Annex 1.1 JARVIS OC2 Guidelines for Applicants, Technical Description: Co-Development v1.1

Funded by the European Union

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement nº 101135708. The dissemination of results herein reflects only the author's view, and the European Commission is not responsible for any use that may be made of the information it contains.

Version	Issue Date	Changes
Annex 1.1 JARVIS OC2 Guidelines for Applicants, Technical Description: Co-Development v1.1	29.04.2026	Changes made to Checklist and visuals to reflect that the consortia should have a maximum of two entities

DOCUMENT SCOPE

This document provides a full set of information regarding the **JARVIS Open Call 2: Co-development track.** All associated Annexes should be read prior to the submission of a Proposal:

Required before the submission stage:

- Annex 2.1 JARVIS OC2 Proposal Template: Co-Development– Applicants should fill the template and submit it in the platform
- Annex 3.1 JARVIS OC2 F6S Application Page: Co-Development – This document is provided as supportive material, so that the applicants can prepare their answers for the F6S platform offline before the final submission on the platform.

Required at the contracting stage once selected:

- Annex 4.1 JARVIS OC2 Consortium Declaration of Honour: Co-Development
- Annex 5.1: JARVIS OC2 SME Declaration: Co-Development
- Annex 6.1 JARVIS OC2 Declaration of Financial Stability: Co-Development

Required after the submission stage once the proposal has been selected for funding:

- Annex 7.1 JARVIS OC2 Sub-Grant Agreement: Co-Development

CONTACTS

The JARVIS Consortium serves the following support:

- Contact e-mail: oc@jarvis-project.eu
- Contact e-mail for the submission platform: support@f6s.com
- Open Call 2 Documents_Co-development: https://jarvis-project.eu/open-calls/open-call-2/

The language of communication is English, any email or communication in other languages will not be addressed.

GLOSSARY

Abbreviation	Explanation
SMC	Smart Mechatronics Control module
MSP	Multi-sensory perception module
HIPAP	Human intention perception and prediction module
TPM	Task planner module
IDT	Intelligent Digital Twins module
OFO	OpenFlow Orchestrator
RCM	Robot Control Module
DOF	Degree of freedom
SLAM	Simultaneous Localization and Mapping
TSDF	Truncated Signed Distance Function
NBV	Next Best View
HAR	Human Action Recognition
ROS	Robot Operating System
UE5	Unreal Engine 5

TABLE OF CONTENTS

1 INTRODUCTION

1.1 What is JARVIS?

This Open Call is part of the **JARVIS** European research project, funded under the Horizon Europe Programme. **JARVIS** focuses on advancing Human-Robot Interaction (HRI) in industrial environments in a human-centric manner. The project aims to develop and validate intelligent robotic solutions supporting agile manufacturing as well as inspection and maintenance operations in complex industrial settings. The JARVIS objectives are:

- Develop AI enhanced means of interaction for seamless human-robot communication, control and programming
- Develop socially interactive robots
- Ensure security, privacy and safety towards trustworthy AI
- Develop cognitive and intelligent mechatronics for advanced HRI, dynamic scene modeling and understanding
- Implement HRI in large scale pilots
- Boost companies, in particular SMEs and start-ups, to adopt industrial HRI solutions

Overall, JARVIS aims to develop a reusable set of technologies that enable AI-driven multimodal interaction: a) involving interfaces for physical and remote information exchange, robot control and programming, b) providing social skills to a variety of robots to achieve seamless user-centric interaction that extends human ability for complex tasks and c) demonstrating scalability of application and ability to achieve economies at scale.

The JARVIS technologies are developed and validated through four industrial pilot environments representing different sectors, including automotive manufacturing, aeronautics production, nuclear decommissioning, and offshore energy operations. To further expand the capabilities of the JARVIS ecosystem, the project includes this **Co-Development Open Call** that supports the development of innovative technological solutions that can be integrated within the existing JARVIS pilots.

In this scheme, the JARVIS framework constitutes the core system, and applicants are invited to develop independent technological components that interface with the existing JARVIS architecture. These solutions may include software modules, perception systems, interaction technologies, or other advanced ROS-deployable modules that contribute additional capabilities to the **JARVIS** ecosystem. Applicants are expected to develop their solutions as ROS-deployable add-ons to the **JARVIS** pilots while collaborating with the JARVIS consortium for the integration and validation of the developed technologies within the JARVIS testbeds. **Co-development** projects are expected to reach TRL6, demonstrating and validating their solutions in an industrially relevant environment through integration within the JARVIS pilot systems.

1.2 JARVIS Consortium

The **JARVIS** consortium brings proven expertise in robotic solutions for advanced Human-Robot Interaction in agile manufacturing and inspection & maintenance applications. Building upon knowledge from previous projects and insights gained in the **JARVIS** project, consortium partners—including technical providers, research institutions and industrial xend-users—will mentor the selected for funding projects. Below is a brief overview of the organizations leading this mentoring process.

LMS Laboratory for Manufacturing Systems & Automation (Coordinator)	**LMS** is a leading European laboratory, specializing in robotic applications in industrial and collaborative environments, human-robot interaction (HRI), autonomous task planning, virtual and augmented reality and AI development for real world shopfloors. LMS has proven experience in coordination, technical contribution and management of EU-funded projects (Project coordinator: THOMAS, SHERLOCK, ODIN and CONVERGING, Node leader in AI Testing and Experimentation Facilities of AI-MATTERS, Project manager in X-act and ROBO-PARTNER). LMS is the coordinator of the **JARVIS** project, leading user-centric design for Human-Robot Interaction, Robot behavior adaptation to human needs and social interaction, and learning of social skills for the robots by observation.
tecnalia MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE	**TECNALIA** is the largest center of applied research and technological development in Spain, a benchmark in Europe and a member of the Basque Research and Technology Alliance. We collaborate with companies and institutions to improve their competitiveness, people's quality of life and achieve sustainable growth. We do it thanks to people who are passionate about technology and committed to building a better society. We work with an increasingly strategic business relationship model based on trust, collaboration, and a shared technological approach, whereby our main scopes of action are: smart manufacturing, digital transformation, energy transition, sustainable mobility, health and food, urban ecosystem and circular economy. We are the first private Spanish organization in contracting, participation, and leadership in the European Commission's Horizon Europe programme and we are ranked fourth in European patent applications.
cea	The French Alternative Energies and Atomic Energy Commission (**CEA**) is a key player in research, development and innovation. The mission of the CEA-List institute, a smart digital system specialist, is to combine scientific excellence in high-fields like robotics and artificial intelligence.
Tampere University	Tampere University (**TAU**) is one of the most multidisciplinary universities in Finland. We bring together research and education in technology, health and society. The university is known for its excellence in teaching and research, and it collaborates with hundreds of universities and organizations worldwide. Our community consists of 21 000 students and over 4000 staff members from more than 80 countries.
KUKA	**KUKA** is a global automation corporation with sales of around 3.3 billion euro and roughly 14,000 employees. The company is headquartered in Augsburg, Germany. In the JARVIS project, KUKA primarily focuses on workplace perception, developing AI-based algorithms capable of transforming raw data gathered from heterogeneous sensors into meaningful information. To

	enhance human-robot collaboration, the scene, such as a robotic cell, should be represented not only by a point cloud but should also contain semantic information. To achieve this, KUKA will tackle the problem of scene understanding and the detection of discrepancies or misplacements of parts. This can also contribute to preventing collisions between robots and humans. This development is evaluated through industrial use cases, particularly in the aeronautics industry by manufacturing passenger aircraft seats, and in the automotive industry by assembling hybrid car battery packs.
netcompany intrasoft	Netcompany-Intrasoft (**INTRA**) is a leading European IT Solutions and Services Group with strong international presence and expertise, offering innovative and added-value solutions of the highest quality to a wide range of international and national public and private organizations. Netcompany-Intrasoft's expertise and strength lie in its proven capacity and successful track record in undertaking and delivering, complex, mission – critical projects. Netcompany-Intrasoft's professionals have developed the ability to combine their technical expertise with thorough understanding of each customer's individual business needs. The company consists of a highly skilled, efficient and flexible human resources base, with an international culture. Netcompany-Intrasoft is a company that understands research & innovation as key enabler for future growth and new business creation. Netcompany-Intrasoft has its own Research & Innovation Development (RID) Department that actively contributes to the development of innovative research prototypes.
SINTEF	**SINTEF** is one of Europe's largest research institutes, with multidisciplinary expertise within technology, natural sciences, and social sciences. SINTEF is an independent foundation which, since 1950, has created innovation through development and research assignments for business and the public sector at home and abroad. SINTEF Digital's Mathematics and Cybernetics team is playing a role in shaping the JARVIS project requirements and specifications. Additionally, SINTEF is the primary technical partner for the offshore energy production use case. Lastly, SINTEF will monitor and provide guidance for the third-party projects utilizing the JARVIS use cases.
Teaching Factory	Teaching Factory Competence Center (**TF-CC**) is oriented on providing training and innovation services to the manufacturing industry. TF-CC focuses on enabling the knowledge exchange between academia and industry and on creating added value for the services and products of manufacturing companies, by promoting innovative technology and research activities performed by academia. For this scope, TF-CC provides a set of Training Services and Innovative Technical Services to their customers aiming to interdisciplinary learning, research & experimentation and to exploit of research results towards industrial applicability in pilots.
Collins Aerospace An RTX Business	**Collins** Aerospace, an RTX business, is a leader in integrated and intelligent solutions for the global aerospace and defence industry. Our 80,000 employees are dedicated to delivering future-focused technologies to advance sustainable and connected aviation, passenger safety and comfort, mission success, space exploration, and more.
TOFAŞ TÜRK OTOMOBİL FABRİKASI A.Ş.	Türkiye's trailblazing automotive manufacturer, **Tofaş** was founded in 1968. 24.3% of Tofaş's shares are traded on Borsa İstanbul and are included in both the BIST 30 and the BIST 100 indexes; control of the remaining shares is divided equally between Koç Holding Stellantis. Tofaş's publicly-traded shares

	are also included in Borsa İstanbul's Corporate Governance and Sustainability indexes. Tofaş's production capacity, export performance, R&D competencies, and workforce of nearly six thousand people make it one of Türkiye's leading industrial concerns. Headquartered in İstanbul, Tofaş's production operations are carried out in Bursa at a plant with 350 thousand m2 of enclosed space situated on nearly 1 million m2 of grounds. As one of Stellantis's important manufacturing and R&D centers, Tofaş creates added value for Türkiye's economy, industry, and R&D know-how. Today, with its knowledge and competencies to develop complete vehicles from scratch, Tofaş R&D Center, takes part in the product development processes of different models within Stellantis, in addition to the models produced at the Tofaş Factory. Tofaş's plant produces Fiat Fiorinos as well as the Fiat Egea family's sedan, hatchback, station wagon. cross and cross wagon models. Tofaş exports more than half of the vehicles it produces to different countries in the world. Committed to being a leading player in all segments of its home market in line with customer expectations, Tofaş offers a broad portfolio of brands and products that include six brands (Fiat, Fiat Professional, Alfa Romeo, Jeep®, Maserati, Ferrari) for which it is the Turkish representative.
equinor	**Equinor** is an international energy company committed to long-term value creation in a low-carbon future. Our purpose is to turn natural resources into energy for people and progress for society. Equinor's portfolio of projects encompasses oil and gas, renewables and low-carbon solutions, with an ambition of becoming a net-zero energy company by 2050. Headquartered in Stavanger (Norway), Equinor is the leading operator on the Norwegian continental shelf. We are present in around 30 countries worldwide.
eDF	**EDF**, a high-performance, socially responsible electricity company and champion of low-carbon growth. One of EDF's activities, associated with the production of electricity from nuclear sources, is the decommissioning and the management of radioactive waste. The decommissioning of nuclear installations requires complex projects to be controlled over a long period of time. To manage these projects efficiently, EDF has reated in 2016 the Decommissioning and Waste Project Division (DP2D). The DP2D is implementing the "waste led decommissioning" approach, which incorporates waste management from the decommissioning scenario study. It enables the optimisation of decommissioning schedules and a reduction in the overall costs of waste management by using, among other levers, the development of innovative robotic solutions.

1.3 Co-Development Track Scope

In the **JARVIS** Open Call 2 "**Co-development Track**", **JARVIS** will **invest a total of €800.000** to enhance the four **JARVIS** core pilots. The call targets technology developers, startups, SMEs, and robotics innovators capable of designing and implementing ROS2-deployable modules or mechatronic components that extend the existing capabilities of the JARVIS pilots, particularly in the areas of human-robot interaction, AI-driven perception, and cognitive robotic skills. The specific objectives of this open call are:

- Objective 1 - **Development of Advanced AI and Human-Robot Interaction Technologies**: Develop innovative technological modules in areas such as human-robot interaction, AI-driven perception, cognitive robotics, and smart mechatronics to support the adoption of HRI solutions in industrial environments by improving the performance of collaborative operations, increasing the added value of human-robot collaboration in complex tasks, improving collaboration fluidity, or reducing complexity in robot programming.
- Objective 2 – **Demonstration of Innovative Capabilities in Industrially-Relevant Context**: Demonstrate and validate advanced solutions that extend the capabilities of the existing JARVIS pilots through innovative add-on components, reaching TRL6 within the JARVIS pilot environments inspired by industrial use cases from the automotive, aeronautics, nuclear, and offshore energy sectors.
- Objective 3 – **Collaborative Knowledge Exchange within the European HRI Ecosystem**: Establish a structured knowledge exchange mechanism enabling bidirectional collaboration between the JARVIS consortium and third-party innovators through the exchange of technical insights, implementation experience, and validation results, supporting the evolution of the JARVIS architecture and strengthening the European HRI research and innovation ecosystem.
- Objective 4 - **Support for HRI Technology Providers**: Provide funding, mentoring, and access to industrial use cases and realistic testing environments to support innovative SMEs and start-ups developing human-robot collaboration technologies, enabling them to integrate and validate their solutions within the JARVIS ecosystem and accelerate the industrial adoption of advanced HRI solutions.

1.4 Key characteristics

The **Co-Development Track** of the second JARVIS Open Call provides funding of up to **€100,000 per project** for the development and integration of innovative Human-Robot Interaction (HRI) solutions within one of the JARVIS pilot testbeds addressing one of the indicated topics. The call will support **eight projects**, and is addressed to technological SMEs/start-ups, or micro-consortia consisting of technological SMEs/start-ups and RTOs each implemented over a **nine-month period**.

Selected projects will follow a structured development process consisting of **three sprints**:

- **Requirements Sprint** – detailed definition of system architecture, integration approach, demonstration and validation scenarios, and key performance indicators.

- **Development & Deployment Sprint** – implementation of the proposed module or component at the applicant's premises including first iterations with JARVIS consortium to refine the module's interfaces.
- **Integration & Validation Sprint** – integration and validation within the JARVIS testbeds.

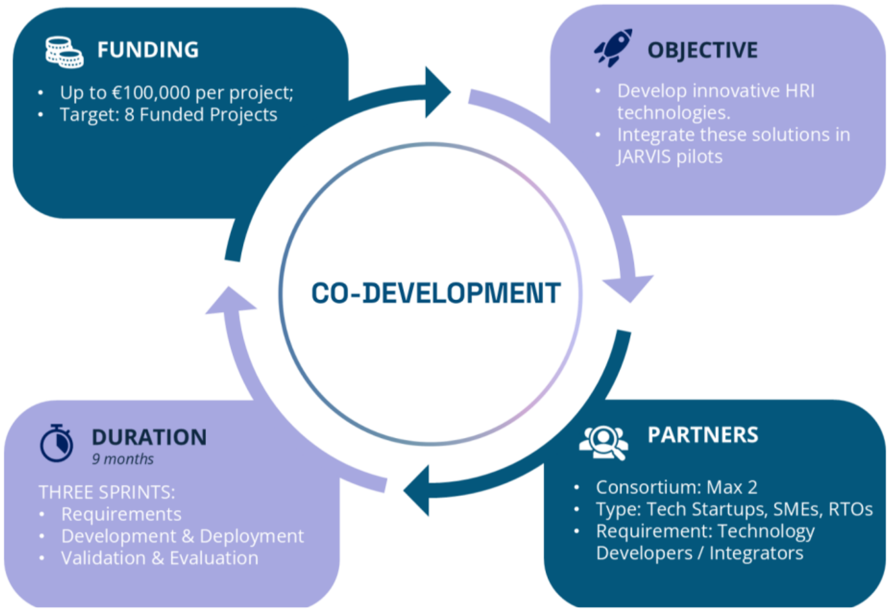


Figure 1. Co-Development OC2 Track Overview

1.5 Expected contribution

The projects selected for funding under the Co-Development track are expected to:

- **Develop and integrate innovative technological modules reaching TRL6**: Design, implement, and integrate value-added ROS-deployable modules within the JARVIS pilot systems in one of the JARVIS pilots' domains in compliance with the indicated topics per sector, aeronautics, automotive, nuclear, or offshore energy domains.
- **Participate in user-centric evaluation activities:** Support user studies conducted within the JARVIS pilots to assess usability, operator acceptance, and the effectiveness of the proposed solution.
- **Demonstrate industrial relevance and market potential:** Showcase the industrial relevance of the proposed solution and demonstrate a credible pathway towards industrial adoption or commercialization of the developed module.

The following sections of this guide present more details about the Co-Development Open Call track including the eligibility criteria, the technical topics of the Co-Development Open Call, and the expected activities within the JARVIS Co-Development Programme.

2 ELIGIBILITY CRITERIA

2.1 Who can apply?

This call is addressed to **individual organizations** or **micro-consortia of two legal entities**. To ensure an industry-driven approach, the consortium must be led by a **technology startup or SME**.

All participating entities must be **legally established** in an EU Member State or a Horizon Europe Associated Country and must hold a **valid VAT number** (or equivalent national tax identifier) at the time of application.

Note: While the participation of a Knowledge Provider (RTO) is optional, the consortium must demonstrate a clear path toward industrial HRI adoption and technical validation.

2.1.1 OC1 Beneficiaries Participation

Entities successfully funded under JARVIS Open Call 1 (OC1) are eligible to apply for the current Open Call, provided they comply with the cumulative funding ceiling established by the JARVIS Grant Agreement.

- Cumulative Funding Cap: The maximum total financial support a single legal entity can receive across all JARVIS Open Calls (OC1, OC2, and any subsequent calls) is €200,000.
- Budget Calculation: Applicants who received funding in OC1 must ensure that their requested budget in the current call, when added to their previous OC1 award, does not exceed the €200,000 limit.
- Compliance: Proposals requesting a budget that would cause the entity to exceed this cumulative cap will be deemed ineligible and will not proceed to the evaluation stage.

Example: If an entity was awarded €120,000 in OC1, their maximum requested budget for the current call cannot exceed €80,000.

2.1.2 SME eligibility

SMEs and Start-ups will be considered eligible only in the case that they have been established at least one year before the submission of the application.

Micro, small and medium-sized enterprises (SMEs) are considered eligible ONLY if complying with the EU definition by the Commission Recommendation 2003/361/EC and in the SME user guide. In summary, the criteria which define an SME are:

1. The headcount in the Annual Work Unit (AWU) is less than 250.
2. Annual turnover less or equal to €50 million OR annual balance sheet total less or equal to €43 million.

Startups that do not have yet annual turnover or balance sheets are also considered eligible given that they fulfil the criteria (a) and (b) at submission time.

In addition, the following conditions apply:

- The applying SMEs should not:

  - have convictions for fraudulent behaviour, other financial irregularities, or unethical or illegal business practices.
  - have been declared bankrupt or have initiated bankruptcy procedures.
  - Be under liquidation or an enterprise under difficulty accordingly to the Commission Regulation No 651/2014, art. 2.18
  - Be excluded from the possibility of obtaining EU funding under the provisions of both national and EU law, or by a decision of both national or EU authority
- Proposals must ensure that there is no risk of double funding. The fundamental principle underpinning the rules for public expenditure in the EU states that no costs for the same activity can be funded twice from the EU budget, as defined in Article 111 of Council Regulation (EC, Euratom) No 1605/2002 of 25 June 2002 on the Financial Regulation.

2.1.3 Eligible countries

Entities legally established in any of the following countries (hereafter collectively identified as the "Eligible Countries") are eligible:

- The Member States (MS) of the European Union (EU), including their outermost regions.
- The Overseas Countries and Territories (OCT) linked to the Member States.
- Horizon Europe associated countries (Association to Horizon Europe is governed by the Horizon Europe Regulation 2021/695): according to the updated list published by the EC .

2.1.4 Eligible Topics

The Applicants must apply to one of the eligible Topics listed in section 4.

2.1.5 Proposal submission

Proposals must be submitted electronically, using the **JARVIS** Online Submission Service accessible via the F6S platform at https://www.f6s.com/jarvis-oc2-co-development/apply

Proposals submitted by any other means will NOT be evaluated.

2.1.5.1 Multiple submission

This call is competitive. Multiple applications are not allowed.

- **ONLY ONE** proposal per team will be accepted.
- An entity can be granted **ONLY once**.

To ensure a fair distribution of funds and efficient use of evaluation resources, each legal entity may participate in only one (1) proposal across both simultaneous JARVIS Open Calls (Co-development and External Pilots.

Execution Rule: If an entity is part of multiple submissions, all proposals involving that entity will be automatically declared ineligible.

2.1.6 Language

English is the official language for **JARVIS** Open Call. Submissions done in any other language will be disregarded and not evaluated.

English is also the only official language during the whole execution of the **JARVIS** programme. This means that it is mandatory that the submission of deliverables is done in English to be eligible.

2.1.7 Conflict of interest

To avoid conflicts of interest, applications will not be accepted from persons or organisations who are partners in the **JARVIS** consortium or who are formally linked in any way to partners of the consortium. Please check the list of partners: https://www.jarvis-project.eu/partners/

Applicants shall not have any actual or/and potential conflict of interest with the **JARVIS** selection process and during the whole project. The winning applicants will be required to declare that they know of no such potential conflicts of interest by submitting **Annex 4.1 JARVIS OC2 Consortium Declaration of Honour: Co-Development** during the contracting sprint.

All suspected cases of conflict of interest will be assessed case by case. Applicants must take all measures to prevent any situation where the impartial and objective implementation of the project is compromised for reasons involving economic interest, political or national affinity, family or emotional ties or any other shared interest ('conflict of interests').

2.1.8 Confidentiality and deadline

Submission to the **JARVIS** Open Call 2 for **Co-Development** is open between the **1st of April 2026 at 00:00 CET** (Brussels time) and the **1st of of June 2026 at 17:00 CET** (Brussels time). Only proposals submitted before the deadline will be accepted.

After application submission, editing is not possible. If the applicant discovers an error in the proposal and provided the call deadline has not passed, the applicant may request the Open Call **JARVIS** team to re-submit the proposal (for this purpose please contact us at **oc@jarvis-project.eu** with a message titled: RESUBMISSION REQUEST). However, **JARVIS** is not committed that resubmission in time will be feasible in case the request for resubmission is not received by the Open Call **JARVIS** team at least 48 hours before the call deadline.

After the call closure, no additions or changes to the received proposals will be considered, whereas the online form will be automatically disabled at the indicated deadline day and hour.

3 JARVIS OC2 CO-DEVELOPENT TOPICS

The topics of the **Co-Development Track are presented per pilot,** as the applicants are invited to develop ROS2-deployable modules that will be integrated as add-ons to the existing JARVIS pilot solutions in order to extend the already existing capabilities.

The four JARVIS pilots include the following:

1. **Aeronautics Manufacturing (COLLINS Pilot)** – This pilot comes from the aeronautics sector, with its testbed installed at TECNALIA premises in San Sebastián, Spain. The primary technical mentor for this pilot is TECNALIA.
2. **Automotive Manufacturing (TOFAS Pilot)** – This pilot is inspired from the automotive sector, with the testbed installed at TF-CC premises in Patras, Greece. The primary technical mentor for this pilot is LMS.
3. **Nuclear Plants Decommissioning (EDF Pilot)** – The focus of the EDF pilot is on the nuclear sector, with the testbed installed at CEA premises in Palaiseau, France. The primary technical mentor for this pilot is CEA.
4. **Offshore Inspection & Maintenance (EQUINOR Pilot)** – This pilot derives from the offshore energy sector, with the testbed installed at SINTEF premises in Trondheim, Norway. The primary technical mentor for this pilot is SINTEF.

Figure 2. OC2 Co-development topics

More details about the pilots and topics are provided in the following sections.

3.1 Aeronautics Manufacturing (COLLINS Pilot)

The COLLINS use case focuses on introducing advanced human–robot collaboration into the lay-up and assembly of composite materials for aircraft interior shells. The overall objective of this use case is to reduce the exposure of operators in tasks involving unhealthy materials (CFRP - Carbon Fibre Reinforced Polymer, resins) while also addressing ergonomic Topics due to the physical effort required and limited accessibility in certain tasks. In parallel, the use case aims to increase the efficiency and reliability of composite ply placement and mechanical assemblies. The end user is Collins, and the technical coach and testbed host for this use case is TECNALIA. The envisioned system enables a single operator, supported by a collaborative robot, to perform complex lay-up and inspection tasks that are currently fully manual. The system will assist in placing the plies, detecting defects, and correcting them.

Overall, this case aims to demonstrate how smart manufacturing systems and collaborative robotics can enhance productivity, safety, and quality in the aeronautics composites sector. The current status of the aircraft seats production testbed is demonstrated below.

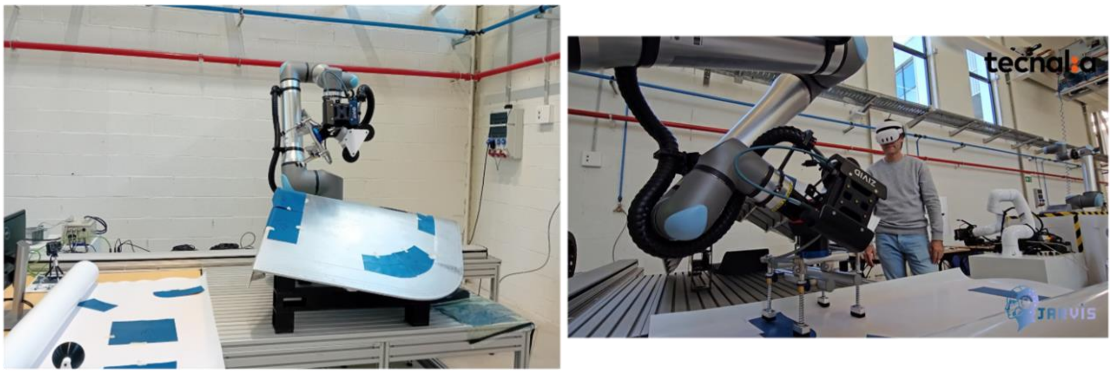


Figure 3. COLLINS testbed at TECNALIA premises, Spain

3.1.1 COLLINS process workflow

The most relevant process steps for the Open Call are the following:

- **Ply Positioning:** This stage involves two types of layers. Small patches (FPP) are installed by the robot with human assistance (for example, to remove the protective plastic or apply complex patches), while large patches are installed through co-manipulation.

In the small patch process, collaboration between the robot and the human is currently sequential. For the large ply co-manipulation, different approaches are under development such as compliance control, allowing the user to pull the material into position, hand tracking and voice commands. A current key limitation to the approaches is the lack of material modelling within the control architecture.

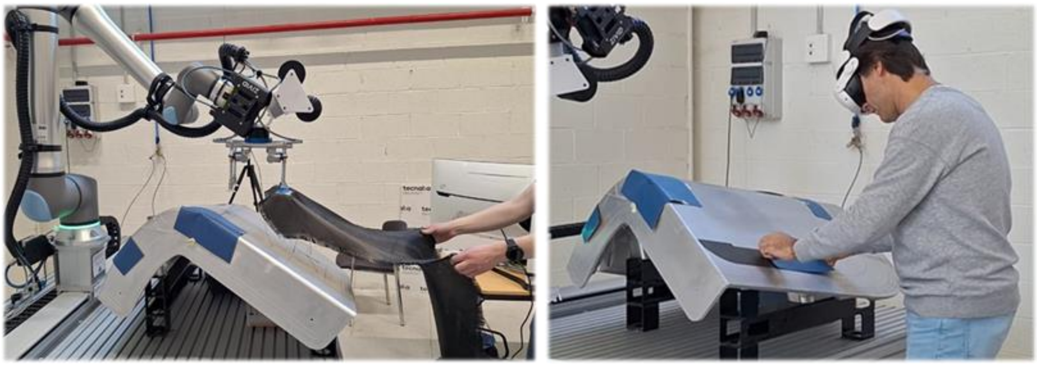


Figure 4. Indicative workflow steps - Small patches placement

- **Consolidation:** This phase addresses the consolidation process of the fibre plies, using specific tools to ensure structural integrity and proper bonding between layers.

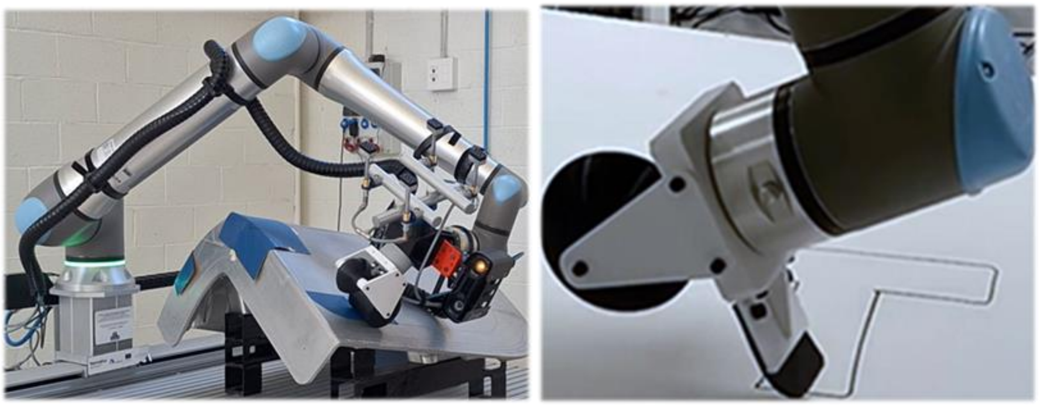


Figure 5. Indicative workflow steps - Consolidation

In each phase, the robot executes articulated trajectories near complex mould geometries and in proximity to the operator, while pneumatic tubes and sensor cabling are routed along the arm. As a result, the risk of self-collisions, cable interference, or collisions with surrounding structures is present throughout the entire process.

3.1.2 Expected interfaces

3.1.2.1 Hardware interfaces

Mandatory mechanical compatibility with the current test bed, composed of:

- Robot Manipulator: UR20
- Linear track
- ZIVID camera for scanning
- Meta Quest 3 + Controllers + Digital Pen (Logitech MX Ink)
- Tools (no tool changer):
    - Gripper for manipulation (different vacuum cups)
        - FPP (phase 1.b)
        - Co-manipulation (phase 1.a)
        - Consolidation tools

3.1.2.2 Software Interfaces

The software architecture of the COLLINS use case is based on **ROS2 Jazzy**, in alignment with the overall JARVIS network implementation. Therefore, all developed software components and interfaces **shall be implemented as ROS2 nodes**, using the following communication mechanisms where applicable:

- ROS2 publishers/subscribers
- ROS2 service servers/clients
- ROS2 actions (if required by the application logic)

3.1.3 Aeronautics Manufacturing (COLLINS Pilot) Topics

3.1.3.1 COLLINS Pilot Topic #1

Topic title: ***"Large and deformable parts models supporting the implementation of impedance control-based for co-manipulation"***
The current pilot involves a collaborative assembly step where an operator and a robot co-manipulate a large composite sheet. While this process currently utilizes an impedance controller to ensure the robot complies with human-applied forces, there is a significant opportunity to optimize the fluidity and precision of the task by addressing the complexities of material deformation. This topic may be addressed in different ways to evolve the co-manipulation framework, however some method to model the carbon fibre sheet is required. The applicants are required to model the flexible carbon fibres and prepare a ROS2 deployable module to be integrated into the JARVIS COLLINS pilot. No matter how the problem is approached, the final solution should be validated into a real-time robot co-manipulation demonstration provided by JARVIS. Indicative technical directions that are relevant for the topic include: • **Dynamic Modelling of Deformable Carbon Fibre:** This approach is to develop a robust methodology for modelling the physical behavior of large carbon fibre sheets. Unlike rigid bodies, these composites exhibit non-linear deformation when subjected to simultaneous pulling and stretching by two agents. The goal is to move toward a system capable of analyzing and predicting these deformations in real time, ensuring the robot understands how the material—not just the human—is reacting to the movement. • **Learning-Based Material Modelling:** This approach aims to capture the complex dynamics of deformable materials using data-driven learning methods. Instead of relying solely on computationally expensive analytical models, the system learns the behaviour of the composite sheet directly from observations and interaction data. Techniques such as Learning from Demonstration (LfD) and Physics-Informed Neural Networks (PINNs) are employed to estimate the material response during manipulation. Through this learning process, the controller internalizes the material dynamics and uses this knowledge to adapt robot impedance parameters and motion trajectories in real time. This enables proactive adjustment to the sheet's elasticity and deformation behaviour, supporting intuitive and stable human-robot collaboration during handling tasks. Other imitation learning or reinforcement learning approaches can be implemented as long as the modeling of the carbon fibres remains reliable enough for safe and user-accepted co-manipulation.

Expected final outcome with Target TRL 6	At the end of the 9-month programme, applicants shall have delivered their modules in ROS2 deployable format with the necessary interfaces to enable direct integration with the JARVIS architecture. For instance, docker images, executables (.exe or.AppImage) or open repositories, where the selection among these formats is up to the applicant and can be updated during Sprint 1. The delivered module shall be integrated and validated into the COLLINS testbed at TECNALIA premises.
KPIs	• **KPI1:** Operator Physical Effort: Reduction in the average force (measured via torque sensors) the operator must apply to the composite sheet to achieve a desired position. • **KPI2:** Material Tension Stability: Variance in the tension applied to the carbon fibre sheet (Target: Minimize variance to prevent material over-stretching or wrinkling).
Resources provided by JARVIS	• Rosbags, video recordings, simulation environments • Expertise and support on learning-based robotics, AI, and perception • Access to testbed for integration and evaluation • Technical collaboration and networking opportunities
Integration Requirements	
Source code availability	API documentation is mandatory. Interface-level access required for integration and validation activities. Open-source publication is encouraged but not mandatory.
Standards	ROS2-compatible communication interfaces, JSON-structured semantic output, are preferred. GDPR-compliant handling of data, if used, and industrial safety awareness during deployment are needed.
Programming language	Flexible but it is preferred to use C++ and/or Python for ROS2 compatibility.
Travel required	Optional travel to test bed in Spain for integration. Remote integration also acceptable however, if the model requires sensors for real-time updates, the sensors must be shipped to Spain.
Other(s)	N/A

Minimum Deliverables required (M-month D-deliverable)

1st Sprint (M2)	**2nd Sprint (M7)**	**3rd Sprint (M9)**
D1.1 Requirements analysis and data capture design (rosbags, videos, sensor data) D1.2 One pager description of impact and scope of the solution	D2.1 Training of models and testing in mockup environment. D2.1 Demo video of prototype solution	D3.1 Integration in testbed and evaluation with real-time human-robot interaction. D3.2 Demo video of final solution integrated in testbed

Ideal candidate	SME, startup or consortium of SME/startup and RTD with demonstrated expertise (e.g., videos, publications, technical reports, previous project outcomes) in: • Flexible material modelling/dynamics prediction • Real-time recognition and modelling of flexible materials • Robot (compliant) control integration • ROS-based robotic system integration Experience in industrial collaborative robotics environments will be considered an advantage.
Keywords	Flexible materials modelling, Human-robot interaction, Collaborative robotics, Reinforcement learning, Imitation learning,

3.1.3.2 COLLINS Pilot Topic #2

Topic title: *"Zero Interface Human Robot Interaction in Agile Manufacturing"*

Applicants are invited to develop a Zero Interface module enabling implicit interaction within a human–robot collaborative aircraft seat composite layup process. During this operation human and robot co-manipulate parts or need to sequentially process different parts. Therefore, non-intrusive HRI is necessary to improve hands-free interaction and retain the focus of the operator on the process.

The solution shall provide a sensing and interpretation layer capable of acquiring and processing human neural, muscular, and physiological signals, such as:

- Electroencephalography (EEG) data for cognitive state monitoring or intention detection
- Electromyography (EMG) data for gesture recognition, muscle activation, and fatigue estimation
- Heart rate / Heart Rate Variability
- Electrodermal activity (EDA)
- Respiratory rate
- Gaze
- or other relevant physiometric indicators

The system provided by the third parties shall:

- Produce actionable human state metrics (e.g., cognitive workload, stress, fatigue, error-related responses, motion intent)
- Stream structured, real-time data and human state metrics to existing JARVIS tools, serving as inputs for adaptive robot behavior modulation
- Support low-latency processing suitable for collaborative manipulation tasks
- Showcase robustness under industrial conditions, including elimination of motion artifacts, electromagnetic noise or other sources of uncertainty that might affect compliance with robustness requirements.

The proposed system should deliver both hardware (wearable, sensing devices) as well as software (reasoning and interpretation of collected signals, sensor fusion – if more than one sensors are used, AI-based signal processing pipelines).

Expected final outcome with Target TRL 6	At the end of the 9-month programme, applicants shall have delivered their modules in ROS2 deployable format with the necessary interfaces to enable direct integration with the JARVIS architecture. For instance, docker images, executables (.exe or.AppImage) or open repositories, where the selection among these formats is up to the applicant and can be updated during Sprint 1. The applicants' module shall reliably capture and process human physiometric signals, extract actionable cognitive and physical state metrics, and stream them to JARVIS modules (ROS2 integration) for real-time robot behavior adaptation. The module shall be integrated into the JARVIS testbed at TECNALIA facilities. The final demonstration shall prove robust module operation, low-latency performance, and improvement in responsiveness, collaboration quality and perceived usability of the solution. Applicants are expected to actively participate in the integration of the results of the project in the JARVIS testbed, which includes integration of sensors and software modules developed as part of the project.		
KPIs	• **KPI1:** Inference time of physiometrics (e.g., stress, cognitive load) - low latency • **KPI2**: Success rate of human activity/metrics recognition • **KPI3:** Robustness under industrial conditions		
Resources provided by JARVIS	• Layout and process workflow information • Access to testbed for integration and evaluation • Rosbags, video recordings, simulation environments • Expertise and support on learning-based robotics, AI, and perception • Technical collaboration • Networking opportunities		
Integration Requirements			
Source code availability	API documentation is mandatory. Interface-level access required for integration and validation. Open-source publication is encouraged but not mandatory.		
Standards	ROS2-compatible communication interfaces preferred, JSON-structured semantic output, GDPR-compliant handling of physiological data, if used. Industrial safety awareness during deployment.		
Programming language	Flexible but it is preferred to use C++ and/or Python for ROS2 compatibility.		
Travel required	Yes		
Other(s)	N/A		
Minimum Deliverables required (M-month D-deliverable)			
1st Sprint (M2)		**2nd Sprint (M7)**	**3rd Sprint (M9)**

D1.1 Report on the requirements analysis and data capture design (rosbags, videos, sensor data) D1.2: One-pager describing project scope, impact on HRI and technical approach	D2.1 Report on the training and testing of models in mockup environment D2.2 Demo video of prototype	D3.1 Integration in testbed and evaluation with real-time human-robot interaction D3.2 Demo video of final solution integrated in testbed

Ideal candidate	SME, startup or consortium of SME/startup and RTD with demonstrated expertise (e.g., videos, publications, technical reports, previous project outcomes) in: • wearable sensing • biosignal acquisition • real-time signal processing, pattern recognition, and sensor fusion • gaze tracking and cognitive-state monitoring • real-time data streaming architectures • API-based integration into larger ecosystems (ROS2) Experience in industrial collaborative robotics environments will be considered an advantage.
Keywords	Human-robot interaction, Physiometric sensing

3.1.3.3 COLLINS Pilot Topic #3

Topic title: *"Real-Time Robot Trajectory and Dress Pack Collision Avoidance"*	
Problems with robot dress packs are a major reason for on-line adjustments of robot programs and unplanned downtime in robot stations. Therefore, it is highly valuable to consider the physical behavior of dress packs already during the off-line programming sprint through simulation. The Topic consists of developing a module capable of verifying and ensuring robot trajectories avoid collisions and self-collisions, dress packs, and surrounding geometry. This solution must be natively compatible with the ROS2 and MoveIt2 ecosystem to support path planning and control which are carried out by existing JARVIS robot control modules. Crucially, all simulation and verification tasks must be performed online, requiring high-performance execution that meets the strict time constraints necessary for real-time motion planning and operational responsiveness. The module will be validated into the JARVIS project pilot which consists of a UR20 robot outfitted with pneumatic tubing and 3D sensor cabling integrated along its arm. The solution can rely on existing sensors in the JARVIS project pilot or introduce new ones. In the second case, both hardware and software solutions shall integrated and validated into the JARVIS pilot.	
Expected final outcome with Target TRL 6	At the end of the 9-month programme, applicants shall have delivered their modules in ROS2 deployable format with the necessary interfaces to enable direct integration with the JARVIS architecture. For instance, docker images, executables (.exe or.AppImage) or open repositories, where the selection

<table>
<tr><td></td><td colspan="3">among these formats is up to the applicant and can be updated during Sprint 1.

This module shall deliver a validated real-time collision and self-collision avoidance solution considering robot dress packs and surrounding geometry.

The delivered module shall be integrated and validated into the COLLINS testbed at TECNALIA premises.</td></tr>
<tr><td>KPIs</td><td colspan="3">• KPI1: Collision detection accuracy (>95%)
• KPI2: Online performance (<2 s per trajectory check)
• KPI3: Successful integration with JARVIS modules
• KPI4: Reduction of offline programming errors related to dress packs</td></tr>
<tr><td>Resources provided by JARVIS</td><td colspan="3">• CAD models of robot, end-effector, and cables/tubes
• URDF description of the robot and robot's workcell and MoveIt integration
• Robot motion trajectories
• Technical support during integration
• Access to the physical workcell for integration and validation</td></tr>
<tr><td colspan="4">Integration Requirements</td></tr>
<tr><td>Source code availability</td><td colspan="3">API documentation is mandatory.
Interface-level access required for integration and validation.
Open-source publication is encouraged but not mandatory.</td></tr>
<tr><td>Standards</td><td colspan="3">ROS2</td></tr>
<tr><td>Programming language</td><td colspan="3">Flexible but it is preferred to use C++ and/or Python for ROS2 compatibility.</td></tr>
<tr><td>Travel required</td><td colspan="3">No</td></tr>
<tr><td>Other(s)</td><td colspan="3">N/A</td></tr>
<tr><td colspan="4">Minimum Deliverables required (M-month D-deliverable)</td></tr>
<tr><td colspan="2">1st Sprint (M2)</td><td>2nd Sprint (M7)</td><td>3rd Sprint (M9)</td></tr>
<tr><td colspan="2">D1.1 Requirements analysis and data capture design
D1.2: One-pager describing project scope, impact on HRI and technical approach</td><td>D2.1 Training and testing

D2.2 Demo video of prototype</td><td>D3.1 Integration in testbed and evaluation with real-time human-robot interaction

D3.2 Demo video of final solution integrated in testbed</td></tr>
<tr><td>Ideal candidate</td><td colspan="3">SME, startup or consortium of SME/startup and RTD with demonstrated expertise (e.g., videos, publications, technical reports, previous project outcomes) in:

• Mechatronic system design and end-effector integration
• Embedded force/tension sensing systems
• Compliant control (impedance/admittance)
• Deformable component manipulation</td></tr>
</table>

	• ROS-based robotic system integration Experience in industrial collaborative robotics environments will be considered an advantage.
Keywords	Robotics, motion planning, collision detection, digital twins, real-time simulation

3.2 Automotive Manufacturing (TOFAS Pilot)

The TOFAS use case focuses on introducing advanced human–robot collaboration into hybrid vehicle battery pack assembly processes. This process is currently manual and exhibits Topics such as variability in assembly quality and cycle time, as well as sustained ergonomic strain. The objective of this pilot is to reduce the mental and physical fatigue arising from repetitive activities and the precision handling of heavy components, while keeping the operator in the loop. In parallel, the use case aims to improve process consistency, thereby reducing the number of errors, and reduce cycle time. The envisaged JARVIS solution deploys collaborative mobile robots operating alongside human workers to support physically demanding and repetitive tasks, while enabling operators to control of sequencing and quality-related decisions. The end user for this case is TOFAS, the technical coach is LMS and TF-CC acts as the testbed host. This case aims to demonstrate how adaptive manufacturing systems and collaborative robotics can enhance resilience, ergonomics, and adaptability in automotive industries. The current status of the TOFAS use case testbed on the assembly of hybrid vehicles battery pack is demonstrated below.

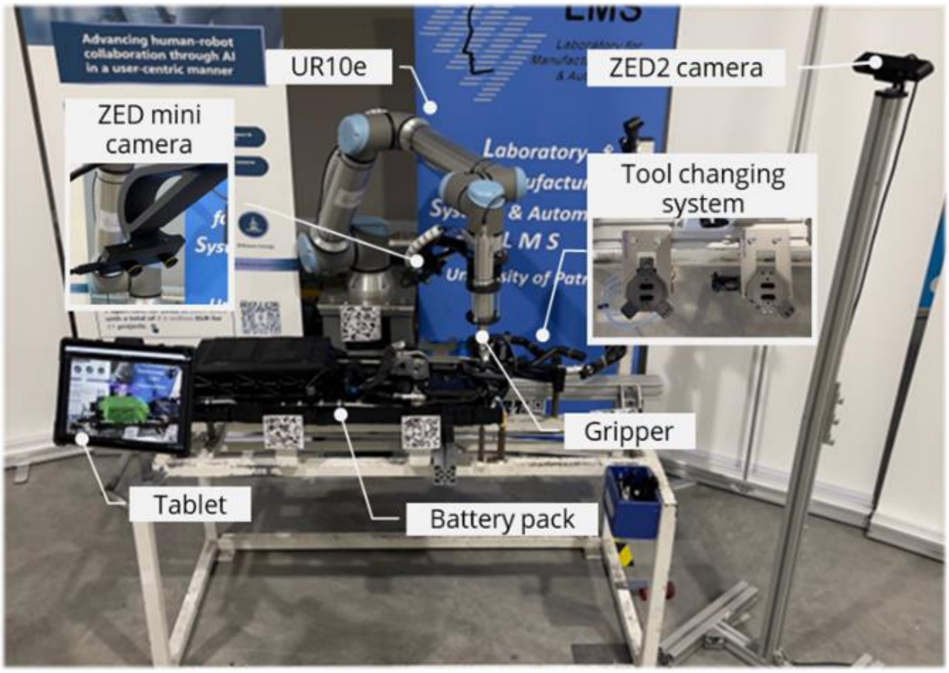


Figure 6. TOFAS testbed.

The TOFAS use case testbed incorporates a UR10e collaborative robot, a battery fixture, a tablet, a tool changing system equipped with the three grippers (cables gripper, screwdriver and clamps gripper) and ZED2 cameras.

3.2.1 TOFAS process workflow

The most relevant process steps of the TOFAS pilot that are relevant for the Open Call focus on the following collaborative assembly:

Collaborative Assembly: During this process phase, the operator and the robot work simultaneously on the battery pack. Firstly, the operator places the battery base to the designated fixture, which supports ergonomic position. Then, both the operator and the robot insert clamps simultaneously. Following, the operator installs the inverter and prepare the nuts for the robotic screwing. While the robot screws the inverter nuts, the operator installs the inverter cover. The robot continues with the screwing process, while the operator installs the pump, cables, pipes and nuts. Finally, the robot installs the connectors and the operator the battery.

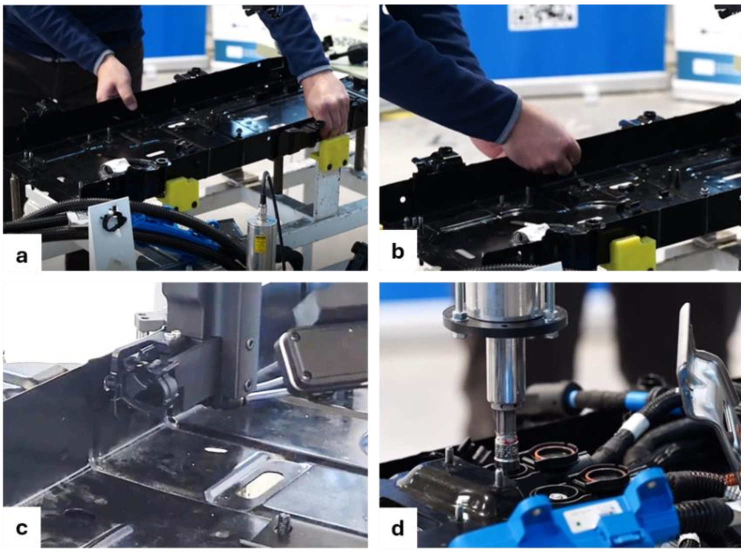


Figure 7 [a] Operator places battery in place. [b] Operator inserts clamps, [c] Robot inserts clamps, [d] Robot screwing task.

Figure 8 Collaborative operation (left), connector installation by the robot (right).

3.2.2 Expected interfaces

3.2.2.1 Hardware interfaces

Mandatory mechanical compatibility with the A TripleA Robotics Wingman tool changer

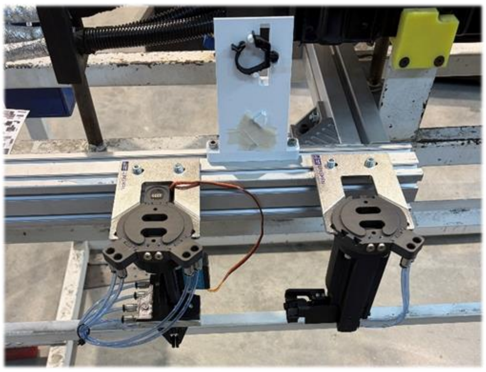


Figure 9. Current setup of the Triple A Wingman WM1-K-04-00 tool changer

3.2.2.2 Software interfaces

The software architecture of the TOFAS use case is based on **ROS2 Jazzy**, in alignment with the overall JARVIS network implementation. Therefore, all developed software components and interfaces **shall be implemented as ROS2 nodes**, using the following communication mechanisms where applicable:

- ROS2 publishers/subscribers
- ROS2 service servers/clients
- ROS2 actions (if required by the application logic)

This requirement ensures seamless integration with existing JARVIS modules, reliable interoperability, and efficient debugging and system-level troubleshooting.

Applications that do not require continuous or real-time interaction with the robot (e.g., physiometrics monitoring modules or virtual reality simulation environments) may internally utilize alternative communication protocols such as **TCP/IP, UDP, or MQTT**.

However, in all cases, the final integration with the JARVIS ecosystem **shall be performed via ROS2-compliant nodes**, meaning that the solutions' outputs to the JARVIS system, and the expected JARVIS inputs' to the solution should be exchanged via ROS.

3.2.3 Automotive Manufacturing (TOFAS Pilot) Topics

3.2.3.1 TOFAS Pilot Topic #1

Topic title: *“Intelligent Mechatronic System for Collaborative Manipulation of Linear Flexible Components”*
Development of an intelligent mechatronic system enabling safe, stable, and compliant human–robot co-manipulation of linear flexible components, such as cables and tubes, during TOFAS battery pack assembly operations. The solution shall enhance the robot’s physical interaction capabilities in close-range HRC scenarios involving routing, positioning, alignment, and shared handling of deformable components.

The system must integrate: • A component-adaptive gripping mechanism (adaptation of commercially available hardware is acceptable) • Embedded sensing for force or tension or contact or slip detection or a combination of these. • Interaction-aware control strategies enabling compliant and safe collaboration The focus is on embodied sensing and adaptive control for deformable component manipulation under realistic industrial conditions. Emphasis is placed on the development of the hardware which will be supported by sensing augmentation, intelligent control, and system integration. The developed system must be mechanically compatible with the Triple A Wingman tool changer currently deployed in the TOFAS pilot. No modification of the robot flange or tool changer is permitted. Mechanical and payload constraints provided by JARVIS must be respected. The system must expose ROS2-compatible interfaces and be validated at TF-CC premises.  Figure 10. Battery cable harness.	
Expected final outcome with Target TRL 6	At the end of the 9-month programme, applicants shall have delivered their modules in ROS2 deployable format with the necessary interfaces to enable direct integration with the JARVIS architecture. For instance, docker images, executables (.exe or.AppImage) or open repositories, where the selection among these formats is up to the applicant and can be updated during Sprint 1. The intelligent mechatronic module shall be validated deployed at TF-CC enabling safe, compliant, and tension-aware collaborative manipulation of linear flexible components. The system shall demonstrate: • Stable human–robot co-manipulation of cables and tubes • Embedded force and interaction awareness • Compliant and safe control behaviour • Full mechanical compatibility with the A Triple A Wingman tool changer • ROS2-based integration within the JARVIS pilot At least one non-confidential artefact shall be prepared for AI-on-Demand contribution.
KPIs	• **KPI1:** Real-time force/tension sensing update rate ≥ 100 Hz. • **KPI2:** End-to-end sensing-to-control loop latency ≤ 150 ms.

	• **KPI3:** Demonstrated compliant behaviour using impedance or admittance control during close human–robot interaction. • **KPI4:** Real-time detection and response to slip, excessive tension, or misalignment events. • **KPI5:** Successful validation at TF-CC premises under realistic assembly conditions, complying with a Triple A Wingman tool changer • **KPI6:** Preparation of at least one non-confidential artefact for AI-on-Demand contribution.
Resources provided by JARVIS	• Technical specifications and constraints of the A Triple A Wingman tool changer. • Description of TOFAS battery pack assembly tasks involving cables and tubes. • Access to TF-CC premises for on-site integration and validation. • Technical support for ROS2-based integration with the JARVIS pilot architecture. • Access to relevant robot interfaces and safety constraints for collaborative operation. • Dissemination support and guidance for AI-on-Demand contribution.
Integration Requirements	
Source code availability	API documentation is mandatory. Interface-level access required for integration and validation. Open-source publication is encouraged but not mandatory.
Standards	ROS2-compatible communication interfaces preferred, JSON-structured semantic output, GDPR-compliant handling of physiological data, if used. Industrial safety awareness during deployment.
Programming language	Flexible but it is preferred to use C++ and/or Python for ROS2 compatibility.
Travel required	Yes, travel to TF-CC premises is required. Greece
Other(s)	Mandatory mechanical compatibility with the A Triple A Wingman tool changer. • No modification of the robot flange or tool changer permitted. • Real-time sensing and control loop implementation required. Physical deployment and validation at TF-CC premises is required with the Third party team. On-site integration is mandatory.

Minimum Deliverables required (M-month D-deliverable)		
1st Sprint (M2)	**2nd Sprint (M7)**	**3rd Sprint (M9)**
D1.1 – System Concept and Mechanical Interface Definition, Functional requirements aligned with TOFAS cable and tube handling tasks, preliminary mechanical design	D2.1 – Report presenting the functional Mechatronic Prototype, Mechanical prototype integrated with embedded sensing, Implementation of force/tension sensing and interaction	D3.1 – report on the integration and Validation at TF-CC, delivery and installation at TF-CC premises, mechanical integration using the A Triple A Wingman tool

compatible with the A Triple A Wingman tool changer, definition of gripping concept and sensing architecture, control strategy outline (impedance/admittance approach), integration plan for ROS2-based interfaces D1.2: One-pager describing project scope, impact on HRI and technical approach	monitoring, Implementation of compliant control strategy, Laboratory (applicant's premises) validation of cable/tube co-manipulation in controlled conditions, ROS2-compatible control interface available D2.2: Demo video with the initial prototype demonstrating co-manipulation and compliant behaviour, and sensing and control response	changer, validation in real TOFAS cable and tube manipulation scenarios, demonstration of stable shared load handling, quantitative performance evaluation (stability, force control, response time) D3.2: Video demonstrating the integrated system at TF-CC

Ideal candidate	SME, startup or consortium of SME/startup and RTD with demonstrated expertise (e.g., videos, publications, technical reports, previous project outcomes) in: Mechatronic system design and end-effector integration • Embedded force/tension sensing systems • Compliant control (impedance/admittance) • Deformable component manipulation • ROS-based robotic system integration Experience in industrial collaborative robotics environments will be considered an advantage.
Keywords	Collaborative robotics, adaptive mechatronic gripper, deformable object manipulation, compliant interaction control, shared load handling

3.2.3.2 TOFAS Pilot Topic #2

Topic title: *"Wearable-Augmented Human Tracking for Uncertainty Reduction in Close-Range HRC"*
Develop a wearable-augmented sensing and interpretation module that reduces uncertainty in human activity recognition and body tracking during close human–robot collaboration and enhances human state awareness with physiometric data. The developed solution should be capable of supporting close human-robot collaboration in TOFAS battery pack assembly operations, which include (screwing, clamp assembly, cable and tube positioning. These tasks can be allocated interchangeably to human or robot, and the two resources can work in parallel. The solution must complement existing vision-based perception systems and enhance robustness under clutter, occlusions, and multi-human presence. In addition, the system must provide physiometric and cognitive load indicators derived from wearable sensing to support workload-aware and safety-aware adaptive collaboration. The developed module should improve: • Continuity and confidence of human body tracking • Reliability of task-sprint recognition • Motion planning robustness under occlusion • Real-time estimation of operator physical strain and cognitive load

The structured human state outputs must be integrated with the existing JARVIS system and provide the necessary data and context to enable adaptive robot behaviour. In the final stage, where the Third party solution will be integrated with the JARVIS robot, functionalities including but not limited to the following should be demonstrated in joint demonstrations: • Robot speed modulation • Adjustment of safety margins • Shared control weighting • Task allocation refinement Outputs must provide structured semantic descriptors of human pose, activity context, and physiometric state that can be integrated into collaborative control and planning loops within the TOFAS pilot.	
Expected final outcome with Target TRL 6	At the end of the 9-month programme, applicants shall have delivered their modules in ROS2 deployable format with the necessary interfaces to enable direct integration with the JARVIS architecture. For instance, docker images, executables (.exe or.AppImage) or open repositories, where the selection among these formats is up to the applicant and can be updated during Sprint 1. The module (software and hardware) shall enable inferring human state in HRC scenarios using wearable sensors. It shall provide real-time structured human state data (pose, activity, physiometric indicators). Finally, the module is required to be validated at TF-CC premises to demonstrate its capability to support adaptive robot behaviour in collaborative assembly tasks.
KPIs	• **KPI1:** Successful on-site integration and validation at TF-CC premises. • **KPI2:** Human body tracking continuity ≥ 95% during close-range assembly tasks under partial occlusion. • **KPI3:** Pose estimation confidence ≥ 0.85 average confidence score in cluttered and multi-human scenarios. • **KPI4:** End-to-end human state inference latency ≤ 150 ms from sensing to ROS2 output publication.
Resources provided by JARVIS	• Layout models and workstation constraints of the TF-CC pilot environment • Access to the TF-CC premises and robot system for on-site integration and validation • Technical support for ROS2-based integration with the JARVIS pilot modules • Access to TOFAS battery pack assembly workflow descriptions (screwing, clamp assembly, cable and tube positioning tasks) • Validation support during final demonstration sprint • Visibility through JARVIS dissemination channels and guidance for AI-on-Demand contribution
Integration Requirements	
Source code availability	API documentation is mandatory, Interface-level access required for integration and testing, Open-source publication is encouraged but not mandatory, The consortium must be granted integration rights for pilot validation

<table>
<tr><td>Standards</td><td colspan="2">ROS2-compatible communication interfaces preferred or TCP-IP, JSON-structured semantic output, GDPR-compliant handling of physiological data, Industrial safety awareness during deployment</td></tr>
<tr><td>Programming language</td><td colspan="2">Flexible, Preferred: Python and/or C++, JAVA</td></tr>
<tr><td>Travel required</td><td colspan="2">Yes, travel to TF-CC premises is required. Greece</td></tr>
<tr><td>Other(s)</td><td colspan="2">Real-time structured human state output (pose + activity + physiometric descriptors), Robust performance under occlusion and clutter Multi-human support preferred, On-site integration and validation required and hardware must be deployable at TF-CC premises</td></tr>
<tr><td colspan="3">Minimum Deliverables required (M-month D-deliverable)</td></tr>
<tr><td>1st Sprint (M2)</td><td>2nd Sprint (M7)</td><td>3rd Sprint (M9)</td></tr>
<tr><td>D1.1: Reporting the requirements specification aligned with TOFAS battery assembly tasks, selected wearable hardware and system architecture definition, definition of structured human state output schema (pose + activity + physiometric descriptors). integration plan for ROS2-based interfaces

D1.2: One-pager describing project scope, impact on HRI and technical approach</td><td>D2.1: Report describing the functional prototype of wearable sensing and interpretation module, presenting qualitative and quantitative results from real-time human state inference (activity + physiometric indicators), demonstration of uncertainty reduction under occlusion in controlled tests, and ROS2-compatible API available for pilot integration

D2.2: Video with the initial prototype of the solution working at the premises of the applicant in a relevant scenario (close-range human-robot collaboration).</td><td>D3.1: Report describing delivery and installation of the wearable system at TF-CC premises, integration with the JARVIS pilot architecture via ROS2 interfaces, validation in realistic TOFAS battery pack assembly scenarios (screwing, clamp assembly, cable and tube positioning) demonstration of adaptive robot behaviour based on structured human state inputs.

D3.2: Video demonstrating the integrated system at TF-CC</td></tr>
<tr><td>Ideal

candidate</td><td colspan="2">SME, startup or consortium of SME/startup and RTD with demonstrated expertise in:

• Human activity recognition using wearable sensing systems
• Wearable sensing systems for physiometric monitoring (e.g. workload, fatigue, stress indicators)
• Interpretation and modelling of cognitive and physical load from sensor data
• Sensor fusion and real-time inference of human state
• Human–robot collaboration environments
• ROS-based system integration</td></tr>
<tr><td>Keywords</td><td colspan="2">Wearable sensing systems, human activity recognition under occlusion, physiometric and cognitive load estimation, multimodal sensor fusion</td></tr>
</table>

3.2.3.3 TOFAS Pilot Topic #3

<table>
<tr><th colspan="2">Topic title: “Digital Safety Validation and Risk-Aware Design for Close-Range Human–Robot Collaboration”</th></tr>
<tr><td colspan="2">Develop a digital safety validation module, optionally immersive (VR/XR-enabled), that enables automated generation and evaluation of diverse human–robot collaboration scenarios for TOFAS battery pack assembly.

The module shall:
• Automatically generate multiple HRC scenarios using generative AI techniques
• Simulate human–robot interaction under varying workspace layouts, motion paths, task sequences, and operator behaviours
• Identify and flag potential safety-critical situations
• Quantify interaction risk levels across generated scenarios
• Recommend mitigation measures (e.g. layout changes, motion adjustment, safety zone refinement)

The solution must support proactive safety design before physical deployment and provide structured outputs that can inform collaborative control and safety management mechanisms within the JARVIS ecosystem.

Validation shall demonstrate automated generation and evaluation of multiple realistic battery assembly scenarios.</td></tr>
<tr><td>Expected final outcome with Target TRL 6</td><td>At the end of the 9-month programme, applicants shall have delivered their modules in ROS2 deployable format with the necessary interfaces to enable direct integration with the JARVIS architecture. For instance, docker images, executables (.exe or.AppImage) or open repositories, where the selection among these formats is up to the applicant and can be updated during Sprint 1.

The digital safety validation module shall automatically generate, simulate, and evaluate multiple close-range human–robot collaboration scenarios for TOFAS battery pack assembly. Specifically, it shall:
• Proactively identify safety-critical interaction patterns
• Quantify risk levels across scenario variations
• Recommend actionable mitigation measures
• Provide structured outputs usable by collaborative control and safety management systems (sensors / interfaces)

The solution shall demonstrate its capability to support safety-oriented design decisions before physical deployment.

The delivered module shall be integrated and validated into the TOFAS testbed at TF-CC premises.</td></tr>
<tr><td>KPIs</td><td>• KPI1: Automated generation of ≥ 20 distinct HRC scenario variations.
• KPI2: Identification and classification of at least 5 distinct risk categories (e.g. collision proximity, unsafe zone overlap, timing conflict).
• KPI3: Generation of mitigation recommendations for detected risk scenarios.
• KPI4: Successful demonstration using realistic TOFAS battery assembly tasks.</td></tr>
</table>

Resources provided by JARVIS	• Digital representations of TOFAS battery pack assembly workstations • Representative robot motion data and safety envelope definitions • Task descriptions for screwing, cable and tube positioning • Technical support for integration with digital twin infrastructure • Virtual validation of the solution. • Dissemination support and AI-on-Demand guidance
Integration Requirements	
Source code availability	API documentation mandatory. Interface-level access required for integration with JARVIS digital representations. Open-source publication encouraged but not mandatory.
Standards	The solution shall align conceptually with collaborative robotics safety principles as defined in: • ISO 10218 • ISO/TS 15066 • ISO 12100 Formal certification is not required within the project scope. The objective is safety-informed modelling and risk evaluation consistent with these standards. Structured output format for safety assessment results (e.g. JSON-based risk descriptors)
Programming language	Flexible. Preferred: C++ or C# for simulation and integration components. Unity if immersive XR components are used.
Travel required	Yes, travel to TF-CC premises is required.
Other(s)	• Automated generation of multiple scenario variations required • Risk scoring or classification mechanism required • Structured output describing risk type, severity, and recommended mitigation • Integration-ready outputs usable by collaborative control and safety monitoring systems • Demonstration using TOFAS battery pack assembly tasks

Minimum Deliverables required (M-month D-deliverable)

1st Sprint (M2)	2nd Sprint (M7)	3rd Sprint (M9)
D1.1 – System architecture and scenario generation concept, definition of generative scenario model, definition of risk assessment methodology, integration plan with TOFAS digital representations	D2.1 – Report presenting the functional prototype, automated generation of multiple HRC scenarios, simulation of robot motion and human behaviour variations, preliminary automated risk detection and classification D2.2: Video with the initial prototype of the solution with evidence of automated scenario	D3.1 – Report presenting the validated safety platform, automated evaluation of at least 10 distinct HRC scenario variations for the TOFAS cell, structured risk outputs usable by control/safety layers, demonstration of

D1.2: One-pager describing project scope, impact on HRI and technical approach	generation, and example risk outputs and mitigation suggestions	mitigation recommendation capability D3.2: Video demonstrating the integrated system at TF-CC

Ideal candidate	SME or startup or consortium of SME/Startup and RTD with demonstrated expertise in: • Risk assessment methodologies in industrial systems • Human–robot collaboration safety modelling • Industrial or XR-based simulation environments • Structured data generation and machine-readable output design • Generative AI techniques for scenario synthesis or simulation automation Experience in collaborative robotics environments or industrial safety analysis is required.
Keywords	Generative AI for scenario synthesis and collaborative workspace analysis, human–robot collaboration safety modelling, automated risk assessment, safety-aware motion validation, decision-support for shared control

3.3 Nuclear Plants Decommissioning (EDF Pilot)

The EDF use case focuses on introducing advanced human–robot collaboration into inspection and intervention activities related to nuclear power plant decommissioning. These operations are currently performed in hazardous and constrained environments, requiring prolonged task execution under strict safety procedures, which leads to operator exposure to radiation risks and accumulated physical strain. The objective of this pilot is to reduce operator presence in harmful environments, increase the degree of remote operation, and improve the reliability and consistency of inspection and dismantling activities, while keeping humans in control of critical decisions. The end user is EDF, and CEA is the technical coach and testbed host of this pilot. The envisaged JARVIS solution deploys robotic systems equipped with advanced perception and interaction capabilities to support 3D cartography, radiation characterization, and dismantling tasks.

Overall, this case aims to demonstrate how human–robot collaboration can enhance safety, robustness, and operational efficiency in safety-critical nuclear decommissioning operations. The current status of the nuclear power plants decommissioning testbed is demonstrated below.

Figure 11. Current status of EDF testbed.

The CEA testbed comprises static elements (walls, vessel, and extremity supports, pipes have been put in place for preliminary tests with 3D cartography and cutting shears experiments.

3.3.1 EDF process workflow

The EDF use case process focuses on three main tasks, which are the following:

1. **Inspection (3D cartography):** Using dedicated onboard 3D sensor, the robot arm performs multiple snapshots from different points of view, selected by the operator. A dedicated algorithm extracts semantic information from the point cloud to reconstruct the 3D scene in the digital twin.
2. **Radiologic characterization:** The operator selects the equipment to work on (dedicated tube and wall) and the robot approaches the position. A teaching virtual guide is then activated, to allow the operator to move the robot along the equipment and teach the point of application. The characterization is done automatically with a dedicated skill, at the previously teached point of application.
3. **Dismantling:** This step is mainly subdivided into cutting selected tubes by the operator, supports and heat insulation.

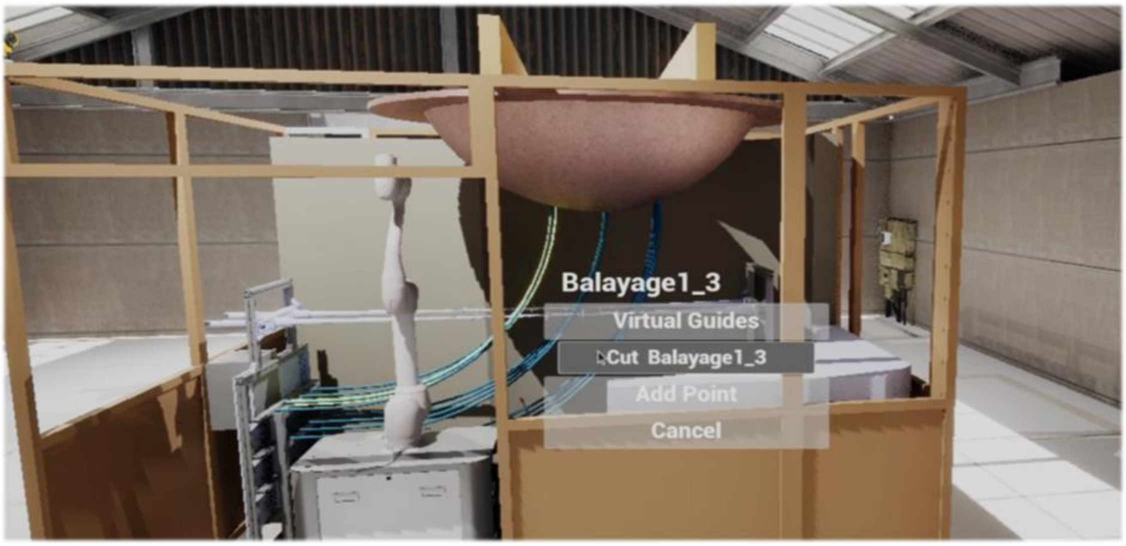


Figure 12. teaching virtual guide.

3.3.2 Expected interfaces

3.3.2.1 Software interfaces

The software architecture of the EDF use case is based on ROS2 Jazzy, in alignment with the overall JARVIS network implementation. Therefore, all developed software components and interfaces shall be implemented as ROS2 nodes, using the following communication mechanisms where applicable:

- ROS2 publishers/subscribers
- ROS2 service servers/clients
- ROS2 actions (if required by the application logic)

This requirement ensures seamless integration with existing JARVIS modules, reliable interoperability, and efficient debugging and system-level troubleshooting.

Applications that do not require continuous or real-time interaction with the EDF testbed robot may internally utilize alternative communication protocols such as TCP/IP, UDP, or MQTT.

However, in all cases, the final integration with the JARVIS ecosystem shall be performed via ROS2-compliant nodes, meaning that the solutions' outputs to the JARVIS system, and the expected JARVIS inputs' to the solution should be exchanged via ROS.

3.3.3 Nuclear Plants Decommissioning (EDF Pilot) Topics

3.3.3.1 EDF Pilot Topic #1

Topic title: *“Optimization of waste volume packaging*”
The dismantling of nuclear facilities generates significant amounts of waste that must be placed into certified waste containers. These containers are then transported to and stored in

specialized facilities with limited capacity. Reducing the number of containers sent to these facilities offers several benefits:

- It extends the operational lifespan of storage facilities.
- It lowers the costs associated with container supply, transportation, and storage.

This Topic focuses on optimizing waste packaging by selecting pre-cut components from a bin and placing them into the final container. It involves grasping parts from an unstructured mix of items with various geometries, such as tubes of different diameters, formed or bent tubes, flat and curved sheets with or without welded attachments, curved panels, I-beams, and others. These components must be reorganized into one or more containers, whose specifications will be provided at the start of the project.

The selected applicant is expected to deliver a physical demonstrator of a robotic solution operating in its intended environment (including at minimum a bin, representative cut parts, and containers).

Expected final outcome with Target TRL 6	At the end of the 9-month programme, applicants shall deliver a stand-alone demonstrator with relevant TRL6 context. The delivered solution shall be integrated and validated with robotic hardware provided by candidate.	
KPIs	• KPI1: Vision Detection Rate > 85% • KPI2: Pick Success Rate > 80% • KPI3: End-to-end Success Rate >80% • KPI4: Volume reduction > 50%	
Resources provided by JARVIS	• Specifications of offcut parts to be handled (material, size, shape) • Containers mock-up (scaled-down to relevant size for demonstration purpose)	
Integration Requirements		
Source code availability	API documentation mandatory. Interface-level access required for integration with JARVIS digital representations. Open-source publication encouraged but not mandatory.	
Standards	ROS2 interface with JARVIS modules	
Programming language	Applicant is free to use any programming language.	
Travel required	Yes	
Other(s)	Applicants must show the capacity to provide a physical demonstrator (Robot and environment) that will be integrated in the overall scenario in the final stage of the project.	
Minimum Deliverables required (M-month D-deliverable)		
1st Sprint (M2)	**2nd Sprint (M7)**	**3rd Sprint (M9)**
D1.1: Design of the envisaged physical demonstrator.	D2.1: Report presenting the functional prototype, and the implemented methodology.	D3.1: Report presenting the validated solution for the EDF cell

D1.2: One pager description of the methodology that will be implemented for grasping and volume optimization problems.	D2.2: Video of the initial prototype of the solution working at the premises of the applicant in a relevant scenario.	D3.2: Video demonstrating the implementation of the solution at CEA premises.

Ideal candidate	SME, startups or RTO with demonstrated expertise (e.g., videos, publications, technical reports, previous project outcomes) on: • Object detection • 3D pose estimation • Path planning • Optimization approaches
Keywords	Object detection, 3D pose estimation, path planning, volume optimization.

3.3.3.2 EDF Pilot Topic #2

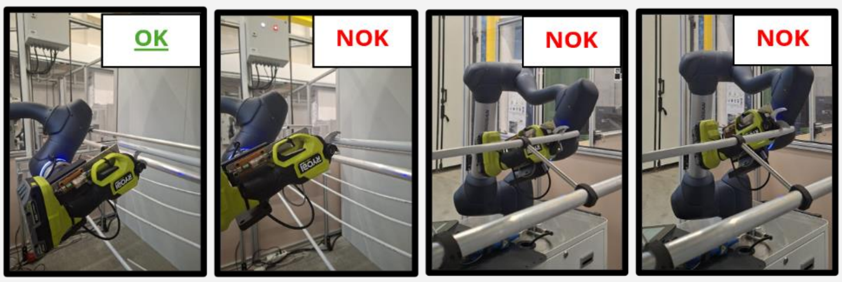
Topic title: *"Anomaly detection for teleoperation and skills execution "*

Remote control of a robot during decommissioning activities requires continuous attention from the teleoperator. The teleoperator must monitor parameters related to several components, including the environment and the component to be dismantled, the tool being used, the robotic arm manipulating the tool, and the various cameras providing feedback on the operation.

This Topic aims to enhance the monitoring of parameters from tools, the robotic arm, and cameras, to generate warnings or stop the execution of the operation when an anomaly is detected. One example is the "pipe cutting" skill using shears. The pictures below illustrate correct (OK) and incorrect (NOK) shear positioning for pipe cutting. The shears may be closed (NOK) or improperly positioned relative to the pipe to be cut (NOK: too high or too low). In addition to this example, other skills such as circular saw cutting and bin placement for offcut retrieval may also be considered.

Applicants should also design an effective information presentation approach (definition data types) that enables the teleoperator to clearly understand detected anomalies and the system status.

The AI-enhanced feedback should be presented to the user through a user-centric visualization (e.g., visual cues indicating correct direction, or camera feeds augmented with geometric information) to support intuitive robot control.



Expected final outcome with Target TRL 6	ROS2 package for handling data capture from multiple sources (cameras, robot arm, tools) ROS2 package for receiving the multisensory data and providing the result as OK or NOK for the cutting. Data capture design about

	camera installation and choice. These packages are to be tested on Pilot robot at CEA premises. At the end of the 9-month programme, applicants shall have delivered their modules in ROS2 deployable format with the necessary interfaces to enable direct integration with the JARVIS architecture. For instance, docker images, executables (.exe or.AppImage) or open repositories, where the selection among these formats is up to the applicant and can be updated during Sprint 1.		
KPIs	• **KPI1:** Detection of 90% of predefined anomalies. • **KPI2:** Online performance (<1 s raising warnings) • **KPI3:** Reduction of false positives		
Resources provided by JARVIS	• Access to test-bed at CEA premises to capture relevant data: Rosbags, video recordings both from real and simulation environments.		
Integration Requirements			
Source code availability	API documentation mandatory. Interface-level access required for integration with JARVIS digital representations. Open-source publication encouraged but not mandatory.		
Standards	ROS2 (if communication with JARVIS modules is needed)		
Programming language	Candidate is free to use their preferred programming language.		
Travel required	No		
Other(s)	N/A		
Minimum Deliverables required (M-month D-deliverable)			
1st Sprint (M2)		**2nd Sprint (M7)**	**3rd Sprint (M9)**
D1.1 Requirements analysis and data capture design (rosbags, videos, sensor data). D1.2 One pager of the proposed solution impact and description		D2.1 Report of the solution implementation and tests in captured and synthetic data D2.2 Demo video of prototype	D3.1 Integration in testbed and evaluation with real-time teleoperation. D3.2 Demo video of final solution integrated in testbed
Ideal candidate	SME, startups or RTO with demonstrated expertise on default detection		
Keywords	Multi sensor fusion, video feature extraction, scene interpretation, visual/auditory cues		

3.4 Offshore Inspection & Maintenance (EQUINOR Pilot)

The offshore energy production use case focuses on introducing mobile manipulators to perform both autonomous inspection and semi-autonomous intervention tasks in industrial environments. Such offshore operations expose operators to safety risks related to process conditions and the operating environment (e.g. high-pressure pipelines and valves, flammable or toxic fumes, and fire or explosion hazards). The objective of this pilot is to reduce operator exposure to hazardous areas while improving the efficiency, reliability, and flexibility of inspection and maintenance processes and reducing the need for robotics expertise during normal operation.

The envisaged JARVIS solution deploys mobile manipulators capable of performing 1) autonomous inspection missions, which are non-contact operations such as visual checks and data collection, as well as 2) semi-autonomous intervention tasks under human supervision, which require physical interaction with the process, such as operating valves or switches. Within the adopted human-in-the-loop approach, operators specify high-level tasks rather than controlling the robot directly, while being supported by AI-based mission planning, and continuously approve subsequent actions.

The JARVIS solution will enable the mobile robots to autonomously navigate the environment, avoid obstacles, and perform self-charging when required, while streaming operational data to dedicated control rooms to support continuous and flexible deployment. The end-user for this use case is EQUINOR, with SINTEF acting as the technical coach and testbed host. The current status of the offshore energy production pilot testbed is shown in the pictures below.

Figure 13. Current status of EQUINOR testbed.

The SINTEF testbed – and outdoor laboratory located in Trondheim, Norway – provides a realistic environment for testing human-machine interaction and autonomous mobile manipulators in inspection and maintenance scenarios. It includes industrial components such as valves and switches, and narrow and wide corridors to replicate operational Topics. The setup will support autonomous navigation, perception-driven manipulation and task-level human-in-the-loop workflows enabling validation of autonomous planning and operator interfaces. Its design also facilitates repeatable data collection and integration of JARVIS modules such as OFO, MSP, HRIM, and IDT for end-to-end system testing.

3.4.1 EQUINOR process workflow

The workflow of the EQUINOR use case involves the following tasks:

1. **Autonomous inspection missions:** These missions are non-contact operations such as visual checks and data collection
2. **Semi-autonomous intervention tasks**: These tasks are performed under human supervision, and require a robot to perform physical interaction with the process, such as operating valves or switches.

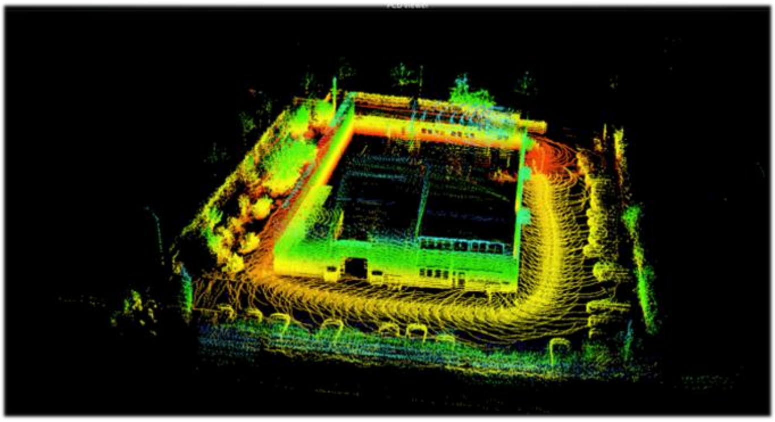


Figure 14. Indicative point cloud of the tested outdoor environment

3.4.2 Expected interfaces

3.4.2.1 Hardware interfaces

Mobile robot: Husarion Panther v1.2
Robot manipulator: Universal Robots UR5e
Lidar 3d ouster 32 beam OS0 (rev6)
2 ZED2i camera s
Gripper: Robotiq 2F-85

3.4.2.2 Software interfaces

The software architecture of the Equinor use case is based on **ROS2 Humble**, in alignment with the overall JARVIS network implementation. Therefore, all developed software components and interfaces **shall be implemented as ROS2 nodes**, using the following communication mechanisms where applicable:

- ROS2 publishers/subscribers
- ROS2 service servers/clients
- ROS2 actions (if required by the application logic)

This requirement ensures seamless integration with existing JARVIS modules, reliable interoperability, and efficient debugging and system-level troubleshooting.

Applications that do not require continuous or real-time interaction with the robot (e.g., virtual reality simulation environments) may internally utilize alternative communication protocols such as **TCP/IP, UDP, or MQTT**.

However, in all cases, the final integration with the JARVIS ecosystem **shall be performed via ROS2-compliant nodes**, meaning that the solutions' outputs to the JARVIS system, and the expected JARVIS inputs' to the solution should be exchanged via ROS2.

3.4.3 Offshore Inspection & Maintenance (EQUINOR Pilot) Topics

3.4.3.1 EQUINOR Pilot Topic #1

<table>
<tr><th colspan="2">Topic title: “Robust self-localization and mapping with mobile robots in semi-outdoor process plant environments”</th></tr>
<tr><td colspan="2">Mobile robots operating in industrial process plant environments (e.g., onshore or offshore oil and gas facilities) require reliable localization despite semi-outdoor conditions and partially GNSS-denied areas.

The goal of this challenge is to develop a robust ROS2-based self-localization and mapping module that improves the accuracy and robustness of the current system, which relies on ROS2 Nav2-based integration of onboard sensors (3D lidar and ZED2 stereo cameras). The solution should include improved localization algorithms and multi-sensor fusion, allowing the system to dynamically determine which sensors to trust under varying environmental conditions. In parallel, it will also support mapping-update of the environment using the onboard sensors, increasing robot awareness and responsiveness. The mapping approach should be easy to set up and allow alignment with existing facility representations such as CAD models or digital maps.

Optionally, the system may include barrier-chain detection, identifying chains temporarily placed across walkways to block access.

The final solution must be implemented in ROS2 and compatible with the Nav2 navigation stack.</td></tr>
<tr><td>Expected final outcome with Target TRL 6</td><td>At the end of the 9-month programme, applicants shall have delivered their modules in ROS2 deployable format with the necessary interfaces to enable direct integration with the JARVIS architecture. For instance, docker images, executables (.exe or.AppImage) or open repositories, where the selection among these formats is up to the applicant and can be updated during Sprint 1.

The module will be delivered as a SLAM solution add-on which is easy to set up and robustly working integrated with the robot’s current navigation system in ROS2.

The delivered module shall be integrated and validated into the EQUINOR testbed at SINTEF premises.</td></tr>
<tr><td>KPIs</td><td>• KPI1: +/- 5 cm absolute accuracy in UGV position estimate.
• KPI2: +/- 5 degrees absolute accuracy in UGV orientation estimation</td></tr>
<tr><td>Resources provided by JARVIS</td><td>• Outdoor robot facility in Trondheim, Norway with skid-steered UGV with Lidar and Zed2i sensor. Gazebo-based simulator of robot and facility (with lidar sensor only).
• Rosbags from real-sensor data and robot odometry during robot experiments</td></tr>
</table>

	• Motion capture system from Qualisys for validation of KPIs[1].	
Integration Requirements		
Source code availability	Documentation on API mandatory. Interface-level access required for integration with robot and onboard sensor(s). Containerized solution Interface-level access required for integration ROS2 nav2 based navigation.	
Standards	ROS2 Humble	
Programming language	Flexible Preferred: C++ and/or Python for ROS2 compatibility.	
Travel required	Yes, travel to SINTEF premises in Trondheim, Norway is required.	
Other(s)	• Preferably the SLAM system works with sensors currently available (i.e., Zed2i, Lidar, odometry), but additional sensors provided by the consortium can also be considered. • Skid-steering robot • Ubuntu 22.04 + ROS2 humble compatible. • Localization (2D position + orientation) update at minimum 20 Hz • No custom ROS2 message definitions unless justified. • Operate on moderate HW resources. • In case specific training data is needed in addition to the data provided by SINTEF, then this must be provided by the pilot consortium. • SW delivered fully tuned to outdoor lab in Trondheim, Norway. • SLAM system shall be compatible with the Nav2 navigation stack by providing the standard interfaces used by Nav2 for localization and global navigation. • In cases where additional hardware is required (e.g., compute, communication, etc.) then this shall be provided and integrated by the pilot consortium. • Travel for on-site integration and testing, ~1 week.	
Minimum Deliverables required (M-month D-deliverable)		
1st Sprint (M2)	**2nd Sprint (M7)**	**3rd Sprint (M9)**
D1.1 – System architecture, requirements, KPIs, and plan for integration with JARVIS UGV in the Equinor use case. D1.2: One-pager describing project scope, impact on HRI and technical approach	D2.1 Report describing the functional prototype. D2.2: Video with the initial functional prototype of the solution working at the premises of the applicant in a relevant scenario	D3.2: Report describing the implementation and testing of the solution, including quantification of accuracy, as well as integration with JARVIS UGV. D3.2 video of results.

[1] Description of Motion Capture system here (in Norwegian. English description will be provided to funded pilots on demand): https://www.sintef.no/laboratorier/hippo-lab/systemkomponenter/#menu

Ideal candidate	SME, startup or consortium of SME/startup and RTD with demonstrated expertise (e.g., videos, publications, technical reports, previous project outcomes) in the technology areas addressed in this Topic description. Experience in industrial collaborative robotics environments will be considered an advantage.
Keywords	Multi-sensor fusion; SLAM;

3.4.3.2 EQUINOR Pilot Topic #2

Topic title: *"Online automatic detection of damages on metal/concrete infrastructure and/or operational features*"	
Industrial facilities require frequent inspection to detect asset damage (e.g., corrosion, coating loss, cracks, leaks) and to verify operational features (e.g., presence or absence of valve car seals, barrier chains, or other safety indicators). Applicants shall develop a vision-based inspection system capable of detecting and categorizing asset damage and operational features in industrial process environments. Typical examples include corrosion, coating degradation, cracks, leaks, and other structural anomalies, as well as operational indicators such as the presence or absence of valve car seals, barrier chains, and similar plant elements. The solution shall enable automated inspection during robot operation by analysing sensor data to identify structural anomalies and operational features in industrial facilities. The system shall produce analysis outputs that clearly indicate: • the detected feature or damage type, • the visual or sensor evidence supporting the detection, • a confidence level associated with the classification result. Results should be presented in a form that is easily interpretable by process plant operators and other relevant personnel, enabling rapid situational awareness without requiring expertise in machine learning nor robotics. The proposed solution shall rely on image data, possibly enhanced with 3D data (e.g., RGB cameras, Zed2i cameras) and implement robust AI models for visual recognition and classification. To ensure reliable model development and validation, applicants are expected to provide or generate appropriate datasets themselves. These datasets may originate from real industrial data collection campaigns or from synthetically generated data that realistically represents the targeted inspection scenarios. The use of pre-trained models and domain-specific datasets is encouraged.	
Expected final outcome with Target TRL 6	At the end of the 9-month programme, applicants shall have delivered their modules in ROS2 deployable format with the necessary interfaces and supports integration with the JARVIS architecture. For instance, docker images, executables (.exe or.AppImage) or open repositories, where the selection among these formats is up to the applicant and can be updated during Sprint 1. The delivered module shall be integrated and validated into the EQUINOR testbed at SINTEF premises in Trondheim, Norway.
KPIs	• **KPI1:** >= 80 % of 10 sampled damage/operational alerts are reported as "clear/understandable" by a test group of 5-10 plant operators (80 % across the group on average)

	• **KPI2:** Precision ≥ 0.90 for a selection of major classes (e.g., corrosion, cracks, coating loss, or car seal presence/absence) on a blind validation dataset. • **KPI3:** On-site integration with robot, robot-onboard sensor and user interface.
Resources provided by JARVIS	• Outdoor robot facility in Trondheim, Norway, with skid-steered UGV with Zed2i sensor, mock-up process equipment, and User Interface to display images from inspection results. • A blind validation set, provided by JARVIS, will be used for final evaluation captured from Zed2i sensor unless otherwise specified by JARVIS. The size of the data set will be limited (tens to low-hundreds of samples) and is intended only for the final scoring, not for training. The dataset will cover a representative subset of the defined target classes and typical environmental conditions (e.g., from an outdoor test facility in Trondheim, Norway. Data from other sources will be considered provided, but is currently not confirmed). Hence, the pilot must provide training data themselves. The exact dataset composition (classes included, environmental variation, and approximate sample counts) will be specified once the final scope is defined, and will remain fixed thereafter.
Integration Requirements	
Source code availability	Documentation on API mandatory. Interface-level access required for integration with robot and onboard sensor(s). Containerized solution, ROS2 compliant interfaces
Standards	NaN
Programming language	Flexible, but preferred: C++ and/or Python for ROS2 compatibility.
Travel required	Yes, travel to SINTEF premises in Trondheim, Norway is required.
Other(s)	• Pilot consortium brings relevant data for training and testing. • No Internet connection needed in operation. • RGB data mandatory. 3D data sources optional. Zed2i camera is available on robot. • If the pilot requires hardware capabilities (e.g., compute, sensor, wireless communication) not available in the current lab setup, then the pilot is responsible for integrating the necessary hardware onsite in Trondheim. • Travel for on-site integration and testing, ~1 week.

Minimum Deliverables required (M-month D-deliverable)

1st Sprint (M2)	2nd Sprint (M7)	3rd Sprint (M9)
D1.1 – System architecture, requirements, and plan for integration with	D2.1 Report describing the functional prototype as a deployable inference pipeline (containerized) integrated with JARVIS UGV.	D3.2: Report describing the implementation and testing of the solution, including quantification of performance, as well as integration with JARVIS UGV.

JARVIS UGV in the Equinor use case. D1.2: One-pager describing project scope, impact on HRI and technical approach	D2.2: Video with the initial functional prototype of the solution working at the premises of the applicant in a relevant scenario	D3.2 video of results.

Ideal candidate	SME, startup or consortium of SME/startup and RTD with demonstrated expertise (e.g., videos, publications, technical reports, previous project outcomes) in the technology areas addressed in this Topic description. Experience in industrial collaborative robotics environments will be considered an advantage.
Keywords	Automatic data analysis; HMI

3.4.3.3 EQUINOR Pilot Topic #3

Topic title: *"Autonomous intervention with mobile manipulator using Foundation Models"*	
Programming robots for intervention tasks in industrial environments typically requires extensive task-specific engineering and manual programming. Recent advances in foundation models for robotics (e.g., vision-language-action models, multimodal foundation models, or generalist robot policies) offer new opportunities to improve robot reasoning, task understanding, and adaptability, enabling robots to perform a wider range of tasks with less manual configuration. The goal of this challenge is to develop an autonomous intervention system for a mobile manipulator operating in a process plant-like environment under varying outdoor lighting conditions. The work will follow two stages. First, participants will develop a simulation environment representing the robot setup and intervention tasks to support development, training, and validation. Second, the solution will be deployed on the real robotic platform consisting of a UR5e mobile manipulator with gripper and two ZED2i stereo cameras integrated with ROS2 Humble. Typical tasks include pressing push-buttons, operating switches, opening and closing cabinets, and turning valve handles. A task catalogue with mechanical details (e.g., object dimensions and approximate approach vectors) will be provided. Hybrid approaches combining foundation models with classical control and perception methods are welcome.	
Expected final outcome with Target TRL 6	At the end of the 9-month programme, applicants shall have delivered their modules in ROS2 deployable format with the necessary interfaces to enable direct integration with the JARVIS architecture. For instance, docker images, executables (.exe or.AppImage) or open repositories, where the selection among these formats is up to the applicant and can be updated during Sprint 1. Functional prototype should be implemented, integrated and tested with UR5e (with Robotiq 2F-85 gripper, and mounted on UGV) at a SINTEF-lab outdoor in Trondheim, Norway.
KPIs	• **KPI1:** >70 % success rate across repetitive tasks: E.g., open a cabinet, push a ~1.5 cm push-button, turn 3 different valve types; Measured over >20 attempts per task.

	• **KPI2:** Tasks completed in < 45 seconds from command to finished action, excluding UGV navigation. • **KPI3:** >90 % of 20 rated explanations rated “clear” by 3 independent human evaluators (non-robot experts)
Resources provided by JARVIS	• Access to robot (UGV with UR5e arm and Zed2i sensor) and outdoor lab (in Trondheim) for the pilot to generate training data and test solutions. • As pilots are running from January 2027 there is wintertime in Norway and the outdoor lab will have snow. Still, on days without precipitation, there could potentially be opportunities to collect training data outdoors. • JARVIS provides rudimentary 3D models of the robot and process equipment (with e.g., non-functional valve handles and a flip switch).
Integration Requirements	
Source code availability	Documentation on API mandatory. Interface-level access required for integration with robot and onboard sensor(s). Containerized solution ROS2-compliant interfaces
Standards	NaN
Programming language	Flexible. Preferred: C++ and/or Python for ROS2 compatibility.
Travel required	Yes, travel to SINTEF premises in Trondheim, Norway is required.
Other(s)	• Ubuntu 22.04 + ROS2 humble compatible. • Simulation environment needs to be provided by the pilot consortium. • Standard ROS2 messages unless custom message definitions are essential for manipulation policies. Justification needed. • Offline inference using local compute resources (e.g., provided by the pilot consortium, or use compute already onboard the UGV) is favourable, but cloud processing can be optional. In case the hardware available in the lab is not sufficient (compute, Wi-Fi, etc.) is not sufficient, then the pilot needs to provide and integration necessary hardware. • SW delivered fully tuned to outdoor lab in Trondheim, Norway, i.e., varying lighting, and snow-reflections from surroundings. • Training on data collected by the pilot consortium (JARVIS does not provide training data). • For each action, provide a compact operator-friendly explanation including, e.g., detected target object, intended action, and a simple rationale. • Travel for on-site integration and testing, ~1 week. • Robot actions shall be executed via ROS2 control interfaces (Cartesian pose goals and/or joint-velocity control). Detailed API will be provided.

Minimum Deliverables required (M-month D-deliverable)		
1st Sprint (M2)	**2nd Sprint (M7)**	**3rd Sprint (M9)**
D1.1 – System architecture, requirements, and plan for	D2.1 Report describing the functional prototype as a	D3.2: Report describing the implementation and testing

integration with JARVIS UGV+UR5e in the Equinor use case. D1.2: One-pager describing project scope, impact on HRI and technical approach	deployable inference pipeline (containerized) integrated with JARVIS UGV+UR5e. D2.2: Video with the initial functional prototype of the solution working at the premises of the applicant in a relevant scenario	of the solution, including quantification of performance, as well as integration with JARVIS UGV+UR5e. D3.2 video of results.

Ideal candidate	SME, startup or consortium of SME/startup and RTD with demonstrated expertise (e.g., videos, publications, technical reports, previous project outcomes) in the technology areas addressed in this Topic description. Experience in industrial collaborative robotics environments will be considered an advantage.
Keywords	Autonomous manipulation, Real-time control, Foundation models integration

4 HOW TO APPLY?

The F6S platform will be the single-entry point for all applications to the JARVIS Open Call for co-development. The applications must happen via https://www.f6s.com/jarvis-oc2-external-pilots/apply

The templates to the Open Call documents are available here → https://www.jarvis-project.eu/open-calls/open-call-2/.

The project proposals must strictly adhere to the F6S application form, which defines sections, required Annexes, and the overall length. Participants are requested to carefully read and follow the instructions in the form. Additional material, which has not been specifically requested in the online application form, will not be considered for the evaluation of the proposals and may be subject to withdrawal from the evaluation.

Applying to an Open Call takes time and dedication and we would like to make sure that you understand the crucial rules:

- **Be on time**: Make sure you submit your proposal through the F6S platform before the deadline. If you submit the form correctly, the system will send you a confirmation of your submission (please check your SPAM folder as well). Proposals submitted by any other means are ineligible, hence will not be evaluated.
- **F6S application**: The F6S platform allows you to work flexibly on the content, which is automatically saved once you progress filling out the form. All members of your team can have access to the application form and contribute to the work.
- **Be exhaustive**: Have you answered all the sections of the form and uploaded all required Annexes?
- **Every question deserves your attention**: All sections of your proposal must be filled in. Make sure that the data provided is true and complete.
- **Documentation format**: Any document requested in any of the sprints must be submitted electronically in PDF format without restrictions for printing.

NOTE 1: It is strongly recommended to avoid waiting till the last moment of submission. Failure of the Proposal to arrive in time for any reason, including communications delays, or network issues is not acceptable as an extenuating circumstance and will automatically lead to rejection of the submission.

The time of receipt of the proposal as recorded by the submission system will be definitive.

NOTE 2: After application submission, editing is not possible. If the applicant discovers an error in the proposal and provided the call deadline has not passed, the applicant may request the Open Call JARVIS team to re-submit the proposal (for this purpose please contact us at oc@jarvis-project.eu with a message titled: RESUBMISSION REQUEST). However, JARVIS is not committed that resubmission in time will be feasible in case the request for resubmission is not received by the Open Call JARVIS team at least 48 hours before the call deadline.

5 HOW WILL APPLICATIONS BE EVALUATED & SELECTED?

The evaluation process is structured into 3 sprints, as illustrated in Figure 15.

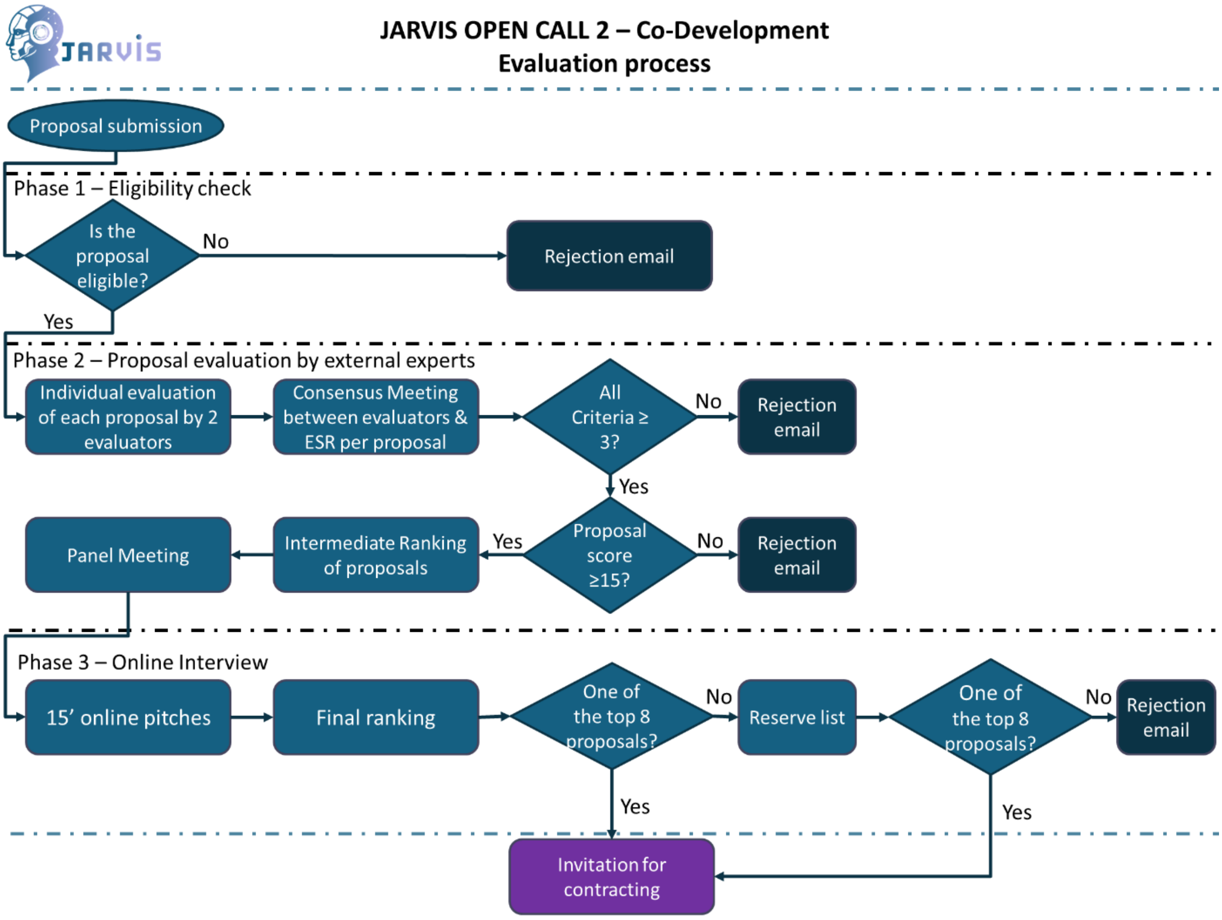


Figure 15. Evaluation process architecture

5.1 Phase 1 – Eligibility check

Eligibility to participate in the funding programme is initially verified against the eligibility criteria defined in section 3. This process is carried out by the **JARVIS** Open Call Management Team. A proposal may be declared ineligible or inadmissible at any stage. The check will verify the status according to eligibility criteria listed in section 3 and summarised in the checklist (Table 1). If any of the eligibility criteria from the table below is not met, the proposal will be deemed ineligible.

The eligible Proposals will be given to external evaluators to initiate the remote evaluation. The non-eligible applicants will be informed by email. **No additional feedback will be given.** Proposals considered eligible will move on to the external remote evaluation sprint.

Table 1. OC2 Co-development eligibility criteria checklist.

#	ELIGIBILITY CRITERION	DESCRIPTION	CHECKLIST
1	**Submission Platform**	Proposals must be submitted ONLY through the designated F6S platform.	YES/NO
2	**Submission deadline**	The proposal must be submitted before the official deadline.	YES/NO
3	**Type of Beneficiary**	SME, Startup or RTO	YES/NO
4	**SME/Startup status**	Registered at least one year before the application submission.	YES/NO
5	**Geographical eligibility**	All entities are registered in the eligible countries.	YES/NO
6	**Consortium composition**	Max. two legal entities applied to the call with required profiles of technology developer and technology integrator	YES/NO
7	**Funding**	The maximum available funding of 100 000 euro per project is not exceeded.	YES/NO
8	**Language**	The entire proposal, including all required documentation, must be submitted ONLY in English.	YES/NO
9	**Legal Status**	Entities are legally established with a valid VAT number	YES/NO
10	**Official Template**	The proposal must strictly follow the provided official Proposal Templates.	YES/NO
11	**Page Limitation**	The proposal must not exceed the maximum page limits.	YES/NO
12	**Completeness**	The application must be complete, including all requested administrative data and obligatory supporting documents requested in the F6S platform.	YES/NO
13	**Thematic Alignment**	The proposed project must be clearly aligned with JARVIS OC2 co-development concept.	YES/NO
14	**Exclusion from Funding**	The applying entity is not a Big Corporate (i.e., not qualifying as an SME).	YES/NO

15	**Multiple submission**	No more than one proposal has been submitted by the entity.	YES/NO
16	**Conflict of Interest**	Entities do not represent a conflict of interest with JARVIS Consortium.	YES/NO
17	**EU Sanctions**	Is there any applying entity subject to any EU restrictive measures (sanctions) under Article 29 TEU or Article 215 TFEU?	YES/NO

5.2 Phase 2 – external evaluation of eligible proposals

The external evaluation of proposals will be conducted remotely by independent evaluators selected from a pool established through a call for expressions of interest. Evaluators will be assessed and selected based on their expertise related to the JARVIS Topics and their experience in the evaluation of research and innovation proposals. The most suitable evaluators for each Topic will be invited to participate in the evaluation process.

Evaluators will perform their assessments in an individual capacity, and not as representatives of their employer or any other organisation. They are required to act in an independent, impartial, and objective manner.

All evaluators will be required to sign a contract, including a declaration of confidentiality and absence of conflicts of interest, before accessing the proposals and participating in the evaluation process.

5.2.1 External individual proposal evaluation

Each proposal will be assigned to two external independent evaluators. The evaluators will be distributed across the different proposals based on their expertise and sector of activity. They will individually evaluate each proposal based on the criteria listed in the table below and the accompanying assessment questions. For each assessment dimension, a score of 1 point will be awarded if the proposal clearly satisfies the dimension, 0.5 points if the proposal partially addresses the dimension, and 0 points if the proposal does not adequately address the dimension or does not address it at all.

JARVIS Open Call 2 Co-Development Track Evaluation Criteria			
#	Criteria	Assessment Dimensions	Threshold
1	Concept & Innovation	• Does the proposal clearly describe the technical problem addressed by the selected JARVIS topic? • Does the proposal present a clear concept for the module or technical capability to be developed? • Does the proposal demonstrate that the proposed solution is innovative compared to	3/5

		current approaches or state-of-the-art technologies? • Does the proposal specify the methods to be used and present previous achievements that will be further developed or adapted within the JARVIS context? • Is the proposed concept technically feasible within the 9-month programme timeframe?	
2	Impact	• Does the proposal clearly describe the value proposition of the developed solution, the target market segments, and the potential industrial users? • Does the proposal demonstrate potential applicability of the solution beyond the specific JARVIS pilot? If there are more than one entities in the consortium, is the IPR management clear? • Does the proposal demonstrate relevance for European industrial competitiveness or robotics innovation? • Does the proposal present a roadmap for scalability and technology transfer? • Are there clear economic and societal impacts of the proposed pilot supported by measurable KPIs?	3/5
3	Technology Implementation Approach	• Does the proposal present a realistic implementation plan with clear task content, expected outcome per task, and responsibilities allocated between the third-party(ies)? • Is the interaction between the applicant solution and the JARVIS consortium adequately considered in the task descriptions, including integration effort to deploy the third-party solution into the JARVIS testbed (e.g. ROS2 interfaces, APIs)? • Are the milestones, deliverables and risks adequately defined? • Are the testing and validation procedures within the JARVIS pilot environment clearly described? • Does the proposal demonstrate that the solution can reach TRL6 validation within the JARVIS pilot testbed?	3/5
4	Consortium/ Applicant Team and Use of Resources	• Does the applicant demonstrate technical expertise relevant to the proposed module or technology? • Does the applicant demonstrate experience in robotics, AI, perception, control, or other relevant	3/5

		technological domains evidenced by scientific papers, videos or other tangible results? • Is the team composition appropriate for the scope of the proposed development activities? • Is the proposed budget allocation realistic and consistent with the planned activities and deliverables? • Does the proposal demonstrate that the applicant has sufficient technical and organisational capacity to implement the proposed solution?	

The independent evaluators will score each one of the four criteria using the assessment dimension s. Each criterion will take values on a scale from 0 to 5 (decimal and centesimal point scores may be given):

- **0 =** Fail: The proposal fails to address the criterion or cannot be judged due to missing or incomplete information.
- **1 = Poor**: criterion is inadequately addressed or there are serious inherent weaknesses.
- **2 = Fair**: proposal broadly addresses the criterion, but there are significant weaknesses.
- **3 = Good**: proposal addresses the criterion well, but shortcomings are present.
- **4 = Very good**: proposal addresses the criterion very well. A small number of shortcomings are present.
- **5 = Excellent**: proposal successfully addresses all relevant aspects of the criterion. Any shortcomings are minor.

Each evaluator will record his/her individual assessment of each proposal using a signed Individual Evaluation Report (IER).

5.2.2 Consensus report per proposal

Following the submission Individual Evaluation Reports (IERs) for each proposal the differences between the criterion and overall scores will be examined by the JARVIS Open Call Management Team. If the difference between the individual evaluations is three points or less in the total score, and there is no disagreement regarding the minimum threshold requirements, one of the two evaluators who evaluated the proposal will be designated as rapporteur and will be responsible for preparing the draft Evaluation Summary Report (ESR) based on the submitted individual evaluations. The rapporteur will consolidate the comments and scores into a single consensus Evaluation Summary Report (ESR), which will be shared with the other evaluator for validation and signature.

A Consensus Meeting (teleconference) will be organised when a significant discrepancy is observed between the individual evaluations. This includes cases where:

- the difference between the total scores exceeds three points,

- one evaluator scores the proposal above the overall threshold while the other scores it below, or
- evaluators disagree on whether the proposal meets the minimum threshold of three points in any evaluation criterion.

The Consensus Meeting will involve the evaluators, and representatives of the JARVIS consortium acting as observers. The purpose of this meeting is to reach agreement on the final scores and comments to be included in the Evaluation Summary Report (ESR).

If the evaluators are unable to reach consensus, a third independent evaluator will be appointed to conduct a blind review of the proposal. The third evaluator will first submit their independent individual assessment before gaining access to the previous evaluations. The third evaluator will then lead the preparation of the final Evaluation Summary Report (ESR).

Following the consensus evaluation stage, proposals that have scored less than 3 points in some individual criterion or less than 15 points overall in their ESR, will be rejected and the applicants will be notified with a relevant e-mail including their ESR.

5.2.3 Intermediate ranking & panel meeting

Following the consensus evaluation stage, proposals will be ranked per Topic based on their final consensus scores. The ranking will be generated automatically according to the evaluation scores and the tie-breaking rules defined below:

- **Rule 1:** The proposals will be ranked per Topic based on their overall score (sum of criterion 1 to 4 scores).
- **Rule 2:** In case following Rule 1 there are proposals in the same position, priority will be given to proposals that their technology better fit to **JARVIS** scope (Criterion 1).
- **Rule 3:** In case following Rule 2 there are proposals in the same position, priority will be given to proposals that have higher impact and market potential (Criterion 2).
- **Rule 4:** In case following Rule 3 there are proposals in the same position, priority will be given to the application that has better capacity to implement the project. (Criterion 4).
- **Rule 5:** In case following Rule 4 there are proposals in the same position, priority will be given to the application that has a lower funding request.
- **Rule 6**: After applying Rule 5 and if there are proposals in the same position, priority will be given to those addressing gender/accessibility/inclusion impact.

Following the automated ranking, the objective of the panel stage is to validate the ranking results and ensure consistency and quality across the evaluated proposals, acting as a second-level review that complements the standardized evaluation approach implemented through the structured assessment questions defined for each evaluation criterion.

To smooth any human factors in the evaluation process, the evaluators involved in the remote evaluation may participate in a common panel teleconference call organised by the JARVIS Open Call Management Team. The purpose of this meeting is not to re-evaluate the proposals but to confirm the consistency of the ranking results and to identify any potential anomalies in the evaluation outcomes.

The panel discussion will primarily focus on exceptional situations, including:

- proposals with identical final scores that are at the top of the ranking, in order to confirm that the implemented tie-breaking rules indeed lead to the selection of the highest-quality proposals,
- cases where the difference in proposal quality between Topics appears significant,
- situations where the number or quality of eligible proposals within a specific Topic is limited.

In such cases, the evaluators may review the ranking results and the respective evaluation reports and proposal information in order to agree on a final ordering of the proposals within each Topic, ensuring that the highest-quality proposals are promoted to the next stage of the evaluation process.

The overall objective of this stage is to identify the top-quality proposals per Topic, aiming to select up to two proposals per pilot to be invited to the next evaluation stage. However, this distribution may be adjusted if the quality of proposals differs significantly across Topics or if the number of eligible proposals within a specific topic is limited.

The final outcome of the panel stage will be a short list of proposals that will proceed to the next phase of the evaluation process. Representatives from the JARVIS pilots will be invited as observers to the panel meeting.

5.3 Phase 3 – online interview

The objective of the interview is to better understand the proposal, particularly its quality and excellence, the expected impact and exploitation potential, quality of the workplan, and quality of the applicants. Any complementary material that can support the presentation of the project is acceptable during the interview.

Interviews will be carried out by a selection of the internal evaluators from the **JARVIS** Consortium. Members of the **JARVIS** team directly involved in the selected Topic that each proposal is addressing will participate in the interview and respective final evaluation process.

Interviews are expected to last approximately 30-45 min. One participant per applicant entity shall participate in the meeting. Applicants are expected to prepare and present a presentation (approximately 15 minutes) and answer any questions regarding their proposal from the internal evaluators.

If at any time during the interview the applicants do not commit to what was included in the submitted proposal, the proposal will be automatically disqualified. If after the interview process the JARVIS internal evaluators still have questions, the applicant may be requested to provide additional information in writing.

At the end of the evaluation phase, eight proposals will be invited for contracting (2 per each pilot, if applicable). The other proposals that were invited to the interview stage will remain on a reserve list in case one of the selected proposals fails to sign the Sub-Grant Agreement (Annex 7.1).

5.3.1 Final ranking and selection

After the online interview process, all proposals will be ranked according to the average scores obtained from (1) the external remote evaluation and (2) the online interviews.

Eight proposals will be selected (2 per pilot, if applicable).

All eligible Proposals will receive an acceptance or rejection letter together with an Evaluation Summary Report (ESR). Proposals not having passed to the online interview stage will receive a report with results of the external remote evaluation. Proposals that passed to the online interview will receive a report with information from both the remote evaluation and interview stages.

5.4 Redress process

Within 3 working days of the delivery of an ESR or a rejection letter considering the proposal as non-eligible, a proposer may submit a request for redress if s/he believes the results of the eligibility checks have not been correctly applied, or if s/he feels that there has been a shortcoming in the way his/her proposal has been evaluated that may affect the final decision on whether to enter the **JARVIS** Consortium or not. In that case, an internal review committee will examine the request for redress. The committee will review the complaint and will recommend an appropriate course of action. If there is clear evidence of a shortcoming that could affect the eventual funding decision, it is possible that all or part of the submitted proposal will be re-evaluated.

6 WHAT HAPPENS AFTER SELECTION?

6.1 Administrative check

Selected applicants will be invited to the contracting sprint, where administrative and financial details and documents are verified and validated. The steps of this phase are:

1. Inclusion of comments (if any) provided in the Evaluation Summary Report as part of the Sub-grant Agreement (SGA).
2. Validation of the entities based on the provision of the following documentation:
   - Formal proof of the entities' legal existence and tax activity.
   - Consortium Declaration of Honour, signed by the legal representative of each consortium partner.
   - SME declaration, signed by the SMEs' applicants.
   - Bank Account Information.

6.1.1 Additional considerations

- A valid VAT is mandatory.
- Deadlines for document submission will be provided and will normally be concluded within two weeks.
- Failure to complete the signatures in time will result in rejection.

6.2 Contracting

Each third-party project will sign the Sub-grant Agreement (SGA) under the 'lump sum model'. This will imply that the Open Call will provide the financial support to the third parties upon delivery of the expected output.

- The SGA will include, as an annex, the Proposal Template submitted by the funded project as Implementation Plan. This document establishes, among others, the KPIs and Deliverables that will be taken into account when evaluating the Third Party(ies) performance at the milestones review, as well as the budget for the project.
- A template of the Sub-Grant Agreement is provided in Annex 7.1. The SGA template is non-negotiable and cannot be modified during the contracting process or at later stages of the programme. The only section that may be updated is the annex containing the Implementation Plan, in order to incorporate adjustments resulting from the Evaluation Summary Report or other project-specific elements agreed between the Third Party and the JARVIS consortium. The template itself may only be updated by the JARVIS consortium in case of administrative or legal updates.
- Signing of the Sub-grant Agreement between JARVIS Consortium represented by the JARVIS coordinator handling the FSTP budget [LMS] and the Consortium Leader.
- Signed documents must be provided as original hard copies signed in blue ink and sent to the address of the JARVIS project coordinator.

Failure to comply with any of these criteria will lead to automatic termination of the contracting sprint.

7 ACTIVITIES DURING THE FUNDED PROGRAMME

7.1 Programme Sprints

Each selected Co-Development project will participate in the **9-month JARVIS programme**, structured into three consecutive development phases referred to as **Sprints**. Funded projects must implement their activities according to this structured programme, with work distributed across the three mandatory Sprints.

The programme supports the **progressive development and integration of novel Human–Robot Interaction (HRI) modules** that extend the capabilities of the JARVIS framework. Activities begin with the detailed definition of system architecture and integration approach in cooperation with the JARVIS consortium, continue with the development and deployment of the proposed module at the applicant's premises, and conclude with the integration and validation of the developed component within the JARVIS pilot testbeds.

Payments will be made in **three instalments (20% + 60% + 20%)** following the lump sum funding mechanism. Each instalment is paid after the successful completion and review of the deliverables and results associated with each Sprint. The third instalment will be executed after the final set of deliverables is delivered and approved by the JARVIS consortium, as well as once the JARVIS consortium will receive the final payment from the European Commission.

Table 2. 9-Month JARVIS programme

9-MONTH JARVIS PROGRAMME for CO-DEVELOPMENT (up to €100 000)			
Name	**Sprint 1**	**Sprint 2**	**Sprint 3**
Duration	2months	5 months	2 months
Goal	**Requirements**	**Development & Deployment**	**Integration & Validation**
Means of verification	**1. Sprint 1 Report** describing the system architecture, integration approach with the selected JARVIS pilot, technical specifications, and roadmap toward the developed component. **2. Dissemination material** one-pager describing the project and the proposed module.	**1. Sprint 2 Report** describing implemented functionalities, achieved progress, and next integration steps with the JARVIS pilot. **2. Video demonstration** of the developed module or component operating in a relevant environment. **3. Dissemination activities:** at least 2 social media posts (e.g., LinkedIn).	**1. Final Report** describing the integrated solution, validation results within the JARVIS pilot testbeds, and future exploitation potential. **2. Video demonstration** of the integrated module within the JARVIS system (target TRL6). **3. Dissemination activities:** at least 2 social media posts (e.g., LinkedIn).
Payment	20%	60%	20%

LMS will be the only organization responsible for making the payments: funds will be secured in a dedicated account at a trusted bank. Payments will be made after the verification of the bank account details (IBAN) of the Third Party(ies).

7.1.1 Sprint 1 - Requirements

Sprint 1 is the starting phase of each project and lasts two months. During this stage, beneficiaries must refine their proposal and finalize the implementation plan for the development of the proposed module and its integration within the JARVIS architecture.

Since the use cases are predefined by the JARVIS pilots, the focus of this Sprint is on understanding the pilot requirements, defining the architecture of the proposed module, and specifying the interfaces required for integration with the JARVIS system.

The outcome of "Sprint 1: Requirements" should include:

- Analysis of the selected topic and pilot scenario, including the operational context of the JARVIS pilot.
- Conceptual description of the proposed module and its role within the JARVIS system architecture.
- Definition of the system architecture and integration interfaces between the proposed module and the JARVIS framework (ROS2 communication).
- Description of the technologies, algorithms, hardware components, perception systems, or models developed by the applicants.
- Identification of baseline technologies or existing prototypes that will serve as the starting point for development.
- Refinement of the implementation plan including development milestones, deliverables, and topic-specific Key Performance Indicators (KPIs) aligned with the selected challenge.

At the end of Sprint 1, beneficiaries must deliver:

1. Sprint 1 Report describing the technical specifications of the proposed module, the baseline technologies, the integration concept with the JARVIS architecture, and the roadmap toward the final demonstrator. The report must also include the finalized topic-specific KPIs and their evaluation methodology.
2. One-page dissemination material including a publishable summary describing the project, the addressed topic, and the expected contribution to the JARVIS pilot.

7.1.2 Sprint 2 - Development & Deployment

Sprint 2 lasts five months and constitutes the main development phase of the co-development projects. During this stage, the beneficiaries implement the functionalities defined in Sprint 1 and develop the proposed module at their premises.

The activities in this Sprint focus on module development, implementation, and interface testing with the JARVIS framework.

Projects should follow the implementation plan defined in Sprint 1 and carry out the following activities:

- Development of the proposed module functionalities as defined in Sprint 1.

- Implementation of ROS2-compatible communication interfaces required for integration with the JARVIS architecture.
- Initial integration with the relevant JARVIS module or pilot infrastructure to test the designed interfaces and data exchange mechanisms.
- Deployment and testing of the module in a relevant development environment, demonstrating its functionality and compatibility with the JARVIS framework.
- Collection of experimental results supporting the evaluation of module performance with respect to the topic-specific KPIs.

At the end of Sprint 2, beneficiaries must deliver:

1. Sprint 2 Report describing the implemented module functionalities, achieved progress, and next integration steps.
2. Video demonstration of the module prototype operating in a relevant environment.
3. Publishable summary of the achieved technical progress to be used in the beneficiaries dissemination activities including at least two social media posts (e.g., LinkedIn).

7.1.3 Sprint 3 – Integrate & Validate

Sprint 3 focuses on the integration and validation of the developed module within the JARVIS pilot testbeds. The objective of this stage is to demonstrate the module operating as part of the JARVIS system and to validate its contribution to the pilot scenario.

During this Sprint, the developed module will be integrated into the corresponding JARVIS pilot environment and tested in collaboration with the JARVIS partners responsible for the pilot. Key activities in this Sprint include:

- Integration of the developed module into the JARVIS pilot testbed.
- Validation of the module's functionality within the pilot scenario.
- Evaluation of the module performance with respect to the topic-specific KPIs.
- Demonstration of the integrated module operating within the JARVIS system environment (target TRL6).
- Development of an exploitation roadmap outlining potential future development or commercialization pathways.

At the end of Sprint 3, beneficiaries must deliver:

1. Final Report summarizing the development results, the integration outcomes within the JARVIS pilot, and the evaluation of the topic-specific KPIs.
2. Video demonstration of the final module integrated into the JARVIS pilot testbed.
3. Publishable summary of the project achievements.

7.2 Evaluation during the Programme

For accessing the funding, the third-party projects need to demonstrate and present proofs of their progress and achievements and the deliverables presented must be assessed positively in each of the Sprint. In case of missing the above, the third-parties are not paid and may be requested to not participate longer in the JARVIS project.

The grant received by the third-parties is to finance:

- Work performed by employees of the third-party.

- Investment in software/ hardware (only the value associated with its depreciation).
- Travels associated with the project deployment or **JARVIS** activities.
- Participation in events/ conferences and promotion campaigns associated with **JARVIS**

Table 3. Review for Co-Development Projects

REVIEW for CO-DEVELOPMENT projects		
Stage	**Item**	**Description**
Sprint 1	**Requirement**	• Signed sub-grant agreement • Timely Submission of the contracted deliverables per Sprint 1 in mid M2. • Reporting all activities required per Sprint 1 listed in selected Topic. • Successful achievement of Sprint KPIs
	Result	Payment of 20% of the grant
	Timeline	Early M3 (Sprint 1 Review)
Sprint 2	**Requirement**	• Timely Submission of contracted deliverables per Sprint 2 in mid M7. • Reporting all activities required per Sprint 2. • Successful achievement of Sprint KPIs
	Result	Payment of 60% of the grant.
	Timeline	Early of M8 (Sprint 2 Review)
Sprint 3	**Requirement**	• Timely Submission of the contracted deliverables per Sprint 3 in mid M9. • Reporting all activities required per Sprint 3 in the selected Challenge and Sprint 3. • Successful achievement of Sprint KPIs
	Result	Payment of 20% of the grant.
	Timeline	Early M10 (Sprint 3 Review)

The relevant KPIs and expected outcomes are gathered in the table below:

Table 4. KPIs for the assessment of the co-development

KPIs – Sprint 1
• KPI-S1.1: Definition of the module's architecture and its role within the JARVIS system. • KPI-S1.2: Definition of the integration interfaces and communication mechanisms with the JARVIS framework (ROS2 compatibility). • KPI-S1.3: Definition of the validation scenario within the target JARVIS pilot. • KPI-S1.4: Preparation of dissemination material, including at least one public announcement of the project scope (e.g., social media).
Technical KPIs – Sprint 2
• KPI-S2.1: Successful development and implementation of the proposed module functionalities. • KPI-S2.2: Successful interface testing and data exchange with relevant JARVIS components. • KPI-S2.3: Demonstration of the module prototype in a relevant environment.

• KPI-S2.4: Intermediate validation of module performance against the topic-specific KPIs defined in the selected challenge. • KPI-S2.5: Preparation of dissemination material, including at least one publishable video demonstration of the prototype.	
Technical KPIs – Sprint 3	
• KPI-S3.1: Successful integration of the developed module within the JARVIS pilot testbed. • KPI-S3.2: Demonstration of the integrated module operating within the JARVIS system environment (target TRL6). • KPI-S3.3: Validation of the module performance against the topic-specific KPIs defined in the selected challenge. • KPI-S3.4: Preparation of dissemination material, including final demonstration of the module integrated within the JARVIS pilot. • KPI-Topic: Successful achievement of technical KPIs as defined in the each topic	
Dissemination KPIs applicable to all Sprints	• KPI 1: Minimum 2 SM posts per each Sprint and 150 interactions in total (likes, shares, comments) across all posts during the programme. • KPI 2: One blog post for JARVIS website per Sprint
Expected final outcome	As defined in each topic

The sub-granted projects must submit to the JARVIS consortium the deliverables and reports corresponding to each Sprint no later than 15 calendar days before the end of the respective Sprint, unless otherwise specified by the JARVIS consortium.

Each Sprint will conclude with a remote review meeting conducted via teleconference. During the review, beneficiaries will present the work performed, describe the progress achieved, and respond to questions from the JARVIS experts.

Following the review, beneficiaries will receive a review report including comments and recommendations. The report will indicate whether the submitted deliverables are accepted, require revision, or are rejected.

Upon acceptance of the deliverables, the corresponding lump sum payment will be approved. Payments will be processed on average within forty (40) working days following the positive review outcome.

In the case of rejected deliverables or an unsatisfactory review outcome, beneficiaries will be requested to revise and resubmit the deliverables. Based on the revised submission, the JARVIS experts will determine whether the project can proceed to the next Sprint or whether the risk of unsuccessful completion is considered too high.

If rejection or an unsatisfactory review occurs during the final Sprint (Sprint 3), the JARVIS consortium may grant a short extension period for the beneficiary to revise and resubmit the deliverables. If the revised deliverables are approved within the extension period, the final lump sum payment will be released accordingly.

7.3 Participation in events

During the three Sprints, the selected beneficiaries shall participate in events such as audio calls, video calls, webinars, online training, virtual conferences, etc. organized or suggested by the JARVIS Consortium.

7.4 JARVIS Mentoring Programme

JARVIS offers a comprehensive support package to support the External Pilots. In addition to the financial support of up to €100,000 per project, participants will benefit from tailored mentoring for the overall solution deployment, as well as expert guidance to integrate and deploy JARVIS digital tools that will complement the existing solutions in real-world scenarios.

Each selected project will be supported by a dedicated JARVIS Mentoring Team, ensuring that External Pilots maximize the potential of JARVIS digital tools while effectively implementing their solutions. The mentoring team includes:

- Innovation Mentor (IME): Main contact point between the External Pilot and the JARVIS project. The IME may provide inputs on innovation and technical aspects, and involve other resources from JARVIS, if necessary.
- SSH Mentor (SSM): Ensures that your solution is fit for market, user-centric, and aligned with societal and regulatory considerations, leveraging insights from social sciences and humanities (SSH).
- Industry Mentor (IND), optional: Contribute with inputs from the overall sector of which the External Pilot operators (e.g., either Manufacturing or Inspection & Maintenance). Whether or not to include an IND will be evaluated on a Pilot-to-Pilot basis, based on, e.g., the composition of the team in the External Pilot and the choice of Innovation Mentor.

To ensure fair and objective assessment, an Internal Evaluator (IEV) will independently evaluate project progress, offering valuable feedback while remaining uninvolved in day-to-day activities.

The Innovation Mentor (IME) will provide the External Pilot with a template, which will serve as a roadmap for monitoring milestones and results. Each External Pilot will undergo a minimum of three evaluation meetings, corresponding to key project sprints, ensuring continuous improvement and impact assessment. The document will be the main part of the "Review report" referred to in Section 8.2. Please see that section for further information about the evaluations.

8 WHAT ELSE IS IMPORTANT TO KNOW?

8.1 Intellectual Property Rights (IPR)

Any background intellectual property brought into the project by either the third parties or the JARVIS consortium partners remains the property of the respective owners.

Results generated independently by the third parties during the execution of the programme, including software, algorithms, models, and technical developments created within the funded project, remain the property of the respective third parties.

The JARVIS modules, tools, software components, and pilot knowledge and infrastructures provided by the JARVIS consortium remain the property of the respective JARVIS beneficiaries that developed or operate them. Third parties participating in the programme are granted access to the relevant JARVIS pilot environments, testbeds, technical documentation, and integration interfaces necessary for the implementation, integration, and evaluation of their solutions within the programme.

Likewise, the JARVIS consortium is granted the right to integrate and test the third-party solutions within the JARVIS architecture and pilot testbeds for the purposes of system integration, validation, demonstration, reporting, and dissemination within the scope of the JARVIS project. The third parties generating results in the pilot are also the main responsible for integrating these results into the JARVIS pilot testbeds.

Data, experimental results, and operational knowledge generated during the execution of the JARVIS pilots, including sensor recordings, performance metrics, and evaluation results, are considered part of the JARVIS pilot activities and remain the property of the respective JARVIS testbed owners (JARVIS consortium partners), unless otherwise agreed. Any beneficiary wishing to use a partner's results or background after a pilot project has ended should sign a separate agreement with the owner.

Where appropriate, non-sensitive datasets produced during the pilot activities may be requested to be shared and uploaded to the AI-on-Demand platform, in accordance with the JARVIS Data Management Plan and the provisions described in the Sub-Grant Agreement (Annex 7.1).

All evaluators involved in the review of the projects will sign a contract before accessing applications or project results, ensuring the protection of intellectual property and sensitive information.

8.2 Ethical issues

JARVIS complies with the fundamental ethical issues particularly those outlined in the "European Code of Conduct for Research Integrity".

- All applicants must submit a self-assessment ethics questionnaire, available in the Proposal Template.
- If the applicant confirms the existence of potential ethical issues, they must contact the JARVIS Helpdesk for guidance, as required.

- The JARVIS will verify the declaration's consistency with the application contents and may contact applicants to resolve any ethical issues.
- Applications that fail to properly address ethical issues or inadequately deal with privacy aspects will be rejected.

8.3 Data protection

In order to process and evaluate applications, and manage project implementation, the JARVIS consortium will need to collect Personal and Industrial Data.

- F6S Network Ireland Limited, will act as Data Controller for data submitted through the F6S platform for these purposes. Please see our privacy policy here.
- A Data Protection Officer (DPO) has been appointed by F6S generally, to ensure compliance with data protection regulations, such as the General Data Protection Regulation (GDPR), and that personal data is collected, processed, and stored in a secure manner.
- The F6S platform's system design and operational procedures ensure that data is managed in compliance with the General Data Protection Regulation (EU) 2016/679 (GDPR).
- Each applicant will accept the F6S terms to ensure compliance. Please refer to https://www.f6s.com/privacy-policy to review the F6S platform's privacy policy and data security policy.
- Apart from the F6S platform, data will also be stored in the F6S Google Drive, and in the project repository on Sharepoint managed by the project coordinator LMS.
- Note that the JARVIS consortium must retain generated data until five years after the balance of the JARVIS project is paid or longer if there are ongoing procedures (such as audits, investigations or litigation). In this case, the data must be kept until their conclusion.

8.4 Confidentiality

Confidentiality obligations:

- Selected applicants are required to maintain confidential any project data, documents, invoices and other materials (in any form) during the implementation of the activities and for 5 years after project completion.
- This confidentiality period can be extended by agreement with the EC and the JARVIS consortium.
- Information shared during the project, whether written or spoken, is only considered confidential if JARVIS agrees and confirms it in writing within 15 days.
- Confidential information must only be used for project implementation, unless otherwise agreed upon.
- Any information shared during the application stage will be treated as confidential.

8.5 Promotion of the action and ensuring visibility of the EU funding

The third-party (ies) must promote the funded project, the JARVIS project and its results, by providing targeted information to multiple audiences (including the media and the public) in a strategic and effective manner and to highlight the financial support of the EC, including on the official third party website. The JARVIS Communication team (CECIMO) will guide and support these communication activities to selected Beneficiaries.

8.6 Checks and reviews

The EC may, at any time during the implementation of the sub-project and up to five years after the end of the sub-project, arrange for a check and review activity to be carried out, by external auditors, or by the EC services themselves, including the European Anti-Fraud office (OLAF). The procedure shall be deemed to be initiated on the date of receipt of the relevant letter sent by the EC.

There will be no financial checks, reviews, or audits to check costs, since beneficiaries have no obligation to document the costs incurred for the action. Checks, reviews, and audits will focus on the technical implementation of the action. However, in cases of delays, incomplete implementation, or deviations from the approved project plan, F6S may require a financial report or other justification of costs.

8.7 EU restrictive measures

Entities subject to EU restrictive measures under Article 29 of the Treaty on the European Union (TEU) and Article 215 of the Treaty on the Functioning of the European Union (TFEU) are ineligible to participate as recipients of FSTP funding.

The Council Implementing Decision (EU) 2022/2506 of 15 December 2022 establishes measures to protect the Union budget from breaches of the rule of law in Hungary.

The beneficiaries must ensure that their contractual obligations under Articles 12 (conflict of interest), 13 (confidentiality and security), 14 (ethics), 17.2 (visibility), 18 (specific rules for carrying out action), 19 (information) and 20 (recordkeeping) of the grant agreement also apply to the third parties receiving the support (recipients).

The beneficiaries must also ensure that the bodies mentioned in Article 25 (e.g. granting authority, OLAF, Court of Auditors (ECA), etc.) can exercise their rights also towards the recipients.