C2 Advanced Multi-domain Environment and Live Observation Technologies

[redacted]

Project Identity

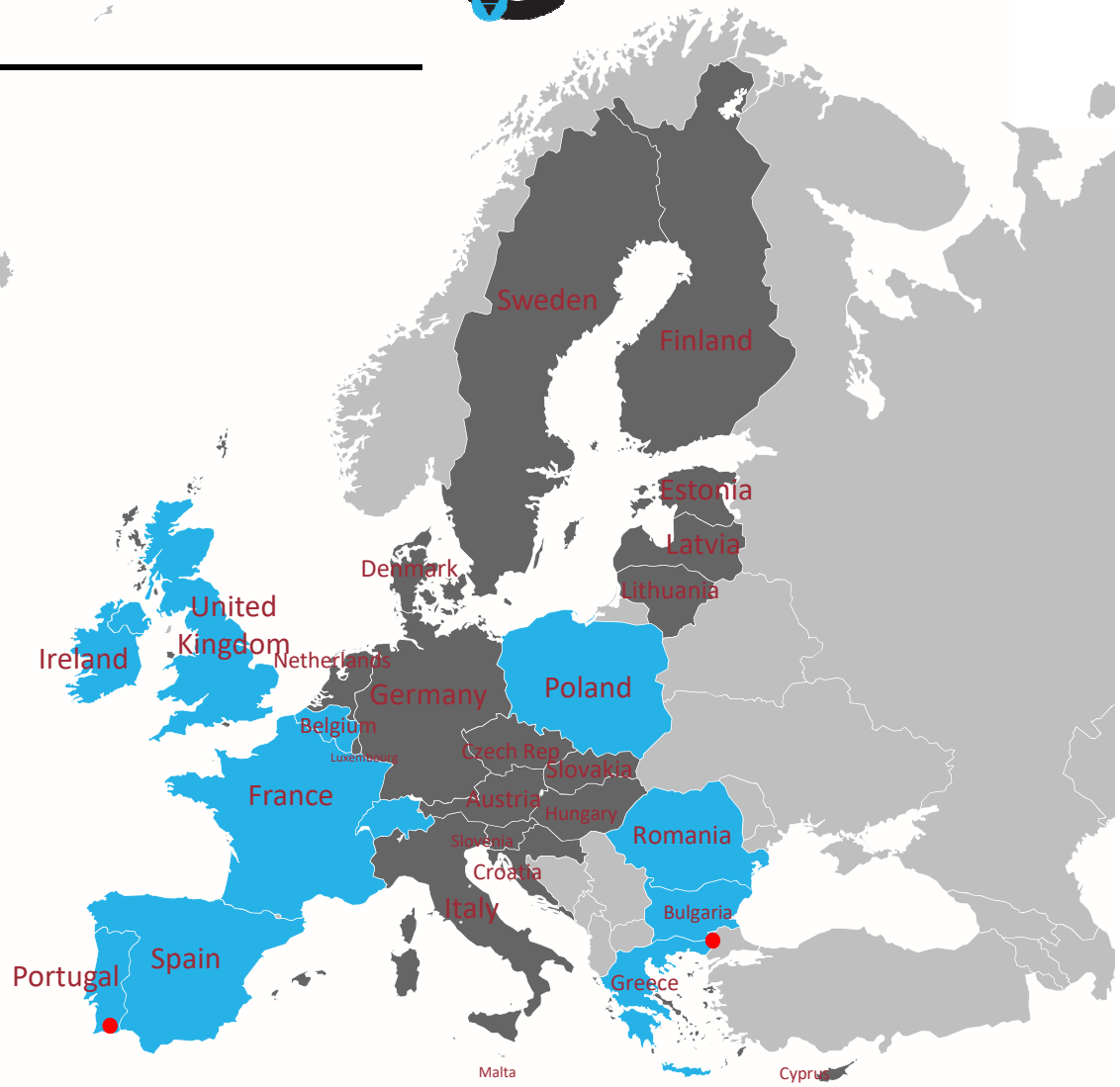
- Research topic: SEC-20-BES-2016: Border Security: autonomous systems and control systems
- Grant Agreement No: 740736
- Start date: 01 May 2017
- Project duration: 36 months + 12 months extension
- End date: May 2021
- Total budget: 9,942,597.93 €
- Project Coordinator: EXODUS S.A. (has replaced TEKEVER)

Consortium

11 countries

23 partners

- Industry: 9
- Research: 4
- End users: 10



The current situation

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.

Only enhanced command and control systems using advanced 3D computer graphics technology may allow to represent accurately the position of surveillance assets and external objects in such complex environments, thus increasing the situational awareness of the decision makers.

Two main challenges

- Ability of commanding and controlling multiple UxVs as well as other sensors and delivering complex services using the same systems and environments.
- Standardization in the domain of command and control systems (in particular control segments for UxVs in the defence domain).

CAMELOT's interpretation of the problem

- Need to rationalize new investments in both assets and C2 systems.
- Need to integrate new, often heterogeneous, assets in a coherent and consistent way with the existing C2 border surveillance systems.
- Desire for widely supported standardized multi-platform, multi-domain and multi-service C2.
- Desire for reduction of footprint/space, power, logistic support and other costs associated with the acquisition and integration of unmanned vehicles from more than one operating domain.
- Desire for increased interoperability between border surveillance assets and systems in line with the vision of EUROSUR.
- Adequately address an increasingly complex threat environment.

CAMELOT…

- will prototype, test and demonstrate different advanced command and control service modules for multiple platform domains based on a state-of-the-art architecture;
- will validate the technical and financial viability of the modules (based on previous work from partners);
- will achieve an exploitable model based on a standardized architecture with well-defined and specified interfaces.
- Target: TRL6 maturity level

Demonstrations

- A final demonstration involving a great number of the modules is envisaged, involving end users and relevant stakeholders.
- Gradual approach to testing
  - Test combinations of multiple modules
  - Gather field data to support tests and demos

Pilot case A: Portimao (PT)

Smuggling and search and rescue of illegal immigrants at a coastal area

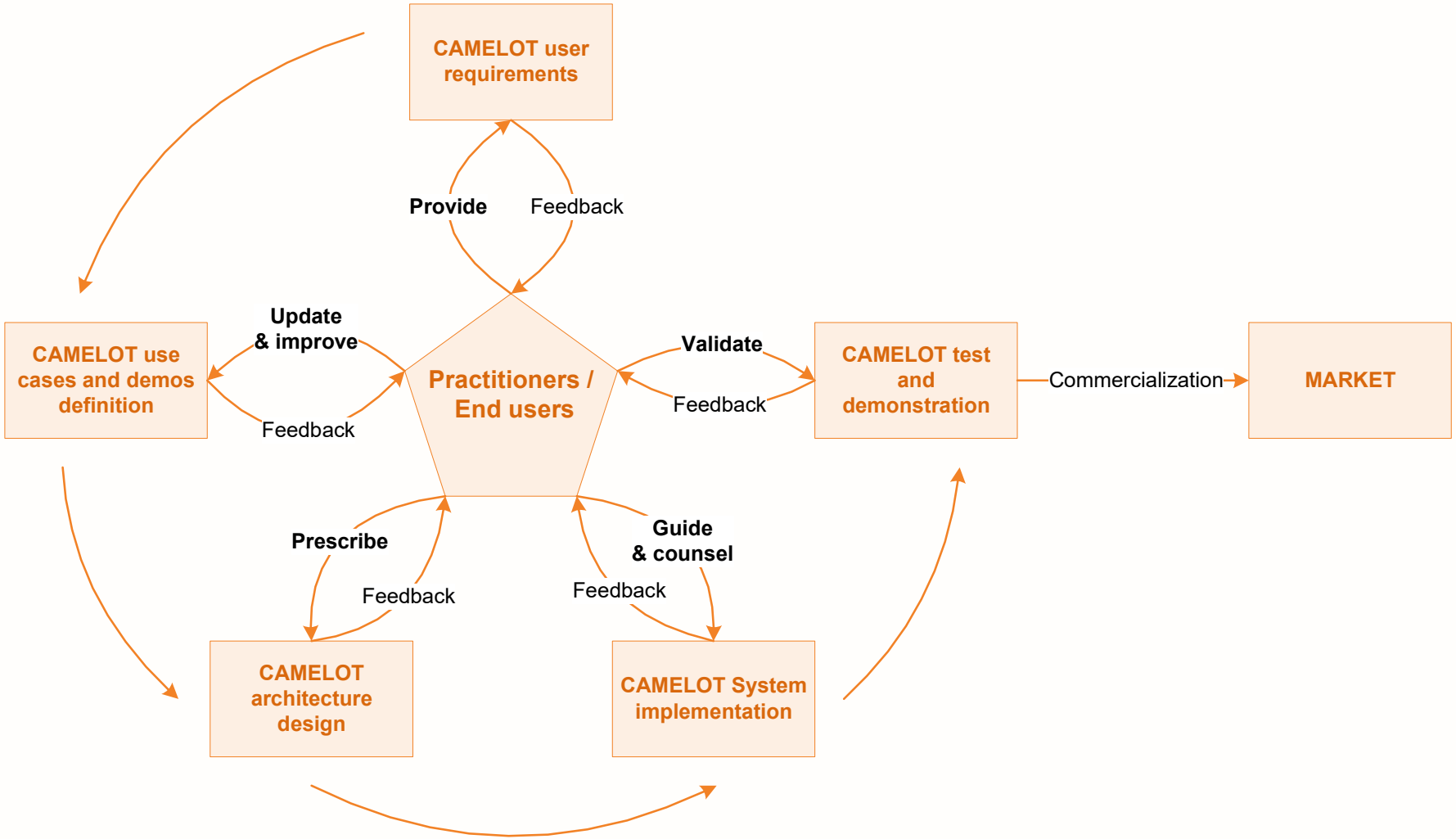
- Employing assets from PT-NAVY
- Maritime border
- Includes: resource mapping, mission optimization, 3D visualization of the complex environment and all deployed assets, sensing and detection services as well as the interfaces to CISE and other surveillance systems.

Pilot case B: Orestiada (GR)

Illegal immigration and drug smuggling over a land border

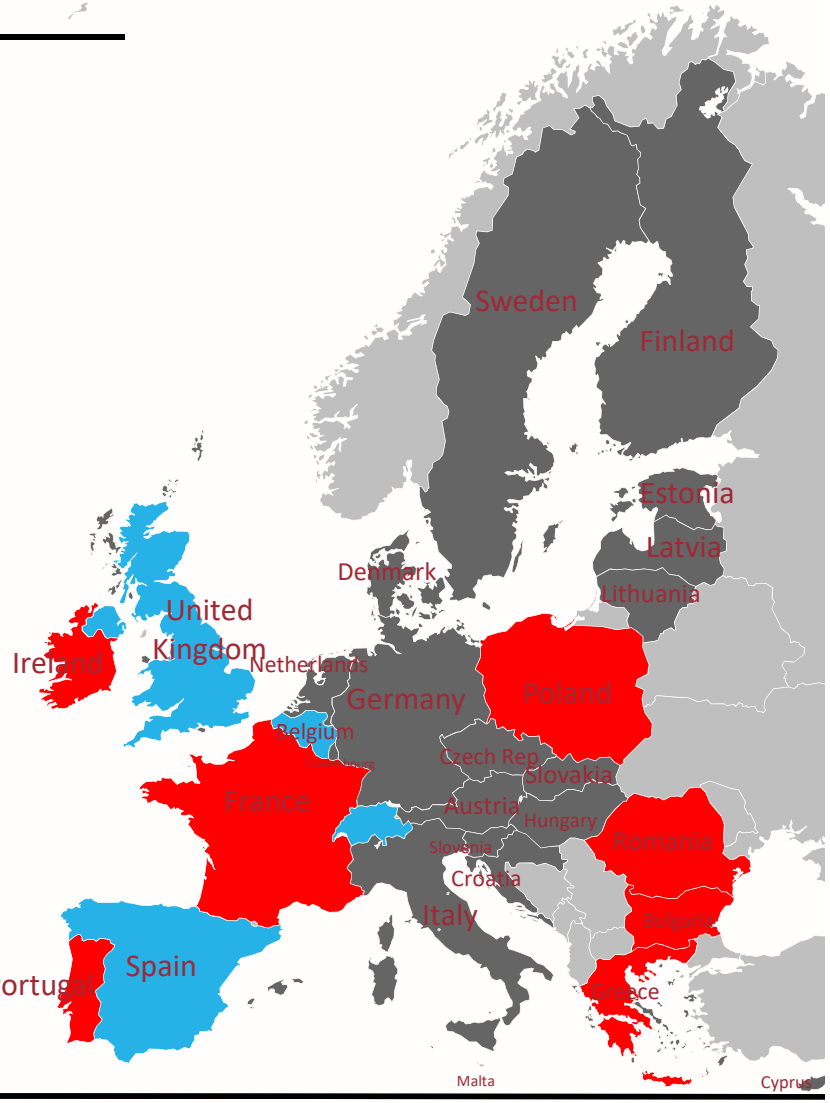
- Employing assets from KEMEA
- Land and river border
- Includes mission preparation, automatic asset tasking and control, mobile applications, augmented reality and automatic detection are of particular importance.

CAMELOT's user driven approach



CAMELOT user community

- Department of Defence – Irish Naval Service
- Ministério da DefesaNacional – Marinha Portuguesa (Portuguese Navy's Research Centre)
- Ministério da AdministraçãoInterna – Guarda Nacional Republicana
- Maritime Analysis and Operations Centre
- Ministry of Interior and Administrative Reconstruction - Center for Security Studies – Hellenic Police
- Hellenic Ministry of Defence
- Polish Naval Academy
- Bulgarian Defence Institute
- Romanian Border Police
- Direction Générale des Douanes et Droits Indirects (French Customs)

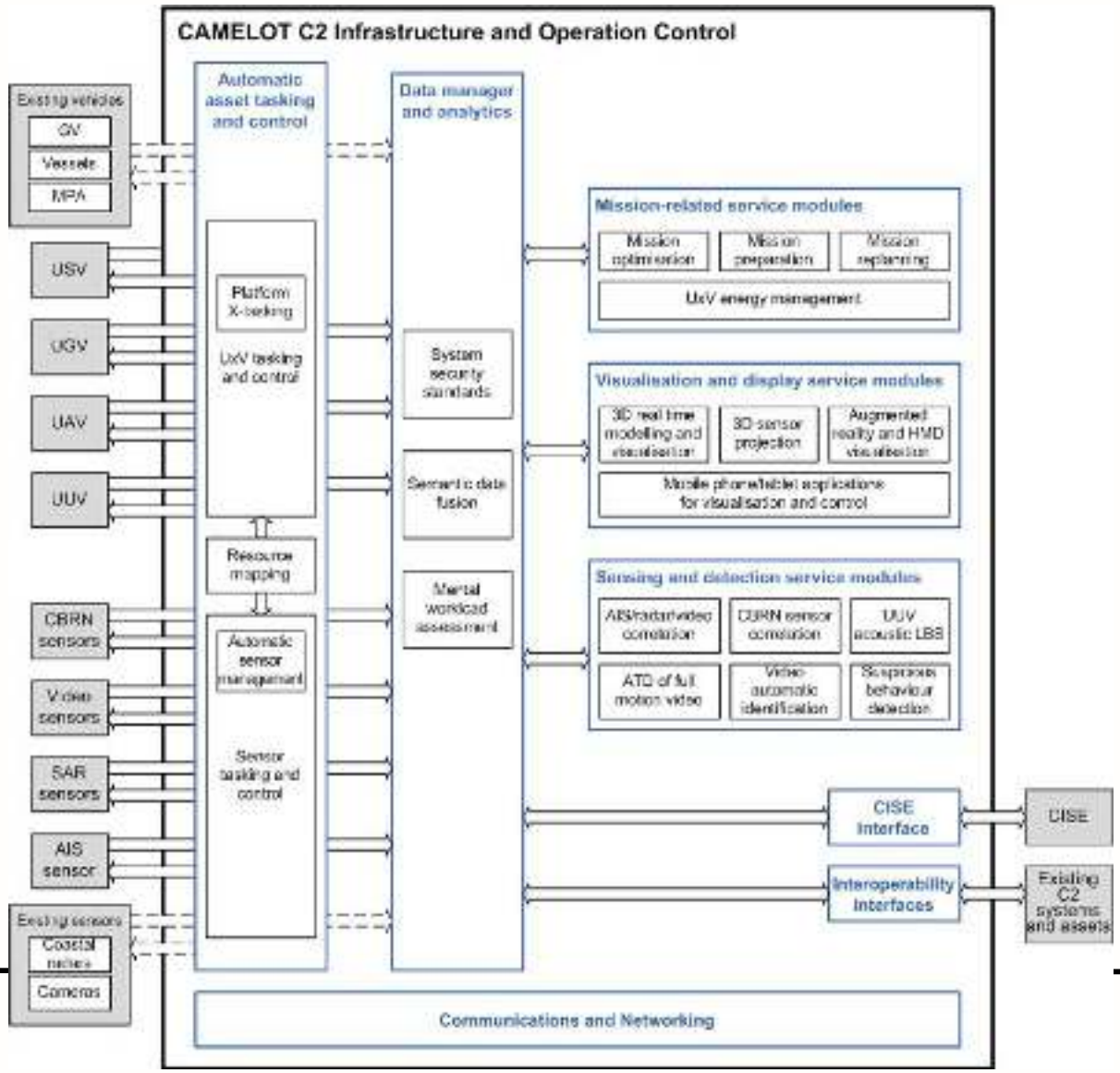


Proposed Architecture

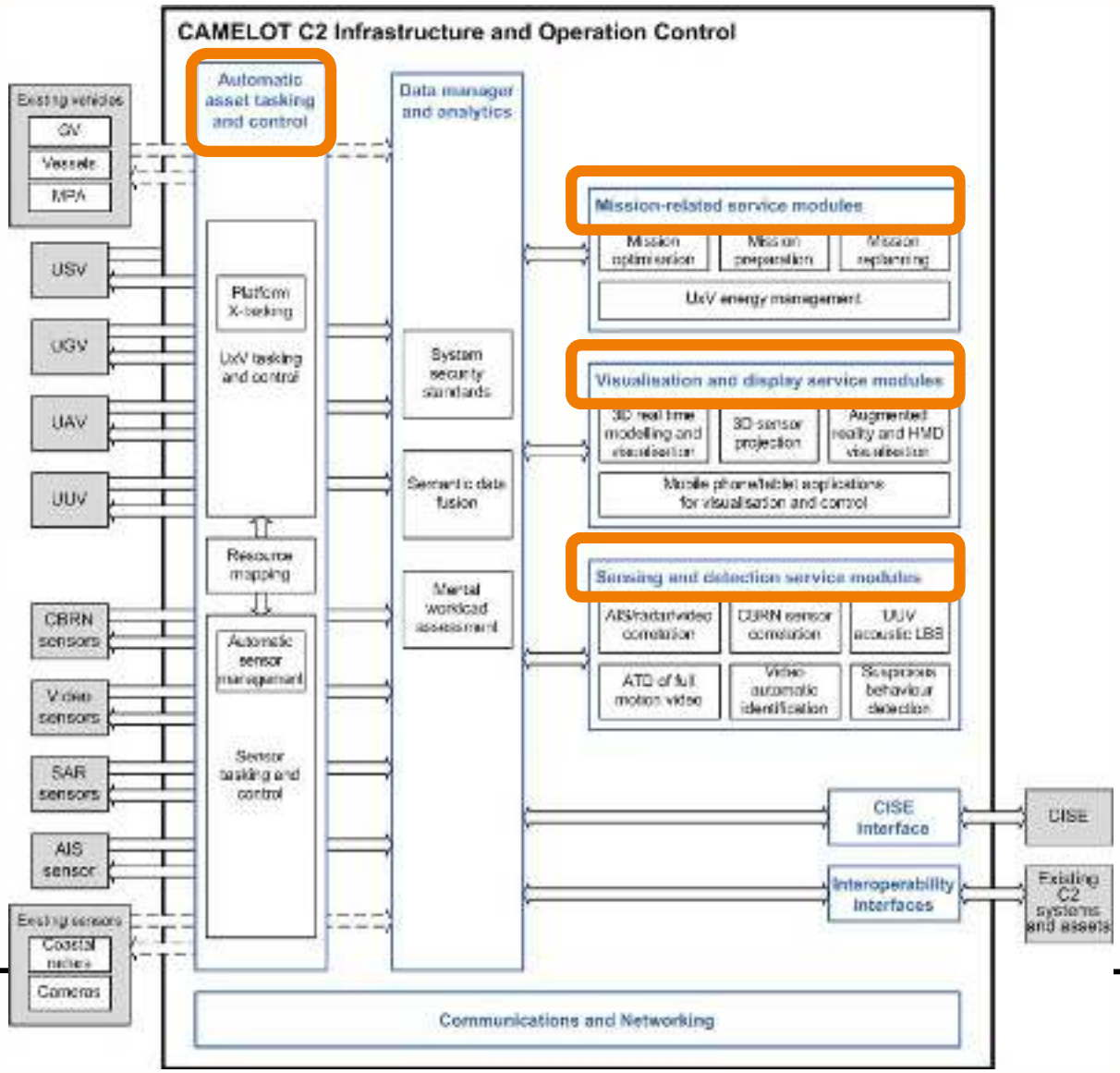
Project CAMELOT seeks to implement a standardized Multi-Service Multi-Domain Command and Control architecture, composed of six core components:

- Automatic Asset Tasking and Control Block;
- Mission Related Service Modules;
- Visualization and Display Service Modules;
- Sensing and Detection Service Modules;
- Data Manager and Analytics Block;
- Communications and Networking Block.

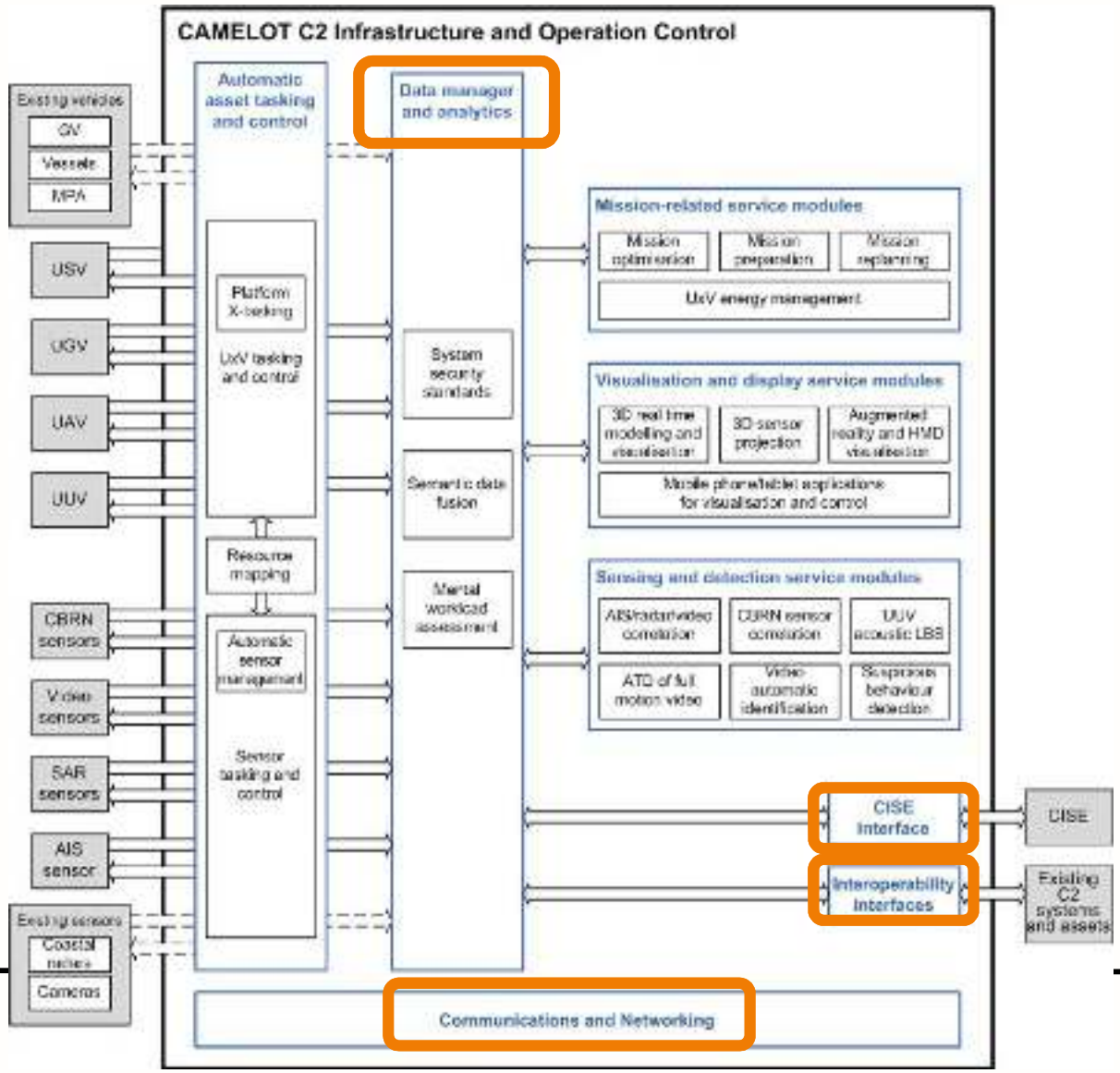
Proposed Architecture



CAMELOT Service Modules



Command and Control Framework



Research questions (1)

- How do we address the heterogeneity of assets?
  - By developing modules that support sensors (e.g. AIS, video, SAR or CBRN) and UxVs (UAV, UGV, USV, UUV).
- How do we support a “Pick and Mix” type of approach to C2 modules procurement by end-users?
  - By combining modules to support new and existing border surveillance workflows.
- How do we provide added value to users deciding to invest on a completely new C2 system for their border surveillance?
  - By developing a C2 framework based on open architecture over which the different service modules can run.

Research questions (2)

- How does CAMELOT contribute to / promote a standard?
  - By adopting or developing a common conceptual data model for UxVs.
- How do we validate the proposed enhancements?
  - Through 2 demonstrations that provide opportunity to end-users to interact directly with the technology and to validate CAMELOT services in the most representative environments and operations of border control practice.

Project status

- Requirements and high-level use cases for CAMELOT have been outlined by the end-users;
- Possible architectures surveyed;
- The CAMELOT architecture is defined and the consortium is focused on the definition of architecture specifications:
- Work on the CAMELOT services (WP4 – WP7) has started.
- Administrative issues have caused a 12 month hiatus which will be covered with an extension period.

CAMELOT

Thank you!

https://www.camelot-project.eu