



**Adriatic**

# cooperAtion unDerwater foR efflcient operATIons vehICles

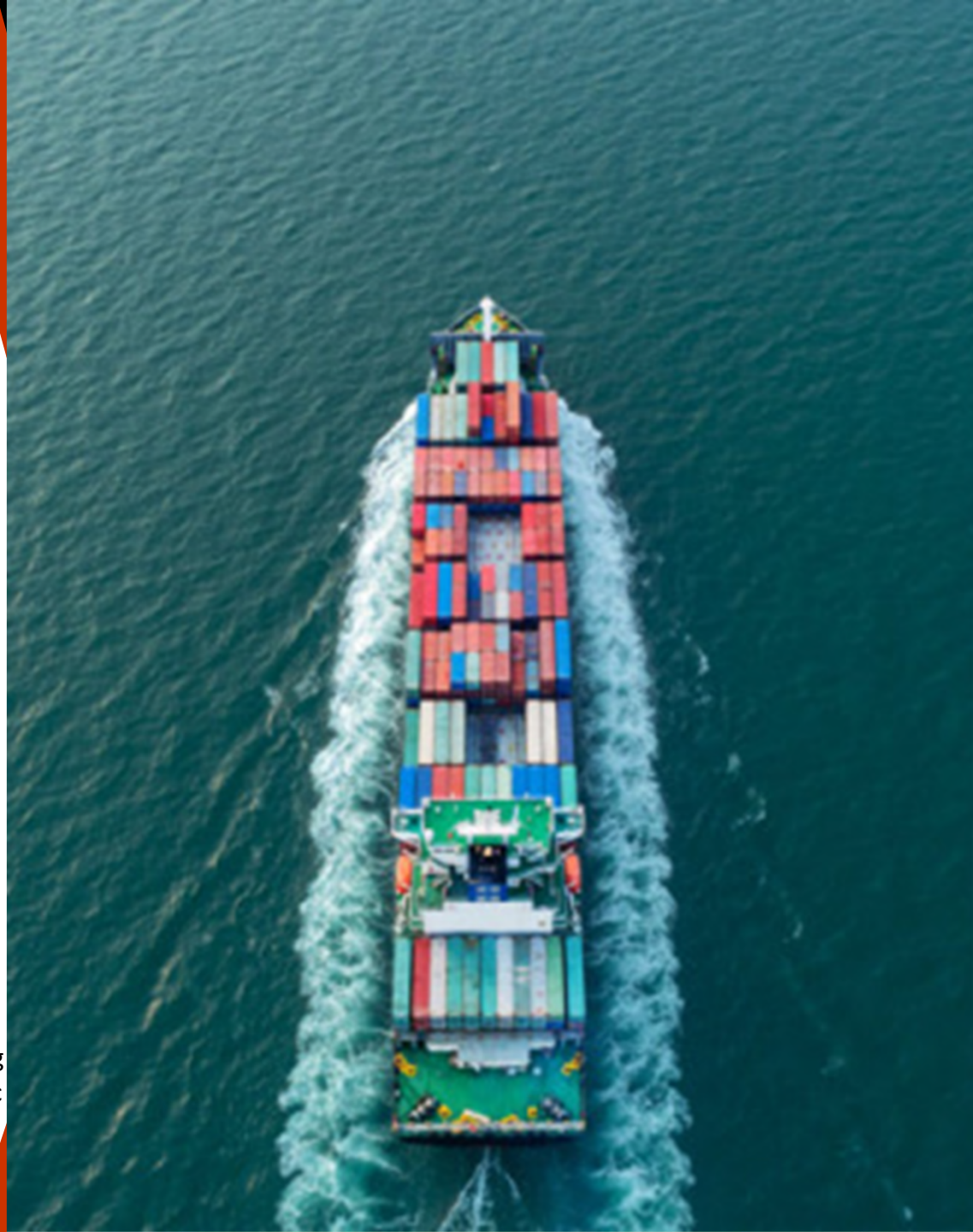
**Partners:**



**Funding:**



ADRIATIC is funded by the MarTERA partners Romanian Executive Unit for Financing Higher Education, Research, Development and Innovation (UEFISCDI), The Scientific and Technological Research Council of Turkey (TÜBİTAK) and The Research Council of Norway (RCN) and co-funded by the European Union.



## AT A GLANCE:

### PRIORITY AREA

- *PA3: Automation, sensors, monitoring and observations*

### SUBTOPIC

- *PA3: Underwater technology*

Project duration: 36 months

- *15/06/2021 – 14/06/2024*

Total budget €1.479M

Requested EC contribution €1.074M

Consortium of 5 partners from 3 EU Countries:

Turkey, Romania and Norway



ADRIATIC adopts a transdisciplinary approach in developing a **comprehensive smart system for monitoring, inspection, intervention and path planning/guidance methodologies for underwater marine vehicles** (Autonomous Underwater Vehicles/Remotely Operated Vehicles). The comprehensive technology will ensure coordinated navigation and efficient operations of multiple cooperative underwater vehicles.

The primary goal of the ADRIATIC project is to **expand the use of underwater vehicles** (AUVs/ROVs) to facilitate the conception, planning and execution of maritime and offshore operations and missions. This will bring the following **benefits**:

- reduce the operational costs,
- increase the safety of tasks for the involved individuals
- expand the offshore sector.

To that extent, an integrated software platform for **autonomous maritime and underwater operations** will be developed in order to improve autonomy, robustness, cost-effectiveness, and reliability of offshore missions through vehicle cooperation.



01

**WP1: Project Management**

02

**WP2: Autonomous operations design: Requirements, design methodology, verification and validation,**

03

**WP3: Coordination Architecture and Specification**

04

**WP4: Environment Recognition and Sensing**

05

**WP5: Communication and Networking,**

06

**WP6 – Autonomous navigation**

07

**WP7 – Demonstrator: Definition, Integration, Verification and Validation**

08

**WP8 – Dissemination, Exploitation and Standardization**

The proposed architecture has the following main tiers.

- **AUV-ROV**

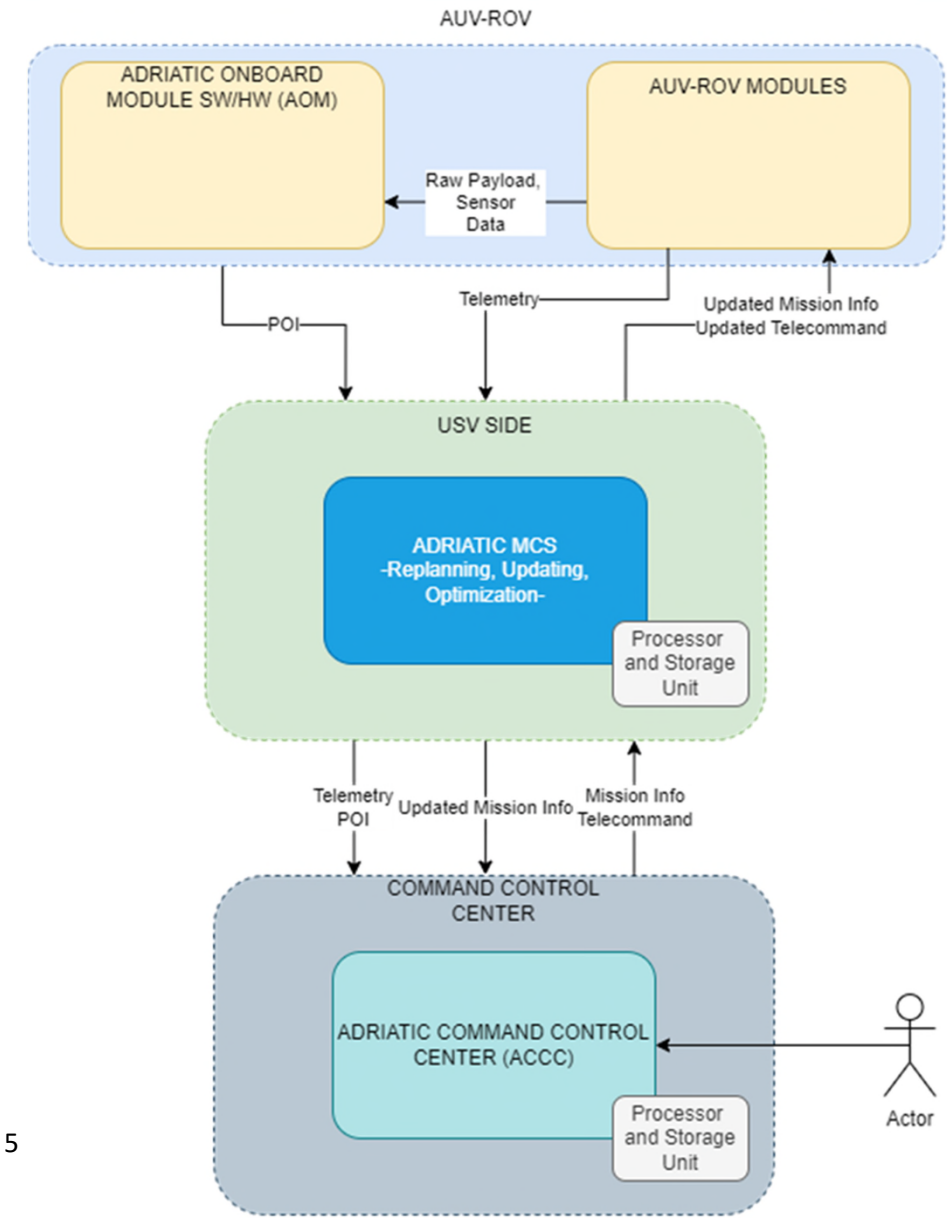
These components enable proprietary based software of the vehicle to communicate with Adriatic

- **USV**

Adriatic Mission management tools which are responsible for replanning, updating and optimization

- **Adriatic Command Control Center**

According to the commands that are received from user, Mission information is generated and transmitted



- Based on the analysis of various suggested scenarios, the main **mission** considered for the ADRIATIC project simulation is the **SHIPWRECK**.

The mission planning is based on the following steps:

## 1. defining the mission

The idea of the mission is to search and interact with a military shipwreck, which is assumed to be on the Norwegian or Black Sea the coast of the area.

## 2. identifying necessary vehicles (in terms of capabilities) for every step of the mission

Preferred Vehicles:

- A9-M Autonomous Underwater Vehicle (Search and Rescue)
- Minerva Remotely Operating Vehicle (Sampling and Observation)

## 3. defining the cooperation level/degree between vehicles

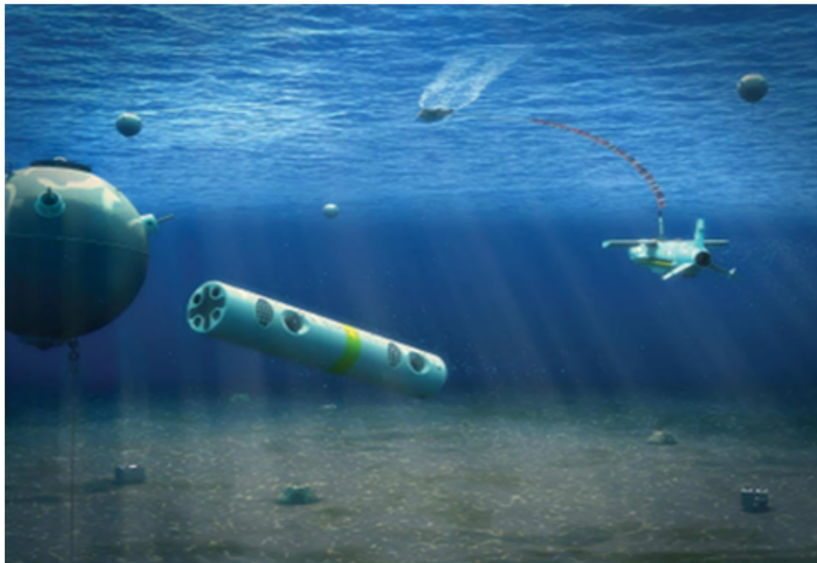


## a) Docking manoeuver (charging, safety in case of bad weather)

If the remaining SOC decreases faster than normal conditions, the system needs to predict the reason, such as current changes, bad weather conditions, or even a failure in the propellers etc.

## b) Retrieving an item/interacting with a POI

- The item needs to be defined according to its dimensions; an image processing will help to clarify this task.
- According to data on the dimensions of the item, the ADRIATIC needs to decide whether to retrieve the item or not. It can also decide whether devices in the inventory can retrieve the item or not.



## c) UXO (unexploded ordinance) near to the POI

- ADRIATIC needs to identify if there is a structure near the UXO that could cause an explosion. The structure can be defined as rock or a pipeline.
- The UXO's type can be defined from the database with image processing. The ADRIATIC can turn on the safe mode and decide to getting closer with specific limitations to the UXO



The interface displays a 3D underwater environment with three Autonomous Underwater Vehicles (AUVs) and a control panel. AUV 1 is at the top right, AUV 2 (REXROV) is at the bottom left, and AUV 3 is at the bottom center. The control panel on the right provides status and control options for each AUV and the ASV (Autonomous Surface Vehicle).

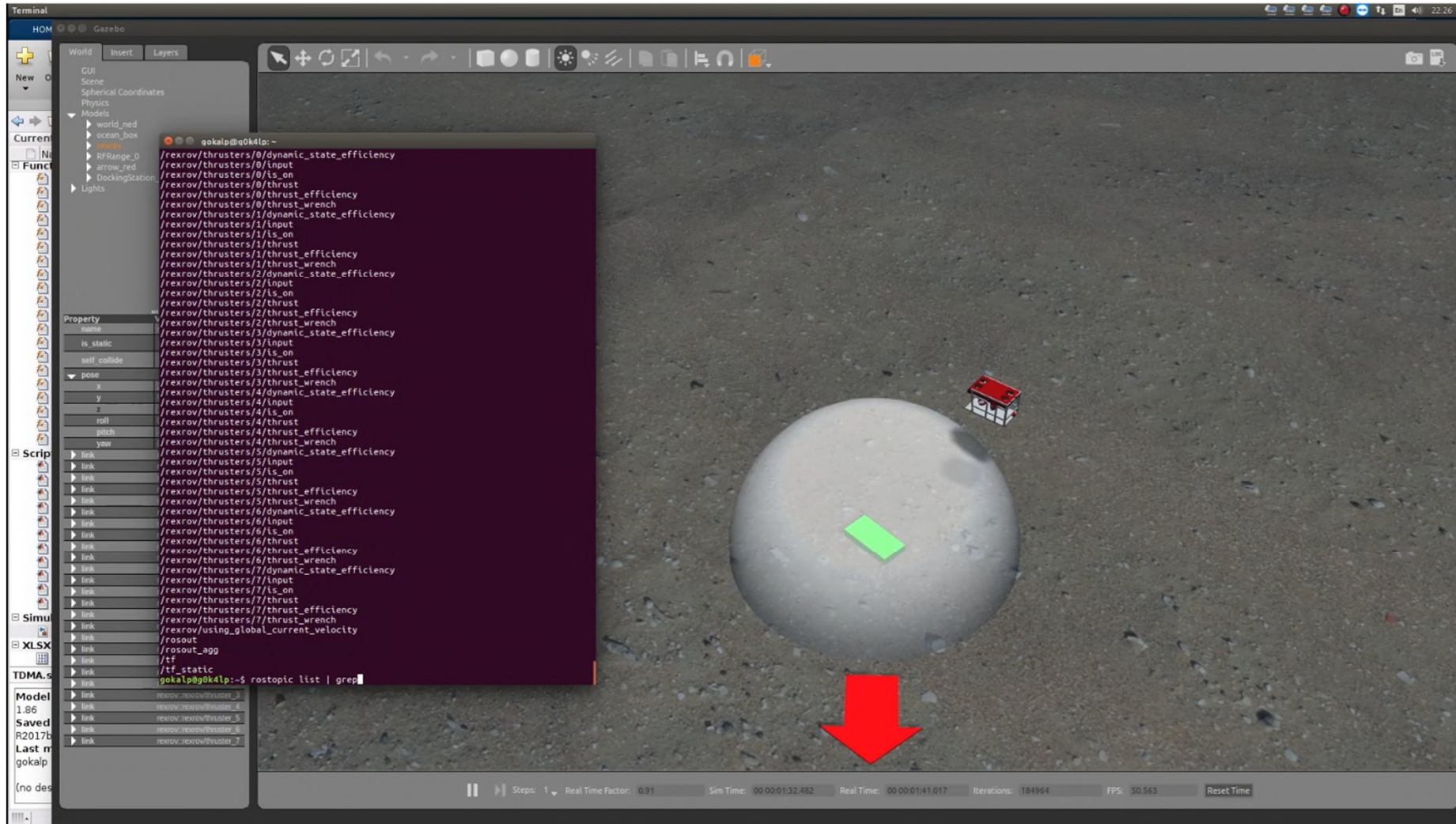
AUV	Status	Battery	Control Options
AUV1	Charging	40%	Camera, Show Trail
AUV2	Detected	70%	Camera, Show Trail
AUV3	Docked	90%	Start Mission
RexRov	Scanning	96%	Camera, Show Trail

ASV Control Options: Control Station, Docking Station, ASV, Map

Coordinates: X: 319,23 Y: 15,05  
Z: 437,64 Temp: 30°C

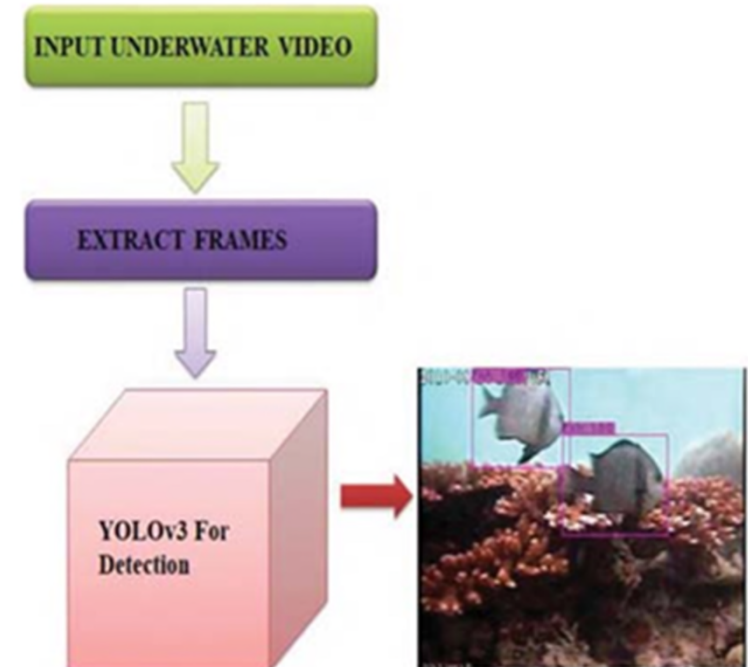


# Docking Maneuver Sub Scenario Deployment



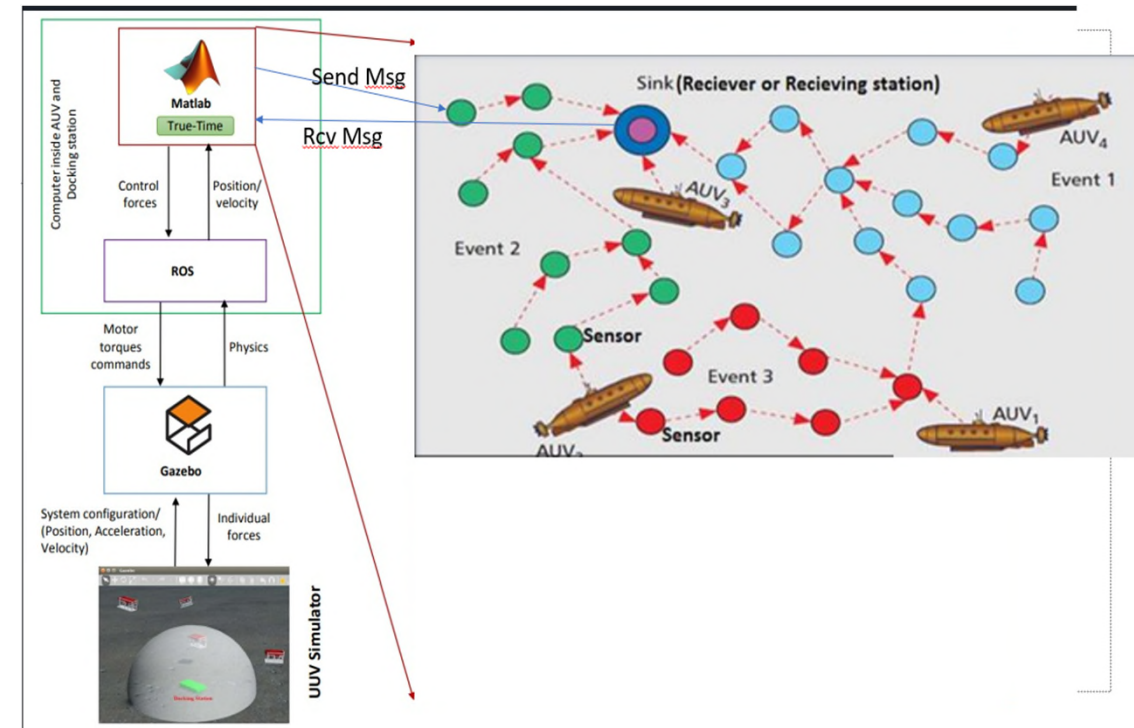
## PROGRESS

- Background on Underwater Imaging and Sensor Simulation
- Underwater 3D Virtual Environment for ADRIATIC
- Underwater optical and acoustic image sensor simulation and generation of synthetic datasets
- Underwater Image Pre-processing Pipeline



## Progress:

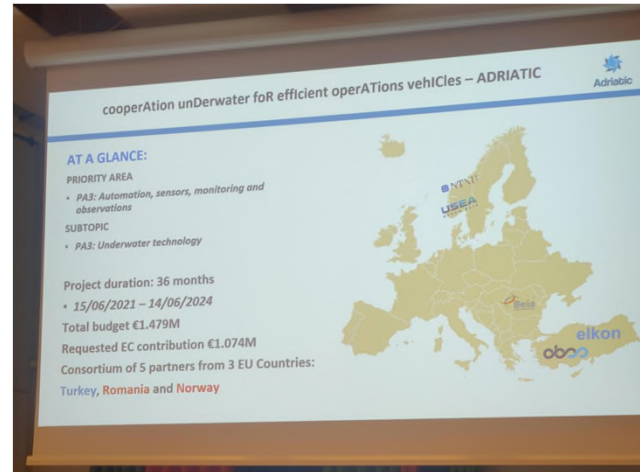
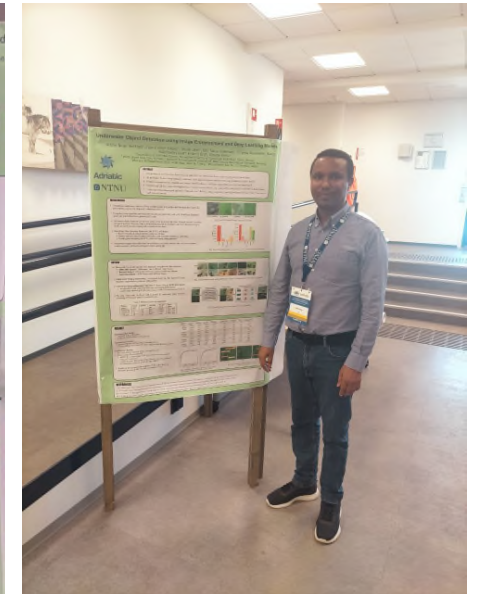
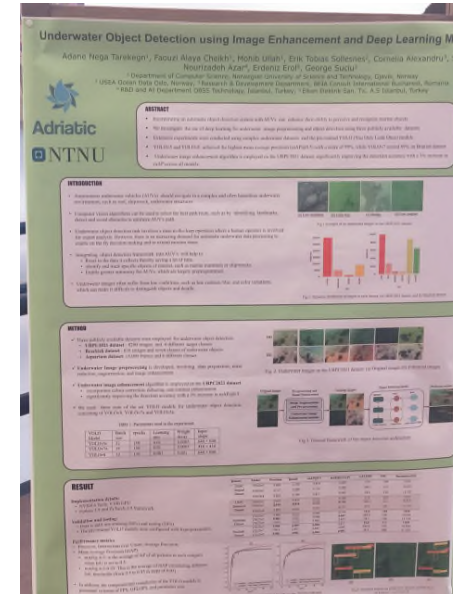
- Deploy multiple AUV in Gazebo
- Employ sonar sensor data
- Perform search and survey
- Integration of Matlab and OMNeT++ for emulation of communication between AUVs
- Implementation of underwater communication channel between AUV in OMNeT++



- **Dissemination** of the developed ideas and the obtained results to a wide audience,
- Ranging from the **research community** to non-scientific audience
- Critical for the overall success and impact of the ADRIATIC project on the targeted sectors.
- WP aims at increasing the visibility of ADRIATIC
- Coordinating the activities related to the dissemination of the results and the communication of the proposed solutions.

# EUVIP 2023 – 11<sup>th</sup> - 14<sup>th</sup> September 2023

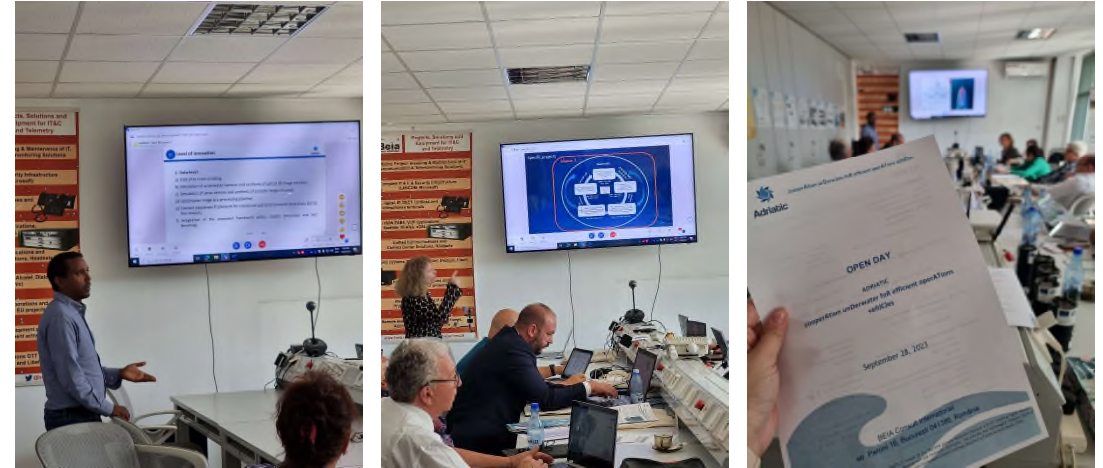
- 11th European Workshop on Visual Information Processing (EUVIP 2023) held in Gjøvik, Norway from September 11th to 14<sup>th</sup>
- NTNU presented a scientific article and a dissemination paper on the project results and impact.



- Event attended by leading experts from academia and industry

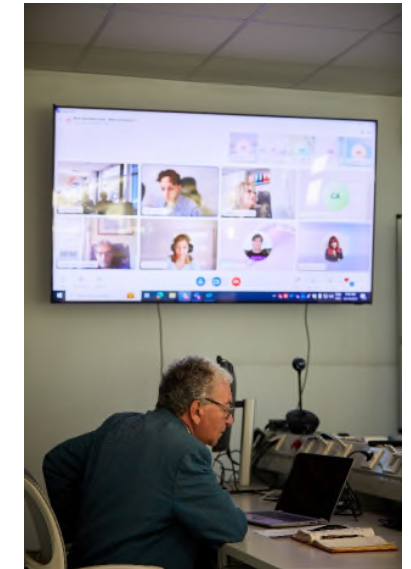
# Adriatic Open Day Event – 28<sup>th</sup> September 2023

- Adriatic Project Open Day Event - September 28, 2023, organized by BEIA.
- Sessions focused on exploring opportunities, addressing challenges, and contemplating future collaborations.
- Presentation of ADRIATIC technical work by coordinator and other partners.
- Final segment "Synergies with Other Projects and Initiatives" featured speakers representing various companies and projects.



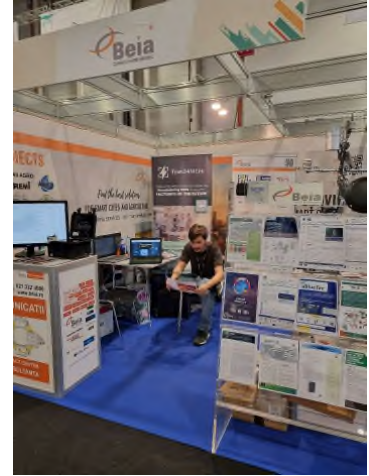
# Blue-GreenWay Open Day – 19<sup>th</sup> October 2023

- Open Day Event - October 19, 2023, organized by BEIA for introducing the BLUE-GREENWAY project
- Discussions on eutrophication in the country.
- Event featured speakers directly associated with the project who provided insights into its objectives, eutrophication concerns, pilot programs, and the corresponding treatment methodologies.
- Several speakers from outside of the project presented their take on the eutrophication issues present in Romania.



At BEIA Consult, we emphasize the importance of knowledge exchange for fostering growth. Our involvement in GoTech World provided an ideal platform to impart our expertise and perspectives. Having the opportunity to set up a booth allowed us to interact with attendees, delve into discussions about the latest technological advancements, and showcase our innovative solutions.

A notable aspect of our experience at GoTech World was the chance to establish connections and broaden our network. Meeting with industry leaders, startups, and potential collaborators who share our enthusiasm for technological progress was a privilege. This event served as an optimal environment to lay the foundation for future partnerships that have the potential to shape the trajectory of technology.







Adriatic

Thank you for you attention!



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Website: <http://www.beiaro.eu/adriatic/>

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