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"The Ocean of Tomorrow 2013"

**a cross-thematic program focused on fostering
research and innovation in marine technologies.**

Understanding the “Blue Planet”

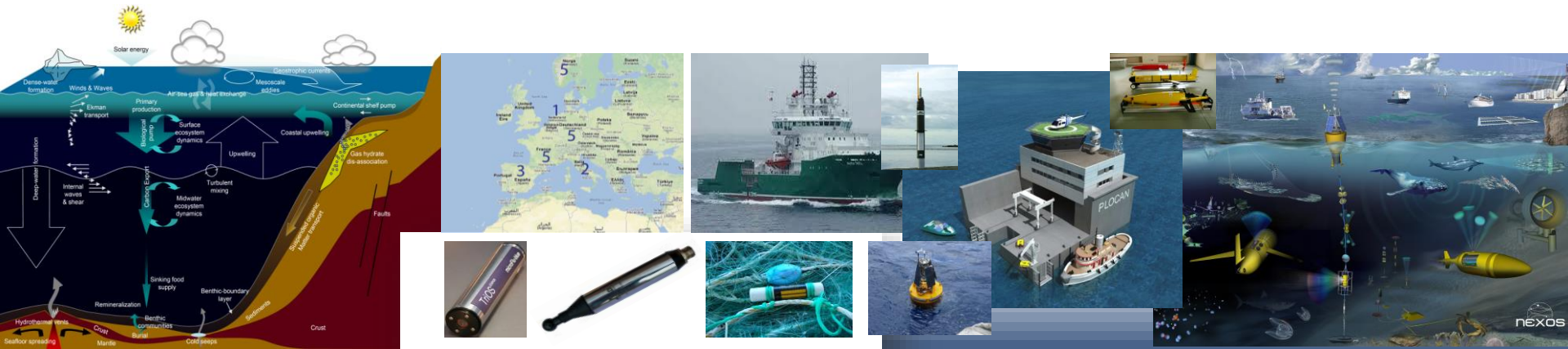
Ocean Observation Challenges

- Pervasive in Space and Time
- Affordable
- Quantifiable
- Interoperable
- Fit for purpose



Oceans surface is $3.6 \times 10^8 \text{ km}^2$

- 4 year FP7 Project, 21 partners
- Optics and acoustics sensors for several application domains
- 8 web-enabled “plug’n play” sensor systems being developed and demonstrated



NeXOS Objectives

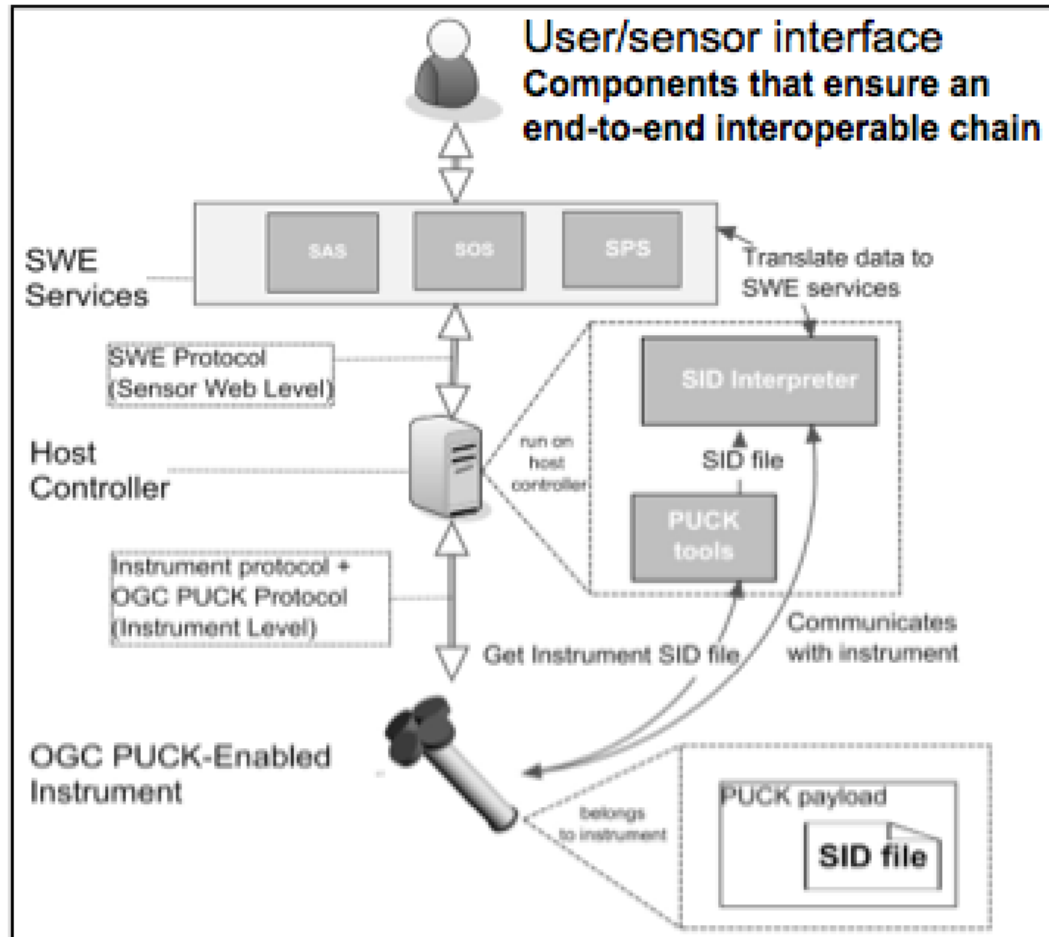
- Lower capital and operating expenses for sensor systems
- Multifunctional sensor packages
- Standard web interfaces for multiple platforms
- Extend the deployment duration of sensors



NeXOS in a nutshell

Sensor Technology		Sensor type	
Optical		O1 Matrix-fluorescence	
		O2 Hyperspectral	
		O3 Carbon	
Passive Acoustics		A1 Preprocessed	
		A2 Real-time	
RECOPECA/EAF		EAF/ Chlorophyll	
		EAF/Oxygen	
Cross-cutting Technologies			
Smart Sensor Interface – OGC PUCK + SWE		Bio-fouling prevention	
Target Platforms			
Gliders	Drifters/prof ilers	Cable Observatories	Ferries
Trawlers	Nets & Lines	Other leisure	Stand alone

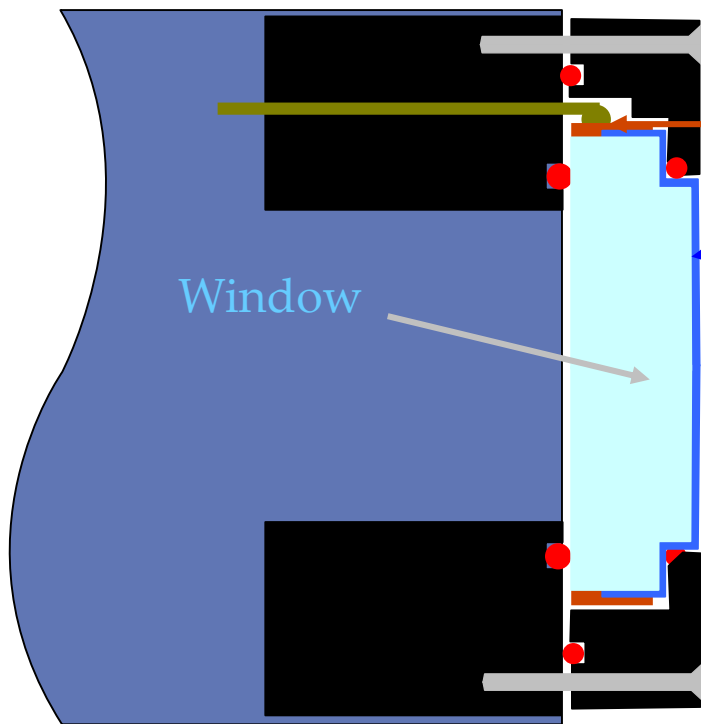
Smart Sensor Interfaces



- Smart Sensor Interface and Web Components Hardware and software interface with miniaturized low power modular design
- Implementation of OGC PUCK protocol for instrument discovery and identification
- Precision Time Protocol (IEEE Std. 1588) for time synchronization
- Open Source software development tools
- Open Data access based on Sensor Web Enablement framework.

Biofouling protection by electro-chlorination on optical windows

Electrochlorination by SURFACE thin film working electrode on window



Copper

Conductive SnO₂ coating
(working electrode)

In situ test: SURFACE thin film electrode on window provides 6 months of protection with test still running

Image and information courtesy of Laurent Delauney, IFREMER

GEO European Project Workshop – 15 June 2015

NeXOS Test and Demo Scenarios

Platform types	O1	O2	O3	A1	A2	EAF
Gliders	X	X		X		
Drifters/ profilers				X		
Cable observatory	X	X	X		X	
Stand alone	X	X	X	X		
Ferries, fixed routes	X	X	X			
Other/leisure	X	x	X			
Trawlers					X	X
Long lines/nets					X	X

Scenario 1: Hydrocarbon observations with gliders; detection and quantification of leakage

Scenario 2: Carbon cycle and carbon sequestration monitoring with ferry-boxes including pH, inorganic carbon, carbonate ions, partial pressure CO₂.

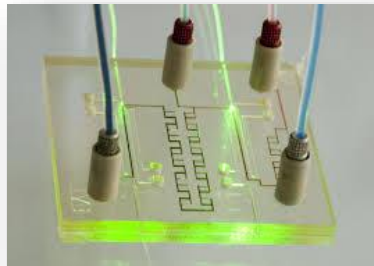
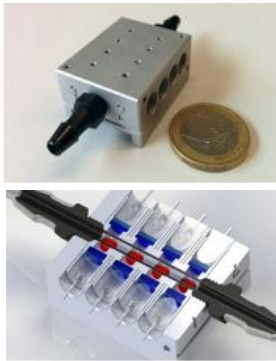
Scenario 3: Passive acoustic monitoring and characterization of underwater sounds from floats and gliders

Scenario 4: Observations for sustainable fisheries observing ocean variables

Scenario 5 : Detection and characterization of phytoplankton blooms and groups

Collaboration Among Projects

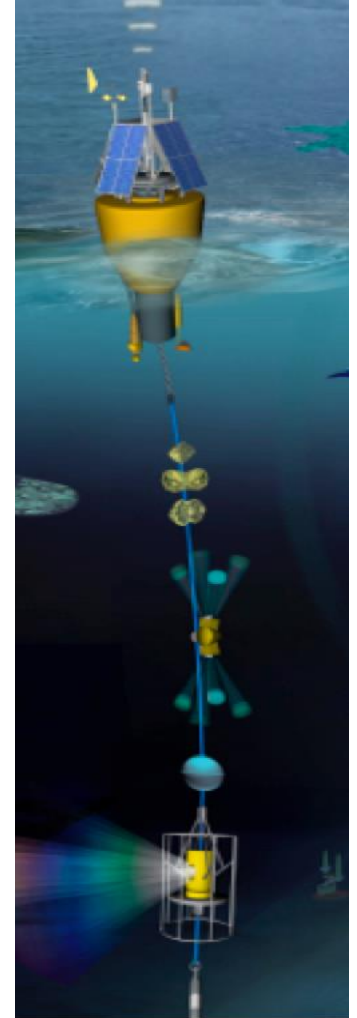
- Modularity of the developed sensor systems
- Standard web interfaces for multiple platforms
- Extend the deployment duration of sensors



Project	Common Sense	NeXOS	SCHeMA	Sense Ocean
Temp, Pressure	X		X	
Oxygen			X	X
CDOM		X		X
Nutrients/carbonates	X		X	X
Phytoplankton		X		X
Hydrocarbons		X		X
Carbon Cycle		X		X
Fisheries		X		
Underwater noise	X	X		
microplastics	X			
Heavy/trace metals	X		X	

Interoperability – Supporting GEO

- **Sensor-Platform Interface** – OGC PUCK protocol for instrument discovery and identification
- **Sensor to Repository** - Standardized web services (SWE) for accessing sensor information and sensor observations
- **Addressing also –**
 - metadata standards
 - best practices in four areas: calibration; robustness and reliability; usability; and platform interface.





Thank You