# C2 ADVANCED MULTI-DOMAIN ENVIRONMENT AND LIVE OBSERVATION TECHNOLOGIES

FLYSEC Final Info Day and Risk-Based Security Projects Cluster meeting

28/06/2018

# OVERVIEW

3 yrs

start date 1 MAY 2017

9.9 Million Euros

FUNDED AT 70 % by the

AMELOT

C2 Advanced Multi-domain Environment and Live Observation Technologies

| | |
|---|---|
| industry | 8 |
| research | 4 |
| end-users | 10 |

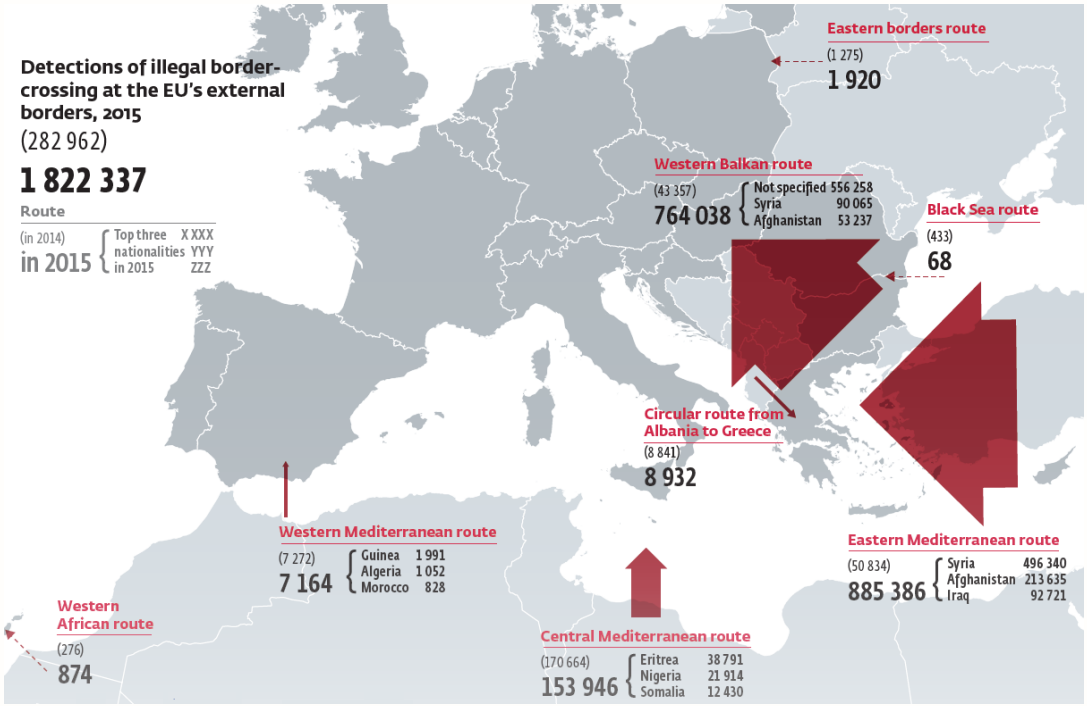
22 Beneficiaries

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 740736

# THE PROBLEM

## *IRREGULAR MIGRATION*

- According to FRONTEX, 283000 migrants entered the EU irregularly in 2014. In 2015, this number almost quadrupled to approximately 1 Million migrants (according to IOM and UNCHR).




*Source: FRONTEX*

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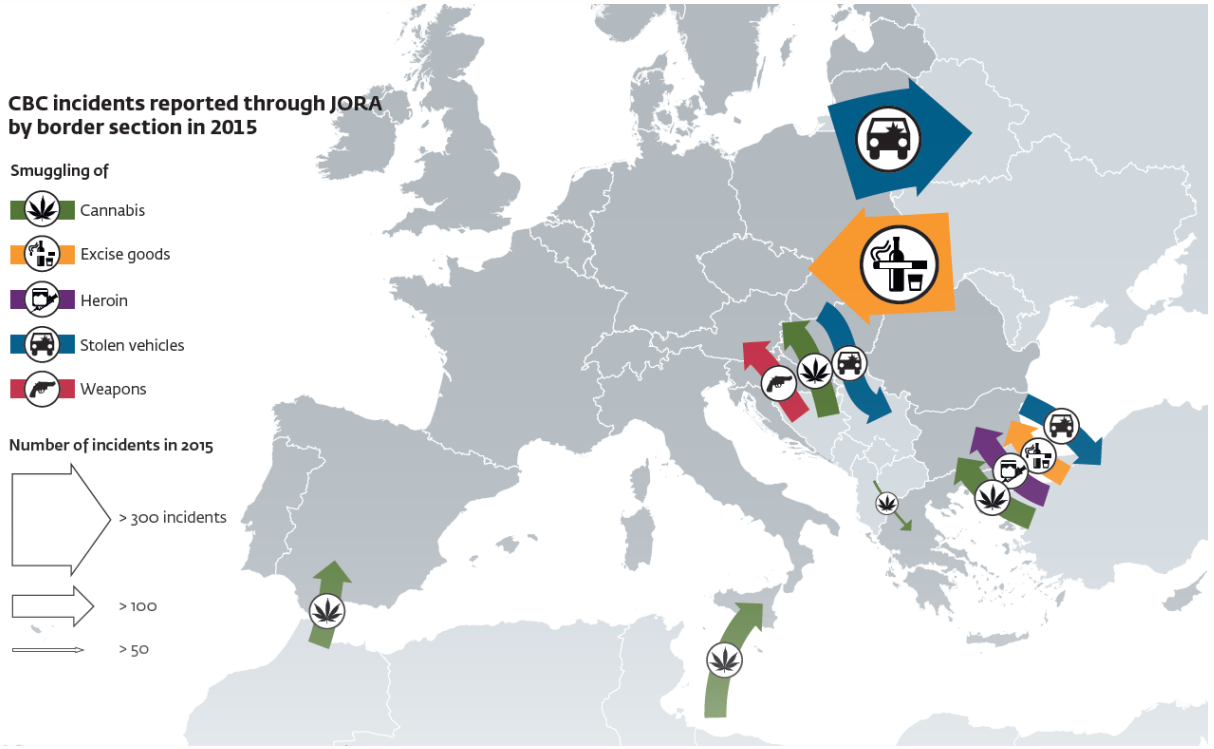
# THE PROBLEM

## *SMUGGLING OF GOODS*

- According to the EMCDDA European Drug Report, in 2014, 80% of drug seizures in Europe were of cannabis and more than 5 tonnes of heroin produced in Afghanistan and transported along the Balkan and Northern routes were seized in the EU.

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# MOTIVATION

- **Low levels of situational awareness on the EU borders**, high at sea and on unpopulated or scarcely populated land areas, are important factors of cost of border surveillance.

- **Current border control systems involve a wide range of heterogeneous assets – manned and unmanned** – to survey from air, surface (land and sea) and underwater. Similarly the objects of their surveillance may be vessels, land vehicles, aircrafts, and underwater vehicles used, for instance, for smuggling and trafficking.

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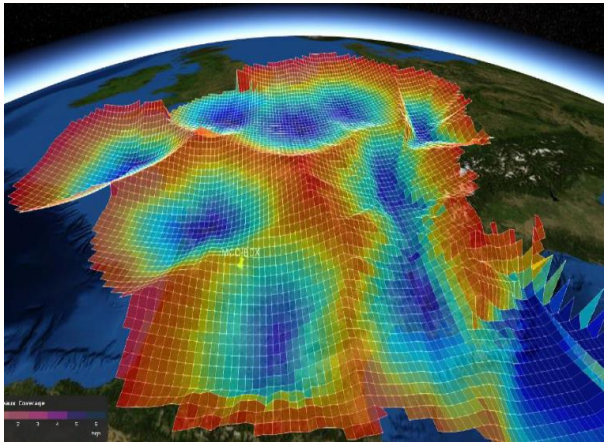
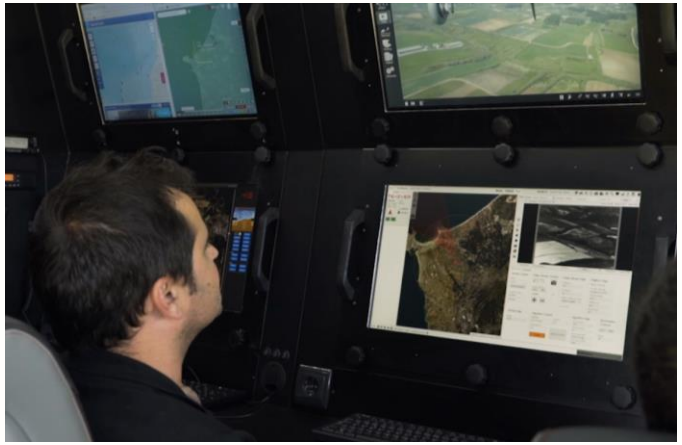
# SOLUTION

An enhanced command and control system using advanced 3D computer graphics technology that allows accurate representation of the position of surveillance assets – including autonomous agents – and external objects in such complex environments.





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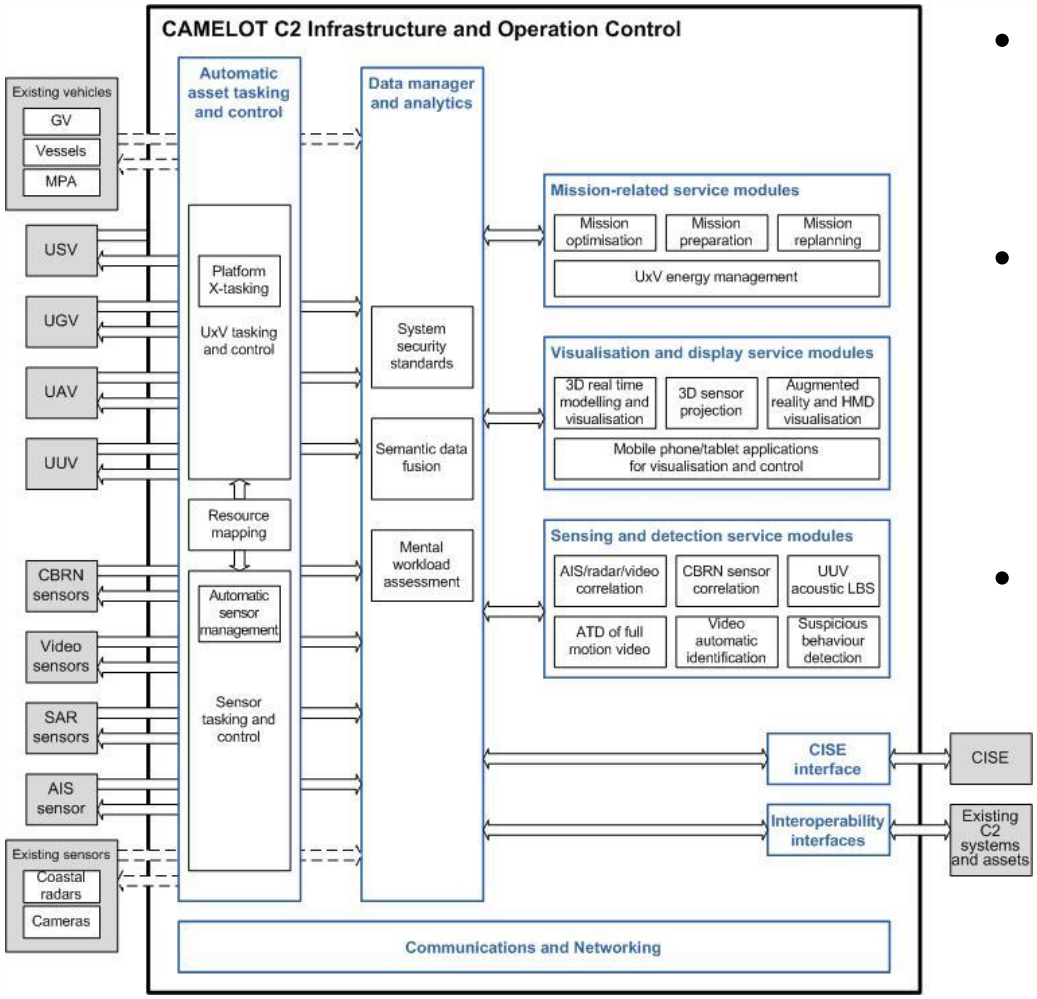
# FRAMEWORK




- Enhanced capabilities and new functionalities built upon frameworks following open and well defined interfaces.
- This will help practitioners and member states rationalize their investments in new C2 infrastructure (allowing for either a “pick and mix” type of approach or completely new developments).
- CAMELOT will achieve this by prototyping service modules exploiting partners’ background. All modules support directly needs expressed by at least one CAMELOT practitioner.

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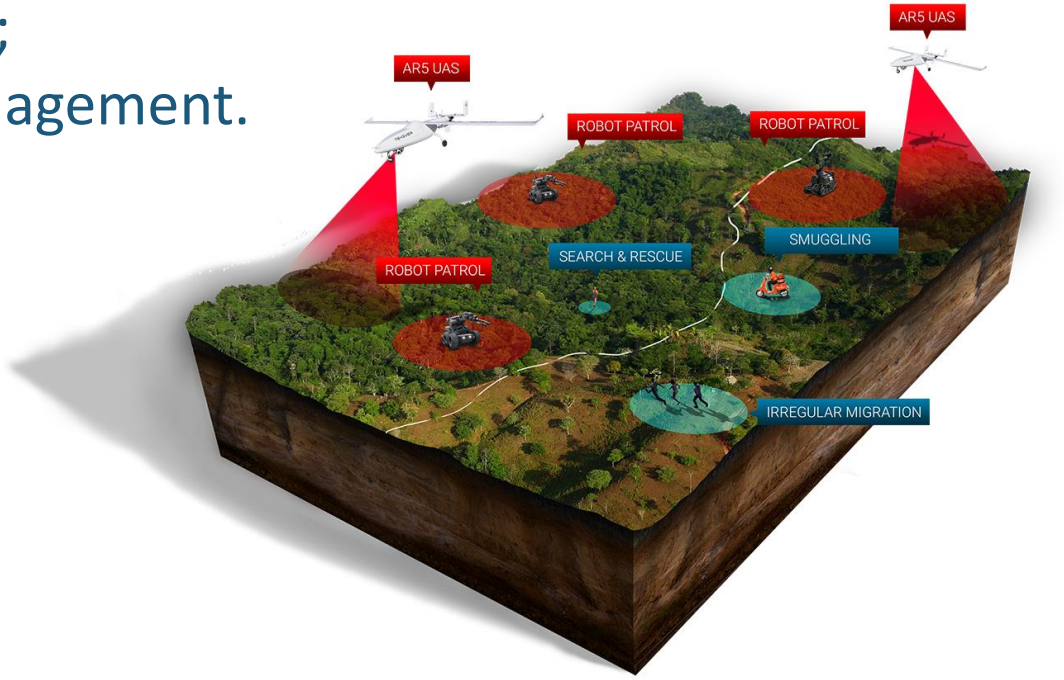
# SERVICES

## *Automatic Asset Tasking and Control*

- Based on three large groups of work:
  - Sensor tasking and control;
  - Platform cross-tasking;
  - Automatic sensor management.

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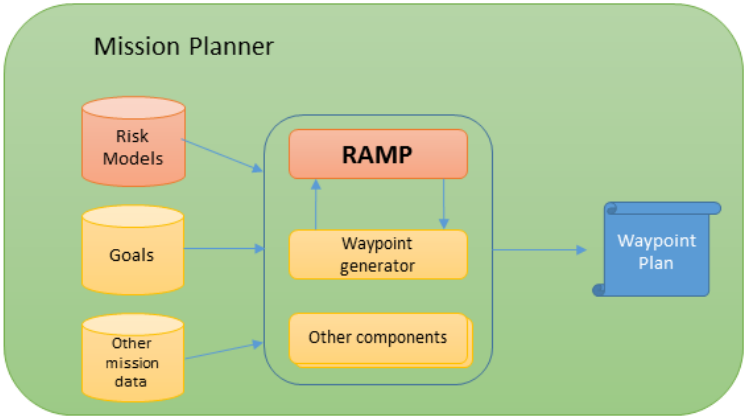
## *Mission Related Modules*

- A mission planner capable of combining metadata from different classes of systems will give an enhanced view of the operating environment. A mission planning and replanning module for unmanned vehicles can quantify different types of risks (possibly using Bayesian techniques) and incorporate them into a tool that generates routes with a given probability of success, based on the prediction of certain risks occurring. CAMELOT will consider additional and more complex risk models and incorporate input data into the route planning/re-planning.

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## *Visualization and Display*

- Researchers have repeatedly demonstrated the effectiveness of different display formats is a dependent task. The display format varies between 2D format, 3D format and a self-centered mapping, exo-centered 2 splitted coplanar screens:
  - The 2D representation is not as effective for high resolution in complex terrain;
  - 3D displays are compelling, integrated and natural, but this natural representation can be misperceived as ambiguous and causing distortion.


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## *Sensing and Detection*

### AIS/Radar/Video Correlation

- In CAMELOT the automatic calculation of length of vessels from Range Profile signals to subsequently verify the correlation with the information transmitted by AIS is proposed. This method can then be automatically implemented in a mission system as a module service.


### ATD of Full Motion Video

- The proposed work focuses on the automatic processing of the detection of moving ground targets from a real-time acquisition by an electro-optic payload.
- The algorithms will also determine automatically the type of detected targets (e. g. boat class) from an image database that will be learning in real-time with the user, using identifications previously performed by the operator.

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## *Data Manager and Analytics*

- A new self-adaptive deep machine learning model is proposed.
- It combines, on one hand, supervised learning paradigm with an unsupervised training process so as to discover structures within the multi-sensory input data.
- On the other, it exploits adaptable mechanisms to automatically update the outputs of the deep multi-layered classifiers so that the current radar environmental data are trusted as much as possible (*discriminative constraints*) with a simultaneous a minimal degradation of the already gained knowledge (*experience*) of the model over previous adaptation cycles (*generative constraints*).

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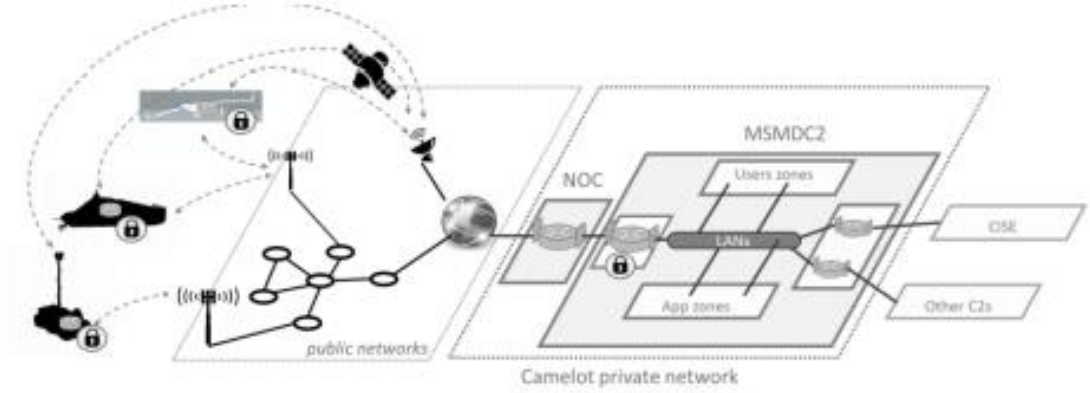
## *Communications and Network Security*

- In CAMELOT, the network will have to be designed as a whole, mainly because it has to connect systems and applications that will share the same information.
- The proposed reference architecture for secure communications will thus be built on a threat intelligence basis that will enable the command and control architecture to withstand new types of attacks without too many modifications of the components.

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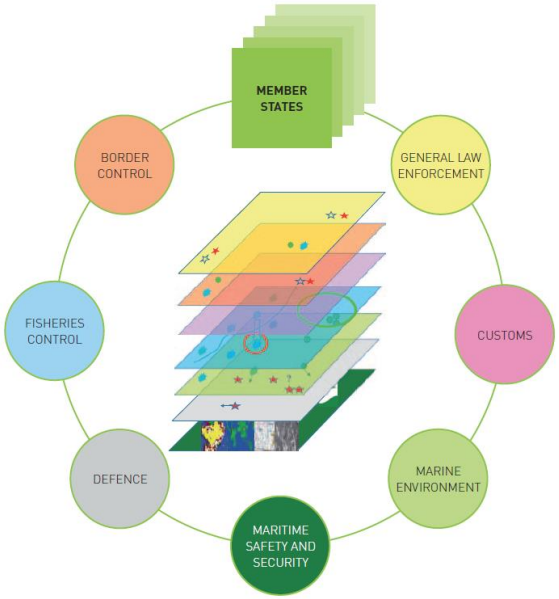
# CISE INTERFACE

- Building on the resulting data model from project EUCISE 2020, CAMELOT will implement an interface for information sharing between the C2 system and the pan-European maritime Common Information Sharing Environment (CISE).

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# DEMONSTRATIONS

## *Maritime Border*

- Smuggling and search and rescue of illegal immigrants at a coastal area (employing assets from GNR and PT-NAVY)

## *Land Border*

- Irregular migration and drug smuggling over a land border (employing assets from KEMEA)

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# CONTACTS

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# Thank you!

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