

An Extended Domain-Specific Modeling Language for Marine Observatory Relying on Enterprise Architecture

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Abstract : A Sensor Network (SN) is considered as an operation of two phases: (1) the observation/measuring, which means the accumulation of the gathered data at each sensor node; (2) transferring the collected data to some processing center (e.g., Fusion Servers) within the SN. Therefore, an underwater sensor network can be defined as a sensor network deployed underwater that monitors underwater activity. The deployed sensors, such as Hydrophones, are responsible for registering underwater activity and transferring it to more advanced components. The process of data exchange between the aforementioned components perfectly defines the Marine Observatory (MO) concept which provides information on ocean state, phenomena and processes. The first step towards the implementation of this concept is defining the environmental constraints and the required tools and components (Marine Cables, Smart Sensors, Data Fusion Server, etc). The logical and physical components that are used in these observatories perform some critical functions such as the localization of underwater moving objects. These functions can be orchestrated with other services (e.g. military or civilian reaction). In this paper, we present an extension to our MO meta-model that is used to generate a design tool (ArchiMO). We propose new constraints to be taken into consideration at design time. We illustrate our proposal with an example from the MO domain. Additionally, we generate the corresponding simulation code using our self-developed domain-specific model compiler. On the one hand, this illustrates our approach in relying on Enterprise Architecture (EA) framework that respects: multiple views, perspectives of stakeholders, and domain specificity. On the other hand, it helps reducing both complexity and time spent in design activity, while preventing from design modeling errors during porting this activity in the MO domain. As conclusion, this work aims to demonstrate that we can improve the design activity of complex system based on the use of MDE technologies and a domain-specific modeling language with the associated tooling. The major improvement is to provide an early validation step via models and simulation approach to consolidate the system design.

Keywords : smart sensors, data fusion, distributed fusion architecture, sensor networks, domain specific modeling language, enterprise architecture, underwater moving object, localization, marine observatory, NS-3, IMS

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