SOFTFIRE

Software Defined Networks and Network Function Virtualization Testbed within FIRE+

Grant Agreement № 687860

SoftFIRE Challenge
(Call for Proposals, Guidelines and Rules for Participation)

Table of Contents

1 About SoftFIRE

SoftFIRE integrates European independent testbeds that are made available with a set of basic functionalities related to Network Function Virtualization (NFV), Software Defined Networking (SDN) and security. The project is aiming at assessing three major characteristics that an NFV/SDN platform should support for being an effective enabler for 5G evolution: **interoperability** with various functional elements, **programmability** of the offered functions and **security** of the entire framework. The federated infrastructure is devoted to experimentation / development of platform services and applications as well as for extensions by means of integration with other physical infrastructures.

More information about SoftFIRE can be found in section 6 and in here: www.softfire.eu

The current document is about the SoftFIRE final Challenge to the NFV/SDN community.

2 SoftFIRE Challenge Objectives

The SoftFIRE Consortium invites applications to its Challenge for original developments, experiments, trials or test to be carried out on the Federated Testbed.

For this Challenge, SoftFIRE is especially interested in receiving proposals that address interoperability/extension of the platform, the creation/consolidation of services and/or the creation of applications on top of the infrastructure. This challenge is very broad in principle and it aims at demonstrating the conformity, compliance and consistency of the NFV/SDN framework to the requirements of nascent 5G realms.

This Challenge call is seeking for proposals that cover the entire spectrum of NFV/SDN applicability from new approaches to NFV security, SDN programmability, and software architecture evolution towards 5G up to the infrastructural integration of experimental access networks with the platform.

Proposal should follow under one of these Challenge streams:

- **Interworking**, this stream addresses issues related to interoperability of the current platform (mainly based on a MANO open source solution, a FIRE open source middleware and OpenDayLight SDN control) with other infrastructures. This comprises, but it is not limited to, mechanisms for interworking with other software platforms based on different software solutions or the integration of physical infrastructures and access networks (e.g., ONOS integration with MANO orchestrator, ONAP or others). The proponents can also address in this stream the integration of Fog Computing, or external Cloud Computing platforms and the like. This stream also includes solutions for integrating different virtualization mechanisms and to use them in conjunction with those adopted by the SoftFIRE platform. This stream includes also the extensions needed to manage and make the platform more operational and deployable in large existing or new deployments.

- **Programmability**, this stream is devoted to experimentations that use the programmable APIs of the platform or extend them in order to program or to ease application programming and to reuse services/functions offered by the platform. This

includes extension of the MANO layer (integration of new VNF Manager, new VIM Plugin able to handle different kinds of hypervisors or a new Open Baton service providing complex automated features)[1]. Participants to the Challenge can propose extensions or applications covering a wide range of application domains. One such domain is 5G networks, which are expected to benefit largely from NFV and SDN technologies. For instance, in this stream, the possible extensions that are needed to support the "slice" concept of 5G networks could be addressed. In this case, proponents should demonstrate how to use and functionally extend the capability offered by the SoftFIRE platform in order to implement "slice control" going beyond what is already provided by the community. This could be in the form of designing algorithms and solutions that monitor the usage/load of a certain network slice that performs a single or a set of network functions, and then spin up new network slice instances that would intelligently distribute the load across multiple instances of that same network functionality(ies), in conjunction with the "horizontal network slicing" concept.

- **Security**, this stream addresses the possible extensions to the platform for increasing the security levels offered to potential stakeholders of SoftFIRE. The theme of security can be addressed working at different levels: the competitors can provide tools in order to extend the capabilities of the SoftFIRE infrastructure, and they can decide to do it both from the point of view of the platform administrators or the users. Otherwise they can try to exploit the virtualization and SDN capabilities that are already offered to provide more complex and automated functionalities on top of them. They can also try to develop plugins able to interact with one or more of the systems provided by the SoftFIRE infrastructure, or they can work to improve the idea of Security-as-a-service. The proposed solutions can refer either to a general NFV/SDN scenario, or be specific to a particular use case considered to be particularly significant (e.g. 5G, IoT).

A proposal could potentially cover more than one stream; for this reason, the Competitors are requested to clearly identify the streams it applies to, prioritizing the preferred one. Selection of proposals will be carried out according to the indicated streams.

3 Challenge Call Information

Project full name: SoftFIRE - Software Defined Networks and Network Function Virtualization Testbed within FIRE+

Project number: 687860

Call identifier: SoftFIRE-CH

Call title: SoftFIRE Challenge

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[1] Note: Being a shared infrastructure, it will not be possible to modify the core code of the platform, that could affect other participants, but only "external" extensions to what is provided will be allowed. In particular, no changes will be allowed to the NFV Orchestrator code or to the GenericVNFM, etc.

Total Budget: € 225.000 in form of prizes (for all three streams)

Maximum Funding per Stream: € 75.000 divided as follows:

<div align="center">

€ 40.000 First Prize

€ 25.000 Second Prize

€ 10.000 Third Prize

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Type of participants: The typical profile of participants is academics, industrial organisations, or SMEs active in the domain of NFV/SDN and 5G research and virtualised applications that need to run experiments to test, evaluate, optimize or provide public evidence of the advantages of their solutions and applications. The rules of participation are described in the SoftFIRE Challenge Call: https://www.softfire.eu/open-calls/softfire-challenge

Language of the proposal: English

Proposal submission: Online submission through the SoftFIRE portal

Call deadline: 31th January 2018 at 17:00h CET (Brussels time)

Proposal Template: Proposals must use the provided template (in Word format)

Detailed Call Information: SoftFIRE Challenge Call

Notification of Acceptance: by 7th February 2018

Contact: opencall@softfire.eu

Web address for further information: http://www.softfire.eu/open-calls/

Challenge event**:** March 13th – 15th, 2018 in Paris in conjunction with Fed4FIRE+ Engineering Conference (FEC3). More information will be made available timely at https://www.softfire.eu.

Closing of the Challenge, Demonstration and Proclamation of Winners**: March 13th, 2018.**

4 Scope and Requirements for Participation in the Challenge

The SoftFIRE Challenge addresses problems that deal with interworking, programmability and security of NFV/SDN platforms in the context of usage in a 5G network. The SoftFIRE Challenge targets the research community, highly trained industry professionals and SMEs that want to propose enhancements to the SoftFIRE federated infrastructure, to demonstrate viable and meaningful applications for future 5G networks or new interworking capabilities between virtualized and controllable platforms and SoftFIRE. Particular attention is devoted to the introduction of security mechanisms either at the platform or at the application level.

Participants of the Challenge (competitors) are requested to demonstrate interworking, programmability or security solutions that can be provided in future 5G infrastructures through the use of the SoftFIRE programmable infrastructure. Competitors are allowed to design their own intelligent solutions over external platforms and infrastructures (e.g. other projects/companies offering infrastructures), but it is required that they ensure the actual interworking of their solution with the SoftFIRE platform and the ability of SoftFIRE infrastructure to orchestrate new resources. Demos about 5G applications and services will

also be suitable for the Challenge if they are built on top of testbed facilities and software tools developed and offered by the SoftFIRE platform.

More specifically, following are the requirements for the participation in the Challenge.

The first requirement is mandatory:

- The theme of the proposal should be in line with at least one of the 3 SoftFIRE streams:
  - **Interworking** with edge, access or other network or software infrastructures;
  - **Programmability**, to exploit or extend the programmability interfaces offered by SoftFIRE in order to increase the platform capabilities or for populating the platform with relevant applications in the context of future 5G applications;
  - **Security,** in order to extend, improve or increase internal and external security functionalities offered by the SoftFIRE platform.

At least one additional requirement from the list below should be met:

- Creation, development and deployment of a mobile or web application/service that makes use of relevant functionalities offered by the SoftFIRE platform;
- Use or integrate with the experimental testbeds and/or software tools created or operated by SoftFIRE;
- Use and/or extend or add intelligent software components developed in SoftFIRE;
- Bring in new intelligent software components that can be plugged into the SoftFIRE platform for extending its programmable software capabilities;
- Bring in new open and publicly usable data sets;
- Integrate with external frameworks or testbeds for functionally extending SoftFIRE.

Competitors will physically participate to the SoftFIRE event organized on March 13th – 15th 2018 in conjunction with Fed4FIRE+ Engineering Conference (FEC3) in Paris in order to publicly demonstrate their achievements. During the event, the jury will judge the demos and will determine the winners for each SoftFIRE Challenge stream.

Only physically present teams are eligible for prizes.

5   Rules for Participation and Prize Money Distribution

The proposals will be evaluated first for acceptance and, if selected, in a second stage for evaluation of their results (demo during the event). All proposals will be evaluated according to specific criteria and related thresholds in order to guarantee quality and merits. In addition, the SoftFIRE project will limit the number of selected proposals to a maximum of 6 proposals per stream that is manageable by the platform and the supporting team. This aims at providing the competing teams with fair platform resources and technical support.

The selection and evaluation will be performed by a panel of internal and external experts. Internal experts are members of the SoftFIRE consortium having the technical knowhow, special knowledge of SoftFIRE testbeds and/or relevant business expertise; external experts are selected according to their specific knowledge of the SDN/NFV and 5G domains.

The platform will be made available "as is" and will provide functionalities in a best effort manner. Resources will be allocated in a fair way among the competitors and the SoftFIRE platform will avoid that a single demo will consume a large share of all resources. For a description of the available resources (they are continuously increased and changed by the SoftFIRE consortium), the competitors can refer to the latest version of the "handbook" or to a dedicated page about the available resources, http://docs.softfire.eu/softfire-available-resources/". The SoftFIRE Consortium offers for each competitor a typical environment up to:

RAM (MB)	20.480
Instances	10
VCPUs	10
Networks	10

These resources are sufficient for large demos.

The general criteria used to accept and to evaluate the proposals are listed below:

- Creativity and innovation of the offered solution and future proof in the context of 5G,
- Best potential for integration in the SoftFIRE framework as a potential add-on,
- Business relevance impact of the offered solution,
- Technical implementation and difficulty level of the proposal and future proof in the context of 5G,
- Technical soundness of the proposal.

The criteria are represented in the following figure:

Criteria	Creativity and Innovation	Integration in SoftFIRE and Business impact	Technical Soundness
Value range	0 - 10	0 - 10	0 - 10
Threshold	6	6	6
Weight	40%	25%	35%
Properties	Relevance of the proposal for SoftFire federated testbeds	Potential of exploitaiton/inclusion in SoftFire of [proposed functionalities and features]	Clarity and quality of the proposal
	Originality and innovative value of the proposed features/tests and their relation to the status of the art	Desirability/need of the proposed service/function and market perspective	Alignement of the proposal respect to SoftFIRE constraints. A minimal requirement is to use at least two SoftFIRE Middleware Managers
	Desiderability of the Solutions for 5G Networks evolution		Overall technical difficulty of the addressed functionalities
			Appropriateness of technical and methodological approach (interoperability, programmability and security)

Figure – Acceptance and Evaluation Criteria

Threshold values have to be met for each criterion in order to be considered for ranking.

5.1 Selection Process

All proposals will be checked for eligibility of the competitors and then they will be shortlisted according to the described criteria. Certain criteria require a minimal quality threshold as indicated in the figure above. In addition, each criterion has a weight that will be calculated for determining the total score of the proposal. Proposals must meet or exceed the threshold in all the criteria. If a proposal does not meet a criterion threshold it will not be shortlisted or considered. The total score will be used to shortlist the received proposals.

Each proposal should clearly indicate the Challenge stream(s) it applies to. These indications will be used for allocating the proposals to streams and to compare them. Up to six highly ranked submissions for each stream will be selected and will have the chance to participate in the competition. Each selected proposal will be assigned to only one stream.

Should the evaluation team select a proposal, the competitors will implement the solution on the SoftFIRE platform, as it is on January 31st, 2018, considering its capabilities, functionalities, limitations and available resources. It is suggested to the competitors to carefully check the status of the platform by referring to the handbook and additional information published on the SoftFIRE web site.

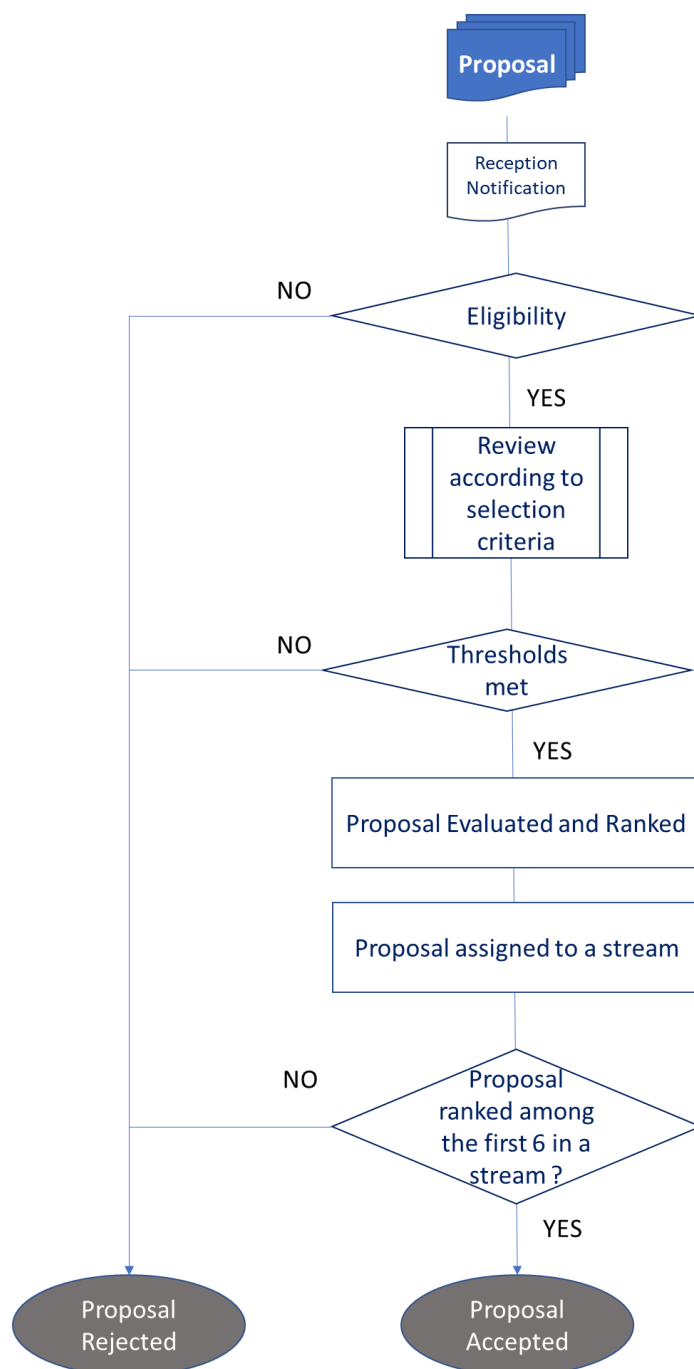The selection process is represented in the following figure:

Figure – Selection Process

Accepted proposals will be granted access to the SoftFIRE platform according to rules, resources, mechanisms and limitations stated in the Handbook.

5.2 Team Access to the Platform

Each selected competing team in the Challenge will be granted access to the SoftFIRE platform starting from February 8th up to March 13th 2018. They can use the platform according to the conditions described in this document.

In order to be eligible for a prize each participating team should finalize their results by the closing date of the Challenge.

Each selected competitor will form a team, which will publicly conduct a demo at the SoftFIRE organized event.

5.3 Evaluation of the Results

The competitors must be physically present on March 13th – 15th, 2018 in Paris at the FED4FIRE+ Engineering Conference (FEC3) in order to be eligible for the prizes. More detailed information about the conference will be published later on the SoftFIRE website.

Each team should prepare a demo to be presented at the event illustrating the strong points of the proposal in terms of the previous discussed evaluation criteria. Software modules, Network Services, virtual machine, in the form of software components, datasets, pseudocode have to be uploaded into a challenge Github repository immediately after the challenge as a proof of work.

An international jury will evaluate the demos considering their execution at the event by applying the mentioned criteria and will determine the winners for the three streams. During the event, the jury will declare the winners for each stream.

6 Background Information on the SoftFIRE Project

The SoftFIRE project has gone through a progressive consolidation by means of a set of different Open Calls. As a result, a consolidated platform is available with its improved functionalities. These improvements are related to API extensions and new dedicated VMs in terms of security functionalities. The project has consolidated the SDN functionalities in order to provide an extended control over communication resources.

Based on the lessons learned from previous Open Calls, the SoftFIRE consortium has further enhanced its infrastructure capabilities by increasing the capacity provided by individual testbeds.

On top of this, the Challenge Call is an opportunity for competitors to propose new 5G oriented trials. The platform provides a physical resource manager to make 5G resources and devices more easily accessible.

The competitors should base their proposals on the information provided in the SoftFIRE handbook document. This is a living document with its web counterpart is always available

here, constantly upgraded as experience grows in the consortium and as new solutions are introduced or bugs are removed.

At the moment, the federated testbed is composed of five heterogeneous hardware infrastructures managed by the following partners: University of Surrey, Technical University of Berlin, Fraunhofer FOKUS, Ericsson and Deutsche Telekom. All of them are going to provide an OpenStack installation (>= Newton), and the total capacity of the testbed is not less than 222 vCPUs, 799 GB of RAM, and almost 4 TB of storage. 5G capabilities will be offered on demand, like mobile core networks and IP multimedia subsystem. However, it is important to clarify that access to the individual OpenStack instances will be granted only via the SoftFIRE middleware, and in most of the cases OpenStack APIs will not be available to be directly accessed by competitors. For scarce resources, (i.e. RAN) the allocation will not be exclusive to a single competitor and resources will be subject to scheduling

A more detailed list of available resources can be found here.

The testbed is aligned with industry-oriented standardisation efforts: TOSCA is exposed to competitors for deploying and provisioning resources on the federated infrastructure. At any time, participants to the challenge can get familiar with the TOSCA APIs and functionalities offered by the Open Baton framework (http://openbaton.github.io/documentation/). The work on these interfaces has been documented in the SoftFIRE Middleware.

SoftFIRE will make use of the Open Baton releases as soon as they will be made available. The Open Baton installation in SoftFIRE provides the following components: NFVO, Generic VNFM, Autoscaling Engine, Zabbix Plugin and OpenStack driver. Competitors could also consider extending the set of components provided by the Open Baton framework. For this purpose, they could make use of the Open Baton SDK and build either a new VIM driver, Monitoring driver, VNF Manager, or external components (using the event mechanism - please refer to the documentation). In this case, the competitor should host the additional developed components on their own premises and interconnect them to the Open Baton framework via the RabbitMQ message bus.

The monitoring functionalities are implemented by the Zabbix system, and are provided as a service to competitors.

In addition to the changes on the SoftFIRE Middleware, the SoftFIRE consortium has worked to provide SDN technologies either as virtualised or physical entities available in some of the testbed islands. Currently, some of the individual testbeds have integrated OpenDaylight controller (ODL Boron SR-2) under OpenStack Neutron to manage the network flows on the compute nodes via the OVSDB 2.7.0 south-bound plug-in. Network programmability could be realised via a set of OpenDaylight RESTCONF APIs exposed by the ODL controller. However, the access to the ODL API will be subject to mechanisms to lower the risk of interfering among virtual object user data configuration. Therefore, access to the SDN technologies is granted in such a way that each competitor could work independently without interferences from other competitors.

NOTE: Please note that these specifications may change according to the progress and the expansions of the testbeds. The evolution of the architecture of the federated testbed exposed to competitors via the SoftFIRE middleware will be consolidated during the execution of the SoftFIRE Open Calls. The experience gained during the execution of these "waves" will be translated into better usage of the experimentation framework. More details about the status of the new development and full documentation will be timely published on the web portal of the project with a dedicated technical section and it is also available a dedicated project's slack

channel (feel free to register here). Competitors are advised to check the website in order to be aware of the latest updates. For these reasons, the interfaces might be slightly different, however the SoftFIRE Consortium will try to document and maintain compatibility with the previous functionalities.

The project will provide several tutorials aiming at describing the novelties and explaining how to properly use the SoftFIRE production federated testbed. In this way, all competitors will be able to start experiments conveniently and in due time. More information can be found here.

Competitors are suggested to carefully read this document and to refer also to the website of the project for timely information. They can also refer to opencall@softfire.eu to get in contact with the Project Consortium in case they need to clarify any issues with this Challenge.

Selected competitors will be granted access to the SoftFIRE federated testbed and will receive support from the consortium on how to access to the production Federated Testbed and will receive full documentation.

7 How to Submit a Proposal

Organisations willing to submit a proposal must do so by using the proposal template available on the website.

Proposals for demos have to be submitted via the portal until the deadline of the open call. The proposals will be judged by internal and external evaluators according to selection criteria and will be ranked in a shortlist. The selected proposals will be notified. The notification may contain suggestions and hints by the evaluators on how to make the proposal more aligned with the effective capabilities of the platform.

All detailed information about the SoftFIRE Challenge Call can be found also on the project's website https://www.softfire.eu/open-calls/softfire-challenge giving indications on how to structure a proposal, how the proposal should be submitted and the criteria for evaluation.

7.1 Eligibility criteria

Applicants:

- Must be eligible for participation in the EC H2020 projects:
  http://ec.europa.eu/research/participants/data/ref/h2020/other/wp/2016_2017/annexes/h2020-wp1617-annex-c-elig_en.pdf
  https://ec.europa.eu/research/participants/data/ref/h2020/other/wp/2016-2017/annexes/h2020-wp1617-annex-a-countries-rules_en.pdf
  http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/3cpart/h2020-hi-list-ac_en.pdf
- Can only be selected for funding for one proposal (even if the proposer submitted multiple proposals that are ranked high enough to be selected for funding).

SoftFIRE consortium members cannot apply to this call.

Also previous winners of SoftFIRE Open Calls for experiments cannot participate in this call.

Proposed applications shall be original work that is realised in the scope of the SoftFIRE Challenge. It shall be highlighted that ideas that are already funded by other activities in the FIRE programme are not eligible. No double funding of the same work can be accepted.

7.2   Proposal Template

Competitors must use the proposal template available at www.softfire.eu/open-calls/softfire-challenge. In the document, competitors will find instructions specifying the type of information expected per section.

Each section should not exceed the maximum number of pages as per proposal template. The competitors are solely responsible for completing all required fields in the template according to the instructions.

7.3   Proposal Participants

The proposal can be submitted by one legal entity.

7.4   Proposal Language

The proposal must be prepared in English.

7.5   Submission of Proposals

Proposals (using the template) must be submitted electronically in PDF format ONLY at www.softfire.eu/open-calls/softfire-challenge.

If you discover an error in your proposal, and provided that the call deadline has not passed, you can submit a new version. Only the last version received before the call deadline will be considered in the evaluation.

Proposals must be received by the closing time and date of the call. Late proposals, or proposals submitted in any other way than through the online submission form will not be evaluated.

7.6   Acknowledgement of Receipt

As soon as possible after the close of call, an acknowledgment of receipt will be sent to you via email by SoftFIRE. The sending of an acknowledgement of receipt does not imply that your proposal has been accepted as eligible for evaluation.

8 Prizes

For <u>each</u> stream (Interworking, programmability and security) following prizes are given:

First Prize   € 40.000

Second Prize   € 25.000

Third Prize   € 10.000

A Jury composed by the SoftFIRE partners and external juror(s) will judge the work produced by the participants. Criteria for judgement are explained in section 5.3.

The winners will be announced during the event, starting on March 13th, 2018. Only physically presented teams will be eligible for a prize.

For the winners of the SoftFIRE challenge following articles of the H2020 Model Grant Agreement here:

http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/amga/h2020-amga_en.pdf

apply:
No. 22, 23, 35, 36, 38 and 46.

9 Support to Competitors

9.1 Call Helpdesk

For further information on the challenge, contact: opencall@softfire.eu;

For more general information, please refer to info@softfire.eu

9.2 Useful Documents

- SoftFIRE Challenge (this document)
- SoftFIRE Middleware Documentation (Handbook)
- SoftFIRE Template for Challenge Proposal

Please refer to https://www.softfire.eu/open-calls/softfire-challenge for the complete documentation.

9.3 Foreground Rights

All intellectual property created at the event is owned solely by the competitors and their team. Further plans may be discussed between the competitors and the members of the SoftFIRE project after the Challenge.

The competitors grant the SoftFIRE consortium partners access to the results, for the pursuance of the objectives of the SoftFIRE Project and the exploitation of the SoftFIRE Project results in accordance with the GA.

Competitors shall respect the intellectual property rights, including copyright, and abide by data protection legislation, that apply to software and data available or part of the Federated Testbed.

9.4 Federated Testbed Availability

The intention is to have the platform available 24 hours a day / 7 days a week. However the SoftFIRE Project cannot guarantee any SLA in case of loss of services and the SoftFIRE consortium partners cannot be held responsible for any loss of data caused by such events. In other words, the platform will be available on a best effort basis.

Support will be provided during these time frames:

Working hours: 10:00 a.m. to 5:00 p.m. CET

                        Monday to Friday

Outside this timeframe: issues/requests should be posted in the Slack channel and will be managed at best effort.

Please check your local time correspondence (http://www.worldtimebuddy.com/).

9.5 Constraints and Limitations during the Experiments

The SoftFIRE infrastructure is composed of loosely integrated platforms under different administrative domains. In addition, the different platforms are built for experimental purposes and they are not yet considered a mass production tool. This means that bugs and issues in the platform behaviour can occur and will occur.

SoftFIRE aims at programmers, but not all the features for a fast programming approach are provided. This is due to differences in the component testbeds and to security controls imposed by different administrative domains.

Service level agreement (SLA) agreements do not apply during the challenge execution period. Because this is a period to test and explore SoftFIRE, the competitors should not run production applications on the infrastructure platform during the demo preparations.

The SoftFIRE project reserves the right to discontinue at any time the service if the use is not consistent with the purpose of SDN/NFV and/or violates any aspects of infrastructure security or shall conflict any on-going demo preparation. Any deliberate intent by a competitor to intervene with other competitor's demo development, or to hack the infrastructure, or cause damage will lead to the revoke of any access right to the platform and to the exclusion of the contest.

During the running period of the demo development, the SoftFIRE project will put in place a team that will support competitors in the running of the platform. It is not offered as a professional service and its operations will be on the basis of best effort. The entire

infrastructure is a test platform. Possible downtimes may occur without notice or due to unforeseen overload caused by parallel developments.

SoftFIRE will offer expertise available by email or dedicated slack channel (with possible follow-up by phone) and two hours per day during the experimentation phase in order to collect issues and provide responses. Each issue and response will be disclosed to all Competitors in order to have a fair treatment. Specific issues related to adaptation of the SoftFIRE platform to specific requirements of a demo will not be taken into consideration in order to preserve the fairness of the Challenge. We will try to provide most of the answers within 24 hours (typically next morning or afternoon). Some issues could be not solvable due to the short time of the demo preparation or due to the need to intervene on the platform. The supporting team will work with competitors to circumvent the problems.

The SoftFIRE team will also issue limits and constraints on the allocation of available resources. This is due to the need to support and allow parallel developments. The SoftFIRE Team will provide equal treatment and capabilities to all the participants to the Challenge. These limitations depend on the total capabilities of the federated platform as well as the number of demos and their requests in terms of resources. Typical limitations could be related to the max number of VMs to be instanced, the number of physical resources usable or the max memory usable per demo. Other limitations could apply, or be notified during the course of the demo preparations.

Additional information for the competitors will be updated in the SoftFIRE portal at http://www.softfire.eu