Federated Interoperable Semantic IoT/cloud Testbeds and Applications

Open Call 2

Second FIESTA-IoT Competitive Call for Extensions

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1. General Call Objectives

The FIESTA-IoT Project herewith announces its second Open Call for Extensions, targeting advance and innovative developments in the Internet of Things over the Experimentation as a Service platform and the underlying IoT testbeds that supports the FIESTA-IoT Consortium.

Overall, the project's experimental infrastructure will provide testbed providers in the IoT domain with the following unique features:

- Access to and sharing of IoT datasets in a testbed-agnostic way. FIESTA-IoT will provide researchers with tools for accessing IoT data resources (including Linked sensor data sets) independently of their source IoT platform/testbed.
- Boost the sharing, reuse and repurposing of IoT facilities at an EU and global scale. FIESTA-IoT will showcase and validate this concept in the scope of enterprise applications/experiments, smart city applications/experiments and more.
- A global market confidence programme for extending the pool of interoperable facilities and testbeds that will comply with the project interoperability model.

More information on the scope of this second Open Call of the FIESTA-IoT project can be found in section 4 of this document.

2. Call Information

Project full name:	**FIESTA-IoT - Federated Interoperable Semantic IoT/cloud Testbeds and Applications**
Project grant agreement number:	**CNECT-ICT-643943**
Call identifier:	**FIESTA-IoT-OC2**
Call title:	**Second FIESTA-IoT Open Call for Experiments**
Submission deadline:	**15th February 2017, at 17:00 Brussels local time**

Financial information

Call	Category / Identifier	Call budget	Max. budget per exp. or ext.	Minimum no. of exp./ext. to be funded
Extensions	FIESTA-IoT-OC2-EXT	€ 150 000	€ 50 000	3
Total funding of this call				€ 150 000

Requirements related to the proposer:

- Proposers must be eligible for participation in the EC H2020 projects.
- Proposals will only be accepted from a single party.
- A proposer 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, or if the proposer submitted multiple proposals in different categories).
- Parties having been selected in previous FIESTA-IoT Open Calls are not eligible to participate again.
- The FIESTA-IoT project especially welcomes and stimulates the participation of new players in the FIRE community.

Other conditions:

- Language in which the proposal must be submitted: English
- Proposals must follow the provided template (see section 6 of this document)
- Proposals must be submitted through the online submission portal (accessible from http://fiesta-iot.eu/opencall/

3. Background information on the FIESTA-IoT project

In FIESTA-IoT project we focus on the problem of formulating and managing IoT data from heterogeneous systems and environments and their entity resources (such as smart devices, sensors, actuators, etc.), this vision of integrating IoT platforms, testbeds and their associated silo applications within cloud infrastructures is related to several scientific challenges, such as the need to aggregate and ensure the interoperability of data streams stemming from different IoT platforms or testbeds, as well as the need to provide tools and techniques for building applications that horizontally integrate diverse IoT Solutions.

The main aim in the FIESTA-IoT federation is to enable an experimentation-as-a-service (EaaS) paradigm for IoT experiments. However, instead of deploying yet another physical IoT infrastructure, it will enable experimenters to use a single EaaS application program interface (API) for executing experiments over multiple existing IoT testbeds that are federated in a testbed agnostic way. Testbed agnostic implies the ability to expose a single testbed that virtualize the access to the underlying physical IoT testbeds. Experimenters will be therefore able to learn the EaaS API once, and accordingly use it to access data and Resources from any of the underlying testbeds.

To this end, the testbeds willing to participate in the federation will have to implement the common standardized semantics and interfaces that are being defined within the FIESTA-IoT project. This will enable the FIESTA-IoT meta-platform to access their data, resources' and services' descriptions and other low-level capabilities.

As can be seen in the figure below, the central component of the FIESTA-IoT meta-platform will be a directory service (so-called FIESTA-IoT meta-directory), where resources from multiple testbeds will be registered. In the same way, the observations produced by them will be also stored. This directory will enable the dynamic discovery and use of resources (e.g., sensors, services, etc.) from all the interconnected testbeds.

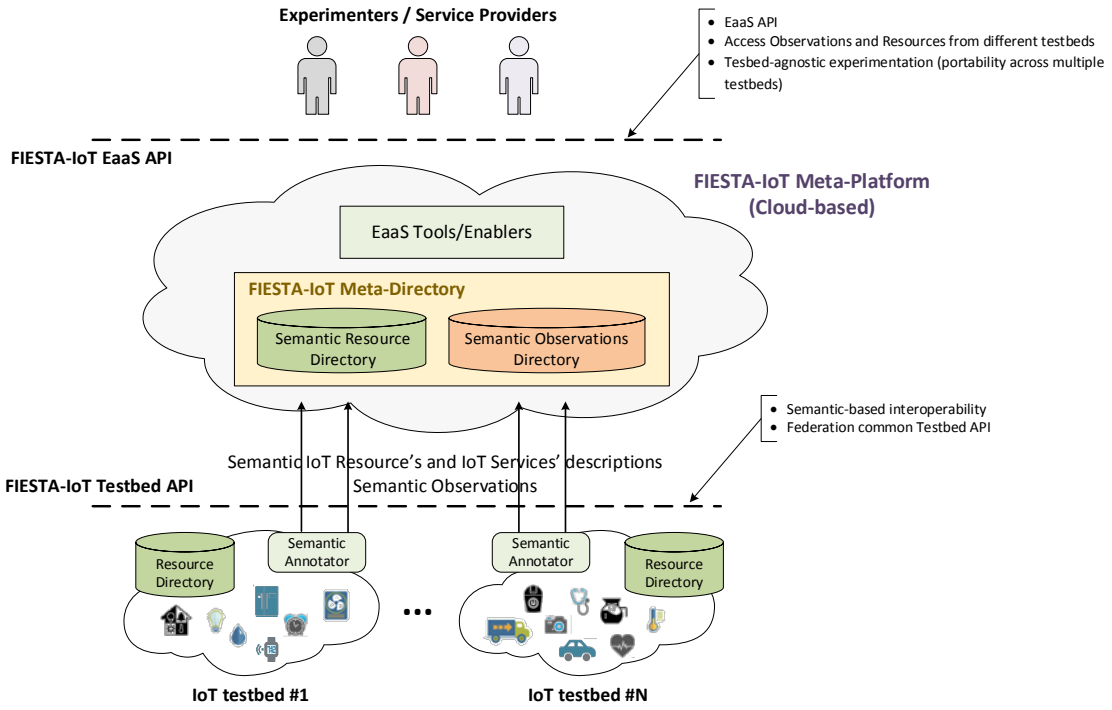

Figure 1 FIESTA-IoT testbed federation concept overview

The key concept behind the federation of IoT testbeds is the specification of a common testbed API that will comprise the interfaces to carry out the registration of the testbed resources as well as pushing the observations to the meta-platform. Besides the actual technologies used for implementing these interfaces, the main feature that underlies the FIESTA-IoT Testbed API is the fact that the information is exchanged in a semantically annotated format. In this sense, federated testbeds will have to implement their own semantic annotators, by means of the transformation of the information they handle internally to a common semantic ontology, defined by the FIESTA-IoT meta-platform. Different Resource Description Framework (RDF) representation formats (i.e., RDF/XML, JSON-LD, Turtle, etc.) are supported as long as the common ontology is used.

A primary decision of the FIESTA-IoT project was to take as reference the IoT ARM as defined in the IoT-A project[1]. This choice has particularly resulted in the observation of the domain model and the information model defined in the ARM. The domain model identifies the key concepts that appears in an IoT environment and the relations between these concepts. The information model defines a meta-model of how to structure information in IoT platforms.

The second main design decision is the use of semantic technologies to support the interoperability between heterogeneous IoT platforms and testbeds. The first step towards a testbed federation is the use of a common language and the definition of relationships between concepts. The taxonomies and ontologies makes it possible to seamlessly deal with data from different sources.

The foremost aspect that these choices have implied is that a FIESTA-IoT ontology[2] has been defined to rule the semantic annotation of the core concepts that compose the aforementioned Domain and Information Models. These core concepts are:

- The resource: is a "computational element that gives access to information about or actuation capabilities on a physical entity". In FIESTA-IoT, this concept is realized through the Device Class and its SubClasses (SensingDevice, ActuatingDevice and TagDevice).
- The virtual entity: is a "computational or data element representing a physical entity".
- The IoT Service: is a "software component enabling interaction with resources through a well-defined interface. It can be orchestrated together with non-IoT services (e.g., enterprise services). Interaction with the service is done via the network".

These concepts conform the baseline for representing the devices and overall IoT infrastructure. However, there is still a major concept that is not tackled within the ARM models. This concept relates to the actual data that is gathered by the devices and offered through the services that expose them. Namely, it is the observation concept:

- An observation is a piece of information obtained after a sensing method has been used to estimate or calculate a value of a property of an Entity. In FIESTA-IoT data from a SensingDevice will be available through the Observations that it has produced.

[1] IoT-A Consortium; Carrez, F. Final architectural reference model for the IoT v3.0. Available online: http://www.google.com.hk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwjl1M7iwb_NAhVKn5QKHS39D2cQFgglMAA&url=http%3A%2F%2Fwww.iot-a.eu%2Fpublic%2Fpublic-documents%2Fd1.5%2Fat_download%2Ffile&usg=AFQjCNE0ZOxwNuyv43YG6Sx1QRTha1D-1A&cad=rja (accessed on 24 June 2016).

[2] http://ontology.fiesta-iot.eu/ontologyDocs/fiesta-iot.html

Linked to this concept and its relation to the entity one through the property idea, another important aspect that has been also addressed during the construction of the FIESTA-IoT ontology is the definition of a taxonomy that sets a common ground for the description of the physical phenomena and units of measurement captured in the observations.

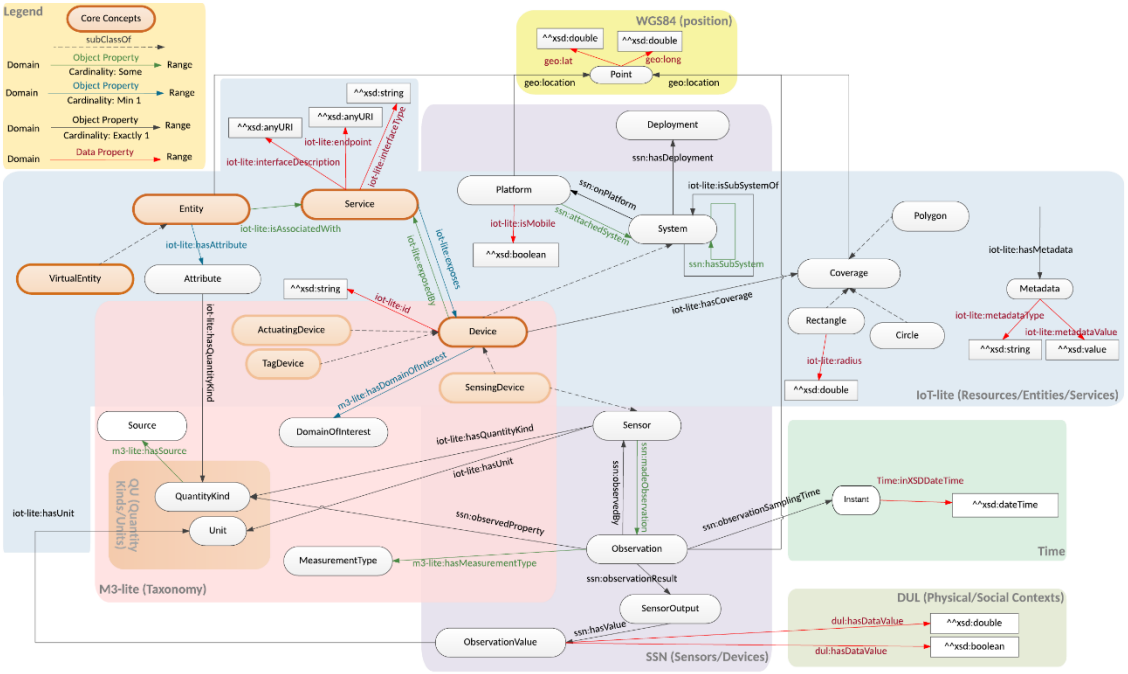

Figure 2 FIESTA-IoT Ontology

It is important to emphasize that this ontology is the baseline for the interoperability of the heterogeneous testbeds and IoT platforms that are expected to be federated in the FIESTA-IoT meta-platform. The different testbeds have to converge for participating in the federation and they must use this ontology as the reference for this convergence.

3.1 Tools/services for experimenters

Experimenters will be enabled with a set of tools for the interaction with the aforementioned FIESTA-IoT EaaS meta-platform. This tools will comprise both EaaS REST APIs as well as a basic UI that experimenters can use to get familiar with the available services in a friendly manner. Experimenters can decide which of the two options best fit their experiment requirements and their technological skills. The main Use Cases that these tools will support are as follows:

- **Registration as experimenters.** In order to keep track of the Authentication, Authorization and Accounting (AAA) of all the users who interact with the FIESTA-IoT platform they must sign up before using the enablers that offers the FIESTA-IoT core functionalities. This way, an individual user management can be achieved and the means to provide a secure access can be accomplished. Experimenters will receive individual credentials to guarantee their private access to the platform experimentation services.
- **Experiment registration.** Beside the registration of the experimenter described in the previous point, each experiment is to be registered so as to: 1- bind the experiment with its actual owner, 2- facilitate the management, 3- permit the dissemination of the experiment with other users.

- **Discovery of resources.** The first step an experiment most likely carry out is to search or browse among all the available assets deployed throughout the FIESTA-IoT federation. Through this service, the platform will generate a list of all the resources that match the experiment requirements, where it can specify:
    1. **No filters**: in this default case, where users do not showcase any kind of preference, the response will be a list with all the resources registered at the FIESTA-IoT repository, with no exception.
    2. **Location-based queries:** Instead of gathering the whole list of assets that the platform can actually provide to users, experimenters could only focus on the ones that are deployed within a particular area (or areas).
    3. **Physical phenomena-based queries:** Another possibility is to indicate only the applicative domain (e.g. through the specification of the set of physical phenomena that matches the context of the experiment). This way, experimenters will filter out all those resource that are not of their interest.
- **Testbed-Agnostic query of datasets and data-streams.** Apart from fetching the very last observations captured by FIESTA-IoT's underlying resources, experimenters might want to opt for the analysis of data already captured and stored within the FIESTA-IoT distributed repositories. In order to facilitate the harvesting of this historical information, a service will be available so that experimenters could specify a temporal window within which the observed measurements will be returned back to them.

As it has been described, FIESTA-IoT EaaS meta-platform uses semantic technologies to enable testbeds interoperability so that experimenters can have access to the datasets and data-streams generated by any of the underlying testbeds in a testbed-agnostic manner.

While some of the tools will intentionally hide the complexity introduced by the use of semantic technologies, others will enable the experimenter to exploit the potentials of semantic and linked data (e.g. use of SPARQL, access to RDF-annotated information, etc.).

3.2 Testbed Provider Interface

The TPI (Testbed Provider Interface) is a set of RESTful web services that enables the integration of the testbeds to the FIESTA-IoT meta-platform. The TPI is spanning across two different layers as it is shown in the figure below. The first is the TPI Configuration & Management layer that runs at the FIESTA-IoT platform side and controls the functionality of the TPI. A dedicated Graphical User Interface (GUI) will be available for Testbed Providers to operate the way they want their testbeds (and more specifically the resources – sensing devices – that are part of them) to behave. The second is the Testbed Provider Services (TPS) API where the Testbed Provider has to implement a list of predefined services that enables the management and manipulation of the offered data.

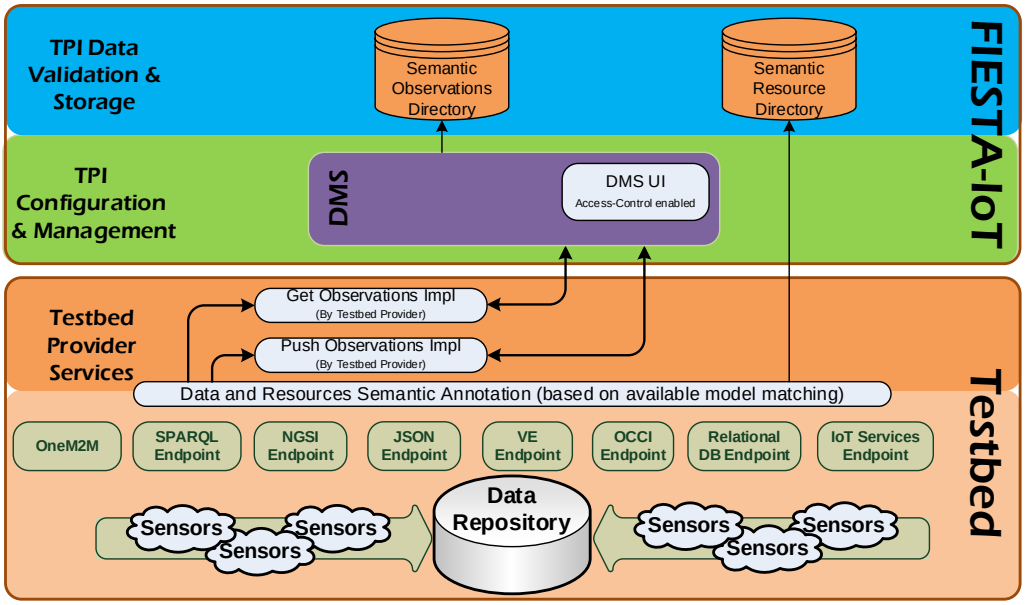

Figure 3 TPI Architecture

As it can be seen in the figure above a testbed may expose internally various standard or proprietary interfaces in order to interact with the sensor data. FIESTA-IoT has specified a list of core services that should be exposed from a testbed in order to enable different connection methods to the platform. These services (i.e. `getObservations` and `pushObservations`), so-called TPS, are one of the critical aspects for the underlying testbeds to be federated, and should be exposed from the testbed. The behaviour of these methods will be controlled from the FIESTA-IoT platform. However, the Testbed Providers will be given with a GUI to control the TPS services that their testbeds exposes. This control will basically consist on either identifying a specific schedule, if the testbed works in a reactive manner (i.e. testbed only offers data if requested), or by enabling a data-stream connection, if the testbed works in a proactive manner (i.e. testbed sends data without a specific request).

Below we can find a high level description of the list of TPS Services that needs to be implemented from the testbed provider:

- getLastObservations: This service provides the latest values of a specific Sensor list.
- getObservations: This service provides the values of a specific Sensor list for a specific time-period once.
- pushLastObservations: This service pushes continuously the latest values of a specific Sensor list to a specific endpoint.
- pushSingleObservation: This service pushes continuously the latest value of a specific Sensor to a message bus with the Sensor ID as queue topic.

In order to be able to initiate this configuration and set up process the Testbed Provider needs first to register all their resources (i.e. IoT devices). This is done by utilizing the services that are exposed from the FIESTA-IoT meta-platform, more specifically the Semantic Resource Directory (SRD) – cf. Figure 1 – management services.

The last mandatory requirement to be observed by the Testbed Provider Interface is that, as previously mentioned, FIESTA-IoT platform is designed to enable interoperability through semantic technologies. In this sense, any piece of information generated by the testbeds, whether sensor observations or resource descriptions must be semantically annotated using the

FIESTA-IoT ontology and taxonomies before it can be stored in the meta-platform Directories. The annotation process, this is, the transformation from the testbed native format and vocabularies, to the FIESTA-IoT semantic format and taxonomies must be handled by the Testbed Provider. In order to ease this process, the FIESTA-IoT meta-platform will offer both annotation services for those Testbed Providers that do not feel comfortable with RDF and semantics as well as validation services for those that prefer to handle themselves the annotation process.

In Annex D an end-to-end example for the sequence of the different interactions of a testbed with the FIESTA-IoT platform is depicted for better understanding of the technical implications for the Testbed Provider to participate in the testbeds federation offered by FIESTA-IoT.

3.3 Available testbeds descriptions

The FIESTA-IoT project partners, offer access to several IoT testbeds, such as SmartSantander (University of Cantabria), Smart ICS (University of Surrey), Comm4Innov and KETI. Moreover, three additional testbeds coming from the FIESTA-IoT 1st Open Call are being currently integrated. All of these testbeds are installed in either outdoor or indoor environments ranging four different domains (i.e. Smart City, Smart Campus, Cellular Networks and Smart Office). A summarized description of each of them follows:

SmartSantander

The SmartSantander testbed is located in Santander, a seaside town settled in the north of Spain. With a population of nearly 200,000 inhabitants, this city was chosen to deploy an experimental test facility (i.e. open laboratory) for the research and experimentation of big-scale architectures, in the context of a Smart City environment. Amongst its assets, the platform spans a number of domains that will be made available for the experimenters under the scope of the FIESTA-IoT's Experiment as a Service (EaaS) interface. Numerically speaking, the SmartSantander testbed manages around 3,000 IoT devices (which communicate through IEEE 802.15.4 interfaces), another 200 devices that play the role of gateways (with cellular communication capabilities) that establish a link between the abovementioned devices and the core of the platform, 2,000+ joint Radio Frequency Identification (RFID) tags/Quick Response (QR) code labels and more than 2,000 points of interest pertaining to a wide range of events (e.g. shopping, restaurants, cultural events, etc.). Table below summarizes the principal domains supported by the SmartSantander platform that will be available in the scope of the FIESTA-IoT federation. Besides, the table also describes the main assets associated to each of these domains, as well as the number of resources available in each of the cases.

Summary of SmartSantander's domains and assets

Domain	Asset (physical phenomena, etc.)	Resource Type	Deployed devices
Traffic monitoring	Vehicle Speed (Average & Instantaneous), Traffic Congestion, Traffic Intensity	Fixed sensors	48+
Outdoor parking	Vehicle presence detectors (buried under the asphalt)	Fixed sensors + Information panels	400+ sensors & 10 panels to display the information

Environmental monitoring	Air Particles Concentration, Ambient Temperature, Altitude, Atmospheric Pressure, CO concentration, Illuminance, Mass, NO_2 concentration, O_3 concentration, Rainfall, Relative Humidity, Soil Moisture Tension, Solar Radiation PAR, Sound Pressure Level, Soil Temperature, Wind Direction, Wind Speed	Fixed & Mobile Sensors	1000+ (fixed) & 150 (deployed on public vehicles)
Bike stops	Bike presence detectors	Fixed sensors	16 bike stops
Bus tracking	Location (fleet management) + Remaining time for the next bus	Mobile sensors	400+
Taxi stops	Location (fleet management system) + Taxis available in each stop	Mobile sensors	50+
Garbage management	Waste container fill level gauge + Trash truck (fleet management)	Fixed sensors (Waste containers) + Mobile sensors (tracking)	50+
Indoor parking	Vehicle presence detectors	Fixed sensors	12 public parking facilities (managed by private companies)
Parks & gardens irrigation	Ambient temperature, Atmospheric Pressure, Rainfall, Relative Humidity, Soil Moisture Tension, Solar Radiation PAR, Wind Direction, Wind Speed	Fixed sensors	48 IoT sensors nodes, covering three different areas (i.e. Las Llamas Park, La Marga Park and Finca Altamira)
Presence & luminosity	Pedestrian presence detector, Luminosity Sensors	Fixed sensors	10
NFC & QR tags	General information (e.g. transportation, cultural elements and shops)	NFC & QR Tags	2000+ tags deployed throughout the city
Electromagnetic exposure	Electric Field in the bands of 900, 1800, 2100 and 2400 MHz	Fixed sensors	48 sensor nodes
Augmented Reality	Contextual information (shops, restaurants, cultural points of interest, etc.)	Points of interest	2000+
Participatory Sensing	Events generated by citizens (Pace Of The City)	Smartphone apps	20000+ apps installed into citizens' smartphones

SmartICS

The SmartICS testbed is located in the Institute of Communication Systems (ICS) at the University of Surrey. The University is located about 40 kilometers south of London in the town of Guildford. The SmartICS testbed provides a smart environment, based on an indoor sensor nodes deployment located in the on all floors of the building. It serves as initial core and experimental micro-cosmos for the envisioned Smart Campus facility.

The IoT node tier consists of up to 200 sensor nodes deployed across all offices and desks in ICS with various sensing modalities, which include temperature, light, noise, motion, and electricity consumption of attached devices. The availability of these sensing modalities may vary across some of the nodes. The IoT nodes consist of 200 TelosB based platforms. Other sensor node platforms are planned to be deployed soon in order to achieve additional hardware heterogeneity in the testbed. The nodes' deployment currently stretches over three floors of the building.

Summary of SmartICS's domains and assets

Domain	Asset (physical phenomena, etc.)	Resource Type	Deployed devices
Desk Electricity consumption	Power	Fixed Sensor	200 (fixed)
Desk Ambient Environment	Temperature, Light Intensity, noise, presence (Infrared).	Fixed Sensor	200 (fixed)

Com4Innov

Com4Innov is a configurable and stand-alone testbed located in the south of France, in the techno-pole of Sophia Antipolis, between Monaco and Cannes. Com4Innov set-up includes a full-scale 4G/LTE/WIFI-Calling access network, an IMS/RCS applicative infrastructure and services. As one center of the FIWARE Lab European laboratory for the Future Internet, Com4Innov has capacities in the areas of Cloud Hosting, Virtual Machines, Big Data Management and Security to help companies test their solutions. Com4Innov is combining its 4G/5G mobile network operator grade for experimentation with a very big cloud infrastructure and a large scale IoT / M2M testbed which is expanding towards IoT^2- Inter-Operability Testing of Internet of Things. Com4Innov can produce data from various sources like 4G/5G cellular modem as well as from the innovative LPWA technology (Low Power Wide Area) networks, i.e. LoRa.

The main features of the Com4Innov experimental testbed are the following:

CELLULAR NETWORK

4G/LTE Core and access network with 2 antenna sites in Sophia Antipolis and one in La Ciotat close to Marseille having outdoor transmission. Roaming capability between Com4innov 4G and Monaco Telecom core network is possible since 2014. LTE IMS services and ability for E2E monitoring permits 100% surveillance for fault detecting thanks to traces and logs system.

The added value of the Com4Innov testbed consists of datasets taken from a real mobile network operator. Com4Innov is able to provide the data from real subscribers who are using the 4G/5G cellular network. Datalog from Telecom network is produced by tools generating traffic simulation on one hand and measuring performance indicators on the other hand. Com4Innov operates the ERCOM Mobipass tool, a 4G traffic simulator which can generate simultaneously traffic from thousands of sensors (terminals). The amount of data that can be

generated and provided to the FIESTA-IoT users can reach hundreds of GigaBytes. These data can be provided to the FIESTA-IoT experimenters for further usage and analysis.

Com4Innov can provide the data and the measurements taken from the sensors that are already embedded in the mobile phone (User Equipment UE) of the subscriber. Therefore, there is no need for adding fixed sensors, as the mobile terminals of the subscribers play that role.

IoT TESTBED

Com4Innov provides a broad IoT testbed in the region of Sophia Antipolis where data can be captured under different wireless technologies. A set of M2M / IoT devices (gateways, network and user interface) is available to the users. Com4Innov operates a full deployed LoRa network with 5 LoRa Gateways where hundreds of LoRa sensors can be attached. The Gateways are connected with LoRa network server, where all the operational, management and maintenance actions for the LoRa IoT devices will take place. Different types of phenomena can be measured by the Com4Innov sensors like inside or outside temperature, humidity, gas CO_2 detection, noise pollution detection.

An exhaustive list of the sensors that are available on the Com4Innov library is provided in the following table:

Summary of Com4Innov's domains and assets

Domain	Asset (physical phenomena, etc.)	Resource Type	Deployed devices
Telecom Network Indicators	Interfaces, traces , logs	Mobipass + TEMs	Any interface between functional module of the Evolved Packet Core
Environmental monitoring	Inside temperature Outside temperature Humidity High Temperature (in a lab) Low Temperature PT1000 Thermal flow Rain measurement Wind measurement	Fixed Sensors	Around 60
Smart metering / smart city (LoRa network)	Pressure level, temperature, Altitude, Longitude, Latitude, GPS Altitude, Radio Link information, smart parking, air pollution, fire detection, ozone presence, healthcare and medical	Fixed or mobile LoRa sensors	Number not frozen as a LoRa sensor can be deployed/attached in the LoRa network very easily
Presence & luminosity	Sun light measurement	Fixed sensors	2
4G/5G terminals	Data from real 4G/5G mobile network operator + IMS services (video etc)	Mobile sensors (embedded in the cellphones)	30 C4I mobile phones + hundreds of C4I SIM cards

KETI

The KETI testbed (originally installed for monitoring building energy consumption) has been implemented on the 5th floor of a Korea Electronic Technology Institute (KETI)'s building in Seoul, Korea. It aims to collect sensing data from a set of areas of offices (e.g., meeting area, relaxing area, and work area) and the parking lot. The deployed sensors (for measuring indoor climate, energy consumption of office utilities, people's presence in offices, and parking lot status) collect information about the physical status of indoor and outdoor building environment, and transfer it to the IoT server platform, Mobius, an oneM2M standard-compatible server platform, which allows further processing and analysis.

The testbed is composed of 40 compound sensors, each of them having 4 kind of raw sensors (temperature, humidity, illumination and presence sensor), 10 CO2 (Carbon dioxide) concentration detection sensors, 10 smart sockets for measuring the electrical power consumption, and 20 parking lot sensors, with total of 200 sensors (i.e., 160 raw sensors + 10 CO2 + 10 sockets + 20 parking sensors). Table x summarizes IoT devices supported by the KETI's testbed that will be available in the scope of the FIESTA-IoT federation.

Summary of KETI's domains and assets

IoT Device	Asset (physical phenomena, etc.)	Resource Type	Deployed devices
Temperature sensor	Ambient temperature of Office area (meeting area, relaxing area, and work area)	Fixed Sensor (compound sensor)	40
Humidity sensor	Relative humidity	Fixed Sensor (compound sensor)	40
Illumination sensor	Illumination	Fixed Sensor (compound sensor)	40
PIR sensor	User occupancy in an office	Fixed Sensor (compound sensor)	40
CO2 (Carbon dioxide) sensor	CO concentration	Fixed Sensor	10
Smart socket	Electrical power consumption	Fixed Sensor	10
Parking lot sensor	Vehicle presence detectors	Fixed Sensor	20

4. Scope of the present Call

This call solicits for the following extensions:

- **Integration of new IoT testbeds.** These testbeds must be compliant with the semantic models and interfaces defined by the FIESTA-IoT project in order to include them into the federation. In order to enlarge the critical mass of the existing experimentation support capacity offered by the 4 existing FIESTA-IoT testbeds and the 3 additional ones being integrated, as well as to probe the interoperability solutions developed within the project, we are seeking for new testbeds that can provide datasets and data-streams on the domains of interest of the existing ones (see section 3). However, testbeds offering extra scenarios (smart agriculture, smart factory, smart grid, etc.) will be also considered for inclusion.

Any testbed should be made available to the FIESTA-IoT consortium and to future external experimenters (either through subsequent (funded) open calls or (non-funded) open access use of the extended FIESTA-IoT testbeds and software platforms), under the terms and conditions stipulated in the contract template for Extensions. Independent evaluations of the submitted proposals will be performed, in order to select the experiments that will be supported by the project. It is required that the extensions are performed by a single organization.

According to what has been described in section 3, extension providers will have to go over the following processes:

- **Testbed registration.** When any testbed wants to become part of the FIESTA-IoT federation, it MUST be first registered into the platform. Adequate registration interfaces are put in place through the FIESTA-IoT Portal.
- **Registration of testbed's resources.** As long as a testbed wants to inject information (i.e. observations) coming from its different underlying resources, it MUST register them beforehand, thus allowing the platform to have a prior knowledge about the different elements that are actually catering with data. To do so, a semantically annotated description, compliant with the FIESTA-IoT ontology, has to be provided to the FIESTA-IoT platform. Testbed providers can decide whether they provide their resources description already annotated or make use of any of the existing available annotators. In this latter case, they will have to comply with the input format (not-semantic) required by each annotator.
- **Management/Update of testbed's resources:** The initial description of a resource is prone to vary throughout its lifetime. For example, its legacy testbed provider may add/remove sensors at any time. Upon such dynamics occur, testbed providers have to keep their testbeds' resources descriptions up to date.
- **Implementation of testbed provider interfaces:** In order to enable access to the observations and data provided by their testbeds' resources each testbed provider has to implement the corresponding TPI interfaces (see section 3). Depending on the nature and internal behaviour (if it only supports request-response or subscription-based access to data) of the testbed it is possible that only a subset of the TPI interfaces at testbed level shall be implemented.

Benefits to participate in this open call are

- Boost the sharing, reuse and repurposing of IoT facilities at an EU and global scale. FIESTA-IoT will showcase and validate this concept in the scope of enterprise applications/experiments, smart city applications/experiments and more.
- FIESTA-IoT project will provide a global market confidence programme for extending the pool of interoperable facilities and testbeds that will comply with the project interoperability model.
- A range of best practices facilitating IoT platform providers and testbed owners/administrators to integrate their platform/testbed within FIESTA-IoT
- The simplified application process compared to the one from the standard H2020 calls together with a rapid review process by independent external evaluators;
- An extra benefit is the dedicated support from skilled FIESTA-IoT members. This will include their general training on IoT interoperability in general and in FIESTA-IoT interoperability in particular, targeted consulting services associated with the interoperability of their platforms/testbeds, as well as continuous support in their efforts to use the FIESTA-IoT results/tools towards improving the level of interoperability of their systems and applications.

Integration of the new testbeds should be accomplished in maximum 6 months. Per proposal a budget can be made available up to a maximum of 50 k€ per extension.

5. Inclusion into the consortium

Once a proposer is selected to perform the proposed Experiment or Extension, he/she will become a Third Party under Cascade Funding to NUIG as coordinator and the recipient will be required to sign an Agreement with the project coordinator (NUIG).

The administrative tasks for the recipients include cost and activity reporting obligations and related documents will be provided during the negotiation and contracting phase.

At the end of the project the recipient will submit a “Final Report” consisting of feedback on their experiments and the platform tools used and a cost report detailing all eligible costs incurred.

This final report will be required before payment will be carried out. A pre-payment of up to 20% of the agreed funding will be made to the recipient before the start of the experiment or extension. Following evaluation of the final report and documentation the project coordinator will make an additional payment of up to 60% of the requested funding. The remaining 20% will be paid following the formal approval of the report and the work at a technical project review by the European Commission (EC). More details on the payment scheme are given in section 8.

Please note that the contractual obligations are not the same for an Experiment and an Extension. The two contract templates will be made available.

Any legally binding commitment from the side of NUIG shall be subject to the entering into of a written contractual agreement between NUIG and the recipient.

6. Proposal template

The use of a specific proposal format as described in this section is mandatory. The template is limited in size and is focusing on “what the proposer wants to do” and “what the expected result is”.

Section A Summary (maximum 300 words). The information in this section may be used in public documents and reports by the FIESTA-IoT consortium.

Section B Detailed description and expected results (minimum 4 to maximum 8 pages)

This section describes the details of the new testbed to be integrated (what does the proposer hope to obtain, how, why is it relevant). This section should also include all information with respect to the State-of-the-Art to show the innovative character of the extension and the expected scientific or business impact. Moreover, information should be provided on how the testbed resources will be made available to the FIESTA-IoT consortium and to future external experimenters (either through subsequent (funded) open calls or (non funded) open access use of the extended FIESTA-IoT testbeds and software platforms, beyond the completion of the testbed federation object of this Open Call (till the end of FIESTA-IoT project and beyond).

Section C Concise summary of testbeds, resources and/or datasets or data-streams provided by the testbed (target length 1 page)

This section should summarize the datasets, data-streams and resources that it will be made available similarly to what can be found section 3 for the existing FIESTA-IoT testbeds.

Section D Compliance check (maximum 1 page)

This section contains the response from the FIESTA-IoT submission platform upon fulfilment of scorecard available.

Section E Background and qualifications (maximum 2 pages)

This section describes the proposer and includes an overview of the activities, the proposer's qualifications, technical expertise and other information to allow the reviewers to judge the proposer's ability to carry out the federation of the testbed.

Section F Expected feedback to the FIESTA-IoT Consortium (maximum 2 pages)

This section contains valuable information for the FIESTA-IoT consortium and should indicate the feedback that the FIESTA-IoT consortium can expect from the testbed integration process. This information is essential in view of the further improving the FIESTA-IoT software platforms, and the testbeds. Note that providing this feedback is one of the key motivations for the existence of the FIESTA-IoT open calls.

Section G Requested funding (1 page)

This section provides an overview of the budgeted costs and the requested funding. A split is made in personnel costs, other direct costs (travel, consumables, etc.) and indirect costs.

Section H Use of proposal information

In this section the proposing party is asked to include some statements related to sharing information of their proposal within the FIESTA-IoT consortium.

Proposals are treated in a confidential way, meaning that only successful proposals must be disclosed to the FIESTA-IoT consortium. Open calls previously organized by other FIRE projects were very successful and have revealed that many submitted non-granted proposals also contain very interesting and valuable information that could be used for setting up collaborations or to extract ideas for further improving the federated test infrastructures. Therefore the FIESTA-IoT project would like to have the opportunity to collect more detailed information and further use this information, also if the proposal is not selected for funding. In any case, the FIESTA-IoT consortium will treat all information of a proposal confidentially.

The full proposal template can be found in Annex A to this document.

7. Support during testbed integration

FIESTA-IoT will establish and operate the Ecosystem Desk; this is a help desk providing first point of contact support for new testbed providers during the process of federating their testbeds with the FIESTA-IoT facility.

8. Payment scheme

As the selected proposers will be linked to the FIESTA-IoT consortium as Third Parties using Cascade Funding, specific arrangements exist with respect to financial costs and payment schemes:

1. The proposing party will need to include an overview of the estimated costs in its proposal at the time of submission. Costs consist of personnel costs, direct costs (such as travel, consumables, etc.) and indirect costs. The costs of the recipient have to comply with the rules and the principles mentioned in Section I, Article 6 (Eligible and ineligible costs) of the H2020 AGA — Annotated Model Grant Agreement (see http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/amga/h2020- amga_en.pdf), in the same way as the beneficiaries, and must be recorded in the accounts of the recipients. In other words, the rules relating to eligibility of costs, identification of direct and indirect costs and upper funding limits apply. Equally those concerning controls and audits of Section I, Article 22 of the H2020 AGA.
2. The maximum requested funding for an experiment in this Call is set at 50,000 €. The maximum requested funding for an extension in this Call is set at 50,000 €.
3. A pre-payment of up to 20% of the agreed funding will be made to recipient, subject to Agreement being signed, before the start of the extension.
4. Recipient of 3rd party funding for extensions will need to submit a report at the end of the experiment or extension (for this call this will be middle of September 2017, under the assumption that the extension starts on 15th March 2017). This report (see section 10), must include an overview of the costs incurred to be included in NUIG's Financial Statement to EC.
5. The report and the declared costs will be evaluated by the FIESTA-IoT consortium.
6. Based on this evaluation, a payment of the remaining agreed funding up to an 80% of the total requested funding will be carried out by the project coordinator.
7. The remaining 20% will be paid following a formal approval of the report and the work at a technical project review by the European Commission (EC).

8. For Open Call 2 a review meeting with the EC is planned for Fall 2017. The exact date will be fixed at the start of the extension. The location of the review meeting is to be decided. At the review meeting the results of the extension needs to be presented, preferably through a real-life demo. The recipients have to present the final results.

9. Access to Foreground information from the project

As indicated by the EC Guidelines, third parties in Cascade Funding is paid in full for its contribution made to a project by the Coordinator, with whom it has an Agreement signed. As a consequence recipients do not have any IPR rights on the foreground of the project.

Access to software components that extensions need to develop for its integration will be available through the FIESTA-IoT software repository.

10.Reporting

As the selected proposers will be linked to the FIESTA-IoT consortium as 3rd parties to NUIG, no input will be required for any of the regular project reports, which the FIESTA-IoT consortium needs to submit to the EC.

A final report needs to be submitted after completion of the extension.

A specific template needs to be used and will include:

Part A. Summary

Part B. Detailed description

This section describes the details on the extension It includes:

- Concept, Objectives, Set-up and Background
- Impact
- Lessons learned
- Impact

The impact should give a clear description of the potential use of the extension by future experimenters specifying exemplary experiments to be conducted over the added testbed.

Part C. Feedback to FIESTA-IoT

This section contains valuable information for the FIESTA-IoT consortium and describes the recipient's experiences while integrating its testbed. Note that the production of this feedback is one of the key motivations for the existence of the FIESTA-IoT open calls. It includes:

- C.1 Resources & tools used
- C.2 Feedback based on design / set-up / and integrating the testbed within FIESTA-IoT
- C.3 Why FIESTA-IoT was useful for the recipient?

This report will not only serve as an evaluation tool to judge payment of the extension, but will also serve as (1) input to the evaluation of the user-friendliness of the FIESTA-IoT platform and EaaS interfaces, and (2) identification of missing gaps in both testbeds and EaaS platform.

Part of this report may be used by the FIESTA-IoT consortium for inclusion in their reporting documents to the EC and in public presentations. Inclusion of confidential information should therefore be indicated and discussed with the FIESTA-IoT consortium.

The enablers and software components necessary for the integration of the testbed, together with the documentation on the use of the extension, must be made available on the FIESTA-IoT project GitLab.

This report, code and documentation will also be used for the formal review by the European Commission. Each recipient is expected to attend this formal review meeting with the EC. In exceptional cases (to be motivated by the recipient), the recipient can be represented by the FIESTA-IoT consortium. The template for the final report will be available well in advance before the end of the extension.

11.Criteria for evaluation of Experiments and Extensions

Evaluation and ranking will be carried out by an external jury.

Selection will mainly be based upon the following criteria:

1. Usefulness: the degree of expected future use of the extension (cf. Section B of the proposal template)

   The score should reflect the potential of the new testbed to be used by future experimenters in subsequent (funded) FIESTA-IoT open calls or by (non-funded) open access of FIESTA-IoT platform. In this respect, this criteria takes into account the amplitude (number and variety) of the testbed IoT resources, their nature (i.e. real or virtual resources), the testbed availability and the accessibility to the testbed resources for FIESTA-IoT users during the whole project duration and beyond.

2. Complementarity: the degree the extension will provide new datasets and data-streams (cf. Sections B and C of the Proposal Template)

   The score should reflect the potential of the extension to:

   - enlarge the critical mass of the existing experimentation support capacity offered by the 4 existing FIESTA-IoT testbeds, as well as to probe the interoperability solutions developed within the project, by providing additional datasets and data-streams on the domains of interest of the existing ones (see section 3) or,
   - offer extra scenarios (smart agriculture, smart factory, crowdsensing, underwater, smart grid, etc.) with a high potential impact in terms of the real-world innovation enabled through the offered infrastructure and its associated datasets and data-streams.

3. Sustainability: the guarantee of availability of the services offered by the extension in absence of this Open Call funding (cf. Section B of the proposal template)

   Proposers will get higher grades if they are able to demonstrate the sustainability of their testbeds once the scope of this Open Call is finished.

4. Feasibility (cf. Section D of the Proposal Template)

   Testbeds with low chances of being successfully integrated within the FIESTA-IoT federation or requiring excessive support from the FIESTA-IoT partners will get a lower score.

5. Qualifications of the proposer (Cf. Section E of the Proposal Template)

   The proposers should exhibit prior testbed management experience and the necessary qualifications to integrate their testbeds within the FIESTA-IoT federation.

6. Potential for Feedback (Cf. Section F of the Proposal Template)

   The FIESTA-IoT consortium is seeking feedback regarding the FIESTA-IoT platform and the process of integrating new testbeds within the federation. Proposals that can demonstrate value of the FIESTA-IoT federation procedures and/or motivate added-value extensions FIESTA-IoT TPI, will get a higher score.

7. Value for money (Cf. Section G of the Proposal Template)

   The requested budget should be in line with the proposed work plan.

Amongst all above listed criteria, criteria 1, 2, 3 and 6 will be weighted higher.

12. Timing of the evaluation

The duration of the evaluation of the proposals and approval by the EU will be kept within 1 month. In case of this specific Call, the target date for acknowledgement of selection is set at 15th March 2017. Experiments/extensions can start at the earliest on 1st April 2017, but no later than 15th April 2017. The deadline for the final report (for experiments and extensions) is expected 6 months after the start of the experiment, and no later than the end of September 2017. The final evaluation of the experiments/extensions will happen at a review meeting with the EC. The exact date and location will be fixed at the start of the experiment or extension.

13.Submission

Submission deadline:	**15th February 2017, at 17:00 Brussels local time**

The proposal must be:

1. Submitted on-line through: http://fiesta-iot.eu/opencall/
2. Submitted in English

Feasibility check: A technical feasibility check is required before submission. This feasibility check will be available from the submission system in the form of scorecards to be filled. As a result of this, an additional concise section is added to the proposal (section D of the Proposal Template).

Annex A. Full proposal template

Federated Interoperable Semantic IoT/cloud Testbeds and Applications

Open Call 2

Second FIESTA-IoT Competitive Call for Extensions

Full title of your proposal

Acronym of your proposal (optional)

Date of preparation of your proposal	mm/dd/yyyy
Your organization name	Your organization name
Name of the coordinating person	Name of the coordinating person
Coordinator telephone number	Coordinator telephone number
Coordinator e-mail address: [This is the email address to which the Acknowledgment of receipt will be sent]	Coordinator e-mail

Note: Grey highlighted areas needs to be filled and/or removed as they are intended to provide clarification on the expected content. Word template can be downloaded from FIESTA-IoT project website (see http://fiesta-iot.eu/opencall/)

Section A Project Summary

(Maximum 300 words)

Summary of the proposed work

Remark: The information in this section may be used in public documents and reports by the FIESTA-IoT consortium.

Section B Detailed description and expected results

(minimum 4 to maximum 8 pages)

This section describes the details on the planned extension: what does the proposer hope to obtain, how, why is it relevant? This section should also include all information with respect to the State-of-the-Art which shows how the testbed has been already useful to support experimentation and how the domain of interest enabled by the testbed is currently mobilizing the scientific and innovation communities.

B.1 Concept and objectives

Describe the specific objectives of the proposed extension, which should be clear, measurable, realistic and achievable within the duration of the extension (not through subsequent development). Show how they relate to the topic(s) addressed in the scope of this competitive call and how and why FIESTA-IoT meta-platform needs such extension. Describe and explain the overall concept that forms the basis for your extension. Describe the main ideas, models or assumptions involved.

B.2 Impact

Describe the potential that the extension will be used by future FIESTA-IoT experimenters from the broader scientific community as well as developers from industry, in particular individuals and SMEs, in subsequent (funded) FIESTA-IoT open calls or by (non-funded) open access of FIESTA-IoT federated testbeds. Proposers should show the amplitude (number and variety) of the testbed IoT resources, their nature (i.e. real or virtual resources), the testbed availability and the accessibility to the testbed resources for FIESTA-IoT users during the whole project duration and beyond.

Show that the proposed extension has sufficient sustainable benefits for the FIESTA-IoT project, meaning that there should be an added value for the FIESTA-IoT project, after the proposer has finished his extension.

B.3 Description of the State-of-the-Art

Describe how the testbed has been already useful to support experimentation and how the domain of interest enabled by the testbed is currently mobilizing the scientific and innovation communities.

B.4 Methodology and associated Work Plan

Provide a work plan. Provide clear goals and verifiable results, and also a clear timing.

The work plan involves at least the following phases:

1. *Design of extension*
2. *Executing the integration of the testbed*
3. *Analysis & feedback*
    - *Analysis of the results of the testbed integration process*
    - *Feedback on user experience*
    - *Recommendations for improvements and/or future extensions of FIESTA-IoT meta-platform and testbeds*
4. *Showcase: Set up of a showcase (demonstration) to be used for the evaluation of the extension at the review meeting with the EC, and for further promotion of FIESTA-IoT*
5. *Dissemination: Regular dissemination actions (journal publications, conferences, workshops, exhibitions, FIRE events, advertising of results at FIESTA-IoT website, etc.)*
6. *Final report, code and documentation*

Section C Provided resources and/or datasets or data-streams

(target length 1 page - fill the tables below)

This section should include a summary table of the resources that will be available through it:

Domain	**Asset (physical phenomena, etc.)**	**Resource Type**	**Deployed devices**
Domain of interest	Brief description of the physical phenomena obtained by the sensing devices	Fixed Sensor / Mobile Sensor / Smartphone / etc.	Number of devices
Domain of interest	Brief description of the physical phenomena obtained by the sensing devices	Fixed Sensor / Mobile Sensor / Smartphone / etc.	Number of devices

Section D Compliance check

The Open Call proposer needs to answer the scorecard available on the FIESTA-IoT Training Platform (http://moodle.fiesta-iot.eu/course/view.php?id=2). Based on the answers, a feedback will be generated which should be included into the following tables.

The Scorecard for extensions is divided into 5 questionnaires. According to the combination of the answers given, an overall feedback (per questionnaire) is going to be generated which must be also included into the corresponding table.

Please make sure you submit each set of answers, as only then, the feedback is automatically given. If help is needed, please refer to the "Scorecard Instructions.pdf" available in the FIESTA-IoT Training Platform, or in case further assistance is needed, feel free to contact the FIESTA-IoT Open Call support team, using the email address provided in the Training Platform front page.

Testbed Data Models questionnaire

Name	**Feedback**
Q1 - Does the testbed supports the SSN ontology?	
Q2 - Does the testbed supports the FIESTA ontology?	
Q3 - Does the testbed supports the IoT-lite ontology?	
Q4 - Does the testbed supports other language to annotate data such as SensorML, SWE?	
Q5 - Does the testbed support a proprietary language to represent the sensor data and/or sensor descriptions?	
Q6 - Does the testbed provides the ability to extract data and/or sensor descriptions in a document format (i.e. CSV, Excel, XML, RDF, JSON, etc.)?	
Q7 - Does the testbed store its data and/or sensor descriptions in a Graph Database?	
Q8 - Does the testbed store its data and/or sensor descriptions in a Document Database?	
Q9 - Does the testbed store its data and/or sensor descriptions in a Relational Database?	
Overall feedback	

Interfaces & Services questionnaire

Name	Feedback
Q1 - Does the testbed offer a SPARQL (Graph DB) endpoint?	
Q2 - Does the testbed offer an OMA Next Generation Service Interface?	
Q3 - Does the testbed offer an Open Cloud Computing Interface?	
Q4 - Does the testbed offer a Virtual Entity end point?	
Q5 - Does the testbed offer a Relational DB endpoint?	
Q6 - Does the testbed offer a document DB endpoint?	
Q7 - Does the testbed offer Resource Discovery (filtered by location, type, name, etc.)?	
Q8 - Does the testbed offer direct access to sensors' observations through services (historical queries and/or event-based subscriptions)?	
Q9 - Does the testbed offer access to sensors' observations stored on a database through services (historical queries)?	
Q10 - Does the testbed offer actuation through offered services?	
Overall feedback	

Security questionnaire

Name	Feedback
Q1 - Does the testbed offer secure encrypted communication channel between all testbed interfaces and FIESTA Platform?	
Q2 - Can the testbed trust FIESTA to identify and authenticate experimenters on its behalf?	
Q3 - Can the testbed determine who is using what features of the testbed?	
Q4 - Is the testbed able to specify access rights to specific resources?	
Q5 - Can the testbed choose to perform local access control decisions and enforcement?	
Overall feedback	

Quality Auditing Aspects questionnaire

Name	Feedback
Q1 - Do you control or set a threshold before which your testbed must give a response to the received request?	
Q2 - Do you control or set a threshold before which your testbed must finish processing the request in the most complex case?	
Q3 - Does your testbed implement any resource optimizing mechanism?	
Q4 - Does the Testbed support the execution of services with different priorities?	
Q5 - Do you define a ratio of failure time/working time that the testbed must respect?	
Overall feedback	

Generic questionnaire

Name	Feedback
Q1 - Does the testbed provide Documentation?	
Q2 - Does the testbed provide development, deployment and management tools?	
Q3 - Can the testbed offer the ability to run third party software (i.e. FIESTA adaptors)?	
Q4 - Can the testbed replicate/annotate it's current data to the FIESTA format in a local Database?	
Overall feedback	

Section E Background and qualifications

(maximum 2 pages)

This section describes the proposer and includes an overview of the activities, the proposer's qualifications, technical expertise and other information to allow the reviewers to judge the proposer's ability to carry out the federation process, this is, implement the required interfaces and tools to make their testbeds complaint with the FIESTA-IoT platform, as well as to support experimentation of subsequent (funded) FIESTA IoT open calls or by (non-funded) open access of FIESTA IoT federated testbeds.

Section F Expected feedback to the FIESTA-IoT Consortium

(maximum 2 pages)

This section contains valuable information for the FIESTA-IoT consortium and should indicate the feedback that the FIESTA-IoT consortium can expect from the use of its software platforms and/or testbeds after carrying out the extension. This information is essential in view of the further improving the FIESTA-IoT software platforms, and the testbeds. Note that providing this feedback is one of the key motivations for the existence of the FIESTA-IoT open calls.

Section G Requested funding

(maximum 1 page)

This section provides an overview of the budgeted costs and the requested funding. A split is made in personnel costs, other direct costs (travel, consumables, etc.) and indirect costs.

Besides the table below, extra information should be provided to support the requested funding and which may help to judge the cost to the reviewers. Absence of this information might lead to lower marks in several evaluation criteria.

Please show your figures in euros (not thousands of euros).

	Total PM	**Cost (€)**
1. Direct Personnel costs		
2. Other direct costs		
3. Total direct costs (sum of row 1,2)		
4. Indirect costs (25% of row 1+2)		
5. Total costs (sum of row 3 and row 4)		
6. Requested funding (up to 50.000 EUR)		

In row 1, insert your personnel costs for the work involved.

In row 2, insert any other costs, for example equipment or travel costs. Please allocate sufficient budget for participation at the final review meeting by the EC, and potential visit(s) to FIESTA-IoT partners, in case this is required in view of advanced support by the Consortium.

In row 3, calculate the sum of your personnel and other costs.

In row 4, calculate the indirect costs that is 25% of the personnel costs (row 1) and other direct costs (row 2). Indirect costs are all those eligible costs which cannot be identified by the participant as being directly attributed to the project but which can be identified and justified by its accounting system as being incurred in direct relationship with the eligible direct costs attributed to the project. You should use a uniform 25% flat-rate of your eligible direct costs.

In row 5, calculate the total costs as sum of total direct and indirect costs.

In row 6, indicate the requested funding. You may request up to the total amount allowed by this call for EC contribution which is 50.000€.

Section H Use of proposal information

(maximum 1 page)

In this section the proposing party is asked to include some statements related to sharing information of their proposal within the FIESTA-IoT consortium.

Proposals are treated in a confidential way, meaning that only successful proposals must be disclosed to the FIESTA-IoT consortium. Open calls previously organized by other FIRE projects were very successful and have revealed that many submitted non-granted proposals also contain very interesting and valuable information that could be used for setting up collaborations or to extract ideas for further improving the federated test infrastructures. Therefore the FIESTA-IoT project would like to have the opportunity to collect more detailed information and further use this information, also if the proposal is not selected for funding. In any case, the FIESTA-IoT consortium will treat all information of a proposal confidentially.

Two types of information usage are envisaged:

- *Information which is part of the Sections A, C, D and F will be used within the FIESTA-IoT project as input for tasks related to testbed and software platform optimizations, sustainability studies, etc. The same information can also be used in an anonymous way to create statistics and reports about this first open call. All proposals submitted to this competitive open call are obliged to allow this form of information access and usage.*
- *Other information belonging to this proposal might also be accessed by the FIESTA-IoT consortium, if allowed by the corresponding proposer. Any use of such information will be discussed and agreed upon with the proposers. Proposers have the freedom to select if they wish to support this kind of information usage.*

I allow that the material provided in Sections A, C, D and F of this proposal may be accessed by the FIESTA-IoT consortium, also if the proposal is not selected for funding. In any case, the FIESTA-IoT consortium will treat all this information confidentially. It will be used within the FIESTA-IoT project as input for tasks related to testbed and software platform optimizations, sustainability studies, etc. The same information can also be used in an anonymous way to create statistics and reports about this first open call.	Yes ☐	
Furthermore, I allow that the other parts of this proposal may be accessed by the FIESTA-IoT consortium, also if the proposal is not selected for funding. In any case, the FIESTA-IoT consortium will treat all information of this proposal confidentially. Any use of this information will be discussed and agreed upon with the proposers.	Yes ☐	No ☐

Annex B. Extension contract template

Annex C. TPI Configuration and Function Sequence example

An end-to-end example for the sequence of the different interactions of a testbed with the FIESTA-IoT platform is depicted in Figure 4 below. In this example, we presume that the testbed has implemented and exposes the "`getObservations`" services, which provides the FIESTA-IoT annotated measurements of a given list of resources for a specific time period.

- The first step for the Testbed Providers once they have registered themselves and obtained the FIESTA-IoT credentials, is to utilize the **SRD component** and store (register) the description of their testbed's resources, based on the FIESTA-IoT ontology.
- After successfully registering all the testbed resources the Testbed Providers can use the **TPI configurator UI** component in order to define how their annotated data is going to be introduces to the FIESTA-IoT platform. The **TPI configurator UI** provides the graphical tools in order to discover the already registered resources of their testbeds and carry out per-resource configuration if necessary.
- The User is capable now to choose the list of resources he/she is interested to interact with and by identifying the periodicity of the execution schedule, with the help of **TPI Configurator UI,** the User can instruct the **Data Management Services** component to initiate the process of retrieving data from the Testbed and send them to the FIESTA-IoT platform.
- By receiving the command from the **TPI Configurator UI** with the list of involved resources along with the periodicity and the subscription URI the **Data Management Services** component enters a continues loop, based on the execution schedule defined by the Testbed Provider. In every execution cycle it requests from the **Testbed Provider Services** (`getObservations`) all the measurements for the resource list for the duration of the last execution cycle.
- The annotated results received are then pushed to the **Semantic Data Directory.**

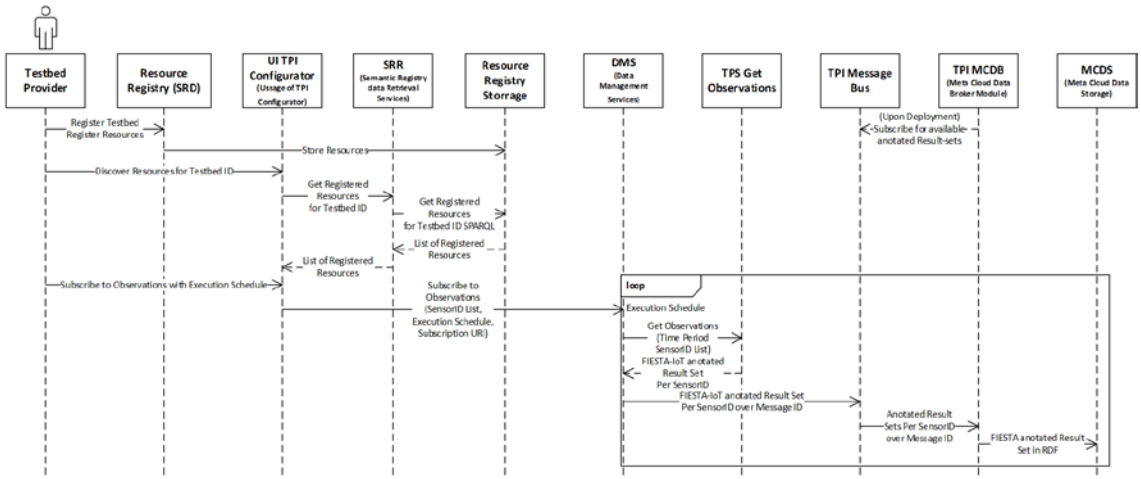

Figure 4 Configuration and Function Sequence example (`getObservations`)