Security Systems Division

R&D industry efforts towards enhanced EU maritime border security

Lessons learnt during the last decade experience. Guidelines for the future

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SUMMARY

INDRA EXPERIENCE. BIRTH OF THE SIVE SYSTEM IN 2000 AND SYSTEMS EVOLUTION.

DRUG SMUGGLING USING THE MARITIME ROUTE INCREASING AT THE BEGINNING OF THE 90´s

ILLEGAL IMMIGRATION USING THE MARITIME ROUTE INCREASING AT THE END OF THE 90´s

Typical Coast Guard responsibilities distributed among different organisations:

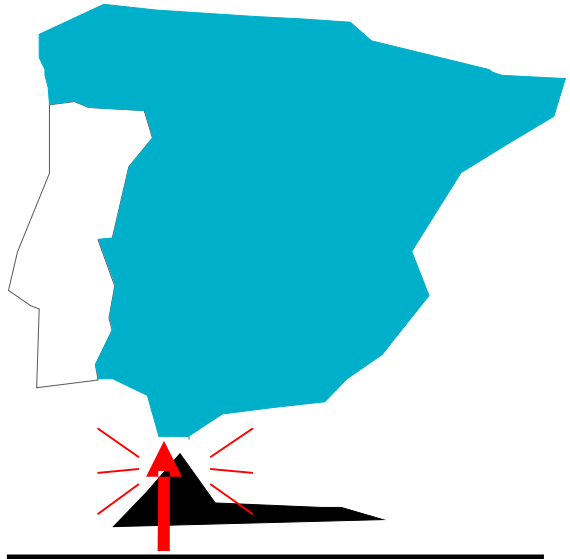
Police related activities:	**Guardia Civil**
Fishering:	**Ministry of Agriculture**
SAR, VTS & Maritime Pollution:	**Ministry of Transport**

INDRA EXPERIENCE. BIRTH OF THE SIVE SYSTEM IN 2000 AND SYSTEMS EVOLUTION.

PRELIMINARY STEPS GIVEN WITH THE SIVE SYSTEM

The problem in the nineties in the south coasts of Spain:

- The Gibraltar Strait provides a ride of only 9 nm. to reach the EU from Morocco.
- Illegal immigrants started to cross during summer in the beginning of the nineties.
- By 1997 the problem grew to unthinkable dimensions driving Spanish MoI to plan the deployment of a MARITIME BORDER SURVEILLANCE SYSTEM TO SUPPORT POLICE RELATED OPERATIONS: **THE SIVE SYSTEM**



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PRELIMINARY STEPS GIVEN WITH THE SIVE SYSTEM

The first SIVE prototype showed the problems:

- Most existing coastal surveillance radars in the market were tested but none was able to detect and track a 1 m2 target.
- New radar extractors with better algorithmic were developed for the deployment of the first system in the Gibraltar Strait area.
- No LR-EOS technology was being used jointly with radars.
- New set of Sw Apps needs to be developed to fulfil GUCI requirements in terms of C3 and integration.

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THE TECHNOLOGICAL RESPONSE GIVEN

Pulsed radars vs. Cw radars

- **CW Relative simplicity and solid state design. Conventional pulse radar requires 1000 times higher peak power, which means that CW radar has:**
  - **Higher reliability and lower maintenance costs.**
  - **Lower weight and dimensions.**
  - **Lower power consumption.**
- **CW lets Waveform flexibility, CW waveform has been designed to perform a variety of functions and algorithms to improve the clutter and noise rejection.**
- **Very high resolution to enable to improve the signal/clutter ratio and reduce the range reduction caused by rough weather conditions (heavy rain, snow or fog).**
- **Minimum non-ambiguous range. In pulse radars the receiver is blanked when the pulse is transmitted, if the time taken for an echo to return form a target is less than the pulse width, this target is not detected by the pulse radar**
- **Narrower radiation beam of CW radars improve ERP**
- **The experience has proven CW radar performances for low RCS targets at sea state 3/5 to be more efficient**

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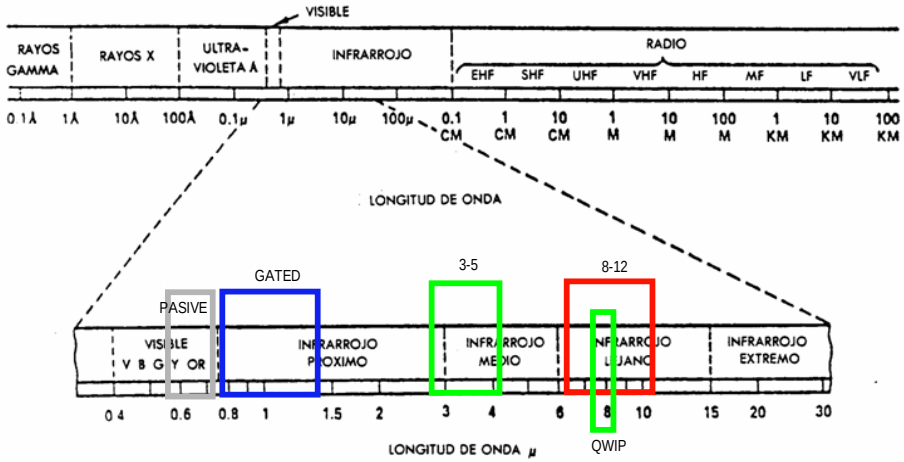
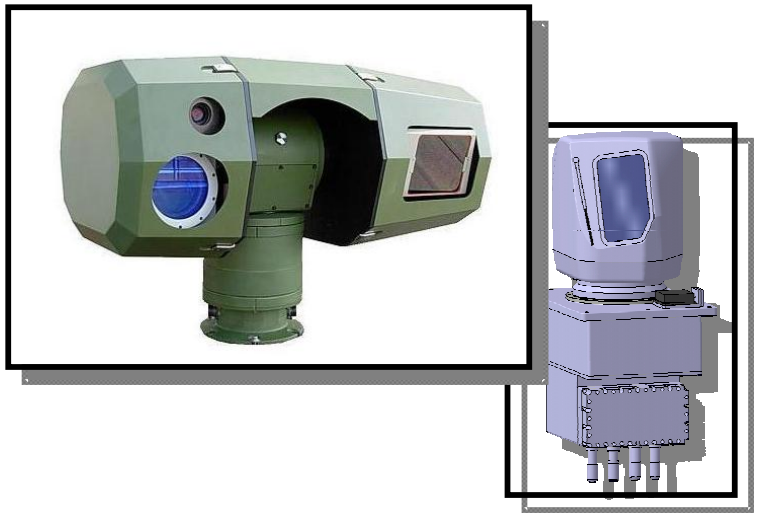
THE TECHNOLOGICAL RESPONSE GIVEN

OPTRONICS

- **Near infrared band not useful to achieve identification**
- **3-5 micrometers band more appropriate for Mediterranean typical temperature (optimum performance 23º Celsius)**
- **8-12 micrometers band transmittance path highly affected by humidity, better for cold climates**
- **3-5 micrometers band is the best compromise to achieve identification at a limit of 18 NM**





R&D industry efforts towards enhance EU m

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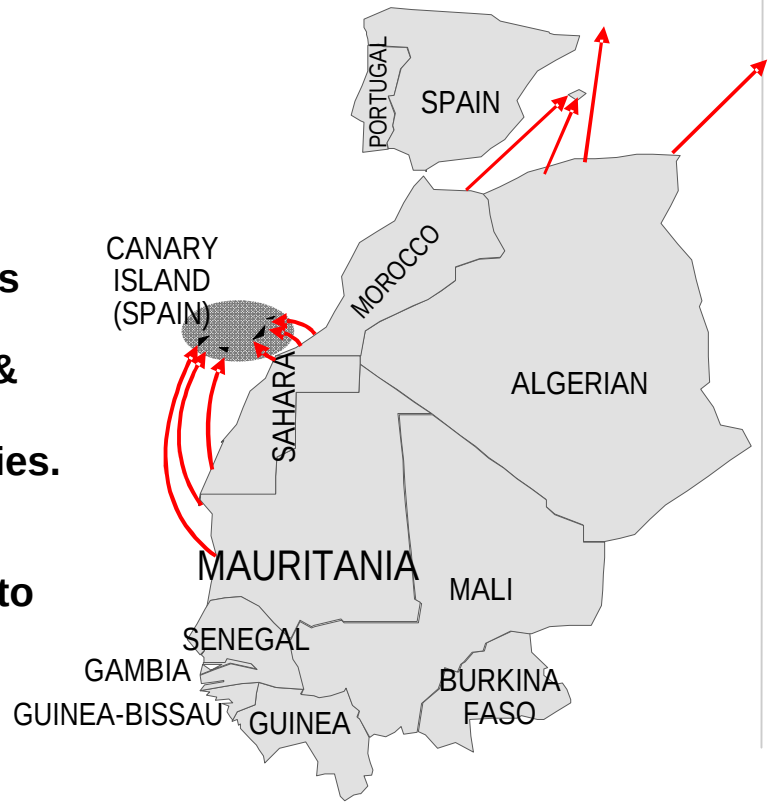
THE EVOLUTION OF THE REQUIREMENTS FROM 2002 TO NOWADAYS

- **Threats have evolved to change coast of arrival and type of crafts. There is a "globalization" of the threat to become a trans-national issue.**
- **Neighbour countries begin to cooperate: Portugal-Spain, Romania-Bulgaria, Latvia-Estonia. Interoperability among countries**
- **Raw information provided by the System is useful to many Agencies in many areas: Border Surveillance, SAR, Fishing safety & EEZ protection, pollution fighting, Smuggling. Interoperability among Agencies.**
- **System integration: MSS, AIS**
- **There is a big amount of raw data waiting to be analyzed to obtain intelligence**



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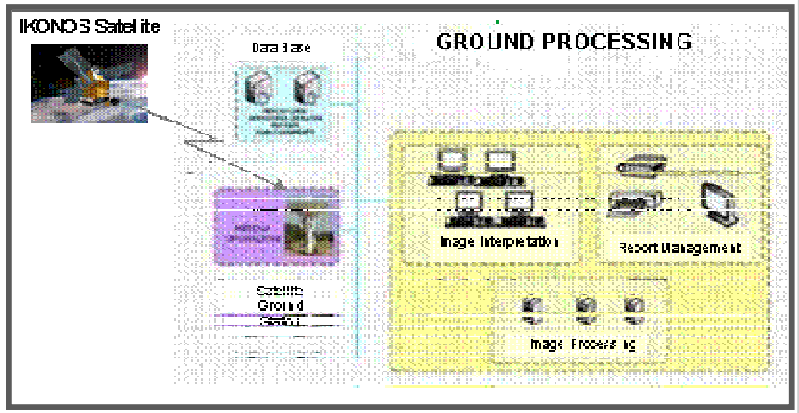
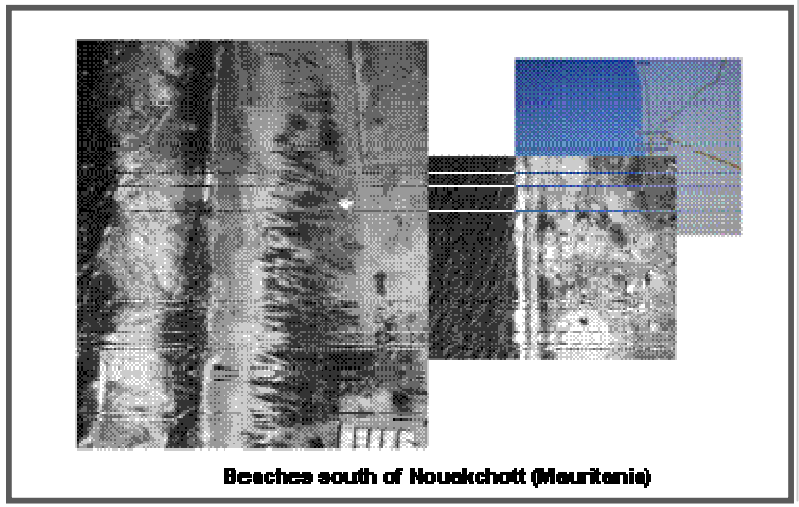
THE TECHNOLOGICAL RESPONSE GIVEN TO THE THREAT CHANGES

The satellite surveillance experience

- The new strategy of using bigger boats and longer trips from Mauritanian and Senegal coasts, obliged to test Satellite Surveillance.
- Ikonos orbits the Earth several times a day at an altitude of 680 km and send 1 meter resolution imagery of areas of 120x 17 kilometers every 1 to 3 days.
- An Ikonos satellite receiving ground station was deployed at Gran Canaria with high performance computing servers to provide image processing of the satellite imagery.
- The servers detected boats sailing and people or vehicles movements in the area of interest to be used for intelligence purposes.





Beaches south of Nouakchott (Mauritania)

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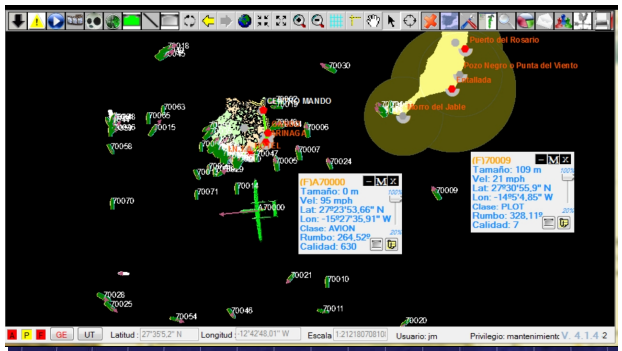
THE TECHNOLOGICAL RESPONSE GIVEN TO THE THREAT CHANGES

The UAV deployement experience

- In December 2008 at Gran Canaria a demonstration was performed of a UAV (equipped with SAR radar, EO and satellite communications), as an additional, mobile sensor station for sea border security surveillance
- Guardia Civil, Spanish Air Force and Indra teaming during 15 days/missions, ranges from 70 nm to 360 nm, over 20 h of flight time.
- Full integration into SIVE system (CRCC and DGGC) was achieved.
- The experience shows the advantage of this technology for extended range surveillance.



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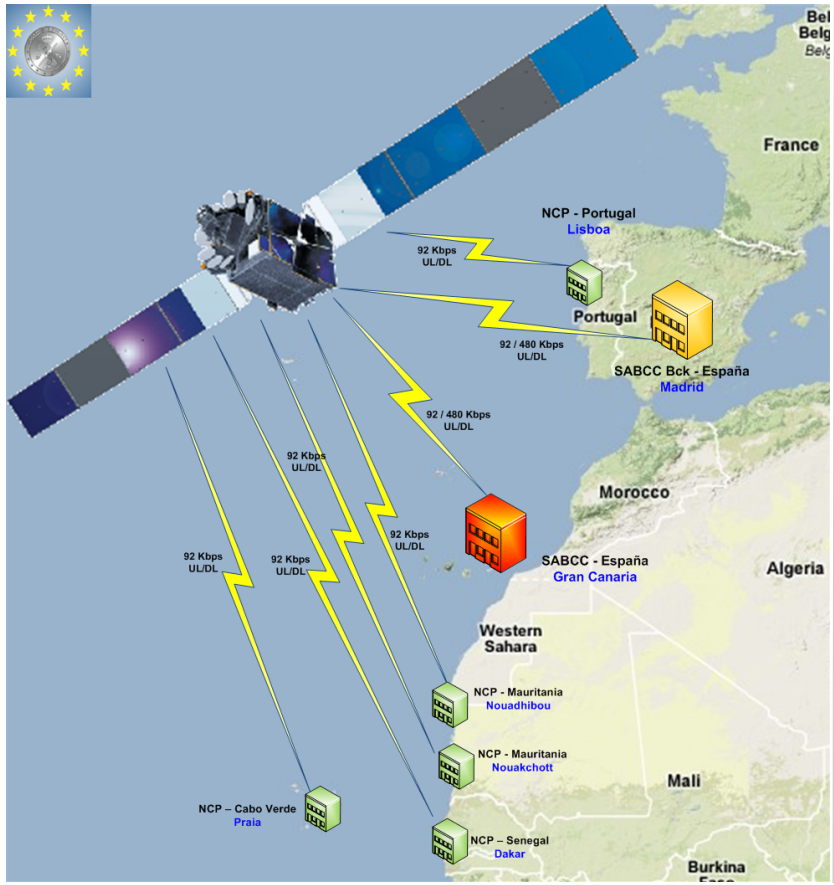
THE TECHNOLOGICAL RESPONSE GIVEN TO THE THREAT CHANGES

The interoperability communications network experience (the Seahorse program)

- Seahorse was established as a co-operation program between Spain, Portugal and several African countries, funded by AENEAS (ES, PT, MT, SN, CV,)
- Phase II became the development and deployment of a secure, reliable satellite communication network to handle intelligence and immigration information
- Phase III is under development as an extension to MC, GB, GA.
- Mediterranean countries, The next step?



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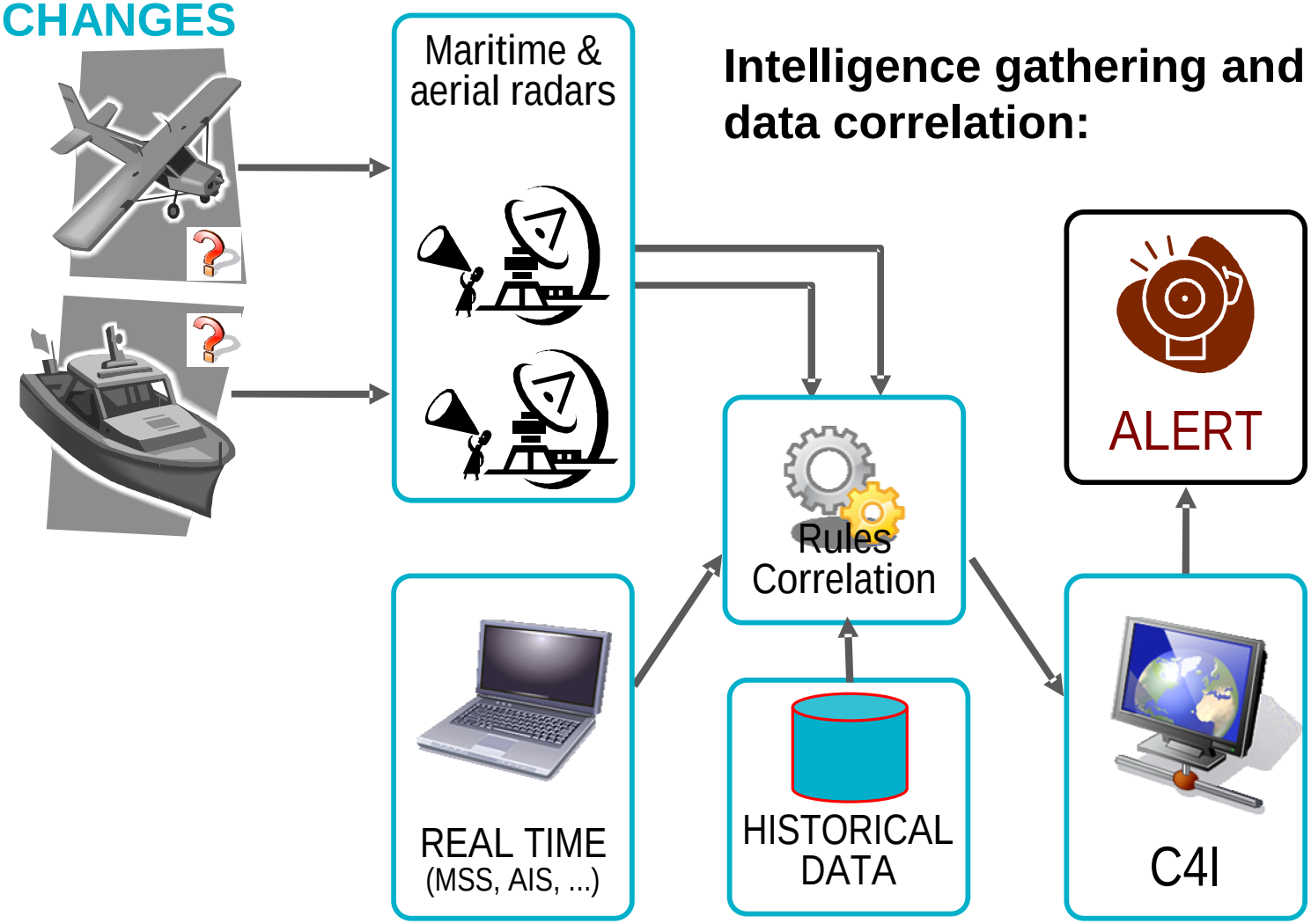

LESSONS LEARNT WITH THE SIVE EXPERIENCE

THE MAIN ISSUES

STANDARDIZATION. INTEROPERABILITY

Long term planning taking into consideration predicted evolution of the threat is a must. Cooperation among agencies and countries become mandatory

INTELLIGENCE GATHERING

Satellite imaging analysis is useful for obtaining intelligence data about the changes of the threat strategies Statistical analysis of historical data and data correlation among systems will provide further intelligence

NEXT GENERATION SENSORS

Long range sensors have to be taken into consideration. UAVs appear to be attractive approach. Payload/Endurance & Cruising Speed are critical factors for such platforms. Aerial radars for low flying targets will become mandatory

SoS APPROACH. NEW IT PLATFORMS

Integration of data from other systems (SAR, vtmis, fishing, environmental surveillance and deployed assets) is needed for better coordination of operations in the sea. Information dissemination is a must

OUR VISION OF A FUTURE MARITIME SCENARIO MANAGEMENT INTEGRATED SYSTEM

THE EXPERIENCE SHOWS US THE FUTURE

PERSEUS: Indra's proposal within the frame of the Demonstration Program: A future maritime scenario management integrated system demonstrator

Main goals:

- **A single technological surveillance platform that integrates border police (coastal waters, deepwater and coast lands), plus vtms, plus sar, plus fisheries management, plus environmental control functions and deployed assets operational picture.**
- **Available to all the users with duties in any or some of the functions.**
- **Capable of providing operation planning tools based on the complete scenario data base provided and real time refreshed.**
- **Without national limitations (available to member states and integrating more than one member state scenario). Interoperability and interface standardization.**
- **Intelligence information through statistical analysis and data correlation.**
- **A system of systems concept**

OUR VISION OF A FUTURE MARITIME SCENARIO MANAGEMENT INTEGRATED SYSTEM

LOGICAL ARCHITECTURE

COAST GUARD SURVEILLANCE SYSTEM

SEARCH & RESCUE MANAGEMENT SYSTEM

PERSEUS DEMONSTRATOR

- Integrates all R.T. common scenario picture (CSP)
- Filters CSP to provide valuable operations outputs
- Feeds ongoing operations data base

FISHERIES CONTROL SYSTEM

DEPLOYED ASSETS OPERATIONAL PCTURE

INFORMATION NETWORK

VESSEL TRAFFIC MANAGEMENT & INFO SYSTEM

INTELLIGENCE AND DATA CORRELATION

- Agency real time CSP data
- On going operations data
- Filtered data for operations planning

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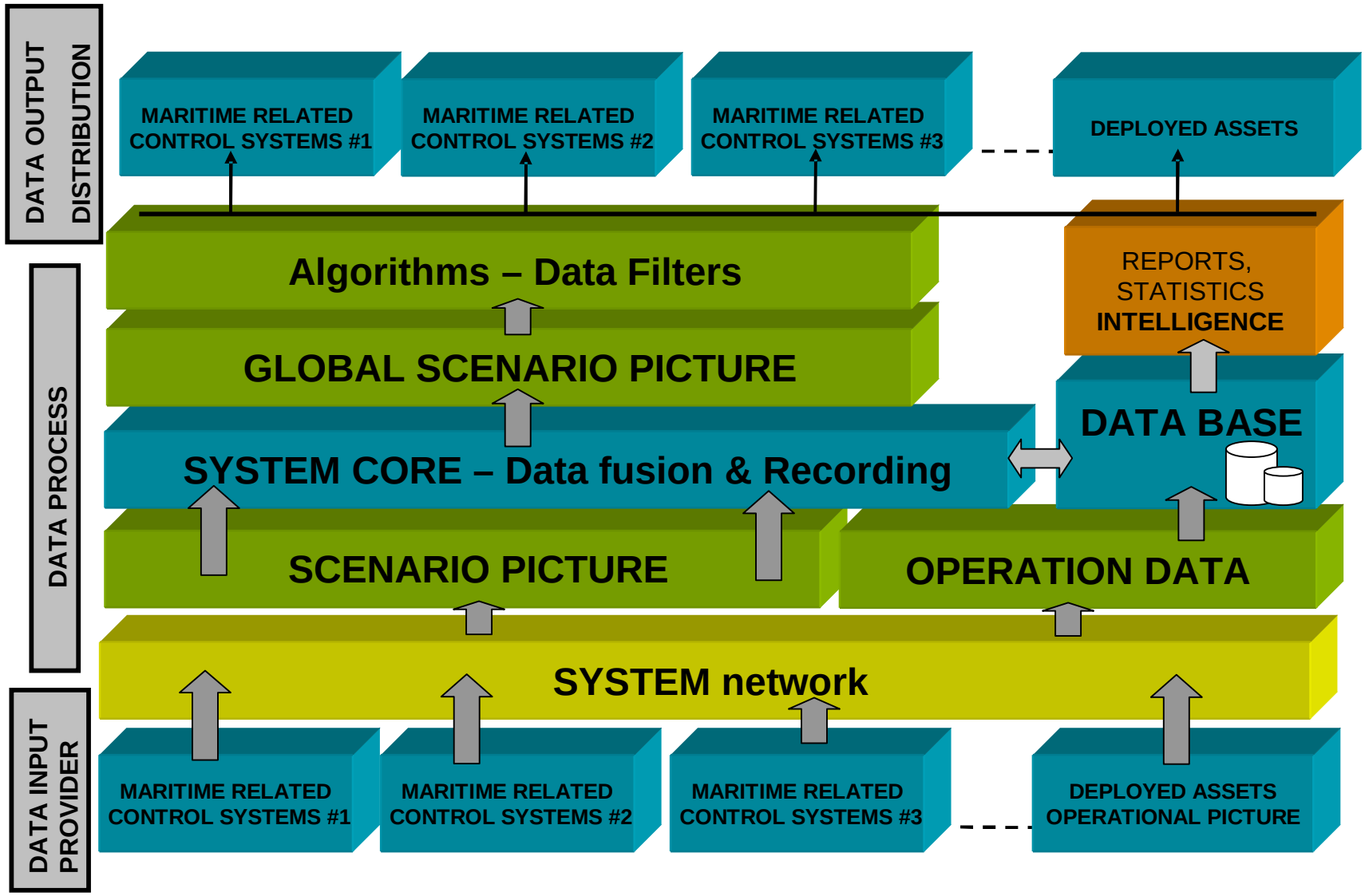
OUR VISION OF A FUTURE MARITIME SCENARIO MANAGEMENT INTEGRATED SYSTEM

FUNCTIONAL ARCHITECTURE



CONCLUSIONS

A SYSTEM OF SYSTEMS

- CREATE A STANDARD, INTEROPERABLE ARCHITECTURE FOR INFORMATION EXCHANGE
- PRODUCE AND DISSEMINATE A COMMON OPERATIONAL PICTURE TO EVERY ORGANISATION INVOLVED
- USE OF EVERY EXISTING INFORMATION SOURCE. CORRELATE INFORMATION TO GET INTELLIGENCE
- MAKING THE MOST EFFICIENT USE OF EXISTING ASSETS.
- SUMMING UP LAYERS OF ADDED VALUE
- ACCESSED BY ALL UE INVOLVED AGENCIES AND BODIES NOTWITHSTANDING THE ORGANISATIONAL OR LEGAL DIFFERENCES BETWEEN MEMBER STATES

ADDRESSING THE POINT OF DEPARTURE ISSUE:

- DEPLOY ASSETS IN COLLABORATIVE COUNTRIES.
- DEPLOY INFORMATION SHARING NETWORKS IN COLLABORATIVE COUNTRIES
- PLACE MOBILE ASSETS AT THE LIMITS OF NON COLLABORATIVE COUNTRIES.
- IMPLEMENT EFFICIENT INTELLIGENCE PRODUCTION TOOLS
- PROVIDE DEPLOYED ASSETS WITH COMPLETE, VALUABLE & UPDATED OPERATIONAL PICTURE

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