



ARIADNA

ARIADNA project: Maritime Volumetric Navigation System

**Project
Coordination:**



**Project
Participants:**





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ARIADNA in figures

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ARIADNA in figures

- Project funded by the EC – **DG- RESEARCH**
- Budget of **3,412,584 €** (75% funding)
- Duration:
 - ✓ **START DATE: 01/11/2009**
 - ✓ Duration: 36 months
 - ✓ **END DATE: 31/10/2012**



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Technical Description

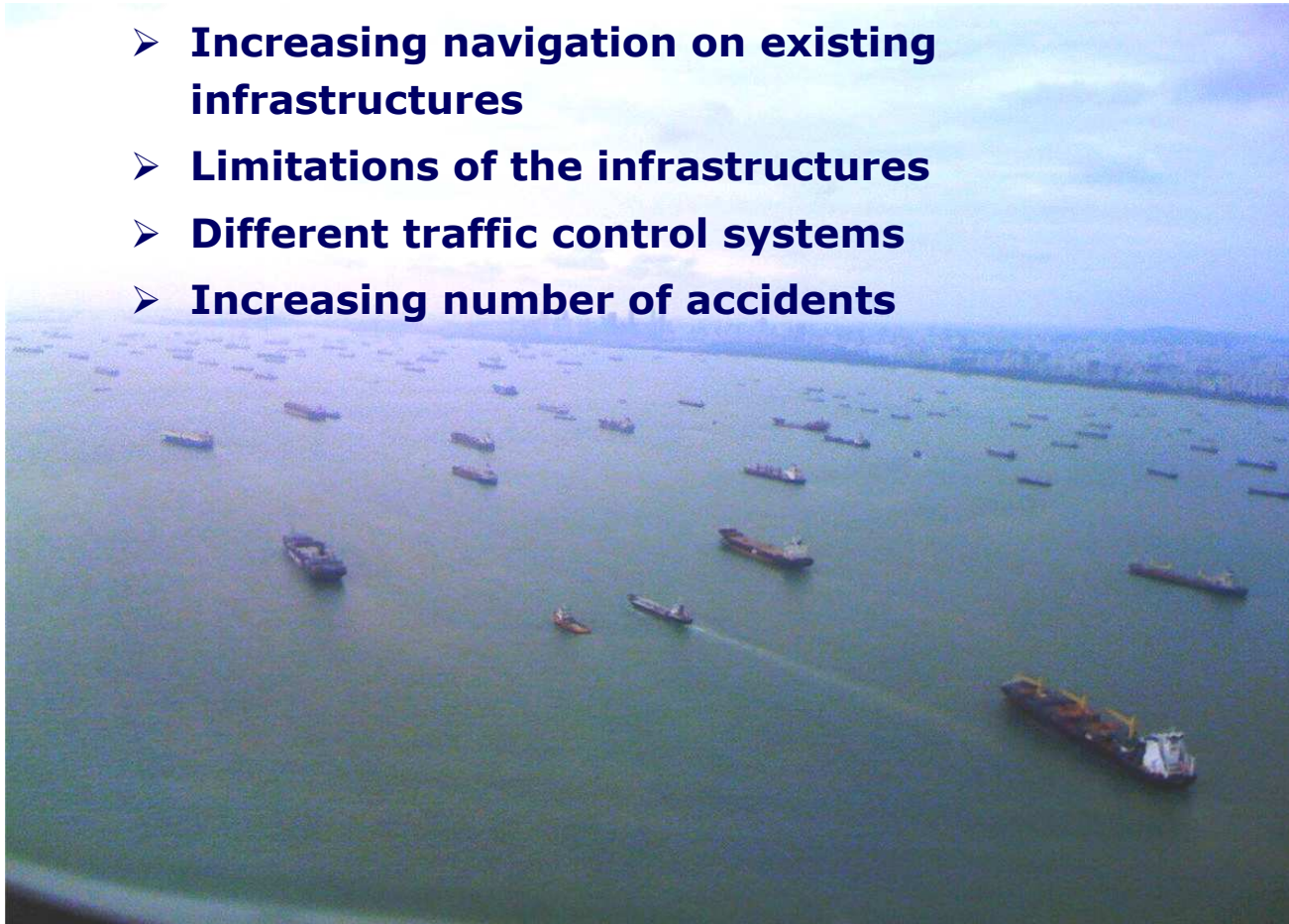
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Problem to solve

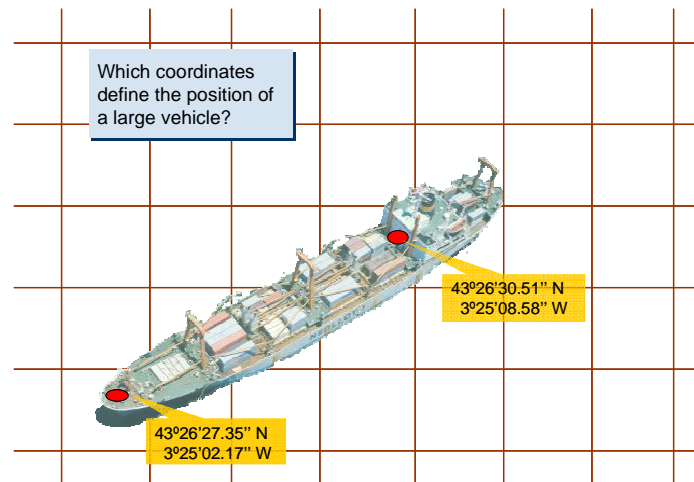
- **Increasing navigation on existing infrastructures**
- **Limitations of the infrastructures**
- **Different traffic control systems**
- **Increasing number of accidents**



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- Which coordinates define the position of a large boat (a single point positioning cannot represent the spatial occupation of a vessel)?
- Which area or volume around a boat do we have to consider, in terms of navigation, efficiency in space utilization and safety?
- How can the operational efficiency be improved on inland waterways, in channels and port approaches and internal navigation?
- How can be solved critical positioning and navigation of small vessels not equipped with AIS?





ARIADNA's new navigational concept

Volumetric Navigation System

Characteristics

- ◆ Every ship may be represented by a volume envelope
- ◆ Combining position, attitude and volume information, each ship may be considered as a geo-referenced geometrical volume.
- ◆ The position and attitude of a ship may be accurately calculated in real time thanks to GNSS technology and attitude sensors.
- ◆ Integrates information from existing systems (i.e.: AIS, ECDIS,...), via communication links.



ARIADNA's new navigational concept

Volumetric Navigation System

Advantages

- ◆ Adds new information that will help to increase infrastructure capacity and routing (i.e.: ports, rivers)
- ◆ Adds new information that will support users increasing safety (specially in straits and inland navigation)
- ◆ Increases efficiency (in terms of capability and economic terms)
- ◆ Provides the possibility of performing environmentally-friendly operations
- ◆ Permits a collaborative navigation environment: ships can see each other (User Terminal) and all ships can be seen from a Local Control System.



ARIADNA's Volumetric Navigation System



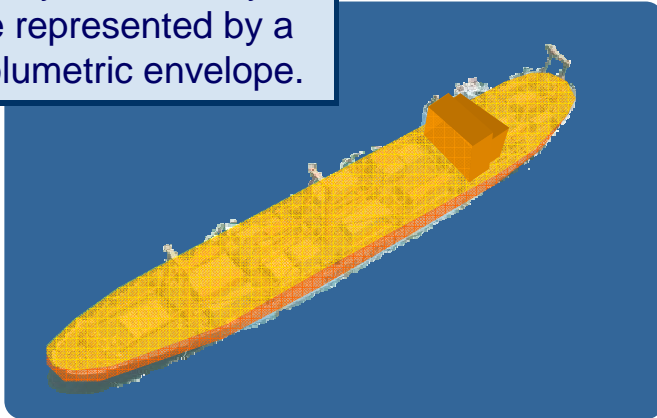
Creates a 4 Dimensional (**space** and **time**) **navigation** tool for optimisation and safety ship guidance considering ship **volume** and **status** and the surrounding **conditions**



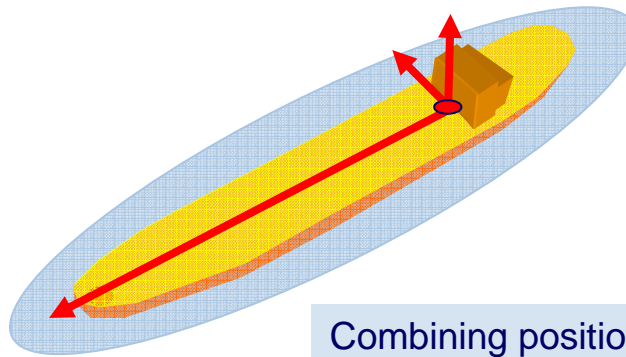
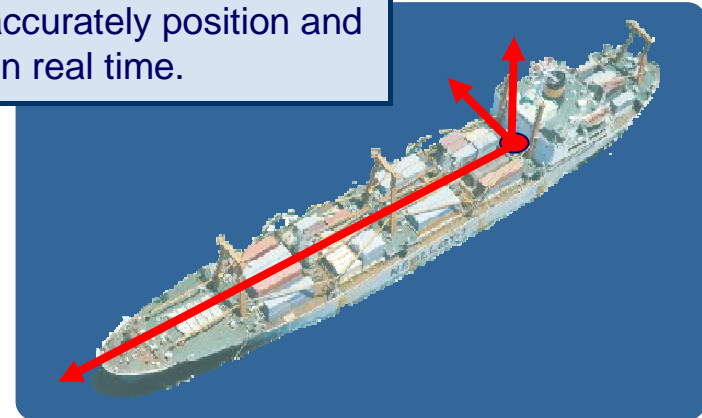
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ARIADNA's Volumetric Navigation System

Every vehicle may be represented by a volumetric envelope.



GNSS and attitude technology define accurately position and attitude in real time.



Combining position, attitude and volume information, each vehicle may be considered as a georeferenced geometrical volume.



ARIADNA's Volumetric Navigation System

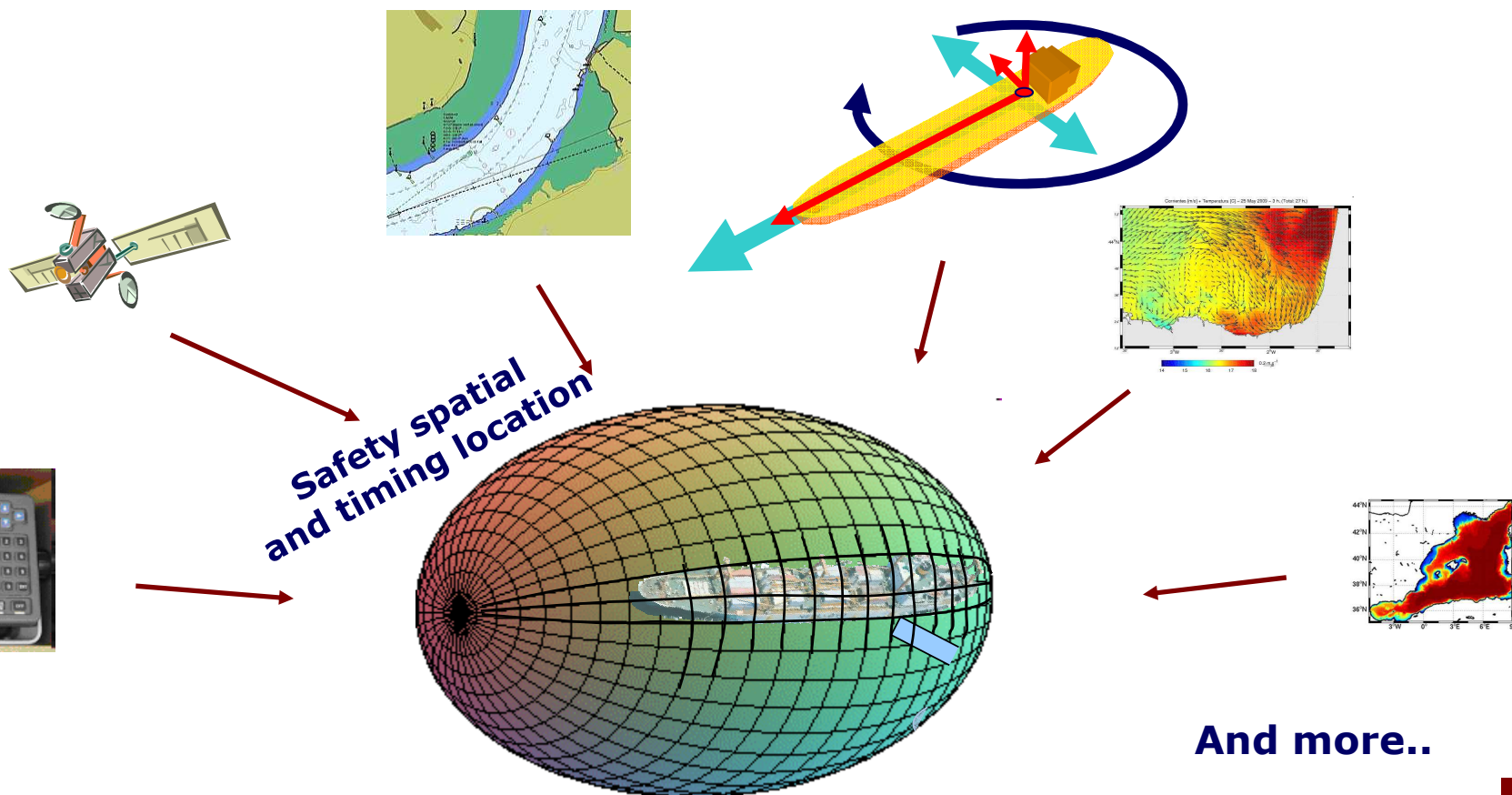
Navigational data

GNSS positioning

Time

Ship's characteristics

Sea status, Weather conditions,...



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And more..

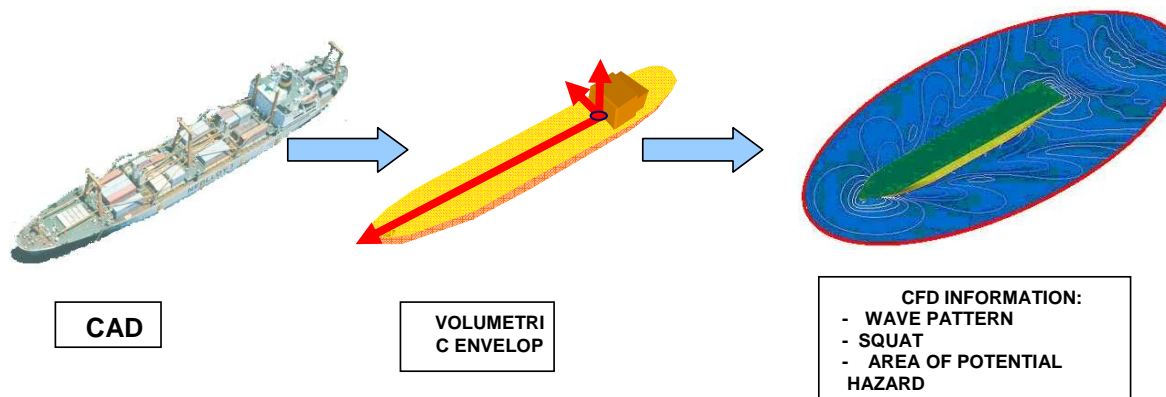


Technical background

- Every vessel may be **represented by a safety volume envelope** which geometry will depend on its real shape, navigation and dynamical parameters and the surrounding environment.
- The position, course and heading of a vessel may be **accurately** calculated in real time from its position, speed and drift by **GPS and GNSS** technologies. Combining these parameters, each vessel may be considered as a geo-referenced geometrical volume.
- In an scenario with different ship sizes, tonnage and speeds each vessel or boat generates his own volume that is **transmitted to the other vessels** in the area. The shore, docks river or channel sides and shallow water obstacles generate a warning when the "volume of the vessel" approaches at different levels of risk.



- Horizontal dimensions of this ship's envelope will consider his **current speed** and also from his **extreme stopping** and **manoeuvring capabilities** from the given speed and load, and correction for the drift due to local measured wind and mapped currents.
- Vertical dimension in navigation at sea is the **water distance below the keel** at fore and the aft of the ship and the sea bottom as given by cartography and tide or water level (inland).
- VNS is a **tool** for human error avoidance such as collision, manoeuvring and navigation in low separation traffic lines and channels, crossings, port traffic, congested shallow waters.





- Demonstrate and support feasibility to **reduce the traffic separation** by **at least 20%** on high density traffic regulated areas as based on a realistic risk assessment considering HNS carried or not, and oceanographic and weather conditions.
- Demonstrate and support feasibility to **increase infrastructures use and passage density** capability **by 20%** on regulated areas based on a realistic risk assessment on infrastructure constraints and navigation conditions.
- Provide a navigation support tool to **reduce human error** and hence increasing safety in an increasing navigation density scenario and reducing collision, grounding and wake effect accidents **by 20%**.
- Reduce **waiting time and manoeuvring** in ports, inland waterways and infrastructures accesses **by 10%** (with inherent reduction of energy and production of CO₂).



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Work Breakdown Structure

WPO Management

WP1 State of the Art and User Requirements

WP2 System Engineering

WP3 System Development and Integration

WP4 System Validation

WP5 Implementation

WP6 Dissemination and Exploitation

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Contact

Project Coordinator:

Ana Gómez Arche

amgomez@isdefe.es