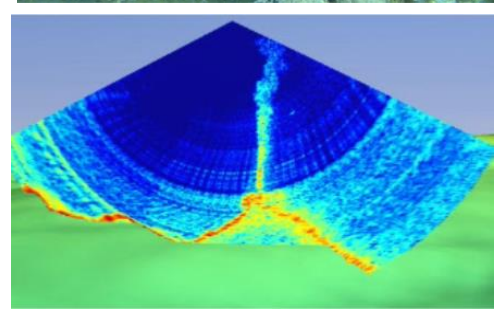
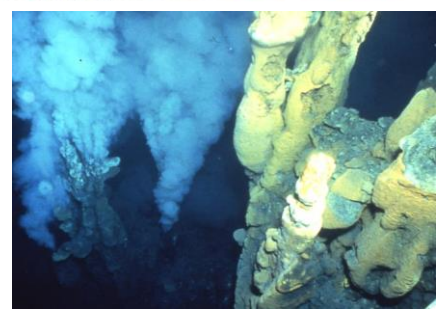
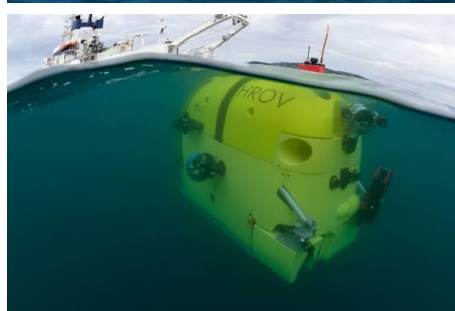
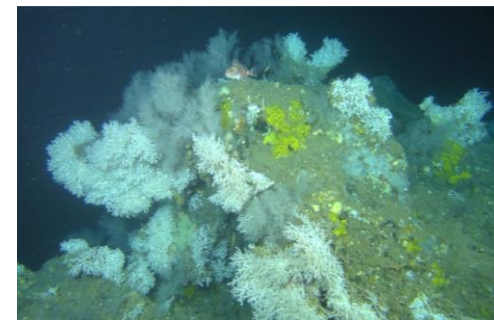
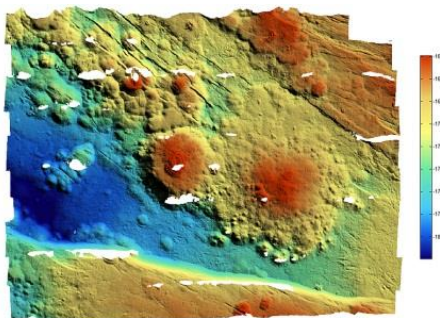






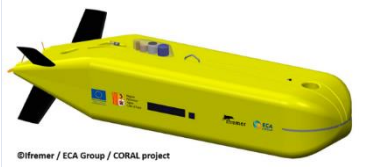



# Underwater vehicle systems at Ifremer

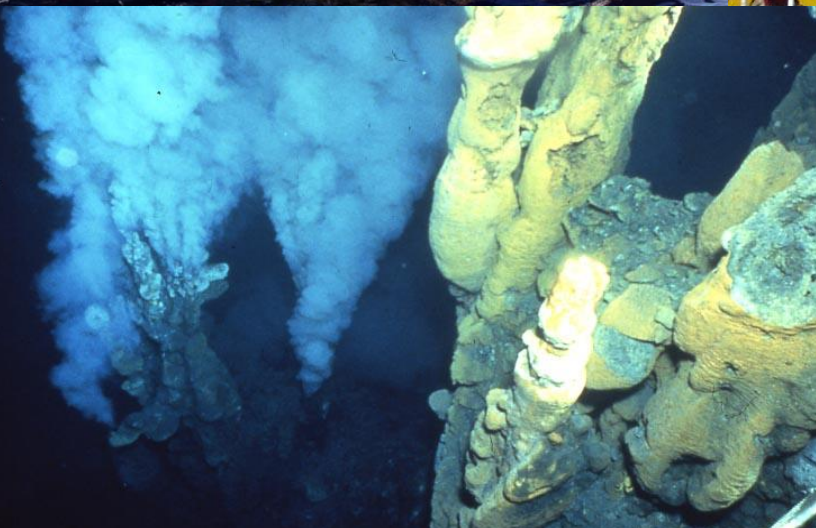
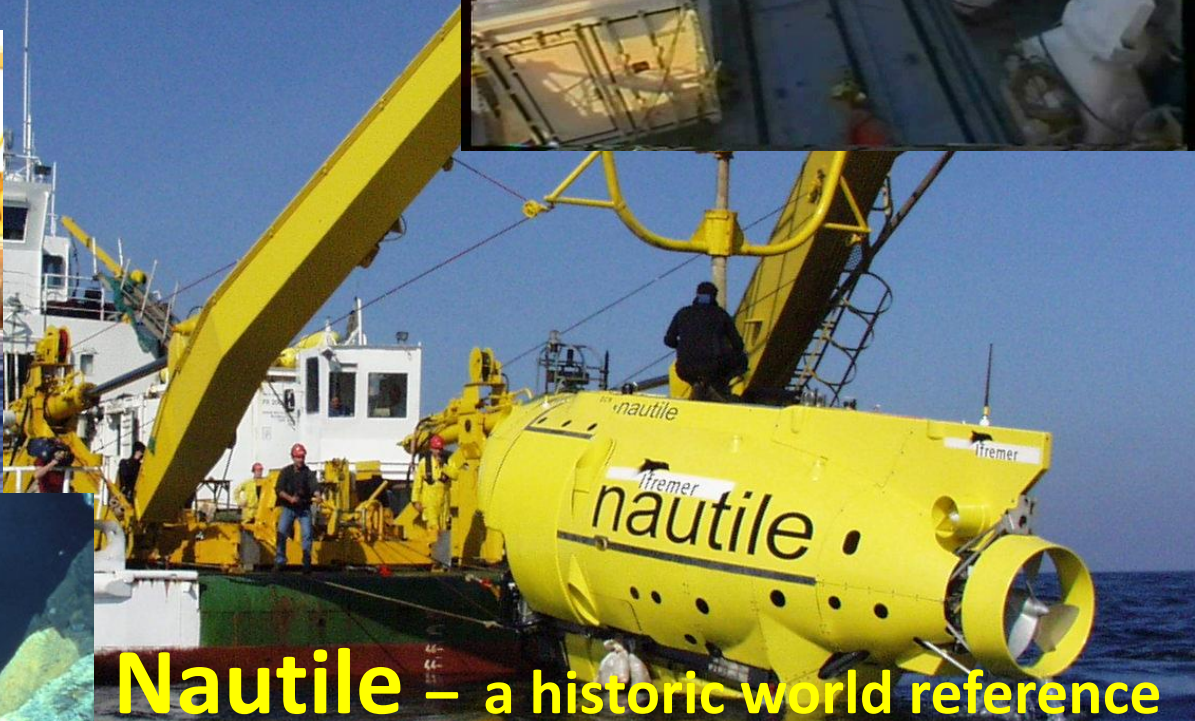
*from technological research  
to operational systems*

Jan Opderbecke



# Underwater Systems in the french oceanographic fleet

<i>Nautile</i>	<i>Victor6000</i>	<i>Coral</i>	<i>Ariane</i>	<i>Aster<sup>x</sup> &amp; Idef<sup>x</sup></i>
 	 	 <small>©Ifremer / ECA Group / CORAL project</small>		 
Manned Submarine	ROV	AUV	Hybrid ROV	AUV
<b>6000m</b>	<b>6000m</b>	<b>6000m</b>	2500m	3000m
Since 1984	Since 1997	Objective 2020	Since 2017	Since 2005
Exploration Intervention	Exploration Intervention Local mapping	Long range Survey	Exploration Intervention Cartography	Survey



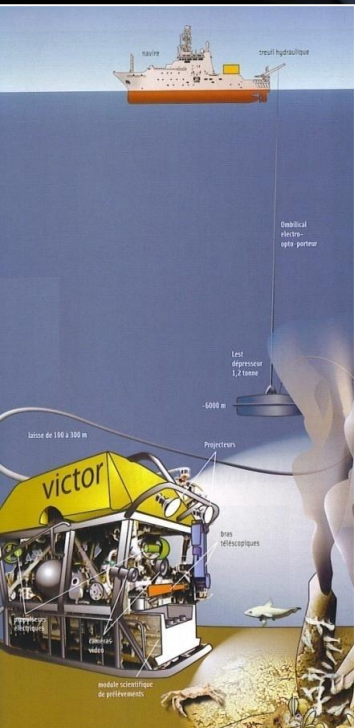
## Nautilus – a historic world reference

1990 dives in 34 years, Max depth 6000m

Length 12m, weight 18T, 2.2m diameter sphere

1 scientist & 2 pilotes dive for 8h, 5-6h on sea-floor

+++ maneuvering, 3D-vision, high payload capacity



# Victor 6000

a scientific workhorse

100+h dives, « clean » sampling capability

4T + 1T depressor weight, 20kw of continuous power

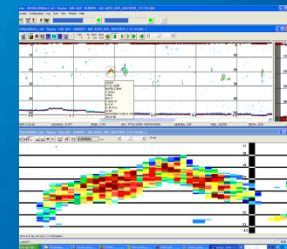


# aster<sup>x</sup> & ideo<sup>x</sup>

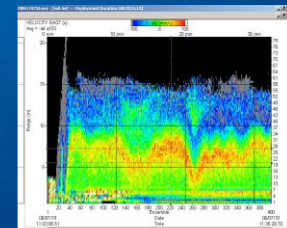
versatile AUVs for scientific survey

4,5m-800kg, small footprint on RV

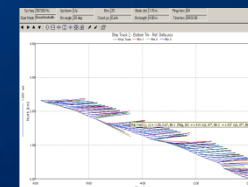
Autonomy 12-16h, 60km, immersion max 2850m



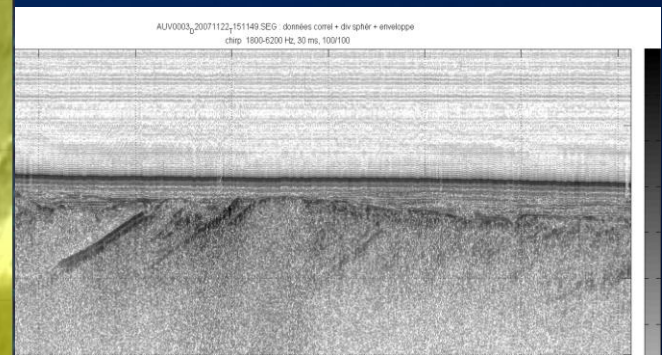
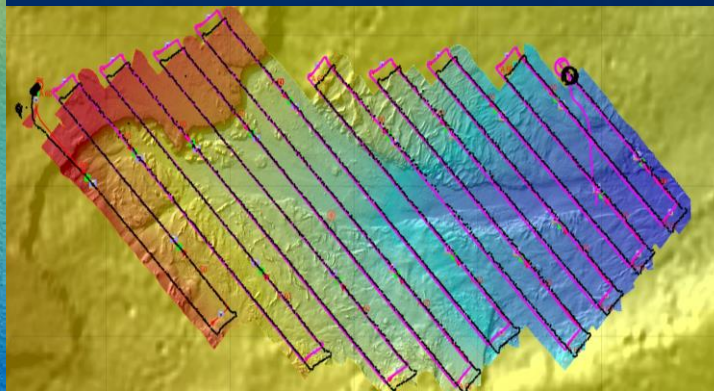
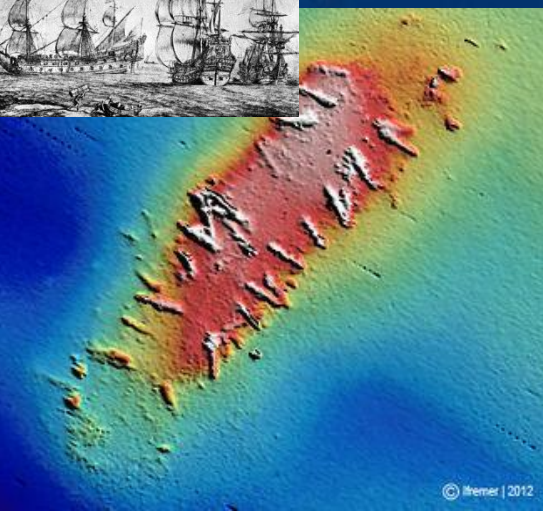
Fish sonar KM EK60



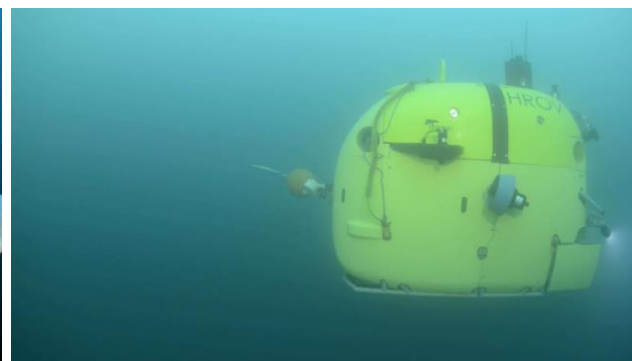
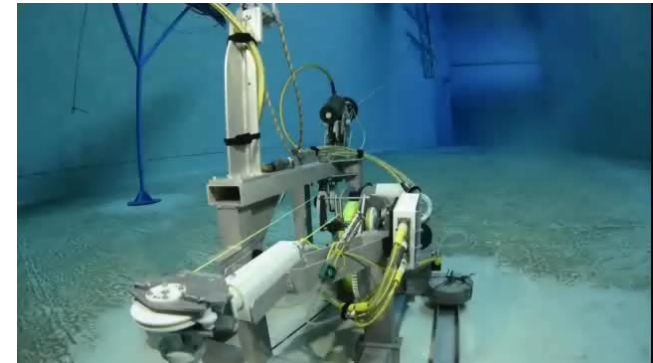
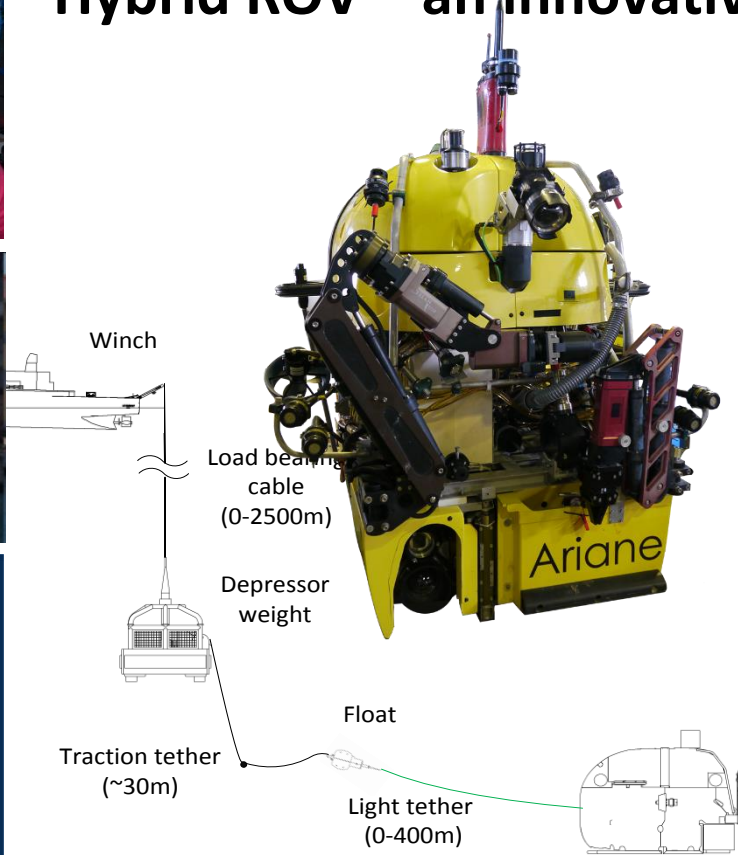
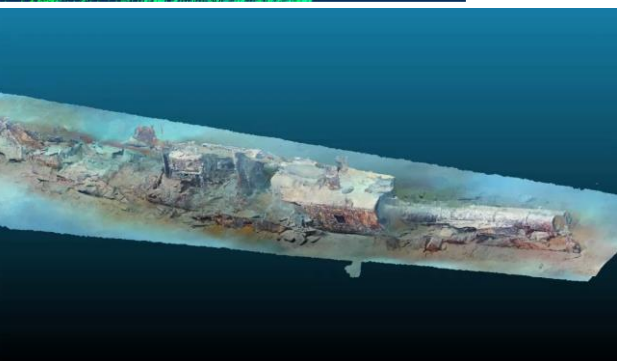
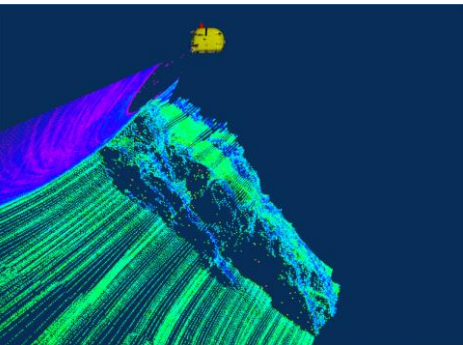
Current profiler  
RDI ADCP 1200



Current profiler  
RDI ADCP 300



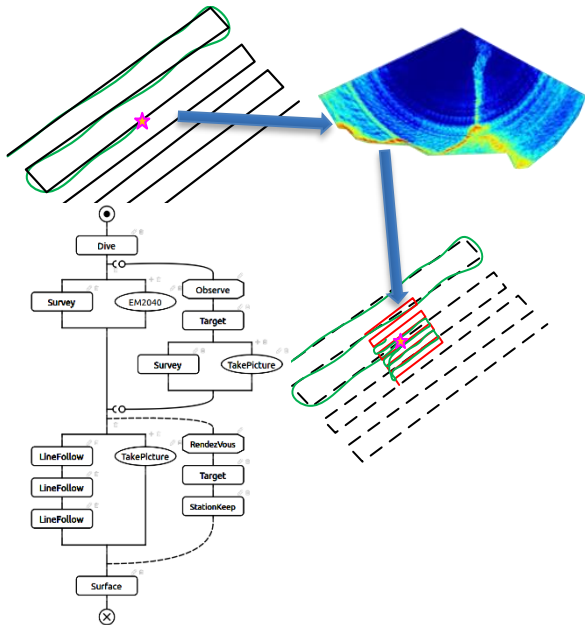
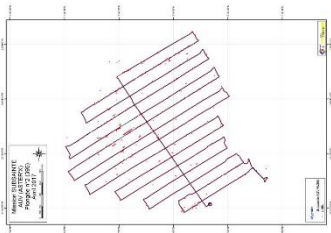
# Hybrid ROV – an innovative concept



# CORAL AUV 6000 features

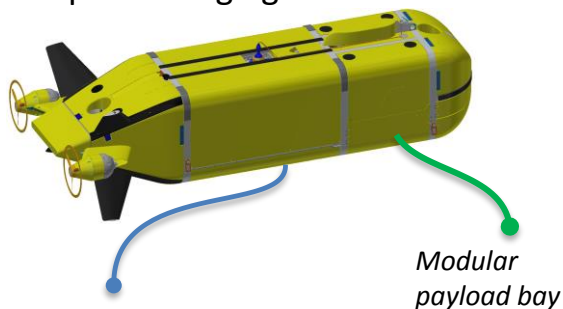
## Functional

- Onboard data processing
- Intelligent mission management



## Scientific

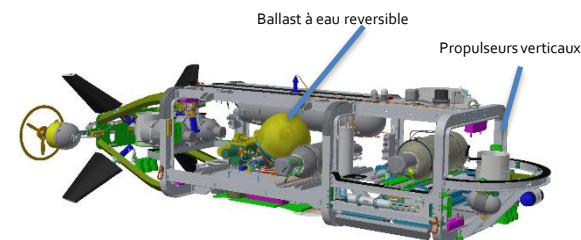
- Multi-sensor/multi-scale approach
- Localised Data thru station-keeping
- Wide area mapping or measurements close to sea-floor
- Optical imaging



*Permanent payload devices MBES, optical imaging*

## Technologic

- Autonomous & « clean » weight control
- Wide angle optic imaging & 3D modeling
- Operational autonomy



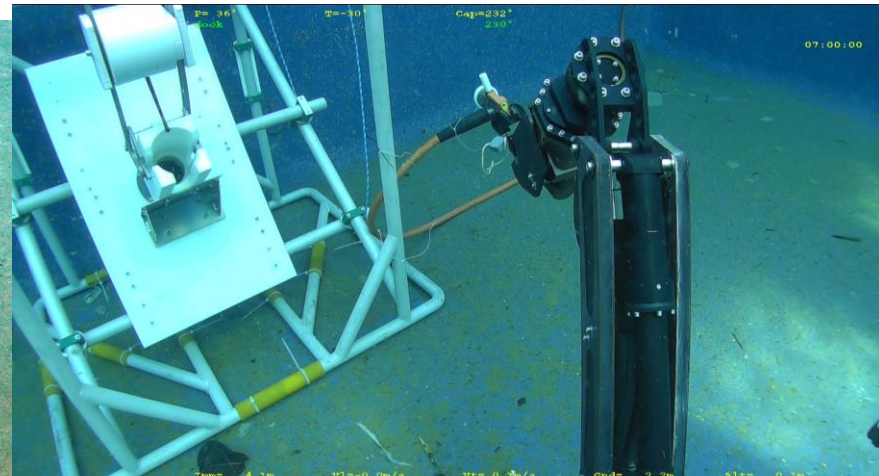
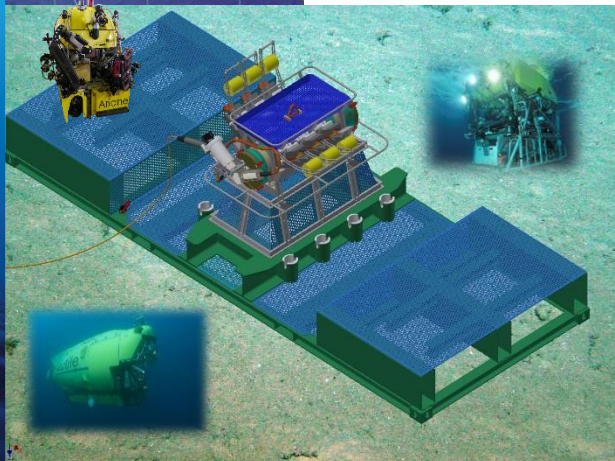
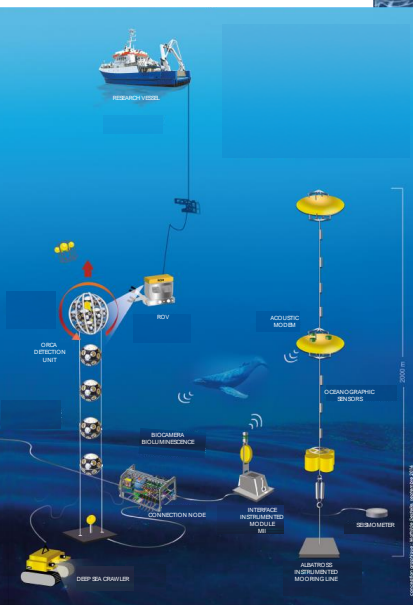
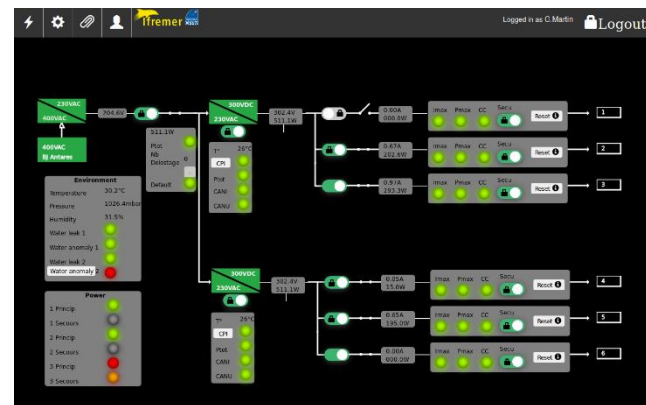
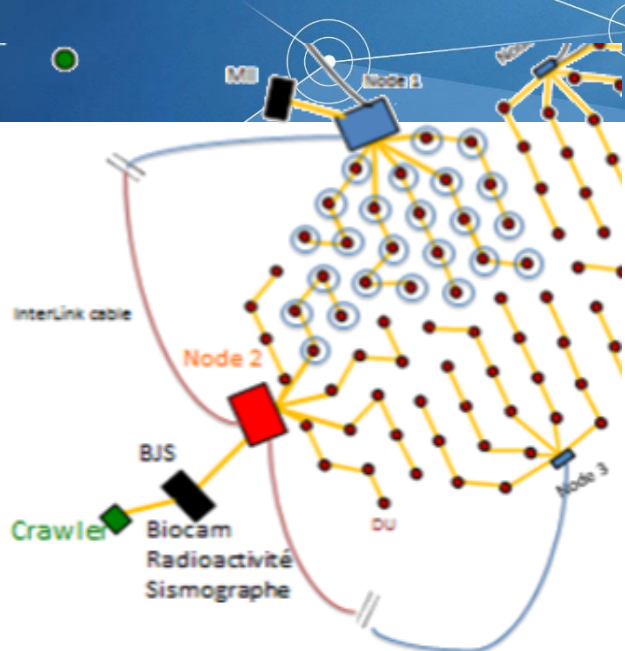
# R&D and legacy in autonomous docking: technology and sea trials with various vehicle types





# MEUST : a connected and integrated system

- Remote instrument access
- Robot – observatory interfaces
- New remote systems : crawler, biocam...



# Connecting & Observatories & Robotics : Perspectives

- **Link spatial- and time-wise observations**
  - Ex MEUST-crawler
  - tethered (ROV)
  - untethered (AUV)
- **Types of observation – types of vectors**
  - payload will define vector size !
  - energy source : cabled/uncabled...
  - comms : cabled/uncabled
  - risk management, diagnostics, maintenance, failsafe modes
- **Spatial scale**
  - crawler : x 100m
  - glider-size AUV : x km
  - survey AUV : x 10km
- **Time scale**
  - crawler : year (heavy = failsafe!)
  - AUV : weeks, months, year ?