Federated Interoperable Semantic IoT/cloud Testbeds and Applications

Open Call 3

Third FIESTA-IoT Competitive Call for Experiments

1. General Call Objectives

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

Overall, the project's experimental infrastructure provides experimenters in the IoT domain with the following unique capabilities:

- 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.
- Execution of experiments across multiple IoT testbeds, based on a single API for submitting the experiment and a single set of credentials for the researcher.
- Portability of IoT experiments across different testbeds, through the provision of interoperable standards-based IoT/cloud interfaces over diverse IoT experimental facilities.

More information on the scope of this third 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-OC3**
Call title:	**Third FIESTA-IoT Open Call for Experiments**
Submission deadline:	**15th June 2017, at 17:00 Brussels local time**

Financial information

Call	Category / Identifier	Call budget	Max. budget per experiment	Minimum no. of experiments to be funded
Experiments	Scientific Excellence FIESTA-IoT-OC3-EXP-EXC	€ 300 000	€ 50 000	6
	Innovation FIESTA-IoT-OC3-EXP-INN	€ 300 000	€ 50 000	6
Total funding of this call				€ 600 000

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.
- For the experiments in the category 'Innovation', proposals must come from companies that can use the experiment to gain competitive advantage for the products and/or services in its portfolio.
- 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).

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 via http://fiesta-iot.eu/index.php/opencall/)

3. Background information on the FIESTA-IoT project

FIESTA-IoT focuses 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 of 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, FIESTA-IoT 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 virtualizes 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.

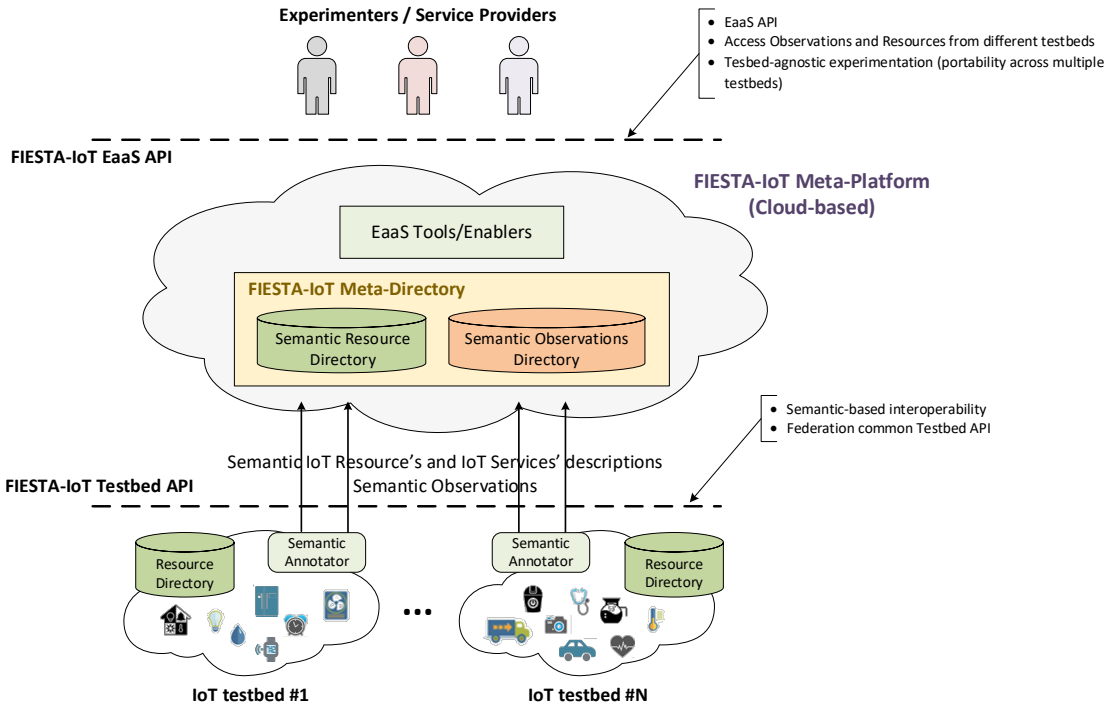

Figure 1 FIESTA-IoT testbed federation concept overview

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 push 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 appear 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 make 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.

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

[1] IoT-A Consortium; Carrez, F. Final architectural reference model for the IoT v3.0. Available online: http://www.meet-iot.eu/deliverables-IOTA/D1_5.pdf (accessed on 10 May 2017).
[2] http://ontology.fiesta-iot.eu/ontologyDocs/fiesta-iot.html

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.

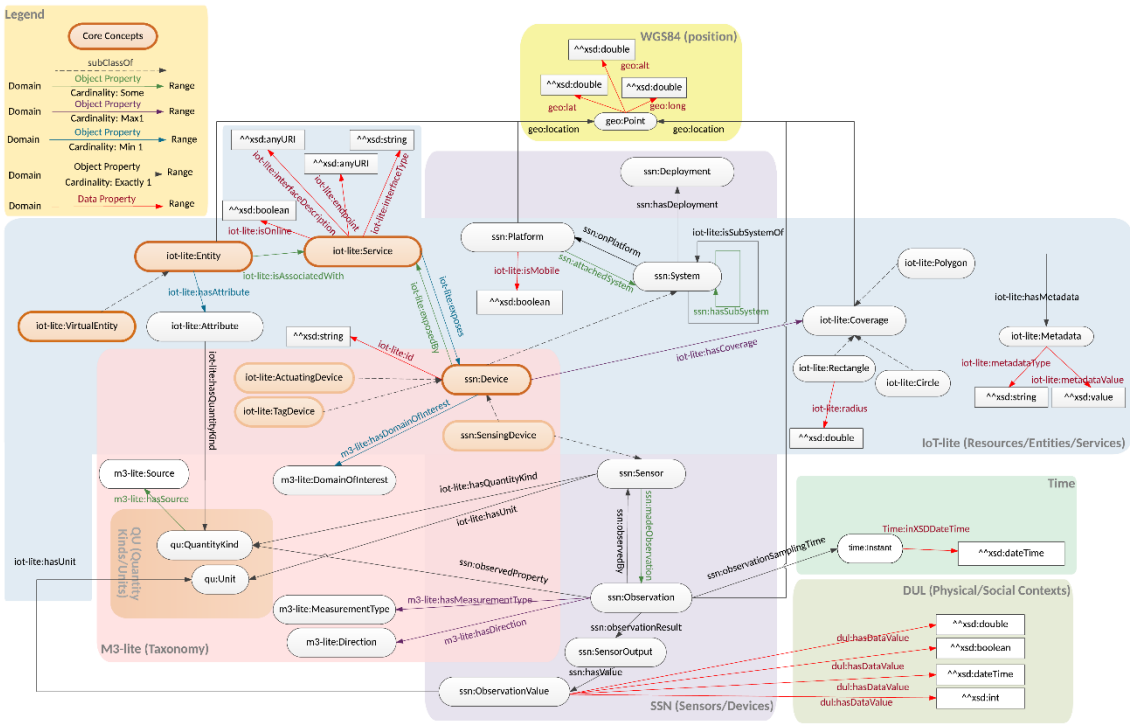

Figure 2 FIESTA-IoT Ontology

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.

3.1Tools/services for experimenters

Experimenters will be provided with a set of tools for the interaction with the aforementioned FIESTA-IoT EaaS meta-platform. These 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: (i) bind the experiment with its actual owner, (ii) facilitate the management, (iii) permit the dissemination of the experiment with other users.

- **Discovery of resources.** The first step that an experiment has to 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 application 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 resources 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.).

3.2Available testbeds descriptions

The FIESTA-IoT project offers access to several IoT testbeds, such as SmartSantander (University of Cantabria), Smart ICS (University of Surrey), KETI and SoundCity, complemented by six (6) testbeds integrated to FIESTA-IoT through the previous open calls. All 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
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)
Traffic monitoring	Vehicle Speed (Average & Instantaneous), Traffic Congestion, Traffic Intensity	Fixed sensors	48+
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)
Outdoor parking	Vehicle presence detectors (buried under the asphalt)	Fixed sensors + Information panels	400+ sensors & 10 panels to display the information
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)

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

SoundCity

The Soundcity testbed is a large-scale crowdsensing testbed developed by Inria-Paris in collaboration with an SME Ambiciti. The testbed comprises of data coming from so called Ambiciti application that is installed on user's mobile phone. The Ambiciti application uses in-built sensors on mobile phones to sense various phenomena such as noise, motion and proximity. Due to privacy reasons, users have to explicitly confirm about their data to be shared to FIESTA-IoT platform, thus the number of Soundcity devices attached to FIESTA-IoT platform varies from time to time. The Soundcity testbed is not bound to any specific location due to the fact that users of Ambiciti application can be anywhere in the world.

Summary of SoundCity's domains and assets

IoT Device	Asset (physical phenomena, etc.)	Resource Type	Deployed devices
Smartphone – Device surroundings	Noise, Proximity	Smartphone apps	Variable

Smartphone – Anonymised Mobility Information	Speed, Accelerometer, location	Smartphone apps	Variable

ADREAM

LAAS-CNRS has built a smart building called ADREAM (https://www.laas.fr/public/en/adream). This building already has more than 6500 sensors that collect 500.000 measures per day (solar panel activity, energy consumption, HVAC, lighting, weather). This is completed by a reproduction of a flat where researchers can deploy extra sensors and actuators.

Summary of ADREAM's domains and assets

IoT Device	Asset (physical phenomena, etc.)	Resource Type	Deployed devices
Lighting	Luminosity, presence, state of ballast	Fixed Sensor	3700
Electricity	Smart meter for building, plug	Fixed Sensor	500
HVAC	Temperature, pump flow, valve status, etc. : all the necessary sensors and actuators to manage the HVAC of a building	Fixed Sensor	1000
Solar panels and batteries and weather	Smart meter, inverter state, wind, luminescence, temperature	Fixed Sensor	1200
Instrumented flat	luminescence, temperature, presence, plug, pressure, smart phone, tablet, relay, contact, fire detection, motor	Fixed sensors and mobile	100

NITOS

NITOS will bring to FIESTA-IoT a set of heterogeneous resources including nodes equipped with Wi-Fi, WiMAX, LTE and Bluetooth, 4G/5G terminals, software defined radios, SDN resources, cloud infrastructure and two wireless sensor networks comprised by commercial and custom made sensor platforms. On top of these diverse and heterogeneous resources, NITOS brings a vast number of experimental datasets generated through the various experiments conducted all these years that NITOS has been operating.

The wireless sensor network consists of a controllable deployment in an indoor environment (Figure 1), as well as an office/building deployment. Most of the sensor platforms are custom-made, developed by UTH, and some others commercial, all supporting open-source and easy to use firmware and exploit several wireless technologies for communication (ZigBee, Wi-Fi, BLE and LoRa). The office/building setup provides metrics related to the environment conditions and composes an integrated application of WSN in real-life scenarios. On the other hand, the WSN which is deployed in an indoor testbed environment is targeted to provide the necessary experimentation capabilities with a plethora of IoT communication interfaces.

Summary of NITOS's domains and assets

IoT Device	Asset (physical phenomena, etc.)	Resource Type	Deployed devices

Lora Experimental Network	Luminosity sensors, Ambient Temperature, Relative Humidity, Lora Network metrics (e.g. RSSI, latency)	Fixed sensors	20 deployed in the NITOS indoor deployment
Office Sensor deployment over ZigBee network	Human presence (PIR), Thermal sensors, Luminosity sensors, Ambient Temperature, Relative Humidity, Sound Pressure Level, Link State Info (e.g. RSSI)	Fixed sensors	40 deployed in office environment & 20 deployed in the NITOS indoor deployment

EXTEND

The facility is located in a bathing and recreation coastal area, offering support for new IoT experimentation scenarios in the unique sea and underwater environment. Moreover, a wide range of communication interfaces (ZigBee, Wi-Fi, LoRa, LTE, Iridium) and types of measurements (sea water and air quality parameters) are supported on all testbed nodes.

Testbed nodes exploit heterogeneous communication technologies to connect with the shoreside network. Moreover, they act as independent sensing units, featuring a vast variety of bathing water and air quality monitoring sensors. They are built on the BeagleBone Black Rev. C board [7], which is characterized by sufficient processing power capabilities (1GHz with 512MB RAM), low power consumption and several communication ports (USB, UARTs, SPI, I2C, etc.) for interconnecting external hardware. Sea nodes feature several types of water quality sensors, such as Ammonium (NH4+), Nitrine (NO2-), Nitrate (NO2-), Temperature, Conductivity (Salinity), pH and Dissolved Oxygen (DO) as well as air quality sensors like air temperature & humidity, Nitric Dioxide (NO2), Sulfur Dioxide (SO2), Dust Sensor, Carbon Monoxide (CO), Ozone (O3) and Ammonia (NH3). The develop buoys feature several communication interfaces, consisting the overall testbed a versatile experimental platform.

Summary of EXTEND's domains and assets

IoT Device	Asset (physical phenomena, etc.)	Resource Type	Deployed devices
Sea Water quality monitoring and Air pollution characterization	Sea water parameters: Ammonium (NH4+), Nitrine (NO2-), Nitrate (NO3-), Temperature, Conductivity (Salinity), pH, Dissolved Oxygen (DO). Atmospheric parameters: Air temperature & humidity, Nitric Dioxide (NO2), Sulfur Dioxide (SO2), Dust Sensor, Carbon Monoxide (CO), Ozone (O3), Ammonia (NH3).	Fixed floating platform	1

Sea Water quality monitoring and Air pollution characterization	Sea water parameters: Ammonium (NH4+), Nitrine (NO2-), Nitrate (NO3-), Temperature, Conductivity (Salinity), pH, Dissolved Oxygen (DO). Atmospheric parameters: Air temperature & humidity, Nitric Dioxide (NO2), Sulfur Dioxide (SO2), Dust Sensor, Carbon Monoxide (CO), Ozone (O3), Ammonia (NH3).	Movable Buoys	4
Power Consumption Measurements	High precision power consumption measurements of the on-board wireless interfaces (WiFi, LTE, XBee, LoRa).	Fixed floating platform & Movable Buoys	5

FINE

FINE aims to design and develop a FIESTA-enabled heterogeneous testbed, significantly contributing to FIESTA-IoT vision. FINE will re-use the architecture, software and hardware components of RERUM, a successful IoT platform. The functional architecture of RERUM is based on the architectural reference model of IoT-A; however, it follows not only a service-oriented approach like IoT-A and most IERC projects, but also assumes that the devices have an important role into ensuring the security and privacy of the architecture. Moreover, RERUM adopts the concept of virtualisation, abstracting the real world objects into virtual objects, for concealing their heterogeneity. All devices are virtualised, and all functionalities related to service management, device discovery, federation formulation, etc., are supported by the RERUM Middleware (RMW).

At the lower layer, RERUM provides a set of functionalities for device registration, data fetching, service activation and de-activation, mainly provided by the RERUM Gateway (RGW). RGW has a southbound interface that communicates directly with the IoT devices, and a northbound virtual interface that binds to the RMW, and provides functionalities like device registration, deregistration, re-registration, measurement provision, etc. The IoT devices, namely the RERUM devices (RDs), are heterogeneous in nature, as they contain both resource-constrained devices (miniature sensors) and non-constrained ones (smartphones). The RERUM Device Adaptor (RDA) is the software API implemented in the RDs that provides the necessary abstractions in order to enable them for reporting various types of measurements to the RGW. Such measurements include ambient light and temperature, noise, humidity, as well as power consumption measurements related to RD's operation, and network statistics like the number of the corrupted UDP packets within a time period.

Summary of FINE's domains and assets

IoT Device	Asset (physical phenomena, etc.)	Resource Type	Deployed devices
Environmental monitoring	Ambient temperature, humidity	Fixed sensors	40
	Ambient light		10
	Noise		23
	PM10		18
	NOx, O3, SO2, VOC		5

	Atmospheric pressure, wind direction, wind speed, rainfall		3
Electricity consumption	AC current, AC voltage	Fixed sensors	2
Network monitoring	RSSI, LQI, corrupted/lost/correctly decoded packets in all layers (MAC, IP, TCP, IP), routing statistics	Fixed sensors	40
Device (sensor) energy consumption	CPU, LPM, Transmit, Listen operations	Fixed sensors	40
Device (sensor) operating information	Uptime, chip temperature, software version, input voltage	Fixed sensors	40
Outdoor parking	Differentiations of the magnetic field	Fixed sensors	6
Smart home management	Voice capturing, software for automatic speech recognition in the form of voice to text processing	Digital microphone array	2
		Actuators	2
		Servomotors	2

RealDC

Data centres (DCs) are currently consuming an average of 2% of electricity produced (based on U.S. consumption alone). Efforts to improve the efficiency of these facilities has yielded impressive results in the last 5 years but authoritative sources assert that better data is needed to continue further. We believe that IoT in DCs provides the best solution to monitor and improve DC efficiencies. A critical mass of DCs publishing their usage data is required to correlate and develop best practice solutions for energy savings. Different types of data centres have varying power and water consumption profiles. The current best practice of using PUE (Power Usage Efficiency) doesn't provide the full picture of DC performance.

In response to the above, the purpose of this proposal is to integrate a live Data Centre into the FIESTA-IoT ecosystem. This integration comes in the form of sensor data on power, cooling and ambient weather, which will be made available to experimenters and other data centre owners as open linked data set through the FIESTA-IoT facilities. We will leverage the technology and ontology developed by the FIESTA-IoT consortium. Where additional software is required to integrate our sensors, testbed and historical observations, this will be made available as open source software. Through targeted workshops and online training, we intend to grow a community of data centre operators and experimenters in the Higher Educational Institute, Telecoms and Manufacturing sectors who can use the data and tools for experimentation and operational support. Our view is that removing barriers to access our data will be for the benefit all.

Summary of RealDC's domains and assets

IoT Device	Asset (physical phenomena, etc.)	Resource Type	Deployed devices
Campus and DC Operations	Schneider Electric PowerLogic PM210 connected to Modbus infrastructure (real, apparent and reactive power, current and voltage data for all circuits)	Fixed Sensors	83
DC Operations	Rittal LCP-Plus SK 3301.480 Liquid Cooling Packages for 26 variable density cabinets	Fixed Sensors	16
Campus and DC Operations	Davis Vantage Vue Weather station data (Temperature, Wind, Humidity, Precipitation, Barometric Pressure)	Fixed Sensors	1
DC Operations	Power metering historical data about to July 2014 (real, apparent and reactive power, current and voltage data for all circuits)	Data set	1
DC Operations	Cooling and cabinet temperature data from LCPs back to July 2014	Data set	1
DC Operations	Historical weather data back to July 2014	Data set	1

Tera4Agri

The basic idea of the Tera4Agri extension is to introduce in the FIESTA-IoT platform the new smart agriculture domain. The testbed is located in Minervino Murge (BT – Apulia Region - Italy) in the Tormaresca - "Bocca di Lupo" estate: a farm which covers an area of about 500 hectares of which 350 are planted with vines and 85 with olive trees. The extension will be compliant with the FIESTA-IoT semantic models and interfaces. The original GIoE solution in the testbed is the Tera project whose object is to enhance the energy efficiency with related reduction of energy bills and it will be customized and increased in this call with new sensors in the meantime product quality, minimizing the chemical treatments in the production chain. The testbed will collect data by sensors that TERA will install in the estate for smart agriculture domain and will

give resources and observations for the FIESTA-IoT platform. Experimenters will be able to use and consume data and resource from Tera4Agri testbed.

Summary of Tera4Agri's domains and assets

IoT Device	Asset (physical phenomena, etc.)	Resource Type	Deployed devices
Environmental monitoring	Temperature Humidity Thermal flow Rain measurement Wind measurement Dew Point Sun light measurement	Fixed Sensor	tbd*
Soil monitoring	Humidity Temperature Water in the soil	Fixed Sensor	tbd*
Tree monitoring	Water on the leaves measurement	Fixed Sensor	tbd*

*to be defined, however not less than 10 deployed device per measurement in order to cover the whole estate area

4. Scope of the present Call

This Call solicits for experiments that design and deploy advanced (experimental) applications, notably applications that will leverage data and resources from multiple administratively and geographically dispersed IoT testbeds.

The scope of the Call is focused on **Novel IoT technologies and services**. FIESTA-IoT will provide the means for testbed agnostic access to experimental IoT datasets and data-streams, thereby open new horizons associated with the development of novel/niche IoT technologies and services in areas such as cloud and IoT integration, IoT and Big Data integration, large scale smart cities applications, ambient assisted living environments, management of emergencies and more. Therefore, FIESTA-IoT could allow cutting-edge researchers and innovative enterprises or individuals to develop, validate and test innovative technologies, applications and services, thereby improving their bottom lines. This will be particularly important for SMEs, which do not usually have the resources and equity capital for large scale experimentation.

The main added-value of the FIESTA-IoT platform is that it will provide the opportunity for accessing shared IoT resources, and for using them in the scope of experiments that will combine data from multiple testbeds. The FIESTA-IoT platform offers this interoperability among the datasets from the underlying testbeds employing semantic models and technologies. Experimenters should exploit the semantic and interoperable nature of the datasets and data-streams within their experiments.

A major innovation introduced by FIESTA-IoT relates to the dynamic discovery and use of IoT data from any of the underlying interoperable IoT testbeds.

Benefits for an experimenter to participate in this open call are:

- The EaaS infrastructure will facilitate experimenters/researchers to conduct large scale experiments that will leverage data, information and services from multiple heterogeneous IoT testbeds, thereby enabling a whole new range of innovative applications and experiments that are nowadays not possible.
- It will enable researchers to share and access IoT-related datasets in a seamless testbed agnostic manner i.e. similar to accessing a large scale distributed database. The objective will also involve linking of diverse IoT datasets, based on the linked sensor data concept. This allows the experimenter to focus on his core task of experimentation, instead of on practical aspects such as learning to work with different tools for each testbed, requesting accounts on each testbed separately, etc.;
- 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.

This call is split in two categories of experiments:

- ***Scientific excellence*** targeting experiments validating novel technologies around the IoT concept and its integration with Cloud and Big Data paradigms that clearly advance the current state-of-the-art.
- ***Innovation*** targeting experiments validating IoT-based solutions that have a large potential for commercial exploitation in existing or new products or services.

These experiments should be of a short duration (maximum 6 months). Per proposal a budget can be made available up to a maximum of 50 k€ per experiment.

Independent evaluations of the submitted proposals will be performed, in order to select the experiments that will be supported by the project. Different categories of experiments will be evaluated against different criteria (see section 11). It is required that the experiments are performed by a **single organization**. In the category 'Innovation', only proposals from enterprises, including unipersonal companies and individuals, that can use the experiment to gain competitive advantage for the products and/or services in its portfolio, will be accepted.

The working topics of the experiments can be in the four different domains of interest of FIESTA-IoT (i.e. Smart City, Smart Campus, Cellular Networks and Smart Office) but are not limited to these. The consortium welcomes proposals for experiments in other domains, leveraging on the data that originate from the project's testbeds.

Experiments can be inspired by the example showcases, currently being implemented and proposed by the FIESTA-IoT consortium:

- **Data Assembly and Services Portability Experiment:** The key feature of this experiment is to build an IoT application that relies on a Smart City Performance Indicator model, based on the information harvested from sensors. Through a set of indicators, the experiment aims at providing the tools to monitor the so-called "health" of a city". Moreover, this analysis can be split into three different dimensions:
    1. *Detail Level*: from general city indicators to specific ones, covering a single aspect of city management, e.g. environmental monitoring.
    2. *Space*: from indicators considering the complete city to indicators on the level of places, streets, even houses or rooms.
    3. *Time*: ranging from the latest values observed by sensors to the gathering of information that had been observed in the past (i.e. historical data).

  These indicators can be used for the visualization, trend analysis and triggering of notifications if a certain situation has occurred. The application will be designed in such a way that different types of sensor information relevant for different application areas can be used. Examples are the monitoring of environmental parameters like pollution, humidity, temperature, light and noise, but could also be: the parking situation in a city/area, water/irrigation levels in a park or agricultural setting, or the activity level in a certain area.

  The experiment aims at demonstrating that semantic interoperability across different IoT infrastructures can be achieved, leading to the huge simplification in what respects to the application development.
- **Dynamic Discovery of IoT resources for testbed agnostic data access:** This experiment addresses the assessment and further validation of the capacity to provide an agnostic and seamless access to different assets, provided and supported by potentially heterogeneous testbeds, through the usage of a single Experiment as a Service interface. Namely, the experiment will focus on the dynamic acquisition and processing

of information related to the weather/environmental domain (e.g. ambient temperature, air pressure, wind speed, UV, relative humidity, etc.), towards consolidating and visualizing data from multiple locations at the same time. Hence, the experimenter will be able to dynamically specify the locations/areas which data will be collected from, as well as to specify the range of physical phenomena that he/she might be interested in. As can be easily inferred, the specification of these areas/phenomena might lead to query data from one or more testbeds; however, the process of gathering all this information is completely seamless to external users.

- **Large Scale Crowd-sensing Experiments:** This experiment will setup and execute a range of crowd-sensing trials through the harvesting of data coming from citizens' handheld devices, following the "Living Lab" paradigm. This experiment will focus on the noise within the context of a large-scale environment. With this, experimenters will be able to identify and even predict noise variations (both spatially and temporally).
  The major goal of this experiment is to explore the ability of FIESTA-IoT platform to manage data coming from different sources either mobile or static. This experiment will specifically utilize data available in FIESTA-IoT platform that is made available to FIESTA-IoT via participatory sensing approach and static sensors available in the region of interest.
- **Predictive Traffic Condition Analytics:** The following experiment aims to check whether a traffic monitoring prediction system can be scalable enough through the utilization of commercially off-the-shelf tools. Its main goal is to have a Hadoop Distributed File System (HDFS)-based setup, which gathers real-time traffic sensor data. Whilst the data is being harvested, a set of machine-learning tasks are executed, detecting potential incremental changes (e.g. through Weka or PredictionIO, well-known data mining and machine learning frameworks). Based on these deltas, a set of machine-learning algorithms will predict the near-term future, e.g. future traffic congestions, emergency routes, etc. A separate process will periodically examine the entire dataset to devise future traffic patterns (e.g. through R). The overall objective of the experiment is therefore to discover if it is possible to have a functional framework, built upon commercially off-the-shelf tools that can perform predictive analysis in near real-time on a large dataset, populated via sensors in an "Internet of Things" scenario, like the city of Santander.
- **Environmental Noise Monitoring using Acoustic Data:** Europe is considered to have one of the most restrictive and extensive environmental laws in the world. The environmental policies in Europe seek to be as much environmental-friendly as possible, increasing their citizens' quality of life as much as possible while leading the fight against the upcoming environmental challenges. This experiment, which runs over the IoT facilities providing noise monitoring information, aims to create a real-time noise monitoring map using acoustic data which can even substitute expensive off-the-shelf offline noise map techniques. The acoustic data as it is, is not sufficient to give a precise noise map, because there is coarse spatial sampling of the urban environment by acoustic/noise sensors, which prevents their combination and visualization in a suitable form. It requires post-processing of the sensor data to improve and get appropriate data. However, the measurements are highly dependent on several factors:
  1. Location and proximity to noise sources.
  2. Malfunctioning sensors.
  3. Sensor calibration to a common reference.

4. Sensor dynamic range (which is slightly variable among them while gathering data but all of them are able to measure between 50 and 100 dBA).

Using data gathered form acoustic sensors that fulfil the aforementioned factors, a regression analysis can be performed, thus calculate the second order polynomial function to all the data measurements. The representation of the noise map in real time can be done using a straightforward web interface.

5. Inclusion into the consortium

Once a proposer is selected to perform the proposed Experiment, 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.

Besides the Final Report, intermediate milestones will be fixed in order to be able to follow the progress and establish a continuous feedback channel with the FIESTA-IoT project. These milestones might have the form of questionnaires to be filled by the experimenters or brief intermediate progress assessment reports.

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. 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.

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 on the planned experiment (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 or a comparison to competing commercial solutions in case of experiments of category ‘Innovation’ to show the innovative character of the experiment and the expected scientific or business impact.
Section C	Requested FIESTA-IoT testbeds, resources and/or datasets or data-streams (target length 1 page) The information in this section needs to be collected in collaboration with the FIESTA-IoT Consortium. For this section a specific format needs to be used, which is included in the proposal template
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 experiment.
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 experiment. 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 experiment and testbed integration

FIESTA-IoT will establish and operate the Ecosystem Desk; this is a help desk providing first point of contact support for users of the FIESTA-IoT facility. The desk consists of two roles: i) a research desk to help experimental researchers with problems and information to get started, ii) a Global Market confidence desk to support SME stakeholders.

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 k€.
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 experiment.
4. Recipient of 3rd party funding for experiments will need to submit a report at the end of the experiment (for this call this will be at the latest end of February 2018, under the assumption that the experiment starts at the latest on 1st September 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 3 a review meeting with the EC might be planned for Early 2018. The exact date will be fixed during the experiment execution. The location of the review meeting is to be decided. At the review meeting the results of the experiment needs to be presented, preferably through a real-life. 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 experiment.

A specific template needs to be used and will include:

Part A. Summary

Part B. Detailed description

This section describes the details on the experiment. It includes:

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

Please note that for experiments, Impact should focus on scientific impact for experiments of the category 'Scientific Excellence' and business impact for experiments of the category 'Innovation'.

Part C. Feedback to FIESTA-IoT

This section contains valuable information for the FIESTA-IoT consortium and describes the recipient's experiences while performing the experiment. 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 / executing the experiment 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 experimenter, 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.

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 experiment.

11. Criteria for evaluation of Experiments

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

Selection will mainly be based upon the following criteria:

Specific criteria:

- Experiments, category 'Scientific Excellence':

  1. Scientific innovation: the degree of scientific innovation of the proposed experiment (cf. Section B of the proposal template)

     The score given here should reflect the degree of innovation: if an experiment is pushing the boundaries of its domain, then it should get a higher score than experiments testing trivial things. In order to demonstrate this criterion, the proposers are expected to clearly motivate their experiments and indicate the State of the Art in the appropriate field.

  2. Scientific relevance: potential for take-up of the results by the broader scientific community (cf. Section B of the proposal template)

     The proposed experiment should be sufficiently relevant form a scientific point of view to be taken up by the broader scientific community. The score given should reflect the extent to which the broader scientific community can benefit from the solution proposed in the experiment.

  3. Publication potential: Prospective dissemination of the results in relevant international conference and journals (cf. Section B of the proposal template)

     The expected results of the experiment should have potential for publication in high-impact scientific journals and/or for presentation/demonstration of the results on major scientific conferences. The proposer is expected to identify publication/presentation/ demonstration opportunities positively assessing joint publications with FIESTA-IoT consortium partners.

- Experiments, category 'Innovation':

  1. Industrial innovation: the degree of industrial innovation of the proposed experiment (cf. Section B of the proposal template)

     The score given here should reflect the degree of innovation: there should be an indication to which extent the proposed experiment provides a novel and innovative service compared to existing and/or competing commercial applications of IoT-based products and/or services. In order to demonstrate this criterion, the proposers are expected to clearly motivate their experiment and compare their proposed solutions with existing solutions in the appropriate field.

  2. Industrial relevance: potential for exploiting the results of the experiment in commercial IoT solutions (Cf. Section B of the Proposal Template).

     This score should reflect the industrial relevance including the expected and projected impact on the company through product development. For example, linked with application to H2020 SME Instrument or similar financing schemes.

3. Impact potential: Prospective dissemination and uptake of the results in relevant fairs and field trials (cf. Section B of the proposal template).

   The expected results of the experiment should have potential for demonstration of the results on relevant events (exhibitions, congresses, technical seminars, networking events, user group events, etc.) as well as mobilize final end-users in relevant Field Trials. The proposer is expected to identify relevant demonstration and field trialling opportunities.

General criteria (applicable to both categories of Experiments)

4. Clarity and methodology (Cf. Section B of the Proposal Template)

   The experiment should be scientifically and/or technically sound. There should be a clear problem statement, a solid experiment design, a good methodology, etc.

5. Feasibility (Cf. Sections C and D of the Proposal Template)

   Experiments with low chances for success or requiring excessive support from the FIESTA-IoT partners will get a lower score.

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

   The proposer should exhibit prior research/development experience and the necessary qualifications to perform the experiment

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

   The FIESTA-IoT consortium is seeking feedback regarding the FIESTA-IoT platform and the benefits of providing interoperability among different testbeds. Proposals that can actually get full benefit of the FIESTA-IoT testbeds' federation and provide valuable feedback on the exploitation of the semantic approach leveraged by the FIESTA-IoT platform will be provided, will get a higher score.

8. 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 7 will be weighted higher.

12. Timing of the evaluation and experiments

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 17th July 2017. Experiments can start at the earliest on 15th of August 2017, but no later than 1st September 2017. The deadline for the final report is expected 6 months after the start of the experiment, and no later than the 15th of February 2017. The final evaluation of the experiments will happen at a review meeting with the EC. The exact date and location will be fixed at the start of the experiments.

13. Submission

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

The proposal must be:

1. Submitted on-line through: http://fiesta-iot.eu/index.php/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 3

Third FIESTA-IoT Competitive Call for Experiments

Full title of your proposal

Acronym of your proposal (optional)

Call / category (for Experiments only) / Identifier	Experiments / Scientific Excellence or Innovation / FIESTA-IoT-OC3-EXP-EXC or FIESTA-IoT-OC3-EXP-INN
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/index.php/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 experiment: 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 or a comparison to competing commercial applications and services in case of experiments of category 'Innovation' to show the innovative character of the experiment, and the expected scientific or business impact.

B.1 Concept and objectives

Describe the specific objectives of the proposed experiment, which should be clear, measurable, realistic and achievable within the duration of the experiment (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 is needed for realizing them. Describe and explain the overall concept that forms the basis for your experiment. Describe the main ideas, models or assumptions involved.

B.2 Impact

Show that the proposed experiment 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 experiment.

For experiments of category ''Scientific Excellence": *Describe how this experiment fits in your internal research roadmap, and to which extent the broader research community can benefit from the results of the experiment.*

For experiments of category ''Innovation"*: Describe how this experiment fits in your activities, and how this experiment may strengthen the competitiveness of your business and the growth of your company. Having close contacts with possible end-users during this experimental phase might be used to illustrate the business impact of the experiment.*

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

For experiments of category ''Scientific Excellence"*: Describe the advances the proposed experiment would provide beyond the state-of-the-art, and the extent the experiment is ambitious. Is this experiment expected to lead to ground-breaking results or rather incremental results compared to existing work?*

For experiments of category ''Innovation"*: Describe in detail how the proposed solution compares with existing solutions in the field covered by the experiment. Are there similar experiments, products, services, etc. on the market? Is this experiment incremental to existing work?*

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:

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

Section C Requested FIESTA-IoT testbeds, resources and/or datasets or data-streams

(target length 1 page - fill the tables below)

***For experimenters**: Please visit the following websites to get details on the specific testbeds, datasets and data-streams, and services available*

- *http://fiesta-iot.eu/index.php/fiesta-testbeds/*
- *http://fiesta-iot.eu/index.php/fiesta-experiments/*

TESTBEDS	**Required (Yes/No)**
SmartSantander	
SmartICS	
KETI	
SoundCity	
ADREAM	
NITOS	
EXTEND	
FINE	
RealDC	
Tera4Agri	

DATASET / DATA-STREAM	**HISTORICAL or CURRENT VALUE**	**FREQUENCY**
Identify the phenomena your are interested in. (One per row)	*Do you require access to bunch of values in a given time or just access to the*	*How often will you require data from FIESTA-IoT?*

	value at the moment of the request?	
Identify the phenomena your are interested in. (One per row)	*Do you require access to bunch of values in a given time or just access to the value at the moment of the request?*	*How often will you require data from FIESTA-IoT?*
Identify the phenomena your are interested in. (One per row)	*Do you require access to bunch of values in a given time or just access to the value at the moment of the request?*	*How often will you require data from FIESTA-IoT?*
…	…	…

SERVICE / TOOL	**Required (Yes / No)**
Experiment management tool	
SPARQL endpoint (resources and observations)	
Resource browser	
REST access to datasets	
Subscription-based access to data-streams	

Section D Compliance check

The Open Call proposer needs to answer the scorecards 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.

If your proposal is for the FIESTA IoT OC3 EXP EXC or FIESTA IoT OC3 EXP INN Categories (i.e. experiment), the questionnaires from the group "Scorecard for Experiments" must be answered. The proposer may delete the tables that do not apply to the proposal (actually the complete sub-section might be removed).

Each scorecard is divided into several questionnaires. The Scorecard for Experiments is divided into 2. 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.

1. Scorecards for Experiments feedback

This set of 5 tables need to be filled in case the proposal is for the Open Call for experiments

Experiment Feasibility questionnaire

Name	**Feedback**
Q1 - Does FIESTA-IoT currently provide all sensor data types need for the experiment?	

Q2 - Does the experiment need data from specific locations not currently covered in FIESTA-IoT?	
Q3 - Does the experiment needs to filter the data during discovery/retrieve? Using which criteria?	
Q4 - Does the experiment need external data to accomplish the goal?	
Q5 - How will the experiment consume data?	
Q6 - Does the experiment require third party tools?	
Overall feedback	

Experiment Feedback questionnaire

Name	**Feedback**
Q1 - What tools do you need among the ones provided by FIESTA-IoT?	
Q2 - How many FIESTA-IoT testbeds do you need to accomplish the experiment?	
Q3 - To what extend will the experiment use semantic data?	
Q4 - Will the experiment generate new knowledge from the requested data and provide it back to FIESTA-IoT knowledge base?	
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 experiment.

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 experiment. 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 can be provided to support the requested funding and which may help to judge the cost to the FIESTA-IoT project.

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 for industrial experiments which is 50.000€.

The maximum funding which is allowed in this call is set at 50 000 € for an experiment of the category 'Scientific excellence' and 50 000 € for an experiment of the category 'Innovation'.

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, B, 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 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, B, 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 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. Experiment contract template