

A FAIR Framework for Management of Maritime Datasets to Assist in the Development of Common Maritime Data Bank

Ping Chong CHUA¹, Kelvin LEE¹, Ke WANG¹, Haiyan XU¹, Terrence TAN², Xiang LIU³, Putu HANGGA⁴, Xiuju FU^{1#}, Zheng QIN¹

¹Institute of High Performance Computing (IHPC), Agency for Science, Technology and Research (A*STAR), 1 Fusionopolis Way, #16-16 Connexis, Singapore 138632, Republic of Singapore

²PSA Marine (Pte) Ltd, 70 West Coast Ferry Road, Singapore 126800, Republic of Singapore

³American Bureau of Shipping, 438B Alexandra Road, Block B, Alexandra Technopark #06-12, Singapore 119968, Republic of Singapore

⁴MTI Co., Ltd., Yusen Building, 3-2 Marunouchi, 2-Chome, Chiyoda-ku, Tokyo 100-0005, Japan

#Email address: fuxj@ihpc.a-star.edu.sg

Abstract:

The maritime industry has traditionally relied on manual processes to collect and manage the data used for planning and decision-making. As the industry embraces digitalisation for enhanced productivity in an increasingly complex and rapidly evolving landscape, it now developed the capacity to collect a variety of data at an unprecedented volume. Therefore, there arises a need for a systematic framework to facilitate efficient management, retrieval and reutilisation of the collected data across various data-driven decision-making applications. To address these challenges, this research proposes a metadata knowledge framework to identify and manage various incoming maritime datasets based on the FAIR (Findable, Accessible, Interoperable and Reusable) principles. The proposed framework comprises of two levels: the dataset-level and table-level metadata. The dataset-level metadata provides a common overview definition of the properties of the incoming raw dataset. The table-level metadata identifies the data tables, with the attributes standardized based on specific use case as defined in the dataset-level metadata. To showcase the effectiveness of metadata knowledge framework from different sources of datasets, the framework is applied on two industrial case studies of predictive maintenance data, i.e., tugboat and marine vessel. The framework aims to assist in the development of a common maritime dataset for knowledge sharing and benchmarking of subsequent use case studies.

Keywords: Metadata, Knowledge Representation, Maritime