FRONTEX
EUROPEAN BORDER AND COAST GUARD AGENCY

Border Guard Authorities - Industry meeting

Warsaw, 21.11.2018

Advanced features for Surveillance and Border Control Systems in the e-Navigation framework

LEONARDO
SECURITY & INFORMATION SYSTEMS

70

1948 · 2018

Remember ?

14 April 1912

Forget the Crew, Drone Ships are here!

The first **radar based Port Control** station was established in Douglas, Isle of Man, in 1948.
Later the same year, the port of Liverpool established a radar site and similar trials took place in Rotterdam.

In 1950, a number of **shore-based radar** chains were established in other European ports, including the approaches to the port of Amsterdam in 1952 and the entire Rotterdam port area in 1956.

The idea of a Vessel Traffic Services (VTS) system comes by evidence of needs of **safety** and **efficiency** for vessels in port areas and their approaches, that traditional lighthouses and sound signals cannot guarantee


• <u>Safety</u>: reduce number of shipping accidents in port's approaches/areas

• <u>Efficiency</u>: increase traffic flows per time unit, avoid traffic delays, provide better port's capacity utilization (increasing port's operational hours)
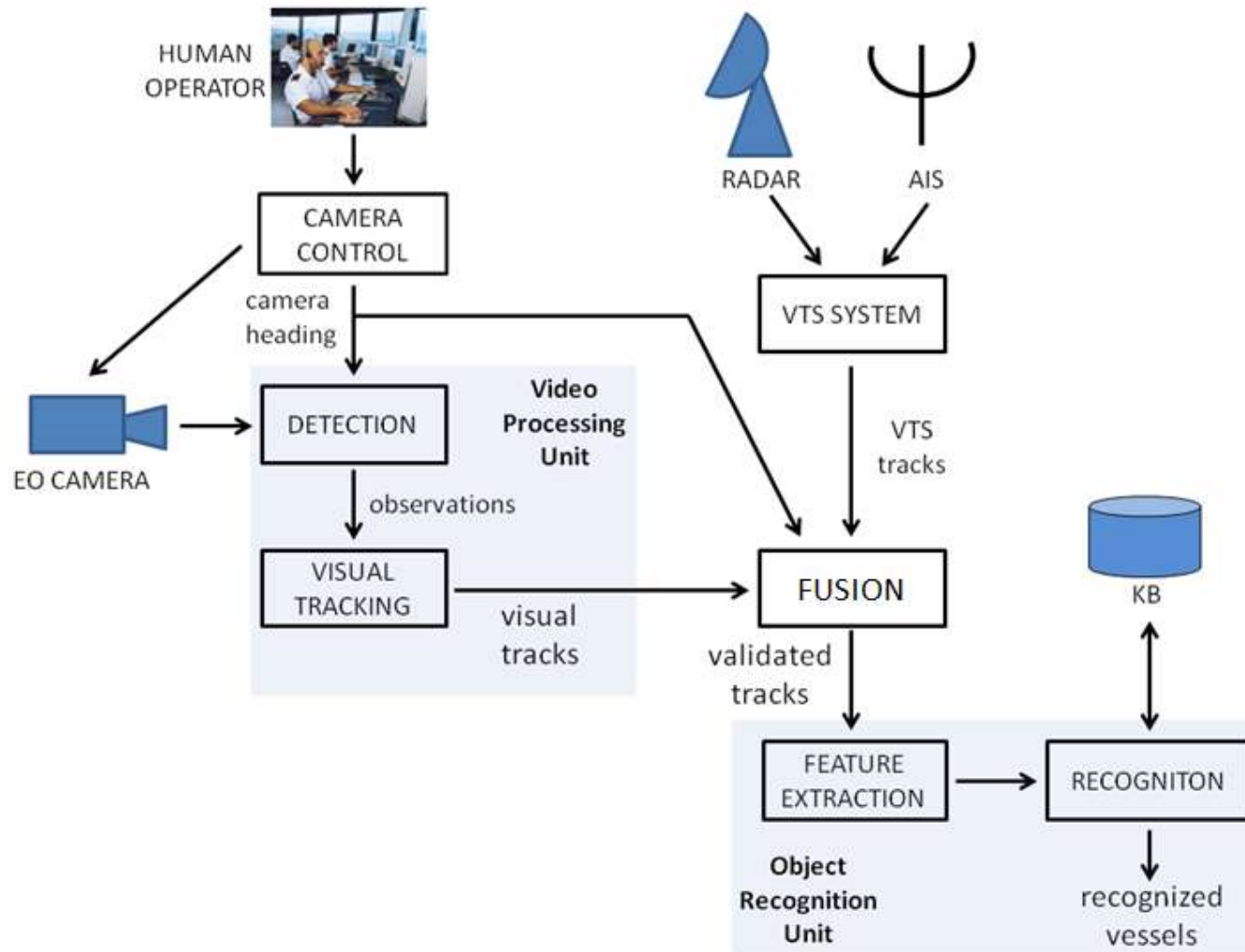
Early VTS systems were composed by just a primary **RADAR** and a **VHF radio**, by the meanings of communication among ships/base stations
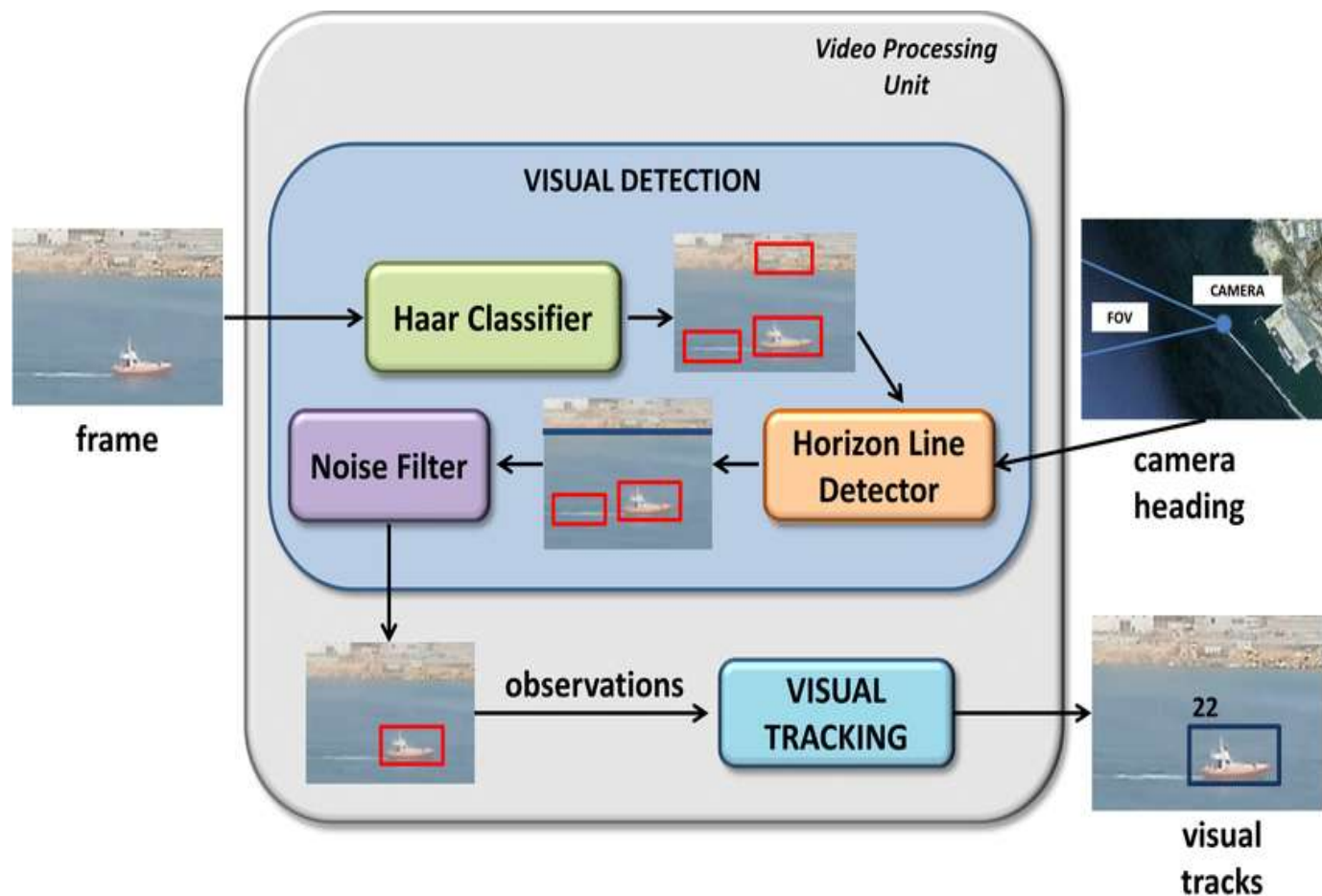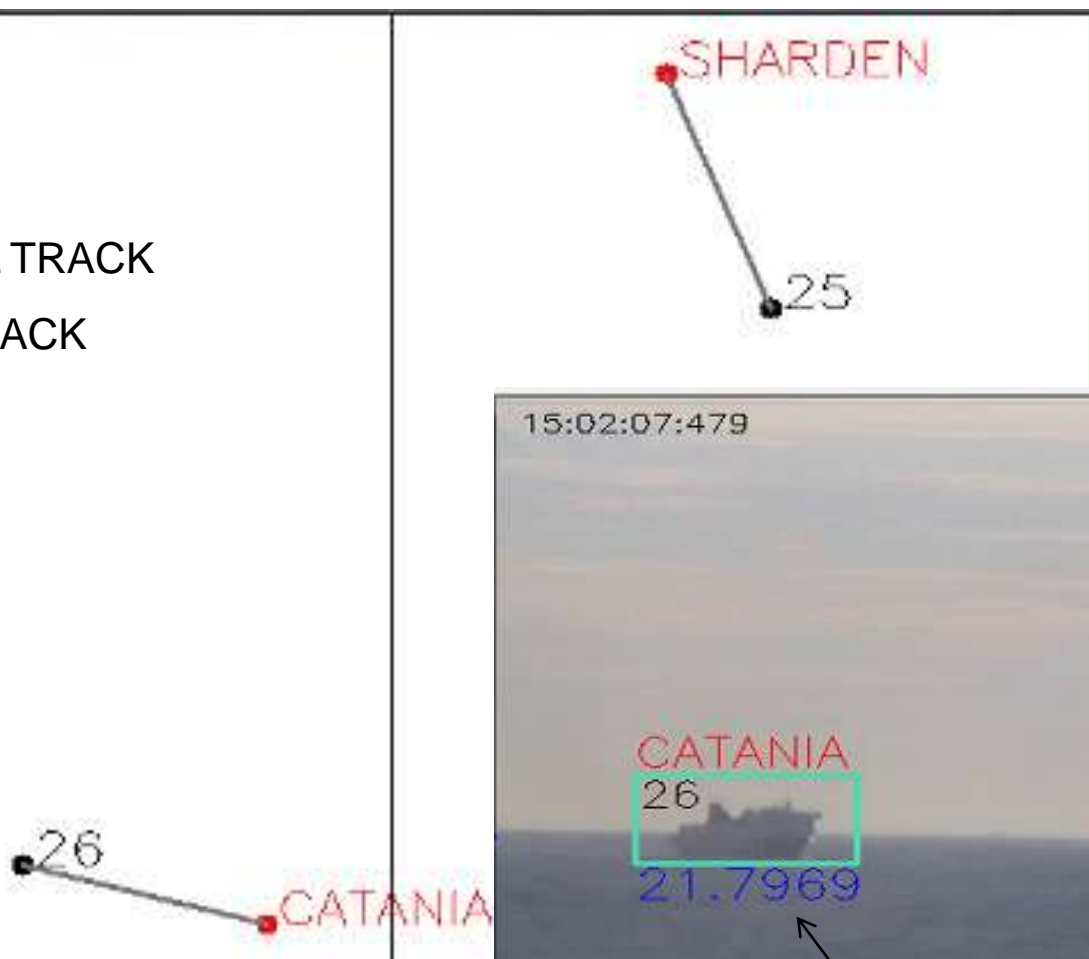
Company General Use

VTS - Evolution
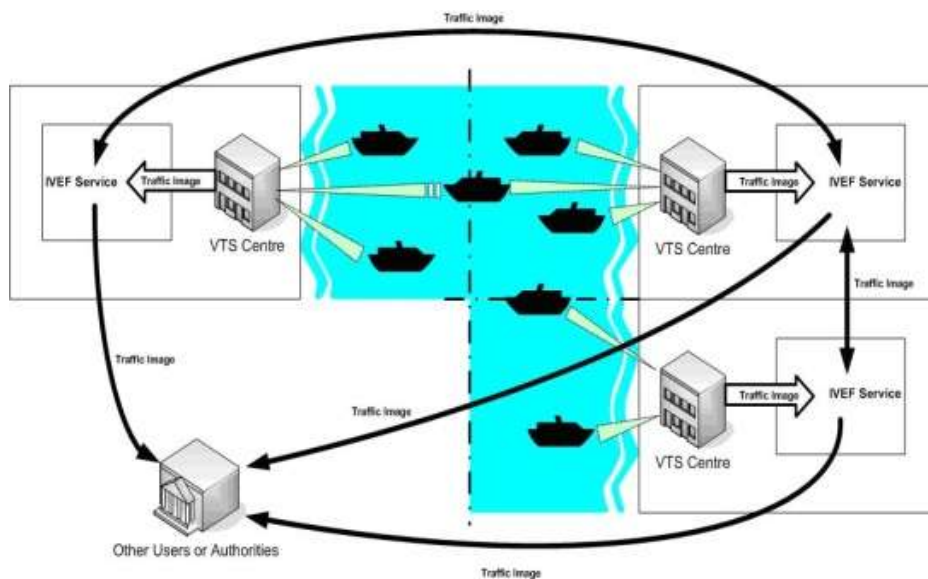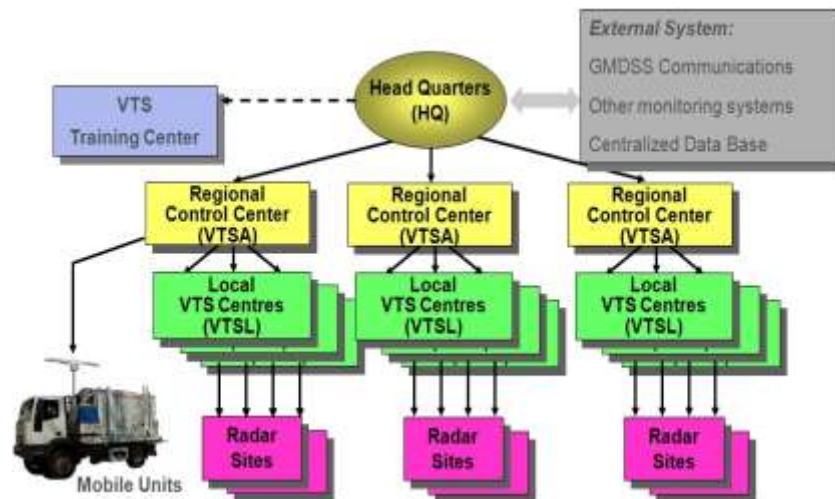
BACKGROUND

Video Processing Unit

DATA ASSOCIATION

⚫ VISUAL TRACK

🔴 VTS TRACK

SHARDEN
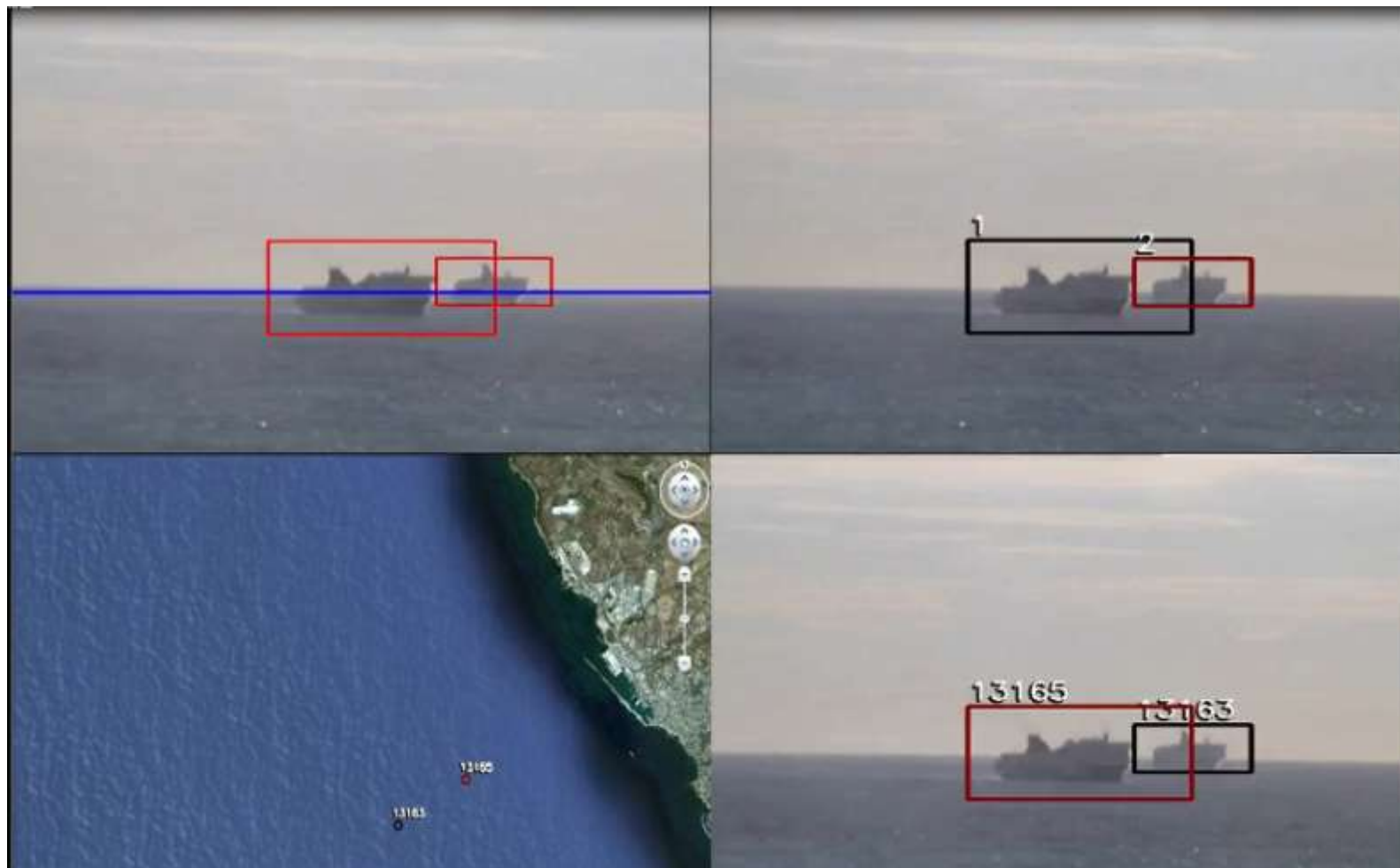25

26
CATANIA

15:02:07:479

CATANIA
26
21.7969

SHARDEN
25
28.125

SHIP HEADING

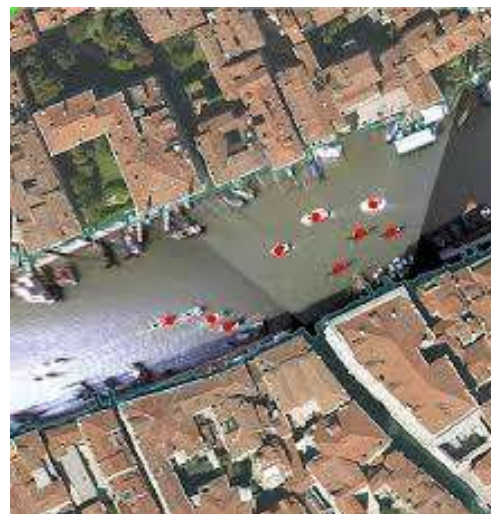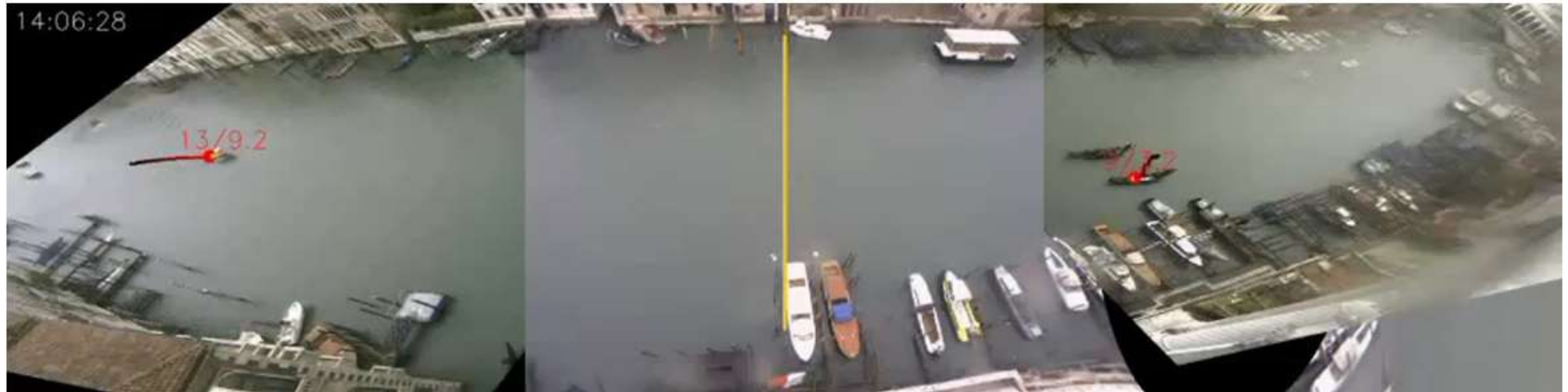# Test – X Path (Robustness)

Data Fusion with AIS

ARGOS SYSTEM

ARGOS SYSTEM

MarDCT database

Maritime Detection, Classification, and Tracking database

The aim of MarDCT is to provide visual data that can be used to help in developing intelligent surveillance system for the maritime environment.
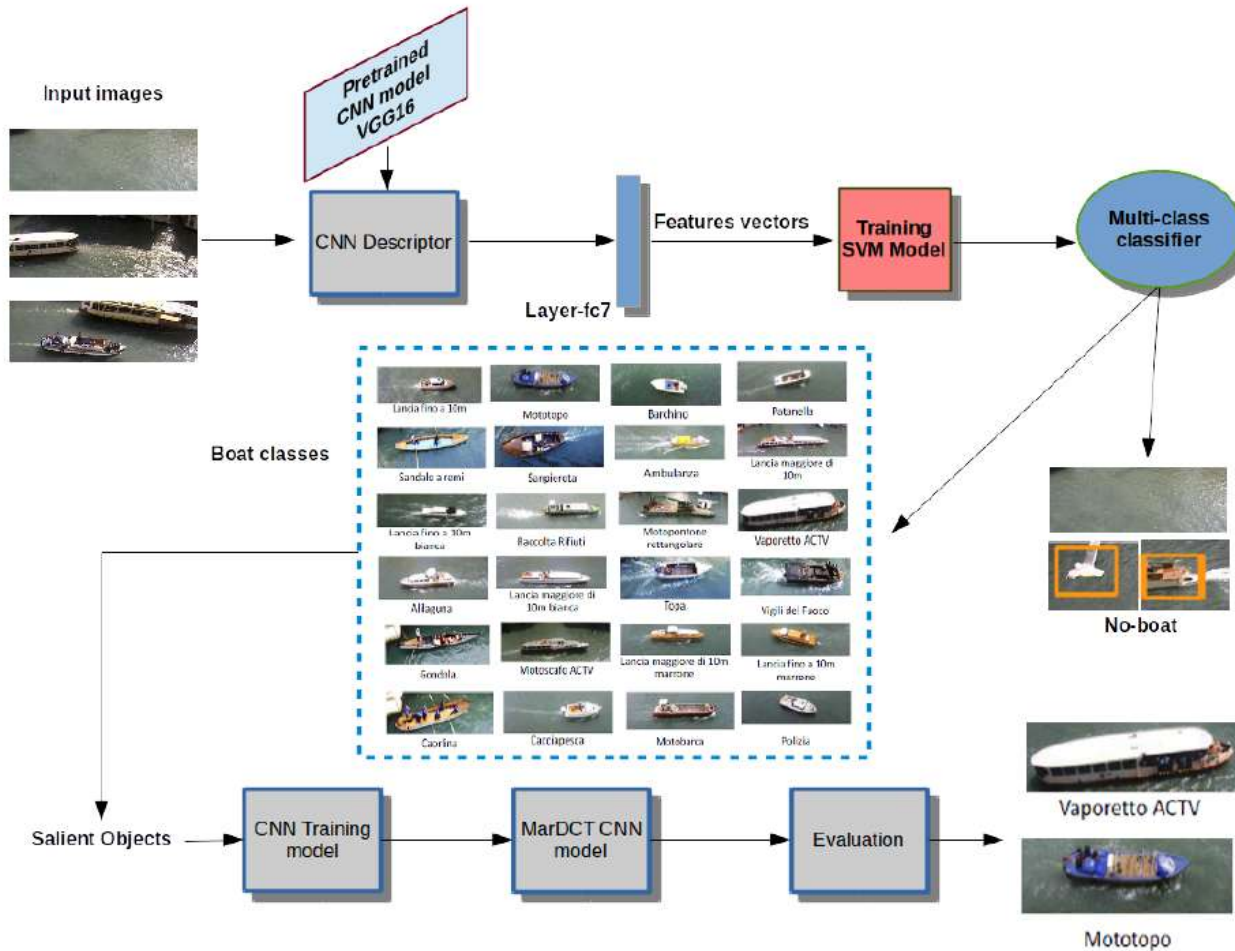
The data sets are divided according to the type of Ground Truth in:

- Detection
- Tracking
- Classification

FUNCTIONAL ARCHITECTURE

CLASSIFICATION

CORRECTLY CLASSIFIED INSTANCES

INCCORRECTLY CLASSIFIED INSTANCES
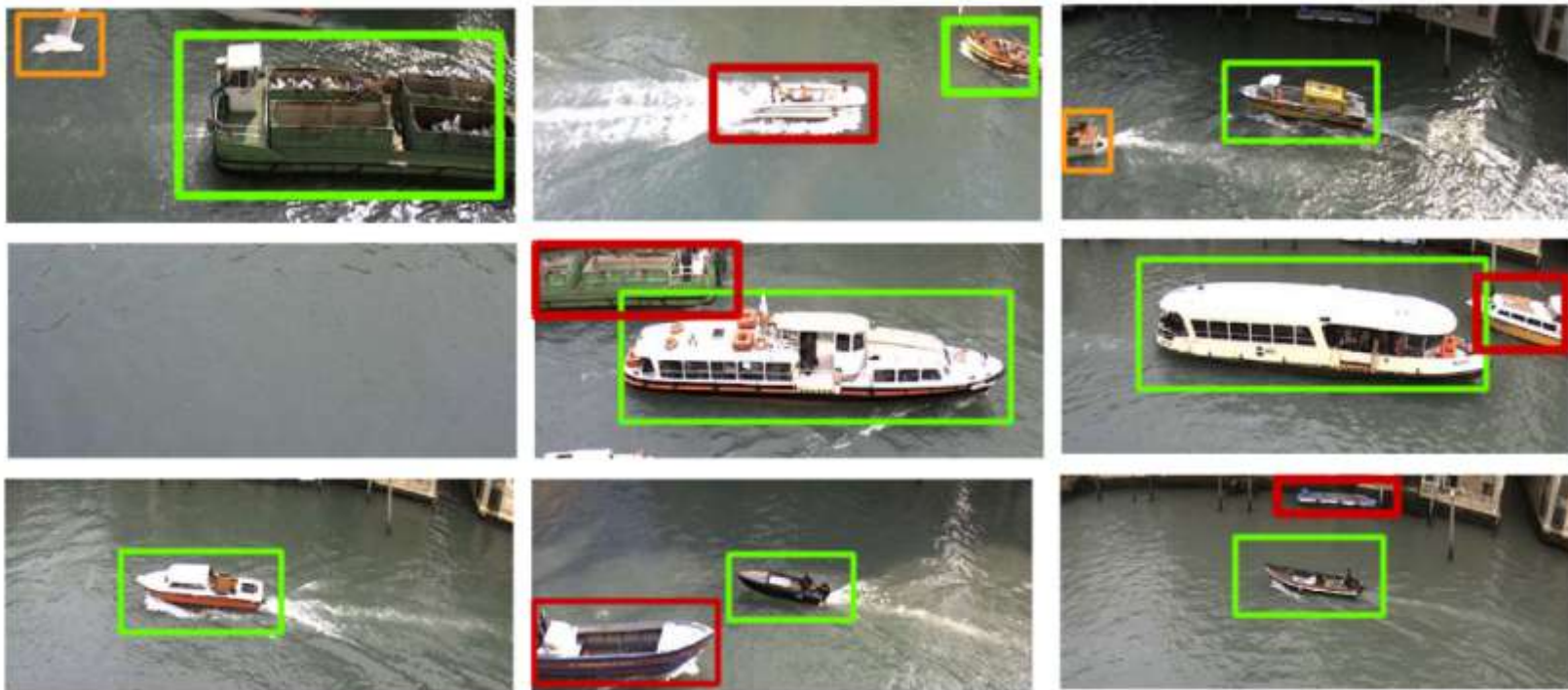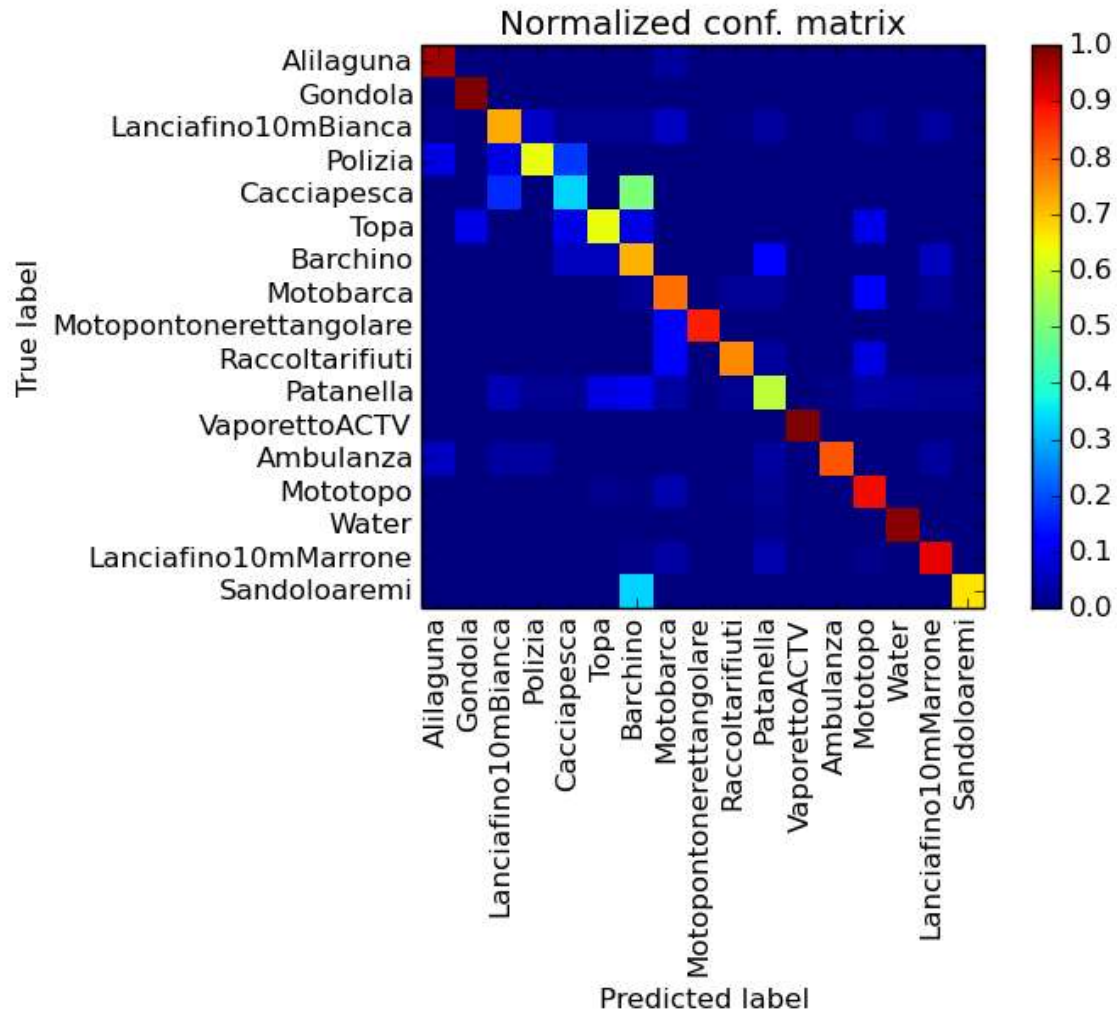
A)

B)

CLASSIFICATION OF MULTIPLE BOATS

CLASSIFICATION RESULTS

Normalized conf. matrix

"e-Navigation is the <u>harmonised</u> collection, integration, <u>exchange</u>, presentation and analysis of maritime information onboard and ashore by <u>electronic</u> means to enhance berth to berth navigation and related services, for safety and security at sea and protection of the marine environment"
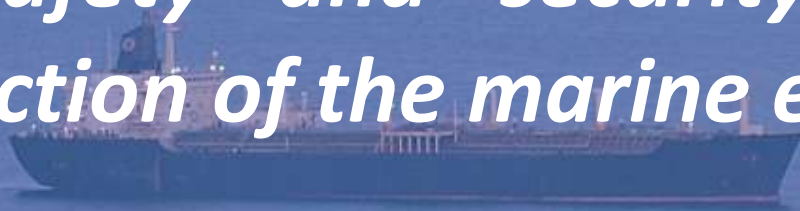
e-Navigation pre-requisites

- **Electronic Navigation Charts** (ENC): worldwide coverage required.

- **Electronic Positioning System**: a robust fail-safe (with redundancy).

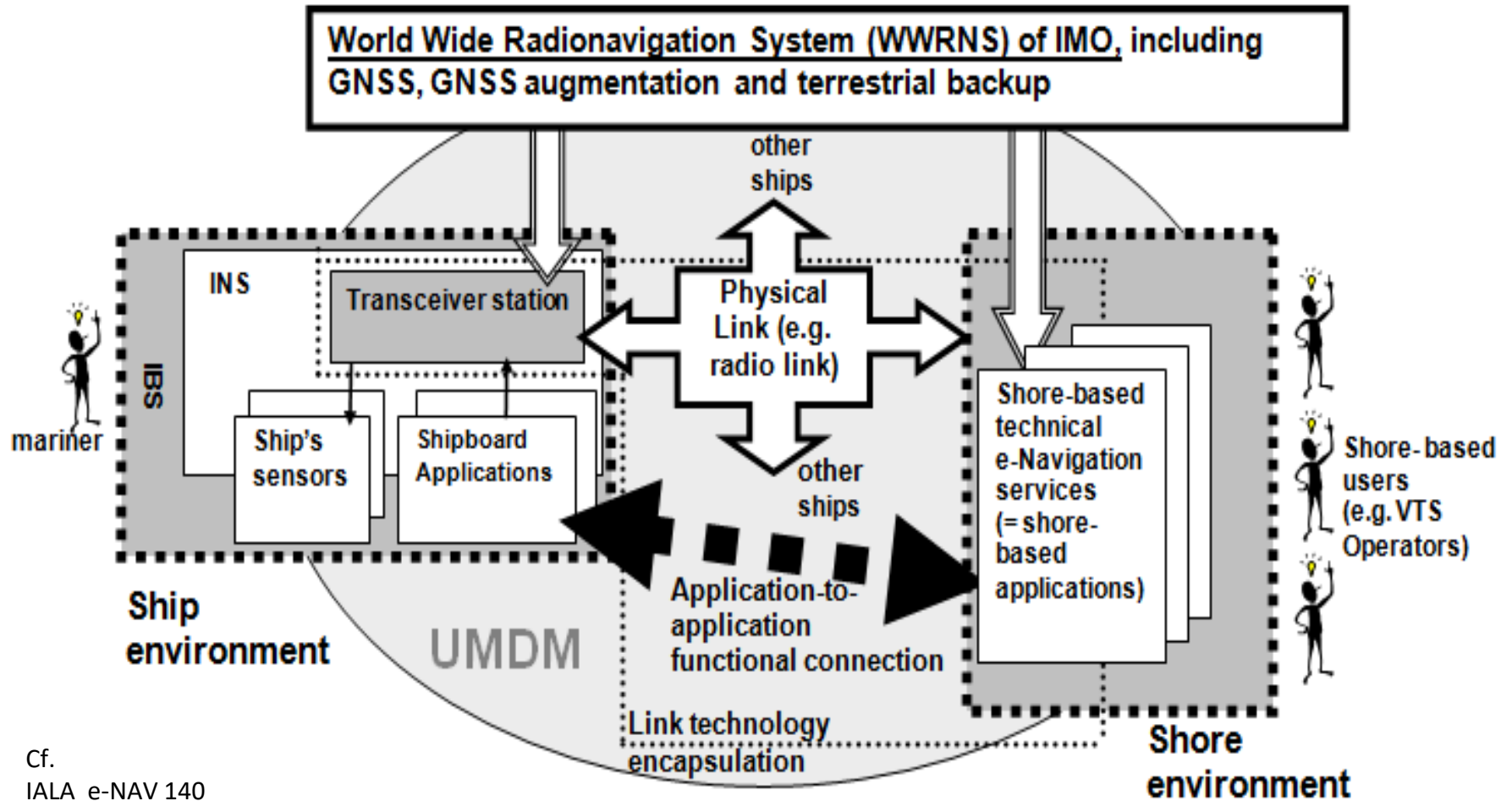- **Ship-Shore link**: an agreed communication infrastructure.
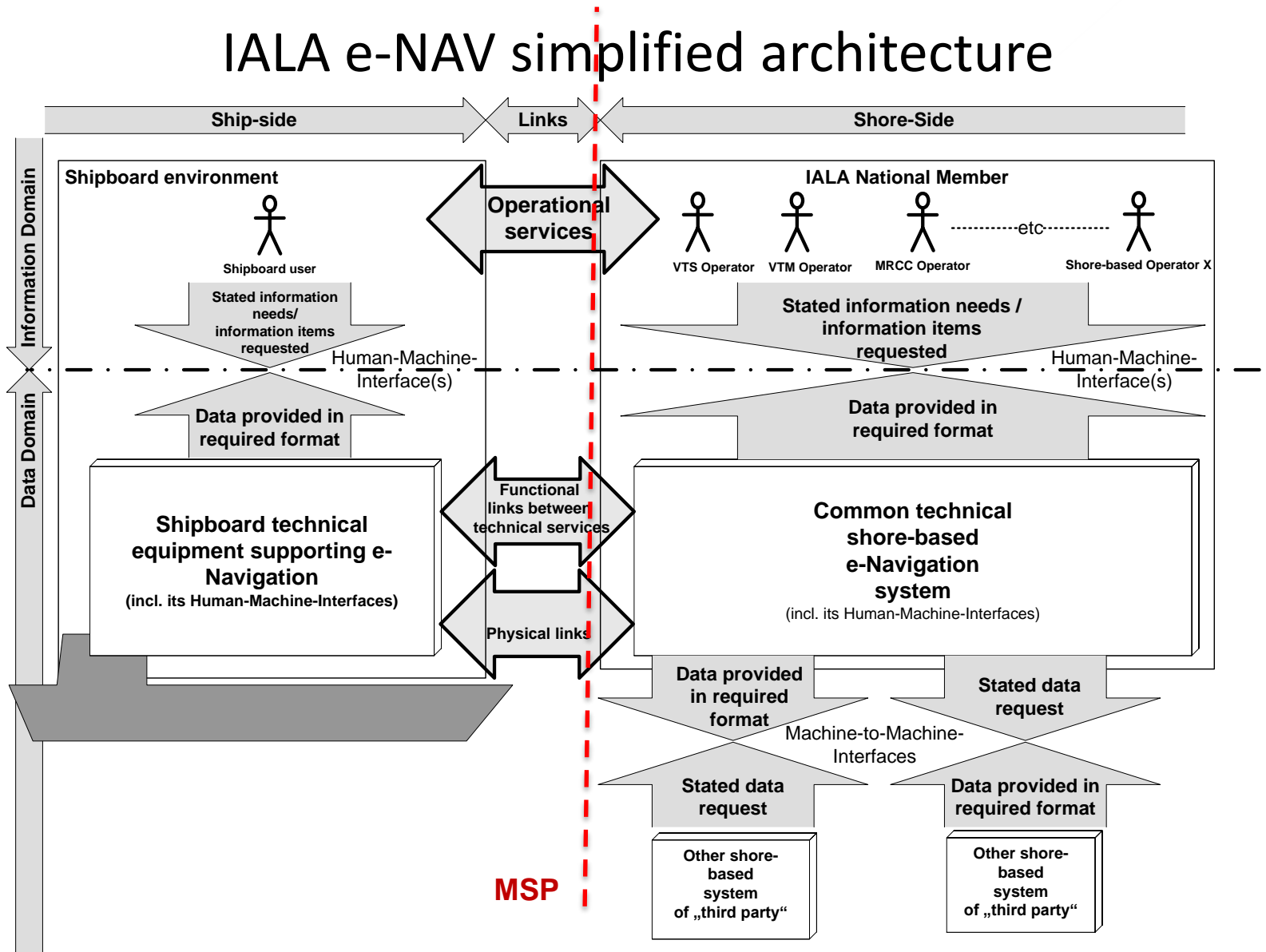
e-Navigation outcomes

- **Ship based systems:**
  - integration of ship's own sensors;
  - electronic positioning;
  - Electronic Navigational Charts (ENC);
  - decision support capability to reduce human error.

- **Shore based systems:**
  - management of vessel traffic and related services from ashore;

- **Communications infrastruture:**
  - authorised information transfer onboard ship, ship-to-ship, ship-to-shore and shore-to shore.
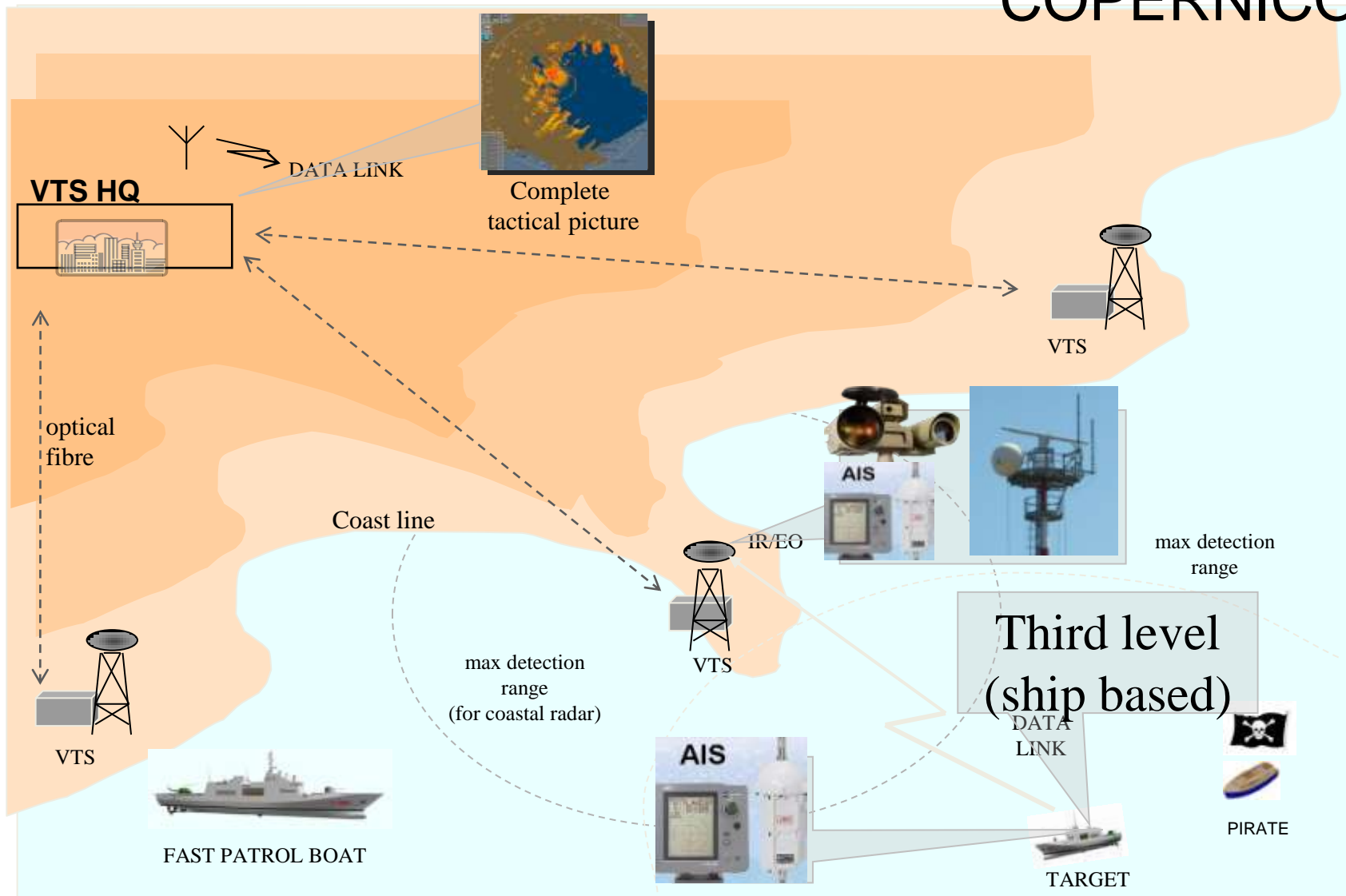
e-Navigation architecture

Cf.
IALA e-NAV 140

IALA e-NAV simplified architecture

VTS HQ

DATA LINK

Complete
tactical picture

VTS

optical
fibre

Coast line

IR/EO

AIS

max detection
range

Third level
(ship based)

DATA
LINK

VTS

max detection
range
(for coastal radar)

VTS

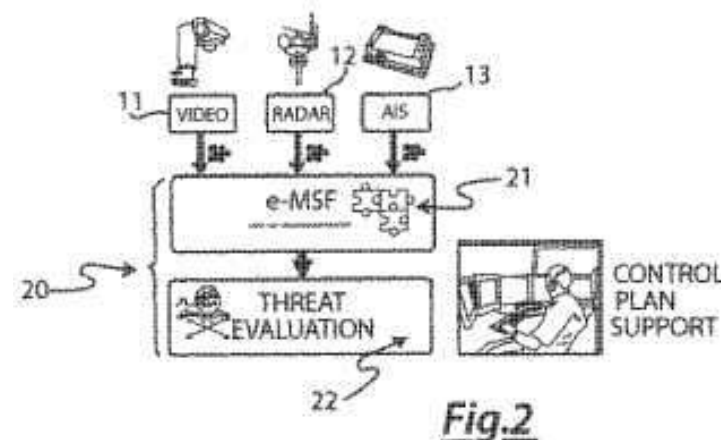AIS

PIRATE

FAST PATROL BOAT

TARGET

Patent Title:

ANTI-PIRACY SYSTEM FOR THE MARITIME NAVIGATION IN CRITICAL AREAS, AND DEVICE FOR DATA EXTRACTION FROM ON BOARD SENSORS

Authors:

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PCT application number:
WO2012017470 (A1)

Fig.2

website:
http://worldwide.espacenet.com/publicationDetails/biblio?CC=WO&NR=2012017470&KC=&locale=en_EP&FT=E

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