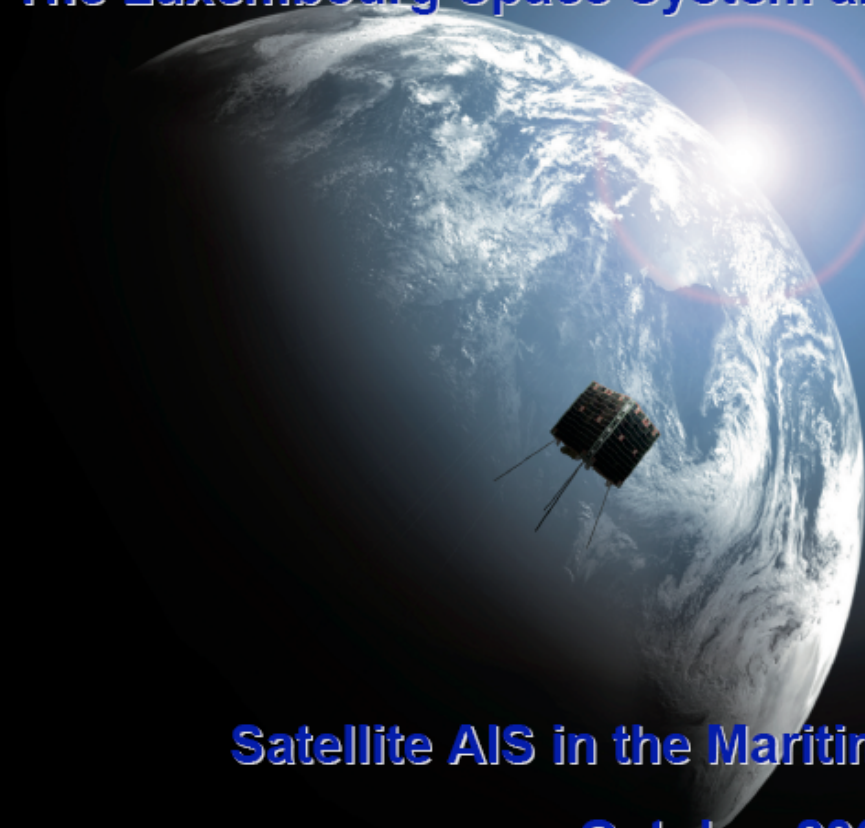


LUXSPACE Sarl

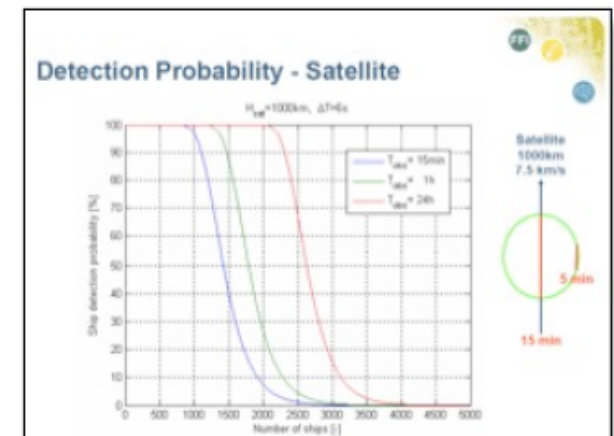
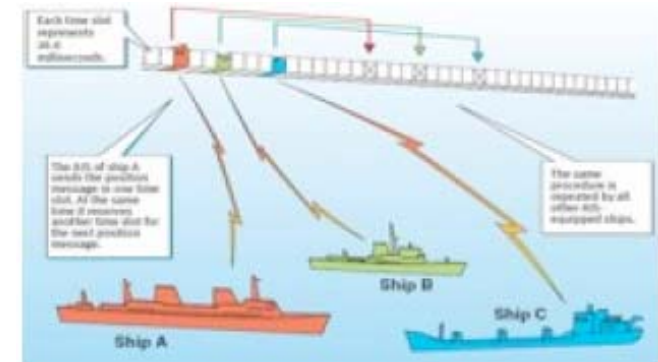
The Luxembourg Space System and Application Company



Satellite AIS in the Maritime Environment

October 2009

- AIS is a globally available, mandatory and thus unique information source of each sea going vessel above 299 GRT including MMSI, name, position, speed, direction, cargo type, port of destination (in total 28 parameters), which are sent every few seconds to minutes
- AIS is a radio transmission in VHF band and can be received openly by vessels, coastal stations (reach 25-60 nm) as well as aircrafts, helicopters and SATELLITES
- AIS can be received from space using relatively simple receiver technology with very low power and data transmission demand - and thus only requires micro satellite platforms of 30 kg
- Major challenge for SATAIS is the collision of signals as the satellite sees several thousands of cells at the same time and vessels may send their signal at the same time in the same frequency.



- The company is working on SATAIS since 2006
- Starting with simulations on maximum decoding, development of decollision systems as well as antenna and receiver designs
- Testing of SATAIS data on global scale, airborne campaigns
- Today, LuxSpace has developed
 - The 1st and 2nd generation SATAIS receivers
 - Some highly advance decoding and decollision algorithms
 - A ground segment to acquire, store and disseminate SATAIS data from different sources
- The company is working on several products and services with European partners and customers using either SATAIS alone or in combination with other sources

Third Party SATAIS Space Assets



■ Orbcomm AIS

- CDS: Coast Guard Demonstration satellite ready for launch (date: march 2008), equipped with AIS receivers, prime OHB System, Payload OSC
- QUICKLAUNCH: Six satellites, all equipped with AIS receiver, prime OHB System, Payload OSC,
- **AIS data for European Users available through LuxSpace to European Customers on global scale on a commercial basis**

■ LuxSpace Payloads on Third Party Missions

- VENTA 1 (Latvia): LuxSpace 1st generation SATAIS receiver with assumed launch of micro satellite of 15 kg weight in 2010
- MAX VALLIER (Italy/Germany): LuxSpace 1st generation SATAIS receiver with assumed launch of micro satellite of 25 kg weight in 2010
- TNS-2 (Russia): LuxSpace 1st generation SATAIS receiver with assumed launch of micro satellite of 15 kg weight in 2010
- PROBA V (Belgium): LuxSpace 2nd generation SATAIS receiver with assumed launch in 2012/13
- Further piggy-back launches under discussion



LuxSpace SATAIS Space Assets



■ PSLV AIS

- 1st generation SATAIS receiver on board of PSLV upper stage
- Launch in end of September 2009 (1-2 years of operation possible)
- Sampling data of 60s or up to 50.000 messages per orbit available for download to REDU G/S

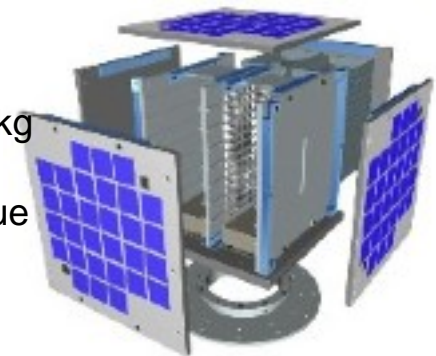
■ LUXAIS / COLAIS

- LuxSpace 2nd generation SATAIS receiver on board of ISS (International Space Station)
- Launch with H-ATV in early September successful
- Start of operations in early 2010 up to end of 2012
- Specific advantages are low orbit height (400 km) and large amount of available sampling data (1 h per orbit)



■ AISCOM

- Design, development, manufacturing of three micro satellites with 30 kg each
- Advanced receiver and antenna concept (2-3 polarizations) with unique spoofing and jamming detection capabilities
- Assumed launch in 2011

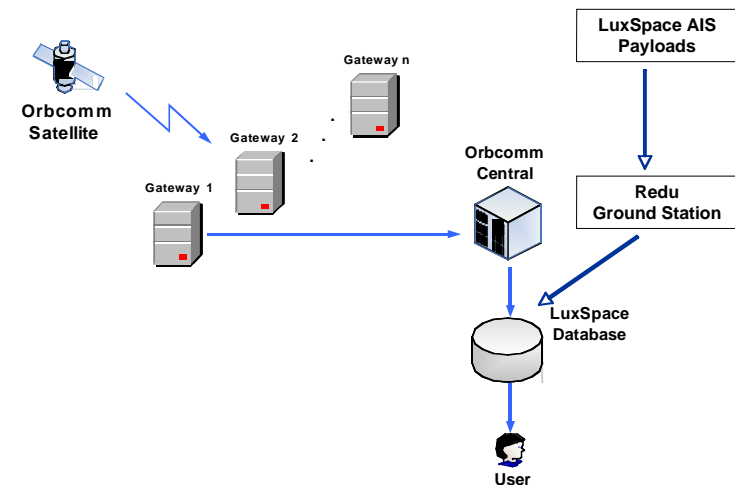


- **Assuming all assets in place a refreshment of 2-4 hours can be guaranteed on global scale**

LuxSpace SATAIS Ground Assets



- LuxSpace, in cooperation with SES, has implemented a **ground station** at REDU (Belgium) for:
 - Receiving AIS data from PSLV
 - Calibration of all SATAIS receivers (uplink of simulated AIS etc.)
- A comprehensive **acquisition, archiving and dissemination infrastructure** has been implemented
 - Implementation of several user interfaces
 - Rapid dissemination of SATAIS data to customers or user access to web interface



AIS Data Interface

LuxSpace Site Fullscreen Logout Help Suggestions

Select the search parameters:

Time interval
Starting point
End point

Area of interest (Decimal Degrees)
Region Id (see profile)
Lat. lower left corner
Long. lower left corner
Lat. upper right corner
Long. upper right corner

User ID (PSS)
Vessel Class
Ship and Cargo Type
Origin of the Vessel
Navigational Status
Speed over Ground

Save search selection? ☐ Yes ☐ No
If yes, specify a name:

Select the display parameters:

☐ Navigational Status
☐ Rate of Turn
☐ Speed over Ground
☐ Latitude
☐ Longitude
☐ Course over Ground
☐ Time Stamp
☐ IMO Number
☐ Vessel Name
☐ Ship and Cargo Type
☐ Estimated Time of Arrival
☐ Maximum present static draught
☐ Destination

User options:

View user profile
View user selections

Users selections:
Region: Select
Delete

User profile

Region ID	Lat. Bc (°)	Long. Bc (°)	Lat. urc (°)	Long. urc (°)	Ship Class	Ship & Cargo Type	Vessel Origin
1	-10	-20	35	10	AI	Passenger ships, Cargo ships, Tankers	Europe, Asia, Africa - Atlantic

Submit

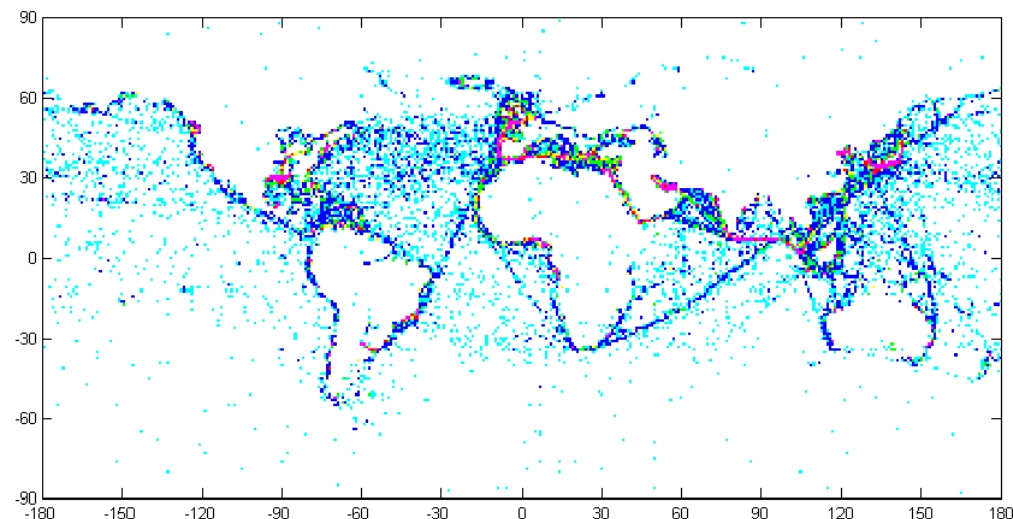
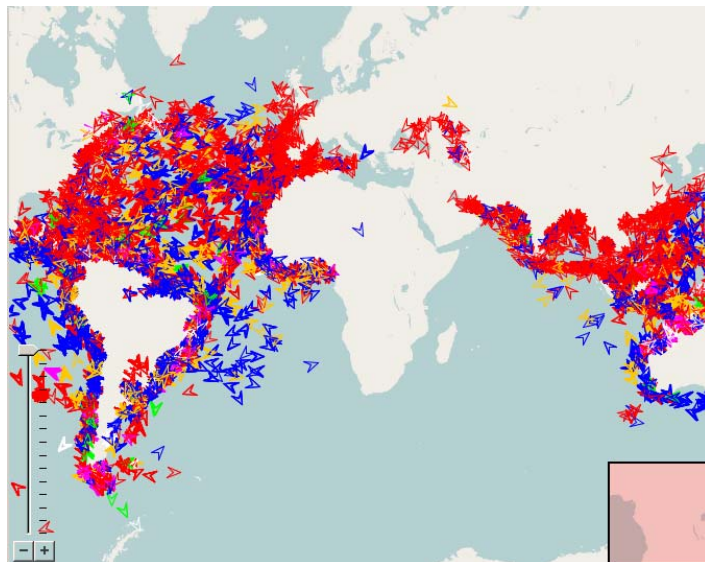
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SATAIS World Coverage

24th November 2008 / 18:00:00-24:00:00

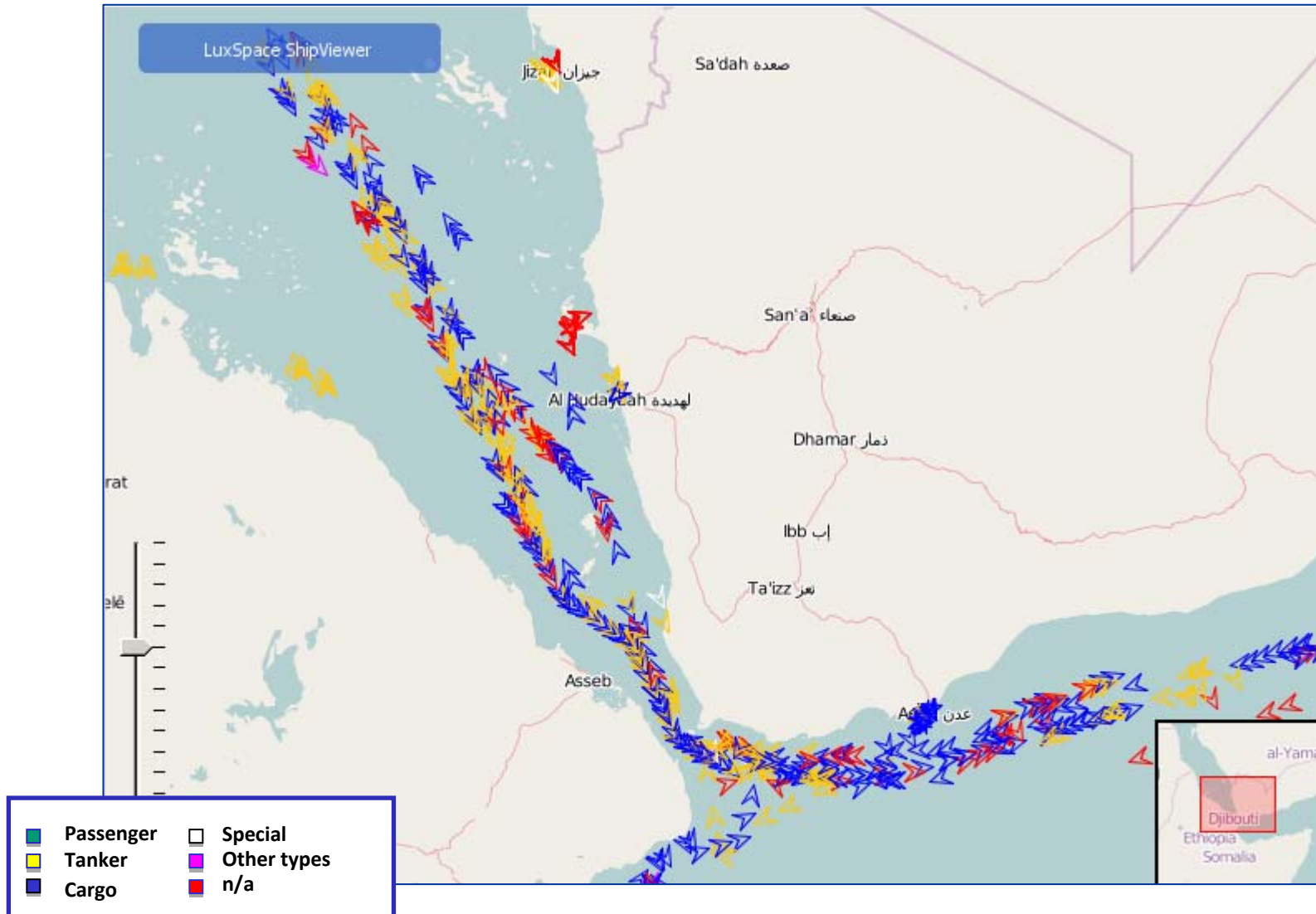
(Orbcomm AIS)



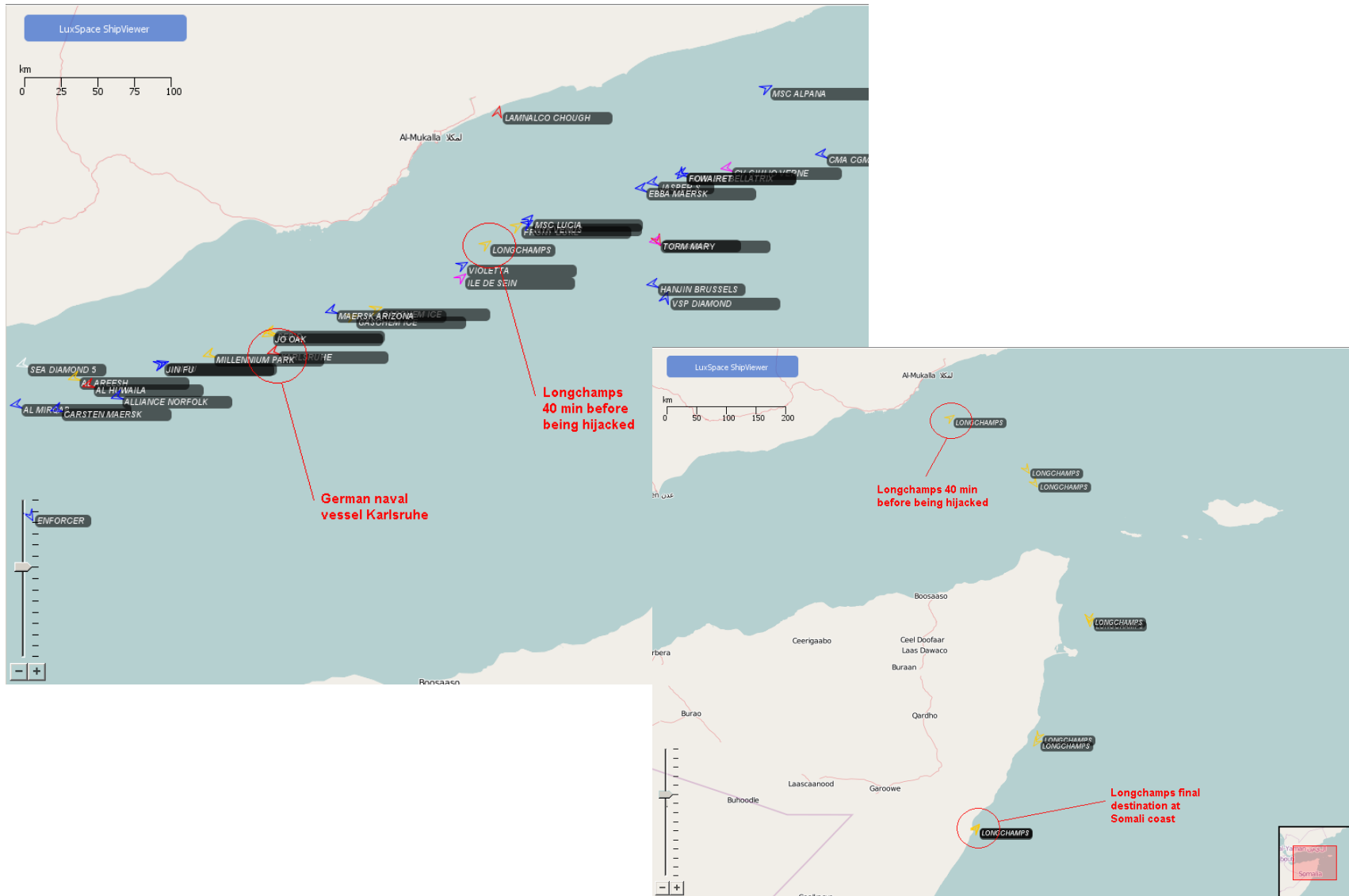
1 Ship from 1 to 5 Ships from 5 to 10 ships from 10 to 15 ships from 15 to 20 ships more than 20 ships

Ship Density based on Orbcomm AIS data
Grid Cell 1°*1°

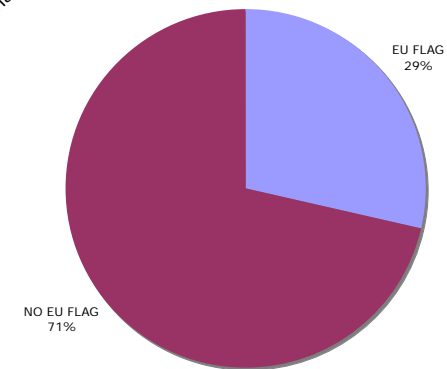
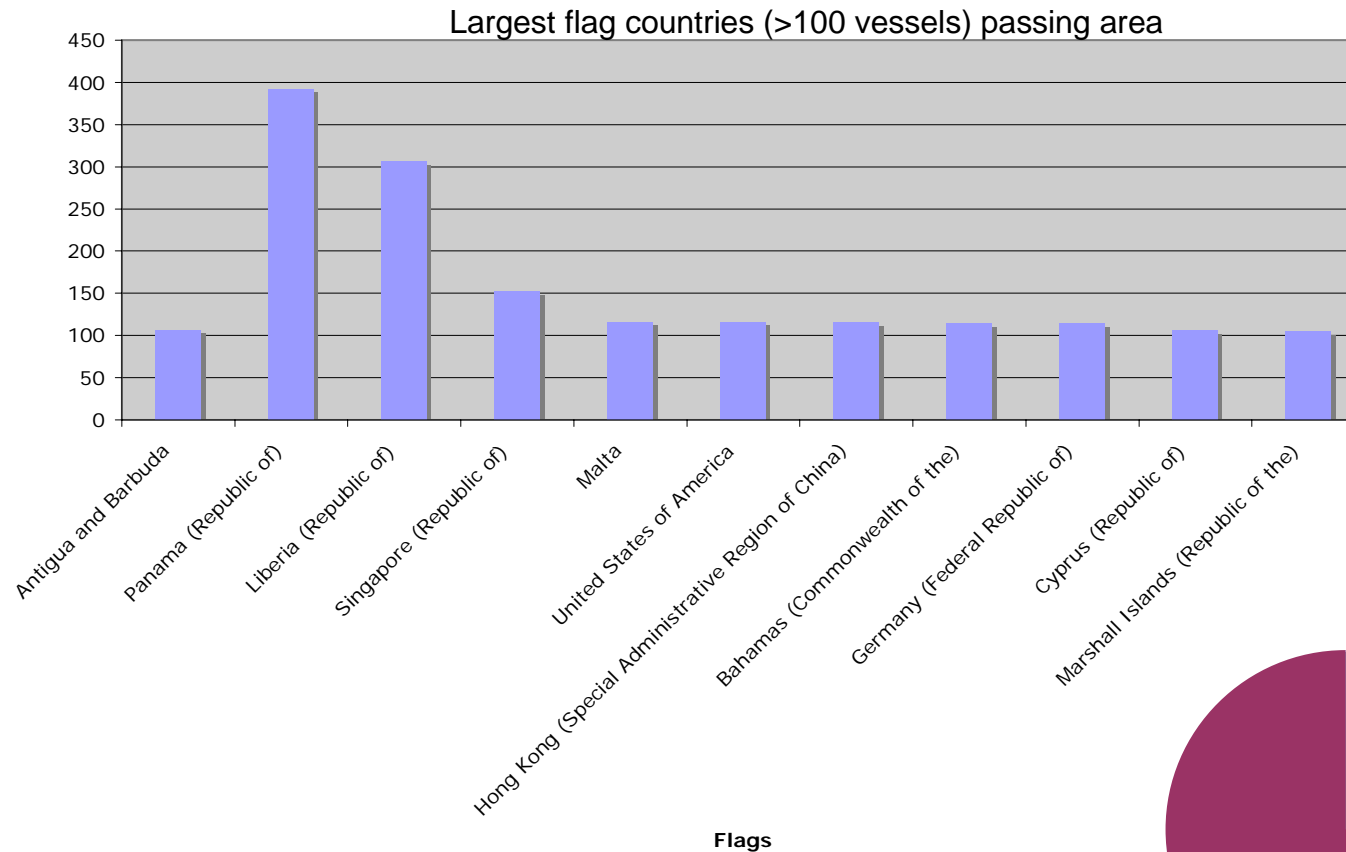
Horn of Africa 13-01-2009



HIJACKED “LONGCHAMP”



Gulf of Aden Vessel Statistics January 2009



„POMPEI”



- Request of DG MARE based on information demand of Belgium Crisis Centre, having lost the vessel POMPEI and asking for latest position at 14:00 on April 21, 2009
- Delivery of latest vessel position by LuxSpace at 16:00 (captured at 7:00 of the same day)
- Request for vessel track of the past days at 19:00 of 21 April
- First information available at 22:00 on 21 April
- Second information with final anchor place (4:56) on April 22 at 23:00

Ship was hijacked 700 nm off Somalia coast and 100 nm from destination (Port Victoria / Seychelle Islands)

- Launch and operation of more SATAIS space assets
- Development of tools specifically dedicated to the tracking of anomalies (first project on-going with technologies taken from aircraft monitoring)
- Development of a X/S band naval radar tracking system in space on-going with launch of first satellite in 2012/2013
- Development of a real-time video satellite on-going

- SATAIS is a highly useful and cost efficient tool to monitor global vessel traffic and several space assets will be available in the upcoming years to offer a comprehensive service:
 - LuxSpace is able to deliver SATAIS data today using Orbcomm AIS either as streamed data with an approximate delay of one hour or deferred (non-real time)
 - In 2010, LuxSpace will operate five additional SATAIS payloads in space leading to an average refreshment rate of 4-6 hours
 - In 2011, LuxSpace will add three further satellites with unique detection capabilities as well as several other payloads on third party satellites leading to a **refreshment rate of 2-3 hours**
 - Current detection rate with Orbcomm depending on geographic area and ranging from 0% (Baltic Sea) to 80% (low density areas)
 - Assumed detection rate with LuxSpace AISCOM satellites in the order of 80-90%
- Combining SATAIS with EO and other sources brings some definite advantages (MARISS experience) and shows complementarity of sources
 - SATAIS for wide area and baseline coverage
 - EO for small area combined coverage to also extract those vessels not having (switched on) their AIS