UC | IoT and Smart Cities |
| **CONNECT** | https://5ginfire.eu<br>https://gitlab.com/futebol/O2CMF | EU | TDC | CONNECT upgraded the Iris SDR testbed performed in cooperation with the 5GINFIRE. FIRE testbed integration is one of the primary objectives of the 5GINFIRE. Part of this upgrade involved extending the Aggregate Manager O2CMF framework to support software defined radio node access with OpenStack. The upgrade allows Iris SDR devices and virtual machine resources currently available on |



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| | | | | Fed4FIRE+ via jfed to be shared with the 5GINFIRE project consortia members and open call experimenters. This is supported by Open Source MANO (OSM), which is delivering an open source MANO stack aligned with ETSI NFV Information Models. |
| **FUTEBOL H2020** | http://www.ict-futebol.org.br | EU-Brazil | TCD | The EU-BR FUTEBOL H2020 project supported the creation of a federated control framework to integrate testbeds from Europe and Brazil for advanced network researchers from academia and industry. Fed4FIRE+ infrastructure was a foundational element for this project. |
| **ORCA H2020** | https://www.orca-project.eu | EU | TCD | A key element to enabling experimentation for open call experimenters in the ORCA project is Fed4FIRE+ infrastructure. To date, the Iris testbed has supported eight funded ORCA open call experimenter projects and infrastructure extensions, all accessing the Iris testbed via jFed. |
| **EMPOWER** | http://www.advancedwireless.eu/ | EU/US | SU | EMPOWER (H2020) has the ambition to accelerate the joint development between the EU and the US of advanced wireless platforms targeting the new connectivity frontiers beyond 5G. Fed4FIRE+'s coordinator has been invited to participate to two events organized together with the PAWR office: a joint meeting, organized in parallel to INFOCOM 2019 (29 April 2019, Paris) and a workshop during GEFI conference (7-8 November 2019, Coimbra). In both cases, Fed4FIRE+ has been involved to those events and discussions with the US side as one of the major transatlantic experimentation and prototyping players. |
| **MESON** | http://meson-project.gr/ | GR | NTUA | MESON project has one industrial robot use case. Two new robots are funded by MESON and are integrated with NETMODE testbed. |



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## 3.7 OPEN CALLS

Fed4FIRE+ provides funding for third parties through the cascade funding by means of the Open Calls, mechanism. The following table presents the proposals that has been received for each Open Call.

*Table 5: Number of proposals that has been received for each Open Call*

| Call | Title | Deadline | Status | Proposal received |
|---|---|---|---|---|
| **F4Fp-01** | 1st Fed4FIRE+ Competitive Call – Innovative Experiments<br>Category "Small experiments (S)" & "Large Experiments (L)" | 15th Feb 2017 | Closed | 13 L<br>30 S |
| **F4Fp-02** | 2nd Fed4FIRE+ Competitive Call – Innovative Experiments<br>Category "SME Cascaded Experiments" | Stage 1<br>18th Sept 2017<br>Stage 2<br>15th Dec 2017 | Closed | 11 XS<br>9 M |
| **F4Fp-03** | 3rd Fed4FIRE+ Competitive Call – Innovative Experiments<br>Category "Medium (M) & "Large Experiments (L)" | 15th Jan 2018 | Closed | 10 L<br>24 M |
| **F4Fp-04** | 4th Fed4FIRE+ Competitive Call – Innovative Experiments Category "Medium Experiments" | 18th Sept 2018 | Closed | 33 |
| **F4Fp-05** | 5th Fed4FIRE+ Competitive Call – Innovative Experiments Category "Medium (M) " & "Large Experiments (L)" | 26th Mar 2019 | Closed | 4 L<br>7 M |
| **F4Fp-06** | 6th Fed4FIRE+ Competitive Call – Innovative Experiments Category "Medium Experiments" | 10th Sept 2019 | Closed | 25 |

The Fed4FIRE+ Open Calls are broadly advertised through:

- Publication of the Open Calls to Fed4FIRE+ website;
- Publication of the Open Calls to all relevant NGI web sites and project web sites, to the "Future Internet" communication list (5,000+ contacts), including reminders
- Dissemination through Fed4FIRE+ social channels, partners and community social channels;
- Dissemination through NGI, Future Internet, 5G-PPP mailing list;
- Mailing list to participants to previous open calls who submitted proposals and were not accepted;
- Flyer are distributed online and offline;
- A dissemination kit (visual/copy/link) is distributed to major community websites to further increase visibility
- Partners mailing list considered relevant for the promotion of the Open Calls at national and European level

More details about the Open Calls themselves is presented in Deliverable D5.1



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### 3.7.1 Publications made by open calls participants

Participants to Fed4FIRE+ open call could have the possibility to present papers on the results obtained by using Fed4FIRE+ testbeds and the publications will be made available on the project channels.

*Table 6: Publications from Open Calls Participants*

| Publication | Submission to | Experiment name | Owner | Link to document |
|---|---|---|---|---|
| On Experimenting 5G: Testbed Set-up for SDN Orchestration across Network Cloud and IoT domains | IEEE | LASH 5G | CNIT -IT | https://www.fed4fire.eu/download/on-experimenting-5g-testbed-set-up-for-sdn-orchestration-across-network-cloud-and-iot-domains/?wpdmdl=3551&masterkey=5d3aa69d9898b |
| Network Orchestrator for QoS-enabled Service Function Chaining in reliable NFV/SDN infrastructure | IEEE | LASH 5G | CNIT -IT | https://www.fed4fire.eu/download/network-orchestrator-for-qos-enabled-service-function-chaining-in-reliable-nfv-sdn-infrastructure/?wpdmdl=3549&masterkey=5d39c85201886 |
| Evaluation of scalable, on-demandDNS-as-a-Service | IEEE | EMPATIA XXL | One Source, PT | https://fed4fire.eu/wp-content/uploads/sites/10/2019/07/1.-evaluation-of-scalable-on-demanddns-as-a-service.pdf |
| Demonstration of Latency-Aware and Self-Adaptive Service Chaining in 5G/SDN/NFV infrastructures | IEEE | LASH 5G | CNIT, IT | https://fed4fire.eu/wp-content/uploads/sites/10/2019/07/2.-demo-nfv-sdn-2018-lash-5g-final.pdf |
| Network slicing - enabled RAN management for 5G: Cross layer control based on SDN and SDR | SCIENCE DIRECT | CLC | University of Athens, GR | https://www.sciencedirect.com/science/article/pii/S1389128619309776 |
| CLONE: An NDN Architecture for Content Distribution at Remote Tourist Sites - a TCP/IP and NDN Comparison | SIGCOMM Conference | CLONE | Tara Hill National Park Teo, IE | http://conferences.sigcomm.org/acm-icn/2018/proceedings/icn18posterdemo-final18.pdf |
| Single Vision-Based Self-Localization for Autonomous Robotic Agents | 7thConference on Future Internet of Things and Cloud Workshops (FiCloudW) | IIoT-REPLAN | Queen's Belfast University, UK | https://airs.turion.info/#ficloud |



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## 3.8 INTERNATIONAL LIAISONS WITH RELATED PROJECTS AND INITIATIVES

The main goal of this activity is to ensure broad outreach and impact of the project's activities, including fostering worldwide collaboration with related initiatives and stakeholders from countries such as USA, Brazil, South Korea, Japan, China and Australia, by exploiting existing cooperation synergies and establishing new ones as relevant.

Fed4FIRE+ liaise with the following international initiatives and support the dissemination and communication efforts and reach the widest audience possible.

*Table 7: international liaisons with other initiatives*

| Initiative | Website | Activities done | Leading Partner | Focus and link to Fed4Fire+ |
|---|---|---|---|---|
| **EMPOWER-PAWR** | https://www.advancedwireless.eu/index.php/event/infocom-2019/?instance_id=5 | Participation / Presentation meetings (29 April 2019) | SU & imec & CERTH | Presentation of testbed experimentation in NGI area |
| **CNERT** | https://infocom2019.ieee-infocom.org/cnert-computer-and-networking-experimental-research-using-testbeds-program | co-organization workshops & presentation of Fed4FIRE+ activities (29 April 2019) | SU & imec & CERTH | Demo's from Fed4FIRE+ testbeds & presentations from Fed4FIRE+ partners |
| **INFOCOM 2019** | https://infocom2019.ieee-infocom.org/main-technical-program | Participation in Panel (2 May 2019) | SU | Fed4Fire+ taken as an example of European testbeds |
| **EU - NGI Coordination activities** | | Participation in workshop (17 May 2019) | imec | Presentation Fed4FIRE+ Federation & strategy / methodology / results from Open Calls |
| **3rd Future Network Development Conference** | http://www.qfnds.com/en/index.php | Participation the conference (22-23 May 2019) | SU | Presentation of the European community and testbeds (incl. F4F+) to the audience |
| **ICSRI 2019 Information and Communication Sciences Research Infrastructures Awareness Day** | | Participation to the meeting 27 May 2019 | SU & imec | Demo session of F4F+ done by imec (hosted by Sorbonne) |
| **EuCNC 2019** | https://www.eucnc.eu/2019/www.eucnc.eu/workshops/index.html | Workshop – Empowering Transatlantic Platforms for Advance Wireless Research 18 June 2019 Valencia, Spain | SU | Presentation of the challenges for developing future test platforms to support research in digital infrastructures (i.e. Fed4FIRE+) |
| **RESCOM 2019** | https://rescom2019.loria.fr/ | 25 June 2019<br>Anglet, France | SU | Lesson 3: Large scale experimental platforms (i.e. Fed4FIRE+) |



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|---|---|---|---|---|
| **IEEE International Symposium on Local and Metropolitan Area Networks** | https://lanman2019.ieee-lanman.org/program/ | Keynote 1 "The Need for a Research Infrastructure in Digital Sciences" chair (1-3 July 2019) | SU | Fed4Fire+ taken as an example |
| **TILECS** | https://www.silecs.net/tilecs-2019/ | Participation in workshop (3-4 July 2019) | Imec & SU | Presentation Fed4FIRE+ Federation, Testbeds & methodology Open Calls |
| **IoT Week 2019** | https://iotweek.org/iot-week-2019-aarhus/ | Participation to the conference | Mandat International | Several components of Fed4Fire+, including the data protection part, were showcased. |
| **Joint ETSI - OSA Workshop** | https://www.etsi.org/events/1319-etsi-osa-workshop#pane-1/ | Participation to the workshop | Feron | Presentation |
| **Supercomputing 18 / 19** | https://sc18.supercomputing.org<br>https://sc19.supercomputing.org | Participation in Supercomputing exhibitions in years 2018 and 2018 | PSNC | Presentation of Fed4FIRE+, presentation of experiments and capabilities of the testbed on the PIONIER booth (managed by PSNC) |
| **2018 IEEE Seventh International Conference on Communications and Electronic** | http://www.icce-2018.org/ | 18-20 July 2018, Hue Imperial City, Vietnam | SU | Dissemination about Fed4FIRE+ activities and results |
| **Global Experimentation for Future Internet - 2019** | https://indico.rnp.br/event/1/overview | Workshop<br>7-8 November 2019<br>Coimbra, Portugal | Imec & SU | Fed4FIRE+ took part to the discussions carried out in the framework of the Global Experimentation for Future Internet workshop. |
| **FUTEBOL H2020** | http://www.ict-futebol.org.br | EU-Brazil | TCD | The EU-BR FUTEBOL H2020 project supported the creation of a federated control framework to integrate testbeds from Europe and Brazil for advanced network researchers from academia and industry. Fed4FIRE+ infrastructure was a foundational element for this project. |
| **5GPPP** | https://5g-ppp.eu/ | Participation in the 5G-PPP software networks working group | CERTH | Integration of NFV based experimentation in the Fed4FIRE+ facility of NITOS |



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## 3.9 CONTRIBUTION TO OPEN SOURCE INITIATIVES AND STANDARDS

The project will contribute actively to standardisation with two main focuses:

- Testbed federation and interoperability;
- Data portability, in line with the General Data Protection Regulation.

The project will relay (through P06 MI) the relevant results to the corresponding SDOs, namely:

- The European Telecommunication Standards Institute (ETSI).
- The International Telecommunication Union (ITU), with a focus on the Study Groups 20 and 11. MI is Rapporteur on Research and Emerging Technologies for the Internet of Things and for Smart Cities at the ITU (SG20) and will lead the standardisation effort within the ITU. In this context, a contribution for the testbeds interoperability and federation was submitted to ITU SG20 in December 2019. This contribution consists to an open API facilitating the interoperability of testbeds which is a strong point of Fed4FIRE+. The feedback given after the submission of this contribution is a proposal to resubmit the contribution in May 2020 to the Study Group 11 (SG11). Indeed, the SG11 is focused on protocols and test specifications. So, Mandat International will proceed as recommended by the ITU-T next year. The reference of the contribution is C-627.
- Institute of Electrical and Electronics Engineers (IEEE), where MI is Vice-Chair of the IEEE
- Subcommittee on the Internet of Things.
- International Standardization Organization (ISO), with a focus on personal data protection related standards, such as ISO 29100, ISO 29101, ISO 15408.

**O2CMF Extension to Support SDR at Iris**

Towards integrating the Fed4FIRE+ and 5GINFIRE projects during the second Fed4FIRE+ reporting period (July 18' to Dec 19'), we extended the O2CMF aggregate manager framework, an open platform for control and management of experiments (O2CMF) developed during the FUTEBOL H2020 project, to support SDR devices in the 5GINFIRE OpenStack cloud environment.



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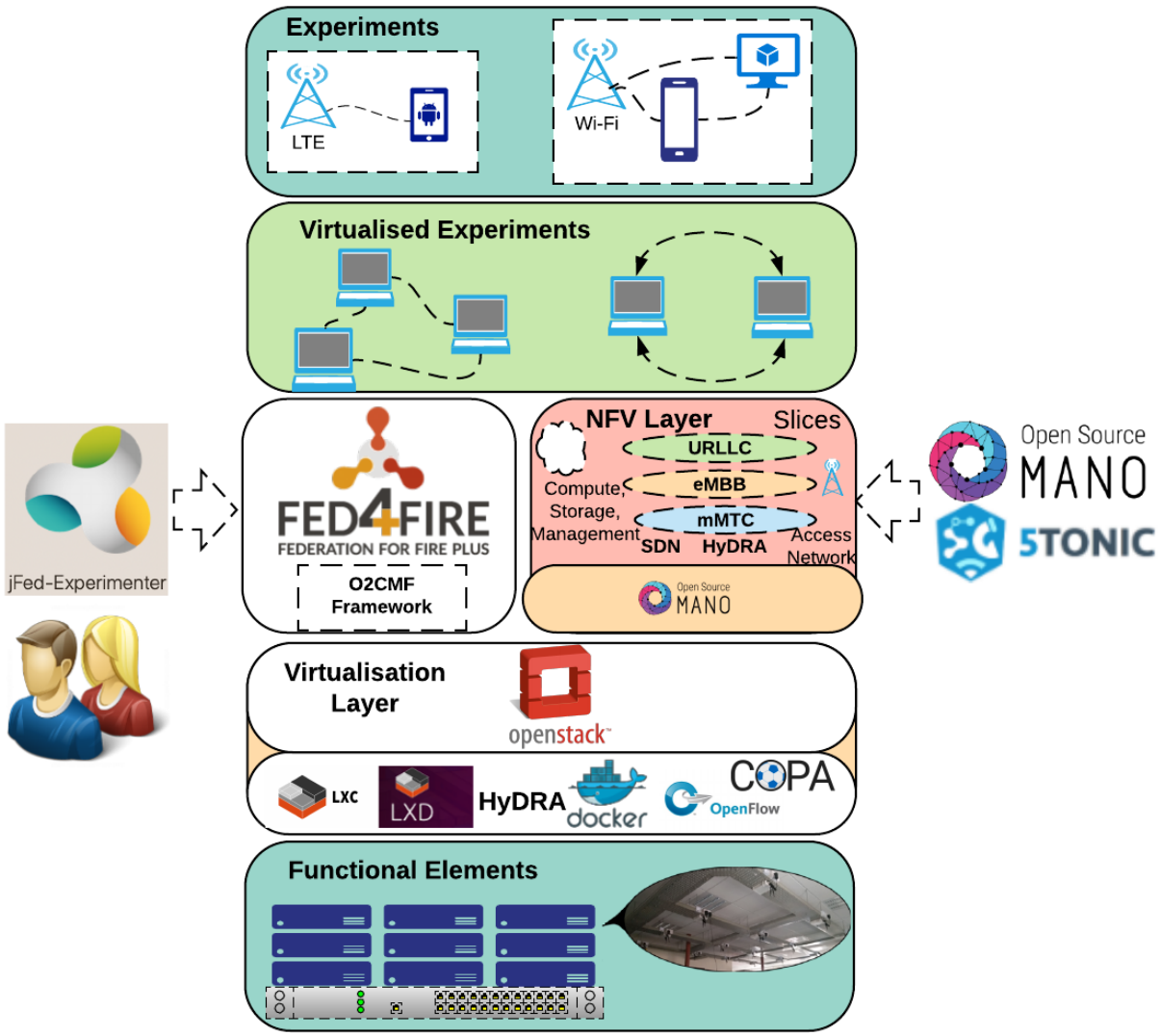


O2CMF is an SFA entity responsible for managing testbed resources and Fed4FIRE+ slivers. It was designed to support repeatable and reproducible experimentation of heterogeneous computing and networking resources by utilizing NFV principals. This is seen as an extension to current Fed4FIRE+ and GENI capabilities which did not offer adequate virtualisation mechanisms to support NFV functionality 5. Due to this extension, both the 5GINFIRE project

[5] Ceravolo, Isabella de A., et al. "O2cmf: Experiment-as-a-service for agile fed4fire deployment of programmable nfv." *Optical Fiber Communication Conference*. Optical Society of America, 2018.



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and Fed4FIRE+ projects share the same cloud-based infrastructure and USRP equipment among project experimenters. The OpenStack VIM central access point for O2CMF and 5TONIC OSM enables VM and USRP resources to be shared between both projects. Furthermore, there is no resource over provision or conflict between project experimenters as the OpenStack VIM allocates resources on a first come, first served (FCFS) basis. This has the added benefit of making Fed4FIRE+ equipment available to the 5GINFIRE community and vice versa. In total, this represents 29 NI USRPs and 13 high powered Dell servers. We plan to make the Iris testbed O2CMF extension to support USRPs available as a branch on O2CMF GitLab 6 to the 5GINFIRE and Fed4FIRE+ communities.

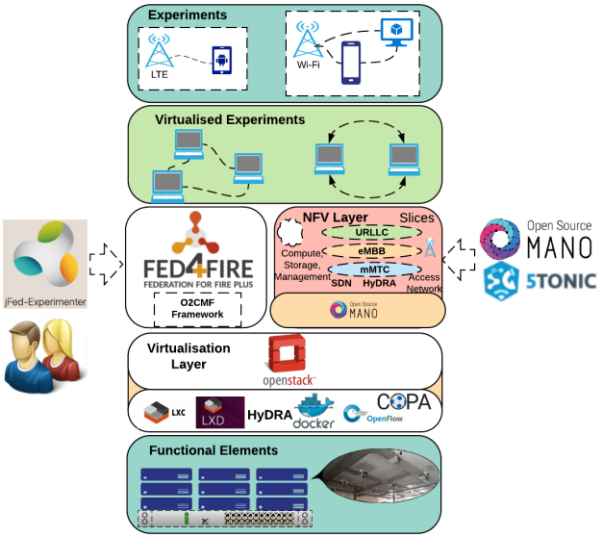


*Figure 14: FIRE integration at WINS_5G*

As a consequence of the 5GINFIRE cloud upgrade to use OpenStack, the Iris radio testbed now pairs underlying flexible radio and computations resources with various hypervisors in the form of software defined radio (SDR) frameworks, virtualized network functions (VNFs), and SDN network slicing capabilities to realize various research and experimentation configurations. We employ a Dell Networking S4048T-ON high performance SDN/OpenFlow 1.3 enabled switch connected to underlying radio devices. Radio resources include 24 NI USRP N210 ceiling mounted nodes equipped with SBX daugtherboards supporting frequency ranges of 400 MHz-4400 MHz offering up to 20 MHz of bandwidth. This equipment supports experimentation with Wi-Fi, WiMAX, S-band transceivers and 2.4 GHz ISM band transceivers, and so forth. We also employ 5 NI USRP X310s supporting DC to 6 GHz frequencies and up to 40 MHz of baseband bandwidth. These platforms are connected to a private computational cloud based on the OpenStack suite of technologies, allowing us to deploy an array of dynamic virtualised computational environments. To expose the functionality of these platforms for applications, we employ a variety of radio hypervisors that freely enable prototyping of wireless systems, as exemplified by GNURadio, srsLTE 3GPP, and Open-Air Interface. These radio hypervisors combined with dynamic distributed network functions enable the realization of heterogeneous radio platforms that can support malleable and adaptable networks.

**Joint ETSI - OSA Workshop**

Feron Technologies is a company involved in the open call “SME 2-stage OC2” through the project “FIVE”. In this context, Dr. Antonis Gotsis and Dr. Dr. Konstantinos Maliatsos presented their work during the Joint ETSI – OSA workshop held the 11-13 December 2018 in Sophia-Antipolis. The main subject of the joint workshop was the open implementations and standardization. The presentation title was “A Real Time SDR Modem for Early LTE V2X Testing: Development Activities & First Field Tests in Vehicles”. The topic of the presentation was the development and the testing of a modem using the software-defined radio (SDR) in the Vehicle-to-Vehicle or Vehicle-to-Infrastructure technology. The development and the tests were notably done in the Fed4FIRE+ testbeds.

[6] O2CMF, https://gitlab.com/futebol/O2CMF



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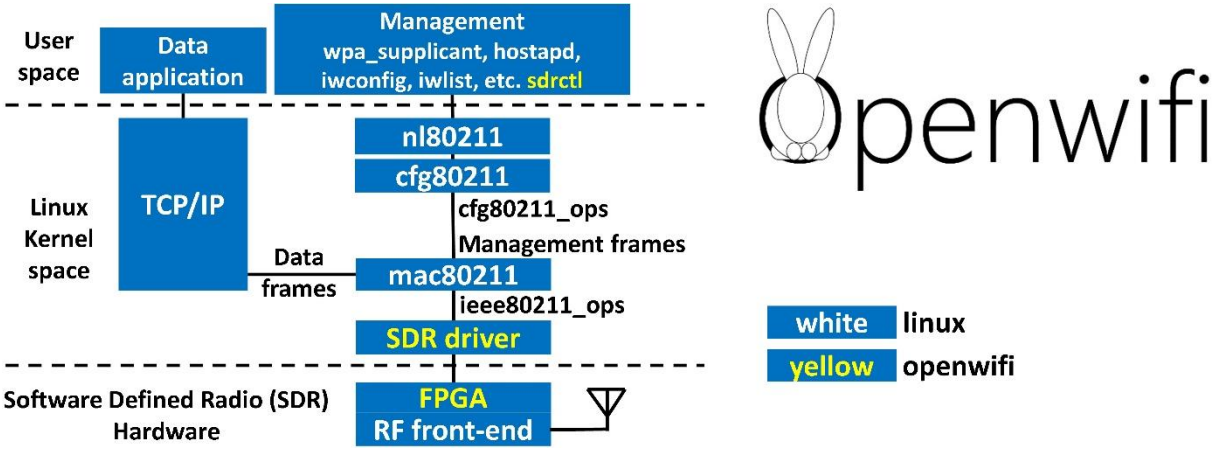
## Open WiFi

In the H2020 Orca project (https://www.orca-project.eu/), imec has developed an open source reference stack for Wi-Fi [7] (802.11a/g/n, 802.11ax is under development) running on software defined radios (FPGA based). This Open Wifi stack is now also implemented on the testbeds used within Fed4FIRE+ at imec.

Below one can see an overview where it fits in the standard linux software stack.




In comparison to other stacks (see table below), the imec openwifi stack is the only fully free and open stack for FPGA, meaning it combines full openness with real world performance.

| | Baseband Platform | Physical Layer | Low MAC | High MAC and Upper | Min. SIFS | Free/Open |
|---|---|---|---|---|---|---|
| **imec openwifi** | FPGA + ARM (Zynq) | FPGA | FPGA (State machine) | ARM (Linux mac80211) | 10us | Yes |
| **WARP 802.11 design** | FPGA | FPGA | FPGA MicroBlaze (C) | FPGA MicroBlaze (C) | 16us | No |
| **NI Labview 802.11** | FPGA + PC | FPGA | FPGA (State machine) | PC (NS3) | 16us | No |
| **H. Wu, tick, Mobicom17** | FPGA + PC | FPGA | FPGA MicroBlaze (C) | PC (Linux mac80211) | 16us | No |
| **Microsoft SORA/Ziria** | RCB board + PC | PC (C/C++/Ziria) | PC (C/C++/Ziria) | PC (C/C++/Ziria) | 10us | Yes |
| **B. Bloessl gr-ieee802-11** | PC | PC (Gnuradio) | / | / | / | Yes |

| | | |
|---|---|---|
| imec openwifi | https://github.com/open-sdr/openwifi | |
| WARP 802.11 design | https://warpproject.org/trac/wiki/802.11 | https://mangocomm.com/802.11-mac-phy/ |
| NI Labview 802.11 | http://www.ni.com/product-documentation/53279/en/ | http://www.ni.com/product-documentation/54094/en/ |
| H. Wu, tick, Mobicom17 | http://metro.cs.ucla.edu/papers/mobicom17-tick.pdf | |
| Microsoft SORA/Ziria | https://github.com/microsoft/Sora | https://github.com/dimitriv/Ziria |
| B. Bloessl gr-ieee802-11 | https://github.com/bastibl/gr-ieee802-11 | |

The only drawback is that FPGA's and SDRs are relatively expensive and not widely available for e.g. students. Through Fed4FIRE, the FPGAs and SDRs (a.o. in the w-iLab.t testbed) are available to everyone. As such, Fed4FIRE offers easy open access to a full performance open reference stack for WiFi. This combination is unique in the world.

[7] Xianjun, Jiao and Wei, Liu and Michael, Mehari, "open-source IEEE802.11/Wi-Fi baseband chip/FPGA design", https://github.com/open-sdr/openwifi, 2019



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*Table 8: Standardisation and Open source initiatives*

| Standards body Initiative | Website | Activities done | Leading Partner | Focus and link to Fed4Fire+ |
|---|---|---|---|---|
| **-** | - | Preliminary evaluation of standardization potential for an standardized Open API | MI | API for IoT to be used in the IoT Lab testbed |
| **TM Forum** | https://www.tmforum.org/ | Collaboration with TM Forum on the Open API approach | MI | API for IoT to be used in the IoT Lab testbed |
| **ITU** | https://www.itu.int/en/Pages/default.aspx | Preparation of an initial draft contribution on testbed interoperability and connectivity through open API | MI | Testbed interoperability |
| **SyncroniCity** | https://synchronicity-iot.eu/ | Collaboration with SychroniCity on the Open API for IoT | MI | API for IoT to be used in the IoT Lab testbed |
| **Joint ETSI - OSA Workshop** | https://www.etsi.org/events/1319-etsi-osa-workshop#pane-1/ | Participation to the workshop | MI-Feron | Presentation |
| **OAI Software Alliance** | https://www.openairinterface.org/ | Contribution to the OpenAirInterface (OAI) platform on the data-plane communication for the 3GPP Option-2 split of the stack | CERTH | Running 5g experiments with the disaggregated OAI stack in the NITOS Fed4FIRE+ facility |
| **OSM** | https://osm.etsi.org/ | Participation in the Open Source MANO Tech meetings | CERTH | Adoption of the latest Open Source MANO release in NITOS Fed4FIRE+ facility |
| **Open WiFi** | https://github.com/open-sdr/openwifi | Development of an open source reference stack | IMEC | Implementation on Fed4FIRE+ testbeds at iC01 imec |



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## 3.10 JOURNALS AND CONFERENCE PUBLICATIONS

The table below presents the publications for the second period (M19-M36) of the project.

*Table 9: List of relevant journals for scientific dissemination*

| Publication | Topic covered | Submission to | Lead partner | Link to document | Focus and link to Fed4Fire+ |
|---|---|---|---|---|---|
| **Collaborative SLA and reputation-based trust management in cloud federations** | Trust Management | Elsevier FGCS | NTUA, ATOS | https://www.sciencedirect.com/science/article/pii/S0167739X18329248 | Reputation and SLA service (T3.1) (*) |
| **Integrating a Smart City Testbed into a Large-Scale Heterogeneous Federation of Future Internet Experimentation Facilities: the SmartSantander Approach** | Testbed federation | Very Large Internet of Things (VLIoT) workshop @ 45th International Conference on Very Large Data Bases (VLDB) | UC | https://www.ronpub.com/ojiot/OJIOT_2019v5i1n10_Sotres.html | Overview of different Fed4FIRE+ federation approaches followed by heterogeneous testbeds with special focus in SmartSantander testbed |
| **An overview of Fed4FIRE testbeds - and beyond?** | Testbeds | GEFI - Global Experimentation for Future Internet Workshop | INRIA | https://hal.inria.fr/hal-02401738/document | Overview of different Fed4FIRE+ federation |
| **Replace a router with a Linux server: feedback from the access gateways to Grid5000** | testbeds | JRES - Journées Réseaux de l'Enseignement et de la Recherche | INRIA | https://hal.inria.fr/hal-02401684/document | On-demand connection between Grid'5000 machines and external platforms, via the GEANT network and the SoftwareDefined eXchange of the Fed4FIRE+ |

(*) restricted access



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# 3.11 EXPLOITATION

## 3.11.1 Consortium-wide exploitation

As defined in the project proposal, the exploitation is strictly related to the results and outputs of the project. For all the duration of the project, the exploitation will be carried out in close relation with the dissemination activities both at Consortium level and individually from each partner. Thanks to their combined expertise each partner delivers the project aims, and seek opportunities to disseminate their contributions.

At consortium level a set of KPI has been identified and are continuously monitored and described in the Paragraph 5.1 Quantitative Indicators.

## 3.11.2 Individual partner exploitation

Beside the overall Fed4FIRE+ vision and mission as a project, each one of the consortium partners has its own, distinct exploitation perspective. Hence, partner-specific exploitation report is seen crucial in ensuring that potential benefits for each project partner and for the whole consortium will be maximized.

### 1 IMEC

As an independent research institute which is working closely with industry, there are two important routes towards exploitation of the results for imec. The knowledge and IPR gained in Fed4FIRE+ is constantly and will further be exploited in future projects with industry. In such projects, industry directly benefits from imec's knowledge and may use consulting services or support in experimental work from imec. However, industry may also take over some of the IPR for further commercialization. A second path is the exploitation by imec of its knowledge by establishing spin-off companies.

In Fed4FIRE+, the research group IDLab (Internet Technology and Data Science Lab) is involved. IDLab is a core research group of imec and its research activities are embedded in Ghent University and University of Antwerp.

The embedding in 2 Flemish universities, allows a very efficient exploitation of knowledge by embedding this in the more advanced master courses in engineering and related high-quality PhD programs.

### 2 Sorbonne University

As a public university, our priority is to promote open access.

Sorbonne Université leverages the work done in Fed4FIRE+ in relation with the several testbeds managed and federated by SU, and with the European and national projects and initiatives in which SU participates. For instance, SU leads the EMPOWER project (H2020) and is also highly involved in the design of the SLICES research infrastructure, at both national and EU level. SU also contributes to share the results to the research community.

During this period, SU attended all the FEC organized and participated to several worldwide conferences and events. Some of them were organized in the framework of other initiatives, like EMPOWER, and SU considered relevant to invite Fed4FIRE+ to take part to the discussions. Those events are listed earlier in this report.



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### 3 Fraunhofer

Incorporation of work related to WP4 and Task 3.5 into own toolkit OpenIoTFog (https://openiotfog.org).

### 4 TUB

To exploit T3.5, TUB want to use the ontologies used in this project in the industrial IoT area and to combine them with natural language processing.

While to exploit WP4, TUB plans to write a paper about the matchmaking system. Among other things, about query processing, since the customer should be able to formulate normal sentences to get suitable results.

### 5 CERTH

At CERTH, where significant part of the experimentation will occur, graduate students will take a hands-on experience. The knowledge and experience acquired by students will provide them with better job opportunities and will be the driving force for distilling know-how to industry. Furthermore, establishment of fundamental knowledge and understanding on advanced and novel techniques of wireless networking will be achieved. Researchers, junior faculty and students will be educated through research conducted along the lines of the project in the form of theses, fellowships or research internships in industrial or other academic partners. The project results will be used in shaping the curricula of graduate and undergraduate studies of partner education institutes, by introducing new courses related to network applications, and by adding state-of-the-art cutting-edge material on already existing courses. CERTH is actively in disseminating project results in terms of publications and standardization work and in providing expertise to the research community. The cooperation with industrial partners will be exploited to give more concreteness to their academic research and to acquire practical experience, especially through the development of the testbeds within other user communities.

### 6 Mandat

Mandat International is managing and hosting the main servers for the IoT Lab testbeds federation. IoT Lab owns several testbeds dedicated to the Internet of Things (IoT) across Europe. Originally, IoT Lab was a European research project with the goal to research the potential of crowdsourcing to extend IoT testbed infrastructure for multidisciplinary experiments involving the end-users. Mandat International has integrated the IoT Lab platform and testbeds to the Fed4FIRE+ testbeds during the period covered by this deliverable. Mandat International is reusing or will reuse the results of the Fed4FIRE+ project to improve its own testbeds based on the tools developed by Fed4FIRE+. The developments made in the context of the project will allow Mandat International and its IoT Lab testbeds to provide new cutting-edge test services to the different categories of users.

### 7 Eurescom

Eurescom, having the mandate to advance technology for the benefit of the telecommunications industry, informed and discuss the current project outcomes with its shareholders and members who all have a business interest in the telecommunication market. As a follow-up activity in the area of experimental research, Eurescom is participating in several projects aiming at establishment of 5G facilities enabling the future experimentation in the area. Also, Eurescom is commercializing its knowledge by selling consulting services on building and deploying large scale testbeds and is active in preparation of the 3rd 5G PPP phase, focused on corresponding trials and experiments.



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## 8 Martel

Martel will continue the planned engagement and marketing activities in Fed4FIRE+ through leveraging a number of related innovation projects and promotional frameworks Martel is involved in**.** These continuous actions will give the opportunity to reach more broad audience and ensure effective establishment and sustainable growth of the future business development of Fed4FIRE+. Moreover, Martel actively contributes to liaisons and communication towards related communities where is actively engaged in. This includes: Next Generation Internet, 5G PPP /Networld2020 and Future Internet Experimentation Research.

## 9 Atos

**ATOS SE** (Societas Europaea) is a leader in digital services with pro forma annual revenue of circa € 12 billion and circa 100,000 employees in 72 countries. Group provides Consulting & Systems Integration services, Managed Services & BPO, Cloud operations, Big Data & Cyber-security solutions, as well as transactional services through Worldline, the European leader in the payments and transactional services industry. ATOS works in different business sectors: Defense, Financial Services, Health, Manufacturing, Media, Utilities, Public sector, Retail, Telecommunications, and Transportation.

Within ATOS Research & Innovation (ARI), node of R&D at ATOS in Spain, there is technology transfer and business development team that works on transition from research results to ATOS global portfolio and service lines. One of these lines is related to Business and Platform Solutions (B&PS) where Fed4FIRE+ results will be transferred, while the other one is within the portfolio of ATOS BPS (Business Process Services) and especially BPaaS (Business Process as a service)[8] which is one of the offerings currently provided in partnership with other companies. When it comes to BPS, in ATOS we make difference between BPO (Business Process Outsourcing) and BPS (Business Process Services) since in BPS we consider the whole mix of people, processes and technology, and what the business needs to achieve to deliver digital transformation strategy, combining customer experience, technology ecosystem, analytical insight, innovative business models etc. In this direction Fed4FIRE+ results and in particular yourBPM will be introduced as a part of technological solution for a specific customer segments. In a matter of fact, FIWARE4Industry catalogue has included a lightweight version of yourBPM (named COMPEL) as one of the enablers for generic manufacturing platform. Finally, ATOS also provides a full offering about Cloud, which includes from own hybrid cloud solutions (edge, public and on premise) to the fruitful alliance with Google Cloud to leverage on Google technology our solutions.

The largest number of customers in business process service portfolio comes from financial sector, public sector and utilities. However, there are also processes that are common to any organisation and can be provided in BPaaS mode, for example, a number of processes are offered on top of Oracle ERP in BPaaS mode, namely Source to Pay (integrating and automating Vendor Master Data, Invoice Processing, AP Payments and Query Resolution), Order to Cash (integrating and automating Customer Payment, Collections, Reporting and Customer Maintenance) or process known as Record to Report (Master Data Management, General Accounting and Cash Management). Our plan is also to contact other potential clients (e.g. Chambers of Commerce) and explore possibilities of joint exploitation with the other Fed4FIRE+ partners.

[8] e.g. https://ATOS.net/content/dam/global/documents/we-do/ATOS-BPaaS-factsheet.pdf



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The exploitable assets of ATOS include yourBPM and SLA manager. Exploitation path for these components are:

1. Technology maturation and transfer within ATOS Research & Innovation portfolio.
2. Contribution to product and service portfolio related to cloud related business of ATOS under the cloud offering of ATOS.
3. Contribution to new paradigms around Business Process Services, including technological environment such as BPaaS or consulting projects around Digital Transformation.

In future vision of the company, as Enri Pages presented in last FEC6 edition on 15-17 October 2019 in Athens, ATOS has a holistic view on how the computing must be transparent and smooth for the users as the available technology is already in charge of deciding where and how each software piece must be computed (edge, cloud, HPC, etc) without interfering with the user's work. Thanks to the Swarm Computing notion promoted by Atos since several years ago, the company is intending to generate business around the offering of services which can manage this kind of computation for users. The ATOS assets developed in Fed4FIRE+ project are included as tools to implement the Swarm Computing approach.

## 10 NTUA

During the second cycle, NETMODE team works on the integration of the reputation and SLA service with the core FED4FIRE+ and designs new semantic models for the wireless resources of NETMODE testbed. Through this process, NTUA has gained considerable knowledge and expertise on the trust management of federated heterogenous testbeds and NTUA's exploitation strategy aims to extend its work on trust with trustless mechanism such as blockchain. Also, NTUA aspires to convert NETMODE testbed from "pure" wireless testbed to edge computing testbed, towards the directives of MEC and 5G.

## 11 Inria

As a testbed provider, Inria's main interest in the project results is in attracting users in a way that generates revenue for its testbeds. Therefore, the results of WP4 are of particular Itnerest to Inria. It is also very interested in the work done to allow federation with minimal adaptations to the native APIs of its testbeds. Adoption of the authentication proxy to service as developped in T3.4 is therefore of particular interest.

The second exploitation path for Inria is related to all the work done in the project to help testbed users perform experiments with a scientifically solid methodology, using tools and services that contribute to making experiments reproducible, and experiment result available.

## 12 It Innovation

IT Innovation will develop its expertise in two major areas through participation in Fed4FIRE+. Firstly, it will enhance its expertise in computational governance via a risk management approach through research into data protection regulatory requirements treated as threats, with compliance to these requirements considered as the mitigation to these threats. Secondly, IT Innovation will build on its experience in federation sustainability and governance management by developing further its contributions to these areas via collaboration with other partners in the sustainability workpackage and Fed4FIRE+'s Federation Board.



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## 13 GEANT Limited

GEANT has not spent any PM in Fed4FIREPlus during this reporting period. The participation of GEANT in the project is limited to attending events, when invited, in order to provide advice on networking plans and issues.

## 14 i2CAT

i2CAT aims to support heterogeneous Future Internet experiments through its test-bed and services offered, as well as in the federated infrastructures in Fed4FIRE+. Feedback provided by the experimenters during the usage of the infrastructure or in the Engineering Conferences can be used to adapt equipment and frameworks to their needs. Consequently, an eventual extension of the infrastructure also benefits from external usage and feedback for further stress testing and fine-tuning of computing or SDN equipment. i2CAT leverages on the experimentation and internal feedback within Fed4FIRE+ to adequate the capabilities, offered via infrastructures and services, to that of the users' needs.

## 15 PSNC

PSNC continues its mission to provide research infrastructures to scientific communities, industry and SMEs in Poland. Fed4FIRE+ is a flagship project offering beyond state-of-the-art facilities for testing and validating innovative solutions in close to real conditions. PSNC plans to continue the service offering through Fed4FIRE+ and invite third party partners to make use of network and compute facilities offered for experiments. Wherever possible, PSNC will update components of the facility offered to Fed4FIRE+, in order to maintain high quality of the infrastructure offered to experimenters.

## 16 Universidad de Cantabria

All the enhancements introduced in SmartSantander testbed during Fed4FIRE+ will ease the interactions with the different stakeholders, whether it be industrial partners, scientific community, smart city managers or research projects. Lower the access barriers to an infrastructure such as SmartSantander will empower knowledge transfer towards local, national and international industrial partners, and at the same time will speed up their experiments in the smart city field.

All the extensions and enhancements included deployed during Fed4FIRE+ on SmartSantander testbed will also be used and promoted in future EU Projects. In addition, the work carried out in Fed4FIRE+ will also be used to support local academic teaching and research in the fields of testbed federation and smart cities.

Finally, University of Cantabria pursue increasing the scientific production of the institution with novel scientific papers, posters and conferences as result of the works carried out in the project.

## 17 Universidad de Malaga

UMA is making public its testbed in the scientific and industrial community in several ways. UMA has participated in all the Fed4Fire+ Engineering Conferences to advice potential users on the features of the testbed. During the first FEC in Ghent UMA presents the tutorial “"Hands-on tutorial on the PerformLTE testbed about LTE experimentation”. The features and visibility of the testbed have been increased thanks to the participation of UMA in further projects like TRIANGLE, Q4HEALTH, EuWireles and 5Genesis. In particular, as far as UMA testbed is being extended with resources from TRIANGLE Project, the papers, webs and other



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dissemination material in TRIANGLE are a powerful method to reach potential open callers in the context of Fed4FIRE+.

## 18 University of Amsterdam

The OpenLab infrastructure that UvA makes available in the Fed4FIRE+ project is continuously evolving to support novel Future Internet experimentation. The interest in this type of infrastructure is significant as well as within the Netherlands, thanks to many national projects, as well as in the European context thorough the participation in data driven H2020 projects.

Future efforts for exploitation of the testbed will lie primarily in the area of secure data sharing, with the infrastructure providing programmable devices that are easily embedded in scientific and industrial usecases.

## 19 Institut Jozef Stefan

Evolution of the LOG-a-TEC (http://log-a-tec.eu/) testbed to version 3 enables to perform trials with several technologies: LoRa, Sigfox, IEEE 802.15.4a, TVWS, clean slate non-IEEE 802.15.4, IEEE 802.15.4. The technology is (can be) used for advanced spectrum sensing, localization, LoS/nLoS classification, link quality classification and prediction, in MTC type heterogeneous networks. Exploitation of results is foreseen as follows: (i) research results will be published in top international journals and conferences (IEEE, ACM), such as GLOBECOM, INFOCOM, and. (ii) developed soft- and hardware will be used in teaching (laboratory).

JSI's facilities and developed components in other EU projects are open for the public. This will benefit the public at large, specifically small companies and enterprises in need of experimentation capabilities and developed components, which will be simplify the buildup of their products.

- LOG-a-TEC testbed is integrated the education process at the Jozef Stefan International Postgraduate School, in particular in courses concerned with (i) sensor technologies, (i) wireless sensor networks, and (iii) wireless communications.
- LOG-a-TEC testbed is exploited in several H2020 projects. In particular, the nodes hosting UWB transceivers are used for development and testing of the indoor passive localization algorithms for assisted living in SAAM project. In the H2020 RESILOC project the LOG-a-TEC LoRA transcivers are exploited in order to develop, implement and test personal devices with UNB connectivity for disaster relief applications.

In addition, the IEEE802.15.4 compatible receivers are applied in the research of the joint routing and scheduling algorithms for 6TiSCH based networks. The ongoing work is in the scope of the bilateral project with the University of Banja Luka, Faculty of Electrical Engineering.

## 20 Trinity College Dublin

The FED4FIRE+ objectives are well aligned with the research vision at TCD, where significant focus is given to resource sharing and slicing, network and radio virtualization, task automation and network autonomy, experiment reproducibility, energy efficiency, orchestration and control in future networks. Our work in FED4FIRE+ advances this research vision by helping our users validate new theories and technologies across real experiment environments, supported by easy to use tools such as jFed Experimenter, high testbed availability, and continuous equipment and technology upgrade and improvement. Additionally, the contacts and relationships developed supporting Fed4FIRE+ open call experimenters, attending FEC conferences, and interaction with Fed4FIRE+ consortia has encouraged and expedited new project collaborations and consortia with CONNECT at Trinity College Dublin for proposals across H2020, 5GPPP, and EU-Brazil initiatives. For example, CONNECT became involved



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in the 5GINFIRE project as a direct consequence of one of these relationships. The results of these cooperative research efforts, together with the dissemination material produced in FED4FIRE+, will contribute to TCD's excellent reputation as a world class research institution. Furthermore, FED4FIRE+ contributes to TCD's experience in EC funded projects, building on the expertise gained in consortia such as 5GINFIRE, WiSHFUL, CREW, WiSHFUL, FORGE, eWINE, ORCA, FUTEBOL, and Fed4FIRE. Finally, TCD leads the CONNECT Centre on Future Networks, a research centre co-funded by the Science Foundation Ireland and by industry. The FED4FIRE+ framework enables these partners to easily explore the exploitation potential of intellectual property developed across 5G networks and beyond.

## 21 Nordunet A/s

No activities in the reporting period.



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# 4 PLAN OF ACTIVITIES: M37-M60 (JAN 2020 – DEC 2021)

## 4.1 PLANNED WORKSHOPS & CONFERENCES

Participation in workshops and conferences is envisaged and will focus on three main activity streams to effectively promote the project's outcomes:

- **Engagement Events:** dedicated and active participation in conferences and workshops co-located with major events as a means to engage new Future Internet players, SMEs/Startups, and FIRE infrastructures providers into theFed4FIRE+ federated platform, such as NGI Forum, Net Futures, etc.

*Table 10: Planned engagement Events*

| Event Name | Date, Place | Type of Audience | Approx size of audience | Leading Partner | Focus and link to Fed4Fire+ |
|---|---|---|---|---|---|
| **IoT Week 2020** | Dublin, Ireland, 1-5 June 2020 | Academic and Industry | 1000 | MI | Workshop led by FedFIRE+ (TBC) |
| **IEEE InfoCom** | Beijing, China 27-30 April 2020 | Academic and Industry | >900 | SU | International liaisons with other testbed initiatives. |
| **GDR Networks and Distributed Systems Days / Journées du GDR Réseaux et Systèmes Distribués** | 23-24 January 2020<br>Nantes, France | Academic | TBC | SU | Discussions around testbeds, platforms, networks and distributed systems. |
| **IEEE ICC** | 7-11 June 2020 | Academic and Industry | 3,000 | TCD | Open Calls, research on Iris infrastructure |
| **WiOpt 2020** | 15-19 June 2020, Volos Greece | Academic | 100-150 | CERTH | As the organizer CERTH will disseminate Fed4FIRE+ activities and capabilities through panel discussions and printed material. |

- **Engineering Conferences:** these events serve as a forum at which experiments will showcase their results and provide feedback to Fed4FIRE+. It will serve as a basis to strengthen the community through which experimenters and facility providers interact and exchange information and experience.



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*Table 11: Fed4FIRE+ Engineering Conferences*

| Event Name | Date, Place | Type of Audience | Approx size of audience | Leading Partner |
|---|---|---|---|---|
| **7th FEC** | 23-25 March 2020 Poznan, Poland | Experimenters, facilities providers, Fed4FIRE+ partners | 130 | IMEC |

- **Road Shows:** this new format of event is recently introduced in the Fed4FIRE+ events to widen the reach of the Federated testbeds and guarantee the connection between the regional innovation ecosystem and the local entrepreneurship. The first road show will be held in Porto (PT).
- The event consists of a 1-day programme including a general overview of Fed4FIRE+ with its goals and testbed facilities, followed by a detailed presentation on a subset of the testbeds, selected on the basis of possible interests, followed by 1 or 2 testimonials of completed experiments on the facilities. The show continues then with 1 or 2 sessions in parallel during which participants receive a tutorial and hands-on training on using and setting up an experiment in Fed4FIRE+. The 1-day event will be free to attend and will be organized in collaboration with local agencies, government authorities or professional organizations which group a significant number of high-tech companies, SME's and start-ups in the broad area of NGI and Future Internet.

*Table 12: Fed4FIRE+ Road show(s)*

| Event Name | Date, Place | Type of Audience | Approx size of audience | Leading Partner |
|---|---|---|---|---|
| **1st Fed4fIRE+ Road show** | 18th February 2020 Porto, Portugal | Local participants from SMEs, University | 50 | IMEC |

- **Summer Schools**: will be carried out through tutorials to set up and run experiments which will take place in the Engineering Conferences and in the Fed4FIRE+ Roadshows**.**

## 4.3 PLANNED COOPERATION WITH RELATED PROJECTS AND INITIATIVES

Fed4FIRE+ will continue the liaison with the international initiatives as indicated in section 3.8 and support the dissemination and communication efforts and reach the widest audience possible on:

- **FP7 FIRE and H2020 projects**
- **Global Collaboration Initiatives**
- **EC Initiatives, especially the NGI**

Furthermore, Fed4FIRE+ consortium plans to strengthen cooperation with NSF initiatives and projects of PAWR (Platforms for Advanced Wireless Research), FABRIC (Adaptive Programmable Research Infrastructure for Computer Science and Science Applications) and ICE-T (Internet Core & Edge Technologies). A more detailed survey will be made available by CERTH regarding the engagement and cooperation of Fed4FIRE+ partners in the several NSF funded projects mentioned above.



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*Table 13: Fed4FIRE+ Cooperation with other initiatives*

| Initiative | Website | Global/EU | Leading Partner | Focus and link to Fed4Fire+ |
|---|---|---|---|---|
| **NGI** | ngi.eu | EU | MAR | Feedback towards NGI community of Fed4FIRE+ and promotion of Ope Calls |
| **5G PPP** | https://5g-ppp.eu | EU | MAR | Promotion of the Open Calls |
| **FIWARE LAB Foundation** | https://www.fiware.org/ | EU | MAR | Promotion of the Open Calls |
| **AIOTI** | http://aioti.eu | EU | MAR | Promotion of the Open Calls |
| **TETRA** | https://www.ngi.eu/about/tetra/ | EU | imec | Member of Advisory Board - Feedback towards NGI community of Fed4FIRE+ expertise on Open Calls and SME participation |
| **TM Forum** | https://www.tmforum.org/ | Global | MI | Telco operators |
| **SyncroniCity** | https://synchronicity-iot.eu/ | EU / Global | MI | IoT and Smart Cities |
| **5GENESIS** | https://5genesis.eu/ | EU | UMA | Malaga 5GENESIS platform will be offered to the open callers to run experiments |
| **EMPOWER** | http://www.advancedwireless.eu/ | EU/US | SU | Collaboration to the EU-US discussions about the EU-US joint development of advanced wireless research platform targeting new connectivity frontiers beyond 5G. |
| **ORCA** | http://orca-project.eu/ | EU | TCD | Iris testbed platform will be available to experimenters from the ORCA open calls |



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## 4.4 PLANNED OPEN CALLS

Fed4FIRE+ provides funding for third parties through the cascade funding by means of the Open Calls, mechanism. The following Open Calls are either already published or are planned.

*Table 14: List of the Open Calls*

| Call | Title | Deadline | Status |
|---|---|---|---|
| **F4Fp-07-L** | **7th Fed4FIRE+ Competitive Call** – Innovative Experiments Category "Large Experiments" | Feb 2020 | Launched |
| **F4Fp-08-M** | **8th Fed4FIRE+ Competitive Call** – Innovative Experiments Category "Medium Experiments" | Jul 2020 | Planned |
| **F4Fp-09-M** | **9th Fed4FIRE+ Competitive Call** – Innovative Experiments Category "Medium Experiments" | Jul 2021 | Planned |
| **SME** | Fast response | Continuous with 2-weekly cut-off dates | Ongoing |

## 4.5 PLANNED INTERNATIONAL LIAISONS WITH RELATED PROJECTS AND INITIATIVES

*Table 15: Planned international liaisons with other initiatives*

| initiative | Website | Activities done | Leading Partner | Focus and link to Fed4Fire+ |
|---|---|---|---|---|
| **GEFI** | https://www.advancedwireless.eu/index.php/event/global-experimentation-for-future-internet-gefi-2019-workshop/ | Co-organization & participation at meeting + demo's | SU & imec & CERTH | Position Paper on 5G Frameworks |
| **ECCE** | https://ecconsortium.eu | Co-organization | FOKUS & TUB | Federated / Distributed Edge / Cloud Computing |
| **5GPPP** | https://5g-ppp.eu/ | Participation in the 5G-PPP software networks working group (weekly calls) | CERTH | Integration of NFV based experimentation in the Fed4FIRE+ facility of NITOS |



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## 4.6 PLANNED CONTRIBUTION TO OPEN SOURCE INITIATIVES AND STANDARDS

With respect to contributions to standards and open source initiatives, the project, during this first reporting period, has mainly been working on identifying topics on testbed federation and interoperability. The standardisation landscape calls for fostering interoperability between the different layers of the IoT domain incorporated within Smart Cities systems. As such this need for interoperability maybe extrapolated to upcoming interconnected testbeds which could in the future serve as the foundation for the expanding smart and sustainable urban realm. In this context, initial work has been focused mainly on identifying potential interactions with “ITU-T SG13 Study Group 13 – Future networks” due to its focus on IMT-2020, cloud computing and trusted network infrastructure is leading the global standardisation work on next-generation networks. Meanwhile, contributions to the standardisation work performed by ITU-T Study Group 20 on IoT and Smart Cities and Communities have been planned.

With respect to data portability, in line with the General Data Protection Regulation (GDPR), the initial set of efforts towards ensuring the adaptation of Fed4FIRE+ testbeds to GDPR, a network of data protection officers (DPO) from all the testbeds was introduced. As part of their monthly meeting with the project DPO (MI), this network has enabled a harmonised approach to GDPR compliance through technical processes aimed to facilitate policy agreement by the end-user while respecting the needs and contextual elements of the testbeds. As part of the expected contributions to the standardisation landscape, future meetings of the network will be focused on identifying potential issues that could be resolved by enhancing data portability among testbeds, as well as defining the most relevant means (including standards, protocols and processes) to implement this right. Once this takes place, the project will seek to provide inputs or feedback to relevant standard bodies and data protection authorities, as necessary to contribute to the definition of standards which meet GDPR requirements.

Within the ITU-T Study Group 20 on IoT and Smart Cities and Communities, there is an ongoing work item on Open API in smart cities. This draft Recommendation is being developed under Question 6/20 on Security, privacy, trust and identification for IoT and SC&C highlights the concept and potential of developing a secured open and interoperable API in the context of IoT deployment testbeds and open data management in smart cities. In the context of this draft Recommendation, it will be beneficial to include core inputs from Fed4Fire, which helps highlight real-life and successful interoperable API schemes and architectural frameworks from a leading European-level project for dissemination through an international standard at the International Telecommunication Union.



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*Table 16: Planned Standardization and Open source initiatives*

| Standards body Initiative | Website | Activities done | Leading Partner | Focus and link to Fed4Fire+ |
|---|---|---|---|---|
| **TM Forum** | https://www.tmforum.org/ | Collaboration with TM Forum on the Open API approach | MI | API for IoT to be used in the IoT Lab testbed |
| **ITU** | https://www.itu.int/en/Pages/default.aspx | Preparation of an initial draft contribution on testbed interoperability and connectivity through open API | MI | Testbed interoperability |
| **ITU** | https://www.itu.int/en/Pages/default.aspx | Submission of the initial draft contribution by November at ITU SG20 meeting | MI | Testbed interoperability |
| **SyncroniCity** | https://synchronicity-iot.eu/ | Collaboration with SychroniCity on the Open API for IoT | MI | API for IoT to be used in the IoT Lab testbed |
| **O2CMF** | https://gitlab.com/futebol/O2CMF | Extention to support Software Defined Radio (SDR) Experimentation | TCD | Aggregate Manager integration for OpenStack Cloud platform with SDR |



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## 4.7 PLANNED JOURNAL AND CONFERENCE PUBLICATIONS

The table below presents an initial list of third party events planned by Fed4FIRE+ to run during M37- M60 (January 2020- December 2021) of the project.

*Table 17: List of relevant conferences and events for scientific dissemination*

| Event Name | Place, Date | Type of Audience | Website | Presentation | Leading Partner |
|---|---|---|---|---|---|
| **EUCNC 2020** | Dubrovnik | Industry, Academia | https://www.eucnc.eu | Conference Paper | |
| **ICC 2020** | Dublin, Ireland | Industry, Academia | https://icc2020.ieee-icc.org | Conference Paper | TCD |
| **The International Journal of Computer and Telecommunications Networking** | n/a | Industry, Academia | https://www.journals.elsevier.com/computer-networks | Journal Paper | TCD |



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# 5 IMPACT ASSESSMENT

## 5.1 QUANTITATIVE INDICATORS

*Table 18: Communication KPIs*

| Measure | Indicators | Target Number | Measured in DEC 2019 |
|---|---|---|---|
| **Brochure** | Cumulative number of brochures (also updated) distributed | >3,500 (700 per year) | **2,350** in total (general, FECs, business cards) |
| **Project Website** | Number of unique visitors to the website (average per year) | >1,000 | **21,678** in total (7,290 from Jan 2019) |
| **Social Networks** | Number of followers in social media | >100 | **401** |
| **Newsletter** | Number of subscribers (by the end of the project) | > 500 | **227** |
| **Engineering Conferences** | Number of events* | 2 per year | **6** |

* Three FECs during the reporting period.

The following table summarises the KPIs and the achievement reached so far by December 2019 (M36).

*Table 19: Dissemination and Communication KPIs*

| Measurable output | KPI | Target Number /year | Measured Dec 2019 (3 years in project) |
|---|---|---|---|
| **# of experiments / year** | # of experiments registered with Fed4FIRE+* | 15 | 81 |
| | # of industry-driven experiments/year* | 10 | 66 |
| **# of testbeds/ year** | # of testbeds added to federation* | 3 | 7 |
| **Heterogeneity of testbeds (cumulative)** | Total cumulative number of application domains covered by the federation** | 6 | >10 |
| **Number of publications / year** | # of relevant publications to conferences and journals, per year*** | 5 | 18 |
| **Participation in major events** | # of major events and conferences with Fed4FIRE+ attendance, presentations and/or booths**** | 4 | >15 |

* Experiments/testbeds through the Open Calls since start of the project (01/01/2017).



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** Based on application areas covered by experiments from Open Calls: e.g. agriculture, medical, learning, data centers, media, automotive, robotics, etc.
*** All publications are based on experiments and necessarily may not be included in this figure. That is why >5 is indicated for known publications.
**** All partners attended events may not be included in this figure. That is why >15 is indicated for known events participated.

## 5.2 PLANNED DELIVERABLES

The table 15 here below lists the Fed4FIRE+ Communication & Dissemination deliverables:

*Table 20: WP6 Deliverables*

| Del. No. | Deliverable name | WP No. | Lead part. | Diss. Level | Del. date | Status |
|---|---|---|---|---|---|---|
| **D6.05** | Fed4FIRE+ Dissemination and Communication Report and Updated Plan | WP6 | Martel | PU | M60 | planned |



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# 6 CONCLUSIONS AND NEXT STEPS

This document presents the Fed4FIRE+ dissemination and promotion activities and plan and describes a number of key activities that the project's partners are focusing on, in order to guarantee broad visibility of the project's work and results in the FIRE+ domain and beyond and to engage target stakeholders and produce a relevant and durable impact.



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