Grant Agreement No. 767498

Innovation Action Project

H2020-FOF-12-2017

MIDIH Second Open Call

Data driven applications and experiments in CPS/IoT

(Call for Experiments, Guidelines and Rules for Participation)

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1 Introduction

MIDIH is funded under the European Commission's Horizon 2020 Framework Programme for Research and Innovation through the Factories of the Future Call for Proposals (addressing the Topic "ICT Innovation for Manufacturing SMEs (I4MS)" (topic identifier: H2020-FOF-12-2017) and is part of the phase 3 of the I4MS (ICT Innovation for Manufacturing SMEs) – www.i4ms.eu – initiative.

MIDIH "Manufacturing Industry Digital Innovation Hubs" will be jointly working as a "one stop shop" of services, providing industry with access to the most advanced digital solutions, the most advanced industrial experiments, pools of human and industrial competencies and access to "ICT for Manufacturing" market and financial opportunities.

MIDIH Call-2 targets the development of data driven applications, preferably by IT SMEs as technology providers, and experiments in CPS/IoT, preferably by Manufacturing SMEs.

The open call aims at complementing functionalities around MIDIH reference architecture and performing experiments in CPS/IOT based on the components provided by the architecture. The experiments must cover one of the three main scenarios: Smart Factory or Smart Product or Smart Supplychain.

Inside the MIDIHs ecosystem there are **9 Competence Centres**, each specialised in peculiar aspects of the CPPS/IIOT technologies and able to mentor IT SMEs, as technology providers, and manufacturing SMEs towards Industry 4.0 projects and cross-border experiments and business.

CC1) CPS/IOT Networks / M2M Communication Germany at **Fraunhofer FOKUS**
CC2) CPS/IOT Trust Management and Cybersecurity in France at **Institute Mines-Telecom**
CC3) CPS/IOT Modelling, Simulation and Digital Twin in Germany at **Fortiss**
CC4) CPS/IOT Real Time Stream Data Analytics in Finland at **VTT Technical Research Center**
CC5) CPS/IoT in Smart production systems and services in Slovakia at **Technical University of Kosice TUKE**
CC6) Cloud Industrial Analytics Architectures and Tools in Italy at **CEFRIEL**
CC7) CPS based distributed edge-fog computing architectures in Sweden at **Lulea University of Technology** LTU
CC8) CPS/IOT Data Sovereignty solutions in Germany at **Fraunhofer IML**
CC9) CPS/IOT HPC-based Cloud Manufacturing in Poland at **PSNC (Poznan Supercomputing and Networking Centre)**

2 Open Call Objectives

2.1 Technological topics

Addressing the technologies around the MIDIH architecture

T1. Modeling and Simulation innovative HPC/Cloud applications for highly personalised Smart Products, Smart Factory and Smart Supply Chain

The MIDIH reference architecture defines reference functions and reference implementations for innovative applications acquiring and processing data from the Product Lifecycle, from its design to its operations to its end of life. Modelling and Simulating complex one-of-a-kind products in the different configurations (e.g. as-designed. as-manufactured, as-maintained, as-recycled or re-manufactured) requires the availability of huge and sophisticated computational IT resources, that just modern Cloud-HPC datacenters could offer.

The **T1** topic looks for product-oriented industrial modelling & simulation IT experiments, which are using the MIDIH "Data in Motion" and "Data at Rest" architectures and reference implementations and the MIDIH Data Infrastructures. Candidates are required to provide advanced algorithms / applications based on the MIDIH architecture and to provide the correspondent datasets to be experimented in MIDIH HPC/Clouds

T2. Smart Factory and Smart Product Digital Twin models alignment and validation via edge clouds distributed architectures

Edge / Fog computing reference architectures and distributed local clouds frameworks aim at inserting a new computational layer between the Real World and the Cloud. Smart factory Digital Twins are digital representations of a real-world artefact in a production site (a machine, a robot, or even the whole production line). Traditionally such models run on the cloud but when real-time (or near real time) performance is required, they can be moved and deployed on a reduced scale closer to the real world. Security and real-time capabilities are strong requirements in such a context.

The **T2** topic looks for factory-oriented Digital Twin IT experiments, which are using the MIDIH "edge / fog" computing architecture and reference implementations and the MIDIH Didactic Factories in Milano and Bilbao. Candidates are required to provide advanced Factory digital models and will have the opportunity to deploy them onto the MIDIH edge/fog framework available in our two Teaching factories.

T3. Advanced applications of AR / VR Technologies for Remote Training / Maintenance Operations (Smart Product and Smart Factory)

Virtual and Augmented reality applications are suitable to enhance both Smart Factory and Smart Product scenarios. In a Smart Factory scenario, production systems, machineries, robots, warehouses, AGVs need to be properly virtualised, while in a Smart Product scenario, virtual models are needed for complex products such as airplanes, vessels, trucks. Typical applications are concerned with remote training, virtual design and commissioning, maintenance operations involving both engineers, workers and even citizens.

The **T3** topic looks for product-oriented or factory-oriented virtual / augmented reality IT experiments, which are using the MIDIH "Data in Motion" and "Data at Rest" architectures and reference implementations and the MIDIH Training Facilities. Candidates are required to provide advanced VR/AR applications based on the MIDIH architecture and will have the opportunity to experiment such systems in one of our two Teaching Factories in Milano and Bilbao

T4. **Machine Learning and Artificial Intelligence advanced applications in Smart Product, Smart Factory and Smart Supply Chains management and optimisation**

According to EC Digitising EU Industry communication and subsequent working groups (especially the WG 2 about Digital Platforms for Manufacturing), Industrial IoT, Industrial Analytics and Artificial Intelligence are the three major pillars for Industry 4.0 Digital Transformation. MIDIH is focussing on providing Open Source "Data in Motion" and "Data at Rest" reference implementations as development (API and SDK) platforms for innovative applications. The MIDIH scenarios are suitable for advanced ML /AI distributed applications due to its inherent heterogeneity of models, ontologies, systems which makes it very difficult for a mere statistical Data Analytics solution to meet its requirement.

The **T4** topic looks for ML/AI applications on multi-stakeholders' owned heterogeneous datasets justifying Data Sovereignty and Smart Contracts requirements. Optionally, MIDIH could also provide candidates with the needed IoT-Cloud Infrastructure (SIEMENS MINDSPHERE based) in order for them to join the MINDAPPS Business Ecosystem

2.2 Experimentation topics

The experiments must cover one of the three main scenarios:

- **Smart Factory OR**
- **Smart Product OR**
- **Smart Supply chain**

The usage of components of the reference architecture is mandatory.

E1. Integrating Additive Manufacturing into legacy production system for experiments with CPS / IOT production technologies.

Additive Manufacturing includes different technologies for products manufacturing through the addition of layers of materials (polymer, metals, composites or ceramics) to obtain complex shapes, functional or semi functional prototypes from data models (typically CAD).

The **E1** topic looks for CPS/IOT data-driven experiments to explore the design challenges and opportunities of additive manufacturing combined with legacy production systems in the following aspects: products customization, rapid manufacturing, design concepts, assembly strategies, combinations of components, cybersecurity etc. Experiments must use the MIDIH reference architectures and reference implementations and the MIDIH Data Infrastructures.

In alignment with AMABLE, the I4MS project which facilitates digital design and solution for secure data chain in additive manufacturing, experiments results will be shared publicly in dissemination events and through the I4MS tools.

E2. Integrating CPS / IOT technologies to bridge factory automation and robotics

Robots are used in manufacturing to execute mainly these types of operations: material handling (pick up and place, movements), processing operations (tool manipulation, welding), assembly and inspection. Current challenges for robotics in manufacturing are related to efficiency, human-robot collaboration, and cognitive operations.

The **E2** topic looks for CPS/IOT data-driven experiments for sensor data collection, data analytics, and machine learning for the implementation of factory automation technologies supported by robotics which must use MIDIH reference architectures and reference implementations and the MIDIH Data Infrastructures.

Candidates are required to provide experiments based on the MIDIH architecture and to provide the correspondent datasets to be experimented in MIDIH HPC/Clouds.

In alignment with Horse, the I4MS project which proposes a flexible model of smart factory involving collaboration of humans, robots, AGV's (Autonomous Guided Vehicles) and machinery in the manufacturing environment, experiments results will be shared publicly in dissemination events and through the I4MS tools.

E3. Integrating CPS / IOT discrete production technologies in Process Industry

The manufacturing industry can essentially be classified into two main categories: process industry and discrete product manufacturing. The process industry transforms material resources into a new material with different physical and chemical properties. This material is then usually shaped by discrete manufacturing into an end user product or intermediate component.

The **E3** topic looks for CPS/IOT data-driven experiments involving all actors along the full value chain – from different types of raw material suppliers, through industrial transformation into intermediate products and applications, with the goal of reducing the environmental footprint and increase industrial efficiency. The experiments must use MIDIH reference architecture and reference implementations and the MIDIH Data Infrastructures.

Candidates are required to provide experiments based on the MIDIH architecture and to provide the correspondent datasets to be experimented in MIDIH HPC/Clouds.

In alignment with SPIRE, the EU Public-Private Partnership dedicated to innovation in resource and energy efficiency enabled by the process industries, experiments results will be shared publicly in dissemination events and through the SPIRE tools.

E4. Integrating CPS / IOT factory logistics technologies in internal/external logistic scenario

CPS/IoT play a fundamental role in the factory internal and external logistics: innovative IT applications need to be developed specifically for planning, scheduling and monitoring raw materials and finite products inside the production system.

The **E4** topic looks for CPS/IOT data-driven experiments involving the integration of the different actors and stakeholders of the supply chain that will guarantee a total coordination and alignment between all the value chain phases. The experiments must use MIDIH reference architecture and reference implementations and the MIDIH Data Infrastructures.

Candidates are required to provide experiments based on the MIDIH architecture and to provide the correspondent datasets to be experimented in MIDIH HPC/Clouds.

In alignment with L4MS, the I4MS project that will develop deployment of small and flexible logistics solutions to make logistics automation extremely attractive for manufacturing SMEs, experiments results will be shared publicly in dissemination events and through the I4MS tools.

3 Open Call Information

Call for Proposals for Data driven applications and experiments in CPS/IOT

Project Acronym: MIDIH

Project full name: Manufacturing Industry Digital Innovation Hubs

Grant agreement number: 767498

Call Identifier: MIDIH OC2

Call title: MIDIH second Open call: Data driven applications and experiments in CPS/IOT

Publication Date: 6th May 2019

Deadline: 6th August 2019**,** at 17:00 Brussels local time

Expected duration: 6 Months

Total budget: € 960,000

Maximum funding request per proposal: € 60,000

Project web address: http://www.midih.eu

Proposal full call information: https://midih.eu/opencall_2.php

Submission site: https://midih.ems-innovalia.org/

A contact tool is available inside the submission site.

Mail: midih_opencall@innovalia.org

4 MIDIH Open Call Requirements

4.1 Eligibility criteria

1. Applicants must be legal entities established in countries eligible for participation in EC H2020 projects, as indicated in the following documents:
   https://ec.europa.eu/research/participants/data/ref/h2020/other/wp/2018-2020/annexes/h2020-wp1820-annex-a-countries-rules_en.pdf
   http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/3cpart/h2020-hi-list-ac_en.pdf
2. Each proposal must be submitted by a single applicant, consortia are not allowed
3. The proposal must be submitted in English
4. Applicants can be selected only for funding for one proposal (even if the proposer submitted multiple proposals that are ranked high enough to be selected for funding).
5. Applicants shall not have any potential conflict of interest with the selection process and during the implementation of the project. All cases of potential conflict of interest will be assessed case by case.
6. Funding will not be awarded to applicants that have already received more than 100,000 Euro via open calls "Financial Support for Third Parties" (FSTP) from H2020 I4MS and SAE projects
7. Winners of MIDIH Open Call 1 are not eligible to participate again.
8. MIDIH consortium members cannot apply to this call

4.2 KPIs

Applicants must clearly indicate in their proposal the results they intend to achieve and how to measure them providing a set of measurable Key Performance Indicators (KPIs) to be validated during the contract negotiation phase. This is a **mandatory** requirement for any proposal.

5 Submission of proposals

5.1 General information

Submission deadline: All submissions must be made by 17:00 Brussels local time, 6th August 2019.

Electronic submission: Proposal submission is exclusively in electronic form using the proposal submission tool accessible via the MIDIH open call web-site: https://midih.ems-innovalia.org/

The central component of proposal submission is the uploading of a PDF-document (whose size must not exceed 5.0 MB) compliant with the instructions on the proposal structure given below.

Proposal format and structure: Proposals must be submitted in English. The main section of the proposal must not exceed 10 pages in length (with text no smaller than 11 point Arial font). Thus, with the inclusion of the cover page and administrative pages (discussed below), the maximum page count is 13 pages. **Proposals will be truncated to this page count and the independent expert evaluators will only be provided with the truncated version.**

The structure of the proposal (and indicative length per section) should be as follows:

1. Summary (0.5 pages)
2. Industrial relevance, potential impact and exploitation plans (3.5 pages)

3. Description of the work plan and concept (3 pages)
4. Quality of the consortium as a whole and of the individual proposers (2 pages)
5. Justification of costs and resources (1 page)

As indicated above, the overall length of the above 5 sections must not exceed 10 pages.

In addition to the 10-page proposal description, a cover page and 2 pages of administrative data for statistics analysis, including, when available, the Participant Identification Code (PIC) issued by the European Commission (http://ec.europa.eu/research/participants/portal/desktop/en/organisations/register.html).

5.2 Submission process

Proposals must be submitted electronically in PDF format ONLY at https://midih.ems-innovalia.org/

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

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

5.3 Acknowledgement of receipt

As soon as possible after the close of call, an Acknowledgment of receipt will be emailed to you by MIDIH. The sending of an Acknowledgement of receipt does not imply that your proposal has been accepted as eligible for evaluation.

6 Indicative budget for MIDIH OC2:

MIDIH will make use of the H2020 Cascade Funding method to support the winners of the open calls. The funding budget for Third Parties for MIDIH OC1 is 960,000€

The funding of Third Parties must follow the same principles as used for existing project beneficiaries of MIDIH, which receives European Commission funding as an “Innovation Action”. Thus, Third Parties will receive 70% funding of eligible costs arising (except for non-profit organisations which receive 100% funding).

The funding for an individual proposal may not exceed 60,000 €. Proposers should consider their actual needs and not target this upper limit mandatorily. The evaluation will take into account the appropriateness of the requested resources.

7 Evaluation Criteria

The evaluation criteria and the scoring scale used are very well aligned with H2020 Programme, but enhanced to favour the integration of CPS/IoT technology, aimed by objective FoF-12-2017. The ranking of selected projects will be created assessing:

1. Soundness of service concept (weight 2);
2. Innovation potential (weight 2)
3. Impact including industrial relevance and business strategy (weight 3)
4. Quality of workplan and resource deployment (weight 1)

Thus, the market impact will have a slightly higher relevance than the Innovation Technical Excellence of the service, while the use of resources and the implementation will have a lesser impact in the final remark.

Each criterion will carry a score ranging from 0 to 5 as usual for H2020:

- 0: The proposal fails to address the criterion under examination or cannot be judged due to missing or incomplete information
- 1 (Poor): The criterion is addressed in an inadequate manner, or there are serious inherent weaknesses
- 2 (Fair): While the proposal broadly addresses the criterion, there are significant weaknesses;
- 3 Good The proposal addresses the criterion well, although improvements would be necessary
- 4 (Very good): The proposal addresses the criterion very well, although certain improvements are still possible
- 5 (Excellent): The proposal successfully addresses all relevant aspects of the criterion in question.

There will be a threshold score of 3 for all criteria.

Funding is then awarded to most highly ranked proposals as long as there is available budget. MIDIH financial support will be granted to projects up to the limits indicated below, on the condition that the service reaches the excellence level requested and till the budget available for each phase is exhausted. If the call budget is not exhausted, the remainder will be diverted to the second call.

The priority order for proposals with the same score is handled as follows:

These proposals will be prioritised according to the scores they have been awarded for the criterion impact.

- If these scores are also equal, priority will be based on scores for excellence.

- If these scores are also equal, priority will be based on scores for the criterion implementation of the workplan with a final reference to the use of resources.

All proposers (successful and unsuccessful) are contacted with the results of their evaluation.

8 Relationship with MIDIH consortium and funding scheme

8.1 Administrative Duties

Selected organizations will become a Third Party of the consortium using Cascade Funding (also known as sub-granting). In the remainder of this document a 'Third Party using Cascade Funding' is referred to as Subgrantee.

Contracts with the Subgrantee will be done by MIDIH's coordinator, EIT Digital IVZW.
Any legally binding commitment from the side of EIT Digital IVZW shall be subject to the entering into a written contractual agreement between EIT Digital IVZW and the Subgrantee

The administrative tasks for the Subgrantee, including cost and activity reporting obligations and related documents will be provided during the negotiation and contracting phase.
The Subgrantee will be requested to submit, at M2, a "Midterm Report" and, at the end of the project, a "Final Report" consisting of:

- Detailed description of the experiment and the MIDIH based solution
- Progress of the experiments
- Technical results including KPI
- Dissemination and exploitation activities
- Cost statement

Besides these two mandatory reports, Subgrantee are free to define and issue other deliverables or documents to present the results of the project.

Subgrantee will be requested to participate to a Kick-off Meeting (KOM) at the beginning of the project (within M1) and to the final demo event at the end of the project, both organized by the MIDIH consortium.

Eligible costs consist of

- Activities
- Personnel Costs
- Equipment Costs
- Travel expenses
- Software licenses
- Indirect cost (25% of direct costs)

Subgrantees have to comply with the rules and the principles mentioned in Section I, Article 6 (Eligible and ineligible costs) of the H2020 AMGA – 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 of the MIDIH project. The rules concerning eligibility of costs, identification of direct and indirect costs and upper funding limits can be found in Section I, Article 22 of the H2020 AMGA. Following other articles of the AMGA apply: 23, 35, 26, 38 and 46.

8.2 Funding scheme

The following payment scheme will apply:

- 30% negotiated contribution upfront, upon contract signature,
- 30% at the end of the project, once the third party has produced all the relevant documentation specified in the contract, including cost statements, deliverables, milestones, etc. and the contractor (EIT Digital), after discussion with the consortium, has accepted them
- 40% final installation upon approval of the experiment outcomes by the Commission

8.3 Intellectual property rights

The IP of the experiment's results generated by the Subgrantee will be owned by it.

Subgrantees grant the MIDIH consortium partners access to the results, for the pursuance of the objectives of the Project and the exploitation of the Project results in accordance with the GA. Details will be defined during the negotiation phase.

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

9 Support to Experimenters

9.1 Call Helpdesk

For further information on the call, contact: midih_opencall@innovalia.org ;

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

9.2 Useful Documents

- MIDIH Open Call document (this document)
- MIDIH Architecture details

Please refer to https://midih.eu/opencalls.php# for the complete documentation.