WHITE PAPER

ODYSSEUS PROJECT INTERACTIONS WITH THE SCHENGEN BORDER CODE

ODYSSEUS

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INTRODUCTION

This white paper, developed under the ODYSSEUS Project (ID 101073910 - Unobtrusive Technologies for Secure and Seamless Border Crossing for Travel Facilitation) that was funded by EU under Horizon Programme, examines how the biometric recognition, advanced surveillance and inspection technologies developed in the project align with Regulation (EU) 2016/399—the Schengen Borders Code[1]. Focusing on Articles 8 and 13 and Annex VI, it highlights how innovations such as facial recognition, drone-based monitoring, X-ray scanning, and automated occupancy detection support secure, efficient, and regulation-compliant border management across the EU.

PROJECT OVERVIEW

ODYSSEUS Project aims to enhance border security within the EU by leveraging advanced surveillance and inspection technologies. The project introduces innovations such as identity verification, drone-based monitoring, X-ray scanning, and automated occupancy detection / people counting technologies to support secure, efficient, and regulation-compliant border management.

REGULATION (EU) 2016/399 SCHENGEN BORDERS CODE

Regulation (EU) 2016/399, also known as the Schengen Borders Code, establishes rules for the movement of persons across borders within the Schengen Area. It aims to ensure the free movement of people while maintaining security and border control measures. Below are some of the provision of this law, of interest for this White Paper:

Article 8 Border checks on persons:

"The checks may also cover the **means of transport** and objects in the possession of the persons crossing the border. The **law of the Member State** concerned shall apply to any searches which are carried out."

Article 13 Border surveillance:

"The main purpose of border surveillance shall be to prevent unauthorized border crossings, to counter cross-border criminality and to take measures against persons who have crossed the border illegally."

"Surveillance shall be carried out by stationary or mobile units which perform their duties by patrolling or stationing themselves at places known or perceived to be sensitive, the aim of such surveillance

[1] Regulation - 2016/399 - EN - Schengen borders code - EUR-Lex

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being to apprehend individuals crossing the border illegally. Surveillance may also be carried out by ***technical means****, including electronic means."*

ANNEX VI Specific rules for the various types of border and the various means of transport used for crossing the Member States' external borders, art 1. Land borders, paragraph 1.1. Checks on road traffic:

"1.1.3. As a general rule, persons travelling in vehicles may remain inside them during checks. However, if circumstances require, persons may be requested to alight from their vehicles. Thorough checks will be carried out, if local circumstances allow, in areas designated for that purpose. In the interests of staff safety, checks will be carried out, where possible, by two border guards."

As outlined in Key Findings, the technology providers' equipment has a clear place for implementation within the Schengen border code at a member state level assisting with vehicle inspection, whilst enabling the occupants to remain within vehicles.

ODYSSEUS CONTRIBUTION TO THE IMPLEMENTATION OF THE SCHENGEN BORDER CODE

Europe's borders are constantly evolving, shaped by growing traveller flows, changing migration patterns and the ongoing effort to balance security with the free movement of people. Within this context, the Schengen Border Code (SBC) and the Entry/Exit System[2] (EES) (Regulation (EU) 2017/2226 of the European Parliament and of the Council of 30 November 2017 establishing an Entry/Exit System (EES) to register entry and exit data and refusal of entry data of third-country nationals crossing the external borders of the Member States and determining the conditions for access to the EES for law enforcement purposes, and amending the Convention implementing the Schengen Agreement and Regulations (EC) No 767/2008 and (EU) No 1077/2011), define how border management should be coordinated, transparent and respectful of fundamental rights.
The ODYSSEUS project supports this vision by combining artificial intelligence (AI), machine learning (ML) and multi-sensor data fusion to make border operations more intelligent, efficient and human-centred.

Alignment with the Objectives of the Schengen Border Code

The Schengen Border Code is based on a clear principle: secure borders and free movement can exist together. ODYSSEUS contributes to this by developing tools that make border checks faster, more consistent and more accurate across Member States.

Through AI-based biometric verification, behavioural analysis and automated risk detection, the platform helps border guards identify potential risks early while maintaining human supervision. This

[2] Regulation - 2017/2226 - EN - EUR-Lex

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approach increases efficiency and supports the Code's emphasis on proportionality and respect for individual rights.

ODYSSEUS also helps ensure a uniform level of control across the Schengen area by providing common, adaptable tools that can be deployed in different national contexts. This supports greater consistency in how border procedures are applied throughout the European Union.

Adapting to Romania and Bulgaria's joining to the Schengen Area

The recent joining of Romania and Bulgaria to the Schengen Area for all types of borders since January 2025 has slightly reshaped the focus of the project. Originally designed to address challenges at the EU's external borders, ODYSSEUS now also shows how its technology can bring value within the Schengen framework itself.

The platform can act as a supporting tool for the Entry/Exit System, especially at land and maritime borders. By connecting with the EES infrastructure, ODYSSEUS helps to register and monitor travellers efficiently and securely. Its flexible design allows Member States to use the same platform for different operational contexts, from land to sea border crossing points.

The drone-based monitoring was tested in land and train pilots and proved to be successful to monitor illegal migrants crossing into the EU space, in combination with faceless counting of people in queues at borders.

This adaptation shows the long-term relevance of ODYSSEUS. Even as border policies evolve, the system remains aligned with the goals of European Integrated Border Management (EIBM) and can continue to enhance both security and traveller experience.

Supporting the Entry/Exit System (EES)

The Entry/Exit System is one of the most important modernisation initiatives in EU border management. EES is an automated IT system for non-EU nationals travelling for a short stay, each time they cross the external borders of 29 European countries using the system. The system registers the person's name, travel document data, biometric data (fingerprints and captured facial images) and the date and place of entry and exit, in full respect of fundamental rights and data protection. It also records refusals of entry. [3]

EES is applied staring 12 October 2025 and will become fully operational as of 10 April 2026. It replaces manual passport stamping with automated registration for travellers from third countries. ODYSSEUS can support this transition by offering a scalable and interoperable platform that can process biometric recognition, verifies the identity and can read non-EU passports.

Through its use of Explainable Artificial Intelligence (XAI), the system ensures that every AI-based decision can be understood and verified by a human officer. If an anomaly is detected, the officer can see why it was flagged. This transparency builds trust and ensures compliance with European legislation.

[3] Entry-Exit System - Migration and Home Affairs - European Commission

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Interoperability and Data Exchange

ODYSSEUS was built with interoperability in mind. It can enable secure and efficient data exchange between national systems and EU-level infrastructures like Schengen Information System[4](SIS), Schengen Visa Information System[5] (VIS), EES, and European Travel Information and Authorisation System[6] (ETIAS).. This makes sure that border guards can access the right information at the right time.

By merging inputs from multiple sensors such as document readers, biometric devices and surveillance cameras, ODYSSEUS creates a complete operational picture that supports faster and more informed decisions. This contributes directly to the development of a truly connected and cooperative Schengen border environment.

Ethical and Legal Compliance

Technology in border management must always respect privacy and human dignity. ODYSSEUS integrates ethical and legal compliance throughout its design and operation.

All AI modules follow the principle that personal data is processed only when necessary and under strict safeguards. Access controls, anonymisation and encrypted communication ensure that sensitive data remains protected and compliant with GDPR.

Benefits for Border Authorities

ODYSSEUS brings several concrete advantages for border authorities:

- Shorter waiting times for travellers through automated verification
- Greater accuracy in detecting fraudulent documents or irregular crossings
- Improved coordination between national and European agencies
- Full interoperability with systems such as EES and ETIAS
- Reduced operational costs and workloads through digitalisation

These features make ODYSSEUS not just a research project but a practical enabler of the Schengen Border Code, improving both efficiency and public trust in border control.

Contributing to the Future of European Border Management

Beyond its technological achievements, ODYSSEUS represents how research and innovation can directly support European policy implementation. It shows that artificial intelligence, can strengthen human expertise rather than replace it.

As Schengen Area continues to develop and systems such as the EES are under implementation, ODYSSEUS remains a flexible and future-ready solution that can adapt to new regulatory and operational contexts.
Ultimately, it acts as a bridge between policy, technology and practice, demonstrating how Europe can build border systems that are secure, interoperable and centred on human values.

[4] Regulation - 2018/1862 - EN - EUR-Lex
[5] Regulation - 2021/1134 - EN - EUR-Lex
[6] Regulation - 2018/1240 - EN - EUR-Lex

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KEY FINDINGS

Key Findings #1

Article 8 of Regulation (EU) 2016/399 provides a mechanism for the inspection of means of transport, these inspections will be carried out in line with the local laws of the member state. Equipment used for these inspections will be legilsated for at a member state level. Technology offerings from the Odyseuss project that could be utalised in these searches include X-ray equiement and camera's mounted on drones.

Key Findings #2

Article 13 of Regulation (EU) 2016/399 details that one of the main purposes of border surveillance is the prevention of unauthorized border crossings. The article also details that this surveillance can be conducted utilizing technical means. The ODYSSEUS project has had a strong focus on occupancy detection in vehicles with both Drone technology detecting occupancy and X-ray equipment counting occupancy and finding hidden persons in an instantaneous automated manner through use of Algorithms.

Key Findings #3

ANNEX VI of Regulation (EU) 2016/399 details the emphasis on enabling occupants to stay in vehicles during inspections. The ODYSSEUS project has focused on enabling this general rule with technological developments that are aimed at comprehensive checks without the occupant needing to move from a vehicle.

Key Findings #4

When compared to Regulation (EU) 2016/399, which lays down detailed measures for the implementation of the common basic standards on aviation security (EU) 2015/1998 of 5 November 2015, the Schengen Borders Code is not prescriptive about the technology that can be used for inspection purposes. This provides more freedom to the applicable agencies to use a range of inspection equipment.

Key Findings #5

The Entry/Exit System (EES) modernises border control across the Schengen Area by replacing manual stamping with automated registration. The ODYSSEUS platform supports this initiative through interoperable, Explainable AI (XAI) modules that can integrate seamlessly with EES infrastructure. This ensures transparent, accountable, and real-time decision-making for border officers.

Key Findings #6

With Romania and Bulgaria joining the Schengen Area, ODYSSEUS demonstrates adaptability by applying its technological framework to both external and internal borders. This flexibility supports the harmonisation of border management practices across Member States and aligns with the objectives of the European Integrated Border Management (EIBM) strategy.

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CONCLUSION

The ODYSSEUS Project exemplifies how cutting-edge technology can reinforce EU border security while adhering to legal standards. By enabling non-intrusive, automated inspections and enhancing surveillance capabilities, the project supports the goals of Regulation (EU) 2016/399—ensuring both effective control and respect for traveller convenience—positioning itself as a model for future-ready, regulation-aligned border solutions.

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