European Satellite AIS under Joint EMSA/ESA Integrated Applications Programme

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http://telecom.esa.int/artes21

SAT-AIS Initiative
Content

1. **SAT-AIS Concept**
2. **European Framework - ESA/EMSA Cooperation**
3. **User Requirements**
4. **SAT-AIS Activities & Roadmap**

European Space Agency
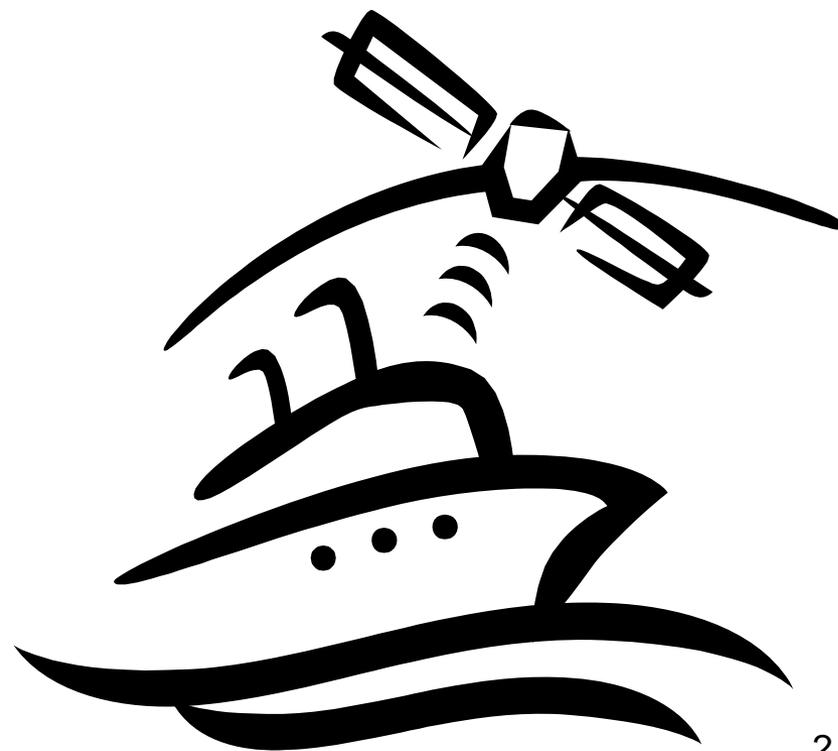
➡️ is a short range coastal tracking system used on ships

➡️ developed to provide identification and location information to vessels and shore stations with the aim of exchanging different types of data including position, identification, course, speed and others

➡️ allows vessels to anticipate and thus avoid collisions at sea by means of continuous traffic monitoring

➡️ additionally it offers important ship monitoring services to coastal guards as well as search and rescue organizations.

27th Feb 2003

Sources: Law Offices of Countryman & McDaniel/CargoLaw.com, International Salvage Union, 2003

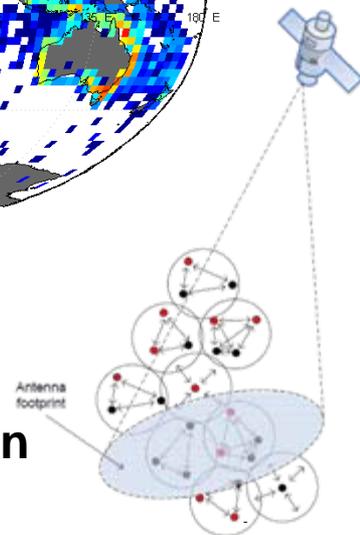**Main problem of space-based AIS is occurrence of message collisions:**

In terrestrial AIS, the SOTDMA concept organizes the shipping traffic into cells

of about 40 NM in size. As every vessel is assigned its own slot within its respective cell,

no message collisions occur.

Main problem in space-based AIS is collision between messages, because multiple cells

are in field-of-view:

a.   Type I: Same slot, but different cells

b.   Type II: Different slots, but due to difference in signal travel time intrusion into other slot occurs
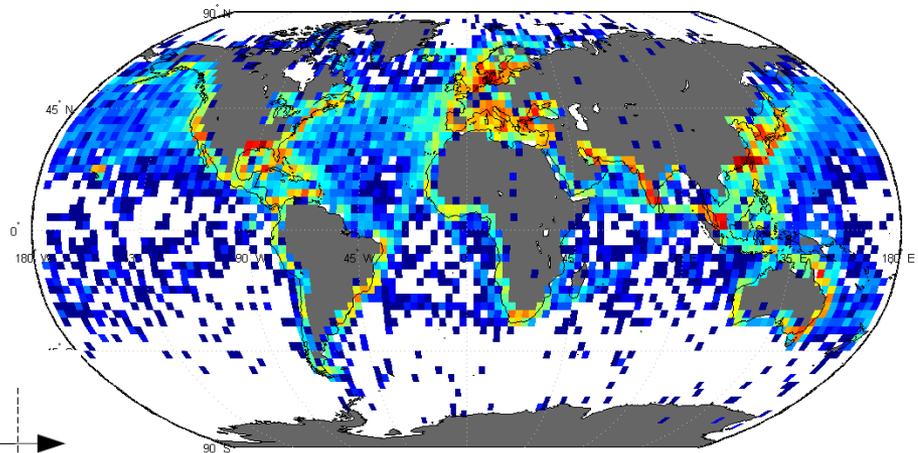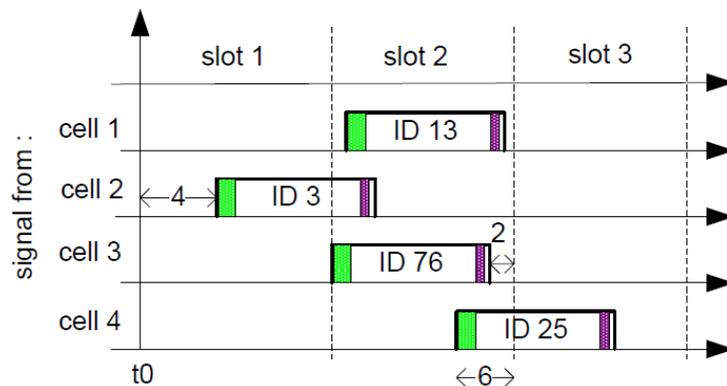
In worst case, number of collisions in same slot can rise as high as 30!

727 AIS shore stations

Coastal coverage in all MS

Coverage of IALA-Net
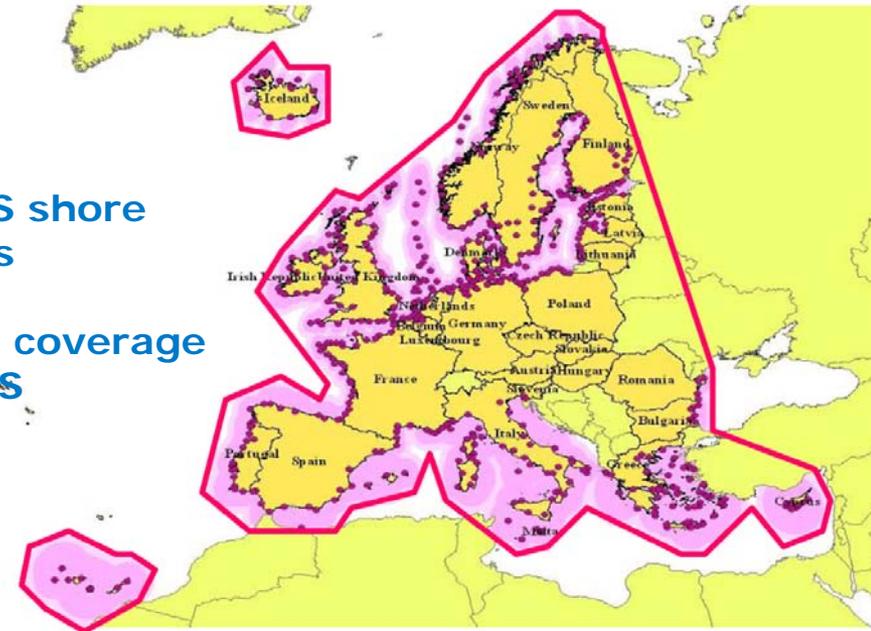
Map of AIS shore based stations [EMSA]

Groenland

Canada

Northern N.Atlantic server

Feroe. Island

North Sea
AIS server

HELCOM
AIS server

Satellite AIS
server

EMSA
SAT-AIS DPC

Mediterranean
AIS server
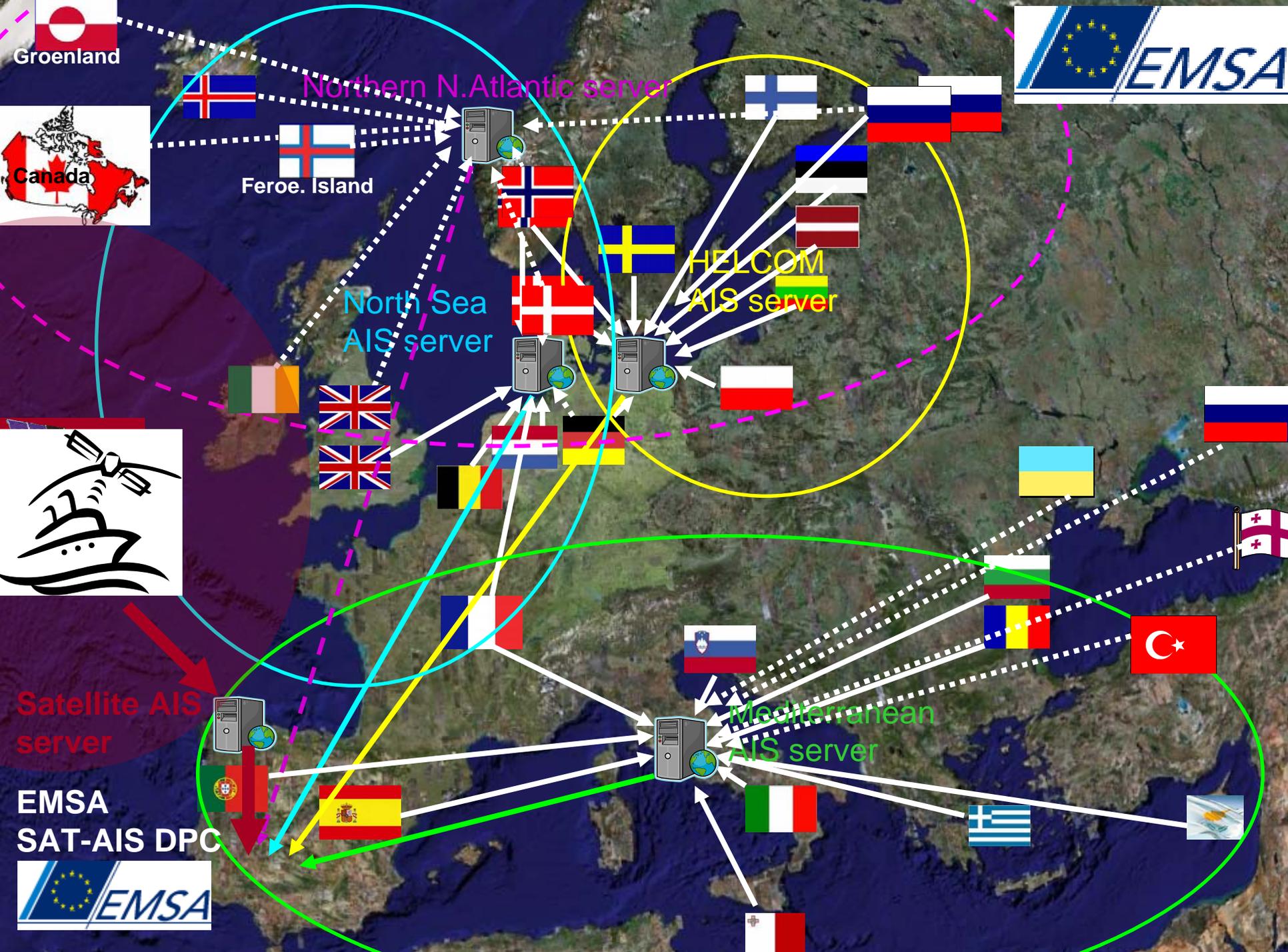
SAR detected ships

SAR ships & AIS tracks

Correlation SAR & AIS

Remaining uncorrelated ships for identification (e.g. UAS)

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European Space Agency

SAT-AIS preparatory steps
Overview

1. EMSA and ESA have started in 2007 (and renewed in July 2010) a mutual collaboration agreement for the Use of space-based Systems and Data in support of Maritime Activities;

2. In a coordinated agreed approach with EC, ESA has undertaken actions to assess the capabilities offered by satellite based AIS to provide a solution answering user needs;

3. A Steering Committee for Evaluation of Pilot Projects (DG MARE: PASTAMARE) and preparatory Actions (ESA: 2x Phase-A) on maritime Surveillance was set up 2008;

4. The SC was co-chaired by DG-MARE and ESA with participants representatives of interested Directorate Generals of the Commission and EU Agencies;

Steering Committee Members :

• DG-MARE (Co-Chair)	• DG-TAXUD	• EDA
• DG-TREN	• DG-INFSO	• EMSA
• DG-ENV	• DG-ENTR	• FRONTEX
• DG-JLS	• DG-JRC	• ESA (Co-Chair)

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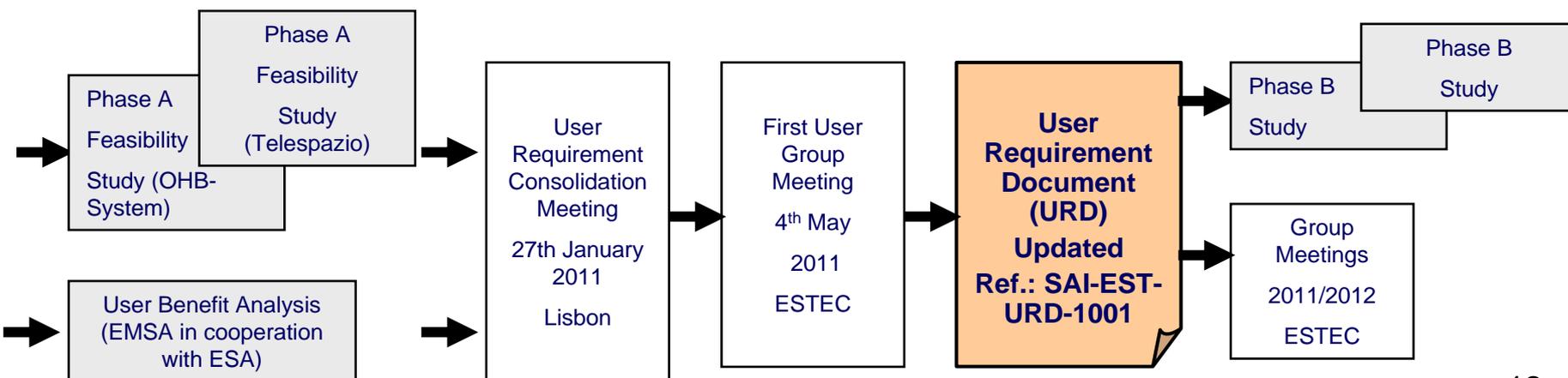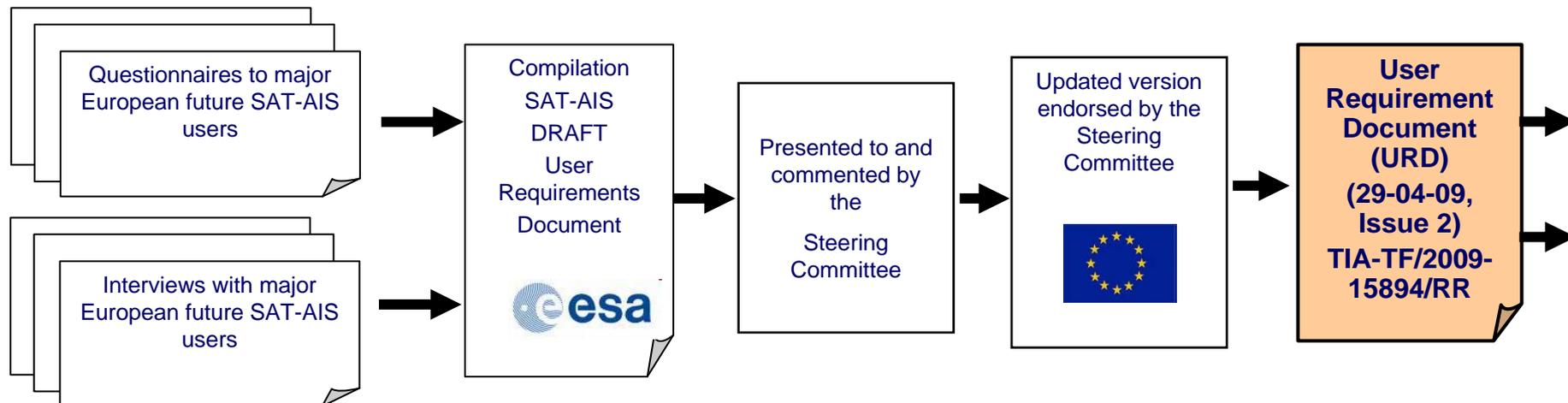
4. **SAT-AIS Activities & Roadmap**

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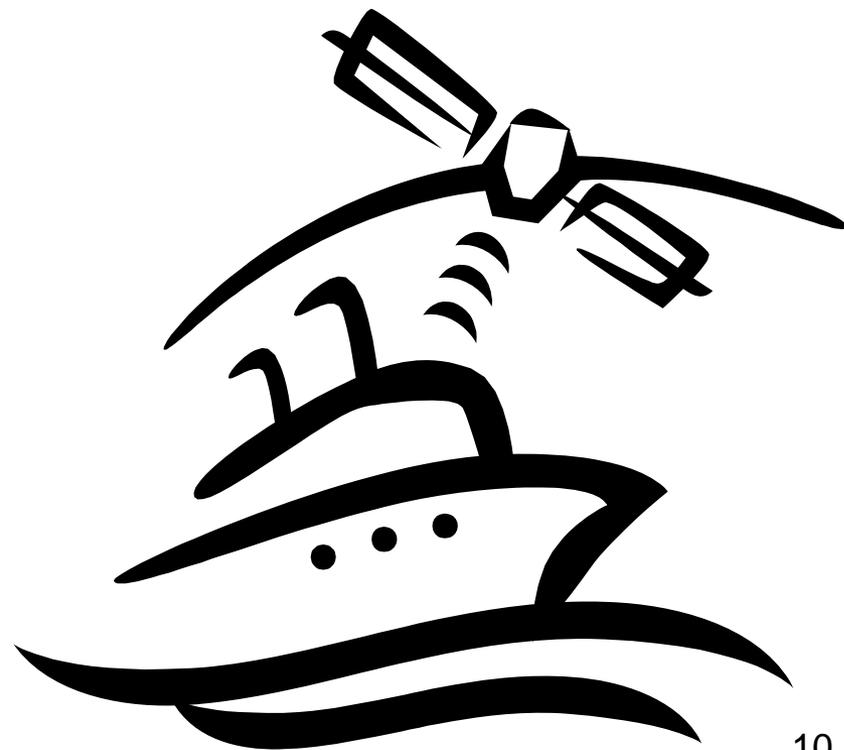
SAT-AIS User Requirements
Capturing Process

SAT-AIS user requirements have been gathered, processed and endorsed through the following process

```
Questionnaires to major     Compilation         Presented to and       Updated version       User
European future SAT-AIS      SAT-AIS             commented by the       endorsed by the       Requirement
users                       DRAFT                Steering Committee     Steering Committee    Document (URD)
                            User Requirements                                                (29-04-09, Issue 2)
Interviews with major       Document                                                         TIA-TF/2009-
European future SAT-AIS                                                                      15894/RR
users
```

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Phase A Feasibility Study   User Requirement    First User Group       User Requirement      Phase B Study
(OHB-System)                Consolidation       Meeting                Document (URD)
Phase A Feasibility Study   Meeting             4th May                Updated               Group Meetings
(Telespazio)                27th January        2011                   Ref.: SAI-EST-        2011/2012
                            2011                ESTEC                  URD-1001              ESTEC
User Benefit Analysis       Lisbon
(EMSA in cooperation
with ESA)
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SAT-AIS on-going
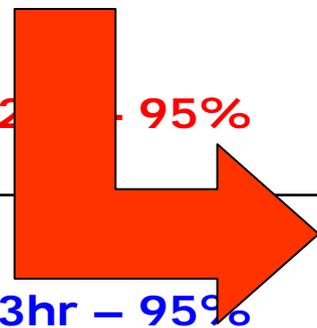## URD: Service scenarios definition (Issue 2.2)

User Group representing 14 European Organizations was set up 14th May 2011, for updating and endorse the URD through Phase-B1 activities.

1. **Scenario 1** addressing:
   a. *Maritime Security services:* support of security operations, maritime security threats
   b. *Law-enforcement services:* anti-piracy, illegal fishing, enforcement of international /national regulations, support of enforcement operations
   c. *Search and Rescue (SAR)*

2. **Scenario 2** addressing:
   a. *Maritime surveillance services:* monitoring of vessels in sensitive areas (international waters), anti-drug smuggling, border control
   b. *Environmental services:* hazardous cargos monitoring, prevention of pollution caused by ships, pollution response

3. **Scenario 3** addressing:
   a. *Maritime Safety services:* vessel traffic/navigation monitoring, vessel traffic management, support of safety operations

4. **Scenario 4** addressing:
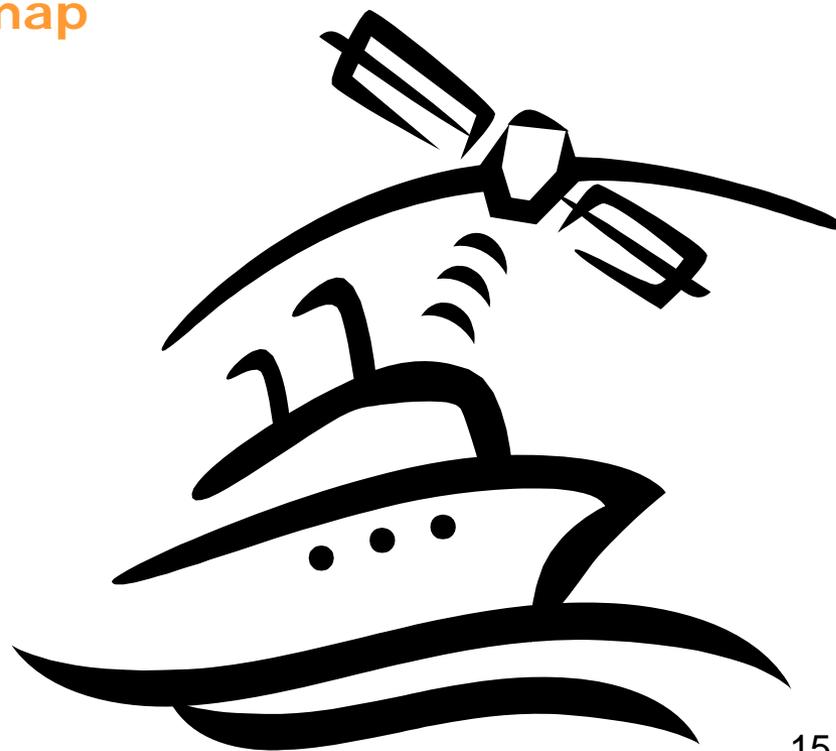   a. *Fleet management services for commercial users* (shipping companies, owners,...)

Summary Table of USR-PER-090 **and -100**

	Time Update Interval (world wide)	Time Update Interval (HTZ)	Timeliness
Sceanrio-1	1hr – 95%		1hr – 95%
Sceanrio-2	2... – 95%	3hr – 80%	1hr – 95%
Sceanrio-3	3hr – 95%		1,5hr – 95%
Sceanrio-4	6hr – 95%		

Guaranteed operational Service for 15 years

70,000 – 110,000 ship detections every 1-6 hours

Redundancy, Spares, Data Integrity/Encryption, User Authentication, …
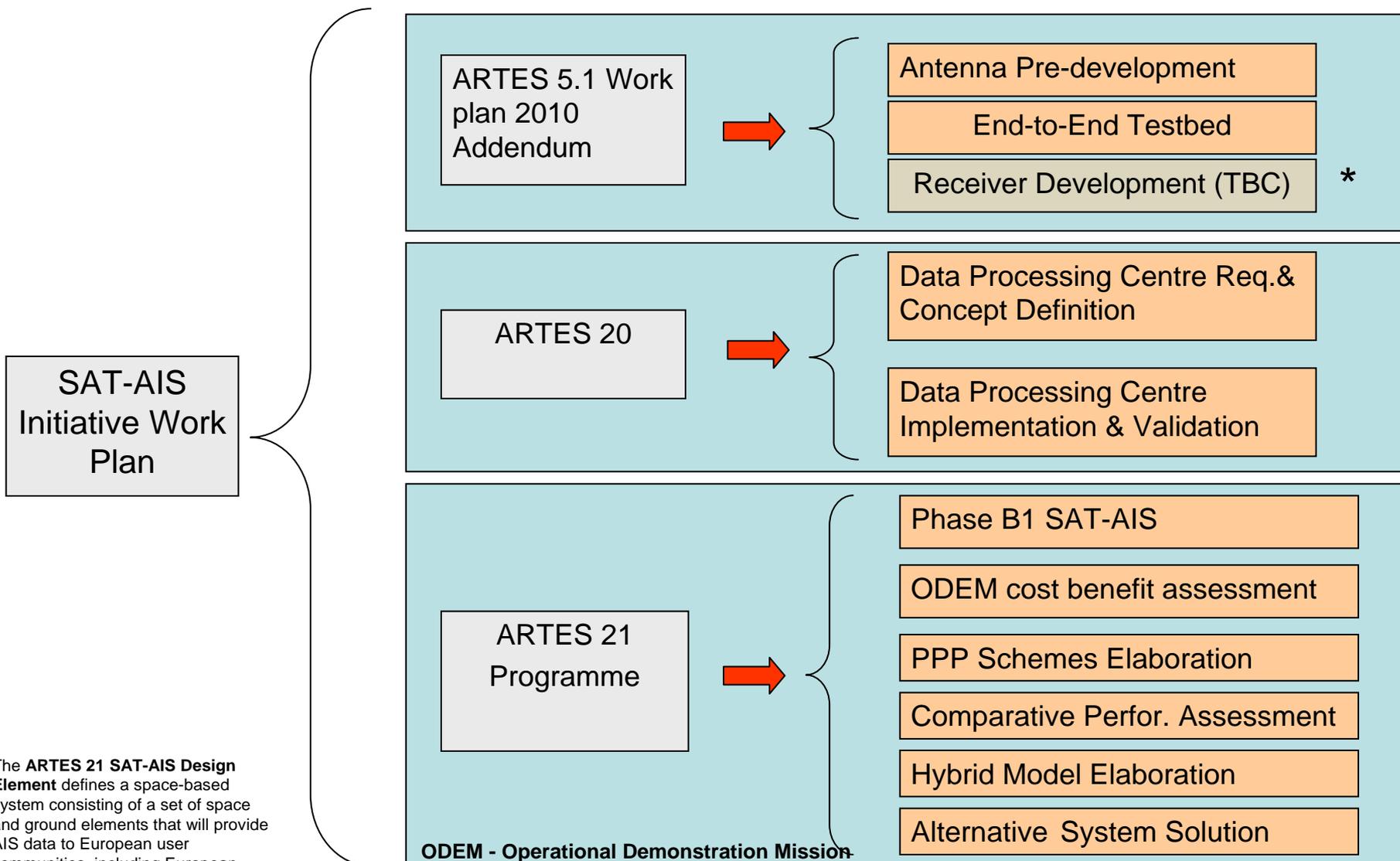
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ARTES 5.1 Work plan 2010 Addendum

- Antenna Pre-development
- End-to-End Testbed
- Receiver Development (TBC) *

ARTES 20

- Data Processing Centre Req.& Concept Definition
- Data Processing Centre Implementation & Validation

SAT-AIS Initiative Work Plan

ARTES 21 Programme

- Phase B1 SAT-AIS
- ODEM cost benefit assessment
- PPP Schemes Elaboration
- Comparative Perfor. Assessment
- Hybrid Model Elaboration
- Alternative System Solution

ODEM - Operational Demonstration Mission

The **ARTES 21 SAT-AIS Design Element** defines a space-based system consisting of a set of space and ground elements that will provide AIS data to European user communities, including European Institutions and possibly private entities.

ARTES-21 - SAT-AIS Initiative
Workplan

Data Processing Center: ESA Element (Block 2), EMSA Element (Block-3) providing 6 services, e.g. enhanced, missing & predicted AIS messages, and EO data service

Short term demo projects using SAT-AIS for areas of interest, e.g. support of EMSA BlueBelt project (2011/12)

Medium term Operational Demo Mission (ODEM): 4x studies on data services and/or demo satellites on-going for service in 2013-2015

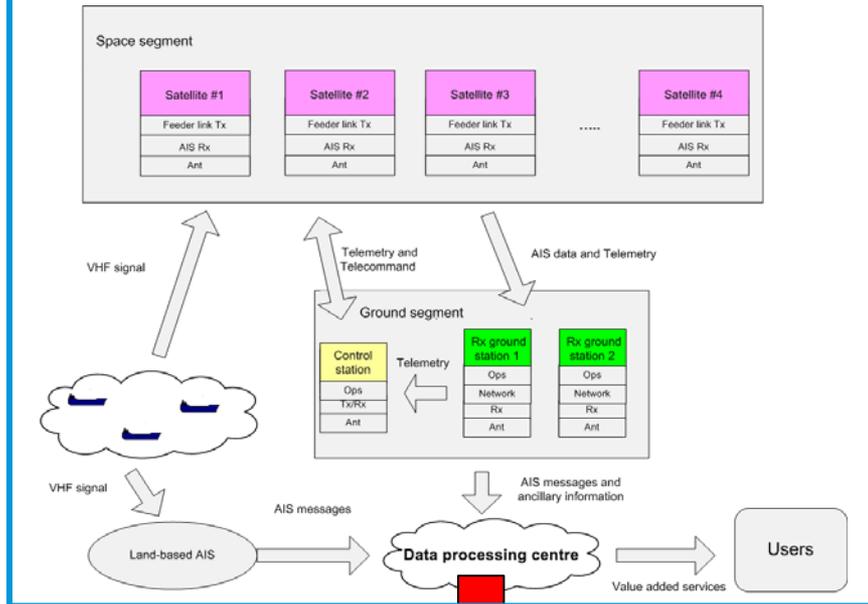**System Design Element**: 2x Phase-B1 studies for full system (2015/16)

Technologies:

– Advanced Algorithm Patented by ESA

– Receiver Designs – Algorithm Improvement

– Testbed (8-12 channels, beam forming)

– Comparative Performance Assessment, performing blind testing of proposed solutions

Implementation Options:

– Private public partner ship – business model evaluation

– Hybrid / Alternative Solutions

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SAT-AIS Initiative

Data Processing Centre – EMSA/ESA collaboration

SAT-AIS end-to-end architecture

The SAT-AIS server is implemented through a jointed EMSA-ESA Data Processing Centre activity

Functional Moduls

Data Retrieval is the function by which input (SAT-AIS, ancillary information and EO) data enters into the system;

Data Processing and Validation generates and validates the final products

Data Prediction is the function providing prediction of future visibility of detected ship by the satellites;

Data Distribution and Archiving is the function in charge of transferring the Data products to EMSA;

ESA + EMSA

DPC
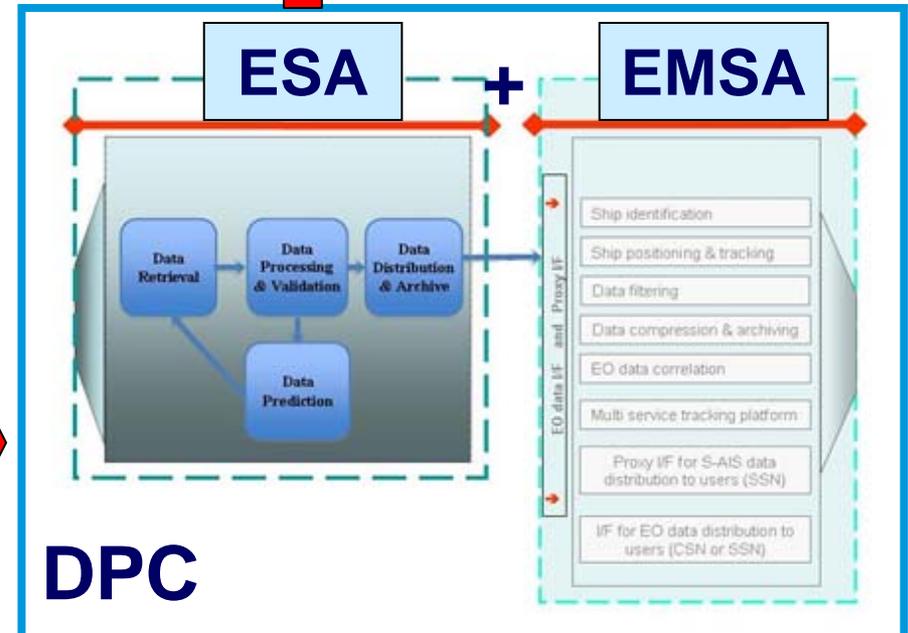
THE BLUE BELT PILOT PROJECT

The aim of the Blue Belt pilot project is to explore new ways to promote and to facilitate Short Sea Shipping in the European Union by reducing the administrative burden for intra-Community trade.

BENEFITS

Customs will benefit from an added degree of certainty with regard to the ship's voyage concerning participating vessels. This will be possible by using existing customs tools in combination with information from the EU vessel traffic monitoring and information system SafeSeaNet.

Customs authorities will receive reliable information on the current and past voyages of blue ships.
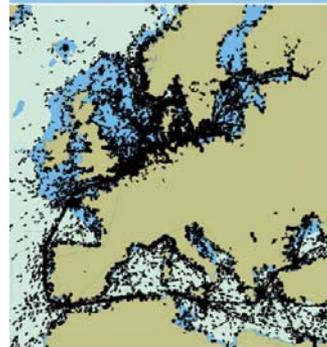
Ships' masters and agents will benefit from faster processing of goods through Customs when arriving at port.

SAT-AIS support to Blue Belt
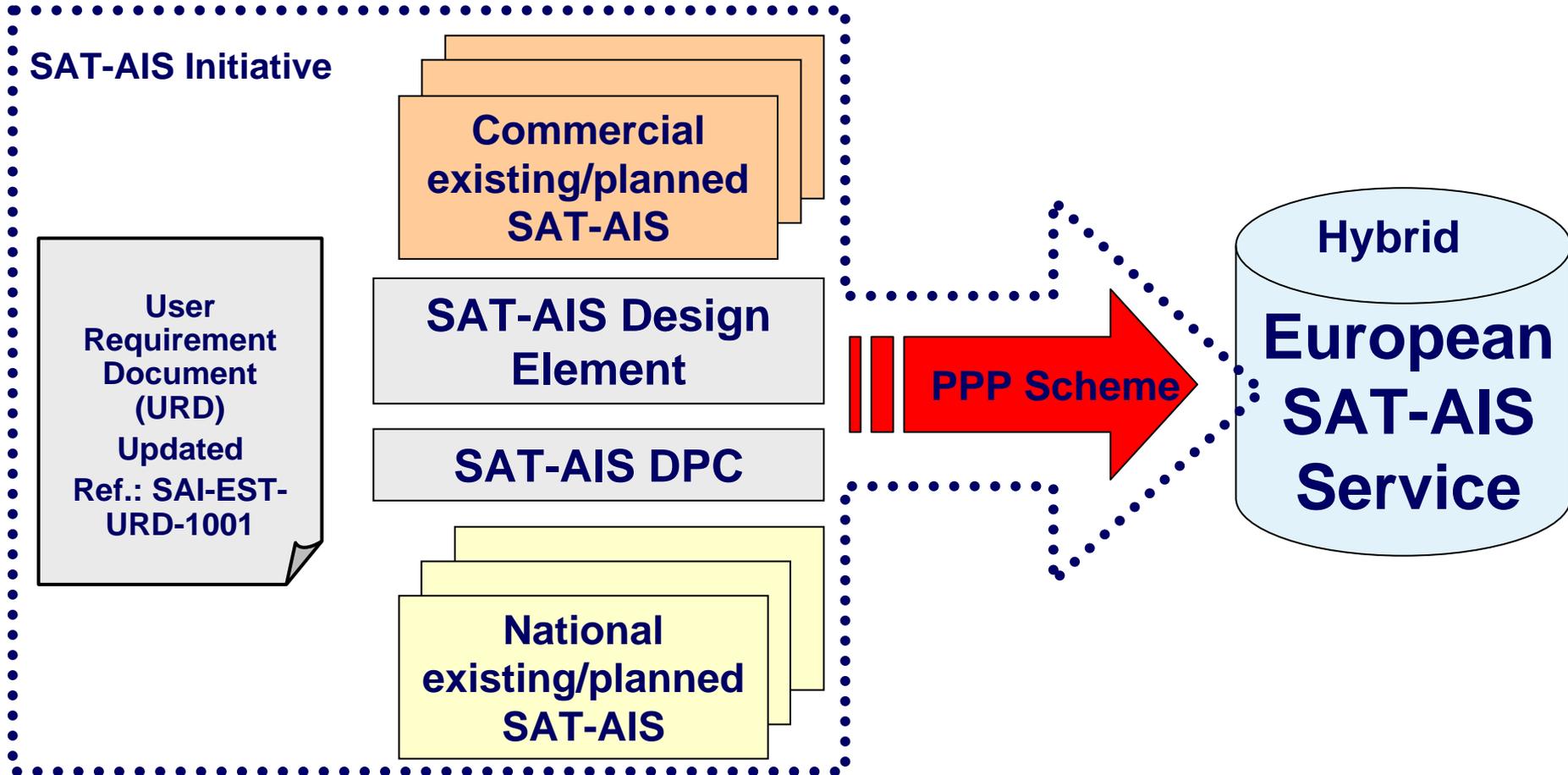Ships sailing outside the coverage zone of terrestrial AIS (until 40 nautical miles from the coast) can still be tracked by Satellite based AIS and this voyage information will be provided to customs

www.emsa.europa.eu

SAT-AIS
Hybrid System – towards a sustainable service

European SAT-AIS
Towards ARTES-21 and MC2012 Proposal

Steering Committee SAT-AIS
Phase A (DG Mare / ESA, …)

1st EMSA/ESA MS Information
Meeting (Jan 2010)

EMSA / ESA Agreement,
(July 2010)

JCB approved ARTES 21 and
SAT-AIS work plan (Sep 2010)

2nd EMSA/ESA MS
Information Meeting (Jan 2011)

User Group 2011/12 (DG Move,
EMSA, SGMER, WSA, NCG, LUX, …)

SAT-AIS High Level
EC Steering Committee

MC2012 – SAT-AIS
Programme Proposal
ESA / EC / EMSA

The ESA and EMSA Directors put ink to paper at the European Space Agency's Paris headquarters on 2 July.

Thanks!

For further information:

http://telecom.esa.int/artes21