



D8.2 - Initial exploitation, dissemination and standardization plan

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Abstract

This report depicts the detailed dissemination, exploitation and standardisation plan for the 5GinFIRE project. This give an overall view of project strategy over the coming months in terms of dissemination and exploitation presenting targeted participation in events, conferences, publication in journals and related means to promote the project (Presentation, leaflets).

In parallel, the document also includes standardization objectives and strategy including an analysis of the topics to be discussed in the various standardisation bodies, setting basis for the initial IPR management plan. This initial work will be updated all along the project life, taking into account the experience and feedback from audiences and other stakeholders.

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Executive summary

5GinFIRE project focus on delivering an Open, and Extensible 5G NFV-based Reference (Open5G-NFV) ecosystem of Experimental Facilities that integrates existing FIRE facilities with new vertical-specific ones and enables experimentation of vertical industries.

The project strategy is based on community building. 5GinFIRE core ideas and solutions will be disseminated via selected channels to engage technical leaders and interested parties in a global and continuous base. In this approach, the project will organise two open calls for industry including SMEs, research institutions, and academia willing to experiment the project infrastructure.

From this concept and methodology, 5GinFIRE consortium designed a dedicated plan to enhance dissemination, exploitation of project outcomes and maximize contributions in standardization.

This report presents the initial strategy defined from partners to create and stimulate the 5GinFIRE community all along the project and after ensuring sustainability of developed technologies. It includes a description of objectives and planned activities to meet them in the following items:

- **Dissemination**
To share experience and knowledge acquired during the project life by coordinating communication actions in publications, workshops and events and broadcasting results on open source software platforms.
- **Exploitation**
To promote results to be stimulated and supported by the consortium while enabling sustainability of the facilities
- **Standardization**
To contribute in the relevant standardization activities and industry forums to develop standards based on core results of the project.

List of authors

Version	Company	Author	Contribution
V0.0	EGM	Nicolas Giunta	Initial document
V0.1, V0.2	EGM	Philippe Cousin	Revision
V0.3, V04	EGM	Nicolas Giunta, Philippe Cousin	Update of standardization plan contributions and rewriting of dissemination and exploitation plans details
V0.5	EGM		First draft to submission to partners for comments and contributions
V0.6	Eurescom	Halid Hrasnica	Inputs for dissemination part, project leaflet, exploitation part
V0.7	UoP, UC3M, BCOM, Bristol	Spyros Denazis, Cristos Tranosris Michel Coriou, Alozio Pereira, Ivan Vidal	Project presentation, exploitation parts
V0.8	Eurescom	Anastasius Gavras	Inputs for targeted events
V0.9	EGM	Philippe Cousin	Final draft for review
V1.0	Eurescom	Halid Hrasnica	Final version for submission

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1 Introduction

The 5GINFIRE consortium will ensure all along the project time a proper dissemination of results and ensure sustainability of developed technologies. This initial strategy plan in dissemination, exploitation and standardization will evolve as consortium members get feedback from the 5GinFire community we intend to build.

Planned dissemination acts as a backbone for other activities, creating awareness on project results towards stakeholders, potential customers, interested communities and all other relevant audience groups, which in one way or another might participate in the adoption of the project results and maximize standards contribution.

This strategy is based on consortium partners and their respective expertise and networks knowledge. Representing 10 organisations from Brazil and 6 European countries (France, Germany, Greece, Portugal, Spain, UK), the consortium will ensure national and international dissemination activities generating values for scientific and industrial communities.

2 Dissemination plan

Dissemination and community engagement are core parts of the 5GinFIRE project, responsible for creating awareness about the project and its results, mobilizing communities and markets players for experimentation and technology adoption. This work, under task 8.1, will serve as a strong basis for exploitation and standardization process to ensure sustainability of developed technology and acquired experience.

2.1 General approach

The 5GinFIRE consortium set up a communication strategy based on a multi-dimensional approach according to key concepts and methodology of the project:

- Generalised marketing of the project activities via selected media and dissemination channels
- Targeted marketing of specific activities and outcomes to each identified target group
- Specific dissemination through events organisation, participation and networks. The workshop activities are especially important as they will give its tempo to the project.

The communication of the project is unified along a common visual entity. A unified and coherent visual chart (colours, fonts, designs) will be derived from the project logo and provided in several shapes and formats (document templates, etc.). All the project partners will be deeply involved in the communication and dissemination activities, both in the countries where they are operating and on worldwide level, as each consortium partner is acting as a member of different networks and special interest groups. This plan will be updated on a regular basis and established collaboratively with the consortium partners. The related discussions will be organized at each project plenary meeting and at least once per month during the regular project audio calls. Thus, the efficiency of the dissemination campaign will be proportionally increased.

2.1.1 Objectives

This action plan follows three main objectives in order to maximize project impacts:

- To create awareness about 5GinFiRE components and outcomes
- To prepare and strengthen position of 5GinFIRE in exploitation and standardization activities
- To generate and animate a 5GinFIRE community composed by research, academic and industry players.

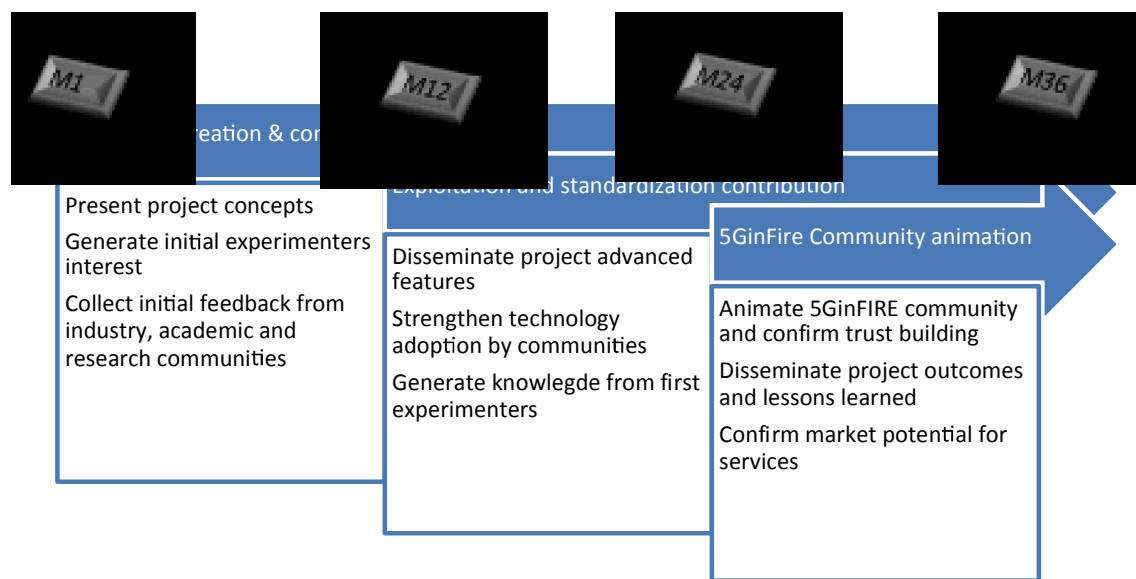


Figure 1 : Dissemination, exploitation and standardization phases

These goals will be reached by enabling a continuous information flow to target stakeholders. The below table shows the minimal indicators that are planned all along the project time:

Table 1: Dissemination indicators

Dissemination Target

<i>Number of related conferences in which 5GinFIRE will be active</i>	2 per year
<i>Number of generic medias (press) releases</i>	2 per year
<i>Number of publication in scientific conferences (Web of Science / Scopus)</i>	10
<i>Number of publication in scientific journals (from Science Citation Index / Scopus)</i>	4
<i>Organizing special sessions and other dissemination actions >=</i>	4
<i>Involving stake-holders through impact creation mechanisms (multipliers)</i>	50
<i>PhD thesis</i>	3

2.1.2 Target groups

5GinFIRE will broadcast open calls inviting key users to experiment project facilities and hence contributing in the knowledge sharing and building and technology development. 5GinFIRE partners will engage the three following categories of stakeholders as wide as possible:

- Research organisation, as experimenters for developing new products or carrying out key research activities
- Test bed owners to liaise and/or federate with 5GinFIRE using NFV techniques
- SMEs, developers willing to develop products or services and experiment them on 5ginFIRE test beds

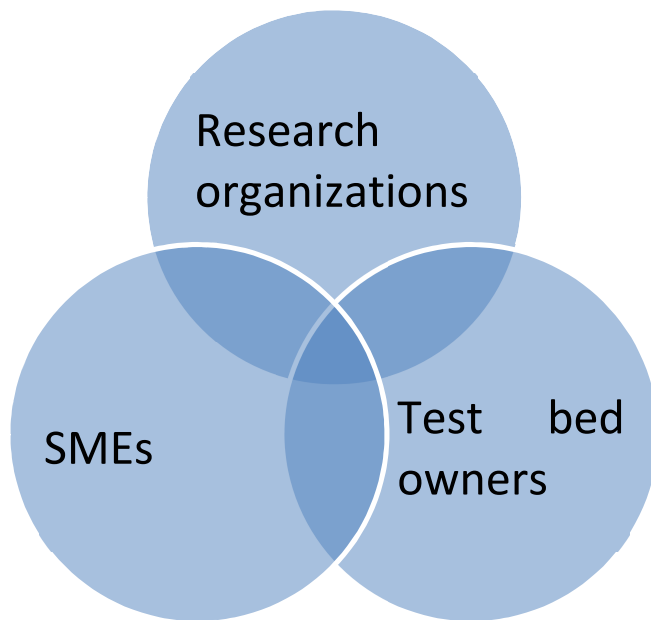


Figure 2: Targeted experimenters

However, project awareness and community building objectives will address a wider audience that will serve as information relay of the project to promote open calls diffusion and prepare exploitation and standardization processes developed in others tasks. Other target communities are:

- Other related projects, relevant to the topics addressed in 5GinFIRE: The consortium partners are involved in a large number of relevant research projects in the context of Responsible Research and Innovation (RRI), ICT applications and services, users' involvements etc. We will aim to maximize our coordination and interaction with these projects.
- European R&D organisations and their relevant researchers working in the project topic or those who might be interested to work in the topic (universities, institutes, R&D centres, etc.);

- EU and national policy makers and other interested actors: In particular, 5GinFIRE will influence EU policy makers by closely cooperating with H2020 funded projects and the cluster initiatives behind (for instance project on FIRE Support Actions)
- Fora and standardization bodies such as car related SDOs (car2car, open automotive alliance, ..), IoT related SDOs, oneM2M, ISO/CEN, ETSI, ITU, W3C, 5GPPP.)

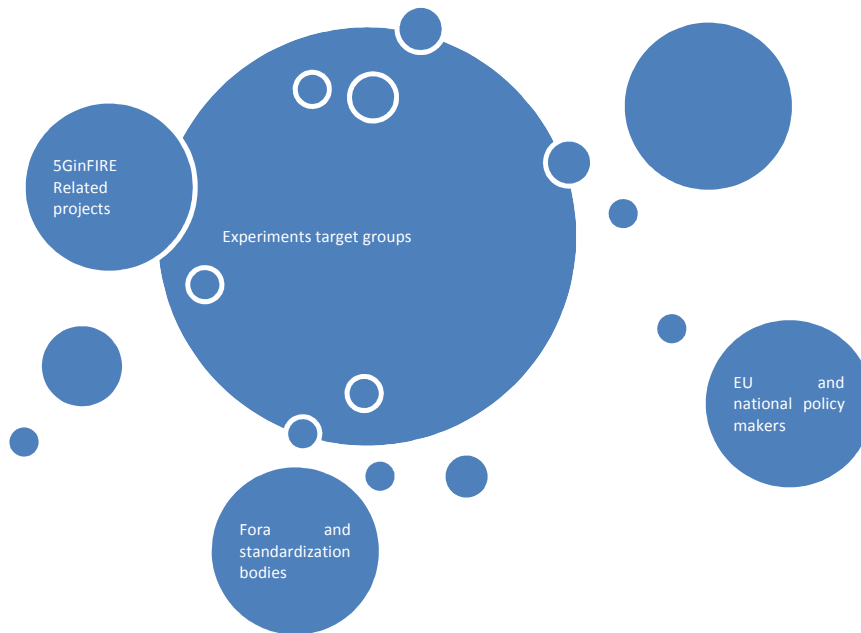


Figure 3: Project dissemination target groups

2.2 Dissemination activities

The dissemination of project concepts, developments and findings to all key actors in the field will be carried out in an interactive way, integrating their feedback at key points of the specification, design, development and evaluation work. The project will communicate key findings and research problems in the scope of the core technical work packages through its website and the project Twitter channel. Other social networking tools (e.g., LinkedIn and Facebook) will be also considered to disseminate activities and results and engage communities not only of technical professionals but also the general public.

2.2.1 Overall strategy

2.2.1.1 Key features in dissemination message

Key features in dissemination message are transcribed in the 5GINFIRE visual identity (Logo and derived templates presented in the deliverable D8.1) that refers to the 5G-PPP, the 5G Infrastructure Public Private Partnership, initiated by the EU Commission and industry manufacturers, telecommunications operators, service providers, SMEs and researchers. This existing logo is included in the FIRE (Future Internet Research and Experimentation) initiative logo to reflect the overall project concept.



Figure 4: 5GINFIRE logo

As a multi-target approach, 5GinFIRE designed specific communication messages derived from project expected benefits for each community and responding to dissemination objectives.

2.2.1.1.1 Awareness creation

The 5GinFIRE members developed specific dissemination messages based on the project impacts and its expected outcomes. These language elements will be used all along the project and mainly broadcasted through communication tools.

- 5GinFIRE - A booster for the NFV/SDN industrial ecosystem in Europe
 - Advanced virtualized networks infrastructure
 - Information technology and telecommunications convergence
 - Infrastructure cost reduction through virtualization of network resources

- ICT Ecosystem stimulator facilitator simplifying deployment and operations while stimulating third-party solution providers and developers.
- 5GinFIRE - A booster for engagement of industry, including SMEs.
 - Open reference ecosystem
 - No entry barriers for new networks applications developers
 - Free access to state-of-the-art approaches for integration, interoperability, and testing new solutions.
- 5GinFIRE - A booster for industrial deployment of enabling technologies.
 - Fully functional network functions API services
 - Time and cost reduction in dynamic network services creation
 - Easy, Free and open sources software and agile processes.

2.2.1.1.2 Experimenters Community building

As mentioned previously, the 5GinFIRE consortium will address targeted messages to strengthen interest for experiments and also generate a specific ecosystem, community around the project activities:

- Research organizations
 - Experiment with all the current results of 5GinFIRE as well as research and develop innovative network algorithms and functionalities
 - Test your network architecture with minimal cost using off-the-shelf white box hardware
 - Create customized architectures and services and contribute in technology progress with new functions
- SMEs and Network Designers
 - Experiment your solutions with different network architectures and permutations
 - Optimize your services before production phase and monitor solutions performance using the provided automated framework
 - Reduce time to market by focusing on core part of network design, a set of already existing functions is provided.
- Testbeds providers, Network/Cloud providers
 - Improve the Quality of Users experience benefiting from dedicated powerfull algorithms
 - Exploit physical hardware devices to improve performance for premium users
 - Reduce capital and operational expenses thanks to the automated instantiation and maintenance of network architectures

2.2.1.2 Key impacts in dissemination message

Taking into account the heterogeneity of target groups, key impacts of 5GinFIRE project are ranked according to their availability based on the fact that time perception isn't the same in industry, research community or standardisation bodies. However, as we intend to ensure sustainability of the project outcomes, all impacts will be developed for all target groups to create a long term vision and generate the strongest interest of all actors:

- Immediate impacts
 - Experiment without the constraints of the physical location or access to a specific experimental facility
 - Reduce experimentation time benefiting from a larger set of experiments to take place on reliable and benchmarked infrastructure that can evolve and be re-configured
 - Access to experimental facilities or environments without time and costs investments
- Mid-term impacts
 - Benefit from experience of other vertical application trials with a good mix of supply and demand stakeholders
 - Contribute in a unique and sustainable experimental facility at European level covering a variety of networking technology areas,
 - Be part of concrete cooperation and cross-fertilisation between European and international initiatives
 - Share knowledge and contribute to standardisation and interoperability of experimental facilities

A progressive strategy will be implemented during the 5GINFIRE project following three main phases intending to: firstly, create project awareness, then, present the first project outcomes and initiate community interactions, and finally, strengthen trust building and results adoption.

2.2.2 Dissemination actions

2.2.2.1 Communication tools

2.2.2.1.1 Public website

The 5GINFIRE project website, established on April 2017 and accessible on <https://5ginfire.eu/> fulfil three main functions such as:

- To provide general project information presenting objectives, workplan, consortium
- To support dissemination of project outcomes such as publications and deliverables
- To ensure the spread of open calls giving advanced level of information for targeted groups



Figure 6: 5GINFIRE Website - Homepage

The website will be continuously updated, in order to present the most recent status of the project and achieved results as well as to present the testing & experimentation infrastructure available in the 5GINFIRE and to promote the planned project Open Calls.

2.2.2.1.2 Promotional materials

In the scope of initial dissemination activities, the first 5GINFIRE flyer (3-fold, double sided) has been designed (Figure 7, Figure 8). The flyer was distributed at the EUCNC conference in Oulu, Finland (June 2017) and is also published on the project website. Content of the project flyer will be regularly updated in accordance with the actual project needs, targeted conferences and events for distribution, major project activities and outcomes, etc.

Furthermore, a template for 5GINFIRE presentations has been established and an overview presentation was created to be used at appropriate occasions by all project partners and is also provided on the project website. The project presentation, which was shown at EUCNC 2017 by Mr Spyros Denazis (5GINFIRE Technical and Scientific Manager), is included in In Annex B.



Figure 7: 5GINFIRE flyer (pages 1-3)

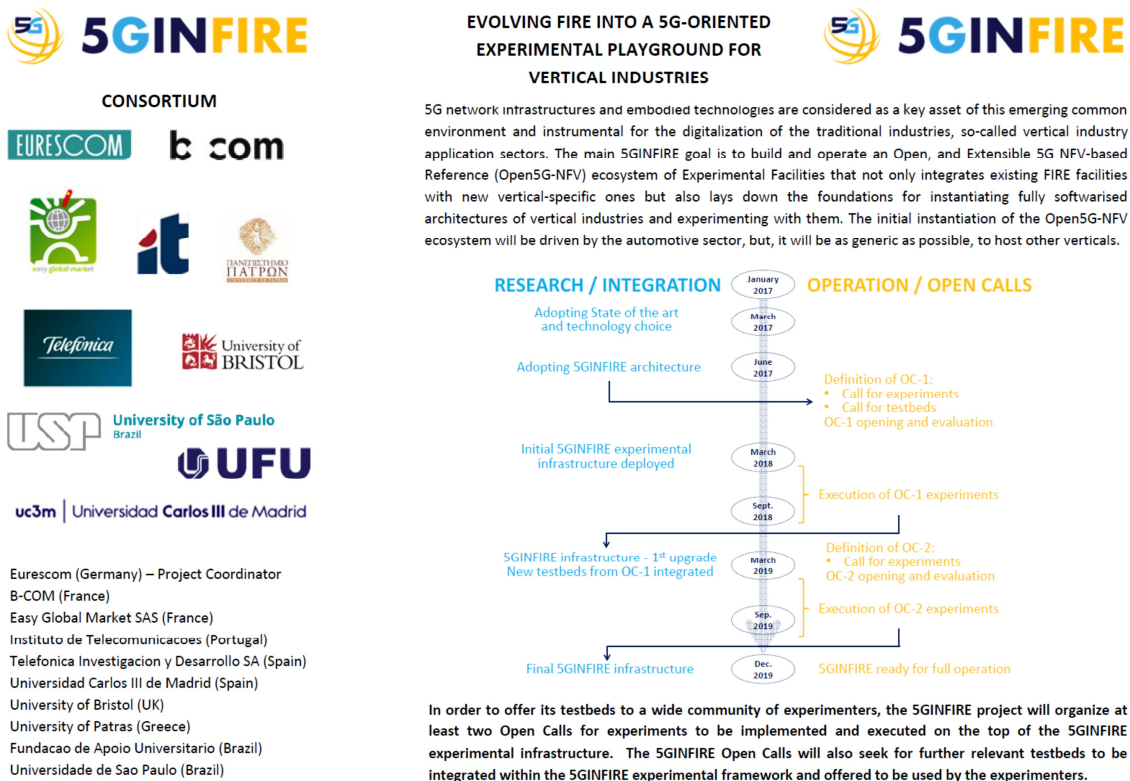


Figure 8: 5GINFIRE flyer (pages 4-6)

In parallel, members planned a regular issue of press releases (at least once a year), including interviews with senior managers or testimonials and presenting project outcomes. This channel will also give opportunity to promote the open calls. Furthermore, the project will provide regular newsletters (at least once a year) and/or targeted new items as appropriate and in accordance with actual project and community needs.

2.2.2.1.3 Social networks

The project benefits from a twitter account, @5GINFIRE, created on January 2017. This tool brings a new communication channel, more selective than the website and able to create dynamism and interaction around our activities and efficient launch of open calls.

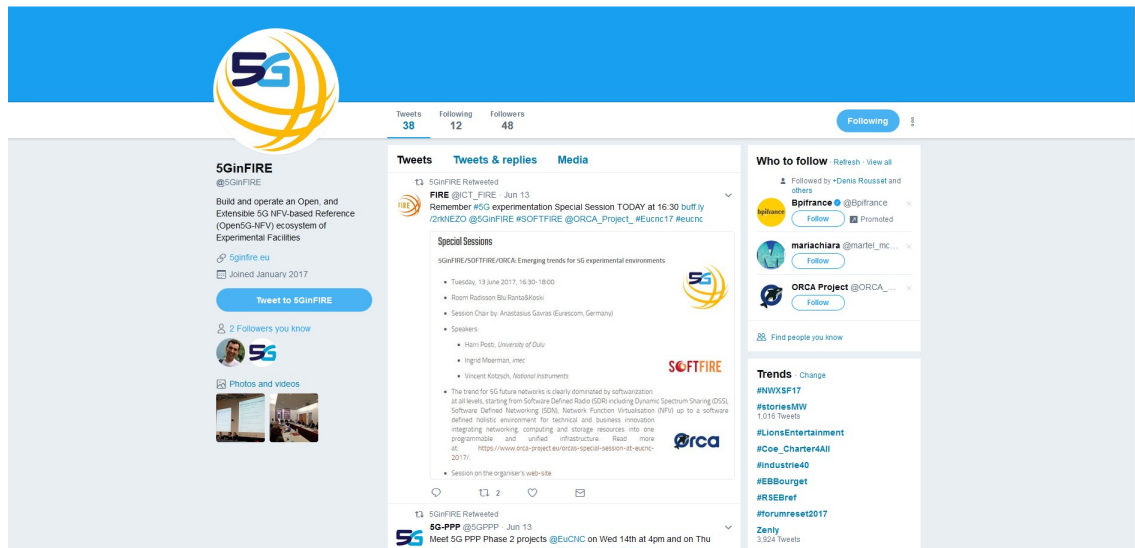


Figure 2: 5GINFIRE Twitter account page

2.2.2.2 5GINFIRE workshops

The 5GINFIRE will organize every six months workshops addressing specific topics to selected communities. This schedule will give tempo the project and reflects the different steps presented in the overall strategy targeting both industry players and end-users:

- Workshop #1: Spring 2017 - Awareness workshop - organized at EUCNC 2017 conference - Presentation of the project objectives, approach, and work plan
- Workshop #2: Autumn 2017 - First Open Call promotion - will be organized at the 5G week in Berlin is taking place from 6-10 November 2017
- Workshop #3: Spring 2018 - First Open Call results - Presentation of results from the first open call; accepted experiments and testbeds joining the project
- Workshop #4: Autumn 2018 - Second Open Call promotion - Presentation of advanced results in the experiments and Second Open Call Promotion
- Workshop #5: 2019 - 5GinFIRE results - Presentation of second call experiment results

- Workshop #5 & #6: 2019 - 5GinFiRE results - Presentation of second call experiment results and dissemination of final project outcomes and future plans for making the 5GINFIRE results sustainable for a longer period.

2.2.2.3 External events and Scientific Publications

Partners will participate in major conferences and scientific events to organize knowledge transfer and also promote open calls and projects (Presentations, Posters, ...). Giving highlight to the 5GinFiRE project with large audience, these events will be relay on by communication channels and for some will be assorted with scientific publications.

Scientific contributions from 5GinFiRE will focus on the most valuable project developments and final results and will target high standing scientific journals and conferences. This activity will be coordinate to ensure high-value in 5GinFiRE for the research and scientific community.

For the time being, the 5GINFIRE consortium identified events, conferences, and other dissemination opportunities to be considered by the project to provide appropriate contributions.

Event / Journal	Intended dissemination activities	Location	Timing
5G IoT Large Scale Pilots workshop at Global IoT Summit	Organization/participation at panel session	Geneva	6-9 June 2017
Summer School of Emerging Architectures and Key Technologies for 5G Networks - AegeanNetCom2017	A summer school course where OSM will be used for the lab to demonstrate VNF deployment	Samos, Greece	28 Aug. - 1 Sep. 2017
The International Conference on Cognitive Radio Oriented Wireless Networks (CROWNCOM)	Project presentation at FIRE workshop chaired by EC	Lisbon	20-22 Sep. 2017
SDN NFV World Congress	Project presentation and elaboration of possibilities for project present and upcoming events	The Hague	9-13 Oct. 2017
Global Wireless Summit	Paper submitted	Cape Town	15-18 Oct. 2017

Berlin 5G week	FUSECO forum: Project presentation at booth	Berlin	6-10 Nov. 2017
	IEEE International Workshop on Federated Testbeds for NFV/SDN/5G: Experiences and Feedbacks: - Paper presentation - Workshop with ORCA and SOFTFIRE		
Visions for Future Communications Summit, Organized by NetworkWorld2020 with the support of 5G Infrastructure Association, European Commission, IEEE and National Science Foundation	Participation in panel discussion	Lisbon	23/24 Oct. 2017
Workshop with 5GinFIRE and NSF	Workshop to find the gaps among different 5G and NFV technologies and propose strategies to suppress these gaps. Two workshops per year are planned	In discussion	
Journal of Network and Computer Applications	Paper submitted		
Orchestration of ultra-dense 5G networks, IEEE Communications Magazine	Paper to be submitted	n/a	1 Oct. 2017
Special Issue on 5G Radios and Networks, Journal of Network and Computer Applications	Paper to be submitted	n/a	15 Oct. 2017
Mobile World Congress	Booth - to be decided	Barcelona	26 Feb. - 1 March 2018
25 th ITS world congress	Papers, booth - to be decided	Copenhagen	17-21 Sep. 2018
Global 5G event in Brazil	Papers, booth, workshop	To be decided	

As mentioned within the general 5GINFIRE dissemination approach, the dissemination targets presented above will be reviewed and updated at all project meetings and during the regular project audio calls.

2.2.2.4 Networking and community engagement

As a complementary approach, each 5GinFIRE member will act as an information relay spreading the word about outcomes, results and project news and open calls. This aims to stimulate internal dissemination, i.e. knowledge transfer within the global organisation of the large partners, to facilitate exploitation of the results.

The project will also enhance external collaboration by organizing two joint workshops in collaboration with other experts in EU in relevant conferences or events in order to attract other experimenters (SMEs, researchers) from other networks such as the FI-PPP players (FIWARE platform users, developers), the 5G-PPP programme players and other related ICT H2020 projects.

3 Exploitation plan

To support the effective transformation of 5GinFIRE research results into potential marketable products, and accompanied by successful commercialization, extensive exploitation activities are planned, which will last for the entire duration of the project. The starting point will be an analysis of the relevant market including fine-grained market segmentation, identifying potential audiences and associated tailored strategies. An important aspect is to raise awareness with respect to the advantages and effects of novel solutions offered by the project. The 5GinFIRE partners follow a stepwise approach in exploitation activities, planning to ensure maximum exploitation of project results

3.1 General Approach

Sustainability is a key objective of the 5GinFIRE defined straight from the beginning. The main concept will be to provide open access to standardised solutions (e.g. openMANO, NFV) to experiment and develop future products and services toward a broad range of vertical areas and targeting major use of future 5G. The sustainability will be ensured by the unique integration of the project results into worldwide fora and standardisation related bodies. A Sustainability Expert Group (SEG) will be established to monitor exploitation paths in the scope of project activities

3.1.1 Objectives

Based on members experience in 5G and FIRE technologies and background in the development of innovative SDN/NFV tools and systems, 5GinFIRE will aim at maximizing exploitation of project outcomes by strengthening the Technology Readiness Level of the below main research items of the project.

Table 3: Expected TRL of 5GinFIRE outcomes

5GinFIRE result	TRL	Notes
<i>Portal and experimentation middleware</i>	TRL 6 TRL 7	We expect to reach TRL 6 before the Open Call and after validation to reach TRL 8.
<i>MANO deployment and integration</i>	TRL 7	We expect to reach this level due to the adoption of work already defined by 5GinFIRE partners
<i>5G Automotive experimentation environment</i>	TRL7	We expect to reach a mature level of allowing 5G Automotive experimentation on top of 5GinFIRE platform

<p><i>Generic EVI experimentation environment</i></p>	<p>TRL7</p>	<p>We expect to be able our 5GinFIRE platform to be as generic to allow the deployment of many EVIs across other 5G domains (ie eHealth, energy, Media & En)</p>
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3.1.2 Exploitation axis

To support the effective transformation of 5GINFIRE research results into potential marketable products, and accompanied by successful commercialization, extensive exploitation activities are planned, which will last for the entire duration of the project. The starting point will be an analysis of the relevant market including fine-grained market segmentation, identifying potential audiences and associated tailored strategies. An important aspect is to raise awareness with respect to the advantages and effects of novel solutions offered by the project. The 5GINFIRE partners follow a stepwise approach in exploitation activities, planning to ensure maximum exploitation of project results:

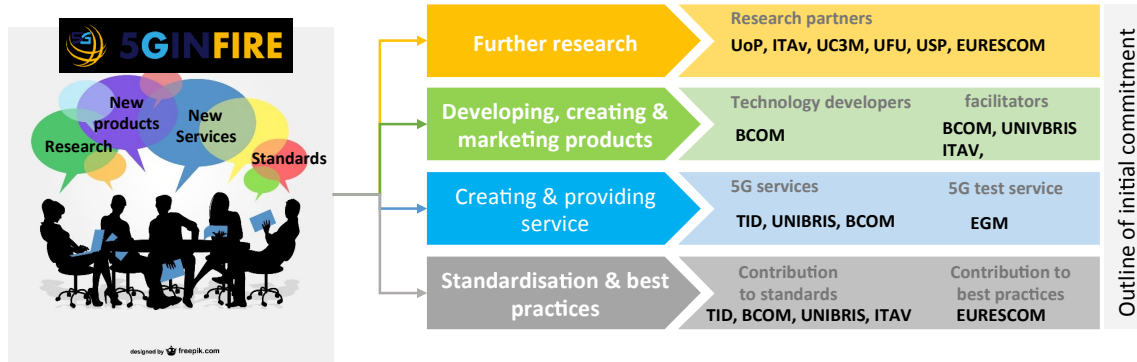


Figure 9: 5GINFIRE exploitation axes

Considering the various categories of project results - Research , Services, Products and standards - the exploitation strategy adopted by the 5GINFIRE consortium will incorporate four main exploitation axes towards the wide adoption and potential commercialization of the project results. These four axes are addressed below:

- **Axis 1: representing the “research market”**, constituting the core exploitation activities of the participating research bodies and the academic institutions that are mainly involved in applied research activities. The 5GINFIRE research institute (BCOM, ITAv) and the 4 involved universities (UC3M, UoP, USP, UFU) in the consortium will focus on: building the scientific community around the manufacturing domain, incorporating significant parts of the developed technologies in their teaching activities, and designing a number of follow-up research projects and initiatives at both national and international level. These activities could be considered as the “scientific exploitation” of the project results,

and could be targeted on promoting both the overall solution as a whole, thus constituting the project's primary market, as well as the individual research developments, constituting their individual markets. Furthermore, they would exploit other results such as the collaborative enterprise networks, business services, collaboration platforms, and novel interfaces related communities. The 5GINFIRE technology development companies (BCOM) will also exploit this axis, namely in cooperation with the academic partners, and towards the following-up research projects and initiatives.

- **Axis 2: representing the “products market”**, to be addressed mainly by the technology development members of 5GINFIRE, and including a number of options, as exemplified below:
 - o The “commercial roll-out model” that will focus on the commercialization and productive deployment of the overall solution and integrated platform, for serving manufacturers in the development of new product-service systems. Apart from the target sectors of generic 5G related software and products, the 5GINFIRE consortium is going to investigate the potentials of supporting other additional sectors such as in Automotive or other sectors addressed by the project
 - o The “commercial integration market”, which foresees the incorporation of individual research results into already existing platforms and services at the respective individual market. As such, research institutes and industrial partners are going to have significant benefits by commercializing their individual R&D results, through their integration with current software solutions that they maintain.

- **Axis 3: representing the “services and technology consulting market”**, which is the axis standing for one of the main exploitation activities of those project partners interested in transfer and consulting on technological know-how, such as on test services, new platforms... 5GINFIRE partners such as EURESCOM, TID, UNIVBRIS, UoP are going to focus on delivery of technology consulting services: to the early adopters in industry, to the new technology providers and integrators, as well as to the SMEs' networks and associations. These “technology exploitation” activities are targeted mainly in promoting individual research & developments know-how to selected industrial users and to technology transfer bodies. The end-user companies, i.e. TID and UNIVBRIS will exploit training services, both for in-house development of a new product engineering culture and for the better integration of their suppliers. Considering 5GINFIRE's aims towards 5G related services and innovation, before addressing the “products market” there will be a need for a number of additional steps corresponding to the “productization” phase. The exploitation of the “consulting market” is, however, closer, as the acquired knowledge and developed methodological results can be rapidly used.

- **Axis 4: representing the "standardization sector"**, while not directly related to monetary returns; this axis also represents an important enabler for wider adoption of 5GINFIRE results. As such, the academic partners and industrial companies will explore their links to various standardization bodies and other industrial organizations, in order to influence the adoption of models and guidelines developed by the project. The research partners, through their links to professional and scientific associations (e.g. TID, BCOM, UC3M, UNIBRIS) will promote the developed frameworks in those communities.

3.2 Exploitation activities

3.2.1 Overall strategy

5GinFIRE will stimulate a joint approach of the market with new products and services based on the obtained results.

For exploitation, the participating companies plan to involve their industrial partners and stakeholders in the design of technically feasible and scalable commercial products from the project concepts and results, and cooperate in the transfer of acquired knowledge to industry. The consortium will also cooperate to promote the adoption of the developed functionalities by other parties not involved in the project.

For sustainability, the project will get feedback of key experts within a Sustainability experts group (SEG) to get feedback along the project lifetime on the alignment to market vision and technologies as well as to establish key liaison and interaction with fora and organisation(s) which can welcome and host some major 5GinFIRE results.

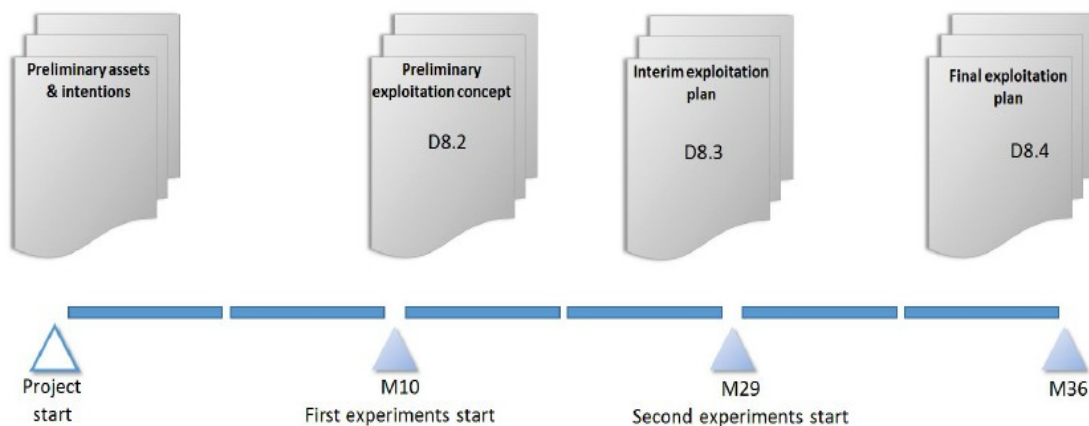


Figure 13: Phases in exploitation plan definition

The 5GinFIRE consortium will periodically update and assess the list of exploitable assets, at each milestone, and add new detail to the assets. A complete and final list of exploitable assets will be available upon completion of the project. This will be based on two continuous processes developed during the project:

- Incremental development and exploitability assessment
A multi-step iterative approach in order to facilitate collaborative product-service design will focus primarily on optimization and sustainability. Exploitability of each component will be evaluated giving key elements for exploitation plan update.
- Results consolidation report
A set of guidelines, based on the validation results and the lessons learnt with the pilots will be elaborated to ensure knowledge acquisition. This memory of generated knowledge will facilitate practical exploitation of assets and ensure the best technology transfer conditions.

3.2.2 Exploitations actions

3.2.2.1 Sustainability Expert Group (SEG) animation

5GinFire will animate all along the project a dedicated industry and users representative group of experts in charge of identifying, assessing, advising on potential exploitation of assets performed in the project.

This group aims at maintaining tight links with the market in order to ensure the sustainability of 5GinFire concept and technologies. It will gather all main project stakeholders such as testbeds providers, experimenters but also fora, industry experts, SMEs and other public authorities. Part of the 5GinFIRE community, SEG members will be selected on expertise level and market knowledge criteria, giving a representative sample of heterogeneity of stakeholders in the field.

The Sustainability Expert Group will be mobilized via interviews, involved in different project workshops and will give a continuous objective look on exploitation assets. Part of the group work will be presented on year 3 during the workshop on best practices and reporting in exploitation report deliverables.

3.2.2.2 Potential exploitation by consortium partners

Participant

Description

EURESCOM

Overall approach: Eurescom, having the mandate to advance technology for the benefit of the telecommunications industry, will provide advice for the exploitation of the project results to its shareholders and members who all have a business interest in the telecommunication market, as well as in the definition of further joint collaborative undertakings that cover all emerging issues in the context of new services over future networks. Exploiting the possibilities with respect to the experimental research can easily result in provision of new services to customers will enrich the service portfolio of telecom operators and service providers in this area. Thus, the project is of significant interest to Eurescom and its shareholders and members.

Currently Eurescom is commercialising its knowledge by selling

	<p>consulting services on building and deploying large scale testbeds. Contracts for this purpose have been signed with the European Space Agency (ESA). The focus of these contracts has been on studying the needs and requirements for testbeds for experimenting with satellite/terrestrial integration in the context of future 5G network infrastructures and services.</p>
<i>EGM</i>	<p>Overall approach: EGM is an SME providing validating and test services and currently active in developing new tests services for ITS and IoT in particular through the oneM2M tests and certification activities, the IoT trust and security label within the H2020 ARMOUR project and the semantic testing under development within the H2020 FIESTA FIRE project. EGM will link all these activities to 5GinFIRE to provide tests services for 5GinFIRE vertical through the openNFV portal.</p>
<i>B-COM</i>	<p>Overall approach: Exploitation focusing on b<>com *Unifier GW* which is the brand name selected by b<>com for what has be named “5G in a box” in the scope of 5GinFire project. b<>com *Unifier GW* is a converged Access Control and Core solution that leverages on SDN and NFV technologies integrated with IT (see https://b-com.com/en/bcom-unifier-gw for more details). In 5GinFire, b<>com provides it as a PNF (Physical Network Function) with a dedicated hardware ("5G in a box") or as a VNF (Virtual Network Function). In both cases, this contribution will help b<>com to raise the TRL (Technology Readiness Level) of the b<>com *Unifier GW* by deploying it on partners' sites and by integrating it on 5GinFire testbed with OpenStack and Open Source MANO.</p> <p>b<>com strategy is based on technology transfer: b<>com is not targeting an "on-the-shelf product" for 5G in a box but aims to transfer some its building blocks to telecom industry players, at least for 5G testbed operation and industrial campus. The sales channel for b<>com is mainly an indirect one and 5GinFire project should demonstrate the ability for b<>com to address such a business plan.</p> <p>Moreover, as b<>com *Unifier GW* is based on various open source modules, the experimentation phases could lead to dissemination into communities like OpenAirInterface, OpenDayLight.</p> <p>In the scope of 5GinFire project, b<>com does not provide testbed assets. Nevertheless, b<>com has its own experimentation testbed named b<>com *Flexible Netlab*, which has been built thanks to internal projects as well as to 5G-ENSURE H2020 phase 1 project. Recommendations, technologies and architectures deployed by partners in the scope of 5GinFIRE project is an opportunity for b<>com to enhance its own testbed and work on its sustainability. In a Continuous</p>

	<p>Deployment approach, b<>com *Unifier GW* MUST be deployed on b<>com *Flexible Netlab* prior to deployment on 5GinFire deployments.</p> <p>Finally, b<>com will advertise for 5GinFire open calls in its regional and national ecosystem. Some SME members of b<>com like Astellia could be interested to deploy their (probe) VNFs on 5GinFire testbeds.</p>
ITAV	<p>Overall approach: As a non profit organisation, and being composed by institutions belonging to both academia and industry, IT Aveiro plans to closely link the results of this project with its mission of "creating and disseminating scientific knowledge in the field of communications", improving the competitiveness of Portuguese industry and Telecommunication operators. More concretely, the raised know-how will empower skilled people, with knowledge in software development for telecommunications, to improve this knowledge, and transfer it to the industry or operators. In a similar manner, it will allow its introduction in graduate studies and projects inside the University of Aveiro, aiming to create even more competitive and proficient future telecom professionals. The results will also be employed and used as an impetus for the acquisition and elaboration of new research projects or consultancy actions with operators and IT companies in the same areas, aiming to attract Ph.D. students and Post-Doctorates, as well as to place influence in standardisation bodies and the industry fora.</p> <p>Furthermore, It-Aveiro will exploit these results in the relationship with a diverse set of companies that are closely associated with IT, such as Veniam, Ubiwhere and Altice Labs</p>
TID	<p>Overall approach:TID As the innovation company of a multinational telecommunications operator, TID will focus its exploitation activity on the technology transfer to the Business Units of Telefónica, and the application of the project results to:</p> <ul style="list-style-type: none"> • The improvement of the Telefónica technology evaluation and testing facilities focused on 5G infrastructures and innovative network services • The enhancement of Telefónica service validation practices, focused on a reduction of time-to-market and a closer loop with customers • The direct integration of relevant contributions in the Software Networks orchestration field to its operational services, through contributions to the applicable open source projects (essentially OSM and OpenDaylight)

<i>UC3M</i>	<p>Overall approach:</p> <p>Universidad Carlos III de Madrid (UC3M) will consolidate its expertise in the area of networking research, more specifically in the field of management and orchestration in 5G environments, strengthening its position as one of the major research centres in Spain and Southern Europe. It will increase its visibility internationally by publishing papers at top conferences and giving seminars on the resulting work. The outputs of the project will also be used to improve UC3M training of under and postgraduate students, as well as to attract post-doctorates and Ph.D. students to the UC3M Ph.D. program. The management and orchestration platform, deployed as a result of the project execution, will be used to support UC3M research and experimentation activities in national and international follow-up research projects within the scope of 5G. Finally, UC3M will also explore the possibility of publishing/licensing software and patenting, under the terms specified in the CA of the project.</p> <p>Assets (e.g. IPR, technology transfer, commercial products or services):</p> <p>UC3M will address the exploitation of the project results in several directions. We will consider the technologies developed during the project to improve UC3M training in post-graduate courses, particularly in the Master in Telematics Engineering and the Master in Telecommunications Engineering of UC3M. Furthermore, the MANO deployment that will be made available in UC3M will serve as a stable platform to support the development of Master and Bachelor Thesis, as well as experimentation activities in other national and international research projects where UC3M is involved, such as the 5GCity (funded by the Spanish Ministry of Economy and Competitiveness, grant agreement TEC2016-76795-C6-3-R). UC3M will also explore the exploitation of the project results and the transfer of the virtualization technologies of 5GinFIRE in the context of contracts with institutions and companies. In this respect, UC3M will leverage its collaboration established with the Spanish National Institute of Aerospace Technology (http://www.inta.es), given the relevance and adequateness of the virtualization environment developed within 5GinFIRE to support experimentation activities with software components of Unmanned Aircraft Systems. Finally, UC3M will contribute to the development of OSM, making all the developed software publicly available under the OSM license (https://osm.etsi.org/about/osm-license).</p>
<i>UNIVBRIS</i>	<p>Overall approach:UNIVBRIS As an educational and research institution, UnivBris intends to enhance and promote its know-how, foster innovation and improve its industrial collaboration. PhD students and researchers will have the opportunity to take part in the related research activities.</p>

Standardisation organisation and fora like ONF will be influenced. UnivBris will utilize the results of 5GinFIRE to strengthen the position of Bristol is Open as a prime environment for facilitating the joint engagement of fog computing relevant vertical industries (large telecom and software companies, small hi-tech start-ups, public service delivery organisations, automotive industry etc.). UnivBris expects, through its project involvement, to

- improve on its ability to leverage additional investments, extending from current additional funds from the UK Smart Cities Catapult for big data visualisation towards attracting private sector customers to conduct their own R&D projects on the network and expand towards other vertical industries such as automotive etc;
- (ii) use results of use case demonstration and showcases for Bristol Council to promote adoption of concept of programmable and open city infrastructure across UK in particular and Europe in general
- (iii) use the technological developments of 5GinFIRE and results of use case demonstration to influence Bristol council on its road map for providing services based on the 5GinFIRE technologies to the user communities of the Bristol is Open infrastructure and in particular vehicular industries and users, media and entrepreneurial community and technology start-ups.

Assets (e.g. IPR, technology transfer, commercial products or services):

1. Bristol is Open aspires to become the laboratory for the development, testing and promotion of new tools and instruments in support of innovation, with a view to helping innovative enterprises to innovate faster and better. The aim is to support all forms of innovation, taking into account the great societal challenges of today that includes technology transfer and telecommunication services.
2. University of Bristol is looking for using 5GinFIRE open-source base architecture as an open science platform to sharing insights through publications.
3. The integration between Bristol is Open and 5GinFIRE will serve as a tech transfer office.
4. Software Assets - all software assets developed in 5GinFIRE will be available in an open source platform.
5. Infrastructure Assets - virtual machines image containing the 5GinFIRE core system will be available, and continued running on the Bristol Cloud after project end allowing for instance service provider perform experimentation of new services before deploy it in large scale.

<i>UoP</i>	<p>Overall approach: UoP UoP is very actively working in standardization activities in IETF/IRTF and ETSI's NFV and will be able to increase its contributions. In addition, the University of Patras will enhance its testbed facilities and services with 5G capabilities that 5GinFIRE will provide.</p> <p>More specifically, the 5GinFIRE technology will be used for the operational procedures of UoP's NAM Group Patras Platforms for Experimentation testbed offerings as well as enhance the automated deployment mechanisms for deploying virtual network functionality. To this end, the local experimentation environment will be upgraded with 5G features that they can become accessible primarily by students, and researchers as well as regional SMEs that cooperate with the UoP. Finally The University of Patras as an educational institute will be able to improve its educational purpose by providing state-of-the-art knowledge and offer more bachelor diploma thesis and PhD positions in upcoming 5G topics as well as access to the research results of 5GinFIRE</p> <p>Assets (e.g. IPR, technology transfer, commercial products or services):</p> <p>UoP will create the 5GinFIRE experimentation portal and VxF marketplace like Open Source solution. This technology can be transferred to OSM release management if necessary.</p>
<i>UFU</i>	<p>Overall approach: UFU exploitation activities will be conducted in three different directions. The first one is related with the effort to provide to the industry high skilled human resources that will have the opportunity to take advantage of 5GinFIRE outputs and outcomes. Also the participation at 5GinFIRE will be an excellent opportunity to the post graduate students at UFU that will have the conditions conduct experimental research in this area. The second direction is related with the industry and also the networking companies in Brazil. In particular, ALGAR Telecom, an operator headquartered in Uberlândia, that has a strong liaison with UFU, can take advantage of 5GinFIRE, thus helping to enable innovation. The third direction is related with the universities and institutions that are engaged with FIBRE in Brazil. In this case, 5GinFIRE will presented and can be exploited by all this community extending the use of FIBRE testbed and also fostering 5G related research by considering vertical requirements.</p>
<i>USP</i>	<p>Overall approach: University of São Paulo exploitation activities will focus on strengthening the expertise of researchers and students of participating research labs, enabling both cutting-edge research and knowledge dissemination in the key areas addressed by this project. As both laboratories involved in the project (LARC-USP e LSI-USP) have strong partnerships with the industry, it is also possible to exploit project</p>

results in the development of commercial solutions. Finally, as USP hosts a startup incubator, it is possible to foster innovation and entrepreneurship in creating startup companies that can built upon project's results

4 Standardisation plan

4.1 General Approach

Standardization efforts are an essential part of the strategy for the project. Without standards to back up the developed technology, any interoperability efforts run an increased risk of marginalization due to lack of market wide adoption. The standardization efforts will begin early in the project with identification of expected outcomes on requirements and architecture.

4.1.1 Objectives

5GinFIRE Consortium aims at contributing in key standardisation fora. Standards (technical reports, specifications and/or recommendations) reflected key results from the project activities.

This activity will also foster other developed plans of this work package, tightening links with that specific community and ensuring proper dissemination of project results. Exploitation will also benefit from this action as standardization processes is a key in trust building.

4.1.2 Target groups

Standardization efforts will be done continuously by consortium partners who have strong expertise and experience in the field. Initially, we will focus on contributing in ETSI ISG NFV including other SDOs such as IETF/IRTF, Open Source MANO (OSM), OPNFV and encourage joint contributions and participation to these bodies.

4.2 Standardisation activities

Standardization activities, in all their facets, including the participation in standards development organisations (SDOs) and the contribution to open-source communities, constitute a key way of achieving long term sustainability and the widest possible use of the 5GinFIRE results. The work in 5GinFIRE builds extensively on existing standards and specifications. Successful contributions to standards not only help to ensure the project's impact and usefulness, but also serve to validate the quality and relevance of its output.

4.2.1 Overall strategy

The standardisation of 5GINFIRE results will be focused on relevant standards development organizations (SDOs) already focused on 5G Software Networks orchestration. The 5GINFIRE team has performed an initial analysis of the most promising of these SDOs and the relevant committees, the results of which is presented in this section. The goals and processes of each SDO are introduced, together with an analysis of the committees and working groups where 5GINFIRE results can be contributed and become part of the produced standards. Since the 5GINFIRE partners acknowledge that the complete standardization process may

well take longer than the project lifetime we want to express our commitment to continue the effort required to achieve full standardization of the fruitful contributions beyond the end of the project, as part of a further exploitation of 5GINFIRE results.

Furthermore, we are aware of the new standardization mechanisms offered by open source communities, beyond the use of open source software as the base for project development and the further distribution of project results under an open source license to maximize impact. Some current open source communities support a different mechanism for standardization, equally or even more effective than documented specifications. This mechanism consists of the definition of open APIs and the availability of a reference implementation distributed as open source. To achieve this standardization effect, open source communities need to have a wide industrial support and governance mechanisms in place that make them in practice similar to SDOs and their processes. 5GINFIRE considers this additional way for achieving a high impact in industrial practice, and the team has therefore identified those open source projects widely accepted by the industry where the results of the project can be contributed as part of the standardization effort.

In addition, the 5GINFIRE team is committed to a continuous observation and evaluation of further standardization opportunities that can appear during the project execution.

4.2.2 Standardization actions

4.2.2.1 ETSI NFV ISG

ETSI is the European Telecommunication Institute, a European Standards Organization recognized by the European Union, and focused on producing global standards for Information and Communications Technologies (ICT), including fixed, mobile, radio, converged, broadcast and Internet technologies. ETSI has more than 800 member organizations in 64 countries all over the world, and among the most salient standards produced by ETSI we can cite the ones around GSM, DECT, or smart cards. ETSI acts as the rooting organization for other global industry standardization partnerships like 3GPP and OneM2M.



World Class Standards

ETSI standardization work is organised around:

- Most of the standardization work is carried out by committees. The members of these committees are technical experts from member organizations. These committees meet typically between two and six times a year, either on ETSI premises or elsewhere. There is a range of different types of committees for different tasks:
 - Technical Committees (TC) and ETSI Projects (EP). Both activities address a number of standardization activities defined in their terms of reference. TCs work

in a specific technology area, while EPs are established to meet particular market sector needs rather than centred around a basic technology, and last for a fixed period of time.

- ETSI Partnership Projects, established when there is a need to co-operate with other organizations to achieve a standardization goal. There are currently two Partnership Projects: The Third-Generation Partnership Project (3GPP) and oneM2M.
- Industry Specification Groups (ISG), operating alongside the traditional standards-making mechanisms and focusing on a very specific activity. ISGs are self-contained, decide their own work programme and approve their own specifications.
- The ETSI Directives define the legal status, purpose, scope, and functions of ETSI and covers the entire lifecycle of our standards.
- ETSI committees are co-ordinated by the Operational Co-ordination Group (OCG), which includes the chairmen of all our technical committees. Ultimately the committees are accountable to the ETSI Board and the General Assembly.
- ETSI members decide what work to be done, by each committee establishing and maintaining a work programme which is made up of individual items of work. Collectively, the work programmes of all the committees constitute the ETSI Work Programme. Each work item describes a specific standardization task and normally results in a single standard, report or other documents.
- ETSI follows an open approach to standardization, and operates by direct participation (ETSI members are not represented by a national delegation or other body), and any member may bring as many contributions and voice as many opinions as desired. Decisions are taken by consensus, declared by the committee plenary.

ETSI encourages the introduction of standardization as early as possible in the development of a new technology, as it would provide a solid foundation for its future exploitation. 5GINFIRE intends to begin early standardization and pre-standardization activities in ETSI, specifically in the committee of highest relevance to the project, the ISG on Network Functions Virtualization. The different working groups in the ETSI NFV ISG to which we believe 5GINFIRE can contribute are:

- **TST.** The TST WG is focused on testing and implementation issues, especially focused on interoperability. This WG is the home of the NFV PoC (proof-of-concept) framework, oriented towards demonstrating the feasibility of the NFV proposals and providing initial experimental evidence of new proposals. The WG is working in making this framework evolving into a complete interoperability assessment one, as well as in the applicability of open-source approaches to build reference implementations able to support these interoperability evaluations. Some activities have been focused on the organization of public events to demonstrate achievements related to the interoperability framework. 5GINFIRE can take advantage of these opportunities for technology assessment and exploration to contribute its results. In particular, demonstrators of the WP5 results can

become part of the PoC framework. Furthermore, results from WP6 and WP7 could take the shape of additional PoCs, or even become part of future NFV interoperability demonstration events.

- **EVE.** The Evolution and Ecosystem WG is focused on exploring new use cases, evaluating new technologies, and acting as the central point for the interaction with other standardization activities related to NFV. Some of the most salient recent results are related to the elaboration of the relationship between the NFV and SDN concepts and architectures, done in collaboration with the Architecture WG of the ONF, and the elaboration of a roadmap for information models applicable to network functions and services. The EVE WG has started to consider 5G requirements and their impact on the NFV framework, and there is a clear opportunity for WP3 and WP4 to bring their results.
- **SEC.** The Security WG considers aspects related to information, network and communications security (including resilience, availability and performance isolation of NFV systems), the security of individual machines/processes, the security of large systems, and networks, security tools, controls and techniques. It addresses security at design-time, deployment-time and run-time, and the appropriate measures for operational efficiency and features to support regulatory requirements, e.g. Lawful Intercept, Privacy, and Data Protection. Since 5GINFIRE is building a multi-domain, multi-tenant NFV infrastructure, it is likely that some of its findings can be contributed to the SEC WG.
- **IFA.** The Interfaces and Architecture WG activity includes NFV architectural aspects, requirements to support interoperability at reference points, the information models and information flows applicable to the deployment requirements and lifecycle management of NFV abstractions, and the definition of interface protocols and data models. It aims at delivering a consistent consolidated set of models and flows to support interoperability at reference points, and the refinement of the NFV architecture and interfaces, with the main goal of producing and maintaining a set of detailed specifications focused on interoperability. Being IFA essentially oriented towards normative aspects in the ETSI NFV ISG the possibility of contribution from 5GINFIRE will be limited to any architectural findings made by WP3 and WP4.
- **SOL.** The Solutions WG is committed to the delivery of a consistent consolidated set of protocols and data model specifications to support interoperability, including the documentation of data models, APIs (and the underlying protocols) for a set of identified functions, templates, descriptors and interfaces of the NFV architecture framework. In plain words, SOL is focused on the translation of IFA requirements and models into concrete protocol and format specifications. As in the case of IFA above, the possibility of contribution from 5GINFIRE will be limited to any specific findings made by WP3 and WP4 relating these protocols and formats.

Finally, it is worth noting the growing interest on end-to-end service management aspects within the ETSI NFV ISG. This interest has been matter of ongoing discussions and several proposals for further, more formalised activities, where some results of WP3 and WP4 could be brought.

4.2.2.2 IETF/IRTF



I E T F®

The Internet Engineering Task Force (IETF) is a large open international organization, which is the gathering point for network designers, operators, vendors, and researchers focusing on the evolution of the Internet architecture and the smooth operation of the Internet. It is open to any interested individual. The IRTF (Internet Research Task Force) is a parallel

organization¹ focusing on longer term research issues. In the rest of this text, the term “IETF” will refer to both parallel organizations unless otherwise explicitly said.

The IETF Mission Statement is documented in RFC 3935 and the *Tao of the IETF* is also available as RFC 4677. The detailed IRTF guidelines and procedures are described in RFC 2014, and RFC 4440 provides further details on the role of the IRTF, provided by the Internet Architecture Board (IAB).

The standardization process is based on the following elements:

- IETF meetings - Much of the work is done through IETF meetings, which are held three times per year, as well as via mailing lists. IETF contributions and decisions are considered made and decided by individuals. Any individual can attend an IETF meeting. Both registration and payment of a registration fee are essential in order to attend an IETF meeting.
- Working Groups - Working Groups are structured around a charter describing their objectives and plans, with at least two co-chairs responsible to foster the completion of the WG charter, moderate discussions, and evaluate and declare WG consensus. There are seven functional areas, each grouping several WGs, with at least two Area Directors per area. The current IETF areas are Applications and Real-time, Internet, Operations and Management, Routing, Security, Transport, and a General area focused on the coordination with IANA.

The IRTF has a similar structure, but the equivalent to WGs are called Research Groups (RG) and there are no areas.

- BoFs - Whenever there are some individuals who are interested on the same topic in a particular area that is not covered by an existing WG, then a face-to-face meeting needs to be held to discuss the opportunity of starting a new WG. Such meetings are called Birds of a Feather meetings (BoFs) and have to be approved by the Area Director in the relevant area before it can be scheduled. Moreover, a mailing list could also be set up, where all participants could start discussing and working on the topic.

¹ The IRTF can be practically considered the “research branch” of the IETF

- RFCs and Internet Drafts - Every IETF standard is published as a Request for Comments (RFC) and every RFC starts out as an Internet Draft (I-D). The procedure in order to publish a standard is the following:
 - Publish the document as an Internet Draft.
 - Receive comments on the draft and edit the draft based on the comments.
 - Repeat the steps above, until the draft is efficiently discussed. Then it is submitted to the IESG.

If the IESG approves the draft to become an Internet standard, then it is published as a Proposed standard and after six months it can become a Draft standard. A few years after a document has been a Draft standard, it can become an Internet standard.

The IRTF follows a similar process, though the final result becomes an experimental RFC and the body in charge of approving it is termed IRSG.

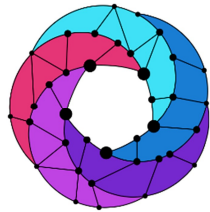
There are a few IETF WGs and IRTF RGs that offer direct standardization opportunities for 5GINFIRE results, especially those in their initial evolution stage, and therefore more suitable for direct influence from the project results. These groups are listed below, in pure alphabetical order, without implying relevance or priority. The project team will keep monitoring and contributing to the evolution of the IETF groups to identify and foster new opportunities.

- **BMWG.** The Benchmarking Methodology Working Group is committed to produce a series of recommendations concerning the key performance characteristics of networking technologies, or benchmarks for network devices, systems, and services. Taking a view of networking divided into planes, the scope of work includes benchmarks for the management, control, and forwarding planes. The scope of the BMWG is limited to the characterization of implementations of various networking technologies using controlled stimuli in a laboratory environment. The BMWG is focusing more and more its activities on virtualized environments, and we believe there are good opportunities for reporting WP3 and WP5 outcomes, as well as some results produced by WP6 and WP7.
- **NFVRG.** The Network Function Virtualization Research Group (NFVRG) brings together researchers from both academia and industry to explore the research problems related to NFV. These problems address not just pure networking issues but also computing and storage aspects in the environments providing support to network functions. It is hoped that the outcome of the research will benefit research efforts in other groups within the IRTF and standardization activities of IETF WGs. The NFVRG focuses its activities on four main areas, listed here according to the potential for 5GINFIRE contribution: new management frameworks, measurement and benchmarking, techniques to guarantee dataplane features, and the re-architecting of network functions. Beyond potential direct contributions to NFVRG documents, especially from the results of WP3, WP4 and WP5, some outcomes of WP6 and WP7 can be provided as experimental reports or additional evidence for ongoing activities.

In addition to these, there are a couple of incipient activities within the IETF focused on aspects directly related to 5G, around the mail lists and BoFs identified as 5GANDIP (exploring how 5G requirements can be satisfied within the Internet protocol stack) and

NETSLICES (considering the application of the Internet protocol stack to support network slicing). The 5GINFIRE team will continue monitoring the activities of these groups, seeking for opportunities to contribute.

4.2.2.3 Open Source MANO (OSM)



Open Source
MANO

ETSI OSM is an operator-led ETSI community that is delivering a production-quality open source Management and Orchestration (MANO) stack aligned with ETSI NFV Information Models and that meets the requirements of production NFV networks.

The OSM community has set itself the goal of being a world-class, production-ready solution. OSM releases are engineered, tested and documented to be functionally complete to support Operator RfX processes, and to be a key component for internal/lab and external/field trials as well as interoperability and scalability tests for virtual network functions and services. The most recent OSM, release (TWO) substantially enhances interoperability with other components and provides a plug-in framework to make platform maintenance and extensions significantly easier to provide and support.

Since 5GINFIRE is committed to use OSM as the base MANO framework, and WP4 plans to stabilize the project orchestration platform on OSM Release TWO, the team expects to be in the position of making contributions to the community, especially on those aspects related to multi-site, multi-domain, multi-platform operations, and in what relates to the interaction with operation support frameworks like the 5GINFIRE portal and middleware.



4.2.2.4 OPNFV

OPNFV is a carrier-grade, integrated, open source platform to accelerate the introduction of new NFV products and services. As an open source community, OPNFV is intended to bring together the work of standards bodies, open source communities and commercial suppliers to deliver a de facto standard open source NFV platform for the industry.

The scope of OPNFV is focused on building NFV Infrastructure (NFVI) and Virtualized Infrastructure Management (VIM) by integrating components from upstream projects such as OpenDaylight, OpenStack, Ceph Storage, KVM, Open vSwitch, and Linx. It is formally a Linux Foundation Collaborative Project and implements many open source best practices familiar to other leading communities.

OPNFV is structured around projects, presented and discussed to the community and steered by a Technical Steering Committee (TSC). The multi-site, multi-technology approach 5GINFIRE has taken could become (part of) an OPNFV project demonstrating such features.

4.2.3 Synthesis

Table 4: Planned standardization contributions for targeted SDOs

<i>SDO / Open Source project</i>	Description
<i>ETSI NFV ISG</i>	Contributions to WGs (planned ones are TST, EVE, IFA, SOL and SEC) Sponsoring and hosting of PoCs
<i>IRTF NFVRG</i>	Project reports Contribution to specific documents (drafts) with 5GINFIRE results
<i>IETF BMWG</i>	Contribution to specific documents (drafts) with 5GINFIRE results
<i>Open Source MANO</i>	Bridging 5GINFIRE findings to the OSM community, as upstream project Direct contributions to the OSM code base
<i>OPNFV</i>	Project proposal(s) to the community to foster 5GINFIRE usage Report project findings through the User Advisory Group

5 Conclusions

For the first months we have a clear strategy for dissemination and exploitation with the definition of target communities and way to reach them. This is presented in chapter 2. As key in the project we also have clear standardisation strategy defined in chapter 4. As far as exploitation activities in the project are concerned, they will be intensified later in the project (Task T8.3 to start at M24). However, as described in chapter 3, we have a clear view on the exploitation paths and already many partners have considered the exploitation action from the beginning. More detailed deliverables on exploitation, dissemination and standardisation will be given in D8.3 (M24) and D8.4 (M36).

Annex A Summary of target groups / project objectives

Project objective \ Targets	ETSI NFV	Automotive	Experimenters	Fire facility	Infrastructure	NFV Vendors	Open source	Other vertical	Research institute	SDOs	SMEs	Software /Hardware	Startups	VXNF provider
<i>#1 - Establish the first 5G NFV-enabled experimental testbed capable of instantiating and supporting vertical industries based on industry-leading and open source technologies</i>	X		X				X			X	X			
<i>#2 Specify, Implement and Operate Verticals drawn from the Automotive Industry on top of the Open5G-NFV common experimental facility.</i>	X							X	X					
<i>#3 Provide a platform for innovation in Europe specifically suitable for SMEs</i>									X		X		X	
<i>#4 Develop open source Management and Orchestration (MANO) functionality and toolsets</i>	X				X		X			X				X

<p><i>for experimental architecture instantiation featuring automation of deployment process, orchestration and lifecycle management aiming at enabling truly Open Experimentation that fosters innovation.</i></p>														
<p><i>#5 Enable in-testbed and extra-testbed demonstrations in an open reference platform</i></p>			X	X				X						
<p><i>#6 Open software and APIs for rapid prototyping and inclusion of new building block functionalities with the necessary metadata definition</i></p>			X								X			
<p><i>#7 Accelerate the formation of an open European-initiated, global-reach, long-term sustainable community and liaise with other relevant initiatives to further the goals of this project</i></p>			X			X	X		X		X			

Annex B 5GINFIRE presentation




Evolving FIRE into a 5G-Oriented Experimental Playground for Vertical Industries

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5GINFIRE is a three years Research and Innovation action / project under the EU program Horizon 2020 (Grant Agreement no. 732497) started on 1 January 2017.




5GinFIRE Fact Sheet

- Full Title:
 - Evolving FIRE into a 5G-Oriented Experimental Playground for Vertical Industries
- Call
 - Future Internet Experimentation - Building a European experimental infrastructure
 - ICT-13-2016, RIA
- Budget
 - €5 M (2,5 M reserved for experiments)
- Starting Date
 - 1/1/2017
- Duration
 - 36 M




5GinFIRE Consortium


Participant No.	Participant organisation name	Part. short name	Country
1(*) (Coordinator)	Eurescom – European Institute for Research and Strategic Studies in Telecommunications - GmbH	EURESCOM	Germany
2	B-COM	B-COM	France
3	Easy Global Market SAS	EGM	France
4	Instituto de Telecomunicacoes	ITAv	Portugal
5	Telefonica Investigacion y Desarrollo SA	TID	Spain
6	Universidad Carlos III de Madrid	UC3M	Spain
7	University of Bristol	UNIVBRIS	UK
8	University of Patras	UoP	Greece
9	Universidade Federal de Uberlandia	UFU	Brazil
10	Universidade de Sao Paulo	USP	Brazil



5GinFIRE Consortium




Participant No.	Country
1(*) (Coordinator)	Germany
2	France
3	France
4	Portugal
5	Spain
6	Spain
7	UK
8	Greece
9	Brazil
10	Brazil



Mind the Gap

- Experimental testbed activities in FIRE instrumental in driving standardization and related ICT technologies but ...
- Too much fragmentation around experimental facilities
 - Different models, APIs etc
 - Different implementations
 - Lack of a reference architecture
 - Federation is not panacea ... some of the homogeneity must be pushed inside the testbeds (through standardization)
 - (This statement may be arguable but the next one is not)
- No real impact on standardization
 - ... although there are results that they could have
- Difficulties in sustainability due to gap between industry-led efforts and experimental efforts



Closing the Gap

- 5G creates new opportunity to close this gap
- NFV technology as an enabler for deploying experimentation testbed instances on top of common physical infrastructure
- Service Lifecycle (XaaS) bears a lot of similarities in testbed experimentation
- Similarly, common key architectural components and APIs may also suitable for experimental facilities
- Resource Models and representation could be identical
- Open source components from established Open Source Project Initiatives widely available
- ...

5GINFIRE Reference Model Architecture

- Based on existing Open Source projects
 - e.g. Openstack, Opendaylight
- MANO functionality
 - OpenMANO
- Introducing and integrating infrastructures from verticals
- Integrating FIRE facilities and access methodologies
- Generalizing the concept of VNFs into accounting for functionalities other than network, namely, for verticals, aka VxFs
 - universal management of virtual functions
- Automated deployment of VxFs and creation of VxV stores

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5GINFIRE Experimentation Workflow

Technologies, Infrastructures and Verticals

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5GINFIRE Workplan & Open Calls

RESEARCH / INTEGRATION	OPERATION / OPEN CALLS
Adopting State of the art and technology choice	
Adopting 5GINFIRE architecture	Definition of OC-1 • Call for experiments • Call for testbeds OC-1 opening and evaluation
Initial 5GINFIRE experimental infrastructure deployed	Execution of OC-1 experiments
5GINFIRE infrastructure - 1 st upgrade New testbeds from OC-1 integrated	Definition of OC-2 • Call for experiments OC-2 opening and evaluation
	Execution of OC-2 experiments
Final 5GINFIRE infrastructure	5GINFIRE ready for full operation

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Thank You!

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