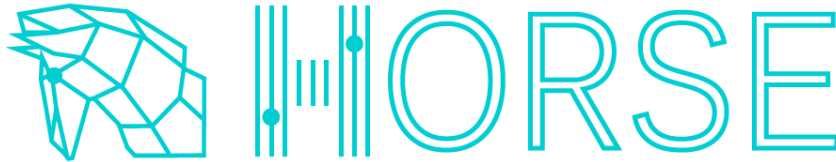


# H2020 – FOF – 09 – 2015

## Innovation Action



Smart integrated immersive and symbiotic human-robot collaboration system controlled by Internet of Things based dynamic manufacturing processes with emphasis on worker safety



*This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 680734*

### D6.1 Call preparation documents: Guide for Applicants, Model Contract, Proposal Template, Call text, and publication plan for the call

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### Abbreviations

CC	Competence Centre
MPMS	Manufacturing Process Management Software
AGV	Automatic Guided Vehicle

## **Executive Summary**

Project HORSE, co-funded from the European Union's Horizon 2020 research and innovation programme under agreement No 680734, foresees as an eligible activity the provision of financial support to third parties, as means to achieve its own objectives.

HORSE aims to bring a leap forward in the manufacturing industry proposing a new flexible model of smart factory involving collaboration of humans, robots, AGV's and machinery to realize industrial tasks in an efficient manner. The main strategy builds on existing technology and research results in robotics and smart factories and integrates them in a coherent and flexible software framework.

The HORSE framework is driven by and validated with end-users - manufacturing companies- in two steps: in the first, the framework was jointly developed together with the selected end-users (Pilot Experiments); in the second, its suitability and transferability to further applications will be validated with new end-users recruited via this Open Call.

This document presents the preparation phase of the open call – the predicted timeline, the electronic tools used in the submission process as well as the open call documents distributed to the applicants.

# 1 Introduction

The goal of this document is to give an overview of the timeline, the content and the intention behind the HORSE open call for experiments. It also provides a short overview of the electronic tools used to manage the call, the guidelines, templates and supporting documents provided to the applicants.

HORSE aims to bring a leap forward in the manufacturing industry proposing a new flexible model of smart factory involving collaboration of humans, robots, AGV's and machinery to realize industrial tasks in an efficient manner. The main strategy builds on existing technology and research results in robotics and smart factories and integrates them in a coherent and flexible software framework.

The main goal of the open call is to involve new end-users in the process of development and validation of the HORSE framework in real industrial settings. The experiments are expected to validate, extend and refine the framework as well as to maximize the impact of HORSE on the European manufacturing sector. This will be achieved by demonstrating the reusability/generalisability of the use cases to be proposed and by detailing the impact in the specific industry.

Section 2 of this document presents how the scope of the open call was shaped, whereas Section 3 gives an overview of the expected timeline of the call and the evaluation process that will follow it as well as an overview of the software tools used in the open call – the software platform and the ticketing system. The outlook for the next actions is given in section 4.

The report also contains the open call documents that were presented to the potential applicants:

- Appendix A: Annex I – information published on portal of the European Commission
- Appendix B: Call text
- Appendix C: Guide for applicants
- Appendix D: Proposal template
- Appendix E: Funding agreement template
- Appendix F: Supporting document presenting information about the HORSE framework.

## 2 Shaping the call

The HORSE framework is driven by and validated with end-users - manufacturing companies- in two steps: in the first, the framework was jointly developed together with the selected end-users (Pilot Experiments); in the second, its suitability and transferability to further applications will be validated with new end-users recruited via this Open Call.

The exact scope of the call was established by the consortium partners in an iterative process of revisions. The main purpose of the call is to validate the framework in an industrial setting, to transfer it to different domains and to extend it with additional software and hardware components relevant to the end users. Therefore, three main foci of the experiments were defined:

- The horizontal integration of the framework – the scope of the experiment is to integrate a wide range of processes and work cells using the HORSE framework using mostly the already available components. The goal is to provide coordination between many workstation using the MPMS
- The vertical extension of the framework (software) – the scope of the experiment is to develop and integrate new software components adding functionalities relevant to the end-users. The experiments do not need to include many work cells and should focus on providing additional features. If development of new components is needed full compatibility with the framework needs to be ensured. Development of components from the following areas (but not limited to them) is especially welcome:
  - Quality inspection (e.g. using machine vision)
  - Situation awareness and prediction for human safety (e.g. multi-sensor human tracking systems)
  - Programming by demonstration
  - Robot control algorithms (e.g. force-feedback for working with delicate surfaces)
- The vertical extension of the framework (hardware) – the scope of the experiment is to integrate new hardware components relevant to the end-users with the framework. The experiments do not need to include many work cells and should focus on interfaces and control of the hardware. There are no requirements regarding the hardware elements used in the experiments. However, it is strongly encouraged to provide support to robots and machinery not integrated in the framework yet such as (but not limited to):
  - Safety components (e.g. SafetyEYE, SAPARO floor etc.)
  - AGVs
  - Haptic teleoperation interfaces and other novel human-robot interfaces.

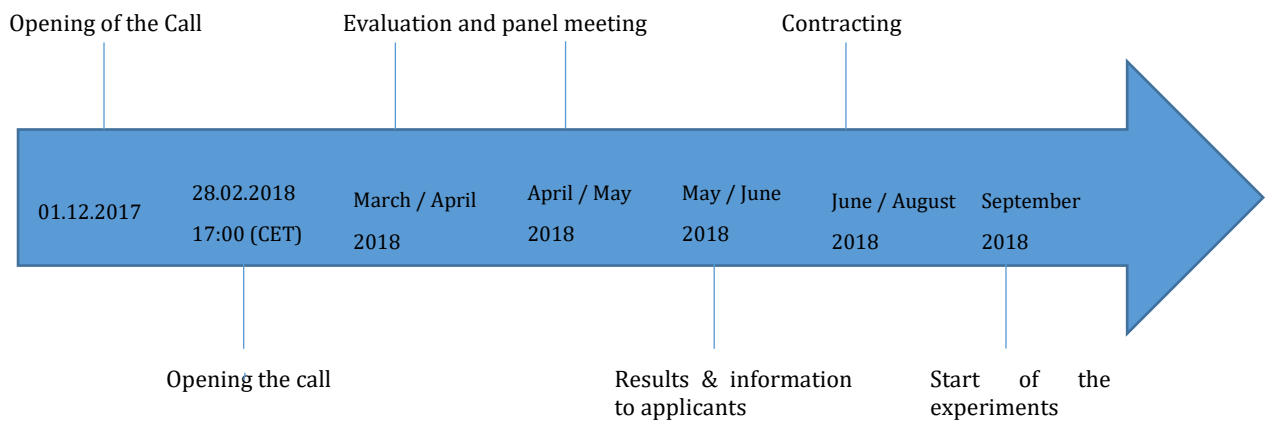


### 3 Timeline, electronic tools and documents

The timeline and workflow of HORSE to manage the Open Call have been set up in compliance with the requirements summarized in the best practice guidelines of the European Commission.

#### 3.1 Timeline

The call of HORSE was opened on the 1<sup>st</sup> December 2017 and will be closed on the 28<sup>th</sup> February 2018. The entire process from the opening of the call in January to the Final selection in May/June will take 6-7 months. The process can be illustrated as follows:



**Figure 1 The timeline of the open call**

#### 3.2 Electronic tools

The HORSE consortium has either customized or developed from scratch several electronic tools to comply with the requirement of the European Commission for a fair, transparent and impartial approach in the management of Open Calls for Third Party funding.

##### 3.2.1 Open Call Management Platform

The platform will be used to manage applications received for the HORSE Open Call (to be opened: 1<sup>st</sup> December 2017, to be closed at 17:00 Brussels time, 28<sup>th</sup> February 2018).

Applicants to the Open Call of HORSE will need to fill out the sections below.

**Administrative data:** This section on the platform will be used to collect general information on the consortium that is applying (also relevant to generate statistical data after the call)

Partner 4 (optional)  
 -- Create new partner --

Legal Name of Organization \*

PIC

PIC is  
 permanent  
 provisional

Short Name of Organization

Department

Street

ZIP Code

City

Country  
 -- Select country --

Status of the Organisation  
 Natural person

Primary Contact Title

Primary Contact First Name

Primary Contact Phone Number

Primary Contact Gender  
 Male  
 Female

Primary Contact Email

Secondary Contact Title (optional)

Secondary Contact First Name (optional)

Secondary Contact Last Name (optional)

Secondary Contact Phone Number (optional)

Secondary Contact Gender (optional)  
 Male  
 Female

Secondary Contact Email (optional)

Add a keyword for organization

Keyword 1 *	Keyword 2 *	Keyword 3 *
<input type="text"/>	<input type="text"/>	<input type="text"/>
Keyword 4 *	Keyword 5 *	Keyword 6 *
<input type="text"/>	<input type="text"/>	<input type="text"/>

Figure 2 The administrative data section of the platform

**Proposal template:** the proposal template will be provided to the applicants to complete it. Then it needs to be uploaded to the platform for submission.

General Information

Proposal Name \*

Proposal Short Name \*

Proposal Document \*

No file selected.

Figure 3 Uploading the proposal template to the platform

Partner 1:

H2020 - Academia

Category	Expenses	Funding Rate	Funded Expenses	Overhead	Funded Overhead	Sum	Explanation
Personel Cost ▼	10.000 EUR	100 %	10.000 EUR	25 %	2.500 EUR	12.500 EUR	
Salary Level	Monthly Income		Man-month	Sum	Explanation	Action	
E14-1	3.600 EUR		1	3.600 EUR	Post-Doc	Delete	
E13-1	3.200 EUR		2	6.400 EUR	Ph.D. stude	Delete	
Add new row							
Sum			3	10.000 EUR			
Travels	1.000 EUR	100 %	1.000 EUR	25 %	250 EUR	1.250 EUR	Kick-off mee
Equipment ▼	11.000 EUR	100 %	11.000 EUR	25 %	2.750 EUR	13.750 EUR	
Item	Cost	Dep. Time in Project ?	Depreciation Time ?	Funded by Project	Explanation	Action	
Robot Arm	50.000 EUR	12	60	10.000 EUR	Required fo	Delete	
Laser Rang	5.000 EUR	12	60	1.000 EUR	SLAM and r	Delete	
Add new row							
Sum				0 EUR			
Consumables	1.000 EUR	100 %	1.000 EUR	25 %	250 EUR	1.250 EUR	Explanation
Subcontracting ?	1.000 EUR	100 %	1.000 EUR	0 %	0 EUR	1.000 EUR	Explanation
Sum:	24.000 EUR		24.000 EUR		5.750 EUR	29.750 EUR	

**Budget information:** to make the provision of financial data – compliant with H2020 funding rules also applicable for the Open Call in HORSE – easier (mainly also for applicants without former experience with EU-funded projects), the Open Call Platform also provides tables which need to be completed and guides the applicants through this exercise.

Figure 4 Entering the financial data into the platform

Once the open call is closed, the open calls management team will be able to provide statics regarding the overview of applications and the applicants. Statistics on data such as the number of applicants, domains of expertise of the applicants, countries that participated in the application and type of institution that have applied will be provided to the EC.

### 3.2.2 Ticketing system

A ticketing system (OTRS 5) to systematically archive and address enquires of applicants was set up. The ticketing system allows all incoming inquiries to be channelled to those members of the core consortium who are most competent to answer them (Administrative, General, and Scientific/ Technical). In addition, it provides an overview of the status of the enquiries (pending or closed) with a time stamp to make sure that all potential applicants will receive the requested information in a timely manner. Another benefit of the system is that the entire correspondence is stored in a closed system which allows tracking the flow of information between the HORSE consortium and the applicants in case of a redress. Statistical data on the number of enquires, the response time etc. can be generated, as well.

To guide the applicants throughout the entire application process, a description of the call will be provided along with Guide for applicants and Call text. An email address to the ticketing system will be also provided on the platform, if applicants have questions regarding administrative, scientific or general questions related to this call.

## **4 Outlook**

The Call will be closed on 28<sup>th</sup> February 2018, 17:00 CET Brussels local time. April and May 2018 will be dedicated to the remote evaluation. Each proposal will be evaluated by two independent experts. The remote evaluation will be finished with a consensus report (provided by an independent expert again, the rapporteur). In May 2018 a panel meeting will take place to accomplish the evaluation, ranking and selection of third parties. The next two months – June and July 2018 - will be invested to inform the applicants about the results and contract the successfully applicants and third parties. The evaluation and selection process will be described in deliverable D6.4.

## Appendix A – Annex I – Published on the portal of the European Commission

Project acronym:	HORSE
Project Grant Agreement:	No. 680734
Project full name:	Smart integrated Robotics system for SMEs controlled by Internet of Things based on dynamic manufacturing processes
Project web address:	<a href="http://horse-project.eu">http://horse-project.eu</a>
Call title:	Open call for HORSE application experiments
Call identifier:	HORSE-AppExp
Full Call information:	<a href="http://horse-project.eu/Open-Calls">http://horse-project.eu/Open-Calls</a>
Call publication date:	01.12.2017
Proposal submission deadline:	28.02.2018, at 17:00 (Brussels time)
Proposal submission web address:	<a href="http://opencalls.horse-project.eu">http://opencalls.horse-project.eu</a>
Expected duration:	9 months
Total budget:	€1,400,000. Maximum funding per proposal: €200,000 (including 25% indirect costs)
More information:	<a href="mailto:opencalls@horse-project.eu">opencalls@horse-project.eu</a>

## Appendix B – Call text

### Open Call for HORSE Experiments

Project acronym:	HORSE
Project Grant Agreement:	No. 680734
Project full name:	Smart integrated Robotics system for SMEs controlled by Internet of Things based on dynamic manufacturing processes
Project web address:	<a href="http://horse-project.eu">http://horse-project.eu</a>
Call title:	Open call for HORSE application experiments
Call identifier:	HORSE-AppExp
Full Call information:	<a href="http://horse-project.eu/Open-Calls">http://horse-project.eu/Open-Calls</a>
Call publication date:	01.12.2017
Proposal submission deadline:	28.02.2018, at 17:00 (Brussels time)
Proposal submission web address:	<a href="http://opencalls.horse-project.eu">http://opencalls.horse-project.eu</a>
Expected duration:	9 months
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More information:	<a href="mailto:opencalls@horse-project.eu">opencalls@horse-project.eu</a>

## H2020 Horse Funding Agreement

Project HORSE, co-funded from the European Union's Horizon 2020 research and innovation programme under agreement No 680734, foresees as an eligible activity the provision of financial support to third parties, as means to achieve its own objectives.

HORSE aims to bring a leap forward in the manufacturing industry proposing a new flexible model of smart factory involving collaboration of humans, robots, AGV's and machinery to realize industrial tasks in an efficient manner. The main strategy builds on existing technology and research results in robotics and smart factories and integrates them in a coherent and flexible software framework. A short description of the framework, its architecture and components is available in the following document.

The HORSE framework is driven by and validated with end-users - manufacturing companies- in two steps: in the first, the framework was jointly developed together with the selected end-users (Pilot Experiments); in the second, its suitability and transferability to further applications will be validated with new end-users recruited via this Open Call.

The project calls for contributions that validate the framework in real industrial settings involving nearly autonomous robotics or human-robot collaboration. The experiments are also expected to extend the framework by providing new functionalities (software components) or integrating new robots and other machinery (hardware components). The main goals of the experiments are to validate, extend and refine the framework as well as to maximize the impact of HORSE on the European manufacturing sector. This will be achieved by demonstrating the reusability/generalisability of the use cases to be proposed and by detailing the impact in the specific industry.

It is of utmost importance for the proposals to tackle human safety issues properly. The safety of the developed system needs to be ensured and validated according to the legal requirements in place (involving safety certification if needed).

Considering the purpose of the Open Call it is crucial that the experiments, regardless of the area of application, utilize the HORSE framework to the fullest extent possible. This means that that the proposed experiments need to use the HORSE middleware for communication between the components and the Manufacturing Process Management Software component for modelling and executing the process. The applicants are strongly encouraged to reuse process-specific modules developed within the HORSE project. If development of new components is needed full compatibility with the framework needs to be ensured. Development of components from the following areas (but not limited to them) is especially welcome:

- Quality inspection (e.g. using machine vision)
- Situation awareness and prediction for human safety (e.g. multi-sensor human tracking systems)
- Programming by demonstration
- Robot control algorithms (e.g. force-feedback for working with delicate surfaces)

There are no requirements regarding the hardware elements used in the experiments. However, it is strongly encouraged to provide support to robots and machinery not integrated in the framework yet such as (but not limited to):

- Safety components (e.g. SafetyEYE, SAPARO floor etc.)
- AGVs
- Haptic teleoperation interfaces and other novel human-robot interfaces.

Because of the expected scope and impact of the experiments the Call welcomes in particular consortia of partners offering complementary, multi-disciplinary competences. Consortia should consist of the end user (a manufacturing organisation, preferably an SME) and other partners depending on the needs, e.g. research institutions, system integrators and hardware providers.

## H2020 Horse Funding Agreement

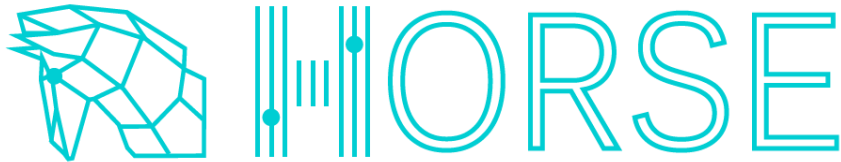
More information and the full call documents, including the guides for the applicants and an electronic submission system, can be found on the website <http://horse-project.eu/Open-Calls> or by contacting [opencalls@horse-project.eu](mailto:opencalls@horse-project.eu).



## **Appendix C - Guide for applicants**

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**Innovation Action**



## **GUIDE FOR APPLICANTS**

*HORSE Application Experiments*

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### Glossary of Terms

**HORSE:** Smart integrated Robotics system for SMEs controlled by Internet of Things based on dynamic manufacturing processes

**SME:** Small and Medium-sized enterprises form a specific target group for the experiments and the CCs in HORSE. The term is used in exactly the same way as defined by the EC (<http://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition/>)

**Experiment:** An experiment is a small to medium sized scientific research and/or technology development project carried out by a team of at least one SME and potentially additional research institutions, robot manufacturers and robot and automation users, which typically lasts no longer than 9 months

**CC:** Competence Centre is a physical infrastructure supporting different user groups by providing state-of-the-art hardware, software components, and support in form of experienced staff.

## 5 General Information

This guide is related to the Horizon 2020 project HORSE (Smart integrated Robotics system for SMEs controlled by Internet of Things based on dynamic manufacturing processes, Grant Agreement Number 680734, [www.horse-project.eu](http://www.horse-project.eu)). HORSE aims to bring a leap forward in the manufacturing industry and to foster technology deployment towards SMEs by:

- Proposing a flexible model of smart factory involving collaboration of humans, robots, AGVs and machinery.
- Providing a generic technical framework facilitating adaptation of robotics by SMEs developed together with selected end users.
- Setting up Centres of Competence that provide infrastructures, expertise and environments enabling SMEs access to the robotics solutions.
- Validating the suitability and transferability to further applications of the framework with new end-users recruited by an Open Call mechanism.

The Open Call mechanism offers funding opportunities to small, focused projects – “experiments” with a runtime of a maximum 9 months and a budget of maximum 200,000€. Funding will support experiments in real industrial settings involving near autonomous robotics technology or cooperation between humans and robots on a production line with no barriers using the HORSE framework. The goal of the experiments is to validate the HORSE framework by adopting it or some of its elements in manufacturing SMEs, to extend the framework by developing new components and integrating additional hardware support or to increase the potential reach of the framework by adapting it to new areas.

The Open Call mechanism is organized in full compliance to the guidelines provided in the “Good practices and templates for organizing open calls under the H2020 Financial Support to Third Parties scheme”.

## 6 Expected contributions and impact

The project calls for contributions that validate the framework in real industrial settings involving nearly autonomous robotics or human-robot collaboration. The experiments are also expected to extend the framework by providing new functionalities (software components) or integrating new robots and other machinery (hardware components). The main goals of the experiments are to validate, extend and refine the framework as well as to maximize the impact of HORSE on the European manufacturing sector. This will be achieved by demonstrating the reusability/generalisability of the use cases to be proposed and by detailing the impact in the specific industry.

It is of utmost importance for the proposals to tackle human safety issues properly. The safety of the developed system needs to be ensured and validated according to the legal requirements in place (involving safety certification if needed).

Considering the purpose of the Open Call it is crucial that the experiments, regardless of the area of application, utilize the HORSE framework to the fullest extent possible. This means that that the proposed experiments need to use the HORSE middleware for communication between the components and the Manufacturing Process Management Software component for modelling and executing the process. The applicants are strongly encouraged to reuse process-specific modules developed within the HORSE project. If development of new components is needed full compatibility with the framework needs to be ensured. Development of components from the following areas (but not limited to them) is especially welcome:

- Quality inspection (e.g using machine vision)
- Situation awareness and prediction for human safety (e.g. multi-sensor human tracking systems)
- Programming by demonstration
- Robot control algorithms (e.g. force-feedback for working with delicate surfaces)

There are no requirements regarding the hardware elements used in the experiments. However, it is strongly encouraged to provide support to robots and machinery not integrated in the framework yet such as (but not limited to):

- Safety components (e.g. SafetyEYE, SAPARO floor etc.)
- AGVs
- Haptic teleoperation interfaces and other novel human-robot interfaces.

## 7 Activities, eligibility and funding

Activities eligible for funding:

## H2020 Horse Funding Agreement

Funding will support Application Experiments in real settings involving near autonomous robotics technology or cooperation between humans and robots on a production line with no barriers using the HORSE framework.

### Cost categories eligible for funding:

Funding mainly addresses personnel expenses, as well as travel and subsistence. Up to 20% of the budget can be reserved for equipment and consumables needed to implement the use case. Purchasing of an industrial robot or other machinery is not possible within the experiments. Only the costs of leasing or renting such a robot are considered eligible. A non-exhaustive list of companies offering robot rental services is available on the HORSE website. The experiment consortia are not obliged to use the services of any of those institutions. Other equipment may also be leased if the need for it is justified in the experiment proposal.

Participants of the experiments are allowed to sub-contract 10% of the budget, but sub-contracting should not cover core activities of the experiment. The subcontracting tasks, objectives and reason to subcontract should be clearly specified very clearly in the proposal.

Each proposal for an application experiment will include justifications of costs and resources for all participating entities. Checking the consistency between these costs and the expected work of the experiment will be part of the evaluation of application experiments.

### Funding rates:

In the HORSE application experiments, one or more organizations can apply for funding by submitting a proposal describing their goal and business value, the technical plan to achieve it, and an estimate of the involved cost. The non-profit third parties will be funded 100% of their respective direct cost (including 25% indirect costs). Funding for the for profit making third parties is limited to 70% of the respective direct costs (including 25% indirect costs). The financial support provided by HORSE will cover a maximum amount of 200,000€ (EC funding rules for H2020 apply), with the involved organizations committing to finance the remaining share.

Third parties can receive pre-financing of up to 25%. There will be a single interim payment of up to 35% of the total budget within the duration of the experiment and a final one upon its successful finalization. The interim and final payments depend on successful completion of milestones and/or deliverables as specified in the respective contract with CEA and measured against Key Performance Indicators (KPI).

### Key Performance Indicators:

Application Experiments proposals should suggest a limited but sharp and appropriate set of individual KPIs. Those KPIs will be fine-tuned during the preparation of the contract. Relevance and appropriateness of KPIs will also be evaluated along the feasibility of the objectives.

### Entities eligible for funding:

Because of the expected scope and impact of the experiments the Call welcomes in particular consortia of partners offering complementary, multi-disciplinary competences. Consortia should consist of the end user (a manufacturing SME) and other partners depending on the needs, e.g. research institutions, system integrators and hardware providers.

In HORSE, financial support may be provided to any legal entity possessing a validated Participant Identification Code (PIC). At the moment of submission, though, the entity can apply with the provisional PIC. Once these conditions are met, financial support can be given to natural persons, public or private bodies, research organizations, non-profit organizations, small and medium enterprises, international organizations, international organizations of EU interest, established in an EU Member State or in an Associated Country.

### Maximum funding and possibility to participate in several proposals:

The funding is limited to 200,000€ for an application experiment in total. There are no restrictions regarding the number of proposals in which an entity can participate. However, the funding for the

beneficiary (as defined by the EC<sup>1</sup>) is limited to 150,000€. (even if the party participates in more than one Experiment). Restrictions of shifts between partners in an experiment concerning this matter will be part of the contract.

## 8 Proposal submission

The proposal will be submitted via a web platform at <http://opencalls.horse-project.eu>. The platform will provide:

- The functionalities to enter general/administrative proposal information and partner data.
- The functionalities to upload a completed proposal document, providing full scientific details of the proposal.
- Information which is required to avoid any potential conflict of interest (e.g. relations to the current HORSE Partners).
- Contacts for administrative, scientific / technical and HORSE-related questions
- The link to a ticketing system to address your requests / enquiries

It is the proposers' responsibility to ensure the timely submission of proposals. The complete proposal consists of (i) the completed and uploaded proposal template and (ii) the completed web forms.

Once the requested information has been entered, the portal will allow you to download a combined scientific-administrative document for your reference. You can submit as many times as you like and the version submitted most recently before the deadline will be considered for evaluation. However, the deadlines given in these guidelines are binding and proposals submitted after the deadline will not be taken into consideration.

Shortly after the effective submission of the proposal, an acknowledgement of receipt thereof will be sent to the e-mail address of the proposal coordinator named in the submitted proposal. The sending of an acknowledgement of receipt does not imply that a proposal has been accepted as eligible for evaluation. For any given proposal, the experiment coordinator acts as the main point of contact between the experiment team and HORSE.

Upon receipt by HORSE, proposals will be registered and their contents entered into a database to support the evaluation process. Eligibility criteria for each proposal will also be checked by HORSE before the evaluation begins. Proposals that do not fulfil these criteria will not be included in the evaluation. A proposal will only be considered eligible if it meets all of the following conditions: (i) it was received before the deadline given in the call text, (ii) template and web forms (all sections!) have been completed and (iii) the eligibility criteria set out in [Section 3 – Activities, eligibility and funding](#) are met.

## 9 Ethical issues

Research activities in Horizon 2020, and particularly in HORSE, should respect fundamental ethical principles, particularly those outlined in “The European Code of Conduct for Research Integrity”. Therefore, questions about ethical issues are to be addressed in the proposal text, if ethical issues apply to an application experiment, before and during the runtime of the research activities within HORSE, including the approval by the relevant committees.

## 10 Pre-proposals

As a special service to potential applicants, pre-proposals can be submitted via the HORSE Open Call Platform during the first nine weeks after publication of the call. A member of the staff of the HORSE Project will respond to pre-proposers within a reasonable period, if longer than five business days, the

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<sup>1</sup> [http://ec.europa.eu/research/participants/data/ref/h2020/grants\\_manual/amga/h2020-amga\\_en.pdf](http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/amga/h2020-amga_en.pdf)

applicants will be informed. The response will be limited to clarifying whether the proposal fits into the scope of the call and how the proposal could be improved. Please note that it is not mandatory to submit one and it has no influence on the evaluation of the full proposal.

## 11 Proposal Evaluation and Selection

The evaluation will be performed in two steps. In the first step, the experts will review each proposal according to the expected impact, realistic estimations of effort and benefit, timeline, transfer potential to other domains and cost (see [Section 8 - Proposal evaluation criteria](#)).

Each proposal will be evaluated by at least two acknowledged evaluators with different expertise in the technology field, in the application area(s) and in the business development. Only external experts (independent from HORSE consortium and from any proposer), will be involved in the evaluation process.

The experts perform evaluations in their private capacity, not as representatives of their employer, their country or any other entity. They will sign a declaration of confidentiality concerning the contents of the proposals they read and declaration of absence of any conflict of interest. Both the confidentiality and the conflict of interest rules will follow the Code of Conduct set out in the Annex 1 of the H2020 Model Contract for experts:

[http://ec.europa.eu/research/participants/data/ref/h2020/experts\\_manual/h2020-experts-mono-contract\\_en.pdf](http://ec.europa.eu/research/participants/data/ref/h2020/experts_manual/h2020-experts-mono-contract_en.pdf)

The outcome of the first step will be a ranked list of all proposals based on the individual scores obtained by each proposal. In the second step, during a physical or virtual panel meeting, the most promising candidates will be identified based on the individual evaluations. The chair of the panel will inform all the participants about the results of evaluation and selection. A public summary report will be published on the project website within 30 days from the end of the selection procedure.

## 12 Redress procedure

Upon receiving the evaluation results the applicants have two weeks to start the redress procedure by sending complaint via the proposal submission platform at <http://opencalls.horse-project.eu>.

## 13 Proposal evaluation criteria

<p><b>1. Expected impact</b></p> <ul style="list-style-type: none"> <li>• End-user's performance, efficiency, quality or/and production flexibility increase due to adaptation of the framework</li> <li>• Potential to address future/wider applications within the targeted industry or in general.</li> <li>• Increased functionalities of the framework (software and hardware components)</li> <li>• Impact assessment approach and KPIs</li> </ul>	<p><b>Weight: 35%</b></p> <p>Score: ? / 10 (Threshold: 8/10)</p>
<p><b>2. Technical excellence</b></p> <ul style="list-style-type: none"> <li>• Clarity of the adaptation/integration/extension of the framework</li> <li>• Technical quality of the framework extensions – new hardware and software</li> <li>• Clear added value to the validation of the framework</li> </ul>	<p><b>Weight: 35%</b></p> <p>Score: ? / 10 (Threshold: 8/10)</p>
<p><b>3. Quality of the workplan</b></p>	<p><b>Weight: 30%</b></p>

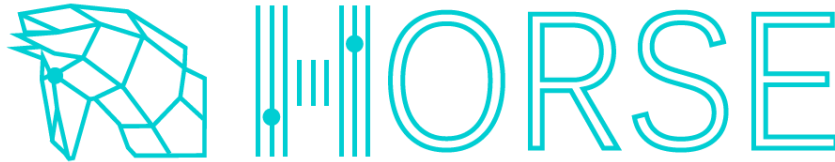
H2020 Horse Funding Agreement

<ul style="list-style-type: none"> <li>• Coherence, appropriateness, effectiveness of the overall implementation and integration approach</li> <li>• Workplan appropriateness and scheduling</li> <li>• Risk management</li> <li>• Coverage of the necessary competences</li> </ul>	<p>Score: ? / 10 <i>(Threshold: 8/10)</i></p>
<b>Remarks</b>	
<p>Ethical implications and compliance with applicable international, EU and national law</p>	<p><i>Essential</i></p>
<p>OVERALL SCORE</p>	<p>Score: ? / 10 <i>(Threshold 8/10)</i></p>

## Appendix D – Proposal template

H2020 – FOF – 09 – 2015

Innovation Action



## PROPOSAL TEMPLATE

*HORSE Application Experiments*

- This template is for the 1st call for HORSE Experiment proposals
- Call opens 1<sup>st</sup> December 2017
- This form may be submitted electronically any time before the 28<sup>th</sup> February 2018, 17:00 Brussels time, to the electronic submission facility at the HORSE-homepage at <http://www.horse-project.eu>

Text in red represents comments and should be deleted in your submission. Page limits refer to this text style in word: Times New Roman 11 pt font, Line spacing 1.15 lines, 6pt after, Standard A4 page size and margins



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## Glossary of Terms

**HORSE:** Smart integrated Robotics system for SMEs controlled by Internet of Things based on dynamic manufacturing processes

**SME:** Small and Medium-sized enterprises form a specific target group for the experiments and the CCs in HORSE. The term is used in exactly the same way as defined by the EC (<http://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition/>)

**Experiment:** An experiment is a small to medium sized scientific research and/or technology development project carried out by a team of at least one SME and potentially additional research institutions, robot manufacturers and robot and automation users, which typically lasts no longer than 12 months

## **1 Excellence (limit: 4 pages)**

Your experiment should address adaptation, validation or extension of the HORSE framework in real settings involving near autonomous robotics technology or cooperation between humans and robots on a production line with no barriers. Your work should have the potential to achieve tangible results: at the end of the experiment, there must be a robust demonstration – ideally in the form of a working prototype.

In this section you should describe:

- the context of your experiment (the current state of the process/processes to which the framework will be applied)
- the way in which the HORSE framework will be used in the process/processes
- the new components that will be developed in your experiment (if any)
- the new hardware that will be integrated in the experiment (if any)
- the way in which the framework will be validated in the experiment

## **2 Impact (limit: 2 page)**

Describe how will your experiment contribute to:

- Increasing the performance and efficiency of the end-user
- Validation of the framework
- Promotion and reach of the framework (new applications)
- Extension of functionalities of the framework (new software and hardware components)

## **3 Implementation (limit: 4 pages)**

Provide a work description including at least:

- Task list including the timing of the different tasks, efforts and role of partners
- List of deliverables
- List of milestones
- Description of the partners and consortium as a whole
- Risk management

## **4 List of Key Performance Indicators (limit: 1 page)**

## **5 Management of knowledge and of IP (limit: 1 page)**

## **6 Appendix. Ethical issues**

## Appendix E – Template for funding agreement

### Horse Funding Agreement

The rights and obligations contained in this Funding Agreement derived from the Horse Grant Agreement and Consortium Agreement.

This Horse Funding Agreement for providing financial support to the Selected Third Party, hereinafter referred to as the “Agreement”, is entered into by and between:

The **COMMISSARIAT A L'ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES** [Atomic Energy and Alternative Energies Commission-CEA], a public entity of a scientific, technical and industrial character, registered in the Paris Trade and Companies Register under No R.C.S. Paris B 775 685 019 and having its registered office at 25 Rue Leblanc, Bâtiment le Ponant D, Paris 75015, hereinafter referred to as “**Cascade Funding Partner**”, represented by Philippe WATTEAU, acting in his capacity as Director of CEA LIST,

and

<p><b>OFFICIAL NAME OF THE SELECTED THIRD PARTY (Acronym):</b> <b>VAT Number:</b> <b>Legal Status:</b> <b>Name of the legal signatory:</b> <b>Legal office address:</b></p>
---

referred to as “**Selected Third Party**”,

Hereinafter referred to as “Selected Third Party”;

Hereinafter sometimes individually or collectively referred to as “Party” or “Parties”.

Whereas European Dynamics Advanced Systems of Telecommunications Informatics and Telematics, SA , CEA, Stiftung FZI Forschungszentrum Informatik am Karlsruher Institut für Technologie, PROSYST Software GmbH, Technische Universiteit Eindhoven, SERCOBE Spanish National Association of Manufacturers of Capital Goods, Harokopio University, Odlewnie Polskie SA, KUKA Automatismes Robotique SAS, Robert Bosch Fabrika Castellet SA, Technische Universität München, Nederlandse Organisatie voor toegepast-natuurwetenschappelijk onderzoek TNO, CETIM, Thomas Regout International bv, (hereinafter sometimes collectively referred as the “Horse Beneficiaries” and individually and alternatively referred as a “Horse Beneficiary”) participate to the H2020 project entitled “Smart integrated Robotics system for SMEs controlled by Internet of Things based on dynamic manufacturing processes” (hereinafter the “Horse Project”);

Whereas the Horse Beneficiaries entered into a Grant Agreement N° 680734 with the European Commission (the “Grant Agreement” or “GA”) and signed together in 2015 a Consortium Agreement with respect to the Horse Project (the “Consortium Agreement” or “CA”).

Whereas the Horse Project involve financial support to selected third parties through a cascade funding scheme (hereinafter “Cascade Funding”).

Whereas further to an open call for a specific Industrial Experiment as described in Annex 1 “Specific Industrial Experiment Contract”, the Selected Third Party has been selected to implement such Industrial Experiment.

## H2020 Horse Funding Agreement

Whereas the Selected Third Party will be in charge of the implementation of such Industrial Experiment with also the participation of the Horse Beneficiaries identified in Annex 1 “Specific Industrial Experiment Contract”.

Whereas the Cascade Funding Partner is willing to provide financial support to the Selected Third Party for the implementation of such Industrial Experiment and the Selected Third Party is willing to receive such funding under the terms and conditions of this Agreement.

Whereas in accordance with the Grant Agreement and the Consortium Agreement, the Cascade Funding Partner shall sign an agreement with the Selected Third Party compliant with the GA and CA, after validation by the other Participating Partners.

Whereas the Cascade Funding Partner is responsible for the execution of this Agreement with the Selected Third Party and for the monitoring of the Industrial Experiment.

Now therefore it has been agreed as follows:

### 1. DEFINITIONS

Words beginning with a capital letter shall have the meaning defined in the preamble of the Agreement or in this Section:

- 1.1 Access Rights** means rights to use Results or Background in accordance with the stipulations of the H2020 General MGA – Multi and under the terms and conditions laid down in this Agreement.
- 1.2 An Affiliated Entity** of a Horse Beneficiary means any legal entity shown in Attachment 4 to the CA, that is reproduced in Attachment 6 to the Agreement, directly or indirectly Controlling, Controlled by, or under common Control with that Party, for so long as such Control lasts;

For the above purposes, "Control" of any legal entity shall exist through the direct or indirect:

- ownership of more than 50% of the nominal value of the issued share capital of the legal entity or of more than 50% of the issued share capital entitling the holders to vote for the election of directors or persons performing similar functions, or
- right by any other means to elect or appoint directors of the legal entity (or persons performing similar functions) who have a majority vote.

Common Control through government does not, in itself, create Affiliated Entity status

- 1.3 Agreement** means this Funding Agreement, together with its Annexes.
- 1.4 Background** means any and all, data, information, know-how– whatever its form or nature (tangible or intangible), including any rights such as intellectual property rights – listed in Annex 1 “Specific Industrial Experiment Contract” – that is Needed to implement the Project or exploit the Results and that is:
- owned or controlled by a Party or a Horse Beneficiary prior to the date of signature of the Specific Industrial Experiment Contract (Annex 1); or
  - developed or acquired by a Party or a Horse Beneficiary independently from the work in the Industrial Experiment even if in parallel with the performance of the Industrial Experiment, but solely to the extent that such data, information, know-how and/or intellectual property rights are introduced into the Industrial Experiment by the owning Party
- 1.5 Controlled Licence Terms** means terms in any licence that require that the use, copying, modification and/or distribution of Software or another work (“Work”) and/or of any work

that is a modified version of or is a derivative work of such Work (in each case, “Derivative Work”) be subject, in whole or in part, to one or more of the following:

- a) (where the Work or Derivative Work is Software) that the Source Code or other formats preferred for modification be made available as of right to any third party on request, whether royalty-free or not;
- b) that permission to create modified versions or derivative works of the Work or Derivative Work be granted to any third party;
- c) that a royalty-free licence relating to the Work or Derivative Work be granted to any third party.

For the avoidance of doubt, any Software licence that merely permits (but does not require any of) the things mentioned in a) to c) is not under Controlled Licence Terms (and so is under an Uncontrolled Licence).

- 1.6 Exploitation or Exploit** means means the use of results in further research activities other than those covered by the action concerned, or in developing, creating and marketing a product or process, or in creating and providing a service, or in standardisation activities;
- 1.7 Fair and Reasonable conditions** means means appropriate conditions, including possible financial terms or royalty- free conditions, taking into account the specific circumstances of the request for access, for example the actual or potential value of the results or background to which access is requested and/or the scope, duration or other characteristics of the exploitation envisaged;
- 1.8 Financial Support** means the cash element of the financial support to be given by the Cascade Funding Partner to the Selected Third Party for the implementation of the Industrial Experiment as detailed in Annex 1 “Specific Industrial Experiment Contract”.
- 1.9 Industrial Experiment** means the experiment detailed in Annex 1 “Specific Industrial Experiment Contract” to be carried out by Horse Beneficiaries and the Selected Third Party.
- 1.10 Participating Partners** means the entities and organisations participating in the Industrial Experiment, as listed in Annex 1.
- 1.11 Intellectual Property Rights Policy** means the Policy set out at Section 5 of this Agreement.
- 1.12 Needed** means:  
For the implementation of the Industrial Experiment:  
Access Rights are Needed if, without the grant of such Access Rights, carrying out the tasks assigned to the recipient party would be technically or legally impossible, significantly delayed, or require significant additional financial or human resources.  
For Exploitation of own Results:  
Access Rights are Needed if, without the grant of such Access Rights, the Exploitation of own Results would be technically or legally impossible. Where Confidential Information is concerned, only Confidential Information which has been disclosed during the Project may be considered as technically essential, except as otherwise agreed between the Parties and/or between a Party and a Horse Beneficiary.
- 1.13 Results** means any tangible or intangible output of the action, such as data, knowledge or information, that is generated in the action, whatever its form or nature, whether or not it can be protected, as well as any rights attached to it, including intellectual property rights;
- 1.14 Technical Expert** means either an expert external to the HORSE Consortium or a HORSE Beneficiary except the Cascade Funding Partner, that is in charge of evaluating the deliverables submitted by the Selected Third Party in execution of the Agreement and of authorizing the Cascade Funding Partner to proceed with the payment of the Financial Support to the Selected Third Party when the deliverables have been accepted.

## **2. CONDITIONS FROM THE GRANT AGREEMENT AND THE CONSORTIUM AGREEMENT REFLECTED IN THE AGREEMENT**

The Cascade Funding Partner receives funding from the European Commission for organizing the Industrial Experiment. Under the Horse Grant Agreement or the Consortium Agreement, some of the obligations have to be imposed on the Selected Third Party. Those obligations are reflected in this Agreement. The specific obligations that the Selected Third Party must ensure are described in the Multi-Beneficiary General Model Grant Agreement (H2020 General MGA – Multi), available at: [http://ec.europa.eu/research/participants/data/ref/h2020/mga/gga/h2020-mga-gga-multi\\_en.pdf](http://ec.europa.eu/research/participants/data/ref/h2020/mga/gga/h2020-mga-gga-multi_en.pdf), in articles 6, 22, 23, 35, 36, 38 and 46. These articles are part of the Agreement, by reference only.

The Selected Third Party acknowledges and agrees that these obligations comprised in this Agreement and in the Multi-Beneficiary General Model are fully applicable to it and shall do everything that is necessary to comply with these obligations, it being understood that the Selected Third Party is only bound by this Agreement and not by the GA or CA.

## **3. TERMS AND CONDITIONS FOR THE FINANCIAL SUPPORT**

**3.1** The Selected Third Party shall take part in the Industrial Experiment in accordance with the state of the art.

The Selected Third Party shall carry out the tasks according to the schedule set forth in Annex 1 “Specific Industrial Experiment Contract” at the latest and shall report to the Cascade Funding Partner on the activities’ progress in regular intervals as indicated in Annex 1 “Specific Industrial Experiment Contract”.

Such technical reports based on the template reproduced in Annex 2 shall contain detailed information on the results generated by the Selected Third Party.

**3.2** The Cascade Funding Partner shall give Financial Support for the Industrial Experiment carried out by the Selected Third Party, within the limits and in accordance with the schedule of payments specified in Annex 1 “Specific Industrial Experiment Contract”.

**3.3** The Selected Third Party shall be entitled to claim eligible costs for the Industrial Experiment as described in Annex 3 “Estimated budget for the action” of this Agreement. The list of the eligible and in eligible costs is attached in Annex 6. The financial support shall take the form of a reimbursement of [*seventy percents (70 %) if the Selected for Party is a for profit making entity OR one hundred percents (100 %) if the Selected Third Party is a non-profit entity*] of the eligible costs of the Industrial Experiment actually incurred within the limit of the maximum financial support.

**3.4** The pre-financing payment shall be paid to the Selected Third Party by the Cascade Funding Partner pursuant to the schedule and conditions defined in Annex 1 “Specific Industrial Experiment Contract”.

**3.5** An interim payment and the payment of the balance shall be made by the Cascade Funding Partner in accordance with the schedule sets out in Annex 1 “Specific Industrial Experiment Contract”, provided that the requirements of this section 3 are met by the Selected Third Party.

**3.5.1** The Selected Third Party shall provide the Cascade Funding Partner with an interim costs report and a final costs report according to the schedule set out in Annex 1 “Specific Industrial Experiment Contract”, each of these costs reports shall be accompanied by written requests for payment and written statements by the Technical Expert in charge of reviewing the deliverables identified in Annex 1 “Specific Industrial Experiment Contract” that such deliverables have been accepted.

3.5.2 The Selected Third Party shall use the costs reporting template in Annex 4 “Costs Report Template”.

3.5.3 The following elements shall at least be included in the Selected Third Party’s costs reports:

- a) The identification of the Industrial Experiment;
- b) A financial statement of costs actually incurred;
- c) The identification of milestones, based on the completion of several tasks.
- d) Detailed information on the deliverable achieved for the implementation of the Application Experiment;
- e) A financial statement of costs actually incurred validated by the legal representative of the company;
- f) Certification of financial statement of costs actually incurred by an independent chartered accountant or an independent statutory auditor.

No payment will be made by the Cascade Funding Partner all the conditions set out in this article are not met or if no sufficient evidence document is presented by the Selected Third Party.

3.5.4 The payment shall be made as indicated in Annex 1 “Specific Industrial Experiment Contract” after the written validation of the payment request by the Cascade Funding Partner however always provided that the conditions listed in this Section 3 are met by the Selected Third Party. For the avoidance of doubt, the payment is capped as specified in the Financial conditions in Annex 1 “Specific Industrial Experiment Contract”.

**3.6** The written payment request together with the documents referred above must be sent by the Selected Third Party to the following address:

CEA SACLAY DIGITEO  
A l’attention de M. Patrick Tourret  
UAF Bât.565 - PC65  
F-91191 Gif sur Yvette cedex

3.6 The Selected Third Party shall complete in a comprehensive manner Annex 5 to the Agreement and shall notify any changes to the Cascade Funding Partner as soon as it has occurred. The Cascade Funding Partner shall not in any case be liable for any late payment incurred by a change in the financial identification of the Selected Third Party.

#### **4. LIABILITY**

**4.1** The Selected Third Party shall comply with all applicable laws, rules and regulations, including, but not limited to safety, security, welfare, social security and fiscal laws, rules and regulations.

**4.2** Selected Third Party shall not be entitled to act or to make legally binding declarations on behalf of the Cascade Funding Partner or any other Horse Beneficiary and shall indemnify all of the latter from any third party claim resulting from a breach of these obligations.

**4.3** The contractual liability of the Cascade Funding Partner under this Agreement shall in any case be limited to the amount of the Financial Support provided to the Selected Third Party hereunder and the Cascade Funding Partner. The Cascade Funding Partner shall not in any case be liable for any indirect or consequential damages such as:

- loss of profits, interest, savings, shelf-space, production and business opportunities;
- lost contracts, goodwill, and anticipated savings;
- loss of or damage to reputation or to data;

- costs of recall of products; or
- any other type of indirect, incidental, punitive, special or consequential loss or damage.

**4.4** This limitation of liability shall not apply in cases of wilful act or gross negligence.

**4.5** The Selected Third Party shall fully and exclusively bear the risks in connection with the Industrial Experiment for which Financial Support is granted by the Cascade Funding Partner. The Selected Third Party shall indemnify the Horse Beneficiaries and the Cascade Funding Partner for all damages, penalties, costs and expenses which the Horse Beneficiaries or the Cascade Funding Partner as a result thereof would incur or have to pay to the European Commission or any third parties with respect to such Industrial Experiment financially supported and/or for any damage in general which the Horse Beneficiaries or the Cascade Funding Partner incur as a result thereof. In addition, should the European Commission have a right to recovery against the Cascade Funding Partner or another Horse Beneficiary regarding the Financial Support granted under this Agreement, the Selected Third Party shall pay the sums in question in the terms and the date specified by the Cascade Funding Partner. Moreover, the Selected Third Party shall indemnify and hold the Horse Beneficiaries and the Cascade Funding Partner, their respective officers, directors, employees and agents harmless from and against all repayments, loss, liability, costs, charges, claims or damages that result from or arising out of any such recovery action by the European Commission.

**4.6** In respect of any information or materials (including Results and Background) supplied by one Party to another Party or to a Horse Beneficiary, or by a Horse Beneficiary involved in the applicable Industrial Experiment to a Party, no warranty or representation of any kind is made, given or implied as to the sufficiency, accuracy or fitness for purpose nor as to the absence of any infringement of any proprietary rights of third parties.

Therefore,

- the recipient shall in all cases be entirely and solely liable for the use to which it puts such information and materials (including Results and Background), and
- there is no liability in case of infringement of proprietary rights of a third party resulting from any Access Rights.

## **5. INTELLECTUAL PROPERTY RIGHTS POLICY**

The Selected Third Party acknowledges the terms of the “Intellectual Property Rights Policy” defined hereinafter. The Selected Third Party agrees that it will comply with the Intellectual Property Rights Policy to ensure that the Cascade Funding Partner will always be able to comply with such terms towards the other Horse Beneficiaries.

### **5.1 General Principle regarding Ownership**

Results are owned by the Party or by the Horse Beneficiary that generates them.

### **5.2 Joint Results**

As requested in the Consortium Agreement signed between the Horse Beneficiaries, among which the Cascade Funding Partner, if, in the course of carrying out the Industrial Experiment, a Result is generated by the Selected Third Party with one or several Horse Beneficiaries, they shall own Results jointly if it is not possible to establish the respective contribution of each Party or separate them for the purpose of applying for, obtaining or maintaining their protection

Where such joint Result is covered by intellectual property rights, the joint owners, the joint owners shall execute a joint ownership agreement regarding the allocation and the terms and conditions of



Exploitation of the joint Results as soon as possible and before any industrial or commercial Exploitation.

Unless otherwise agreed:

- each of the joint owners shall be entitled to use their jointly owned Results for internal non-commercial research activities and educational purposes on a royalty-free basis, and without requiring the prior consent of the other joint owner(s), and
- each of the joint owners shall be entitled to otherwise Exploit the jointly owned Results, including by granting non-exclusive licenses to third parties (without any right to sub-license), if the other joint owners are given:
  - (a) at least 45 calendar days advance notice; and
  - (b) Fair and Reasonable conditions compensation.

The joint owners shall agree on all protection measures and the division of related cost in advance.

### **5.3 Access Rights**

5.3.1 For the purpose of this article 5.3, Background shall mean the Background as listed in the Specific Industrial Experiment Contract and validated by the Participating Partners for the concerned Industrial Experiment.

The Selected Third Party endeavours to detail in Attachment 1 the Intellectual Property under Controlled License Terms that will be used in the Industrial Experiment.

During the Industrial Experiment, the intended introduction of Intellectual Property (including, but not limited to Software) under Controlled Licence Terms in the Industrial Experiment requires the prior approval of the Cascade Funding Partner and of the Participating Parties to implement such introduction.

5.3.2 Due to provisions of the Consortium Agreement signed between the Horse Beneficiaries, Access Rights to Background and Results may be requested by the Selected Third Party from a Participating Partner only in the following case and if the following conditions are fulfilled:

Selected Third Parties have Access Rights to Background and Results if and when such Access Rights have been agreed upon on a case-by-case basis in a separate written agreement between the Selected Third Party and the Horse Beneficiary/ies concerned. Such separate agreement shall not affect any legitimate right of another Horse Beneficiary nor violate any of the provisions as set out in the GA and/or CA. The separate agreement shall ensure that the other Horse Beneficiaries have access to the Background and Results of the Selected Third Parties if Needed for the Implementation of the Project or Exploitation of its own Results.

Selected Third Parties which obtain Access Rights in return shall fulfil confidentiality obligations at least as stringent as the obligations stated in the Consortium Agreement to be arranged in a separate confidentiality agreement between the Selected Third Parties and the Horse Beneficiaires concerned.

Access Rights may be requested by the Selected Third Party up to twelve (12) month afer the end of the Industrial Experiment.

5.3.3 The Selected Third Party shall grant Access Rights on its Background and/or Results to the Horse Beneficiaries as far as such Background and/or Results are Needed for implementation of the Industrial Experiment and/or implementation of the Horse Project, and/or exploitation of the Horse Beneficiaries' Results.

5.3.3.1 Where any Horse Beneficiary has Access Rights on the Selected Third Party's Results and/or Background for implementation of the Industrial Experiment, such Access Rights shall be granted on a royalty-free basis.

5.3.3.2 Where Access Rights on Results and/or Background of the Selected Third Party are Needed by Horse Beneficiaries in order to implement the Horse Project:

- Access Rights to the Selected Third Party's Results shall be granted on a royalty-free basis and shall comprise the right to sublicense such Results to the other selected third parties participating in the Horse Project;
- Access Rights to the Selected Third Party's Background shall be granted only if such Background is Needed to use the Selected Third Party's Results to implement the Horse Project. Such Access Rights shall be granted on a royalty-free basis, and shall comprise the right to sublicense such Background to the other selected third parties participating in industrial experiments under the Horse Project:
  - as far as these other selected third parties Need to have access to such Background to use the Selected Third Party's Results to carry out their own industrial experiment under the Horse Project; and
  - if no major interest opposes.

5.3.3.3 Where Access Rights on the Selected Third Party's Results and/or Background are Needed by Horse Beneficiaries in order to exploit their Results, the conditions on which Access Rights will be granted shall be negotiated between the Selected Third Party and the Horse Beneficiary concerned and agreed in a separate written agreement.

Access Rights may be requested by the Horse Beneficiaries up to twelve (12) months after the end of the Industrial Experiment.

## 6. CONFIDENTIALITY

6.1 All information in whatever form or mode of communication, which is disclosed by a Party or a Horse Beneficiary (the "Disclosing Partner") to the other Party or to any Horse Beneficiary (the "Recipient") in connection with the Project during its implementation and which has been explicitly marked as "confidential" at the time of disclosure, or when disclosed orally has been identified as confidential at the time of disclosure and has been confirmed and designated in writing within 15 calendar days from oral disclosure at the latest as confidential information by the Disclosing Party, is "Confidential Information".

6.2 The Recipients hereby undertake for a period of four (4) years after the end of the Industrial Experiment:

- not to use Confidential Information otherwise than for the purpose for which it was disclosed;
- not to disclose Confidential Information to any third party (other than to its Affiliated Entities and Subcontractors) without the prior written consent by the Disclosing Partner, wherein the Recipient must ensure that an arrangement is in place prior to such disclosure that subjects the Affiliated Entities and/or Subcontractors to provisions at least as strict as provided in this Section 10;
- to ensure that internal distribution of Confidential Information by a Recipient, its Affiliated Entities, Subcontractors shall take place on a strict need-to-know basis; and
- to return to the Disclosing Partner, or destroy, on request all Confidential Information that has been disclosed to the Recipients including all copies thereof and to delete all information stored in a machine readable form to the extent practically possible. The Recipients may keep a copy to the extent it is required to keep, archive or store such Confidential Information because of compliance with applicable laws and regulations or for the proof of on-going obligations provided that the Recipient comply with the confidentiality obligations herein contained with respect to such copy for as long as the copy is retained.

6.3 The recipients shall be responsible for the fulfilment of the above obligations on the part of their employees, its Affiliated Entities or third parties involved in the Project having access to Confidential Information pursuant to this Section and shall ensure that they remain so obliged,

as far as legally possible, during and after the end of the Project and/or after the termination of the contractual relationship with the employee or third party.

- 6.4** The above shall not apply for disclosure or use of Confidential Information, if and in so far as the Recipient can show that:
- the Confidential Information has become or becomes publicly available by means other than a breach of the Recipient's confidentiality obligations;
  - the Disclosing Partner subsequently informs the Recipient that the Confidential Information is no longer confidential;
  - the Confidential Information is communicated to the Recipient without any obligation of confidentiality by a third party who is to the best knowledge of the Recipient in lawful possession thereof and under no obligation of confidentiality to the Disclosing Partner;
  - the disclosure or communication of the Confidential Information is foreseen by provisions of the Multi-Beneficiary General Model Grant Agreement;
  - the Confidential Information, at any time, was developed by the Recipient completely independently of any such disclosure by the Disclosing Partner;
  - the Confidential Information was already known to the Recipient prior to disclosure without any confidentiality obligation to the Disclosing Partner, or
  - the Recipient is required to disclose the Confidential Information in order to comply with applicable laws or regulations or with a court or administrative order, subject to the provision Section 10.7 hereunder.
- 6.5** The Recipient shall apply the same degree of care with regard to the Confidential Information disclosed within the scope of the Project as with its own confidential and/or proprietary information, but in no case less than reasonable care.
- 6.6** Each Party shall promptly advise the other Party or the concerned Horse Beneficiary in writing of any unauthorised disclosure, misappropriation or misuse of Confidential Information after it becomes aware of such unauthorised disclosure, misappropriation or misuse.
- 6.7** If any Party becomes aware that it will be required, or is likely to be required, to disclose Confidential Information in order to comply with applicable laws or regulations or with a court or administrative order, it shall, to the extent it is lawfully able to do so, prior to any such disclosure:
- notify the Disclosing Partner, and
  - comply with the Disclosing Partner's reasonable instructions to protect the confidentiality of the information.

## **7. DISSEMINATION**

Each Party agrees that any dissemination activity (including publications, presentations or contributions to any standards organisation) by the Selected Third Party is subject to the prior written approval of the other Participating Partners.

The Cascade Funding Partner and the other Participating Partners are entitled to include the main issues and information regarding the Industrial Experiment in their reporting towards the European Commission, subject to prior written notification to the Selected Third Party.

## **8. CHECKS AND AUDITS**

The Selected Third Party undertakes to provide any detailed information, including information in electronic format, requested by the European Commission or by any other outside body authorised by the European Commission to check that the Industrial Experiment and the provisions of this Agreement are being properly implemented.

The Selected Third Party shall keep at the European Commission disposal all original documents, especially accounting and tax records, or, in exceptional and duly justified cases, certified copies of original documents relating to the Agreement, stored on any appropriate medium that ensures their integrity in accordance with the applicable national legislation, for a period of five years from the date of payment of the balance specified in the grant agreements.

The Selected Third Party agrees that the European Commission may have an audit of the use made of the Financial Support carried out either directly by the European Commission staff or by any other outside body authorised to do so on its behalf. Such audits may be carried out throughout the period of implementation of the Agreement until the balance is paid and for a period of five years from the date of payment of the balance. Where appropriate, the audit findings may lead to recovery decisions by the European Commission.

The Selected Third Party undertakes to allow European Commission staff and outside personnel authorised by the European Commission the appropriate right of access to the sites and premises of the Selected Third Party and to all the information, including information in electronic format, needed in order to conduct such audits.

In accordance with Union legislation, the European Commission, the European Anti-Fraud Office (OLAF) and the European Court of Auditors (ECA) may carry out spot checks and inspections of the documents of the Selected Third Party, and of any recipient of Cascade Finding, including at the premises of the Selected Third Party, in accordance with the procedures laid down by Union law for the protection of the financial interests of the Union against fraud and other irregularities. Where appropriate, the inspection findings may lead to recovery decisions by the European Commission. The Articles 22 and 23 of the Multi-Beneficiary General Model Grant Agreement, also apply to the Selected Third Party.

## **9. TERMINATION**

- 9.1** The Cascade Funding Partner can terminate this Agreement with immediate effect through written notice to the Selected Third Party and to the other Participating Partners:
- if the Selected Third Party is in breach of any of its material obligations under this Agreement, which breach is not remediable, or, if remediable, has not been remedied within thirty (30) days after written notice to that effect from the party not in breach,
  - if, to the extent permitted by law, the Selected Third Party is declared bankrupt, is being wound up, is having its affairs administered by the courts, has entered into an arrangement with its creditors, has suspended business activities, or is the subject of any other similar proceeding concerning those matters, or
  - if the Selected Third Party is subject to an Event of Force Majeure, which prevents the Selected Third Party from correct performance of its obligations hereunder and such circumstances have lasted, or can reasonably be expected to last more than 3 months.
- 9.2** Access Rights granted to the Selected Third Party shall cease immediately upon the effective date of termination.

## **10. CONCLUDING CONDITIONS**

- 10.1** The Parties will not sign Annex 1, and the terms of this Agreement (for the sake of clarity this includes Annex 1) will not be effective, until the Cascade Funding Partner has received written confirmation from each Participating Partner that it agrees to their content. This written confirmation can be given by each Participating Partner sending by email or facsimile to the Cascade Funding Partner.

Once each written confirmation is given by each Participating Platform Partner, any ancillary agreements, amendments, additions or modifications to this Agreement shall be made in writing and signed by the Parties, but will only become effective after the Cascade Funding Partner has

## H2020 Horse Funding Agreement

received written confirmation from each Participating Partner that it agrees to their content, such written confirmation to be given in the manner set out at the above paragraph.

- 10.2** The Selected Third Party's consistent level in its respective field of expertise played a key role in the selection of the Selected Third Parties to implement the Industrial Experiment. Any total or partial transfer of provisions and the rights and duties it entails in the prior formal approval of all signatories.
- 10.3** Any subcontract by the Selected Third Party concerning some of its tasks under this Agreement requires the prior written consent of the Cascade Funding Partner and does not affect its own obligations resulting from this Agreement. The Selected Third Party shall secure that the subcontractor will comply with all obligations – especially coming from the Multi-Beneficiary General Model Grant Agreement, and with regard to confidentiality – resulting from this Agreement and that the results attained by the subcontractor will be available in accordance with Section 5.
- 10.4** The Agreement will enter into force on the date of the last signature by the Parties.
- 10.5** This Funding Agreement shall continue in full force and effect until complete fulfilment of all obligations undertaken by the Parties. However, this Funding Agreement or the participation of one or more Parties to it may be terminated in accordance with the terms of this Funding Agreement.
- 10.6** If any provision of this Agreement is determined to be illegal or in conflict with the applicable law, the validity of the remaining provisions shall not be affected. The ineffective provision shall be replaced by an effective provision which is economically equivalent. The same shall apply in case of a gap.
- 10.7** This Agreement shall be governed by and construed in accordance with the laws of Belgium.
- 10.8** Any disagreement or dispute which may arise in connection with this Agreement and which the Parties are unable to settle by mutual agreement will be brought before the courts of Brussel, Belgium.

Done in two originals, one for each Party.

On behalf of the Cascade Funding Partner: CEA  
Signature of the authorized representative:

On behalf of the Selected Third Party:  
Signature of the authorized representative:

Name: Philippe WATTEAU  
Title: Director of CEA LIST  
Date:

Name:  
Title:  
Date:

## ANNEX 1 - SPECIFIC INDUSTRIAL EXPERIMENT CONTRACT

### Horse Specific Industrial Experiment Contract

This Horse Specific Industrial Experiment Contract for implementation of the Industrial Experiment by the Selected Third Party, hereinafter referred to as the “Specific Industrial Experiment Contract”, is entered into by and between:

The **COMMISSARIAT A L'ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES** [Atomic Energy and Alternative Energies Commission-CEA], a public entity of a scientific, technical and industrial character, registered in the Paris Trade and Companies Register under No R.C.S. Paris B 775 685 019 and having its registered office at 25 Rue Leblanc, Bâtiment le Ponant D, Paris 75015, hereinafter referred to as “**Cascade Funding Partner**”, represented by Philippe WATTEAU, acting in his capacity as Director of CEA LIST,

and

<b>OFFICIAL NAME OF THE SELECTED THIRD PARTY (Acronym) :</b> <b>VAT Number :</b> <b>Legal Status:</b> <b>Name of the legal signatory :</b> <b>Legal office address:</b>
---

Hereinafter referred to as “**Selected Third Party**”;

Hereinafter sometimes individually or collectively referred to as “Party” or “Parties”.

Whereas the Cascade Funding Partner and the Selected Third Party have agreed the main terms and conditions to implement the Industrial Experiment in the course of the Horse Project by signing the Standard Industrial Experiment Contract which form part of this Specific Industrial Experiment Contract.

Now therefore it has been agreed as follows:

#### 1. TERMS AND CONDITIONS FOR THE INDUSTRIAL EXPERIMENT

The Selected Third Party shall implement the Industrial Experiment in accordance with the following:

Description of the Industrial Experiment	
Acronym	
Full Title	
Horse call identification	
Starting date of the Industrial Experiment:	
Duration of the Industrial Experiment:	
Date of selection of the Selected Third Party	

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Participating Partners (name, company and role)	
---	--

Industrial Experiment outcomes	
Expected results in terms of Industrial Impact	
Expected results in terms of IPR, software, know-how	

Implementation of the Industrial Experiment	
Outline scope of work	<b>M1:</b> <b>M2:</b> <b>Etc.:</b>
Milestone M1	
Deliverables	
<b>TASK 1</b>	
<b>Task 1.1</b>	
Description	
Starting date	
Duration	
Inputs	
Deliverable	
<b>Task 1.2</b>	
Description	
Starting date	
Duration	
Inputs	
Deliverable	
<b>TASK 2</b>	
<b>Task 2.1</b>	
Description	
Starting date	
Duration	
Inputs	
Deliverable	
<b>Task 2.2</b>	
Description	
Starting date	
Duration	
Inputs	
Deliverable	
<b>[Add as many tasks as necessary]</b>	

Deliverable (number)	Deliverable name	WP	Lead	Type	Dissem. level	Delivery date
D2.1						
D1.1						
D2.4						
D2.2						
D3.1						
D5.1						
D5.4						
D7.4						

Participating Partners Background	

Participating Partners IPR	

Financial conditions	
Financial Support	
Schedule of payment	After signature of the Funding Agreement by both parties, i.e. Selected Third Party and Cascade Funding Partner (incl. annex 1): Pre-financing: <input checked="" type="checkbox"/> – up to 25% of the financial support) Interim payment X: <input checked="" type="checkbox"/> – up to 35% of the financial support) Project closure: <input checked="" type="checkbox"/>
Payment conditions	For the prefinancing:  For the interim and the final payments: After receipt of the written request together with the completed costs report as stipulated in article 3 of the Horse Funding Agreement - payable within 30 days net without any deductions.
Penalties	If any payment is not made on its due date, (i) a lump sum of 40 Euros will be charged, and (ii) interest on the unpaid amount, calculated on a daily basis at a rate equivalent to four (4) percentage points over the European Central Bank prime rate prevailing on the due date.

Participating Partners involved in the Industrial Experiment	
Selected Third Party Project Manager	
<b>Name &amp; surname</b>	
<b>Department</b>	



<b>Tel:</b>	
<b>Email:</b>	
Cascade Funding Project Manager	<b>CEA</b>
<b>Name &amp; surname</b>	
<b>Department/laboratory</b>	
<b>Tel:</b>	
<b>Email:</b>	
<b><u>Date of agreement of all the Participating Partners involved in the Industrial Experiment</u></b>	

**2. MISCELLANEOUS**

2.1 This Specific Industrial Experiment Contract, composed of the Standard Industrial Experiment Contract and its Annexes 1 to 4 included, constitutes the sole and complete understanding of the Parties with respect to its subject matter and supersedes all prior or contemporaneous communications between the Parties concerning such subject matter. This Specific Industrial Experiment Contract will be governed and construed according to the choice of governing and constructive law set forth in the Standard Industrial Experiment Contract.

2.2 Save to the extent expressly modified in this Specific Industrial Experiment Contract, all of the terms of the Standard Industrial Experiment Contract and Annexes 1-4 included shall apply to this Specific Industrial Experiment Contract. Save to the extent expressly specified in this Specific Industrial Experiment Contract, all capitalized terms used in this Specific Industrial Experiment Contract which are defined in the Standard Industrial Experiment Contract shall have the meaning given in the Standard Industrial Experiment Contract. In the event of a conflict between this Specific Industrial Experiment Contract and the terms of the Standard Industrial Experiment Contract, the terms of the Standard Industrial Experiment Contract shall apply.

2.3 The terms of Clause 11.1 of the Standard Industrial Experiment Contract will apply to the signing and enforceability of this Annex 1.

Done in two originals, one for each Party.

On behalf of the **Cascade Funding Partner**: CEA  
Signature of the authorized representative:

On behalf of the **Selected Third Party**:  
Signature of the authorized representative:

Name: Philippe WATTEAU  
Title: Director of CEA LIST  
Date:

Name:  
Title:  
Date:

**ANNEX 2 - TECHNICAL REPORT TEMPLATE**

1. Reporting period

2. Objectives of the period

Description of the objectives of the Industrial Experiment period (concept and objectives), achieved progress and potential innovation, targeted Results description and used Background.

3. Summary of achievements

4. Results achieved

5. Issues with the implementation

6. Risks management

7. Summary and Conclusion

Summarize major results and achievements and evaluate them compared with the objectives.

ANNEX 3 ESTIMATED BUDGET FOR THE ACTION

0000FFH2020 Model Annex 4: General MGA Multi Beneficiary; December 2013

print format A4 landscape

MODEL ANNEX 4 FOR GENERAL MGA - MULTI-BENEFICIARY

FINANCIAL STATEMENT FOR [BENEFICIARY [name]/ LINKED THIRD PARTY [name]]

Eligible* costs (per budget category)											Receipts		EU contribution			Additional information		
A. Direct personnel costs		B. Direct costs of subcontracting		[C. Direct costs of fin. support]		D. Other direct costs		E. Indirect costs		[F. Costs of ...]		Total costs	Receipts	Reimbursement rate %	Maximum EU contribution ***		Requested EU contribution	Information for indirect costs:
A.1 Personnel		A.4 SME owners without salary				D.1 Travel		D.4 Costs of large research infrastructure		[F.1 Costs of ...]**		[F.2 Costs of ...]**		Receipts of the action, to be reported in the last reporting period, according to Article 5.3.3				
A.2 Natural persons under direct contract		A.5 Beneficiaries that are natural persons without salary				D.2 Equipment												
A.3 Seconded persons [A.6 Personnel for providing access to research infrastructure]						D.3 Other goods and services												
Form of costs****	Actual	Unit ①	Unit ①	Actual	Actual	Actual	Actual	Flat-rate ②	Unit ③	Unit ③								
			XX EUR/hour					25%	XX EUR/unit									
	(a)	Total (b)	No hours	Total (c)	(d)	(e)	(f)	(g)	(h)=0.25*((a)+(b)+((c)+(d)+(e)+((f)+(g)))④	No units	Total (i)	Total (2)	(j) = (a)+(b)+(c)+(d)+(e)+(f)+(g)+(h)+(i)+(2)	(k)	(l)	(m)	(n)	

The beneficiary/linked third party hereby confirms that:  
 The information provided is complete, reliable and true.  
 The costs declared are eligible (see Article 6).  
 The costs can be substantiated by adequate records and supporting documentation that will be produced upon request or in the context of checks, reviews, audits and investigations (see Articles 17, 18 and 22).  
 For the last reporting period: that all the receipts have been declared (see Article 5.3.3).

① The beneficiary/linked party must declare all eligible costs, even if - for actual costs, unit costs and flat-rate costs - they exceed the amounts indicated in the estimated budget (see Annex 2). Amounts not declared in the individual financial statement will not be taken into account by the [Commission]/[Agency]

\* See Article 6 for conditions for costs to be eligible

\*\* Depending on its type, this cost will or will not include indirect costs.

Costs that include indirect costs are: costs of energy efficiency measures in buildings, costs of providing trans-national access to research infrastructure and costs of clinical studies.

\*\*\* This is the theoretical amount of EU contribution if the reimbursement rate is applied to all the reported costs. At the payment of the balance, the theoretical amount of EU contribution for the action is capped by the maximum grant amount.

\*\*\*\* See Article 5 for forms of costs

① unit : hours worked on the action; costs per unit (hourly rate) : calculated according to beneficiary's usual accounting practice

② unit : hours worked on the action, cost per unit : XX EUR

③ flat rate : 25% of eligible direct costs, from which are excluded: direct costs of subcontracting, costs of in-kind contributions not used on premises, direct costs of financial support, and unit costs declared under Point F if they include indirect costs

④ unit : ...; costs per unit : XX EUR

⑤ unit : ...; costs per unit ... (the units and the costs per unit are set out in Annex 2 of the grant agreement)

⑥ only unit costs not including indirect costs to be added

Name of the legal representative of the Selected Third Party

Function of the legal representative of the Selected Third Party

Stamp of the Selected Third Party

**ANNEX 4 - COSTS REPORT TEMPLATE**

<b>1</b>	<b>COSTS CLAIMED</b>	<b>DEADLINE</b>
Please fill in the fields in yellow completely, so that we can deal properly with your request, thank you		<i>asap</i>
<b>2</b>	<b>EFFORTS USED</b>	<b>DEADLINE</b>
From the efforts sheet, please provide the efforts in PM used in the relevant Work Packages and the deliverable associated. Indicate total costs including overheads.		<i>asap</i>
<b>3</b>	<b>OTHER COSTS</b>	<b>DEADLINE</b>
Other direct costs = From the cost items sheet, please select the right cost category available in the menu list (travel - consumables - equipment depreciation); report your cost items; provide a short description and specify under which WPs the costs are related to.		<i>asap</i>
<b>4</b>	<b>SUBCONTRACTING</b>	<b>DEADLINE</b>
Subcontracting costs: if such cost were necessary please note that R&D tasks are excluded from subcontracting in the context of Industrial Experiments. Subcontracting should only be envisaged for minor specific technical tasks and related to hardware and		<i>asap</i>
<b>5</b>	<b>MEETINGS ORGANISED</b>	<b>DEADLINE</b>
From the meetings sheet, please provide information about the meetings you have participated to		<i>asap</i>
	<b>SIGNATURE</b>	<b>DEADLINE</b>
<b>Lead Partner</b> : Please sign all the pages of the Funding Template and don't forget the stamp of your institution		<i>asap</i>



I4MS RDMI-Hub

**Costs Claimed**

Project Name	LEAD Partner Name	Period No.	Date

	Total Personnel Cost (€)	Total Effort
a) Personnel Costs	0,00	0,00

	Total Others Costs
b) Other Costs	0,00

	Cost (€)
c) Subcontracting costs	0,00

<b>Total Eligible Costs (a+b+c)</b>	<b>0,00</b>
-------------------------------------	-------------

Signature of authorised representative

Name

**Efforts**

Project Name	LEAD Partner Name	Period No.	Date
0	0	0	00/01/1900

Partner name #1				
WP	Effort P.M	Personnel Costs	Deliverable n°	Total Personnel Cost
WP1			D1.x,D1.y	0
WP2				0
WP3				0
WP4				0
<b>Sub Total</b>	0	0		0
Partner name #2				
WP	Effort P.M	Personnel Costs	Deliverable n°	total Personnel Cost
WP1			D1.x,D1.y	0
WP2				0
WP3				0
WP4				0
<b>Sub Total</b>	0	0		0
Partner name #3				
WP	Effort P.M	Personnel Costs	Deliverable n°	total Personnel Cost
WP1			D1.x,D1.y	0
WP2				0
WP3				0
WP4				0
<b>Sub Total</b>	0	0		0
Partner name #4				
WP	Effort P.M	Personnel Costs	Deliverable n°	total Personnel Cost
WP1			D1.x,D1.y	0
WP2				0
WP3				0
WP4				0
<b>Sub Total</b>	0	0		0
<b>Total</b>	<b>0</b>			<b>0</b>

(Signature of authorised representative)

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**OTHERS COST**

Project Name	LEAD Partner Name	Period No.	Date
0	0	0	00/01/1900

Other Costs	Cost (€)	Cost Description	WP
Sub TOTAL Partner N°	0,00		
Sub TOTAL Partner N°	0,00		
Sub TOTAL Partner N°	0,00		
Sub TOTAL Partner N°	0,00		
<b>TOTAL</b>	<b>0,00</b>		

(Signature of authorised representative)

Name  
Position  
Date

# H2020 Horse Funding Agreement

<b>SUBCONTRATING COSTS</b>
----------------------------

Project Name	LEAD Partner Name	Period No.	Date
0	0	0	00/01/1900

SUPPLIER'S NAME	Cost (€)	Cost Description	Invoice Number	Date of the Service	WP
Sub TOTAL Partner N°	0,00				
Sub TOTAL Partner N°	0,00				
Sub TOTAL Partner N°	0,00				
Sub TOTAL Partner N°	0,00				
<b>TOTAL</b>	<b>0,00</b>				

(Signature of authorised representative)

Name  
 Position  
 Date



# H2020 Horse Funding Agreement

Meetings						
Project Name	LEAD Partner Name	Period No.	Date			
0	0	0	00/01/1900			

Partner name #1						
No.	WP	Date	Name of meeting	Where	Participants (ie company)	Purpose of the meeting
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						

Partner name #2						
No.	WP	Date	Name of meeting	Where	Participants (ie company)	Purpose of the meeting
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
17						
18						

Partner name #3						
No.	WP	Date	Name of meeting	Where	Participants (ie company)	Purpose of the meeting
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

## ANNEX 5 - SELECTED THIRD PARTY FINANCIAL INFORMATION

H2020 HORSE Funding Agreement

### ANNEX 4 - SELECTED THIRD PARTY'S FINANCIAL IDENTIFICATION



#### FINANCIAL IDENTIFICATION

PRIVACY STATEMENT

[http://ec.europa.eu/budget/contracts\\_grants/info\\_contracts/financial\\_id/financial\\_id\\_en.cfm#en](http://ec.europa.eu/budget/contracts_grants/info_contracts/financial_id/financial_id_en.cfm#en)

Please use CAPITAL LETTERS and LATIN CHARACTERS when filling in the form.

<b>BANKING DETAILS ①</b>	
ACCOUNT NAME ②	<input style="width: 90%;" type="text"/>
IBAN/ACCOUNT NUMBER ③	<input style="width: 90%;" type="text"/>
CURRENCY	<input style="width: 90%;" type="text"/>
BIC/SWIFT CODE	<input style="width: 45%;" type="text"/> BRANCH CODE ④ <input style="width: 45%;" type="text"/>
BANK NAME	<input style="width: 90%;" type="text"/>
<b>ADDRESS OF BANK BRANCH</b>	
STREET & NUMBER	<input style="width: 90%;" type="text"/>
TOWN/CITY	<input style="width: 45%;" type="text"/> POSTCODE <input style="width: 45%;" type="text"/>
COUNTRY	<input style="width: 90%;" type="text"/>
<b>ACCOUNT HOLDER'S DATA AS DECLARED TO THE BANK</b>	
ACCOUNT HOLDER	<input style="width: 90%;" type="text"/>
STREET & NUMBER	<input style="width: 90%;" type="text"/>
TOWN/CITY	<input style="width: 45%;" type="text"/> POSTCODE <input style="width: 45%;" type="text"/>
COUNTRY	<input style="width: 90%;" type="text"/>
REMARK	<input style="width: 90%; height: 30px;" type="text"/>
BANK STAMP + SIGNATURE OF BANK REPRESENTATIVE ⑤	DATE (Obligatory)
	SIGNATURE OF ACCOUNT HOLDER (Obligatory)

① Enter the final bank data and not the data of the intermediary bank.

② This does not refer to the type of account. The account name is usually the one of the account holder. However, the account holder may have chosen to give a different name to its bank account.

③ Fill in the IBAN Code (International Bank Account Number) if it exists in the country where your bank is established

④ Only applicable for US (ABA code), for AU/NZ (BSB code) and for CA (Transit code). Does not apply for other countries.

⑤ It is preferable to attach a copy of RECENT bank statement. Please note that the bank statement has to confirm all the information listed above under 'ACCOUNT NAME', 'ACCOUNT NUMBER/IBAN' and 'BANK NAME'. With an attached statement, the stamp of the bank and the signature of the bank's representative are not required. The signature of the account-holder and the date are ALWAYS mandatory.

## **ANNEX 6 - LIST OF ELIGIBLE AND INELIGIBLE COSTS - EXTRACT FROM THE GRANT AGREEMENT**

### **ARTICLE 6 — ELIGIBLE AND INELIGIBLE COSTS**

#### **6.1 General conditions for costs to be eligible**

'Eligible costs' are costs that meet the following criteria:

(a) for **actual costs**:

- (i) they must be actually incurred by the beneficiary;
- (ii) they must be incurred in the period set out in Article 3, with the exception of costs relating to the submission of the periodic report for the last reporting period and the final report (see Article 20);
- (iii) they must be indicated in the estimated budget set out in Annex 2;
- (iv) they must be incurred in connection with the action as described in Annex 1 and necessary for its implementation;
- (v) they must be identifiable and verifiable, in particular recorded in the beneficiary's accounts in accordance with the accounting standards applicable in the country where the beneficiary is established and with the beneficiary's usual cost accounting practices;
- (vi) they must comply with the applicable national law on taxes, labour and social security, and
- (vii) they must be reasonable, justified and must comply with the principle of sound financial management, in particular regarding economy and efficiency;

(b) for **unit costs**:

- (i) they must be calculated as follows: {amounts per unit set out in Annex 2 or calculated by the beneficiary in accordance with its usual cost accounting practices (see Article 6.2, Point A) multiplied by the number of actual units};
- (ii) the number of actual units must comply with the following conditions:
  - the units must be actually used or produced in the period set out in Article 3;
  - the units must be necessary for implementing the action or produced by it, and
  - the number of units must be identifiable and verifiable, in particular supported by records and documentation (see Article 18);

(c) for **flat-rate costs**:

- (i) they must be calculated by applying the flat-rate set out in Annex 2, and
- (ii) the costs (actual costs or unit costs) to which the flat-rate is applied must comply with the conditions for eligibility set out in this Article.

#### **6.2 Specific conditions for costs to be eligible**

Costs are eligible if they comply with the general conditions (see above) and the specific conditions set out below for each of the following budget categories:

- A. direct personnel costs;
- B. direct costs of subcontracting;
- C. *direct costs of providing financial support to third parties*;
- D. other direct costs;
- E. indirect costs;
- F. *not applicable*.

'Direct costs' are costs that are directly linked to the action implementation and can therefore be attributed to it directly. They must not include any indirect costs (see Point E below).

'Indirect costs' are costs that are not directly linked to the action implementation and therefore cannot be attributed directly to it.

#### **A. Direct personnel costs**

### Types of eligible personnel costs

A.1 **Personnel costs** are eligible<sup>2</sup>, if they are related to personnel working for the beneficiary under an employment contract (or equivalent appointing act) and assigned to the action (**'costs for employees (or equivalent)'**). They must be limited to salaries (including during parental leave), social security contributions, taxes and other costs included in the **remuneration**, if they arise from national law or the employment contract (or equivalent appointing act).

Beneficiaries that are non-profit legal entities<sup>2</sup> may also declare as personnel costs **additional remuneration** for personnel assigned to the action (including payments on the basis of supplementary contracts regardless of their nature), if:

- (a) it is part of the beneficiary's usual remuneration practices and is paid in a consistent manner whenever the same kind of work or expertise is required;
- (b) the criteria used to calculate the supplementary payments are objective and generally applied by the beneficiary, regardless of the source of funding used.

Additional remuneration for personnel assigned to the action is eligible up to the following amount:

- (a) if the person works full time and exclusively on the action during the full year: up to EUR 8 000;
- (b) if the person works exclusively on the action but not full-time or not for the full year: up to the corresponding pro-rata amount of EUR 8 000, or
- (c) if the person does not work exclusively on the action: up to a pro-rata amount calculated as follows: {{EUR 8 000 divided by the number of annual productive hours (see below)}, multiplied by the number of hours that the person has worked on the action during the year}.

A.2 The **costs for natural persons working under a direct contract** with the beneficiary other than an employment contract are eligible personnel costs, if:

- (a) the person works under the beneficiary's instructions and, unless otherwise agreed with the beneficiary, on the beneficiary's premises;
- (b) the result of the work carried out belongs to the beneficiary, and
- (c) the costs are not significantly different from those for personnel performing similar tasks under an employment contract with the beneficiary.

A.3 The **costs of personnel seconded by a third party against payment** are eligible personnel costs, if the conditions in Article 11.1 are met.

A.4 **Costs of owners** of beneficiaries that are small and medium-sized enterprises (**'SME owners'**) who are working on the action and who do not receive a salary are eligible personnel costs, if they correspond to the amount per unit set out in Annex 2 multiplied by the number of actual hours worked on the action.

A.5 **Costs of 'beneficiaries that are natural persons'** not receiving a salary are eligible personnel costs, if they correspond to the amount per unit set out in Annex 2 multiplied by the number of actual hours worked on the action.

### Calculation

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<sup>2</sup> For the definition, see Article 2.1(14) of the Rules for Participation Regulation No 1290/2013: **'non-profit legal entity'** means a legal entity which by its legal form is non-profit-making or which has a legal or statutory obligation not to distribute profits to its shareholders or individual members.

Personnel costs must be calculated by the beneficiaries as follows: {{hourly rate multiplied by the number of actual hours worked on the action}}, plus for non-profit legal entities: additional remuneration to personnel assigned to the action under the conditions set out above (Point A.1)).

The number of actual hours declared for a person must be identifiable and verifiable (see Article 18).

The total number of hours declared in EU or Euratom grants, for a person for a year, cannot be higher than the annual productive hours used for the calculations of the hourly rate. Therefore, the maximum number of hours that can be declared for the grant is: {the number of annual productive hours for the year (see below) minus total number of hours declared by the beneficiary for that person in that year for other EU or Euratom grants}.

The '**hourly rate**' is one of the following:

(a) for personnel costs declared as **actual costs**: the hourly rate is the amount calculated as follows: {actual annual personnel costs (excluding additional remuneration) for the person divided by number of annual productive hours}.

The beneficiaries must use the annual personnel costs and the number of annual productive hours for each financial year covered by the reporting period. If a financial year is not closed at the end of the reporting period, the beneficiaries must use the hourly rate of the last closed financial year available.

For the 'number of annual productive hours', the beneficiaries may choose one of the following:

(i) 'fixed number of hours': 1 720 hours for persons working full time (or corresponding prorata for persons not working full time);

(ii) 'individual annual productive hours': the total number of hours worked by the person in the year for the beneficiary, calculated as follows:

{annual workable hours of the person (according to the employment contract, applicable collective labour agreement or national law) plus overtime worked minus absences (such as sick leave and special leave)}.

'Annual workable hours' means the period during which the personnel must be working, at the employer's disposal and carrying out his/her activity or duties under the employment contract, applicable collective labour agreement or national working time legislation. If the contract (or applicable collective labour agreement or national working time legislation) does not allow to determine the annual workable hours, this option cannot be used;

(iii) 'standard annual productive hours': the 'standard number of annual hours' generally applied by the beneficiary for its personnel in accordance with its usual cost accounting practices. This number must be at least 90% of the 'standard annual workable hours'. If there is no applicable reference for the standard annual workable hours, this option cannot be used.

For all options, the actual time spent on **parental leave** by a person assigned to the action may be deducted from the number of annual productive hours;

(b) for personnel costs declared on the basis of **unit costs**: the hourly rate is one of the following:

(i) for SME owners or beneficiaries that are natural persons: the hourly rate set out in Annex 2 (see Points A.4 and A.5 above), or

(ii) for personnel costs declared on the basis of the beneficiary's usual cost accounting practices: the hourly rate calculated by the beneficiary in accordance with its usual cost accounting practices, if:

- the cost accounting practices used are applied in a consistent manner, based on objective criteria, regardless of the source of funding;

- the hourly rate is calculated using the actual personnel costs recorded in the beneficiary's accounts, excluding any ineligible cost or costs included in other budget categories.

The actual personnel costs may be adjusted by the beneficiary on the basis of budgeted or estimated elements. Those elements must be relevant for calculating the personnel costs, reasonable and correspond to objective and verifiable information;

and

- the hourly rate is calculated using the number of annual productive hours (see above).

**B. Direct costs of subcontracting** (including related duties, taxes and charges such as non-deductible value added tax (VAT) paid by the beneficiary) are eligible if the conditions in Article 13.1.1 are met.

**C. Direct costs of providing financial support to third parties** are eligible if the conditions set out in Article 15.1.1 or 15.2.1 are met.

**D. Other direct costs**

**D.1 Travel costs and related subsistence allowances** (including related duties, taxes and charges such as non-deductible value added tax (VAT) paid by the beneficiary) are eligible if they are in line with the beneficiary's usual practices on travel.

**D.2 The depreciation costs of equipment, infrastructure or other assets** (new or second-hand) as recorded in the beneficiary's accounts are eligible, if they were purchased in accordance with Article 10.1.1 and written off in accordance with international accounting standards and the beneficiary's usual accounting practices.

The **costs of renting or leasing** equipment, infrastructure or other assets (including related duties, taxes and charges such as non-deductible value added tax (VAT) paid by the beneficiary) are also eligible, if they do not exceed the depreciation costs of similar equipment, infrastructure or assets and do not include any financing fees.

The costs of equipment, infrastructure or other assets **contributed in-kind against payment** are eligible, if they do not exceed the depreciation costs of similar equipment, infrastructure or assets, do not include any financing fees and if the conditions in Article 11.1 are met.

The only portion of the costs that will be taken into account is that which corresponds to the duration of the action and rate of actual use for the purposes of the action.

**D.3 Costs of other goods and services** (including related duties, taxes and charges such as non-deductible value added tax (VAT) paid by the beneficiary) are eligible, if they are:

(a) purchased specifically for the action and in accordance with Article 10.1.1 or

(b) contributed in kind against payment and in accordance with Article 11.1.

Such goods and services include, for instance, consumables and supplies, dissemination (including open access), protection of results, certificates on the financial statements (if they are required by the Agreement), certificates on the methodology, translations and publications.

**D.4 Capitalised and operating costs of 'large research infrastructure'**<sup>3</sup> directly used for the action are eligible, if:

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<sup>3</sup> 'Large research infrastructure' means research infrastructure of a total value of at least EUR 20 million, for a beneficiary, calculated as the sum of historical asset values of each individual research infrastructure of that beneficiary, as they appear in its last closed balance sheet before the date of the signature of the Agreement or as determined on the basis of the rental and leasing costs of the research infrastructure.

- (a) the value of the large research infrastructure represents at least 75% of the total fixed assets (at historical value in its last closed balance sheet before the date of the signature of the Agreement or as determined on the basis of the rental and leasing costs of the research infrastructure<sup>4</sup>);*
- (b) the beneficiary's methodology for declaring the costs for large research infrastructure has been positively assessed by the Commission ('ex-ante assessment');*
- (c) the beneficiary declares as direct eligible costs only the portion which corresponds to the duration of the action and the rate of actual use for the purposes of the action, and*
- (d) they comply with the conditions as further detailed in the annotations to the H2020 grant agreements.*

#### **E. Indirect costs**

**Indirect costs** are eligible if they are declared on the basis of the flat-rate of 25% of the eligible direct costs (see Article 5.2 and Points A to D above), from which are excluded:

- (a) costs of subcontracting and*
- (b) costs of in-kind contributions provided by third parties which are not used on the beneficiary's premises and*
- (c) costs of providing financial support to third parties;*
- (d) not applicable.*

Beneficiaries receiving an operating grant<sup>5</sup> financed by the EU or Euratom budget cannot declare indirect costs for the period covered by the operating grant.

#### **F. Specific cost category(ies)**

*Not applicable*

#### **6.3 Conditions for costs of linked third parties to be eligible**

*not applicable*

#### **6.4 Conditions for in-kind contributions provided by third parties free of charge to be eligible**

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<sup>4</sup> For the definition, see Article 2(6) of Regulation (EU) No 1291/2013 of the European Parliament and of the Council of 11 December 2013 establishing Horizon 2020 - the Framework Programme for Research and Innovation (2014-2020) (OJ L 347, 20.12.2013 p.104)-('Horizon 2020 Framework Programme Regulation No 1291/2013'): 'Research infrastructure' are facilities, resources and services that are used by the research communities to conduct research and foster innovation in their fields. Where relevant, they may be used beyond research, e.g. for education or public services. They include: major scientific equipment (or sets of instruments); knowledge-based resources such as collections, archives or scientific data; e-infrastructures such as data and computing systems and communication networks; and any other infrastructure of a unique nature essential to achieve excellence in research and innovation. Such infrastructures may be 'single-sited', 'virtual' or 'distributed'.

<sup>5</sup> For the definition, see Article 121(1)(b) of Regulation (EU, Euratom) No 966/2012 of the European Parliament and of the Council of 25 October 2012 on the financial rules applicable to the general budget of the Union and repealing Council Regulation (EC, Euratom) No 1605/2002 (OJ L 218, 26.10.2012, p.1) ('Financial Regulation No 966/2012'): 'operating grant' means direct financial contribution, by way of donation, from the budget in order to finance the functioning of a body which pursues an aim of general EU interest or has an objective forming part of and supporting an EU policy.

**In-kind contributions provided free of charge** are eligible direct costs (for the beneficiary), if the costs incurred by the third party fulfil — *mutatis mutandis* — the general and specific conditions for eligibility set out in this Article (Article 6.1 and 6.2) and Article 12.1.

**6.5 Ineligible costs ‘Ineligible costs’** are:

(a) costs that do not comply with the conditions set out above (Article 6.1 to 6.4), in particular:

(i) costs related to return on capital;

(ii) debt and debt service charges;

(iii) provisions for future losses or debts;

(iv) interest owed;

(v) doubtful debts;

(vi) currency exchange losses;

(vii) bank costs charged by the beneficiary’s bank for transfers from the *Commission*;

(viii) excessive or reckless expenditure;

(ix) deductible VAT;

(x) costs incurred during suspension of the implementation of the action (see Article 49);

(b) costs declared under another EU or Euratom grant (including grants awarded by a Member State and financed by the EU or Euratom budget and grants awarded by bodies other than the *Commission* for the purpose of implementing the EU or Euratom budget); in particular, indirect costs if the beneficiary is already receiving an operating grant financed by the EU or Euratom budget in the same period.

**6.6 Consequences of declaration of ineligible costs**

Declared costs that are ineligible will be rejected (see Article 42).

This may also lead to any of the other measures described in Chapter 6.



## Appendix F – The Open Call supporting document

### HORSE FRAMEWORK

- What it is
  - Overview

The European manufacturing industry needs to embrace the Industry 4.0 revolution in order to remain globally competitive. Although doing that may be relatively straightforward for big industry, the SMEs face a number of difficulties in the process, mainly the lack of expertise, highly qualified workforce and resources needed to refurbish the whole business in one step. Moreover, there is still some reluctance present, as the benefits of digitizing the business are not always immediately clear and visible. Finally, it is crucial to understand, that digitization encompasses much more than just buying and setting up an industrial robot.

The HORSE project delivers solution to those problems. The software components are designed in a way that makes them easy to customize, use and reprogram, limiting the necessity for highly knowledgeable and qualified personnel. Even more important is the fact, that the framework is easily scalable. Therefore, it is possible to start the digitization with one part of the process (a production line, or even just a single workcell) and then just expand once the framework proves its usefulness and additional resources are acquired.

Small enterprises usually cannot commit to having a single-task robot and their employees also need to be assigned to different tasks depending on the current needs. The flexible and dynamic approach of tasks monitoring and allocation in the HORSE framework is one of its more important features. As a result, the state of all the resources is continuously monitored and both human and robot agents are assigned to tasks according to their individual capabilities and the current project needs. Thus, the overall efficiency within a production shop-floor can be greatly improved.

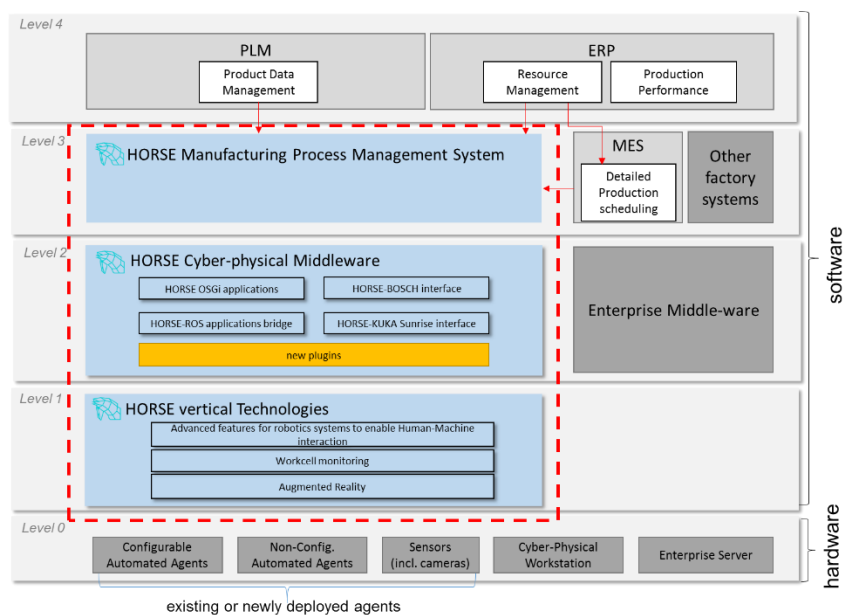


Figure 5: The HORSE Framework

All of those are possible due to the design of the framework, which consists of the basic, universal skeleton, which is used in every HORSE deployment scenario. This skeleton consists of the Manufacturing Process Management System used to describe and control the whole manufacturing process, the HORSE middleware providing standardized means of communication between the components, and the Hybrid Task Supervisor coordinating human operators and robots on the workcell level. This lightweight skeleton is then tailored to the needs of the concrete application by adding reusable, easy to develop case-specific components such as the robot control, augmented reality instructions, safety modules etc.

The goal of this document is to provide an overview of the whole HORSE framework. This short introduction is followed by presentation of the benefits of using the framework (both business and technical) and positioning of the framework in the wider picture of software for manufacturing control. Afterwards, the success stories – the HORSE pilot use cases – are presented. The next section presents the contents of the framework and finally, the steps to deploy it are presented in the last section.

### ○ Benefits from a Business Perspective

In manufacturing, we currently typically find situations with rather fragmented automated support for manufacturing processes and activities (if available at all). Different systems may be in place for setting up and executing manufacturing batches, allocating tasks to human workers in manufacturing, supervising product flows, and controlling robotic solutions where these are used. Where robots are not used, availability of integrated software solutions may be one of the problems. This leads to sub-optimal situations with little integration between high-level processes (on the factory level) and low-level activities (at the work cell level) on the one hand, and little integration between the activities of human workers and robots on the other hand, or even the absence of robotic solutions where these could bring big benefits. Consequently, we see a lack of flexibility in the assignment of workers and robots, unnecessary waiting times in production, idling robots, inefficient transfer of information between the dispersed systems, and ineffective, ad-hoc handling of exceptions in the manufacturing process (such as a malfunctioning work cell).

The HORSE framework aims at addressing all these issues in an integrated way. HORSE covers both the global level of manufacturing processes (at the factory or production line level) and the local level of individual manufacturing activities (within specific work cells). It addresses both the set-up of processes and functions at these levels, and the real-time execution of processes and activities.

*HORSE is a customizable and modular framework; not only it provides important tools which can be adapted to the specific needs of each SME, but new and legacy hardware and software is able to be integrated and used within the framework.*

To achieve this aim, the HORSE System is built on the principles of flexibility and standardisation. The benefits of the system can be summarised in the following points:

- The availability of the complete solutions provided by the HORSE system makes the **accessibility of robotic manufacturing solutions for SMEs much easier**.
- **Adopted international standards and best practices notation (OSGi, ROS, OPC-UA, etc. )** makes the HORSE System applicable to any discrete or batch production facility.
- The **modular** design of the HORSE System makes the system **flexible and adaptable** for different situations and to address a variety of challenges which are faced by manufacturing industry SMEs

– not every SME context requires the full HORSE framework; production resources can easily be added, deleted or updated.

- **Seamless integration between HORSE System modules and openness to external technology** (such as robotic platforms and sensors) makes Industry 4.0 technologies accessible to SMEs in manufacturing.
- The explicit manufacturing process management approach (at the global level of the HORSE System) allows **for high levels of flexibility in manufacturing process design**, thereby opening ways for easy re-use of manufacturing activities and underlying manufacturing infrastructure, and evolution towards mass-customization of products.
- The **dynamic allocation of production resources** (such as workers and robots) in manufacturing processes is a strong basis for improved process efficiency, leading to shorter throughput times of manufacturing processes and higher resource utilization.
- Provided **high-level overview of the status of the manufacturing process** at the production line level and manufacturing activities at the work cell level make sure that operational management of manufacturing facilities is always up-to-date of the real-time status of your business.

### ○ Benefits from a technical perspective

The HORSE Framework promotes a modular solution with clearly defined functional elements and interfaces. The key benefits for the developers, integrators and service providers are:

- **Clear interfaces** that allow replacement of modules and integration of new ones:
  - OSGi plugins to the existing OSGi nodes;
  - New ROS components;
  - Modules based on other technologies;
- **A scalable messaging middleware** that
  - is based on a widely accepted communication protocol (WebSocket)
  - is exchanging well-structured JSON formatted messages
  - permits encryption of the payload or the entire communication channel
  - offers reusable components (messaging agents) in Java (OSGi) and Python
  - features bridges to ROS and OSGi
  - supports prioritisation of the messages
- Web services standards simplifies integration to manufacturing technology, making the HORSE System suitable for factories with existing and heterogeneous robotic solutions.

### ○ Wider picture

IEC62264 presents a functional hierarchy for manufacturing control. This hierarchy acts as a reference framework to classify the various types of control found in modern factories, ranging from control of complete enterprises to control of individual components of a production machine. At the top of the hierarchy, Level 4 is concerned with the broader business management, including the resource, financial and supply chain management functions. Level 3 is responsible for the planning, directing, coordinating and monitoring of operations in the factory. Level 2 includes the functions used to coordinate and synchronise a grouping of manufacturing resources, to support process execution. Level 1 is the direct control of a single resource (such as a production robot) to execute tasks. Finally, Level 0 is not a control level, but represents the actual production shop agents, humans and industrial hardware (such as robots) that execute the tasks.

Figure 6 shows the HORSE System (in blue) in the context of other systems usually found in a factory. The systems are organised according to the functional hierarchy of IEC62264. These systems may be information systems, hardware or even cyber-physical systems. Figure 6 also attempts to relate the external systems to the landscape of computer integrated manufacturing.

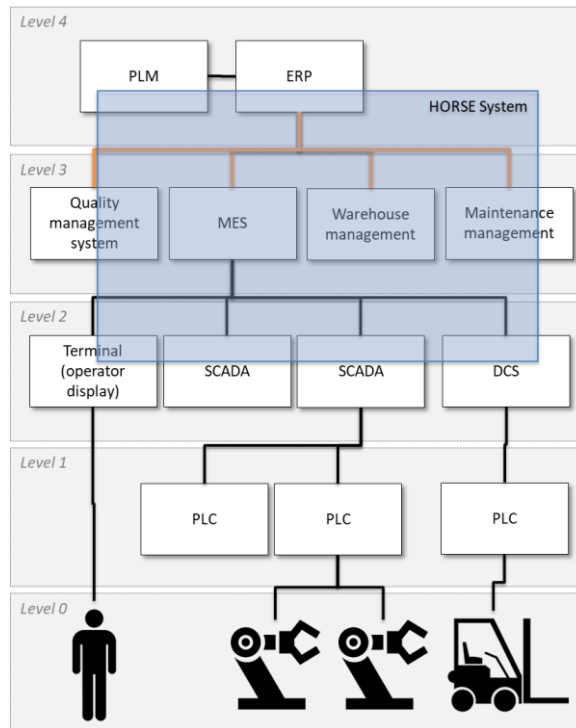


Figure 6: Typical systems found in a manufacturing system, arranged according to the functional hierarchy of IEC62264. HORSE System shown as an overlay, to convey its positioning in relation to other systems.

The HORSE System may take input from the operations manager, production planner or other information systems. Production is initiated by activating a manufacturing process (on level 3). Once the process reaches the first human or robot task, a task instruction is sent to the control system of a robot or the user interface for a human. This control system and user interface still forms part of the HORSE System, and is situated on level 3 of the functional hierarchy.

- How is it used
  - TRI use case

Thomas Regout International (TRI) is one of the partners of the project that drives the HORSE requirements and is used to demonstrate flexible assembly. At the moment TRI finds itself in a worldwide leading position in producing and designing customized telescopic slides for several industrial equipment applications. The market of the company is characterized by high quality demands (zero defects), just in time delivery, high service levels, and, customized small series with short time-to-market. The production processes of shaping, punching and assembly are semi-automated.

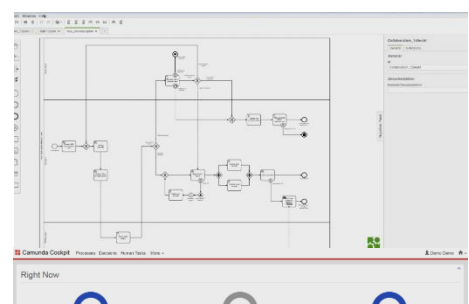


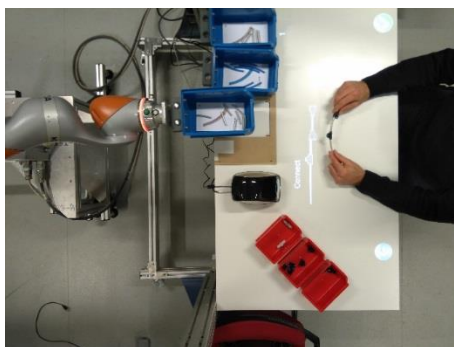
Figure 7: With HORSE, the use of resources is now optimized

The current production process consists of the following 3 steps:

1. Cold forming of steel, stamping and welding (P1).
2. Surface treatment of the steel profiles (P2).
3. Final assembly of slides (P3).

The challenge for TRI pilot case is to connect these three processes by a usable and easy to use **Human-Robot interface** that allows **adaptability** of the production processes and promotes **interoperability** between different systems and semi-automated procedures.

The HORSE framework was used in two separate aspects here. The first one is a robotic station performing a tedious and tiresome task of putting parts on the hangers for the chemical processing and then removing them from the hangers. This allowed to eliminate the non-ergonomic aspect of the process. The second one is providing assembly instructions in the task that still requires manual manipulation. This applications significantly reduced dependability on highly-skilled workers and improved the quality of assembled components.



*Figure 8: With HORSE, workers with no experience are now able to assemble production tools, faster and with less errors than experienced workers used to.*

### o BOS use case

Robert Bosch España Fábrica de Castellet S.A.U. (BOS) is located in Catalunya and is part of Robert Bosch GmbH. BOS is one of the pilot partners and is used to demonstrate **human-robot co-manipulation**. BOS pilot case is implemented in front Wiper Systems Assembling (WSA) lines. Currently, the last step of the manufacturing process is manual and consists of unloading the WSA from the conveyor belt, performing the visual quality check of the part, packaging it into a box layer by layer and laying layer separators when needed. Such a process is uncomfortable physically (due to non-ergonomic movement) and mentally (as the faults are relatively rare) to the human operators.



**Figure 9: With HORSE, workers can now be focused more on added-value activities, as the**

The HORSE intervention focused on developing an automated visual inspection and packaging system. The robot arm picks the WSA from the conveyor belt, presents it to the automatic vision system and, if the part is correct, puts it in the box. In case a defect is detected the robot enters the collaborative mode and the assistance of the human operator is requested. Once the operator arrives, the part is held in front of him or her and the suspected faults are highlighted directly on the part using the

projector-based Augmented Reality system. The final decision whether to accept the part as is, reject it or rework it on spot is made by the operator.

The HORSE Manufacturing Process Management System is used to control the flow of the process and the Hybrid Task Supervisor is used to control and synchronize the tasks of the robot, the AR system and the human operator on the local workcell level.

- OPSA use case

The third of the pilot partner industries is Odlewnie Polskie Joint Stock Company (OPSA), a service foundry that is used at the HORSE project in order to demonstrate **human robot co-working with programming by demonstration**. The company produces annually about 16 thousand tons of cast iron castings within weight of 2 - 100 kg in different configuration and use (approx. 990 different types of castings). Most of the operations in manufacturing process are mechanized and automated. These are automatic moulding processing station, automatic moulding lines (horizontal for bigger parts and vertical for smaller), pouring and shake out operations, automatic core shooters.

The biggest challenge for the foundries, such as OPSA, is **automation** and robotization of fettling operations, due to the amount of the **processes and product variations**. As a result, **adaptability** and **flexibility** are among the most important aspects of the system, so that auto-configuration approaches are applied and robotics can adapt easily to various castings configuration, as well as the rapid change of the demand in order to finally build an intelligent system.

The biggest problem which most of the foundries face in this area is separation of castings; meaning cutting and knocking off of castings from gating and riser systems, called "grapes", as these operations are done only manually. Currently, the operator takes out the full grape from the pallet using manual labour or manipulator, puts grapes on the floor, uses a heavy grinder or 15kg hammer to separate the castings from the gating system, puts the castings on a pallet and the gating system to scrap box.



**Figure 10: Workers had to manually cut the castings for many product variations. With HORSE, the task is now automated, and workers can be more focused on the final product quality.**

The HORSE intervention focused on providing an industrial grade robot equipped with a specialized tool that is capable of separating the castings. The number of part variants makes it unfeasible to program the robot using the traditional means, therefore a programming by demonstration approach was selected. The HORSE Manufacturing Process Management System is used to trigger the local tasks of programming and performing the cutting operation.

- What is there

- Introduction

The HORSE framework consists of several software components that can be grouped into three main groups: the generic components, the interfaces, and the case-specific ones. The first group contains the components responsible for management of the whole manufacturing process, the **MPMS – Manufacturing Process Management System** and for execution of tasks in the workcell, the HTS - Hybrid Task Supervisor. They can be successfully used regardless of the actual scope of the use case. The interfaces contain both the HORSE middleware, which is essential to communication between the components of the framework, and the interfaces connecting the framework to other

systems e.g. the Bosch infrastructure or ROS components. Finally, the case-specific components provide functionalities required by concrete applications. Those may involve robot control, trajectory planning, augmented reality etc. Their development is usually driven by a specific use-case; however, they can be adapted to similar scenarios with minimal effort.

The core, obligatory elements of each HORSE deployment are the MPMS and the middleware. The first one is necessary to define, execute and monitor the process (further described in Section o). The second one is the middleware that provides communication capabilities for the heterogeneous components of the framework (details provided in Section o). Depending on the realized scenario the HTS can be also used to trigger and synchronize tasks on the level of individual workcells. Section o provides information on how to use it.

The case specific components may be adapted and used in different scenarios if they fit the requirements. Although reusing the existing software is strongly recommended, new components can be integrated as well, as long as they are connected to the messaging middleware of HORSE.

- Generic components

- Manufacturing Process Management System (MPMS)

The MPMS is the collection of subsystems responsible to orchestrate the tasks of agents in the manufacturing processes. Orchestration is dependent on the design of the processes and agents. The MPMS includes the functionality to design processes and describe agents, and execute the processes by assigning activities to agents. Figure 11 shows the process management layer, embodied by the MPMS, as a function of horizontal and vertical integration. Horizontal integration refers to the inter-operability between the manufacturing processes and other management or support processes in the enterprise. Vertical integration refers to the link between the process management and resources located on the factory floor.

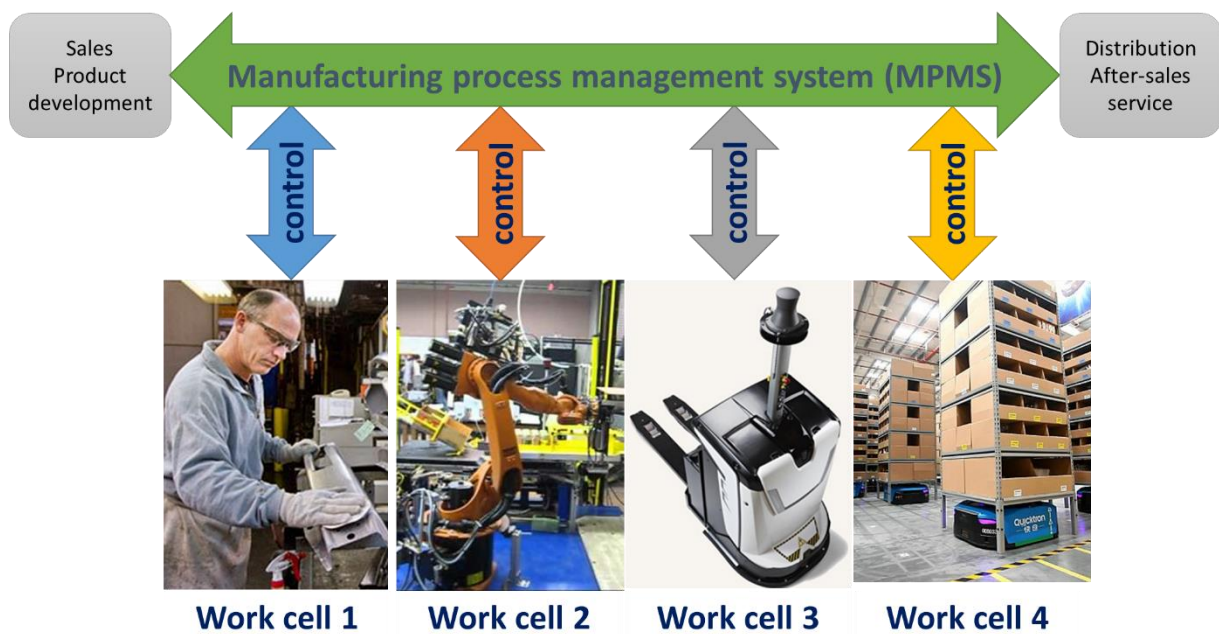


Figure 11: Conceptual illustration of the MPMS in relation to the work cells

The MPMS consists of three system modules and a single data store within the larger HORSE System. The MPMS elements can be described as the following:

- **Process design:** The modules which enable visual modelling of a manufacturing process, comprising of tasks, events, gateways and connectors.
- **Agent design:** The modules which enable creating or editing profiles of production agents, including their competences, authorisations and performance indicators.
- **Global execution:** The run-time process engine which enacts the designed process and assigns agents to perform the tasks. This subsystem also provides an overview of active processes and their status.
- **Process / agent data:** This represents a collection of data stores in which process and agent definition and execution data is stored. These are logical data stores which may or may not be realised in a single database.

An important scoping dimension to mention is the distinction between **global and local functions**. The software aspect of the architecture clearly contains layers corresponding to notions of global and local. Local includes all activities and objects within a single work cell, while anything that crosses work cells is considered global. This is used as a starting point to establish a scoping statement that is not dependent on the physical hierarchy of the manufacturing system.

A manufacturing process consists of activities, events, gateways and connectors. Activities may be sub-processes or tasks. A single process may contain multiple tasks, located and performed in multiple work cells. A task is assigned to and performed by a team of one or more agents. This team may be a virtual team that only exists for the duration of the task execution. A single task is entirely contained within a single work cell, for the duration of the task. For this reason, task is considered the smallest unit of work that appears in the global layer. The case of vehicles is more complicated, but still conforms to this definition. The transport task performed by a vehicle is located in the work cell that is defined by the route of the vehicle.

Finally, it is prudent to state functions which are explicitly excluded from the system. The HORSE Project does not aim to develop detailed planning and scheduling technology. Such technology is widely available and advanced. Instead, the MPMS aims for run-time control which orchestrates all agents in an efficient manner. Planning optimisation and detailed scheduling are assumed to be done and available as input to the HORSE System. The MPMS then executes the process according to control flow, in support of the production plan.

### ▪ [Hybrid Task Supervisor \(HTS\)](#)

The Hybrid Task Supervisor is the component related to the local execution of a task in a work-cell by both the human operators and the robots. It receives the task execution requests from the MPMS and it keeps track of the progress of the task execution. Tasks are defined through the user-friendly graphical interface available in the HORSE framework.

When a request is received, the Hybrid Task Supervisor retrieves the information related to the considered/matching task in order to activate the autonomous agents in the work-cell.

Furthermore, after the processing of a request, this component sends a message to the MPMS global level to notify the start time of the execution of the task involved. A similar notification is sent after the completion of the task, allowing the work-flow of the entire process to continue.



In addition, the Hybrid Task Supervisor allows to keep track of the progress of the task during the execution, receiving also information about anomalies, like obstacles or unexpected humans that block some robot trajectories. In this case the component is responsible to send an alert to the global level.

- Interfaces

- Middleware

The HORSE middleware is a software solution supporting HORSE to overcome the heterogeneity of the HORSE software components adopting widely adopted standards. It is realised through a messaging infrastructure with star topology in which the individual components (nodes) communicate with each other through a local broker. The components could be organised in functional domains, each represented by a broker and all brokers communicating with each other through a dispatcher. The JSON formatted messages are exchanged over the WebSockets low-level communication protocol. This allows the implementation of the HORSE Message Node specification as part of every HORSE module, with no additional constraints for the programming language or the execution environment.

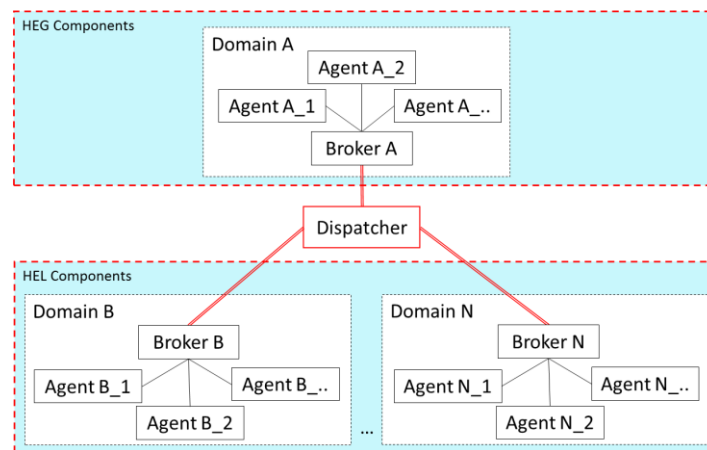


Figure 12 HORSE Messaging Middleware components

The message-driven collaboration between the major HORSE components permits the detachment of their implementations from the agreed interfaces. This in turn promotes the continuous development and testing of all components with increasing maturity of the implemented functionality.

The biggest benefit of such an approach is that integration of new components in the framework requires only development of WebSockets-based communication client and processing the messages exchanged between the new component and the rest of the HORSE framework.

- HORSE-ROS bridge

The HORSE-ROS bridge interface allows the easy communication between native ROS nodes (the Open-Source framework "Robotic Operating System") and nodes using the HORSE middleware.

This interface permits middleware clients to use the full ROS functionality available to native ROS nodes. The forwarding of HORSE events originating at native ROS nodes to middleware nodes is supported as well and it offers a ROS service interface to forwards arbitrarily complex messages.

The HORSE-ROS bridge is a useful interface to connect ROS based components to nodes using the HORSE middleware. For example, the user is allowed to use ROS hardware interfaces to communicate with the

other HORSE components. It can be easily used to connect software and hardware components already integrated with ROS to the HORSE framework.

- **Interface to industrial equipment: HORSE-BOSCH adapter**

The HORSE-BOSCH adapter (Figure 13) was developed as a bridge between the HORSE Message Broker and the corresponding Bosch industrial equipment: the Visual Control system, the conveyor belt and a beacon. The module provides support of etherCAT, PLC and OPC-UA. Additional protocols could be easily integrated.

The Bosch Adapter is a set of OSGi components deployable on a networked PC equipped with an EtherCAT Master Card and Java (for the OSGi framework).

Although the component is not necessarily applicable in every use case it is a working example of integration of the HORSE framework with an existing infrastructure and control software of a factory. Thus, it can be used as a base for development of similar interfaces for different applications.

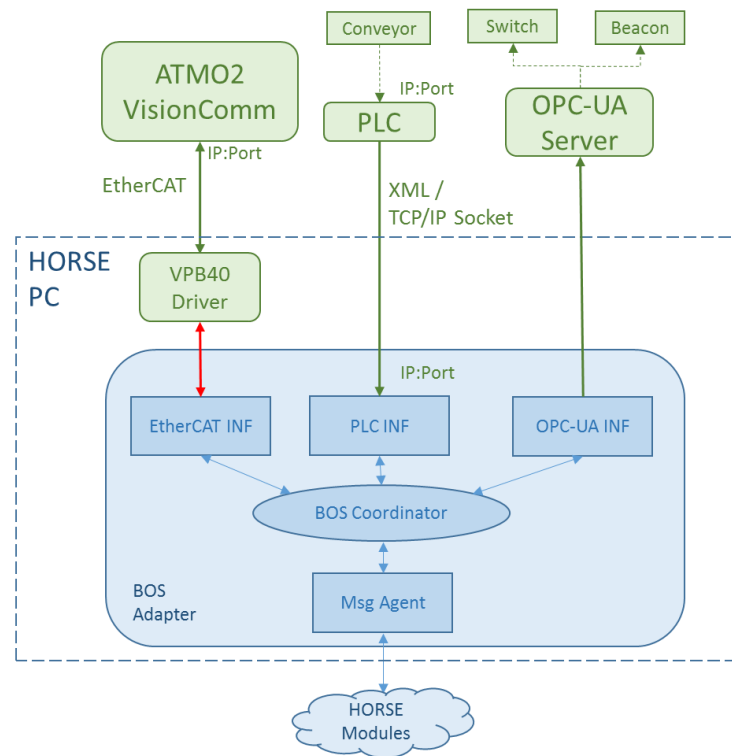


Figure 13 The Bosch adapter and Bosch machines

- **Specific components**

- **Augmented Reality for assembly**

The Augmented Reality (AR) for assembly component was initially developed for the TRI use-case. However, it has been already successfully transferred to other applications. The main purpose of the component is to display information which aims to improve on the one hand the efficiency and quality of work (e.g. assembly instructions) and on the other the safety and working conditions (e.g. safety zones). This is applied directly on the assembly table where parts are worked on and supports processing the input from the user (e.g. his or her gestures) and displaying this information on the table.

Using the component requires setting up a workcell consisting of an overhead projector and an RGB-D sensor (e.g. Kinect) used to track the motion of the operator. The proper operation of the component requires calibration of the workcell components relative positions and defining the overlays to be displayed as well as the reactions to user actions (e.g. using virtual buttons displayed on the assembly table). The component is fully integrated with the HORSE middleware messaging system.



Figure 14 The AR for assembly

- **Augmented Reality for quality inspection**

The Augmented Reality for quality inspection component was also developed for assisting the human operators of the Bosch factory in efficient visual quality check of the handled part. The component is responsible for projecting additional information (e.g. highlighting the inspection points) directly on the part held by the robot or placed in a known position. The functionalities of the component are provided as a set of ROS actions triggered via the HORSE-ROS bridge (Section 0). In case the robot is used to manipulate the part the robot control and AR are synchronized by the Hybrid Task Supervisor (Section 7).



Figure 15: An exemplary part with a control point (label) highlighted

In order to use the component in a different use case it is necessary to set up a workcell with an overhead projector, a camera and, optionally, a robot arm. This needs to be followed by an optical and spatial calibration of the elements of the workcell and setting up the overlays to be project and, again optionally, robot arm positions.

- **Collision detection and avoidance**

The Collision Detection and Prevention ensures safety during any human-robot collaboration in a shared workspace.

This component can be used in every use-case that involves the need of a human operator into the robot workspace, in order to identify and avoid upcoming collisions and guarantee better efficiency fostering the robot to work in areas away from obstacles.

Factory automation has revolutionized manufacturing over the last years, but there is still a large set of manufacturing tasks that are tedious or strenuous for humans to perform. Some of these tasks, such as electronics or aircraft assembly, are difficult to automate because they require workers to collaborate in close proximity and adapt to each other's decisions and motions, which robots cannot currently do. Rather than automating such tasks fully (which may not be possible and/or cost-effective), HORSE consortium believes that human-robot collaboration enables safe and effective task execution while reducing tedium and strain of the human.

For example, mobile manipulators can supply different work stations with parts and perform standard assembly tasks, while human workers perform more complex tasks in the same workspace.

To allow for such shared human-robot workspaces in cluttered environments, robots have to be able to avoid collisions with static and dynamic obstacles while they are executing their original tasks. This involves both the monitoring of the robot environment to detect obstacles and the motion control that has to be able to avoid collisions while moving the robot along reference trajectories determined in a high level planning layer in order to fulfil the robot task.

At the basis of the HORSE Collision Detection and Prevention component is the GPU-Voxels framework that can be used for monitoring and planning applications in 3D and performs all computationally expensive calculations on the GPU. GPU-Voxels is a novel approach to live environment representations, in fact most similar approaches are not voxel-based and not capable of offering similar level of detail and response times.

This component allows the robot to automatically switch from its currently executed plan to a new one, when dynamic changes in the environment prohibit further progress towards the current goal, avoiding idle waits for the clearance recovery.

- **Situation Awareness**

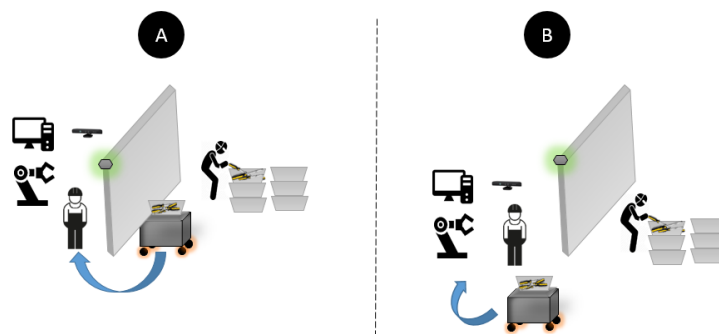
Smart factories could significantly increase production time and improve operators' working conditions in the manufacturing industry. They involve the collaboration without fences of robots and humans, whose safety needs to be ensured. Specifically, safety stops must be avoided because they may considerably slow down the production (safety protocol verification, re-launching the production line, etc.).

HORSE project provides a solution through a situation awareness mechanism to prevent from safety stops and adapt the agents' behaviors when a critical situation is detected.

The situation awareness mechanism of HORSE framework takes into account all the data related to the agents to predict a hazard, warn the operator and revise the robot's task accordingly. This module is hardware independent and is configured with the agents and the sensors participating to the process.

- *Example of application*

In a use case of deployment of a mobile base (AGV), one essential issue is to guaranty the safety of the operators who are in the same space of the robot. As shown in figure below (on the left side) there is a situation where a collision may occur between a human agent leaving a workcell and a mobile base entering into the same workcell. The mobile base is able to detect collisions but this will lead to an emergency stop which will slow down the task. The situation awareness gathers all the data in the environment including the operator and the robot positions. The situation awareness mechanism adapts the robot behavior to avoid a collision (scenario B on the right side).



- *How does it work?*

The situation awareness module (shown in the figure below) is decomposed into two HORSE components: Event Processing and Global safety guard. The Event processing is able to detect critical events and the global safety guard relies on a reasoning system and a planner in order to generate a new action plan for the appropriate agents.

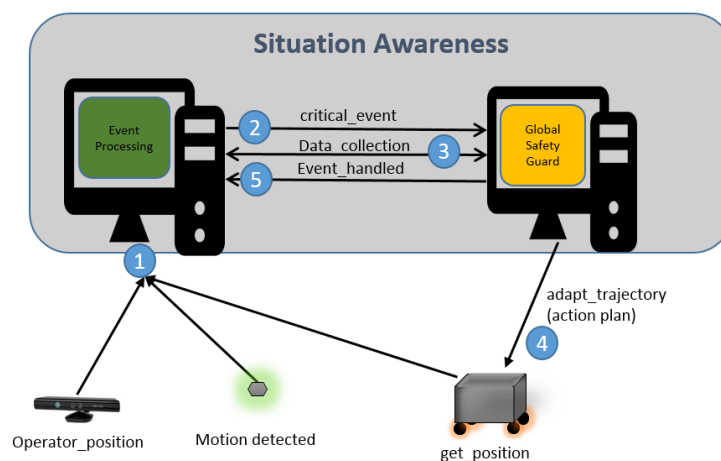


Figure 16- Situation awareness mechanism.

1) Data are gathered from the devices and the agents participating in the workcell; 2) A critical event is raised whether an anomaly may occur; 3) Relevant information from the environment is collected by the Global Safety Guard where a reasoning about the environment is done; 4) An action plan is generated to the concerned agents.

- How to get started
  - Defining the scenario

The HORSE Project uses a dual-perspective approach to describe demonstration scenarios. Due to the inherent physicality of manufacturing, factories are traditionally considered from a layout perspective. The factory floor layout shows the location of work units and how work is directed from one work unit to the next. The HORSE Project views the physical position of work units and the flow of work as separate aspects of the manufacturing system.

The physical aspect is reduced to a system breakdown structure of the factory. The goal of such a depiction is to catalogue the entities present in the factory and how those entities are organised. The physical aspect is documented according to the physical hierarchy of IEC62264:2013. Figure 17 shows the physical hierarchy model recommended by IEC62264:2013.

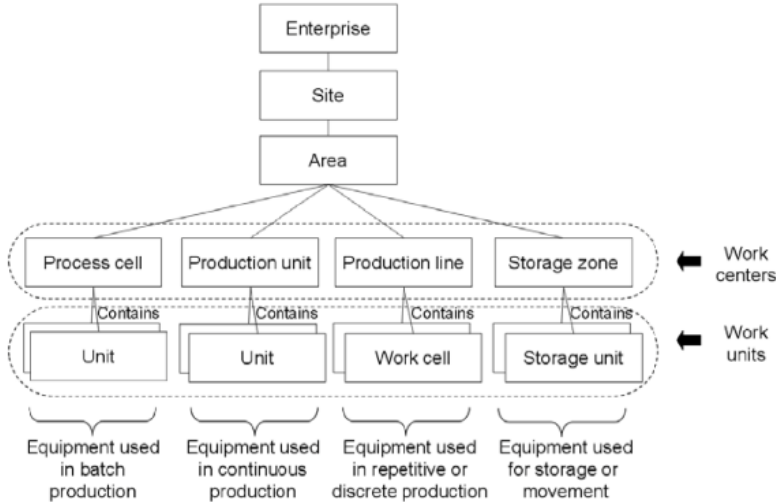


Figure 17: Physical hierarchy of a manufacturing system, as recommended by IEC62264:2013

By adopting the structure of the physical hierarchy, open call applicants can describe the composition of their factory. It is not necessary to detail every work centre and work unit of the factory, but rather to show the position of the demonstration scenario in its physical context. To serve as an example, Figure 18 shows the physical hierarchy for Thomas Regout International (TRI), one of the three pilot cases of the HORSE Project. The demonstration scenario in this factory is part of the production line labelled “PL2.1: Loading.”

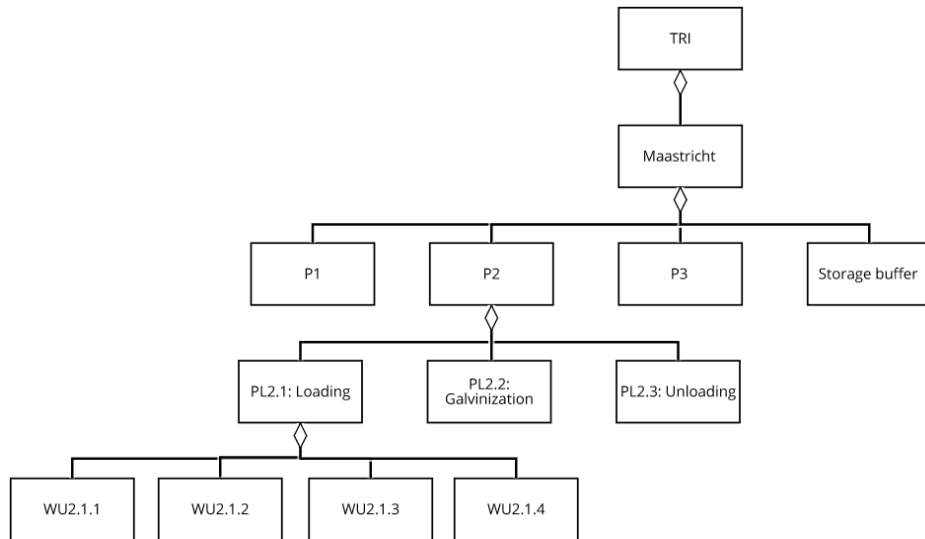







Figure 18: TRI interpretation of physical hierarchy, with demonstration scenario as part of P2

A clear understanding of the physical composition of the factory makes it easier to model the manufacturing process. The end-to-end manufacturing process model should at least cover the activities performed at all production areas. The goal is to depict the dependencies between those activities. For example, the activities performed at P1 must always happen before P2, because P1 produces the material that must be treated in P2. This may seem obvious, but it is highly informative to a person not familiar with the factory.

The HORSE Project makes use of internal standards to model processes. Specifically, the Business Process Model & Notation 2.0 (BPMN2.0) is used for the purposes of the open calls. The following four model elements are used to model processes:

Table 1: Symbols used for the four elements used in process models

Element	Symbol	Description
Activities		Actions performed by agents
Events		Things that may happen during the execution of a process
Exclusive choice gateways		A decision point that activates one of several process flows. Also used to merge alternative process flows into a single flow.
Parallel gateway		Splits the process flow into two or more active flows. Also used to merge two or more active process flows.
Connectors		Links between activities, events and gateways that enable the process flow

The physical hierarchy (see Figure 17) can be created with any software package with simple drawing tools, such as MS Powerpoint. For the process models though, we recommend that the applicant downloads the Camunda BPM modeller, which can be found [here](#). The following two process models should be created by the applicant:

1. A contextual model of the end-to-end manufacturing process, of which the demonstration scenario is part of, and
2. A descriptive model of the process involved in the demonstration itself.

We provide illustrative process models to give some insight into such models. Figure 19 shows the contextual process model of TRI. The same three production areas are shown in three lanes. The storage area is not shown, because was deemed not important for the process view.

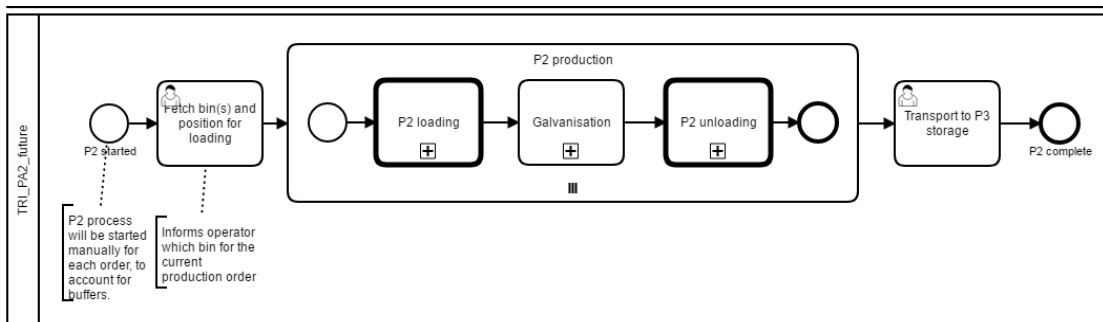


Figure 19: End-to-end process model of TRI

The demonstration scenario at the TRI factory is situated in production area P2. Figure 20 shows the process model of the demonstration scenario at TRI. For the applicant, it is not necessary to be concerned with the detailed symbols shown on the figure, but to understand that this process modelling will be required.

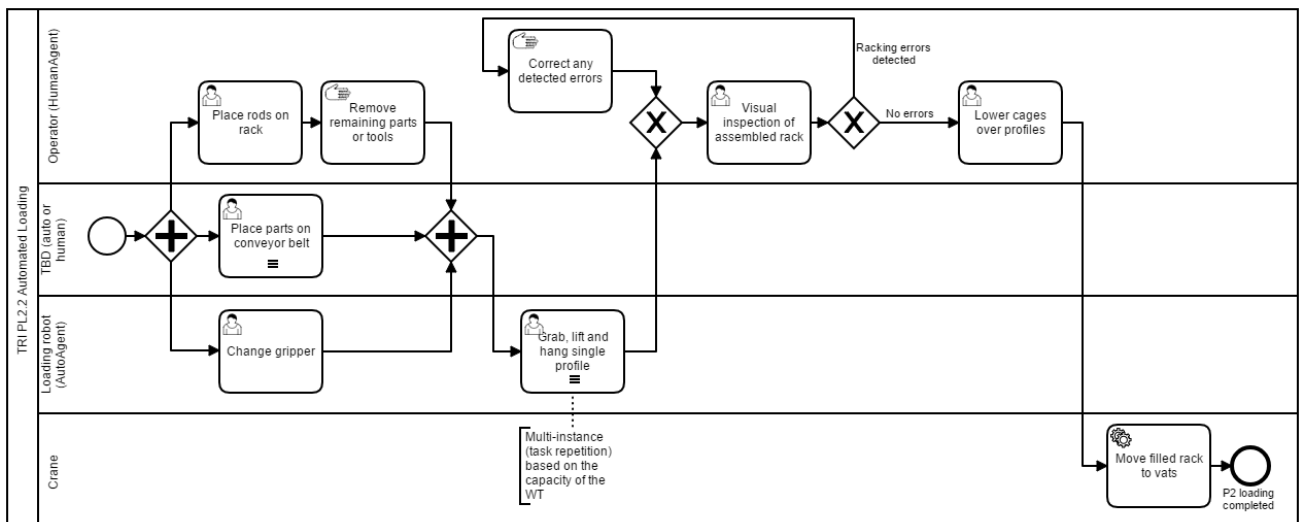


Figure 20: Process model of the demonstration scenario at TRI



Any of the models created by the applicant can be supplemented by a textual description to convey additional information about the problem or special considerations. The final step is to describe the expected change. By referring to tasks from the last process model (see Figure 20), the applicant can describe how the process and its tasks should change to demonstrate advanced manufacturing technology.

### ○ Defining the tasks

Modern and flexible industrial production requires a quick and easy operation of robot systems. When several robots or several robot components need to operate cooperatively, the effort for programming the system becomes considerable, given the difficulty of efficiently synchronizing all the working components. Therefore, there is the need to program the robot tasks in an intuitive way providing the possibility to easily change the work flow using user-friendly interfaces.

In order to define tasks in an easy way, HORSE extends the FlexBE framework, which allows the definition and testing of custom tasks through a user-friendly graphical interface.

The user can connect together building blocks that represent the steps, which together define a complex task. The steps represent for example the movement of a robotic arm or the activation of a specific tool. They can be parameterized to permit an easy specification of the desired values in the task editor and it is possible to fully customize step definitions to allow for the integration of additional hardware and software interfaces after the initial deployment of HORSE.

Once the basic steps to control a robot or a tool are defined, the user can easily connect them to fulfill the desired task workflow using the graphical interface. This allows the easy definition or modification of a task without the need of a software expert.

Through this module is also possible to define the requirements related to the execution of a task, for example the need of an autonomous agent equipped with a gripper or capable of handling heavy payload. Once these requirements are defined, it is possible to retrieve this information to allow the HORSE framework to select the suitable agents for the execution.

In conclusion, using FlexBE for the task definition allows the user to define the task execution flow, all the required parameters and the necessary components that are needed for the complete task definition, avoiding the need of specialized operators.

### ○ Using and developing components

The HORSE framework features a number of components realising specific aspects of the production process or providing the safety of the humans and machines. It communicates with the other systems as demonstrated in the figure below.

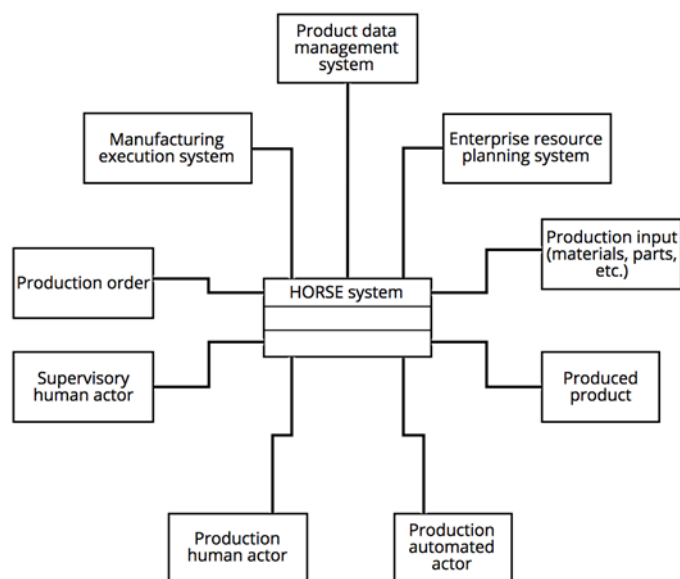


Figure 21 Context of the HORSE system

The customisation of the system according to the needs of the specific deployment requires understanding of the functions of the available components and interfaces, including the taxonomy of the alerts. These are available in details in separate documents. Few non-binding guidelines:

- Existing software systems could be integrated by:
  - direct utilisation of the middleware and HEG (HORSE Exec Global) interfaces and databases, or
  - by introducing an adapter (see HORSE-BOSCH interface) that exposes the system functions in the messaging middleware.
- Hardware equipment and other devices could be integrated through the appropriate device or agent interfaces. Some of the existing implementations (e.g. ROS bridge, industrial and device protocols) could be used or a completely new adapter.
- For an integration to the messaging middleware the new component needs to:
  - implement a local WebSocket client,
  - know the topics of the expected messages and the messages the other party is expecting;
  - know the intended recipients or send broadcasted messages;
  - know the senders of the incoming messages (or filter all incoming messages on filter and other properties)
  - know the access parameters of the local broker (IP and port);
  - know the semantic of the payload
- It is expected that the existing DB structures should be customised to support the specific product and agent definitions.

○ Testing the framework – Competence Centers

Competence Centres in HORSE are physical locations providing expertise, equipment, service, advices and support in robotics technologies and applications in manufacturing. Competence Centres will offer expert advising support on deployment and fast assessment of robotics solutions in manufacturing.

During the HORSE open call preparation and execution, Competence Centres will support the application experiments with knowledge and equipment, as they hold robotics equipment and supplies used in production lines. They will be available to support the adoption and customisation of HORSE framework for the Application Experiments selected by the Open Call. Each of the experiments will be able to use the facilities of CCs for up to two weeks during the implementation of the experiment.

Four Competence Centres are supported within the project. Three existing Competence Centres in France (Paris-Saclay, CEA), Germany (Munich, TUM), the Netherlands (Delft, TNO) will be further equipped and expanded, thus exploiting existing facilities, equipment, experience and network. The fourth one will be established by HORSE in Slovenia (Celje, TCS), and will be the seed for the future and a model for the deployment of Competence Centres in Europe. Please refer to Deliverables D7.1 for more information on the Competence Centers.



Figure 22 Location of the Competence Centers

<p>CEA – CC Rue Noetzlin, 91190 Gif-sur-Yvette, France www.digiteo.fr</p>	<p>TNO – CC Bakemastraat 97K, 2628VK Delft, Netherlands</p>
<p>TUM – CC Schleißheimer Str. 90A, 85748 Garching bei München, Germany</p>	<p>ROBOFLEX SLOVENIA Kidričeva ulica 25, 3000 Celje, Slovenia</p>

The ROBOFLEX CC is being set up during the HORSE project, therefore the bulk of the assistance to the experiments will be provided by the other three CCs. The following equipment can be accessed in their facilities:

CEA CC:

## H2020 Horse Funding Agreement

- Two highly transparent robots SYBOT usable as collaborative robots or as a telerobotic slave robots
- One HAPTION haptic device usable as a master arm for teleoperation
- One A6.15 RB3D 7 DOFs collaborative robot
- One COBOMANIP from SARAZIN technology – collaborative robot for assistance to load handling
- STAUBLI RX90L and TX90LTX90 6-axis industrial robot for tele-operation or hybrid command (force and position control)
- One KUKA arm IIWA
- One YUMI from ABB
- One UR10 from Universal Robotics
- One Artemis AGV (automated driverless vehicles) from BA system for intra logistics
- VR platform for virtual prototyping and training for industrial applications
- One 3D TV equipped with a real time simulation environment for physical interactions.
- One high performance 7 degrees of freedom upper limb exoskeleton ABLE from HAPTION
- One KINOVA 6 DOF JACO robot equipped with a 3 fingers gripper and mounted on a ROBOSOFT ROBULAB 10 mobile platform for feasibility tries

### TUM CC:

- Collaborative robot arm : KUKA LRB iiwa with a human-robot interaction safe R800 gripper
- SAPARO tactile floor
- Hokuyo UTM-30LX laser scanner
- RGB-D sensors (Kinect, RealSense)
- Logistic robot (FESTO Robotino)
- Mock-up of catory manufacturing cell with overhead, projector-based AR setup
- HORSE framework
- Access to engineering software (Matlab, ANSYS etc.)

### TNO CC:

- 2 Collaborative robot arms: KUKA LRB iiwa with a human-robot interaction safe R800 gripper
- LRMate200iB
- HORSE framework
- Access to engineering software (Matlab, Python, CAD, etc.)
- Industrial (3D) cameras and Kinect camera's
- Computers for supervision and control
- Beamers
- OPS Light Guide systems
- AR Software
- Physical assembly work station
- Human movement registration systems: XSENS MVN and KINECT
- Muscle activity measurement system: EMG
- Eye tracking & emotional face reader
- Cognitive load registration system (e.g. VIG track)
- Force plate or alternatives to record forces for biomechanical analysis
- Heart rate registration devices

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