IAP Meeting the Challenges of the "Port of the Future"

TSC Workshop, 10/03/2016
ESA Directorate of Telecommunications and Integrated Applications

Section 1
What IAP has been doing in the transport sector

Section 2
How "port of the future" needs and challenges are understood

Section 3
How IAP might meet these challenges

IAP addresses transport and infrastructure needs

➢ **GNSS**: GPS, GALILEO, GLONASS, BEIDOU

  ▪ for positioning and tracking of vehicles/cargos/vessels, fleet management, traffic data collection, driverless vehicle tracking and monitoring, route optimization, RPAS navigation, etc.

➢ **EO**:

  ▪ Meteo derived data to modify/optimise the route according to the weather condition, to monitor pollutants in the atmosphere;

  ▪ SAR imagery for surveillance purposes, etc.

➢ **Satcom**:

  ▪ for providing back-up solution to terrestrial link, for assuring data transmission everywhere (Satcom mega constellation), for safety & security systems, RPAS guidance, etc.

➢ **SAT-AIS**:

  ▪ for fleet monitoring and control, search and rescue, maritime security, collision avoidance, vessel traffic services, aid to navigation, etc.

➢ **And ALL COMBINATIONS**

The transport sector, in its diversity, is extremely important in terms of impact that space assets can have for provision of new services of enhancement of current process (**40% transport-related projects in the IAP portfolio**)

Geography of ARTES20 Transport Projects
Sample of 23 projects

- 23 ARTES 20 demonstration projects dedicated to transport of freight, passengers and linked to logistics activities were analysed and categorized per transport mode, e.g. maritime (36%), road (22%), train (11%)

- These projects involve 73 companies from 15 different European countries as prime or subcontractors
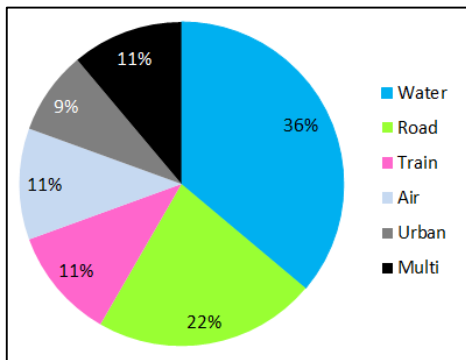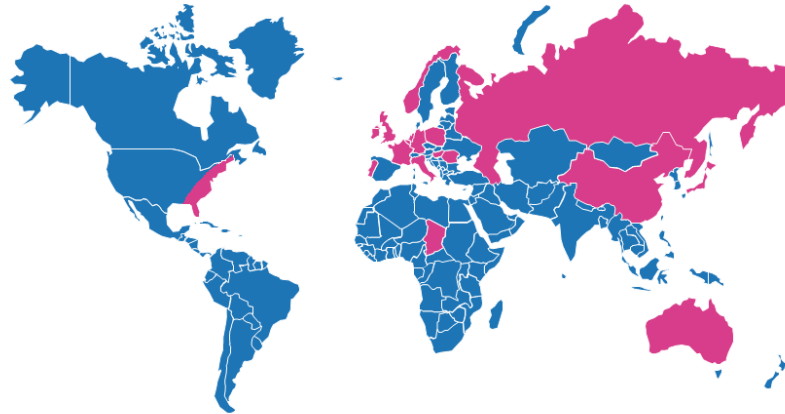

Distribution of transport modes[1]

Project's prime location

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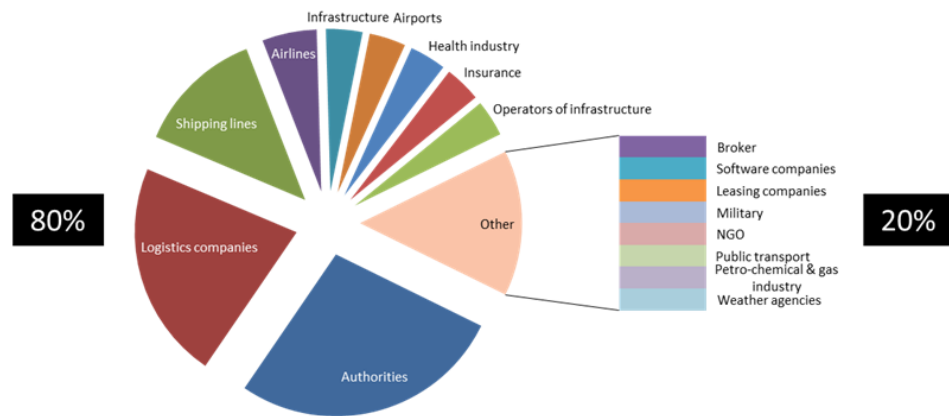[1] *multimodal projects are also integrated in the different modes*

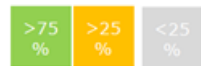# Users and customers geography

International footprint

users and customers location during the demonstration
19 countries

Main categories of users and customers

main customer categories

Space assets usages

- Multimodal applications capture more value from the space assets and their combinations: they increase their usage
- SatCom and GNSS is the space asset impacting the highest number of transport means.
- IAP projects are evenly spread among the different transport sectors.

	WATER	ROAD	TRAIN	AIR	URBAN	MULTI
SatCom	>25%	>25%	>75%	>25%	>25%	>75%
EO Images	>25%	>25%	<25%	>25%	>25%	<25%
Meteo/Ocean EO Derived Data	<25%	>25%	<25%	>25%	>25%	>25%
SAT-AIS	>25%	<25%	<25%	<25%	<25%	>75%
GNSS	>25%	>75%	>25%	>75%	>75%	>75%

Legend: >75% (green) | >25% (orange/amber) | <25% (grey)
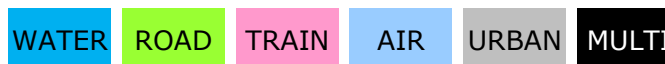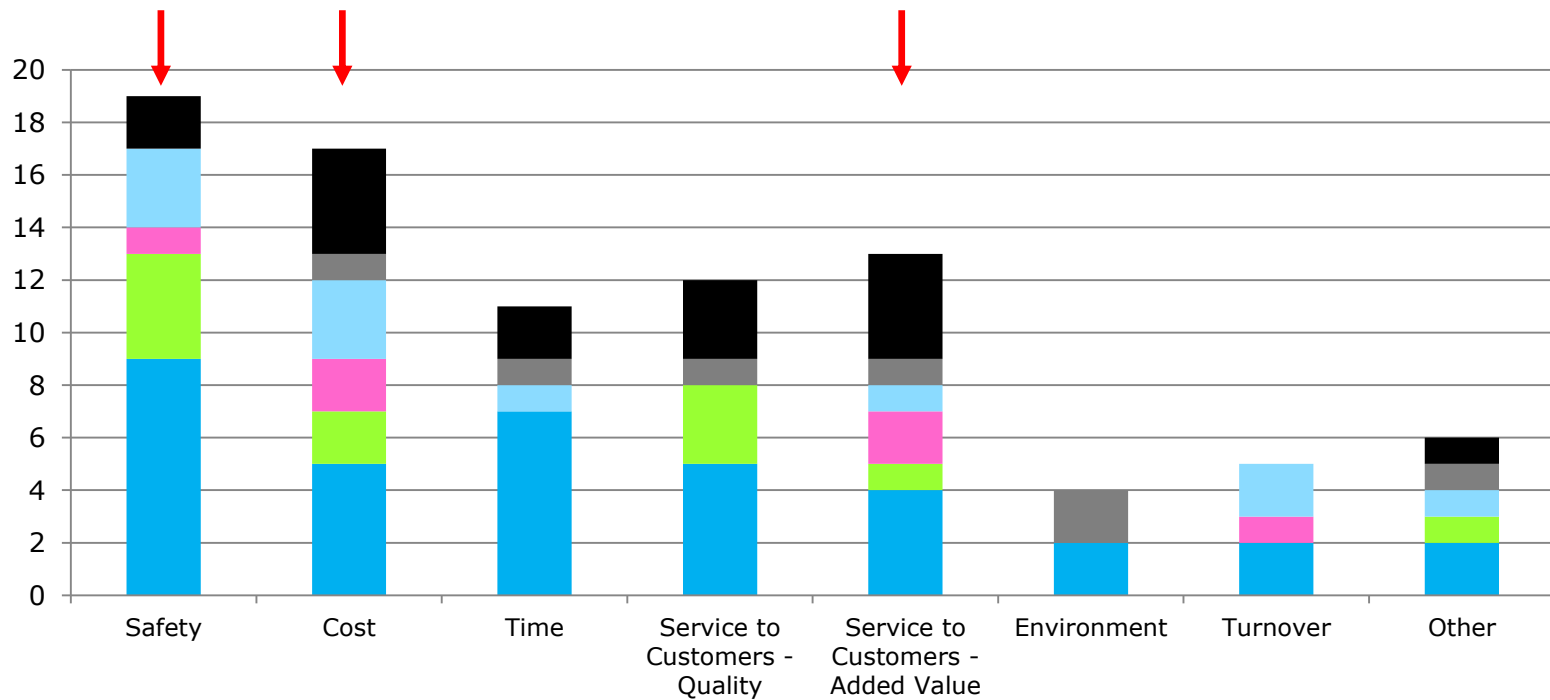
Out of the X studied projects that are linked to the medium [water; road; train; air; urban], about <25%, 25% < n < 75%, > 75% of the projects use the space asset [satcom; EO images; Meteo/ocen EO derived data; SAT-AIS; GNSS]

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Projects mainly target objectives that impact safety, cost and value creation

Legend: WATER | ROAD | TRAIN | AIR | URBAN | MULTI

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How IAP understand the needs and challenges of the Port of the Future
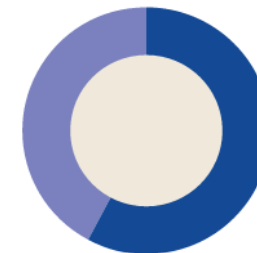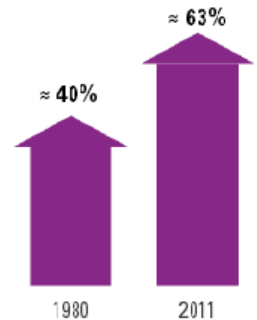
© PA

Relevant future trends

➤ **Digital Future** - cloud, big data, IoT introduce new services, products, business and delivery models, but also present significant challenges, as robotic technologies replacing workers, privacy concerns and cybersecurity threats.

90%

Of the digital data today was created in the last 2 years

➤ **Global marketplace** – Global merchandise trade forecasts to grow 8% annually to 2030 outpacing the GDP growth.

≈ 63%

≈ 40%

Global trade as a share of GDP increased from

1980   2011

➤ **Economic shift**– Driven by trade liberation, economic reforms, free movement of technology, emerging market economy are increasingly important players

Developing countries will account for an estimated **57%** of global GDP by 2030.

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Relevant future trends

Projected CO₂ emissions in 2030[112]

Millions of metric tons of CO₂ produced annually
- 250 MtCO₂ or less
- 250.1 to 1000 MtCO₂
- 1000.1 to 4000 MtCO₂
- 4000.1 to 5000 MtCO₂
- More than 5000 MtCO₂

➤ **Climate change** – Rising greenhouse gas emissions (GHGs) are causing climate change and driving a complex mix of unpredictable changes to the environment while further taxing the resilience of natural and built systems. Achieving the right combination of adaptation & mitigation policies is required.

➤ **Resources management -** The pressures of population growth, economic growth and climate change will place increased stress on essential natural resources including water, food, arable land and energy.

40%
Estimated global gap between water supply and demand by 2030.[121]

➤ **Urbanization** – UN reports percentage of world population living in cities to increase from 54% to 66% by 2050 implying need for investments in rail, ports, airports, water, telecommunications…

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Example of ports challenges
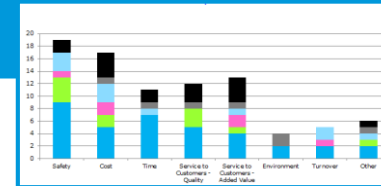
1. Efficient movement of ports freight with regard to safety and security goals

2. Multimodal transport operations cost-effective and automated.

3. Sustainable maintenance, repair and reconfiguration.

4. Capacity management with reduced costs and land use.

5. Lower environmental impact and climate change adaptation.

6. Integration in the urban surrounding environment connecting with the hinterland transport network

7. Seamless transport chains for passengers and freight.

| Service to customer |
| Cost |
| Environment |
| Service to customer |
| Cost |
| Turnover |
| Environment |
| Environment |
| Service to customer |
| Time |

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Current IAP projects meeting the port challenges

Challenge	Projects
Efficient movement of ports freight with regard to safety and security goals	EASY · SASS@SEA · EOMST · AMTRAC · GAF
Multimodal operations cost-effective and automated	NG-RMP · SIMONA · Xcit'ID · Europort · i-Port
Sustainable maintenance, repair and reconfiguration	DG-TRAC · FLYSAFE · SAMOLOSA
Capacity management with reduced costs and land use	Xcit'ID · Europort · i-Port
Lower environmental impact and climate change adaptation	SEMAFORS · i-TRAQ · SAMOLOSA · RTICM
Integration in the urban surrounding environment connecting with the hinterland transport network	SAFERDANUBE · SASS@SEA · S2BAS · i-Port
Seamless transport chains for passengers and freight	Mapp · EASY · BLUE BELT · PLASMA · NG-RMP · TIM · EOMST · 3INSAT · S2BAS · PLANET2 · FLYSAFE · GAF

Legend: WATER · ROAD · TRAIN · AIR · URBAN · MULTI

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I-PORT - Optimising Intermodal Freight Transport through European Ports
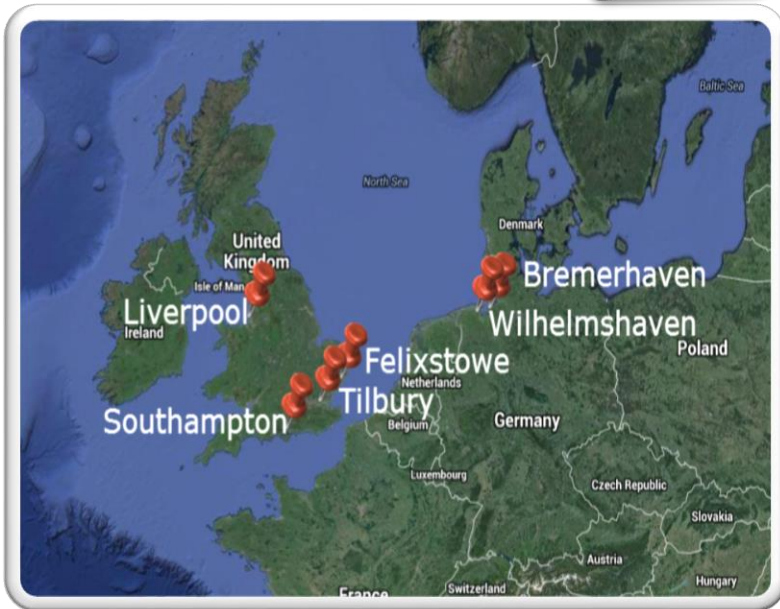

I-Port is an ARTES20 IAP demonstration project led by Aimes (UK), in conjunction with Avanti (UK), Container Port (UK), ISL (DE), DBH (DE)

I-Port integrates space with logistics data to:
- track the location of vessels and trucks,
- compute the estimated time of arrival and optimal routing for vessels and trucks,
- optimize container movement by accessing container locations,
- enable adjustments of vehicle slots in the port terminal.

The I-PORT *mobile app* is:
- used by drivers to interact with the companies
- used by haulers to track their subcontractors and own vehicles, providing 100% tracking coverage.
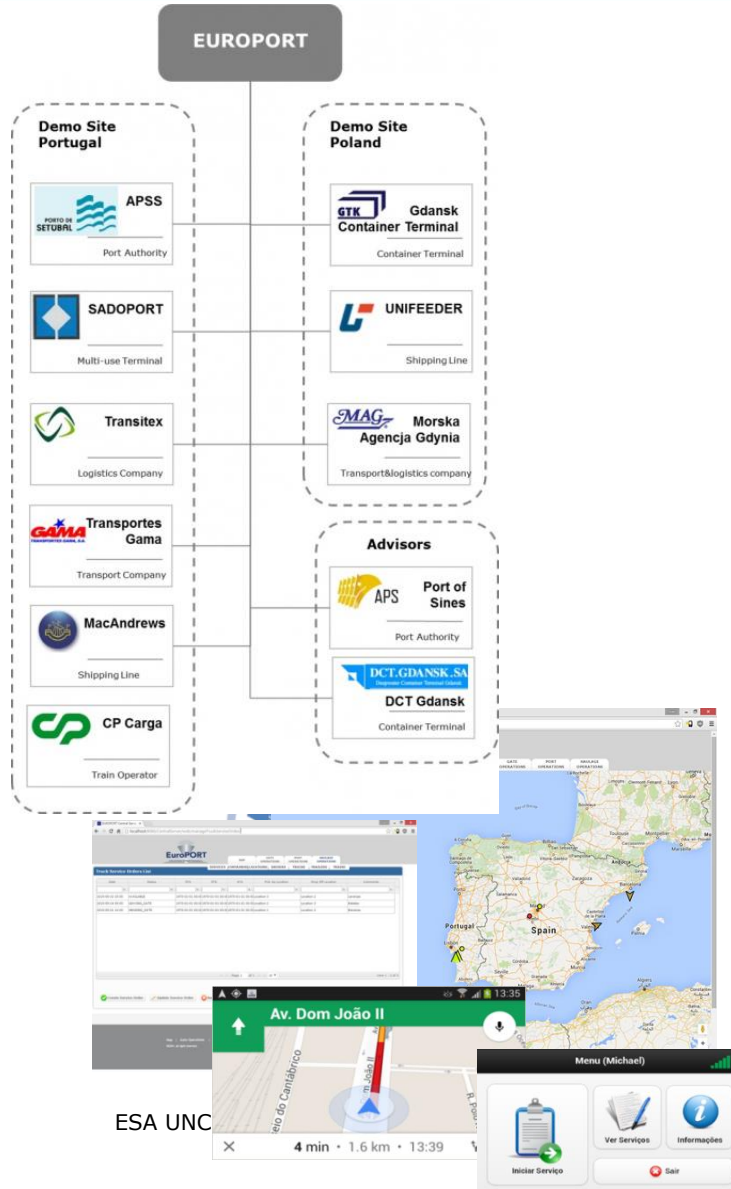
The I-PORT *portal* is: used in the office by shipping lines eg. ACL, as a step towards ensuring they get 100% tracking coverage of shipments

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https://artes-apps.esa.int/projects/i-port-0

EUROPORT - Optimising Intermodal Freight Transport

EUROPORT is an ESA IAP demonstration project led by GMV Innovating Solutions (PL), in conjunction with TIS.pt (PT), GMV SKYSOFT (PT).

The objective is to provide sustainable services based on the use of satellite assets to end users involved in intermodal freight transport through European ports in order to optimize the intermodal transport chain.

EUROPORT integrates space with logistics data to:

- Optimize the accuracy of the Estimated Time of Arrival (ETA) and Departure (ETD) of ships in ports;
- Optimize the accuracy of the estimated time of arrival and departure of trucks to/from terminal and port gates;
- Improve port gate-in and gate-out operations in order to reduce time spent in these operations;
- Improve the efficiency of pick-up and delivery operations in the yard.

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https://artes-apps.esa.int/projects/europort

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# NG-RMP- Next Generation Recognised Maritime Picture

NG-RMP is an ESA IAP demonstration project led by Skytek (IE), in conjunction with Exact Earth (CA), Irish Naval Services (IE), LuxSpace(LU), NSC (IE) and UCC (IE).

NG-RMP service will provide a complete end-to-end solution for the generation of an advanced recognised maritime picture (RMP) for the Irish Naval Services (INS).

The system will provide support using multiple external data sources ranging from space to terrestrial assets for RMP generation.

The service will visualise the solution onto operators workstations and provide support during daily INS HQ Irish coastal water monitoring.
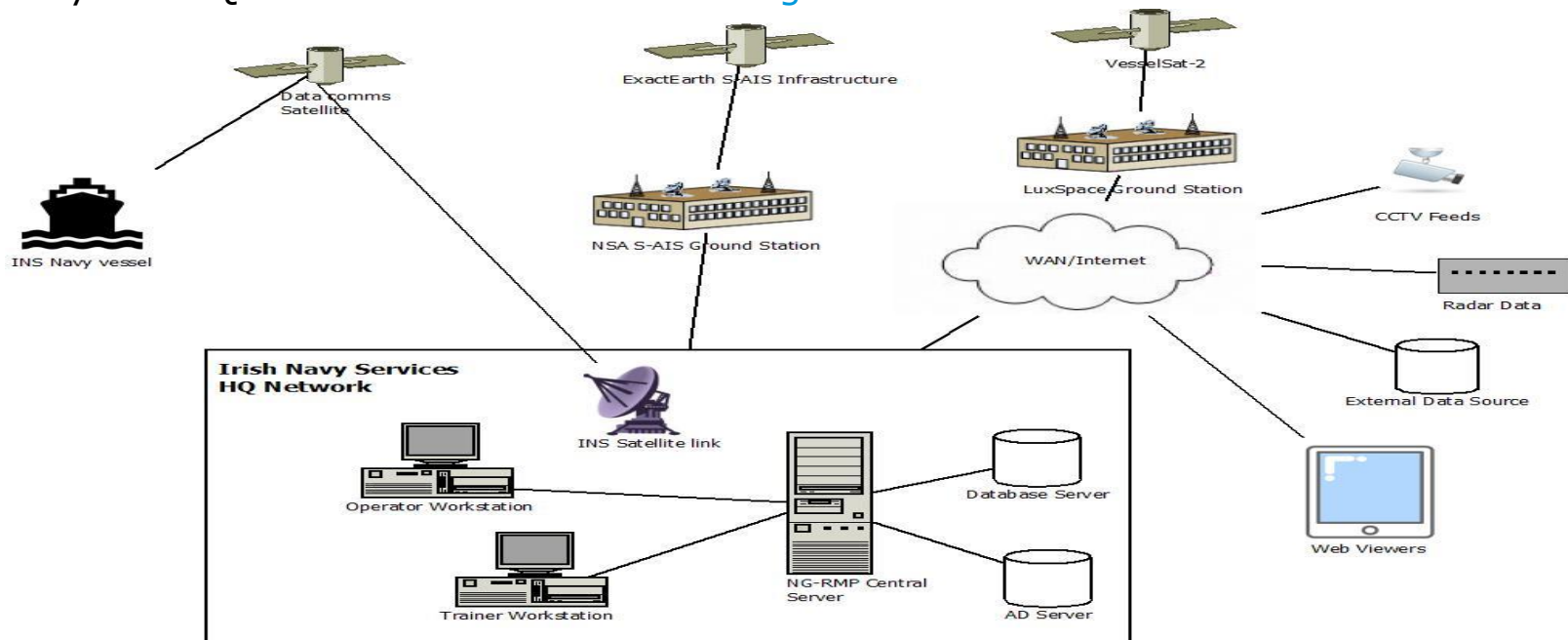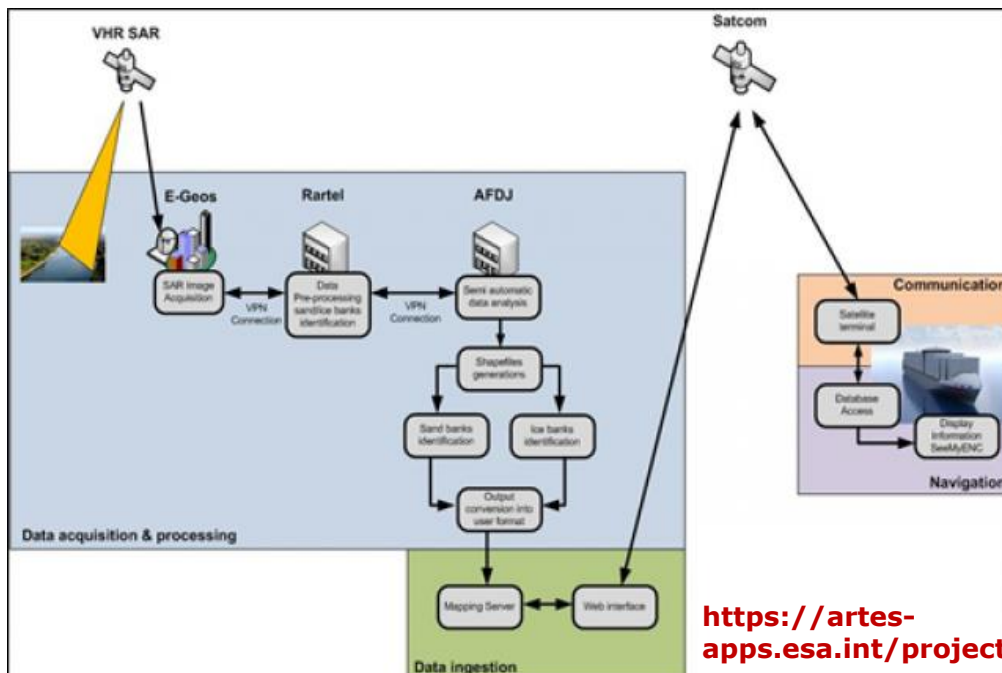
SAFERDANUBE Satellite Assistance for Danube Navigation

SAFERDANUBE is an ESA IAP demonstration project led by Rartel S.A. (RO), in conjunction with e-geos(IT).

Navigation on the Danube River is limited by the presence of sand banks(dry periods) and ice banks(winter), phenomena which impact navigation safety and continuity and effectiveness of goods and passengers' transport operations.
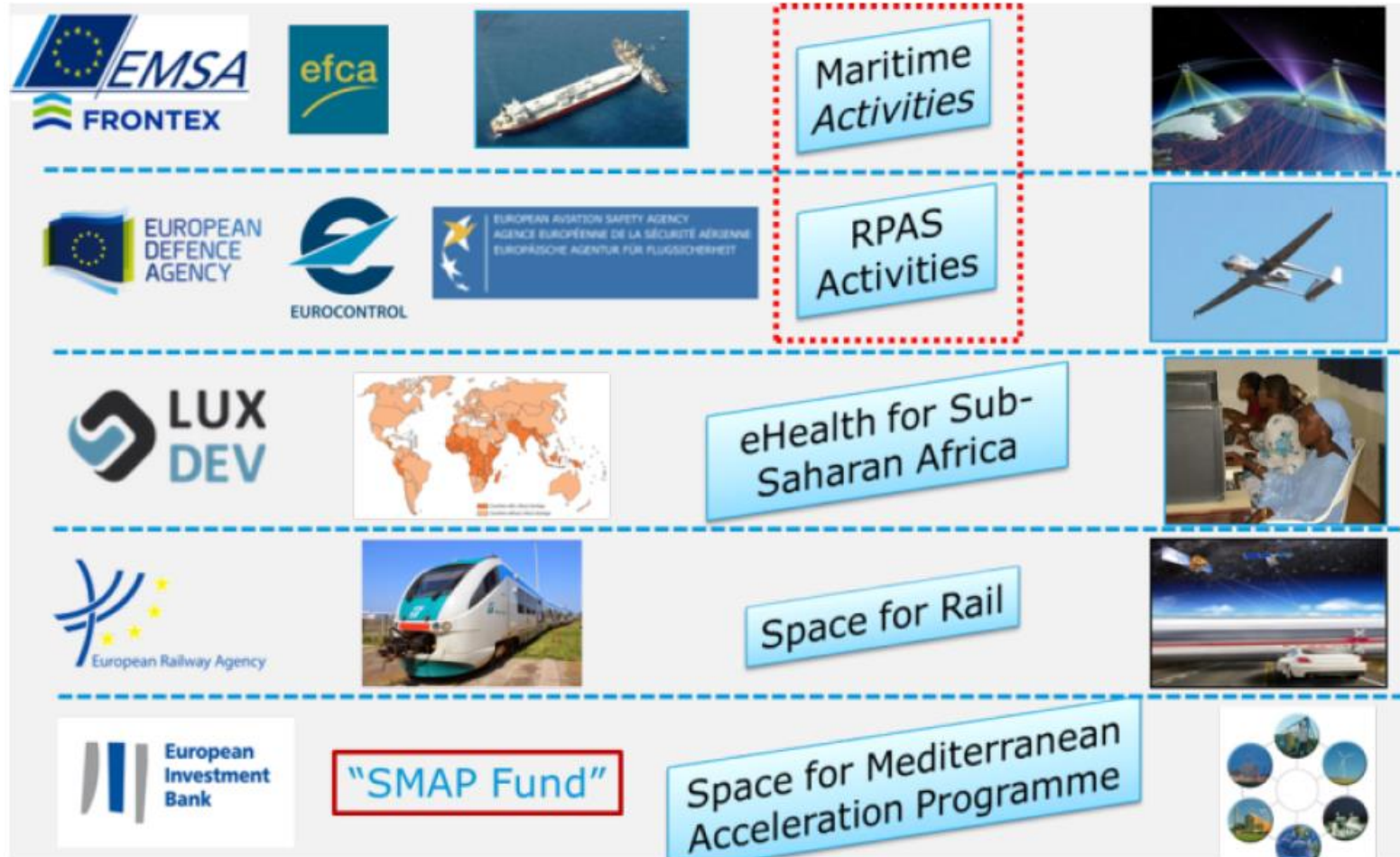
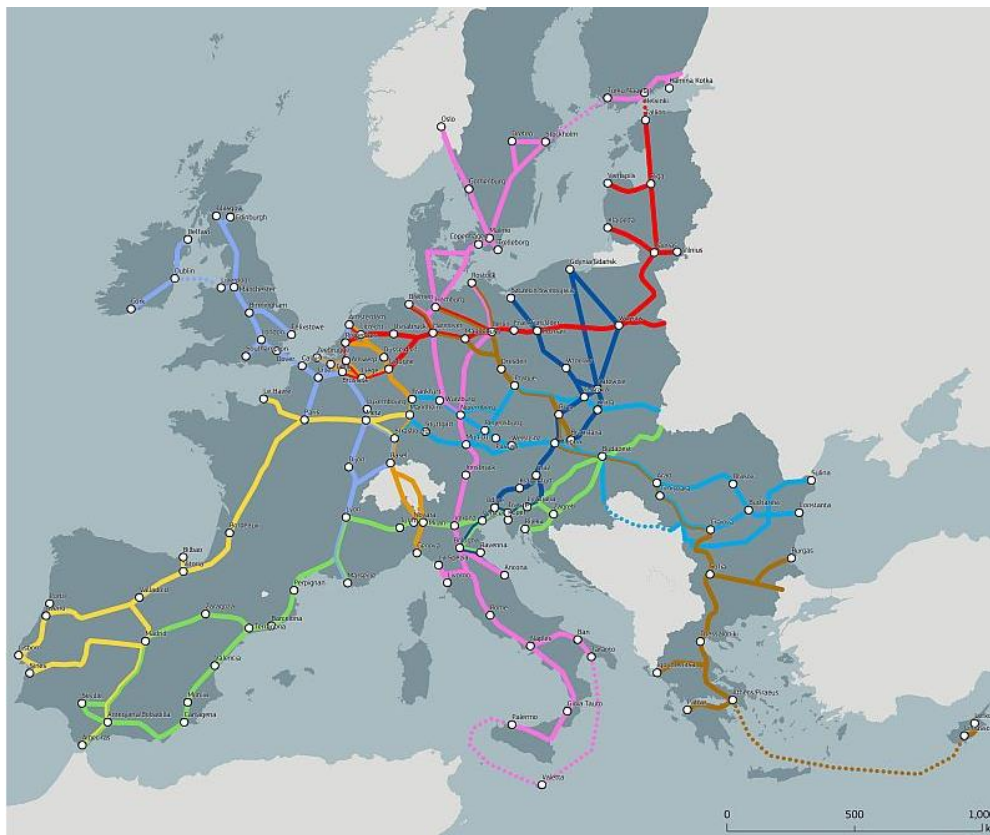SAFERDANUBE service will help the Romanian River Administration of the Lower Danube (AFDJ) in improving safety and fluency of the naval traffic during the winter and summer periods.

https://artes-apps.esa.int/projects/saferdanube

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What we can also bring

European Commission - INEA

INNOVATION AND NETWORKS EXECUTIVE AGENCY

INEA

INEA develops the European transport infrastructure policy supporting the 9 TEN-T corridors with following objectives:

- remove bottlenecks
- build missing cross-border connections
- promote modal integration and interoperability
- integrate rail freight corridors
- Promote clean fuel
- Promote innovative transport solutions
- Develop advancing telematics applications for efficient infrastructure use
- integrate urban areas into the TEN-T
- enhance safety

ESA

Support the development of the space component

Final considerations

IAP could address the "Port of the Future" challenges by:

➢ Supporting the development and demonstration of services based on the integration of space and terrestrial assets

➢ Providing experience and lessons learned from past projects in the transport sector

➢ Developing new partnerships

➢ Support industrial actors to reach export markets (e.g. MENA region through SMAP)

➢ Complementing existing mechanisms (INEA)

➢ Collaborating in existing projects for specific space related aspects

Let's innovate together and collaborate