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21, 22 E 23 DE JUNHO DE 2016

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MarinEye – A prototype for multitrophic oceanic monitoring

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GOVERNO DE PORTUGAL | INESCTEC | MARE IPLeiria | ESCOLA SUPERIOR DE TURISMO E TECNOLOGIA DO MAR | ipma | ciimar | dgpm Direção-Geral de Política do Mar

Introduction

✓To understand the marine ecosystems, it is important to know their biological, chemical, physical, atmospheric, and geological processes

✓Their knowledge is severely limited by the paucity of infrastructures able to support sustained and timely acquisition of data

✓Requires new and transformational approaches to ocean observation

Objectives

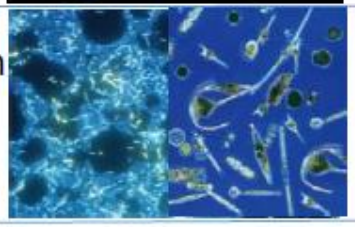
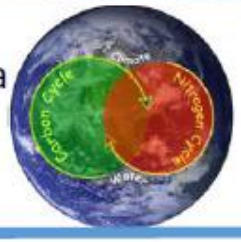
✓ To develop an autonomous system for integrated marine chemical, physical and biological monitoring

✓ To combine a range of technologies capable of providing data that will give an integrated view of the trophic levels with the environmental conditions

Combination of technologies in a modular, compact system that can be deployed on fixed and mobile platforms

- ✓ High-resolution imaging (targeting plankton)
- ✓ Acoustic (plankton, fishes)
- ✓ Hydrophone (mammals, noise)
- ✓ Fraction filtration systems (prokaryotes and unicelular eukaryotes)
- ✓ Sensors (temperature, salinity, dO_2, dCO_2, pH, turbidity, radiation)

Concept and approach

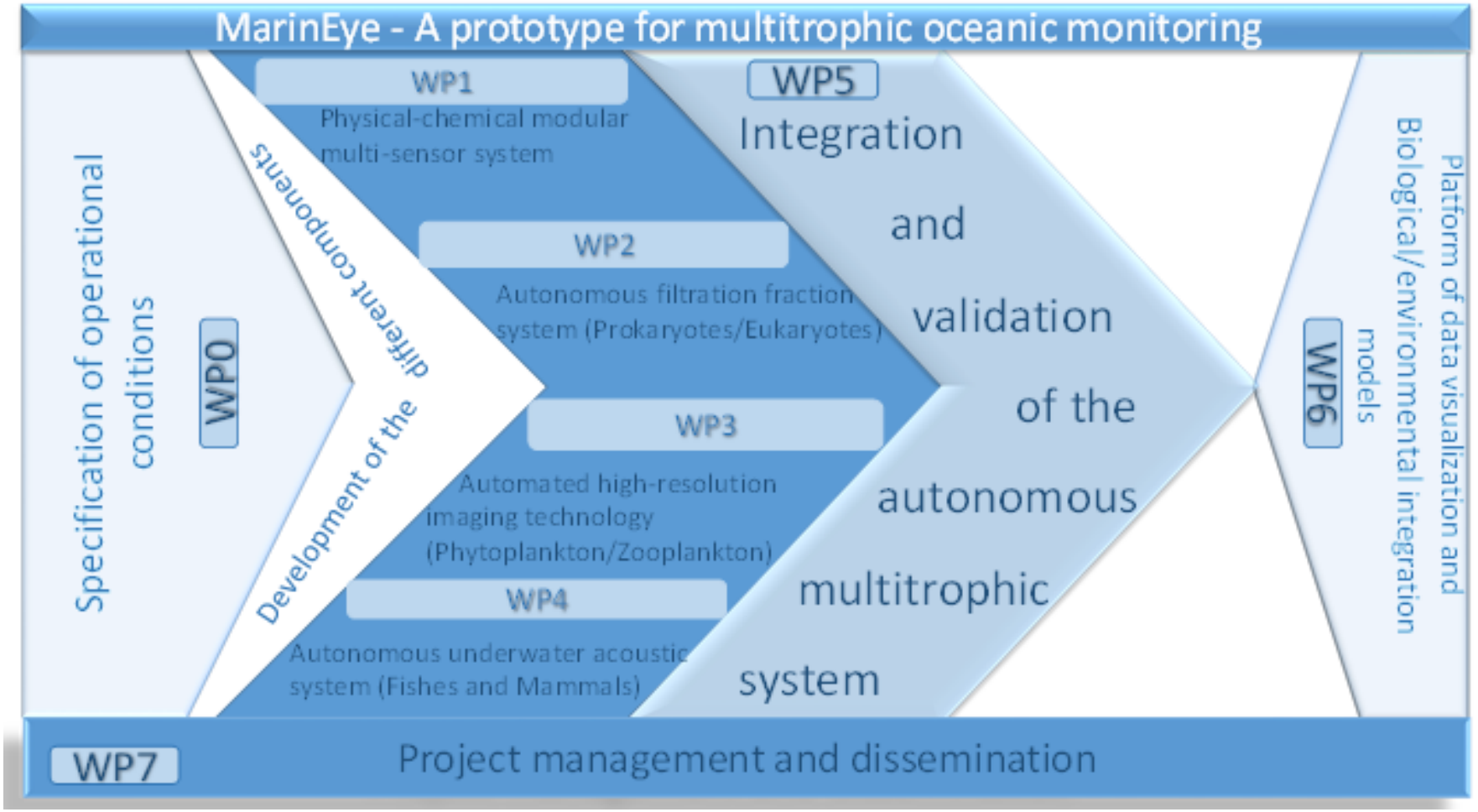
Biological Compartments			Autonomous Technology *Holistic approach*
Predators	Fish Mammals		Hydroacoustic • Active sonar • Hydrophone
1st Consumers	Zooplankton		Autonomous filtration • 0.8 µm Eukaryotes Image Detection
Producers	Phytoplankton (Prokaryotes Eukaryotes)		Autonomous filtration • 0.2 µm Prokaryotes • 0.8 µm Eukaryotes Image Detection
Biogeochemistry	Physical-chemica parameters		Multi-sensor system Optical sensors

Implementation in fixed and mobile ocean observatories

Synchronized biological and environmental ocean monitoring

Provide essential information on marine ecosystems interactions and biological functions

Structure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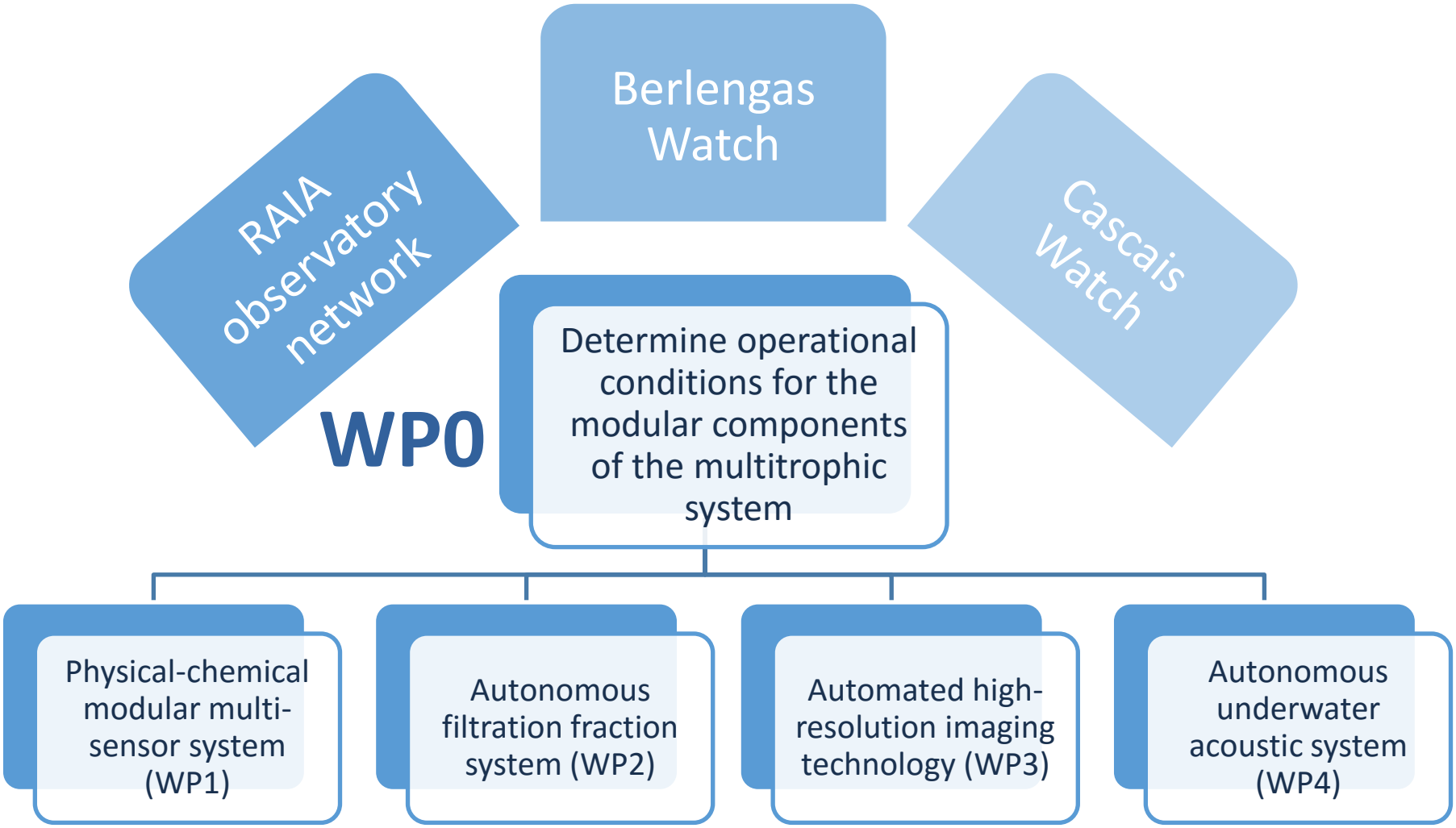
Specification of operational conditions
WP0
Development of the different components
WP1
Physical-chemical modular multi-sensor system
WP2
Autonomous filtration fraction system (Prokaryotes/Eukaryotes)
WP3
Automated high-resolution imaging technology (Phytoplankton/Zooplankton)
WP4
Autonomous underwater acoustic system (Fishes and Mammals)
WP5
Integration and validation of the autonomous multitrophic system
WP6
Platform of data visualization and Biological/environmental integration models
WP7
Project management and dissemination

Organization and workflow

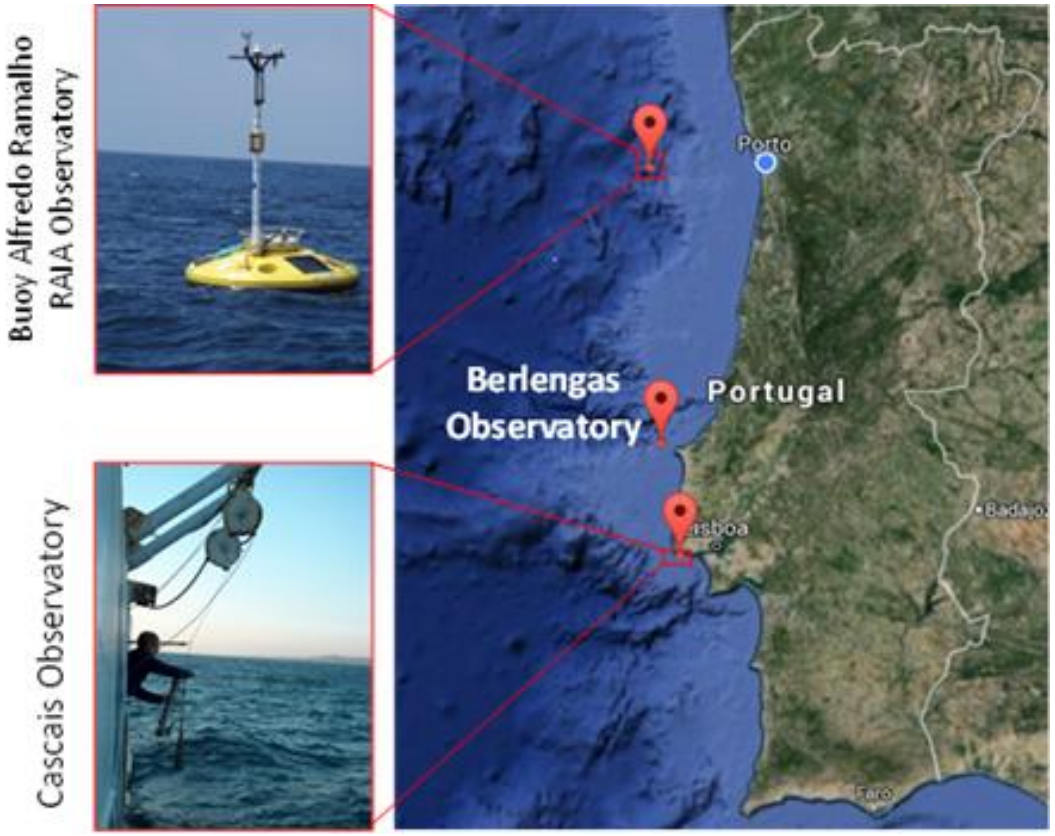


Organization and workflow

WP0

Specification

of operational conditions



Organization and workflow

WP1

- Selection and adaptation of commercial sensors for:
  - Salinity
  - dCO_2
  - dO_2
  - Temperature
  - pH

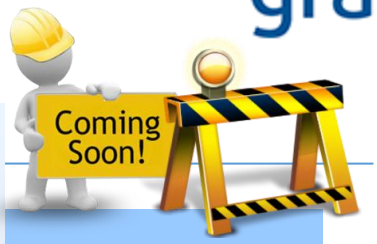
WP2

- Development of an automatic bio-sampler system
- Validation of the filtration efficiency and sample preservation

WP3

- Development of a plankton high-resolution imaging system
- Adoption of image-processing software
- Validation of acquired data

WP4



- Selection of underwater acoustic equipment
- Equipment adaptation to working conditions
- Selection and adaptation of software

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WP5

- Integration of the individual components in a compact system
- Benchtop validation
- Test of the different components together in a unique compact system
- Validation in the field

WP6

- Development of a centralized data infra-structure to integrate the disparate data
- Development of a software platform able to help to analyze the data generated by the autonomous system

WP7

- Co-ordination of the activities of the project
- Communication and dissemination

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PORTUGAL ESTÁ A DESENVOLVER UM PROTÓTIPO PARA MONITORIZAR OS OCEANOS E PROMOVER A GESTÃO SUSTENTÁVEL DOS RECURSOS

Investigadores portugueses criam forma de vigiar oceanos

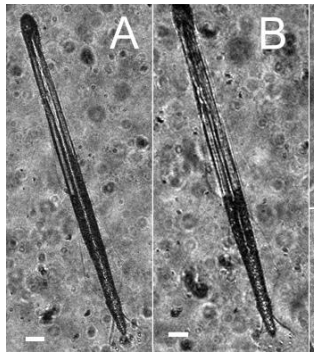
Investigadores portugueses estão a desenvolver um sistema autónomo para monitorizar os diferentes componentes dos oceanos e verificar as alterações na biodiversidade, os impactos no clima e as anomalias ambientais, o que vai permitir uma gestão sustentável desses recursos.

Investigadores portugueses criam protótipo para monitorização oceânica

Actualizado em 23 de Fevereiro, às 09:49 Lusa

WP3 - Automated high resolution imaging technology

Objective: to assess diversity and abundance of planktonic organisms with > 50 µm through an image collection system



How?

1. To instal an *in situ* plankton imaging system

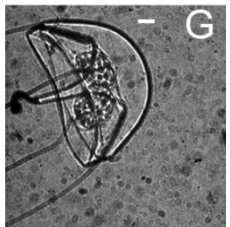
- Camera resolution 4920 x 3264
- Lens with 400x magnification factor

2. To store the images in a high-throughput data storage for further image post-processing

3. To process images by an image processing software

4. To validate the plankton imaging data acquisition by morphological and molecular techniques

- Cascais Watch
- Berlengas Watch
- RAIA



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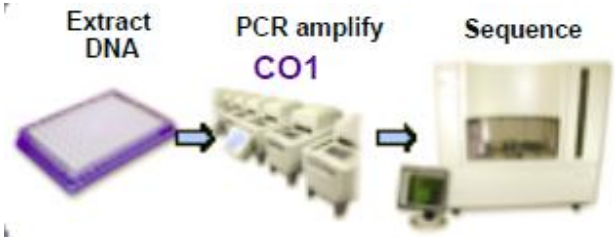
Molecular and morphology-based approach to the study of zooplankton in the Cascais Watch monitoring station

Rational

- **Monitoring station**
  (database with occurring species)
- **DNA barcode protocol for zooplankton known**
  (e.g. Bucklin et al. (2010) Deep-Sea Res II 57: 2234-2247)
- **List of primers available for most of the species**
  (database with primers list/taxon/marker)

3. ICES Identification Leaflets for Plankton



Protocol

1. **Collection and preservation of samples**
2. **Selection of specimens**
3. **Morphological id**
4. **Mitochondrial DNA barcode (658 bp COI gene "Folmer region")**

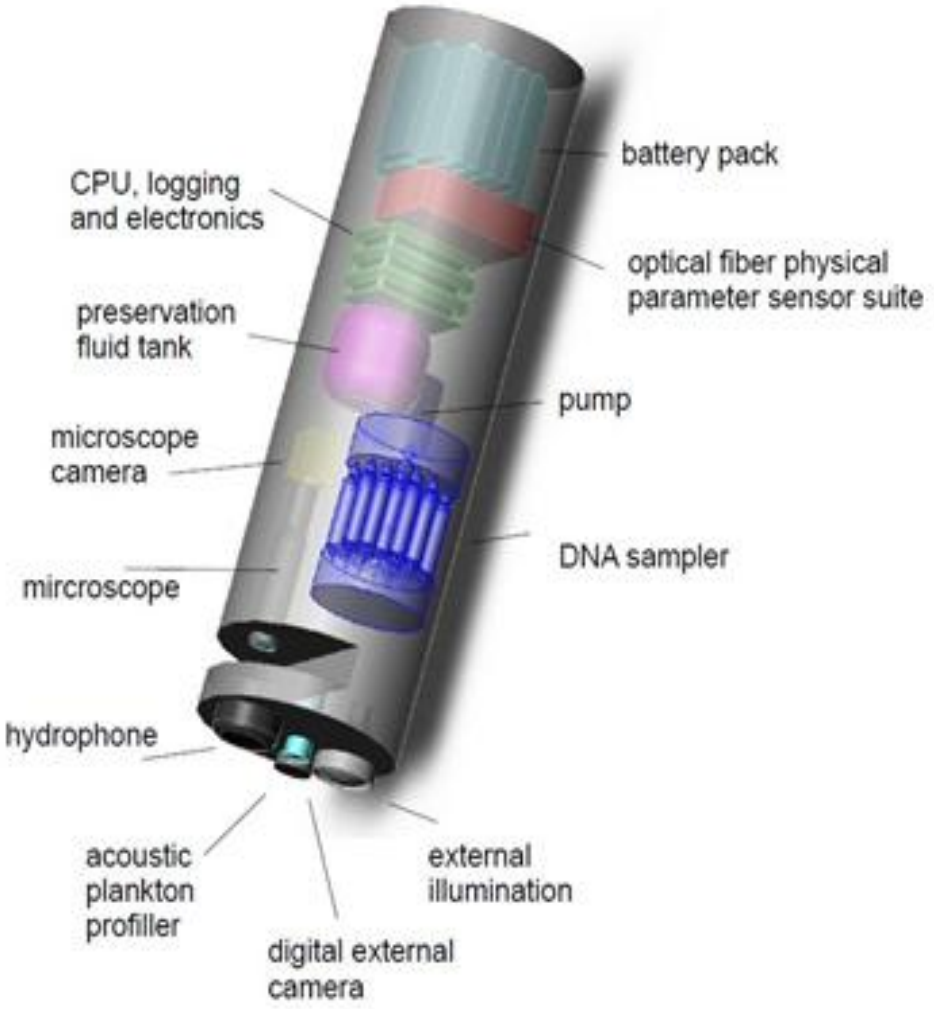
Deliverables and Outputs

- ✓ Important contribution for the consolidation of infrastructures dedicated to the observation of the marine environment

- ✓ Implementation of adaptive management approaches, as the EU MSFD, allowing the development of marine strategies for the continuous assessment of the marine waters GES

- ✓ Multitrophic system development

MarinEye prototype and its components



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