METROLOGICAL EVALUATION AND TESTING OF ROBOTS IN INTERNATIONAL COMPETITIONS

PILOTING WORKSHOP

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THE METRICS PROJECT

- We will organize **challenge-led robotics competitions** in **four priority areas** identified by the European Commission:
  1. healthcare,
  2. agri-food,
  3. **inspection and maintenance of infrastructure,**
  4. agile production.

- METRICS is designed to organize competitions as reproducible and objective evaluation campaigns.

THE METRICS PROJECT

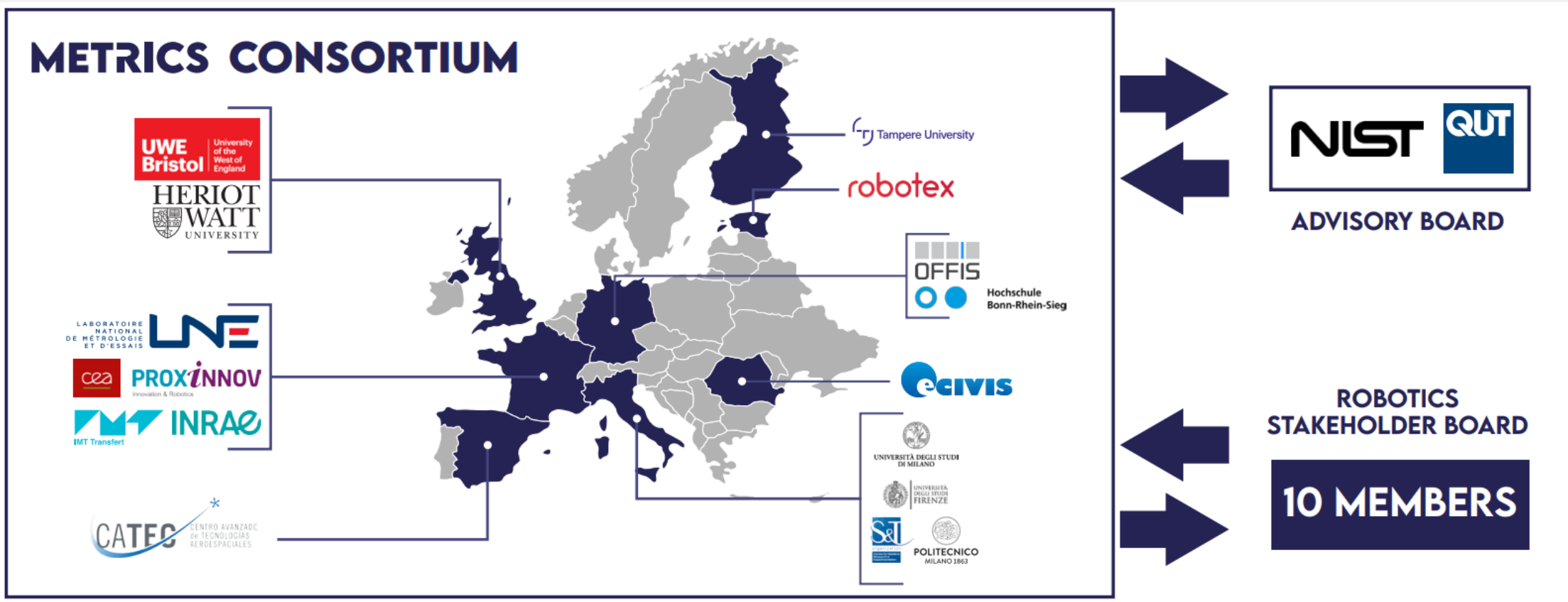
- METRICS will develop an **evaluation framework** based on **metrological principles**.
- For each competition, we will organize **3 field evaluation campaigns** (in physical environments) and **3 cascade evaluation campaigns** (on datasets) to engage with the AI community.
- The competitions are designed to get attention from the entire economic sector, the academia and **digital innovation hubs** in Europe, while stimulating **public engagement**.
- METRICS will collaborate with external partners and **sponsors** to support the organization of the competitions and **ensure** their **industrial relevance.**

METRICS CONSORTIUM

- METRICS brings together **17 partners**, all expert in **robotics competitions** and **metrology**, with highly complementary testing facilities and networks.

- This experienced consortium ensures that METRICS benefits from the feedback of past and current competitions and projects and is highly complementary with European initiatives and networks.

- METRICS will contribute to structuring a sustainable network of European robotics stakeholders in the four priority areas through the organization of **industry-relevant competitions** based on **robust evaluations methods**.



METRICS consortium relies on the collaboration of **17 partners from 8 EU countries** (Estonia, Finland, France, Germany, Italy, Romania, Spain, United Kingdom), which will contribute to strengthening the European Robotics community, including in EU Widening countries.

INSPECTION AND MAINTENANCE

Robotics for Asset Maintenance and Inspection Competition

CHALLENGE

- **The RAMI (Robotics for Asset Maintenance and Inspection) competition** aims at addressing I&M tasks achieved by **aerial and underwater robots** in risky and/or hostile environments where human intervention is challenging or impossible (direct link not guaranteed).

- In such scenarios, **autonomous decisions** are necessary to reduce **operational time** and ensure **repeatability** while maintaining an appropriate safety level for the mission.

- The evaluation process of RAMI competitions will mainly involve **tasks related to autonomous navigation** and **data acquisition for inspection purposes**.

- Aerial and underwater domains will be evaluated separately in two different tracks.

TEST FACILITIES AND LOCATIONS

AERIAL ROBOTS:

- RAMI competition for aerial robots will take place in the indoor testbed from CATEC (Seville, Spain) with the VICON positioning system.

MARINE ROBOTS:

- RAMI competition for underwater robots will take place in the seawater basin of CMRE (La Spezia, Italy).

FIELD EVALUATION CAMPAIGNS

AERIAL ROBOTS

- The evaluation process of the aerial robotic platforms will be mainly focused on addressing the following **autonomy-based** functions and **inspection** tasks:
    - precise **autonomous navigation** without GNSS,
    - **automatic detection of defects** using advanced **AI** algorithms,
    - performing **punctual inspection** in difficult access area,
    - and obtaining images from the same location in a repetitive way.

FIELD EVALUATION CAMPAIGNS

MARINE ROBOTS

- The general evaluation scenario requests the robot to reach, inspect and map the operation area where Objects of Potential Interest (OPIs) are deployed.

- OPIs are of different nature:
  - submersed buoys (of different dimensions, colours and numbers),
  - pipes of various lengths,
  - pipeline assembly structures and several markers.

- Then the robot has to intervene in the environment, closing/opening valves, staying in touch with a pipe for its inspection and has to perform pick and place with some objects in dedicated areas.

SOCIO-ECONOMIC IMPACT

- The use of aerial and marine robots in inspection & maintenance tasks offers the possibility of increasing the spatial/temporal resolution of the inspection process**, improving the operation persistency** and the **quality of the acquired data**.

- At the same time, they have the potential to **reduce the operational costs** and to **increase the safety of workers**, especially in dangerous areas, like explosive atmosphere (ATEX) environments, or works at heights.

- However, in order to tackle the different challenges of the I&M sector and increase the added value of using robots, it is key to **increase their autonomy level**.

FOCUS

- A high degree of autonomy is especially required **when a direct link with an operator cannot be guaranteed** (e.g. long-time continuous monitoring of structures underwater)

- The most promising applications in the I&M sector require the use of **aerial** and **underwater** robots due to the **risks and costs** associated to work at height or underwater inspection performed by human operators.

- In particular, RAMI will focus in the **Oil & Gas sector**, both off-shore and on-shore facilities.

- Commercial robots used for I&M are usually teleoperated such as **ROVs** or **drones** for visual inspection of large infrastructures.

- RAMI addresses this need by increasing, assessing and evaluating the robot autonomy in I&M tasks.

PARTNERSHIPS

Innovate for the future,
Gain access to the best talents in Europe

HOW CAN YOU ENGAGE?

- METRICS competitions can only be meaningful if they are **relevant to industry and public stakeholders**.
- Whilst METRICS will provide the framework and some public funding to organize, the competitions, **we are looking for private partners** willing to help us **drive** the competition.
- This includes financial contributions through **sponsorship** as well as an **active involvement in the definition of the scenarios**, evaluation criteria and judging of the competitions.
- Your level of involvement (cash or in-kind) will determine your influence on the various aspects of the competition and your media exposure in the marketing campaigns run by METRICS.

WHAT'S IN IT FOR YOU?

METRICS provides a one-stop shop to access talent and innovation across Europe:

- **Sixteen European organizations** specialized in the evaluation of intelligent systems and the main European players in the organization of competitions (Sciroc, Echord++, Rockin, Euron, Euroc, Rockeu2, euRathlon, ERL and Robocup) **across European countries**: France, Germany, Italy, Spain, United Kingdom, Estonia, Finland, Romania;
- Direct links to large clusters representing over **ten thousand members**, in particular AI4EU with a strong focus on trust in AI based systems;
- Connections to the most important **European Digital Innovation Hubs (DIH)** for the four application areas of the call: Rima, Hero, DIH², Trinity, Midih and Agrobofood;
- International associate partners, including **the National Institute of Standards and Technology** (NIST) of the United States and the **Queensland University of Technology** (QUT) of Australia.

THE METRICS COMPETITIONS WILL BE WORLD LEADING IN THE FIELD OF ROBOTICS

- Focal point for **industry**, **young talents** and the academic robotics research in Europe.
- Large **media attention**, thus resonating with the **general public.**
- Showcase Europe's know-how in robotics and artificial intelligence and address the scientific and technological barriers identified in partnership with our competition **sponsors**.
- Opportunity to **shape the competition challenges, rules and evaluation criteria** to make them **meaningful** to your business current and future needs in robotics.
- Exchange, influence and establish links with researchers and students interested in solving problems in the real world and with a **practical focus**.
- Excellent **recruitment** ground of **young talents** in robotics.

THANK YOU

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