



SMART BUOY SYSTEM

WP 4.0 e-NAV Services

WP 4.5 Smart Buoy Service

Marek Ledóchowski

Marek Dziewicki

Maritime Office in Gdynia, Poland

PRESENTATION PLAN

- 1 Short reminder of SMB idea & functionality
- 2 What has been done WP 4.5
 - Discussions and stake holder interviews
 - Internet Questionnaire
 - Traffic analysis
 - SMB concept & user requirements
 - Technical project
- 3 Modules integration and prototype design
- 4 Laboratory tests
- 5 Future expectations



SMB CONCEPT

01. WHAT IS THE **SMART BUOY SYSTEM** AND WHAT DOES IT REALLY MEAN?

Smart Buoy System is an autonomous system consisting of the different electronic modules with dedicated software for managing operation of Aids to Navigation from enhancing functionality perspective.

02. WHAT IS THE PURPOSE OF THE **SMART BUOY SYSTEM**?

Main navigation and general purpose of Smart Buoy System is to implement enhanced features of Aids to Navigation for only necessary time the ships really need. This enables to save significantly energy consumption of enhanced/additional Aids to Navigation.

03. HOW DOES THE **SMART BUOY SYSTEM** WORK AND WHAT IS ITS POTENTIAL?

First of all, Smart Buoy System must detect the ship (by AIS signal and dynamic parameters (defined on statistical bases) entering previously created and predefined area.

When the ship is detected, the system triggers enhanced/additional Aids to Navigation for dedicated time (for example high power lantern or radar enhancer).





ABOUT SMB

SMB buoy provides near-real time H-M information in support of vessel navigation and local operations within approach to the port.

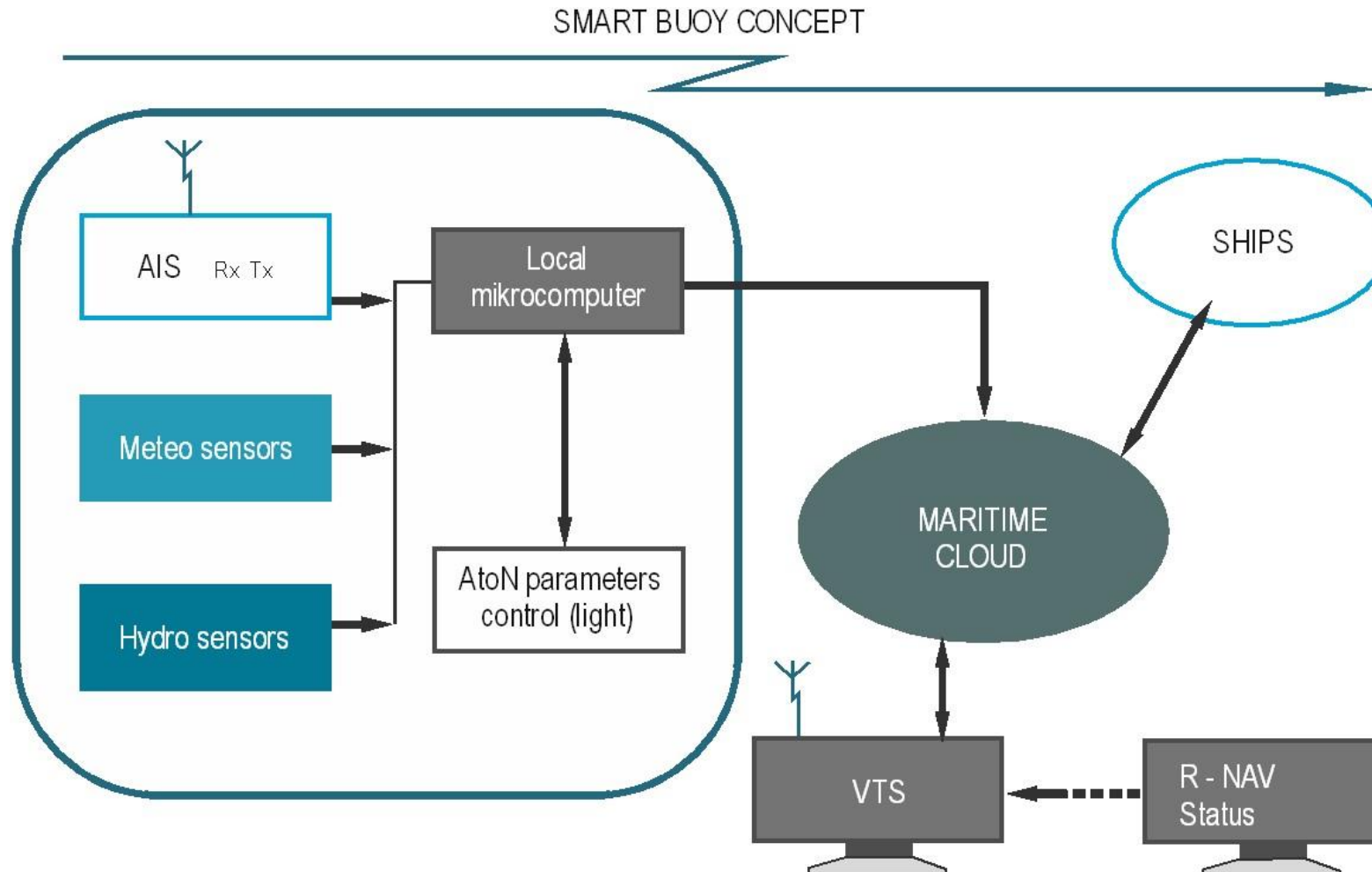
SMB can calculate which ships will for sure enter the port and based on this analysis can optimize own functionality AtoN (light/ radar/text message).

Due to multi-mode connectivity **SMB** can automatically serve for Maritime Cloud registry.

SMB can interact with local VTS and/or Port Authority.

SMB CONCEPT

General description of the Smart Bouy



SMB REQUIREMENTS

Purpose of the questionnaire

01.

To investigate all groups of maritime stakeholders

02.

To ask for a need of real-time weather info

03.

To check the request of functionality

04.

To establish priority of suggested parameters

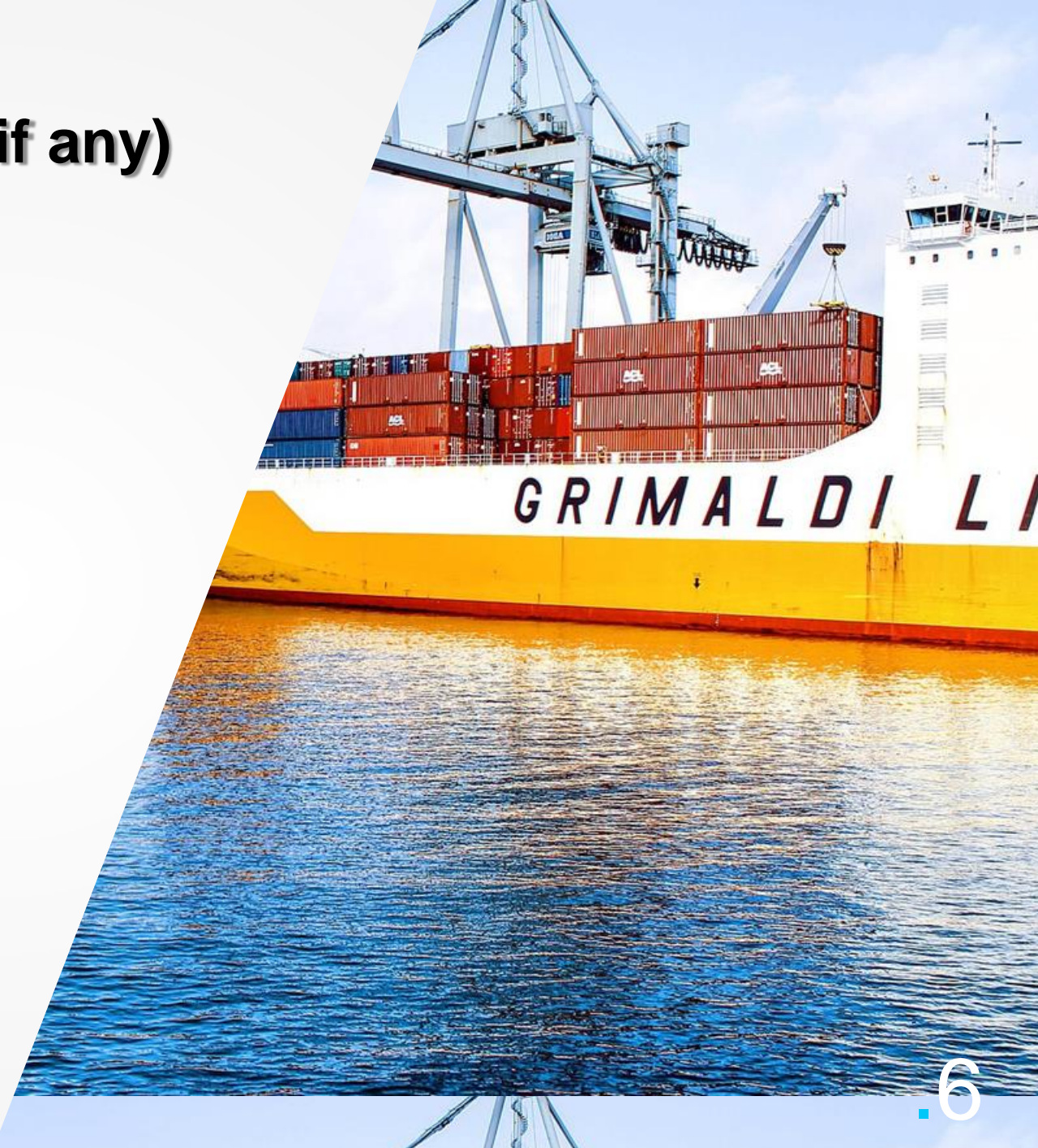
05.

To ask for recommended locations

Q1: What kind of functionality (if any) should the SMB have ?

* You can choose

- air parameters measurement, water parameters measurement, changing the light intensity, presenting data on display, radio-broadcasting of messages, , performing short range ship tracking, performing local traffic intensity analysis, keeping the VTS & port informed
- own position and light status checking, off position warning, navigational warnings re-transmission, changing own light characteristic.

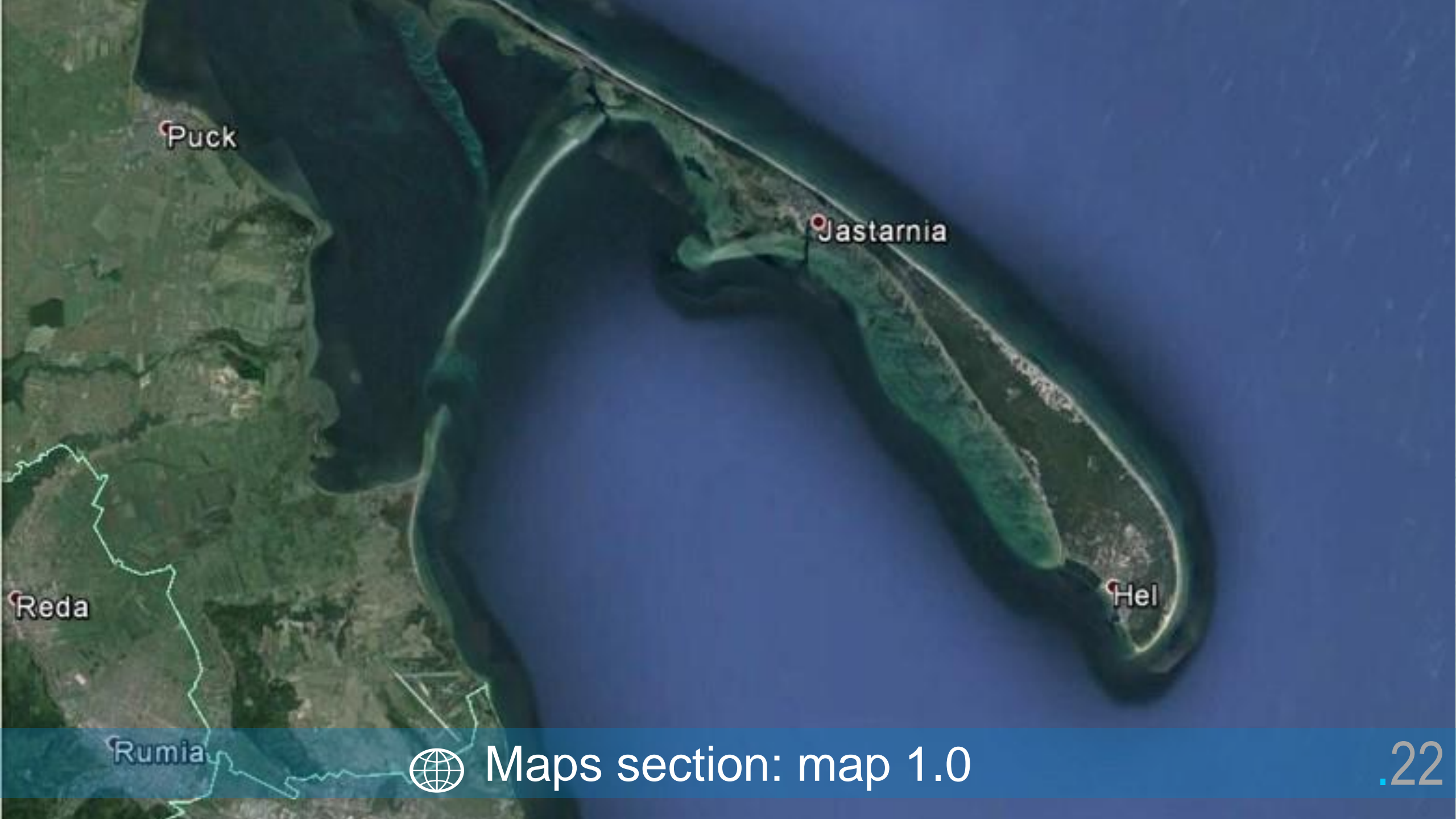


Survey results

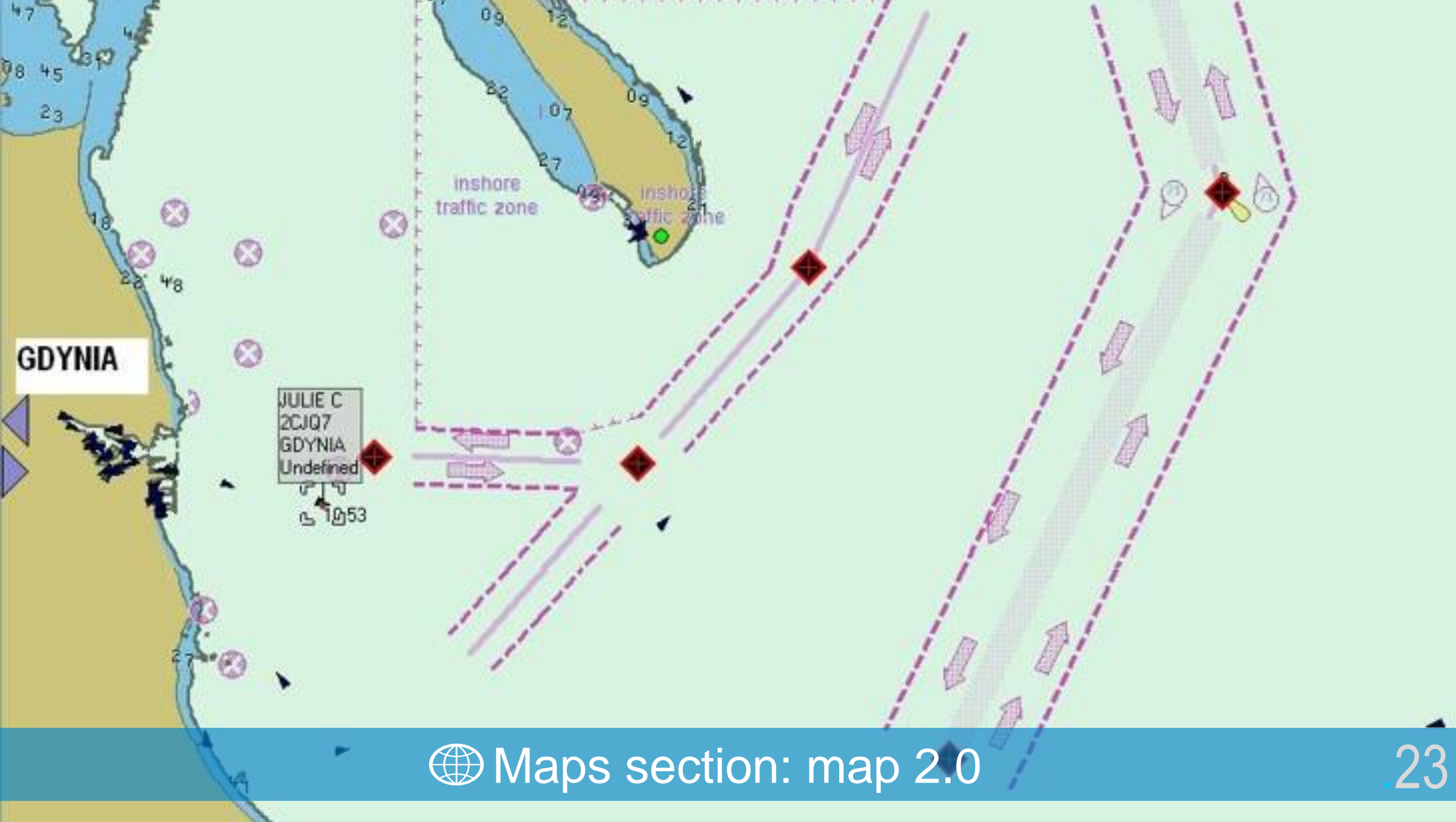
Analysis showed user interest in:

- 01.** Access to current local information of air and water parameters (mainly wind and current)
- 02.** Transferring this data via various means of communication including mobile apps
- 03.** VTS involvement in data information
- 04.** AIS use for data transmission
- 05.** Installation of such device/solution in the beginning or in the half of approaching channel



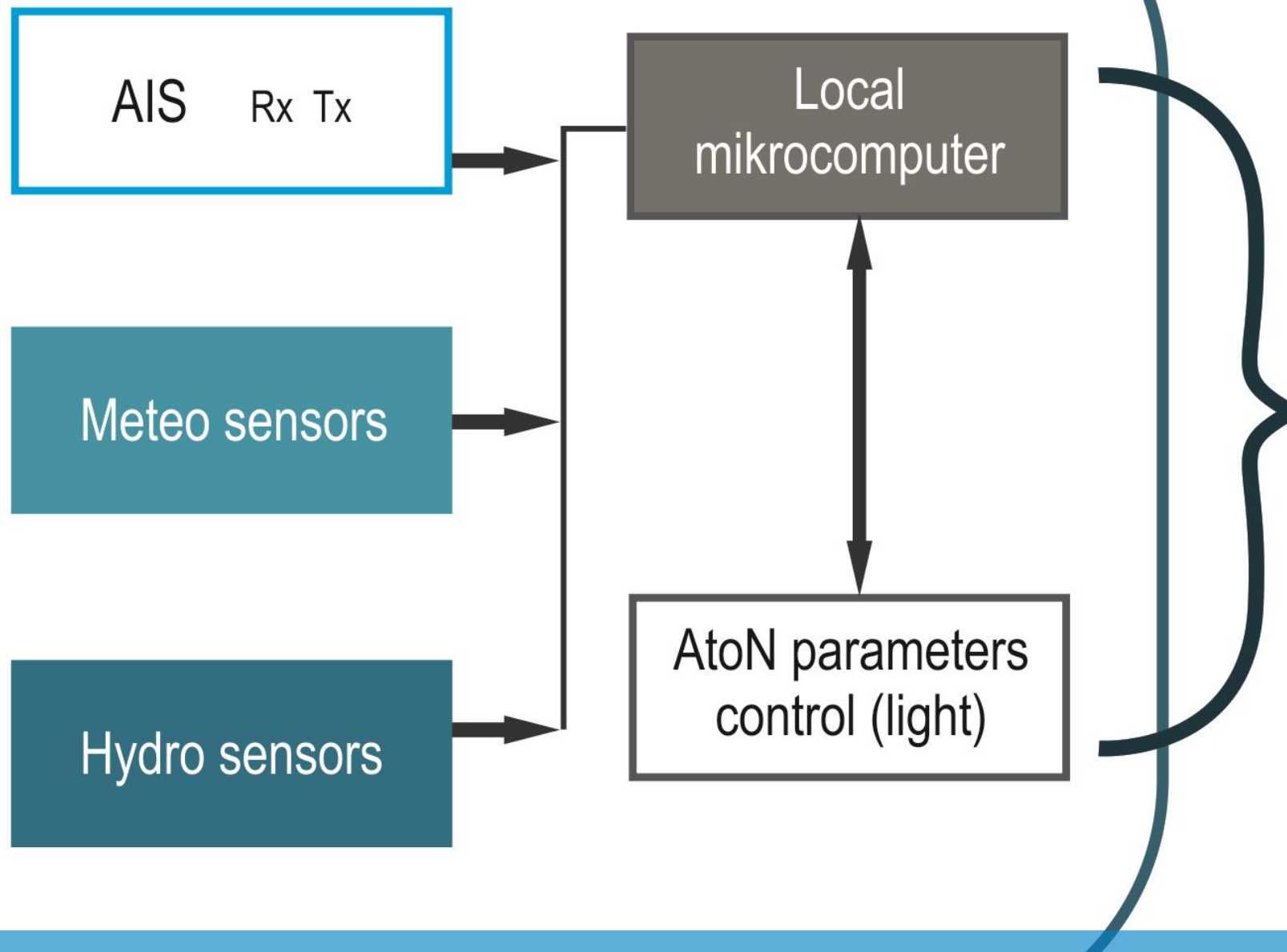


Maps section: map 1.0





24



Schema 2.0



TECHNICAL PROJECT

Primary focus

Technical project was focused on **definitions of internal and external functionalities**, such as:

- communication with ships AIS, land authorities by radio GSM, UHF, (AtoN admin, VTS service, via Maritime cxxCloud)
- **Internal logistics**, data conversion & management (conversion from external and autonomous sensors, AIS data, traffic analysis, hydro-meteo and text messages)
- **External equipment driving** (light on /off, light intensity, radar enhancer)
- **Low power consumption**



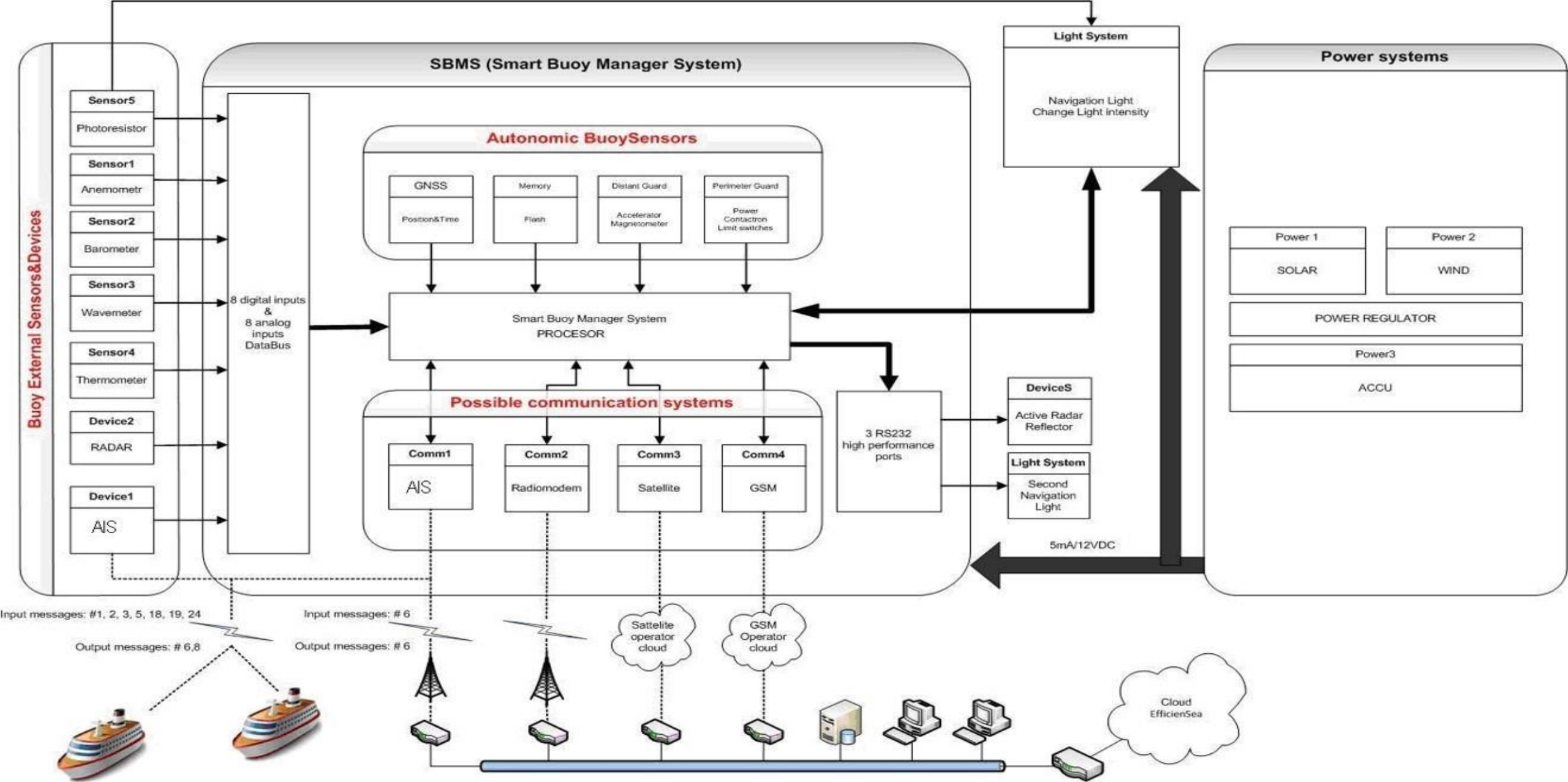
TECHNICAL PROJECT

Hardware: the SMB module

Basic SMB hardware included/includes (?) the following modules:

- **SMB Manager** based on low power microprocessor with GNSS receiver, RAM and accelerometer
- **Autonomic external** buoy Sensors and Devices
- **External Connectivity** (AIS, GSM, Sat Comm, Radiomodem)
- **Standard Interface**: for External and Internal Sensors and Devices
- **Supply**





SELECTED SMB MODULES FOR PROTOTYPE TESTS

Laboratory tests for individual modules' parameters

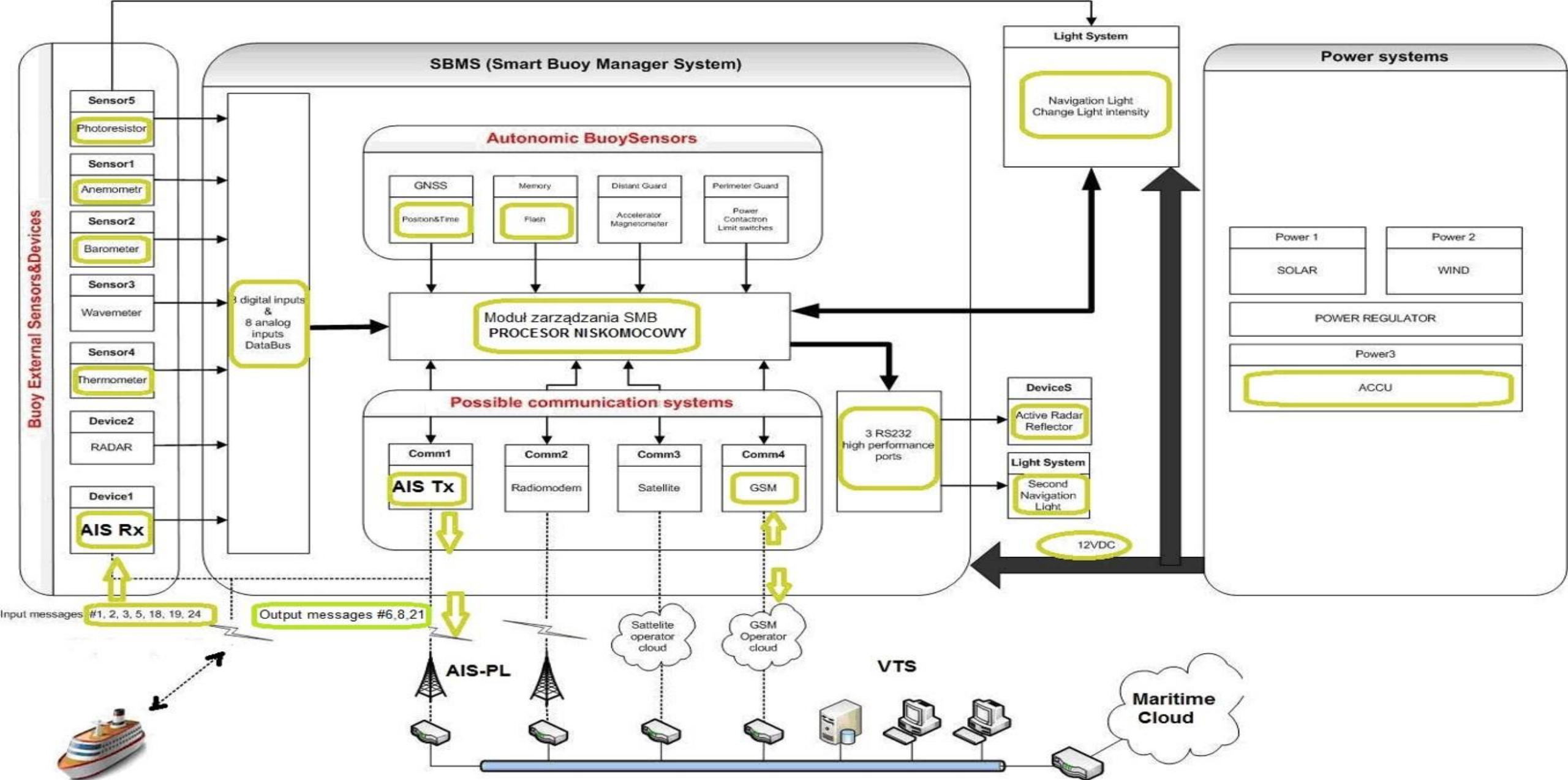


Functional tests of internal and external communication



Aspects of minimum power consumption in view of
green energy





Schema 4.0

SMB prototype will provide near-real time H-M information in support of vessel navigation and local operations while approaching to the port.

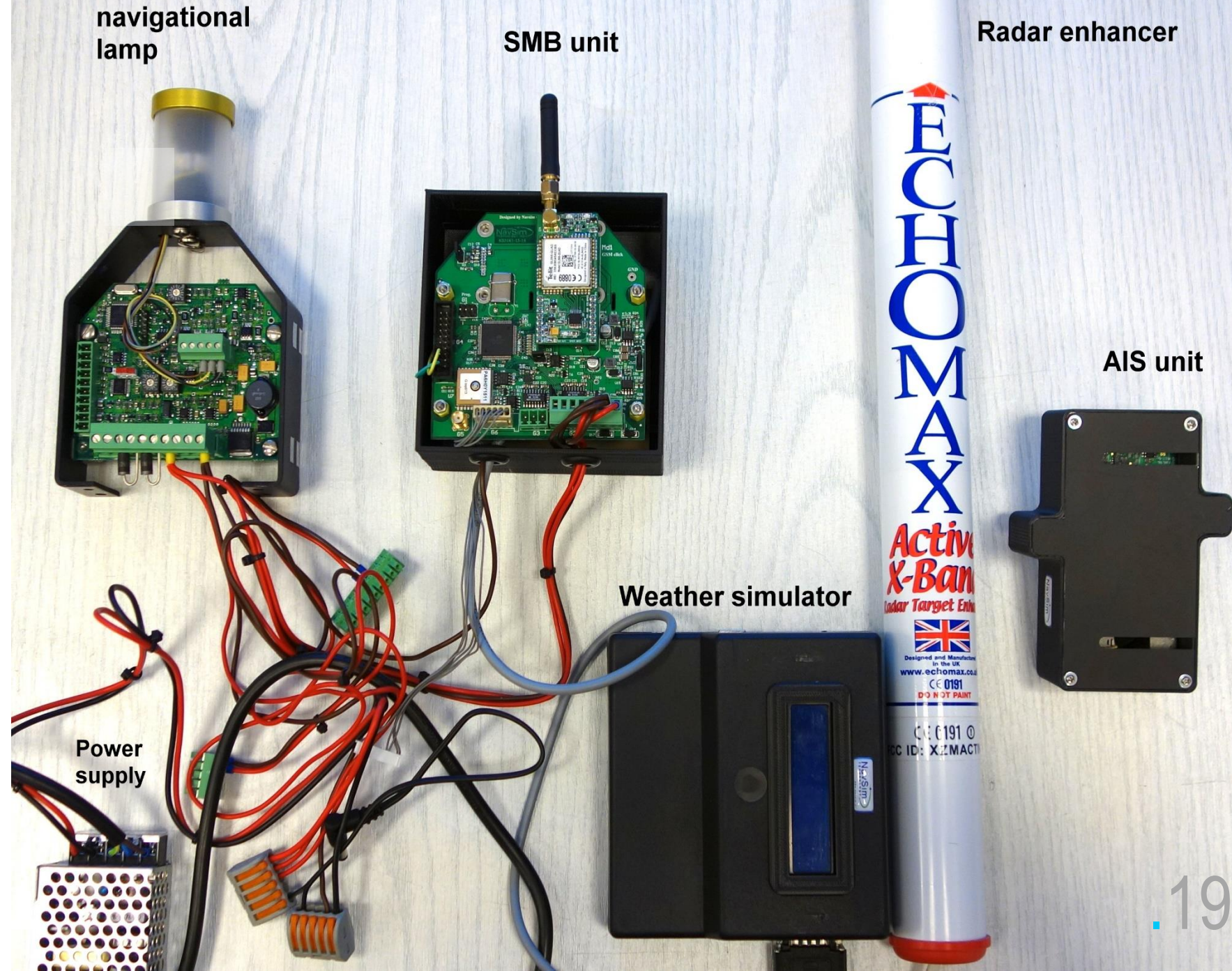
Due to multi-mode connectivity the **SMB** can automatically serve for Maritime Cloud registry.



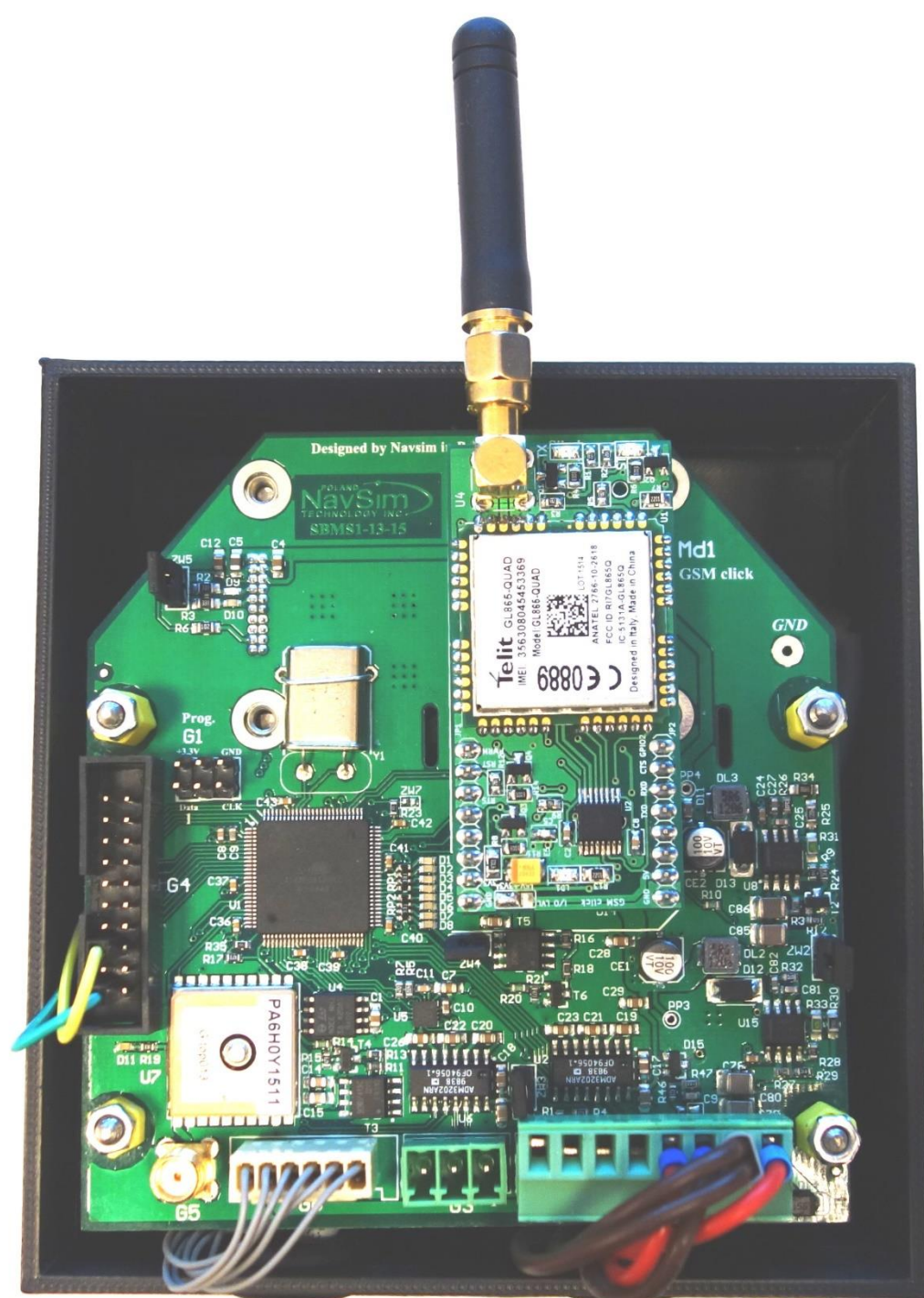
SMB can calculate which ship is going to enter the port and based on this analysis can optimize own functionality AtoN (light/ radar/text message).

SMB can interact with local VTS and/or Port Authority.

PROTOTYPE PRODUCTION PHASE- COMPONENTS



PROTOTYPE PRODUCTION PHASE- COMPONENTS



PROTOTYPE PRODUCTION PHASE- COMPONENTS

SBMS Configurator

System Registers Light AM6 GPS GSM AtoN Efficiency Time frames Storage

SMBS System name

Copyright

Serial number

Device ID


Device group

Synchronization time sec

System time UTC

Up time sec

Free RAM bytes



Laboratory tests of the SMB power consumption

	Parameter	Result	Comment
1	Test of common Power source	$\leq 30\text{mA}$	SBM sleep mode
2	Central processor and RAM - self test	OK	LED sequence blinking
3	External devices controls	Ok	Light intensity 0- 50- 100% or linear
4	Total Power cons. of all SMB components	50mA	Equal to 0,6W at 12V
5	mikroP board – power consumption	5 mA	(0,8 mA sleep mode)

PROTOTYPE

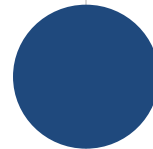
PRODUCTION

PHASE-OUTPUT
PARAMETERS

THE NEXT STEPS

2016

- 01. Completing hardware
- 02. Building system complying with technical project
- 03. Laboratory tests



01. Installation on the buoy

02. Marine test bed at Gdynia Port approaching channel

03. Draft of SMB recommendation for IALA

2017



SUMMARY OF PROGRESS

01.

System was described in view of user and e-Nav requirements.

02.

General technical project was developed to cover all aspects of functionality and connectivity.

03.

Prototype of the **SMB** is expected to be ready in 2017.

04.

Converted data can simultaneously be sent to users and Maritime Cloud.

SMB BENEFITS



Navigational awareness



Traffic logistic



AtoN parameter
optimization



Environmental
surveillance



Nautical information dissemination



THANK YOU FOR ATTENTION

