Wanted: Project teams for creating and demonstrating innovative industrial robot workcells

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- Deadline: 14 October 2013, at 17:00 CEST

Summary
The SMErobotics initiative, consisting of major European robot manufacturers and leading research institutes, is looking for teams to transfer the initiative's ideas and results into innovative industrial robot workcells for small and medium sized manufacturing. Teams, typically composed of an end-user and a robot system integrator are invited to propose novel robot applications. Four proposals will be selected to form demonstration projects which will receive up to 250 000 € (each) in funding for the engineering and demonstration of the robot workcell in a real-world manufacturing scenario.

An overall objective of SMErobotics is to create technical foundations for productive and intelligent robot solutions that are feasible in small to medium-scale production settings. To that end, we strive to bring cognitive robotics to the shop-floor, thereby enabling the use of automation and robot technology to improve the competitiveness of small and medium-sized enterprises (SMEs).

Participants in each demonstration project are encouraged to take up suitable software components from SMErobotics which support among others robust assembly by robots, intuitive task description (avoiding programming), self-configuration, error recovery, and seamless human-robot cooperation.

This solicitation is open from August 15th to October 14th 2013. The appointed demonstration projects will be notified by early November, work is expected to start early 2014 with a maximum runtime until the planned end of SMErobotics in December 2015.

1. Introduction
The SMErobotics project aims to create the technological foundation for profitable and intelligent robot solutions for small and medium-sized manufacturing. As part of the project's outreach, assessment and dissemination, four demonstration teams will be selected, each of which will consist ideally of a robot system integrator ("supplier") and a manufacturing company ("end-user").

Candidate demonstration teams are invited to propose demonstration projects for advanced robot applications that address and support one or more of the SMErobotics project objectives, see Chapter 2.1.

At the end of a successful application, evaluation and accession process, four demonstration teams will be made partners of the SMErobotics Consortium and will be invited to benefit from SMErobotics project results and resources to engineer, implement and assess their own demonstrator in a real-world SME-type end-user environment.

In this context, demonstrator means an integrated piece of hardware and software that solves a specific task or range of tasks. Demonstration means the whole process of designing, implementing, running and assessing a demonstrator. A demonstration is carried out by a demonstration team.

These, in the context of SMErobotics so-called supplemental demonstrations should preferably address challenging use cases for automation in typical SME manufacturing scenarios, such as:

1. Assembly or handling of small parts or workpieces in typical manual-assembly scenarios
2. Assembly of larger parts, workpieces in a bigger robot workspace
3. Welding or cutting
4. Handling, machining, processing

Members of candidate demonstration teams should be interested in participating in a highly visible research project on advanced industrial robot technologies, in interacting with the project partners to access the latest prototype technologies, in supporting the project vision and mission by contributing
interesting demonstrations and in helping to extend the project's outreach, technology transfer and dissemination.

2. **Background Information: the SMERobotics project**

This solicitation for engineering, implementing and assessing innovative demonstrations in SME manufacturing scenarios is related to the FP7\(^1\) project SMERobotics (European Robotics Initiative for Strengthening the Competitiveness of SMEs in Manufacturing, Grant Agreement No. 287787).

The project is made up of major European robot manufacturers and leading research institutes as so-called core partners ([www.smerobotics.org](http://www.smerobotics.org)). These core partners are responsible for the RTD work, which will be integrated into the four so-called core demonstrators. The project's demonstration base is to be expanded by calling for supplemental demonstrations. The project was launched in January 2012 and is planned to run to the end of 2015 (four years).

2.1. **Objectives of SMERobotics**

The objective of SMERobotics is to make the industrial robot SME-compatible: to combine the high productivity, consistent quality and unerring accuracy of modern robot-based industrial automation with the flexible, customer-focused methods of production characteristic of SMEs. To achieve this objective, set-up, operation and maintenance must be made much simpler and adaptability to different work environments, processes and tasks must be improved. In short: the project is driven by a vision in which workers with no expert knowledge of robot systems can easily “teach” their robotic co-workers what to do.

SME needs are grouped into four objectives, which are addressed by the project's work plan:

1. **Lean equipment for rapid changeover (by the worker).** A lean set-up supports a rapid changeover of the robot system (when switching to new parts, processes, equipment). All changeover and set-up uncertainties must be manageable even when using low-cost devices.

2. **Robust production through embedded cognition competences.** Robustness means that the robot is tolerant to variation and change and that the robot system is able to work not only close to a predefined operating point but within a dynamic operating range. Operation uncertainties must be manageable, including situations in which application-level errors occur and are gradually addressed.

3. **Continuous process adaptation and task-learning.** Even where a robot is working robustly within an operating range, that operating range may change because of new products, variants or tasks. In such a case, the robot system must be adapted to suit the new situation, something which, at present, may require just as much time as the initial set-up phase. Within each working situation, there must be a continuous adaptation of parameter sets and ranges in order to optimize production. Hence, models and learned or adapted parameters should be transferable to a new setting.

4. **Total cost of ownership (TCO)-effectiveness under conditions of uncertainty.** An SME needs a system that is cost-effective in all phases of its life-cycle. Therefore, the technico-economic objective is to increase the life-cycle effectiveness for the owner of the robotic system.

2.2. **SMERobotics core demonstrations**

The four core demonstrations will showcase the take-up, integration and evaluation of methods, components and tools from the project's research results. These core demonstrations aim at creating reference implementations of robotic workcells in a variety of applications that have not so far been economically and technically feasible, under realistic SME manufacturing conditions. The four core

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\(^1\) The European Union’s Seventh Framework Programme for Research
demonstrators (Ds) will be based on industry-grade equipment. They are currently in preparation by the SMErobotics core partners (for contacts see also Chapter 4.2.1):

- **D1: Assembly (medium-sized workpieces) with dual-arm industrial manipulator**
  - Assembly processes that normally require specific fixtures, to be handled by a flexible dual-arm set-up
  - Handling of uncertainties with regard to component placements, dimensions, etc.
  - Generating assembly plans from CAD models and refining by worker interaction
  - Assembly combines synchronized dual-arm motions with a robot skills engine
  - Exception handling through human-robot interaction
  - Major focus on motion coordination in uncertain environments and sensor fusion, additional focus on service oriented architecture for devices.
  
  Contact / responsible partner: Alfio Minissale / Comau Robotics

- **D2: Human-robot cooperation in wooden-house production**
  - "Lot size 1 production" in SME woodworking workshop
  - CAD data only partially available
  - System awareness of workcell layout during configuration
  - Ability to operate together within a robot workspace
  - Awareness of material uncertainties (wood)
  - Dynamic distribution of tasks between robot and worker, depending on availability of skills
  - Major focus on models for reuse and composition of knowledge and on software services for cognitive systems

  Contact / responsible partner: Dominique Schär / Güdel AG

- **D3: Assembly (small-sized workpieces) with sensitive compliant robot arms**
  - Flexible small lot-size production
  - Ability to completely assemble a workpiece (many tasks) and / or
  - Ability to handle the same tasks on different workpieces
  - Easy and interactive programming using sensors and motion/grasp planners
  - Easy transportation and set-up
  - Dynamic distribution of tasks between robot and worker, situative human-robot interaction and configuration, planning and program generation

  Contact / responsible partner: Uwe Zimmermann / KUKA Laboratories

- **D4: Welding robot assistant**
  - Scanning of workspace and workpiece recognition
  - Detection of welding seams and illustration on workpiece using laser projectors
  - Assisted generation of welding plan
  - Sequences and parameters are continuously learned and improved by the robot
  - Welding system handles uncertainties by using online sensor-based control
  - Interaction between worker and robot for larger uncertainties and exceptions
  - Major focus on symbiotic human-robot interaction and models for reuse and composition of knowledge, additional focus on configuration, planning and program generation
3. What applications are we looking for?

To summarize the above information, we are looking for proposals of innovative supplemental demonstrations based on the objectives and results of the SMErobotics project that:

- Address real-world manufacturing scenarios, preferably in the application areas of assembly/handling, welding/cutting, handling, machining or processing.
- Retailor a core demonstrator (D1 to D4, see above) in a different application scenario (different workpieces, different manufacturing process, different industries, etc.) or use/build upon SMErobotics results (hardware, software) to solve problems in a new manufacturing scenario.
- Include interaction with the SMErobotics Consortium to transfer results.
- Include the specification, implementation and assessment of the demonstrator in a real-world SME-type manufacturing scenario within a timeframe of 18 to 24 months, depending on start date but ending on end of 2015.
- Participate in the dissemination of SMErobotics results, particularly regarding the supplemental demonstrations.

A candidate demonstration team will typically consist of a system integrator and an end-user, but other arrangements may be suitable as well, e.g. an end-user with in-house system development or an end-user cooperating teaming up with a research institute.

4. Accession of demonstration partners to the Consortium

Upon positive evaluation of the supplemental demonstration proposals, the respective candidate demonstration teams will be invited to join the SMErobotics Consortium (the Consortium Agreement explicitly provides for this option), so that interaction with the SMErobotics core partners, transfer of research results and cooperation between partners can be formalized and organized along a typical time-line:

- In January 2014 at the earliest (SMErobotics mid-term, month 25), candidate demonstration team members would join the Consortium (becoming so-called supplemental demonstration partners) and would perform their demonstration projects until the project end of SMErobotics (set for December 2015). The date of joining depends on timely execution of the European Commission’s processes for participation in funded research projects by the joining party, see also Chapter 5.6.
- The first half-year of 2014 is envisaged mostly for introductory work, i.e. networking with the project partners and producing a detailed functional/technical specification of the proposed supplemental demonstrators.
- In the second half of 2014, feasibility experiments, technical specification, engineering etc. will take place. Hard- and software support from the SMErobotics core consortium will be available.
- Set-up of the supplemental demonstrators and assessment of the demonstrators will be the main task in 2015. Towards the end of the project, there should be enough resources/time dedicated to evaluation, support for showcasing of the demonstrator (e.g. video shoots, publications, etc.).

4.1. Submission of demonstration proposals

The proposals from candidate demonstration teams should convincingly present an innovative robotics demonstrator based on this solicitation’s objectives and should lay out the planned engineering, implementation, assessment and dissemination work.
• This Solicitation is open for about eight weeks (15 August 2013 to 14 October 2013).

• During October 2013, the proposals will be evaluated by members of the SMErobotics consortium and independent experts from research and industry, ranked by the expert panel and approved by the European Commission.

• Candidate demonstration teams will be informed of their evaluation results by the beginning of November 2013.

• Successful candidate demonstration teams will enter a negotiation phase (November/December), in which the proposals will be aligned to the project.

• Successful candidate demonstration team members not yet involved in funded European research projects, must complete their so-called “legal and financial validation” with the European Commission in November. The SMErobotics secretariat will closely guide and support this process. A failed legal and financial validation disqualifies the respective team.

• The supplemental demonstrations are planned to start three months after this solicitation has closed, i.e. starting on 1 January 2014 at the earliest.

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The SMErobotics solicitation is an open solicitation for supplemental demonstrations that will intensively interact and exchange ideas and results with the project’s core partners. In this sense, the proposed demonstrations are not independent, but should apply intermediate results of SMErobotics (see 4.2) to new real-world manufacturing scenarios and are expected to introduce new insights and challenges into the core consortium.

Therefore, demonstration proposals should make provision for sufficient travel budget and person-month inputs for plenary meetings (2-3 per year) as well as for integration and evaluation meetings.

4.2. Available hardware and software components

The SMErobotics core demonstrators are based on off-the-shelf robot hardware components. In the interests of competent support by the Consortium, applicants are encouraged to use similar hardware components through the purchase or (recommended) rental of major components (i.e. robots).

Numerous software components have been developed during the project. A selection of them will be made available to the demonstration projects. However, new partners to the project should be aware that any preliminary results from the current SMErobotics Consortium made available within the project may be subject to change. While this, of course, represents a certain risk, it also gives the demonstration teams the possibility to access and contribute to the latest software developments in industrial cognitive robotics. Support (within certain limits) from the SMErobotics consortium for the hardware and software used and developed in the core demonstrators (2.2 and 4.2.1) will be available after AUTOMATICA 2014.

4.2.1. Supported hardware components of SMErobotics

The four core demonstrators of SMErobotics (D1 to D4, www.smerobotics.org/demonstrations.html) each use specific hardware components and come with specific interfaces and software packages.

• Core demonstrator D1 uses a COMAU dual-arm system with a payload of 10 kg per arm (one positioner, two arms) for a total of 13 axes with the following interfaces and ports available: Profieldbus, TCP/IP, I/O and standard connections to power. The following software package is included in this specific robot hardware: robot controller (CG5). Furthermore other software options could be included as for example: C5G open controller and interference region software.

Further information, data sheet and rental or purchase price on request (please contact Mr. Alfio Minissale, alfio.minissale@comau.com or Mr. Gian Paolo Gerio, gianpaolo.gerio@comau.com)

• Core demonstrator D2 uses a GÜDEL portal with track-motion linear axes, 3-DOF gantry robot and 3-axis hand wrist. A number of different tools (e.g. for milling, sawing,
stapling/nailing, handling) are available by means of a Schunk tool changer. An ABB IRC5 controller is used. Pre-visualization of motions is utilized. Working volume of the used Güdel gantry is around 5x8x32m³.

Further information, data sheet and purchase price on request (please contact Mr. Dominique Schär, dominique.schaer@ch.gudel.com) Due to the expected high installation and capital-expenditure costs, there is no rental service for these portals. It is advisable for demonstration teams proposing to work with this type of robot to already have an existing portal. Appropriately scaled down settings (for experimental purposes) may be suitable as well.

- Core demonstrator D3 uses KUKA lightweight robot "LBR iiwa". The system includes the new KUKA Sunrise controller and the Sunrise Workbench as engineering suite. Further information, data sheet and rental or purchase price on request (please contact Mr. Uwe Zimmermann, Uwe.Zimmermann@kuka.com).
- Core demonstrator D4 uses a Reis robot RV30-16 and a Fronius welding system. The robot control is based on ROBOTstarVI and the teach pendant “reisPAD”. The following interfaces and ports to the Reis robot controller are available: RSV commands interface to interact and control the robot to an external PC, Binary / analogue I/O’s e.g. to connect the robot to welding source and equipment. The Reis robot controller offline version RobOffice/ProVis, a PC-based version to program and simulate the robot, is included. Further information, data sheet and rental or purchase price on request (please contact Mr. Manfred Dresselhaus, <m.dresselhaus@reisrobotics.de>)

4.2.2. Software components of SMErobotics

Numerous software components will be made available to supplemental demonstration partners.

- Software for symbiotic human-robot interaction
- Software for motion coordination in uncertain environments
- Software services for cognitive robot systems.
- Software for configuration, planning and program generation.

For details, please refer to Annex 1, page 12, to this document "Catalogue of Software Components", which groups the software components according to primary purpose (perception, manipulation, human-robot interaction, planning and reasoning and system monitoring).

Also, the following tools will be made available for the integration and evaluation of demonstrators:

- Decision support in contract manufacturing
- Software models for reuse and composition of knowledge.

All information on the software components, including short descriptions of the components and the interfaces, will be kept up to date on the project website http://www.smerobotics.org/Solicitation.

4.3. Activities and reimbursement

4.3.1. Activities to be funded

The required activities in connection with a proposal must be limited to demonstration activities (DEMO) as defined by the European Commission’s funding guidelines, i.e. means designed to prove the viability of new SMErobotics and other technologies that offer a potential economic advantage, but which cannot be commercialised directly (e.g. testing of products such as prototypes). The EC contribution, i.e. the funding, may reach a maximum of 50% of the total eligible costs.

Other types of activities (e.g. management) are not eligible for funding. For details of the different types of activities in FP7, contact the SMErobotics secretariat.
4.3.2. Reimbursement

Reimbursement will be based on eligible costs as defined in Article II.14 of the FP7 model grant agreement. Direct and indirect costs are to be identified in accordance with Article II.15 of the FP7 model grant agreement. The maximum reimbursement rates of eligible costs for Demonstration (DEMO) are, in accordance with Article II.16(1) of the FP7 model grant agreement, 50% for total costs.

More information on reimbursement is available from the SMErobotics secretariat (see contacts below). For an example calculation, refer to Annex 2: Example calculation for reimbursement, page 22, or to the project secretariat.

Although demonstration teams are strongly encouraged to use equipment from the core demonstrators (see 4.2.1) and although the project's four robot manufacturers (COMAU, Güdel, KUKA, Reis) offer their robotic hardware for rental or purchase at very competitive rates, other equipment may be used as long as the need and benefit is justified in the proposal. The Consortium is aware that the timeline for supplemental demonstrations is tight and that proposals must convincing stress the achievable of the demonstration objectives by the end of 2015.

For each of the four demonstration teams (typically a system integrator and an end-user), a maximum of €250 000 (based on €500 000 project costs) funding over up to two years is available.

More information on the (rental and purchase) prices of project hardware is available from the SMErobotics secretariat.

5. Form, content and submission of demonstration proposal

5.1. General information

This solicitation is open from 15 August 2013 and will close on 14 October 2013 at 17:00 (CEST). Supplemental demonstrations are planned to start four months after the solicitation has closed (i.e. starting 1 January 2014 at the earliest).

The proposal must meet the following requirements:

- It must be submitted by email to solicitation@smerobotics.org and by the specified deadline. (A notice of receipt will be returned within 24 hours). All information is also available on the SMErobotics website [http://www.smerobotics.org/Solicitation](http://www.smerobotics.org/Solicitation).
- Each demonstration team must name one team member as the demonstration team coordinator.
- The proposal must be submitted by the demonstration team coordinator on behalf of the whole demonstration team.
- The proposal must address one or more SMErobotics objectives (see 2.1) and either must supplement one of the core demonstrators (see 2.2) by revising, retailoring, broadening or enriching (see 4.1) the described scenario; or must use/build upon SMErobotics results (hardware, software) to solve problems in a new manufacturing scenario.
- The proposal must follow the template for SMErobotics Demonstration Proposals (see 6.3).

For a given proposal, the demonstration team coordinator must act as the single point of contact between the supplemental demonstration partners and SMErobotics. The coordinator of the proposal will generally be responsible for the overall planning of the proposal and for building the demonstration team that will do the work.

Although the size, scope and internal organisation of a demonstration proposal can vary depending on the scenario and the innovation, the proposal should be concise and factual. A supplemental
demonstration proposal can be submitted by a single partner. Proposers should keep the number of demonstration team members small (2 to max. 3 companies/partners). The funding of a proposal is expected to be not more than €250 000 (equivalent to max. 50% of project costs) and the duration should be between 18 and 24 months, ending 31 December 2015.

5.2. Information day, coaching and pre-proposals
For interested teams, an information day will be held on Friday 13 September 2013 at Fraunhofer IPA in Stuttgart. Please see www.smerobotics for details.

The SMErobotics secretariat will coach the earlier stages of proposal development, e.g. through evaluation of pre-proposals.

Pre-proposals can be submitted (solicitation@smerobotics.org) until three weeks before the solicitation closes. They should not be longer than two pages and describe only the supplemental demonstration idea and concept. A staff member of SMErobotics will respond to pre-proposers within one week. The response will be limited to clarifying whether the proposal is compatible with the scope of this solicitation (innovation, compatibility with solicitation).

5.3. Proposal form
Proposals must follow a standard template, which will be available on the SMErobotics website when the solicitation opens, to allow easy conversion to a Description of Work in the event of the proposal being selected.

The proposal text must be submitted as a single pdf document that complies with the Template for SMErobotics Supplemental Demonstrations Proposals (Annex 3: Template for SMErobotics Solicitation Proposals, page 23).

5.4. Evaluation process

5.4.1. General
On being received by SMErobotics, proposals will be registered and acknowledged and their contents entered into a database to support the evaluation process. Formal eligibility criteria for each proposal will be checked by SMErobotics before evaluation begins. Proposals that do not fulfil the criteria below will not be included in the evaluation process.

A proposal will be considered eligible only if it meets all of the following conditions:

- It is received before the deadline specified in the solicitation announcement text.
- It is complete (i.e. all parts of the proposal description have been submitted)
- The proposal must be submitted by a legal entity established in an EU member state or in an associated country. For a list of associated countries, see ftp://ftp.cordis.europa.eu/pub/fp7/docs/third_country_agreements_en.pdf.
- The content of the proposal relates to the above-described SMErobotics scenarios, innovations and demonstration types.
- The applicant can show that it has the ability and financial capacity to fulfil the technological requirements. Please note: Selected proposers must undergo financial and legal validation by the European Commission (http://cordis.europa.eu/fp7/pp-valid_en.html).

5.4.2. Evaluation by an experts panel
Proposals will be evaluated by expert from the SMErobotics consortium and other external institutions whose appointment has been approved by the European Commission. Each proposal will be evaluated by three experts (evaluators), of which one is from the research institutes in the SMErobotics core consortium, and two who are independent of SMErobotics and the proposers. All evaluators are required to have no conflicts of interest. Strict confidentiality with respect to the whole
The independent experts will perform their evaluations in a private capacity and not as representatives of their employer, country or other entity.

5.4.3. Evaluation criteria

Proposals will be evaluated on the basis of scores given according to three basic criteria:


b. Quality and efficiency of implementation and management, suitable for assessing the efficient use of resources and quality of the participants.

c. Potential impact towards the SMErobotics objectives through implementation and assessment of the demonstrator. Potential impact on awareness of new automation solutions through transfer and use of project results within end-user and system integrator communities.

A score between 0 and 5 will be awarded for each criterion. The proposal will be included in the final selection if each score is above a lower limit of 3 and the total of the three scores is not less than 10. Half-points can be awarded.

In case of disagreement between individual evaluators regarding a specific proposal, a consensus meeting will be held where the evaluators agree on a common score. If such an agreement is not possible, the arithmetic average will be used.

5.4.4. Handling of conflicts of interest during the evaluation process

Experts must declare any known conflicts of interest beforehand and must immediately inform SMErobotics if such a conflict becomes apparent in the course of evaluation. The SMErobotics consortium will take whatever action is necessary to eliminate any conflict. A disqualifying conflict of interest will exist where an evaluator:

- was involved in preparation of the proposal; “involved in preparation” includes, but is not limited to: coaching of the proposal writing process, relaying information about the SMErobotics project not readily available to all applicants, knowing details of the proposal before the evaluation starts.

- they or their organisation could stand to benefit or be disadvantaged as a direct result of evaluation;

- has a close family relationship with any person representing a participating organization in the proposal;

- is a director, trustee or partner of any beneficiary participating in the proposal or is a subcontractor/third party carrying out work for any beneficiary in the proposal;

- is employed by a beneficiary participating in the proposal or by a subcontractor/third party carrying out work for any beneficiary in the proposal;

- is in any other situation that compromises their ability to review the proposal impartially.

Evaluators with disqualifying conflicts of interest cannot take part in the evaluation of proposed demonstrations. A potential conflict of interest may exist even in cases not covered by the above-indicated disqualifying conflicts where any expert:

- was employed by a participating organization in a proposal in the last three years;

- is involved in a contract or research collaboration with a participating organisation or has been so in the previous three years;

- is in any other situation that could cast doubt on their ability to review the proposal impartially or that could reasonably appear to do so in the eyes of an external third party.
Evaluators will be barred from evaluating proposals where they have a potential conflict of interest. Also, they will be excluded from the evaluation panel meeting (see section 5.5 for more details). However, they can evaluate proposals if no potential conflict of interest exists.

5.4.5. Confidentiality of the evaluation process
Experts must maintain strict confidentiality with respect to the whole evaluation process and will sign in advance a separate non-disclosure agreement in order to ensure that confidentiality will be kept with respect to the evaluation process and the provided personal and company data. Under no circumstance may an expert attempt to contact an applicant on their own account, either during or after the evaluation process. Of course SMErobotics internal evaluators will interact with positively evaluated proposal partners once they start negotiations however not disclosing information about the evaluation.

5.5. Selection
A panel meeting will be held, at which proposals will be ranked and the scores of the proposals calibrated. The appointment of the evaluation panel and its chair will be approved by the European Commission.

The initial ranking of proposals will be based on the scores of the evaluations. The panel will then check the consistency of the scoring and may increase or reduce the scores. Also, the panel will resolve any cases in which proposals have equal scores. The number of ranked proposals receiving funding will depend on the budget requested and available for this solicitation. An annotated ranking of proposals will be compiled at the end of the evaluation panel, together with evaluation summary reports.

The evaluation summary reports will be sent to the proposers. The reports and evaluation panel minutes will then be forwarded to the European Commission by SMErobotics. Based on this information, the European Commission will approve the final list of selected supplemental demonstrations, which will receive funding.

5.6. Joining the SMErobotics Consortium
After selection, strict deadlines will be set by SMErobotics for compliance with the obligations relating to the accession procedure:

- For submission of the finalized Description of Work and budget.
- For compliance with the administrative requirements of the European Commission.

In case deadlines are missed accession to the SMErobotics Grant Agreement may be at risk.

Selected proposals will be converted into contractual Descriptions of Work and the budget for supplemental demonstrations will be finalised during a negotiation phase, scheduled for November 2013. The organisations involved in selected proposals will be proposed for accession to the SMErobotics Grant Agreement. Accession must be approved by the European Commission.

The Description of Work and the budget of the selected supplemental demonstrations will be appended to the SMErobotics European Commission Grant Agreement. Each new selected Party approved by the European Commission will access the Consortium Agreement by signing the Accession Form (Attachment 3 to the Consortium Agreement) which will be countersigned by the Coordinator on behalf of the Consortium.

5.7. Implementation of the supplemental demonstrations
Supplemental demonstrations will receive a payment from the SMErobotics Coordinator at the beginning of the demonstration to cover part of their equipment costs. Labour and other costs will be paid after the end of SMErobotics’ reporting periods in accordance with the provisions of the Grant Agreement. Payments usually happen 3-4 months after the end of a reporting period, which is the calendar year.
Supplemental demonstration partners will be especially supported by the SMERobotics secretariat. Although new partners will not be granted individual voting rights within the Consortium, they will have one combined vote represented by the SMERobotics secretariat.
6. Annexes

6.1. Annex 1: Catalogue of software components

This catalogue describes the software components available from the SMErobotics core consortium for implementing of supplemental demonstrators (so called “Type 2 demonstrators”).

The components are grouped into categories based on primary purpose:

- Perception
- Manipulation
- Human-Robot interaction
- Planning and Reasoning
- System Monitoring

Different software components are available by different means, for example as link library for some given platform(s), as a network service or by other means of access and integration.

All these components are **work in progress** and **experimental**. They may fail in various ways and it is the **responsibility of the user** of a component, to ensure that its system will react in a save way to any possible foreseen or unforeseen failure of any of the components from this catalogue.

### 1. Components for Perception

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<th>Name</th>
<th>Description of functionality</th>
<th>Requirements and properties</th>
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| C-01| Articulated Body Tracker       | This module automatically segments and identifies users in the scene. Each user in the scene is given a unique and persistent ID, and the main output of the user segmentation process is a labelled map giving the user ID for each pixel. The skeleton tracking algorithm uses this labelled map to generate a skeleton and tracks it. According to the labelling of parts of human from the Nite API, it returns positions and orientations of the skeleton joints. | Required runtime platform  
  - Linux 32 bit  
  - Microsoft Kinect Sensor  
  Interface  
  - Application binary offering ROS services  
  Input data  
  - Microsoft Kinect data |
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| C-02 | Web-based User Interface | This module provides a user interface for teaching process plans to robots. It can be customized for specific domains. It allows the human operator to communicate with the Interaction Manager in an intuitive manner.                      | Output data  
- Position and orientation of skeleton joints  
Required runtime platform  
- State-of-the-art web browser capable of dealing with HTML5, JavaScript, WebGL  
Dependencies  
- Interaction Manager  
Interface  
- ROS network service |
| C-03 | Speech-Text Processing   | This module uses a Microsoft Kinect for speech recognition. The Kinect has a microphone array and built-in noise cancellation. Speech recognition produces a list of recognized strings together with a confidence value that indicates how well the spoken utterance was recognized. In the next step, Combinatory Categorical Grammar (CCG) is used to parse the string from speech recognition. This yields a logical representation of the sentence, which is presented in hybrid logics. | Required runtime platform  
- Windows XP or 7  
- MS Kinect + SDK  
Interface  
- Network service including ROS, ZeroICE, Custom TCP/IP protocol  
Input data  
- Digitized audio signal  
Output data  
- List of recognized strings including confidence  
- Grammatical analysis of the sentence (strings) |
| C-04 | Optical tracking         | This module automatically detects and tracks tools equipped with passive markers. It uses infrared cameras with structured light source. The cameras are arranged in a stereo configuration and are calibrated.                                                            | Required runtime platform  
- Linux 32 bit with PAE  
- Multi-Core processor (i7 or better recommended)  
- Stereo IR Camera with structured-light source |
### No. | Name | Description of functionality |
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Requirements and properties
- Camera calibration data (XML)
- Marker arrangement model (XML)

### Interface
- Application binary offering ROS and custom TCP/IP protocol

### Input data
- Stereo image stream

### Output data
- 6D pose of targets

### 2. Components for Manipulation

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Description of functionality</th>
</tr>
</thead>
</table>
| C-05 | Skill Execution Engine   | The Skill Execution Engine is responsible for robust task execution. It receives a sequence of skill networks and coordinates their execution by orchestrating the command flows to the robot controllers and peripherals. The Skill Execution Engine consists of two Modules:  
  (a) The Execution Coordinator (EC), which instantiates the skill networks, executes the respective state charts, triggers exception handling and executes recovery actions.  
  (b) The Hardware/Software Abstraction Layer (HAL), which is responsible for the communication with the hardware and software components. |

#### Requirements and properties
- Description of hardware components and the supported skills available for execution in SCXML format, as well as some proprietary code (file-based)

### Interface
- Reads files containing skill networks

### Input data
- Specification of task sequence and skill networks in SCXML format (file-based)

### Output data
- Control information towards robot controller and
### Components for Human-Robot interaction

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Description of functionality</th>
<th>Requirements and properties</th>
</tr>
</thead>
</table>
| C-06| Interaction Manager                       | The core functionality of the interaction manager is to provide services for symbiotic human-robot interaction. It describes the world in a semantic form and uses this information for perception, reasoning and planning. Through this functionality, the interaction manager allows a human to intuitively interact with robot systems.                                                                                                                        | Required runtime platform:  
  - Linux  
  - Prolog Interpreter  
  - Protégé system  
  Interface:  
  - Application binary offering ROS services  
  Input data:  
  - World model (poses of objects, humans, etc.)  
  - State of robot  
  - Model of active process  
  Output data:  
  - Task instructions for human and/or robot |
| C-07| Mixed-Initiative Information Gathering    | The "Mixed-Initiative Information Gathering" (MIIG) is in its core a dialogue management system. It is responsible for handling communication requests from system to user and vice versa. Such communication requests can be commands given by the user or an actual request for clarification sent from, for instance, the high level task planning in case of a lack of information being detected.  
  This component manages dialogue requests from the system and the user and maintains a history of communication-related user preferences. It performs Interaction Monitoring (interpretation of interaction status and user intentions in a rather wide sense, interpreting a short term interaction history) | Required runtime platform:  
  - Linux  
  - Interaction manager component  
  Interface:  
  - Application binary offering ROS services  
  - Link library  
  Input data:  
  - World model (poses of objects, humans, etc.) |
### C-08 Multimodal Situation Based Dialogues

This module fuses raw data from different input modalities, resolves input ambiguities and represents the input in a semantic form. It also analyses which input or output modalities (speech, gesture, text on a screen, etc.) are most suitable to be used in the current situation.

The components consists of several subcomponents running on different platforms (Linux or Windows).

<table>
<thead>
<tr>
<th>Required runtime platform</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linux (for some subcomponents)</td>
</tr>
<tr>
<td>MS Windows (for some subcomponents)</td>
</tr>
<tr>
<td>Audio output capability</td>
</tr>
<tr>
<td>Video output capability</td>
</tr>
</tbody>
</table>

#### Dependencies

- One or more other components out of: Articulated Body Tracker, Object Detection, Optical tracking, Speech-Text Processing

#### Required configuration data

- XML description of sensors
- XML description of system

#### Interface

- Application binaries offering ROS services

#### Input data

- Various, depending on subcomponent used

#### Output data

- Various, depending on subcomponent used
### 4. Components for Planning and Reasoning

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Description of functionality</th>
<th>Requirements and properties</th>
</tr>
</thead>
</table>
| C-09 | Assembly Planner | The assembly planner reads a specification of an assembly group and generates an assembly sequence on task level. Here, an assembly group is a list of linked assembly parts, each with a 3D model and relative positions to its base part. The assembly planner analyses the assembly group, and calculates a graph of possible assembly steps, also regarding collisions and grasps. Finally, an optimal sequence is extracted. | Required runtime platform - Linux  
  Dependencies - grasp- and path-planner, task execution engine  
  Required configuration data - cell description (kinematic constraints, fixtures, …)  
  Interface - Binary application  
  - Read and writes files  
  Input data - high-precision 3D model for each part and assembly group description incl. relative positions  
  - work cell setup  
  - start positions of all parts in the work cell  
  Output data - Assembly Sequence |
| C-10 | Sampling-based Motion planner | The sampling-based motion planner module offers the possibility of planning a collision-free path for a specific robot. The module consists mainly of two sampling-based algorithms belonging to the category of Rapidly-Exploring Random Trees (RRTs): the Inverse-Kinematics based, bidirectional RRT (IKBiRRT) and the Cartesian-constrained, bidirectional RRT (CBiRRT). Whereas the former algorithm is used to plan from a starting joint configuration of the robot to a goal position defined in the Cartesian workspace of the robot, e.g. to grasp objects, the latter is used to plan a transfer motion with possible | Required runtime platform - MS Windows  
  - Robot-specific libraries:   
    - Robot Model   
    - Inverse kinematic   
    - Motion generator |
<table>
<thead>
<tr>
<th>C-11</th>
<th>Situation Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>This module fuses sensor perception, system control states and knowledge to assess the spatio/temporal situation, deciding if the current situation is desirable or not. It will take world states delivered by the World State Generator subcomponent of the Interaction Manager, relate them to known states and then on that basis compare the current and known situation pattern with expected situation patterns, concluding whether an abnormal situation has occurred. Note: A situation is <em>not</em> a state or snapshot of the world, but a sequence of actions, c.f. R. Reiter. &quot;The frame problem in the situation calculus: a simple solution (sometimes) and a completeness result for goal regression&quot;, Artificial intelligence and mathematical theory of computation, USA, 1991.</td>
</tr>
<tr>
<td></td>
<td>Required configuration data</td>
</tr>
<tr>
<td></td>
<td>- Environment model</td>
</tr>
<tr>
<td></td>
<td>- Constraints on end effector pose</td>
</tr>
<tr>
<td></td>
<td>Interface</td>
</tr>
<tr>
<td></td>
<td>- MS DLL</td>
</tr>
<tr>
<td></td>
<td>Input data</td>
</tr>
<tr>
<td></td>
<td>- Description of planner task</td>
</tr>
<tr>
<td></td>
<td>Output data</td>
</tr>
<tr>
<td></td>
<td>- Geometric path as ordered list of joint configurations</td>
</tr>
</tbody>
</table>

<p>|      | Required runtime platform |
|      | - Linux |
|      | - Libraries: |
|      |   - ROSbridge |
|      | - Database server (MySQL) |
|      | Dependencies |
|      | - Interaction Manager |
|      | Required configuration data |
|      | - Models that parameterizes situations |
|      | Interface |
|      | - Application binaries offering ROS services |
|      | Input data |
|      | - World model (poses of objects, humans, etc. |
|      | - State of robot |</p>
<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
<th>Configuration Data</th>
<th>Runtime Platform</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weld Seam Ordering</td>
<td>The component makes a suggestion for the ordering of the weld seams on a workpiece. The planning result is presented to the worker and corrections to the ordering are possible through an easy to understand interface, resembling communication between welders. Corrections to the ordering of weld seams are stored and used to improve the suggestions for weld seam ordering during subsequent use of the weld seam ordering functionality.</td>
<td>- Part data (CAD-model of workpieces) including specification of weld seams - Specification of welding process</td>
<td>- MS windows - Reis RS V or RS VI robot controller for direct file transfer - Current source interfaced with the robot - Seam tracking system connected to the robot controller</td>
</tr>
<tr>
<td>Weld-seam planner</td>
<td>The planner for weld-seam following transforms input about the local properties of the weld seam into a path for the robot system and a parameter set for the execution of a seam following skill, if required. For that purpose a CAD-model of the workpiece including a specification of the weld seams and the weld plan (seam ordering) is read into the software. The software computes the motion of the robot, the required welding parameters, parameters for a weld seam following controller and additional motions to approach and retract from the weld source.</td>
<td>- Ordered list of weld seams stored in the CAD part of the part - Process constraints (e.g. cooling times between weld seams)</td>
<td>- Link library</td>
</tr>
</tbody>
</table>

Input data
- Workpieces geometry and desired weld seams

Output data
- Currently executing plan
- Assessment of current situation
5. Components for System Integration and Monitoring

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Description of functionality</th>
<th>Requirements and properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-14</td>
<td>Real-time component interfaces</td>
<td>Sub-systems and robot-skill implementations often include a real-time part (e.g., for sensor feedback), which in systems and platforms today (such as ROS) is managed locally. When real-time requirements span across these sub-systems, in unforeseen manners due to SME requirements, the system integration gets overly complex (low-level programming required). To overcome this difficulty, and also to manage incompatibility issues, new real-time capable solutions will be provided, supporting both ROS and some industrial field-buses.</td>
<td>Interface</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Libs for linking</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Constraints</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Real-time communication is mainly based on raw Ethernet (below IP, with sub-millisecond round-trips within the robot cell), with Linux/Xenomai as the execution platform.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- On platforms with soft or no real-time performance, communication is on top of IP in an OS portable manner.</td>
</tr>
<tr>
<td>C-15</td>
<td>Knowledge services</td>
<td>Apart from specific (experimental) representations of information and knowledge in each of the above categories, there is also a more generic knowledge server available. This provides means for building upon existing (e.g., ontological) definitions, but also a structured way of adding new types of knowledge that other partners/users can connect to. Access to a server running the knowledge services is provided.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Interface</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Web service</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Both a more rudimentary RDF server (Jena) and a more complete knowledge server (OntoBroker) will be used, the latter on central SMErobotics servers only but with both web and programming interfaces.</td>
</tr>
</tbody>
</table>

- Detailed CAD-model of the welded path including seam preparation
- Model of the workcell
- Robot program and additional configuration files for sensor functionality (seam following) and welding source
- Configuration file for seam following sensor and related feedback loop on controller
<table>
<thead>
<tr>
<th>C-16</th>
<th>Exception Handler</th>
<th>This component is responsible for handling Exceptions and Errors, by comparing the sensor data input with expectations about that input formed either during the teaching phase of the process or through analysis of the process specifications. A difference indicates an anomaly, which might point to an error/exception. Using Bayesian networks, which connects errors to faults and to recovery actions; it formulates a hypothesis as to the underlying fault and dispatches an appropriate recovery action. If the recovery action succeeds, this is an indication that the hypothesis was right and the probabilities of the corresponding links in the Bayesian networks are increased. Does not provide real-time service.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Required configuration data</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- list of error types (XML file)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- list of failure hypotheses (XML file)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- list of recovery actions (XML file)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interface</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Event-based web service</td>
<td></td>
</tr>
</tbody>
</table>
6.2. Annex 2: Example calculation for reimbursement

**Example**

Imagine, for example, an SME adopting a 60% flat rate for calculation of indirect costs. Let it be assumed that the institution is able to depreciate only a fraction (e.g. 50%) of the net (i.e. without taxes) equipment costs (e.g. €60,000) during the project (one and a half of three years of depreciation). In this case, a possible budget figure for the participant might look like this.

**Direct costs**

Personnel costs: EUR 30,000  
Travel expenses: EUR 10,000  
Equipment (50% of net costs): EUR 30,000  
Total direct costs: EUR 70,000

**Indirect costs** (60% of direct costs for SMEs)

Personnel costs: EUR 18,000  
Travel expenses: EUR 6,000  
Equipment: EUR 18,000  
Total indirect costs: EUR 42,000

**Funding**

Personnel costs (50% of direct+indirect costs for personnel): EUR 24,000  
Travel expenses (50% of direct+indirect costs for travel): EUR 8,000  
Equipment (50% of direct+indirect costs for equipment): EUR 24,000  
**Total funding:** EUR 54,000

In other words, an institution can apply as direct costs only those full equipment costs for the duration of the demonstration (max. 2 years) as a fraction of the real or expected useful life of the equipment (perhaps 4, 5 or 6 years); such a fraction may depend on local or national rules on depreciation. In such a case, we would advise that equipment be rented than purchased.
6.3. Annex 3: Template for SMErobotics Solicitation Proposals

Template for SMErobotics Solicitation Proposals

(Also available as MS-Word docx on the website www.smerobotics.org)
SMErobotics Solicitation Proposal

For supplemental demonstration

Full title of proposal:

Acronym of proposal:

Name of Coordinating Person: ...
Phone no. of Coordinating Person: ...
E-mail address of Coordinating Person: ...

Institution of Coordinating Person: ...
Address of Coordinating Person: ...

List of Participants

<table>
<thead>
<tr>
<th>Participant no.</th>
<th>Legal name of participant</th>
<th>Country</th>
<th>Organisation type</th>
<th>PIC number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The above information, together with other general information about the proposal (such as scenario, research focus, list of participants) must be emailed to solicitations@smerobotics.org. Instructions are available at www.smerobotics.org. For further information, please contact the SMErobotics secretariat.

SUMMARY

Provide a short summary of the proposal. (1/3 page)

---

2 For example, SME end-user, multinational industrial, etc.
3 Participant Identification Code (PIC), obtained from the following website: http://cordis.europa.eu/fp7/ppsPic_en.html
1. TECHNICAL QUALITY
Maximum length of whole of section 1: 10 pages.

1.1. Demonstrator scenario
Maximum length for Section 1.1: 1.5 pages.
Describe the planned scenario (possibly in difference to an existing manufacturing scenario), the innovations and advances you are targeting and their relevance, if applicable, to the chosen SMErobotics scenario (which core demonstrator do you want to supplement?).

Describe your concrete objective(s) with the demonstration. The objective(s) should be achievable within the demonstration and relevant to the selected scenario. Give clear answers to the following questions:
- Why is it necessary to address this problem from an application standpoint?
- What technological issue does the proposal address?

1.2. Progress beyond state of the art and industrial practice
Maximum length for Section 1.2: 1.5 pages.
Describe the state of industrial practice regarding automation in the relevant industrial scenario and the technological, ergonomic or organisational advance that the proposed supplemental demonstrator would achieve in the area(s) outlined in the description of the chosen scenario.

Please answer the following questions:
- What previous work/experiences does the proposal capitalize on?
- Which components (hardware, software) from the SMErobotics project are intended for use in your demonstrator?
- What components do you intend to bring into the project (for your own demonstrator)?
- What are your specific approaches and why are the proposed solutions promising?

1.3. Technological methodology and associated work plan
Describe in detail how the proposers will develop their demonstrator and what will be achieved during the demonstration (suggested time-frame: 6 months of introduction and specification, approx. 12 months of set-up and refinement, approx. 6 months of evaluation and dissemination).

Provide a description of the technological approach and/or methodology by which you will attempt to achieve your objectives.

A work plan should be presented, broken down into tasks, which should follow the logical phases of engineering, implementation and assessment of the demonstrator.

A task is usually an identifiable, self-contained step towards the implementation of the demonstrator. Typical examples are: identification of requirements and constraints for the operation of the demonstrator, specification of user interaction and safety issues, physical setup and test of the demonstrator, definition of performance criteria and performance evaluation etc.

The number of tasks must be appropriate to the complexity of the work and overall value of the proposed demonstration. The planning should be sufficiently detailed to justify the proposed inputs. Furthermore, the role of each partner (in case of two or more partners) within each task should be clearly stated, including the predicted inputs (i.e. person months planned per task). For a 24 months project, 4 to 6 tasks should be defined, more if needed.
Each Supplemental Demonstration should have a small set of deliverables, as to enable the tracking of the projects progress.

- **Suggestion:** One deliverable for each task: e.g. specification (typically written concise report), set-up (suggested: video of the running system), and evaluation (typically written report)

During the demonstration, the supplemental demonstration team members are encouraged to produce multimedia material (video and images) showing their progress.

Present your plans as follows:

(i) Show the timing of the different tasks and their components (Gantt chart or similar).

(ii) Provide a work description broken down into tasks:
    a. Task list (use table 1.3a);
    b. List of deliverables (use table 1.3b);
    c. Description of individual tasks (use table 1.3c);
    d. Summary of proposal inputs (person months, use table 1.3d)

(iii) Describe significant risks in the implementation and potential alternatives (approx. 1 page)

### Table 1.3 a: Task List

<table>
<thead>
<tr>
<th>Task No.</th>
<th>Task title</th>
<th>Lead participant</th>
<th>Short name</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T2</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>....</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 1.3 b: List of Deliverables

<table>
<thead>
<tr>
<th>Del. No.</th>
<th>Deliverable name</th>
<th>Task No.</th>
<th>Nature⁴</th>
<th>Dissemination level⁵</th>
<th>Delivery date⁶</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>....</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

⁴ Please indicate the nature of the deliverable using one of the following codes: R = Report, P = Prototype, D = Demonstrator, O = Other

⁵ Please indicate the dissemination level using one of the following codes: PU = Public; PP = Restricted to other programme participants (including the Commission Services); RE = Restricted to a group specified by the consortium (including the Commission Services); CO = Confidential, only for members of the consortium (including the Commission Services)

⁶ Measured in months from the demonstration’s start date (month 01).
### Table 1.3 c: Description of Individual Tasks

**Task 1: [include timing information]**

<table>
<thead>
<tr>
<th>Participant</th>
<th>Role</th>
<th>Person-months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Objectives:**

**Description of work and role of participants:**

**Task X: [include timing information]**

<table>
<thead>
<tr>
<th>Participant</th>
<th>Role</th>
<th>Person-months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Objectives:**

**Description of work and role of participants:**

### Table 1.3 d: Summary of Supplemental Demonstration Input (Person month efforts)

<table>
<thead>
<tr>
<th>Participant short name</th>
<th>Acronym 1</th>
<th>Acronym 2</th>
<th>Acronym 3</th>
<th>Project Acronym</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>-</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>T2</td>
<td>3</td>
<td>-</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total person-months</strong></td>
<td><strong>3</strong></td>
<td><strong>2</strong></td>
<td><strong>6</strong></td>
<td><strong>11</strong></td>
</tr>
</tbody>
</table>
2. IMPLEMENTATION

2.1. Individual participants
For each participant in the proposed supplemental demonstration team provide a brief and relevant description of the organization, the main tasks assigned to them and the previous experience relevant to those tasks. Show that each participant has the ability and financial capacity to fulfil the assigned tasks. Provide also a short profile of the staff members who will be undertaking the work.

When describing the main tasks assigned to each participant, note that neither RTD nor significant dissemination nor management activities should be contributed. Also, the coordinating participant must be indicated.

Maximum length for Section 2.1: 1 page per participant.

<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Legal Name of participant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>URL</td>
<td>URL of website (if available)</td>
</tr>
<tr>
<td></td>
<td>Location</td>
<td>City, Country</td>
</tr>
</tbody>
</table>

Description of legal entity

Text

Main tasks assigned in demonstration

Text

Previous experience relevant to assigned tasks

Text

Profile of staff members who will undertake the planned work in the demonstration

Person 1: Text
Person 2: Text

2.2. Description of the partnership (if more than one partner)

Maximum length for Section 2.2: 1 page.

If there is more than one participant, justify why each of them is needed, describe how the participants will collectively constitute a team capable of achieving the supplemental demonstration objectives, and how they are suited and committed to the tasks assigned to them. Describe the complementarity between the partners; explain how the composition of the team is well-balanced in relation to the objectives of the supplemental demonstration.

2.3. Overall Supplemental Demonstration Resources – costs and funding

Maximum length for Section 2.3: 2 pages.

In addition to the staff input presented in Section 1.3 above, please identify any other major costs (e.g. equipment).

The SMErobotics core demonstrators are based on off-the-shelf robot hardware components. In the interests of expert support from the Consortium, applicants are encouraged to use similar hardware components through purchase or (recommended) rental of the components.

The four core demonstrators of SMErobotics (D1 to D4) each use specific hardware components and come with specific interfaces and software packages (refer to Chapter 4.2.1 "Supported hardware components of SMErobotics").

Please provide a table indicating, for each partner, the direct and indirect costs, requested funding and total amounts.
In addition to the table, please provide a breakdown of the major cost items: Personnel, Travel expenses, Equipment and consumables.

**Example**

*The demonstration team members are committed to mobilise the resources needed to guarantee the achievement of the project results. The total budget for the demonstration is € xxx,xxx.xx. The total requested funding is € xxx,xxx.xx.*

**Breakdown of costs**

- **Personnel**: The involvement of the x participants in the xx months will amount to € xxx,xxx.xx
- **Travel expenses**: Attendance at periodic technical meetings will amount to € xxx,xxx.xx
- **Equipment and consumables**: The cost of laboratory equipment will amount to € xxx,xxx.xx (provide a brief description of equipment to be purchased)

**Financial Plan:**

<table>
<thead>
<tr>
<th>Partner acronym (repeat for each partner)</th>
<th>Cost category</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Personnel costs (€)</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>Travel (€)</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>Equipment &amp; consumables (€)*</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>Indirect costs (€)*</td>
<td>D</td>
</tr>
<tr>
<td></td>
<td>Total budget (€)</td>
<td>A+B+C+D</td>
</tr>
<tr>
<td></td>
<td>Requested funding (€)*</td>
<td>50% of (A+B+C+D)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cost category</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personnel costs (€)</td>
<td></td>
</tr>
<tr>
<td>Travel (€)</td>
<td></td>
</tr>
<tr>
<td>Equipment &amp; consumables (€)</td>
<td></td>
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<tr>
<td>Indirect costs (€)</td>
<td></td>
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<tr>
<td>Total budget (€)</td>
<td></td>
</tr>
<tr>
<td>Requested funding (€)</td>
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</tbody>
</table>


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7 Only the eligible part of the full equipment costs (without taxes) for the project's duration; this may depend on local or national rules on depreciation.

8 To be computed on the basis of the total costs in the first 3 rows (A+B+C), by adopting one of the methods available in the FP7 framework (i.e. transitional flat rate of 60% for SMEs, flat rate of 20%, actual indirect costs).

9 All activities for Supplemental Demonstrations are considered as demonstration activities, i.e. designed to prove the viability of new SMErobotics and other technologies that offer a potential economic advantage, but which cannot be commercialized directly (e.g. testing of products such as prototypes). The EC contribution may reach a maximum of 50% of the total eligible costs.
3. IMPACT

Maximum length for Section 3: 2 pages.

3.1. Expected Results

What are the expected tangible result and innovations?

How can the technology/innovation and benefit of the demonstration be showcased to motivate various stakeholder groups (manufacturing industry, equipment/technology suppliers, public) to engage in advanced robot automation?

What are the benefits in terms of the partners’ relative position in the competitive environment (i.e. market share, creation of new products revenue, reputation)?

What are the expected benefits in terms of expanding the impact of the SMErobotics initiative?

3.2. Exploitation Plan of Demonstration Results and Management of Knowledge and Intellectual Property

Try to describe possible uses of the proposed demonstration outcome, highlighting any know-how and technology transfer.