

**IMPROVED PORT EFFICIENCY AND SAFETY USING A NOVEL
WIRELESS NETWORK AND DIFFERENTIAL GLOBAL NAVIGATION
SATELLITE SYSTEM PROVIDING ENHANCED VESSEL
NAVIGATION**

Nereus Workshop

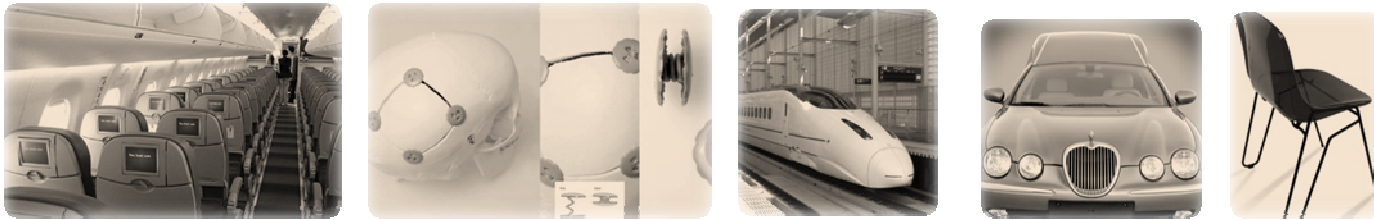


Pepa Sedo

Venice, 16 April 2012



- The Aerospace Research and Technology Centre (CTAE) is a non-profit foundation set up in 2005 by Academia, Government and Industry in the region of Catalonia (Spain) aiming to enhance industrial competitiveness and promote innovation by providing research and technological developments services based on aerospace technologies.



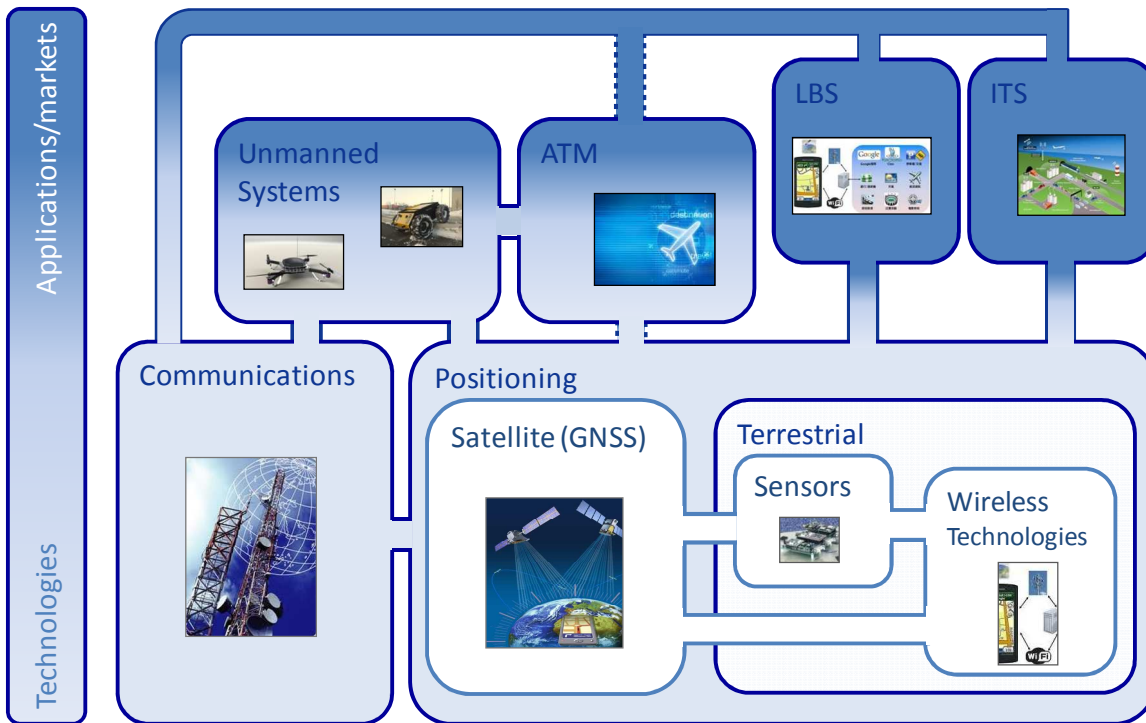
- Early this year, CTAE has been integrated into ASCAMM foundation, a leading private, non-profit organization specialised in design and production technologies, which has been developing its activities for almost 25 years in:

- Industrial R&D
- Technical Assistance
- Knowledge Transfer





accuracy aerospace aircraft applications atm available
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- Project presentation
- Requirements
- Architecture
- Positioning subsystem

- The aim of DockingAssist is to develop a cost-effective location system, providing the necessary centimeter positioning/speed accuracy, but covering the complete port zone, to provide efficient and safe maneuvering within the entire port area enhancing vessel trajectory, and providing constant monitoring for moored/docked vessels.
- This solution will result in:
 - improved port traffic management (reduction in transit time),
 - a reduction in operating expenses,
 - CO2 emissions and fuel usage (reduce the environmental impact of shipping)
 - The time reduction in transit will increase throughput in European ports with a minimum investment.



Participants:

- **CRIC, RTD Performer and coordinator**
- MARIMATECH AS, SME Denmark
- NET TECHNOLOGIES, SME Greece
- PRODEVELOP, SME Spain
- RUNCOM TECHNOLOGIES LTD, SME Israel
- Port of Cork, end-users Ireland
- Centre de Tecnologia Aeroespacial, RTD Performer Spain
- TEKNOLOGIAN TUTKIMUSKESKUS VTT, RTD Performer Finland

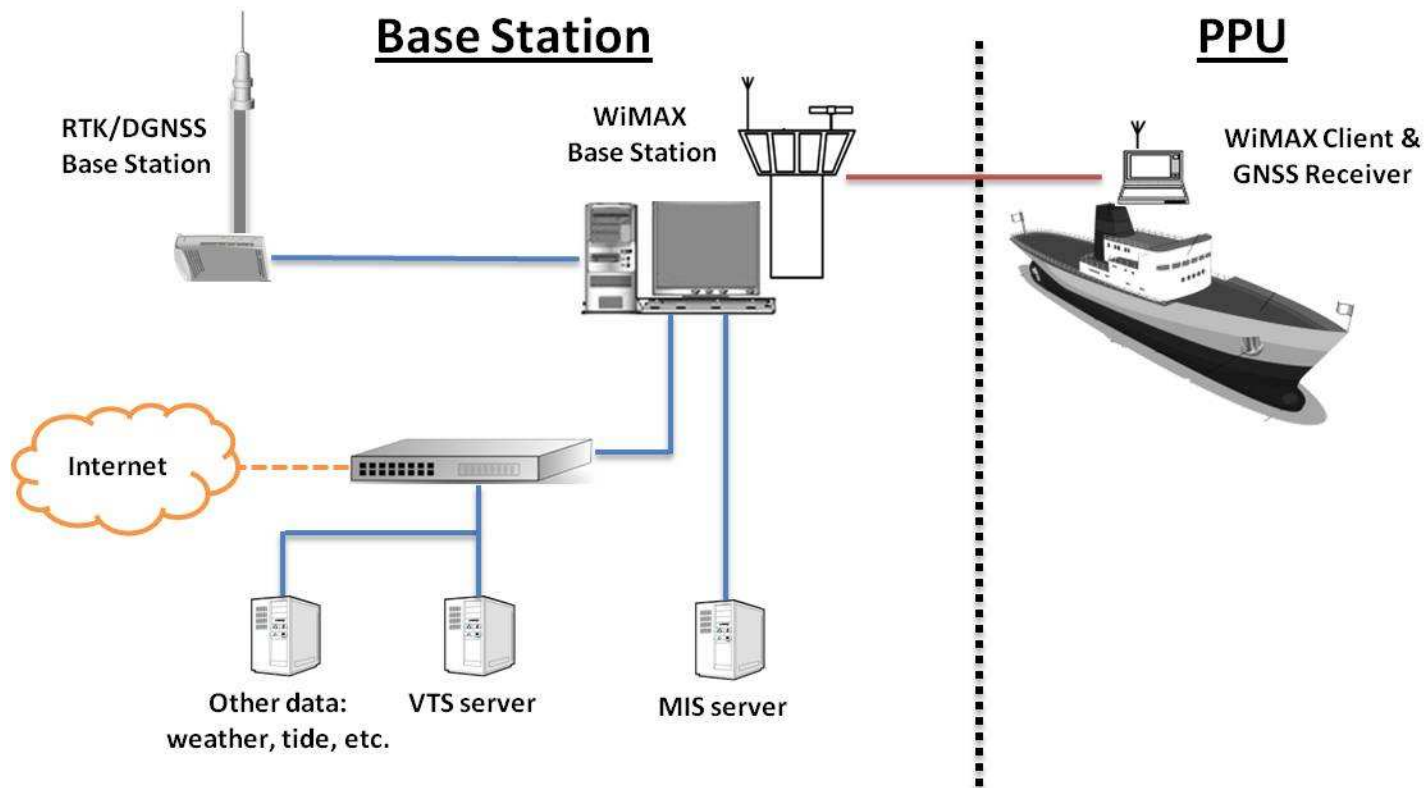


Duration: 2 years
 Research on the Benefit of the SME
 Start date: November 2011

Conclusions from the surveyed Ports, for system design:

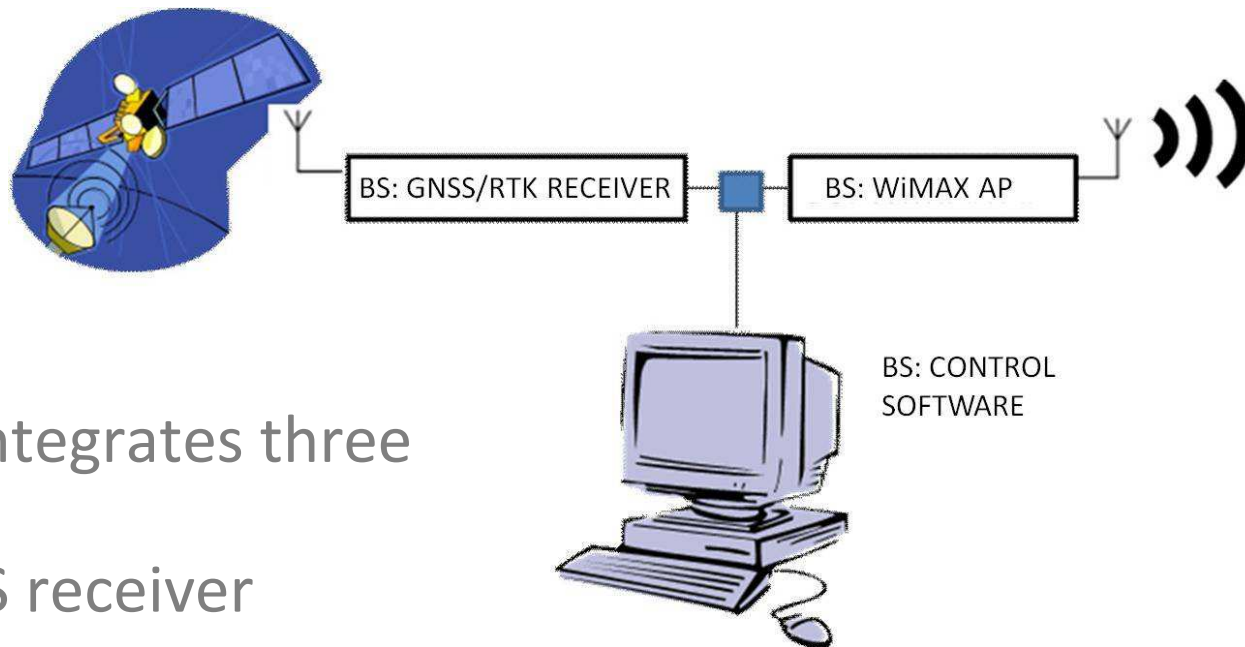
- There are more than 40% of the surveyed Ports which are not equipped with any vessel positioning system.
- There are 22% of the surveyed Ports which indicate that the current vessel positioning systems they use are not enough for their operations.
- There are more than 75% of the surveyed Ports which are not using PPU for the pilots.
- The most popular software integrated by the PPU are AIS and VTS.
- The most popular RF channels used by current docking/berthing equipments are VHF and UHF channels.
- Apart from having a good accuracy in vessel positioning, transmitting weather conditions, ship specific information, real-time tidal data, transversal velocity and rate of turn data to the PPU should be incorporated in the DOCKINGASSIST system.

Considering all the feedbacks of this online survey, the DOCKINGASSIST system would be an exciting product for current and future docking/mooring applications, since it will support dozens of users and it will cover the entire navigation port area by WiMAX network.



The overall architecture is mainly composed of the base station, a PPU and the corresponding communication networks.

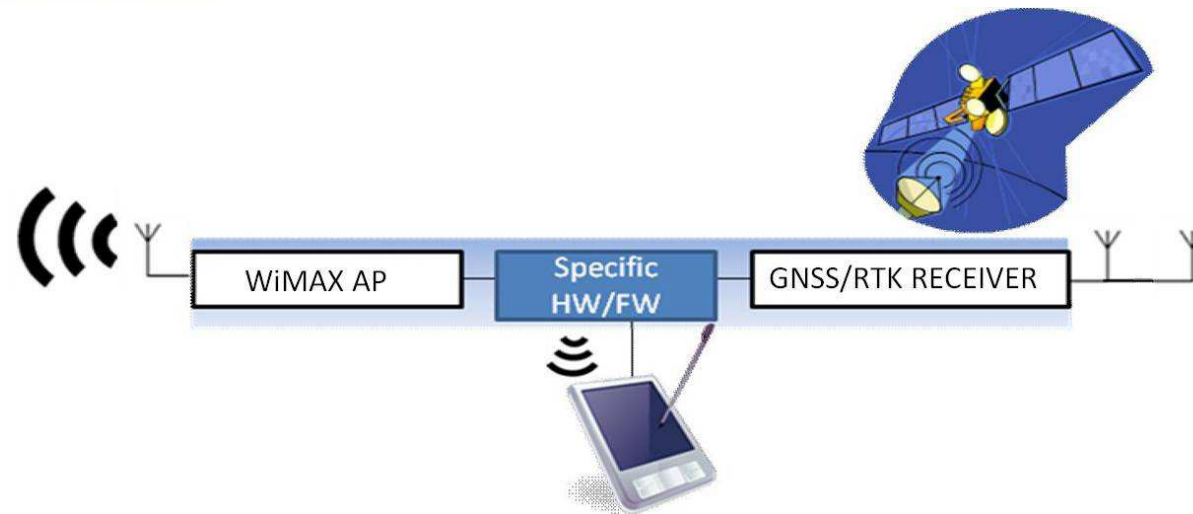
- **Base Station:** a shore server providing the centralised data base and transmitting the necessary information and RTK/GNSS correction data to the PPU. The base station is designed by integrating the RTK/DGNSS receiver, WiMAX AP, the PC control software and necessary services from VTS, MIS, etc.
- **PPU:** onboard unit to collect the information from the GNSS receiver and the WiMAX AP. The PPU system includes one GNSS receiver with two antennas to acquire the heading, one WiMAX node and its corresponding software.
- **Communication Networks:**
 - WiMAX (connection between Port and PPU)
 - WiFi (connection between PPU and laptop)



Base station integrates three elements

- The RTK GNSS receiver
- The WiMAX AP
- The PC control software





- A **portable unit** will be installed on the ship mainly composed of a **GNSS/RTK receiver** and a **WiMAX node** to receive the corrections from the harbour. A specific embedded hardware/firmware will be developed in order to integrate the software. The structure of the PPU is similar to the Base station one since it includes one GNSS/RTK receiver, but the PPU has two antennas to acquire the heading, one WiMAX node, and its corresponding software.



Overview of the positioning requirements

Parameter	Requirement	Comments
Position accuracy *	20 cm (in dynamic measurements)	Different versions with different accuracies and prices could be exploited.
Bow and stern speed	1 cm/sec	same as above
Heading accuracy	0.1 degrees	same as above
Rate of turn (ROT)	0.1 deg/min	same as above
GNSS RF bands	Dual band	Two bands are needed for dual frequency measurements.



- We have seen that there is a little difference in price from receivers of several manufacturers. Thus, we have selected those providing a better performance in terms of weight and power consumption. Both base station receiver and rover receiver are a TRIMBLE one, belonging to the BD982 series
- Galileo satellites cannot be used yet for RTK positioning, trying to find a way for its evaluation

Thank you

For more information, please visit us at www.ctae.org

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