# NEWSLETTER

## ODYSSEUS H2020 PROJECT

*Preventing, Countering, and Investigating Terrorist Attacks through Prognostic, Detection, and Forensic Mechanisms for Explosive Precursors*

## ODYSSEUS Newsletter No 4.

We are pleased to share with you the fourth ODYSSEUS newsletter!

The ODYSSEUS project is counting three years of activities and developments. Our newsletter aims to provide you with latest information on the project's results, on recent events and achievements.

This edition focuses on the final pilot use case trial of the ODYSSEUS Project held in Romania offering for the last time participating LEAs the chance to test almost all ODYSSEUS platform components developed in the project in the course of one pilot use case scenario.

Furthermore, the Newsletter sheds light on the second bilateral ODYSSEUS/INHERIT workshop held in Greece in October 2024.

Moreover, the Newsletter presents the highlights of the ODYSEEUS Final Conference, held in Sofia in November 2024.

We hope you enjoy this final newsletter and wish you all the best!

The ODYSSEUS team

# ODYSSEUS Consortium implements PUC 1.c in Romania

In October 2024, PUC 1.c was executed at a test site of SPP in the outskirts of Bucharest, Romania.

SPP offered an impressive conference venue at Snagov Palace, where the consortium had all opportunities to test the sensors and the UAVs in different scenarios.

The PUC followed a use case scenario of detecting a clandestine HME factory based on the use of ODYSSEUS' prognostic, detection & forensic tools. In this PUC, the final version of the Dashboard was provided offering several new features and further improved functionalities (see below).

In this final PUC, the Project Officer from the European Commissioner as well as one of the project reviewers had the opportunity to monitor the achievements of the project on first-hand.



*Consortium partners at PUC 1.c in Bucharest (Photo: SPP)*

Within the conference venue, a control room was set up, allowing the monitoring of the operational use case exercise by following on a big screen the operation of the online investigation tools on the ODYSSEUS Dashboard, the visualization of the investigation results as well as the video streams from the UAV, the sensor data streams of the mirSense water sensor and the T4i Dover Ultra air sensor data streams from the UAV on the Dashboard.



*The control room for the PUC (Photo: SPP)*

Moreover, additional laptops were set up for the LEA representatives to allow them to operate the ODYSSEUS online tool functionalities on the dashboard by themselves.

*Set-up of operation lab tops for the LEAs (Photo: Stodiek)*

In the implementation of the use case scenario workflow, the first ODYSSEUS tool, introduced to the participants was the final version of the ODYSSEUS Dashboard. The final version of the DASHBOARD included further improved and new functionalities, including, inter alia:

1. Introduction of different roles of platform operators, with different access rights: (Platform admin, Mission Commander, Web Analyst, Transaction Analyst, Field Operator);
2. New features on the platform administrator user management page;
3. Advanced Import/Export features for of Recipes-Ingredients;
4. A Transaction Operation Heatmap;
5. Visualisation of COREF Text Analysis in Web Operation;

6. Advanced Import/Export functions for Field Operation data;

7. Field Operation historical sessions visualisation;

8. UAV video streaming visualisation;

9. Threat Assessment thresholds configuration;

10. Advanced ATDL visualisation.

In line with the use case scenario, participants had the opportunity to see the web crawling and content analysis results, based on real website data from benign sites and synthetic chat data that had been prepared in advance of the meeting.
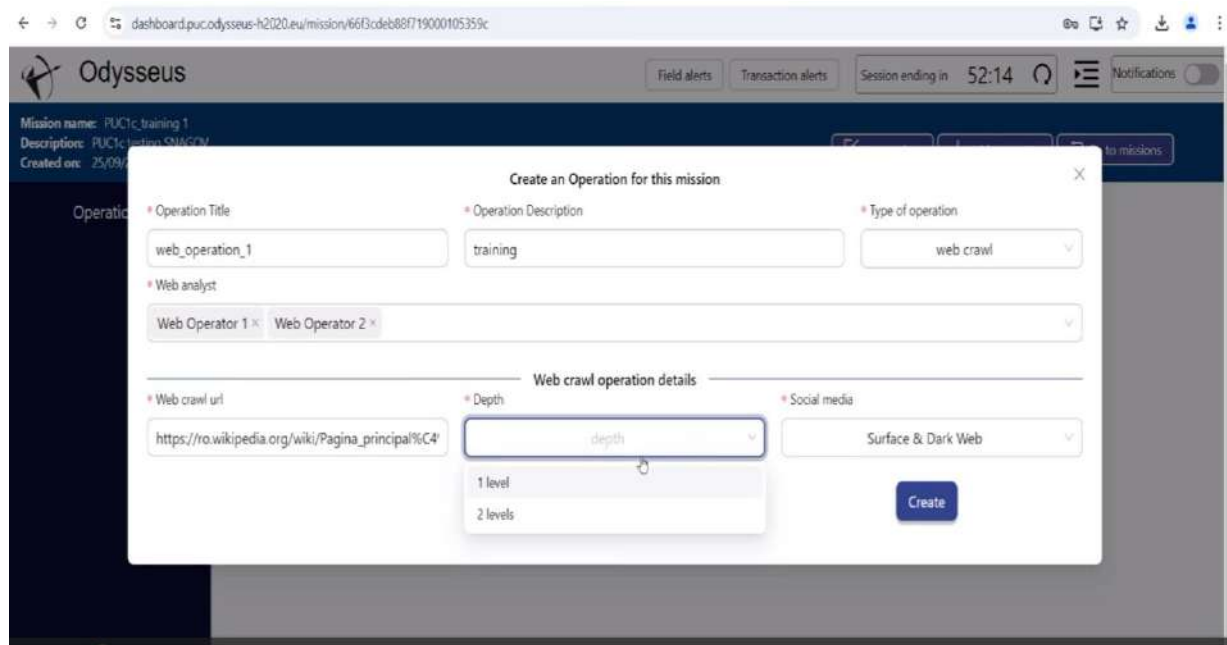


*Screenshot from Dashboard showing interface*
*for starting a web crawling operation*

The Text Analysis (TAN) component was tested, including new functionalities such as (i) co-reference resolution, for linking same linguistic entities and (ii) entity disambiguation, leveraging external online resources for enhancing the information provided for the identified entities. The final version of TAN incorporates feedback from the previously executed pilots, including modifications in the entities of interest.
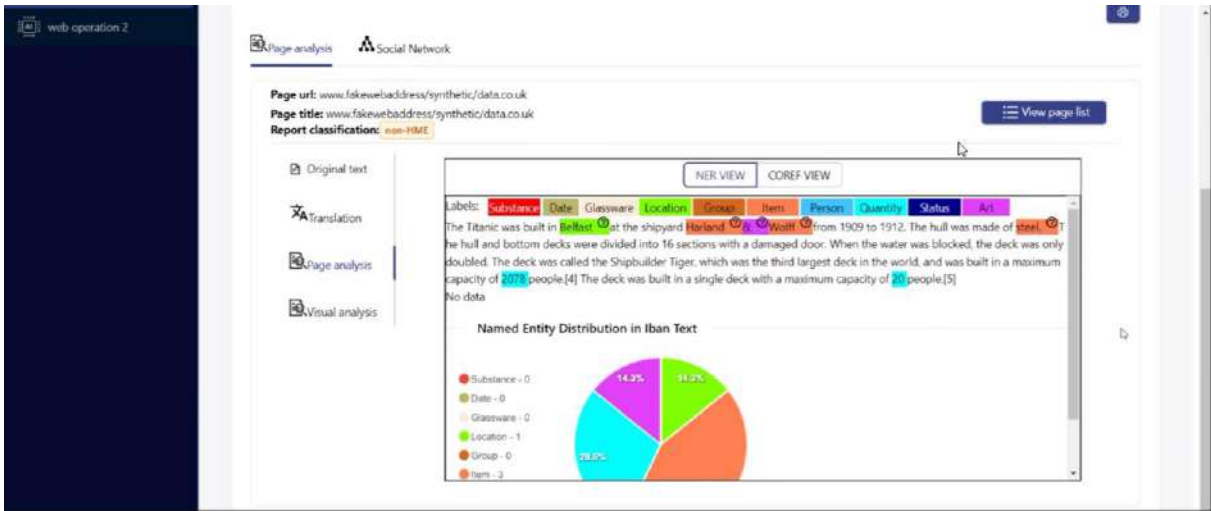
*Visualization from the text analysis page on the ODYSSEUSD Dashboard*

The results showed that the content analysis module was capable of differentiating HME-related web content from non-HME-related content.
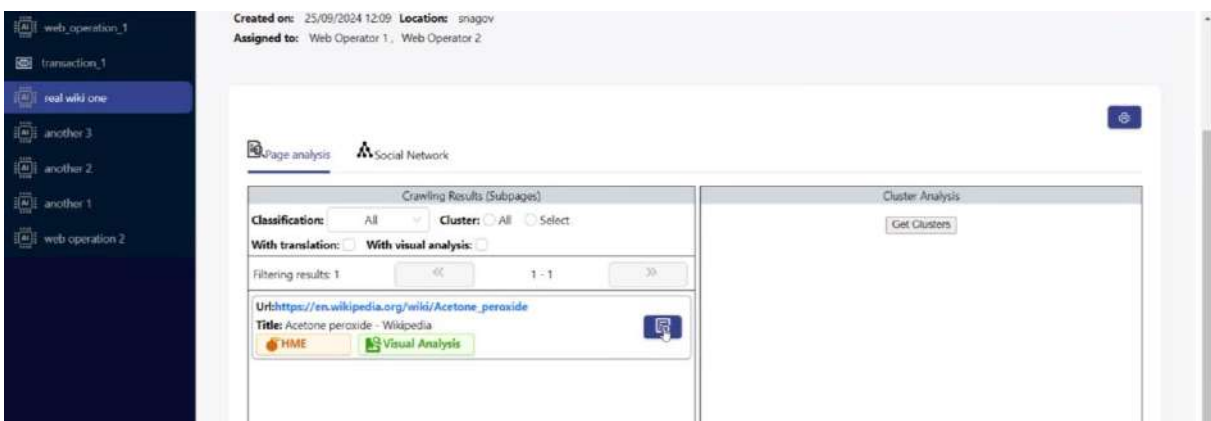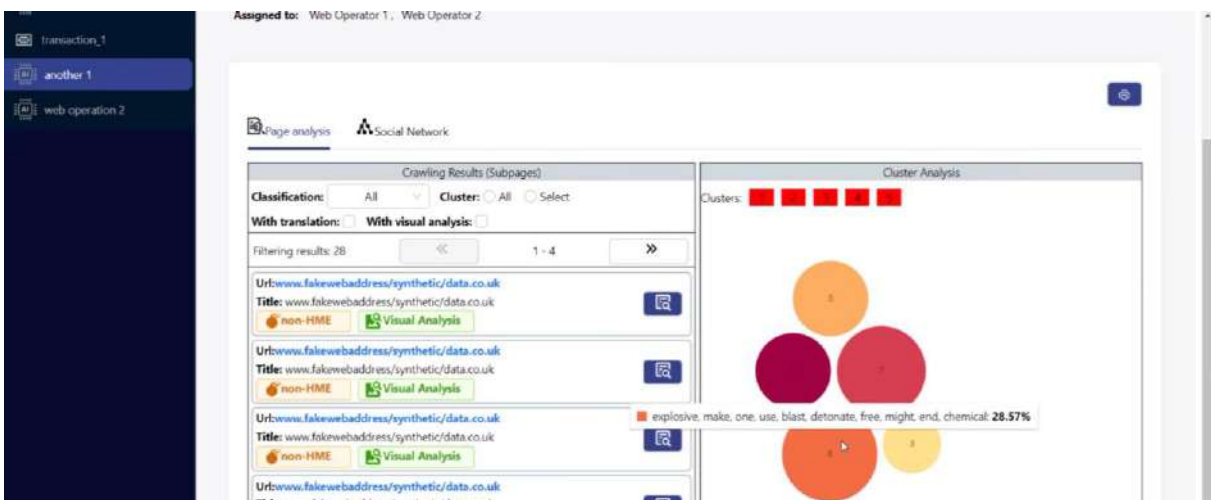




*Visualization from the text analysis page on the ODYSSEUSD Dashboard*

In addition to the text analysis functionality, the final version of the Visual Understanding (VU) component, responsible for analysing images gathered from online resources and detecting HME-related objects/concepts was also tested. Based on data gathered from the Web, the UV identified a number of HME-related objects including advanced segmentation techniques to track structures with no particular shapes. The final list of objects of interest supported has been updated according to the feedback received from the end users, during and after the execution of the previous pilots.

Based on the analysis of other synthetic data, the supply chain monitoring tool was capable of identifying certain suspicious transactions based on the substances and their quantities purchased by certain users in a specific geographic area.
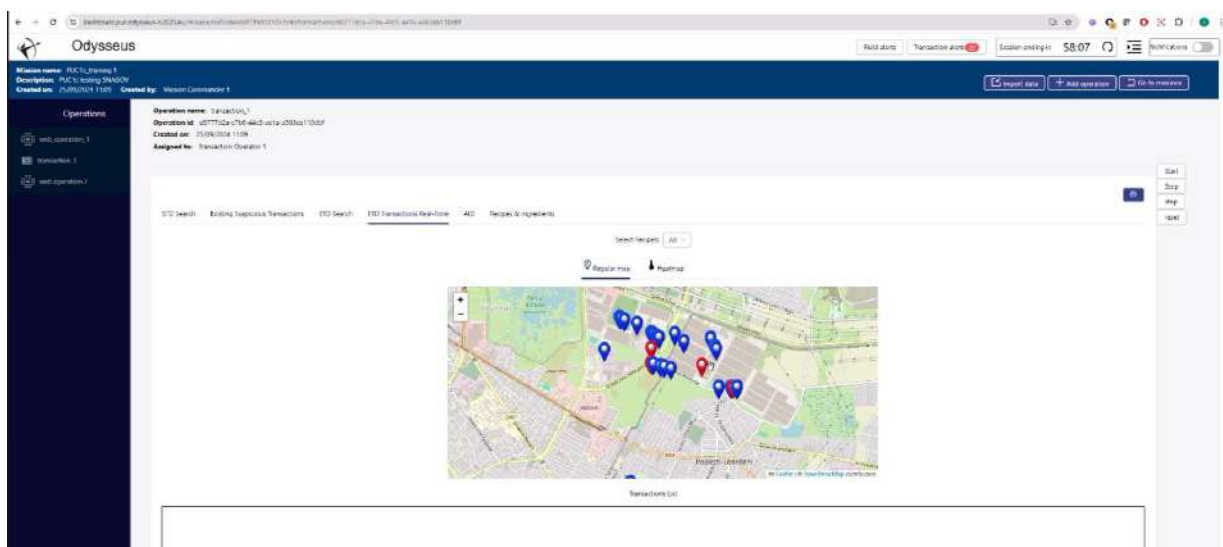


*Screenshot of Suspicious Transaction Detection tool results. Suspicious transactions are marked with red pins*
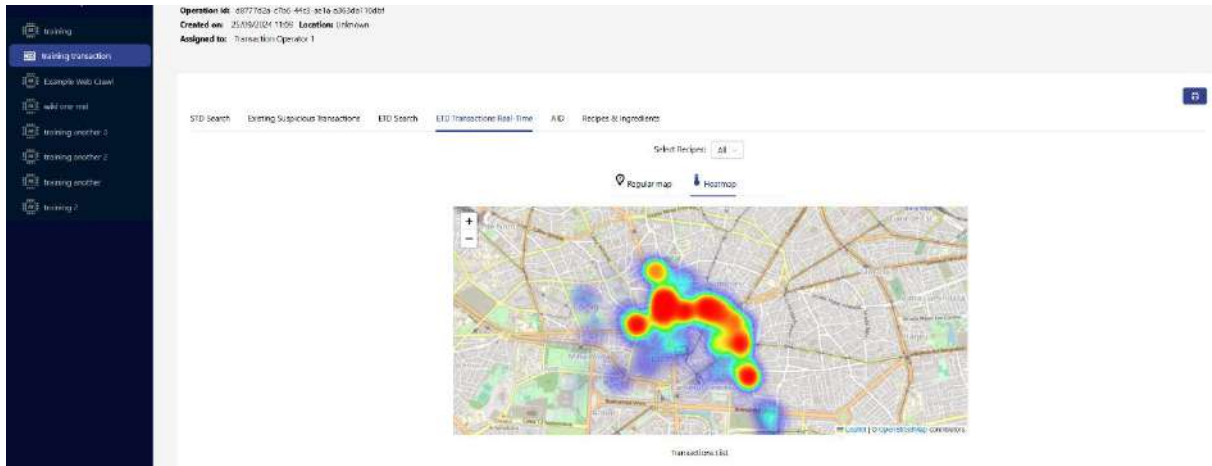
*Screenshot of the new Suspicious Transaction Heat Map*

Based on the suspicious transaction detection results, ten air measurements were conducted in the geographic area, where a clandestine laboratory was expected to be located. With the utilisation of the ODSSEUS Airborne Threat Detection & Localisation (ATDL) component, it was possible to detect and localise the potential release area of suspicious HME-related chemicals.
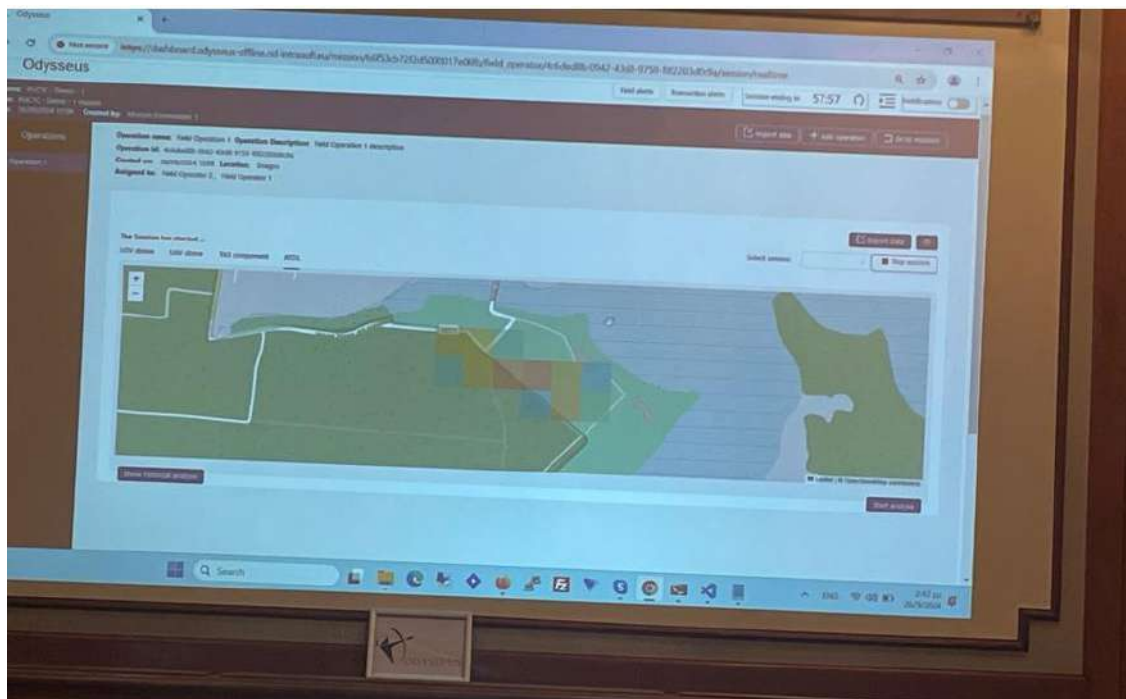


*ATDL map on the big screen, presenting the area
with the highest concentration of the detected precursor
in the red fields at the PUC1.c site. (Photo: Stodiek)*

In line with the work-flow of the use case scenario, the results of these investigation activities lead to the deployment of the UAV, carrying the T4i DOVER® Ultra as well as the deployment of the mirSense water sensor, to identify precursor substances in the air and in the water in the specific geographic area located by the ATDL. Here, a clandestine laboratory was expected to be found.



*UAV carrying the T4i Dover Ultra detector (Photo: SPP)*

Plastic boxes, containing Acetone and Toluene were placed at the ground level and at a higher level to test the detection capabilities of the T4i DOVER® Ultra in different environments where vapours can disperse in different ways.

*The UAV carrying the T4i Dover Ultra appraches the source
of the explosive precursor on the ground (Photo: Stodiek)*

In this PUC, the UAV was able for the first time to stream video pictures of its flight live to the ODYSSEUS Dashboard.
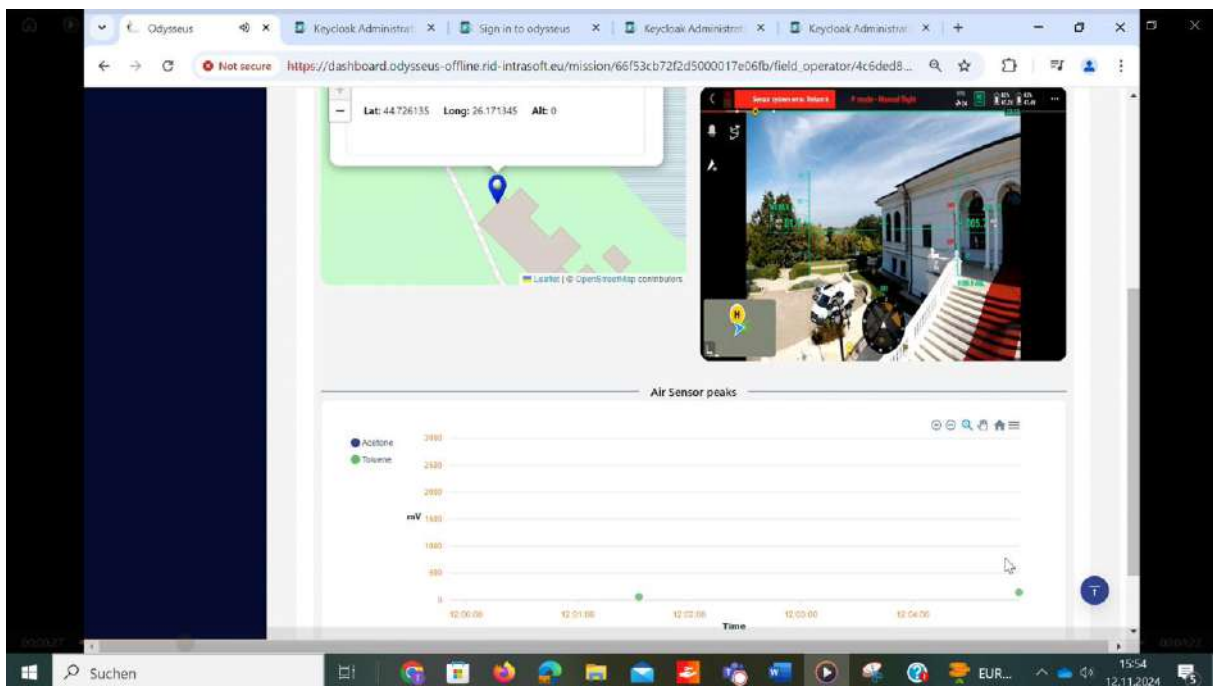


*Screenshot from the Dashboard showing live strem pictures from the UAV
as well as measurments of Toluene detected by the T4i Dover Ultra.*

The tests of the T4i DOVER® Ultra verified the excellent capabilities of the chemical detector, allowing for fast and real-time detection and identification of the substances and the seamless transmission of alarms to its ground station and to the ODYSSEUS platform through an offline module using dynamic IDs.

In addition to the T4i DOVER® Ultra air sensor, the mirSense water sensor was deployed to find traces of explosives precursors in wastewater close to the expected location of the potential clandestine laboratory.



*Technical partners are presenting the mirSense water sensor (Photo: SPP)*

*The sensor is taking a sample from a container (Photo: INTRA)*

Based on the measurements of explosives precursors in the air and water in the area of interest, the ODYSSEUS Threat Assessment and Decision Support tool (TAS) presented the threat level at the location of interest on the ODYSSEUS Dashboard. New functionalities of the TAS enabled the operator to fine-tune the level of threats by changing default settings. The final version of TAS includes feedback from the previously executed pilots.
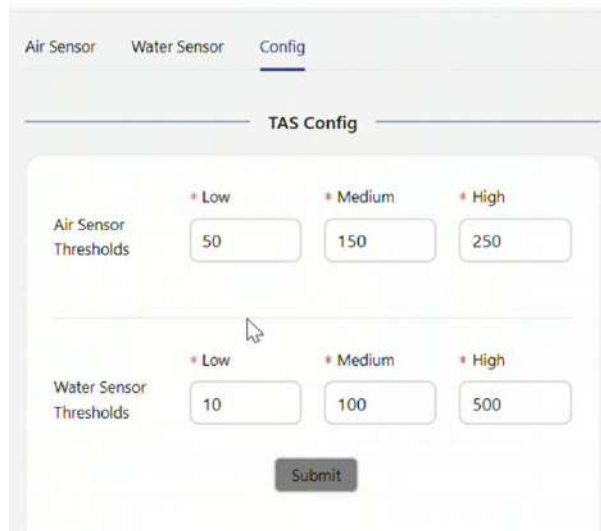
*Screenshot from the new TAS Threat Assessment thresholds configuration feature*
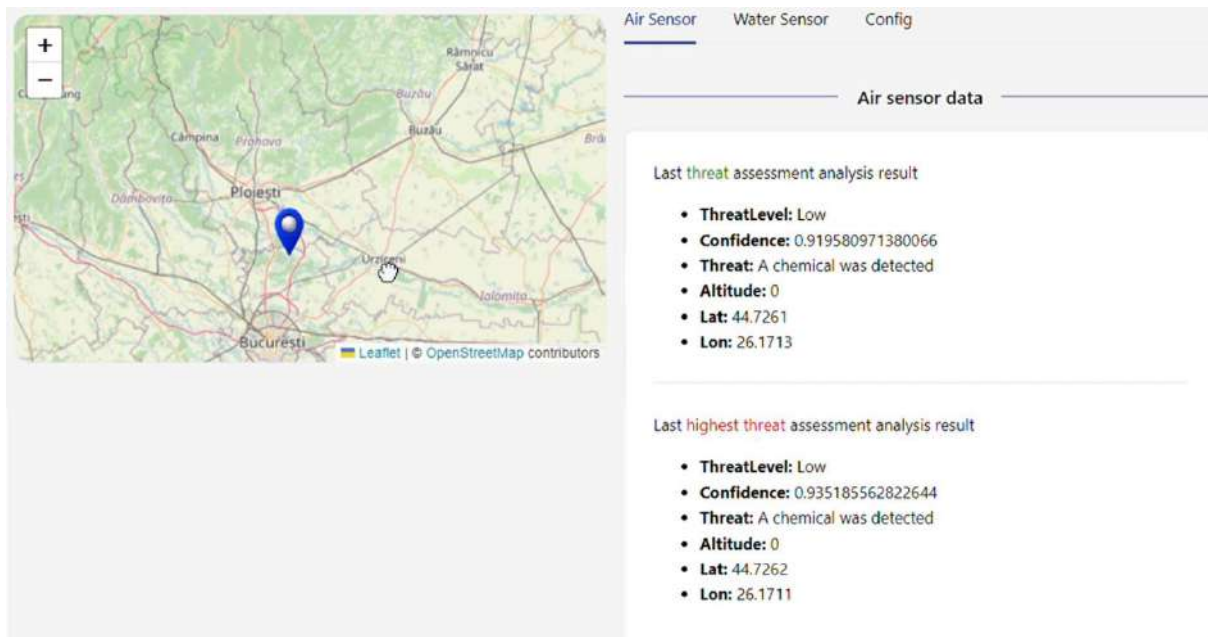


*Screen shot of the TAS map, presenting the area with the highest concentration of the precursor as well as the assessed threat level.*

During the PUC, the Project Officer from the EU Commission and one of the project reviewers had the opportunity to ask questions related to the operation of all platform tools.

The PUC was concluded with a feedback session allowing the consortium members and the guests from the EU Commission to share their impressions of the use case scenario operational flow and their initial assessment of the ODYSSEUS platform capabilities. The participating LEAs provided very positive feedback about the performance of the further enhanced ODYSSEUS platform tools.

# Other important events

## Joint Workshop of the H2020 projects ODYSSEUS and INHERIT at RISE-SD 2024

In the margins of the RISE-SD 2024 event ("Research and Innovation Symposium for European Security 2024" - https://rise-sd2024.eu/), held in Chalkidiki, Greece, on October 16-17, the two H2020 projects ODYSSEUS and INHERIT organized a joint workshop on 17 October. This was the third joint workshop of both projects since 2023, highlighting the close working relationship between both projects. 48 members of both projects participated in the event.

The workshop featured presentations of key results from the ODYSSEUS, INHERIT, and TICHE (Threats Identification by Collaborative vehicles for Human lifesaving against Explosives) projects, highlighting their achievements and their complementarities.

In particular, the coordinator of INHERIT, Mr. Hans Önnerud from the Swedish Defence Research Agency (FOI), gave an in-depth overview of the project and its outcomes, followed by Ms. Helen Gibson from the Centre of Excellence in Terrorism, Resilience, Intelligence and Organised Crime Research - Sheffield Hallam University (CENTRIC), who presented techniques developed in ODYSSEUS for detecting explosive precursors through online analytical methods and Dr. Iraklis Paraskakis from the South-East European Research Centre (SEERC) who showcased

technologies employed in ODYSSEUS to detect suspicious transactions within the chemical supply chain.

Mr. Theofilos Dimitriadis from iKnowHoW S.A. (IKH) presented the current results of project TICHE towards developing a multiplatform solution to detect and characterise hidden Improvised Explosive Devices (IED) and landmines in complex environments.

The workshop concluded with a fruitful panel discussion exploring best practices, lessons learnt, and challenges encountered in the domain of homemade explosives during the course of ODYSSEUS and INHERIT. The panelists were researchers and experts from the ODYSSEUS and INHERIT projects.

Mr. George Kalpakis (Centre for Research and Technology Hellas - CERTH) moderated the discussion.

Mr. Hans Önnerud (FOI) and Ms. Wiebke Grunert (Bundesanstalt für Materialforschung und -prüfung - BAM) addressed questions regarding the chemical properties of identified precursor substances.

Dr. Iraklis Paraskakis (SEERC) and Mr. Konstantinos Gkountakos (CERTH) discussed the challenges and lessons learnt from the development of technologies for suspicious transaction detection and computer vision applications for homemade explosives, respectively, whereas Mr. Peter Hübelbauer (University of Vienna- UNIVIE) elaborated on the legal and ethical

concerns shaping the development of AI-based technologies in the domain of homemade explosives.



*Representatives of both projects in a panel discussion (Photo: CERTH)*

A Q&A session followed, allowing the audience to engage with the speakers and learn more about the two projects.

## ODYSSEUS Final Conference in Sofia

On 26 November, the ODYSSEUS Final Conference was held in Sofia. Organized by the project coordination team of BDI, the conference was held in the Bulgarian Central Military Club in Sofia, Bulgaria.

The hybrid conference convened 40 participants, out of which 10 participated online, and 30 on-site in Sofia.

Among some high-ranking guests were Mr. José Caetano from EUROPOL, the ODYSSEUS Project Officer Ms. Alina Suhetzki and Mr. Luc de Meyer from the EU Commission.

The main objectives of the conference were to:

- present project results and achievements;
- address upcoming challenges identified in the project;
- present working prototypes and their operational capabilities;
- discuss common strategy for long-term exploitation of the project results;
- identify joint directions for further development;
- examine the beneficiaries' contributions and their integration within the project;
- define the expected potential scientific, technological, economic, competitive and social impact, and plans for using and disseminating results.



*Participants at the Final Conference (Photo: BDI)*

Following the introduction to the project by the Project Coordinator Col. Dr. Nikolai Stoianov (BDI), which included an overview of the project's objectives, activities and achievements, Associate Professor PhD Boyan Jekov, Bulgarian National Contact Point Horizon Europe Cluster 3 praised the achievements by the project and concluded by highlighting the challenge of making the achievements of the project sustainable, either by using them in practice by LEAs and other end users, or to use them as a basis for future technological development in the context of a successor project.

In the subsequent presentations, project beneficiaries presented in more detail the key objectives and achievements of the different ODYSSEUS platform components.

Mr. Dimitris Skapalazos (KEMEA) presented the user co-creation efforts and the ethical, legal and societal aspects that had been taken into consideration in the process of identifying and meeting end user requirements and developing the use case scenarios for the various PUCs.

Mr. Peter Hübelbauer (UNIVIE) and Dr. Iraklis Paraskakis (SEERC) presented a sociotechnical and legal analysis of the platforms tools for discovering suspicious transactions in the supply chain, how they met the requirements of Reg. (EU) 2019/1148 and how the use of Ai could positively impact the work of economic operators and LEAs and also the safety of society while at the other hand also had the potential to negatively impact on society if everyone in the supply chain could be suspicious by default and human rights could be violated.

Mr. Chris Theodosiadis (CERTH) described the new tools and techniques developed for collecting, translating and analysing HME-related content from the internet.

Ms. Wiebke Grunert (BAM) elaborated on the project's efforts in identifying new HME-related recipes in online forums and testing some of the new recipes for the energy content and sensitivity of the substances. While 3 new precursors had been identified, it turned out that all "new" HME recipes included at least one precursor substance that is already effected by Reg. (EU) 2019/1148.

Dr. Isaak Kavasidis (SEERC) introduced the ODYSSEUS tools for discovering clusters of suspicious transactions in the chemical supply chain that complete HME recipe compositions.

Ms. Angeliki Antonopoulou (T4i) presented the technology of the T4i DOVER® Ultra used for enhanced sensing of explosives precursor detection in the air as well as the user- friendly interface for presenting the results of the measurements and Mr. Apostolos Apostolakis (FZU) introduced the mirSense water sensor for enhanced detection of explosives precursors in sewage water. Both sensors allowed for real-time detection and on-board data processing with results automatically transmitted to the ODYSSEUS platform.

Ms. Maria Beneyto (ROB) presented the UGV developed by Robotnik which was developed to carry the MirSense water sensor and support the remote water sample collection process as well as the transmission process of the sensor data to the ODYSSEUS platform; as well as the airborne solution for carrying the T4i

DOVER® Ultra on a custom-made commercial quadcopter UAV, developed by KEMEA.

Mr. Chris Theodosiadis (CERTH) introduced the ODYSSEUS Airborne Threat Detection and Localisation (ATDL) component which leverages the air sensor measurements from the wider area of interest, in combination with a meteorological model to estimate the potential release point of the detected gas; as well as the Threat Assessment for Decision Support (TAS) component of the ODYSSEUS platform, which, based on the measurements of explosives precursors in the air and water determines the threat level of explosives precursors substance in an area of interest.

Mr. Paraskevas Bourgos (INTRA) finally demonstrated how all different components have been integrated into a common ODYSSEUS platform, how the findings from the different component are visualized on the ODYSSEUS Dashboard, and how the end users can operate the platform via the Dashboard interface.

The scientific papers, on which the presentations by the ODYSSEUS beneficiaries were based, will be collected and published in a Conference Proceeding by the Journal of Defence & Security Technologies, expected to be released by the end of December 2024.

Following the presentations on the various ODYSSEUS components and subsequent Q&A sessions after each presentation, guest speakers from 4 other H2020 projects that are

topic-wise related to the work of ODYSSEUS introduced their projects.

Mr. Hans Önnerud from the Swedish Defence Research Agency (FOI), introduced the objectives and achievements of the recently finalized INHERIT project, which focused on disrupting or preventing the production of HMEs; on disrupting or preventing the use of HMEs by markers and their detection; on tying a perpetrator to the crime by forensics, where the crime is in a preparatory phase; and on assessing the countermeasures and further exploit the results.

Mr. Önnerud also introduced the project HiTDOC. Its objective is to organize a challenge, based on the design and development of test procedures and methodologies, that will allow evaluating the performances of detection technologies. During the iteration of four challenges, the testing procedures will be further updated, aiming at being able to propose, at the end of the project, recommendations on standardized test procedures to objectively evaluate system performances.

Mr. Jose Luís Pérez Díaz from the University of Alcalá (UAH) presented the work of the MELCHIOR project. MELCHIOR aims at the fast detection of drugs, explosives, weapons and illicit goods concealed on individuals and in critical cavities of the human body, by improving, maturing and demonstrating the novel infrasound interrogation Z-MESMERISE technology in operational environments including border controls in airports and sea-ports and land borders as well as other environments where the technology would be quite useful like crowded events and prisons.

Finally, Mr. Pérez Díaz introduced the new project STBERNHARD, which aims to develop innovative technologies for the mass decontamination of people, animals, and infrastructures; the identification of CBRN aerosols and getting a 3D model of the scenario; developing an AI modular tool for generating operating procedures for First Responders operating under CBRN-E events.

In his closing remarks the ODYSSEUS Coordinator, Nikolai Stoianov thanked the presenters for their excellent presentations and the participants for their interest in the topic.

He also highlighted the interest from LEAs inside and outside the consortium to further test the ODYSSEUS platform components, which could also be used for investigative work related to drugs or weapons.

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## ODYSSEUS H2020 PROJECT

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