Marine Data Interoperability Using a Smart Sea Cable

Ehsan Abdi

Cyprus Subsea

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 635359
Underwater Gliders

- Autonomous underwater buoyancy-driven vehicles play an important role in global observing networks.
- Very efficient and have long endurance (months)
- Data available after every dive (~ every 7 hours for 1000m dive) via iridium satellite
BRIDGES

Dissolved Oxygen

Lab on a Chip
- Nitrate
- Phosphate
- Silicate
- Ammonia

Echo-Sounder

Fluorescence
- Turbidity
- Chlorophyll
- CDOM
- Crude Oil
- Crude Oil

Passive Acoustics
- Noise monitoring
- Event Detection

Water Sampler

Smart Camera
count and measure particles (organic and inorganic, > 100μm) in real-time

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 635359
Piloting tools and data formats

- Limited toolboxes and mostly work only locally
- Lots of efforts to standardize scientific data but not platform data
- EGO, IOOS, IMOS
Standardization in BRIDGES

- **Phenomenon Time**: The time frame in which the measurements took place.
- **Result Time**: The time when the observation was created/stored.
- **Observation**: The property that has been observed.
- **Result**: The feature of interest (area) that is covered by the observation. Should be a link to a vocabulary.
- **Content Structure**: The structure of the data to enable discovery.
- **Values**: Values can be provided inline as XML or by reference to a NetCDF EGDC file.
- **Reference**: Additional reference information.
- **Identification**: Manufacturer Name and Model Number.
- **Characteristics, e.g.**: Weight, Height, Length, Width, Material, Storage Capacity.
- **Glider Type**: Classification, Operating Depth, Survival Depth, Sampling Rate, Resolution.
- **Capabilities, e.g.**: Operating Depth, Survival Depth, Sampling Rate, Resolution.
- **Local Reference Frame**: sml:SpatialFrame with textual descriptions of origin as well as X, Y and Z axes.
- **Outputs**: sml:InterfaceParameters: see InterfaceDescription and protocol.
- **Contacts**: Manufacturer.

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 635359.
Smart Cable

- Initially built for purpose of analog to digital data conversion
- Extremely low power (20mW while active)
- Pressure tolerant (down to 6000m)
- Consists of voltage regulators, a Microcontroller, memory unit, ADC, etc.
OGC PUCK Protocol

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 635359
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 635359
This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 635359
Future Work

- Demonstrations of the Smart Cable capabilities in field (AtlantOS Interoperability experiment, BRIDGES sensor demonstrations)
- Offering the Smart Cable assembly service
- Working on improving a platform for easy to use SensorML generation
- Providing a platform for running any user-defined process on the sensor data
- Making the hardware/software available Open Source
Thank you!