BigDataOcean - Exploiting Oceans of Data for Maritime Applications

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1 BigDataOcean in a Nutshell

BigDataOcean (BDO) is a 30-month H2020-RIA project started in January 2017, targeting maritime Big Data applications for EU-based companies, organizations, and scientists (http://www.bigdataocean.eu). Its main objective is to deliver services for various stakeholders on top of a multi-segment platform that will address the velocity, variety, and volume of maritime-related data and provide an inter-linked, trusted, and multilingual engine. In particular, BDO will leverage existing modern technological breakthroughs in the areas of Big Data and Linked Data and roll out a completely new value chain of interrelated data streams coming from diverse sectors and heterogeneous sources. Eventually, BDO envisions to revolutionize the way maritime related industries work and exhibit economic, societal, and environmental impact by introducing an economy of knowledge into a traditional sector, which until now does not operate in an orchestrated manner.

2 BigDataOcean Goals and Pilots

The effort of BDO is strongly market-oriented, the main outcome of the project will be a product providing novel maritime-related services and applications for both providers and consumers of maritime data. The BDO platform will allow to generate (a) factual and evidence-based analytics, (b) decision support models, and (c) new business services, focusing on knowledge sharing and real-time collaboration. BDO will be a constantly growing pool of cross-sectorial and multi-lingual Linked Data, offering services to organizations of different activity fields and needs. To this end, BDO follows a four-step approach including: (1) the market need recognition, (2) the product development, (3) the product assessment, and (4) the market entry preparation. These steps are strongly supported by four pilot cases coming from various stakeholders in the maritime domain.

Pilot 1 - Fault Prediction and Proactive Maintenance: Unpredicted damages and mechanical failures increase the costs of shipping companies, since they are related with high costs of repairs and spare parts, loss of earnings due to immobilisation of vessels, and even environmental damages. In order to minimize such incidents, contemporary vessels are equipped with sensors and monitoring utilities, collecting operational and performance data. However, the full potential of this sensor data is not exploited and the collected data are not correlated with historical or external data streams. Two shipping companies, ANEK

and FOINIKAS, will leverage BDO's cross-domain analytical tools for achieving proactive maintenance.

Pilot 2 - Mare Protection: Oil spill models provide contingency planning and effective response strategies against hazardous oil spills at sea. Such models require the combination of cross-sectorial data such as atmospheric, wave, and hydrodynamical numerical models in addition to location, rate, and characteristics of an oil spill. The integration of existing systems with weather, satellite, and pollution data could increase the forecasting capabilities. The Hellenic Centre of Marine Research will exploit the BDO platform for increasing the effectiveness of their environment protection plans (`http://poseidon.hcmr.gr`).

Pilot 3 - Maritime Security and Anomaly Detection: A deep understanding of activities, events, and threats in the maritime environment has direct impact on security, economy, and environment. This requires the ability to identify patterns from big amounts of real-time data from thousands of vessels. The integration of cross-sectoral data (e.g., incidents, weather and nautical data) and machine learning algorithms, can improve predictions and classify "anomalies" related to terrorism, illegal trafficking, and fishing. The company EXMILE, experienced in managing real-time information about vessel movements (`http://www.marinetraffic.com`), will leverage BDO to identify anomaly detection patterns and advance maritime security.

Pilot 4 - Wave Power: Wave energy industry demonstrated to be very promising but still in its infancy due to various technological hurdles. In order to continue developing this technology, the ability to effectively predict the best locations, the expected energy production, and equipment costs, as well as the environmental impact is crucial. The correlation of existing data (e.g. environmental and geophysical) with knowledge coming from different sources and sectors, collected by vessels and buoys, combined with advanced analytics could accelerate wave energy studies. NESTER research center will use the BDO platform to achieve more accurate estimations and higher level of confidence in the Oceanplug wave energy-testing zone (`http://www.oceanplug.pt`).

3 Dissemination and Networking

Currently, during the first six months of the project, the BDO partners are investigating the market needs and stakeholder requirements by elaborating the four pilots and addressing other interested stakeholders in the maritime domain. The maritime data value chain has been identified with regard to the BDO pilots. In addition, the BDO platform architecture, as well as the tools and technologies that will be used are now defined. The architecture is based on a "Data Lake" infrastructure partially reusing the components offered by BigDataEurope (`http://www.big-data-europe.eu`). Semantic technologies are used for data integration and interoperability of heterogeneous data sources. At this stage, BDO intends to attract potential data providers and users interested in services in the maritime domain. BDO invites companies and organizations to contribute with maritime and environmental data and profit from innovative services, business intelligence, and analytics the resulting platform is offering.