

OWO – An Offshore Wind Ontology

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Abstract

This document describes a development process of an offshore wind ontology based on the IEC 61400-25 standard. The methodology “METHONDOLOGY” and Protégé are used to build the ontology.

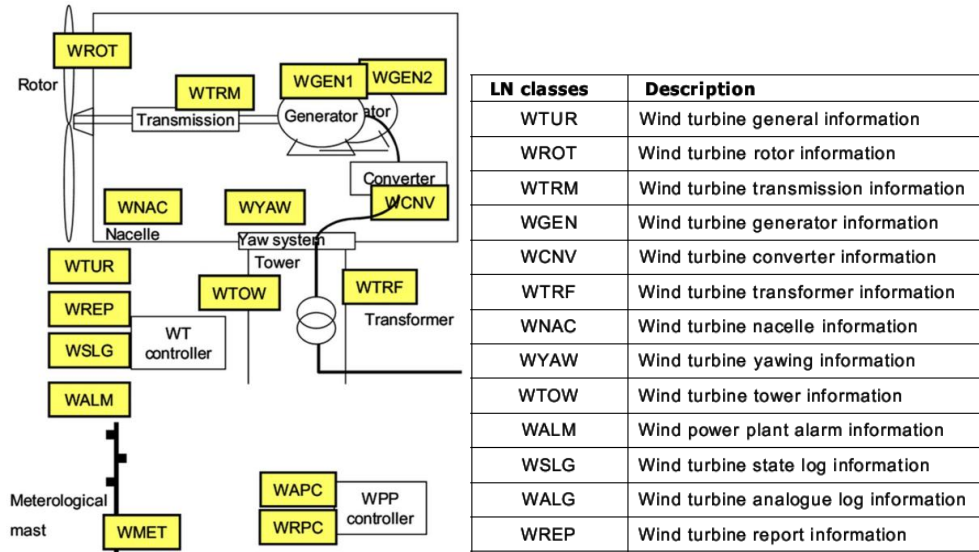
Introduction

Organizational units and information technology systems rarely last more than a few years. Only some parts of the data from these systems are used for decades and become one of the main assets. Obviously, the most stable elements in this environment are the terminologies used in the business domains along the value chain. The idea of creating an Offshore Wind Ontology (OWO) from the terminologies in order to share, reuse knowledge, and reason about behaviors across domains and tasks, is important. In general, an ontology is needed to make an abstract model of some phenomenon by identifying the relevant concepts of that phenomenon. It facilitates integration of processes within and across business domains, creation of autonomous solutions, and ability to store data over time. It is also a key instrument in developing the semantic web which is an extension of the current web in which information is given well-defined meaning, better enabling computers and people to work in cooperation. In order to develop the OWO, domain knowledge and concepts of the offshore wind industry are necessary. Thus, IEC 61400-25, IEC 61850, and CIM could be good reference standards for the OWO development. In addition, the International Organization for Standardization (ISO) 15926 provides an ontology for oil & gas. Building an ontology based on ISO 15926 not only brings benefits for the offshore wind ontology development but also makes it easier for the oil & gas industry to enter the wind energy business.

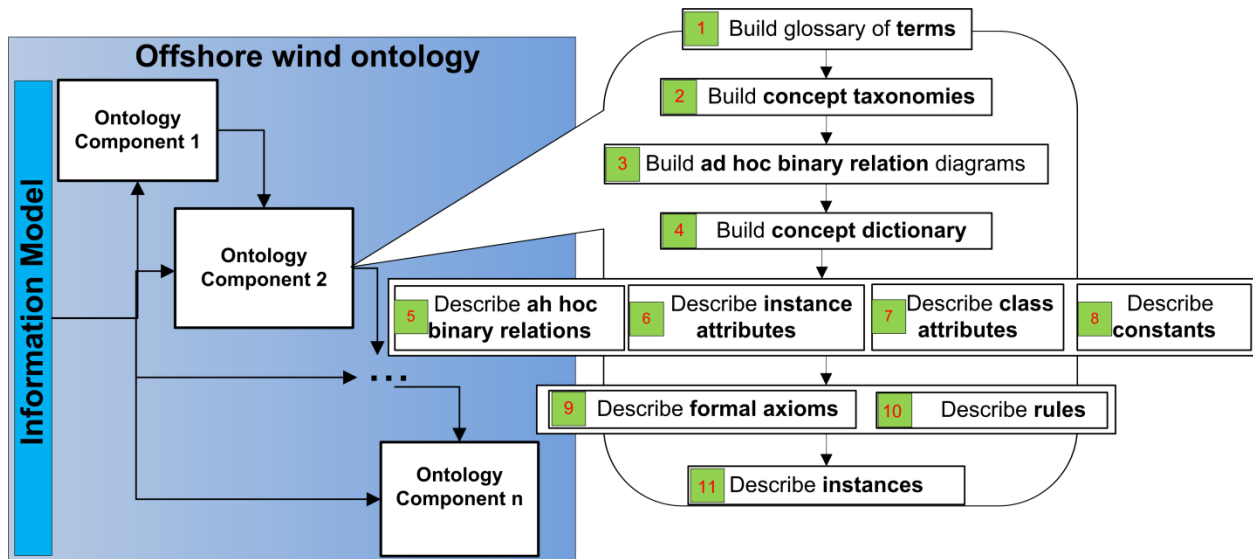
Development

Step1: Building an information model based on the IEC 61400-25 [1]

The IEC 61850 standard series is essentially a standard for power substation automation. The IEC 61400-25 standard is an adaptation of the IEC 61850 standard series, with special concern for controlling and monitoring WPPs. Therefore, the IEC 61400-25 standard series is not merely a replica of IEC 61850, but reuses the terms and definitions that will apply to all substations. Furthermore, the IEC 61400-25 standard series extends the IEC 61850 with unique information models which only apply to WPPs. Such unique features include rotor speed, turbine or other vendor specific components. The IEC 61400-25 standard describes information units for wind power plants (WPP), which are decomposed into smaller parts (logical nodes). Each logical represents a WPP component such as WROT (Wind turbine ROTor information).

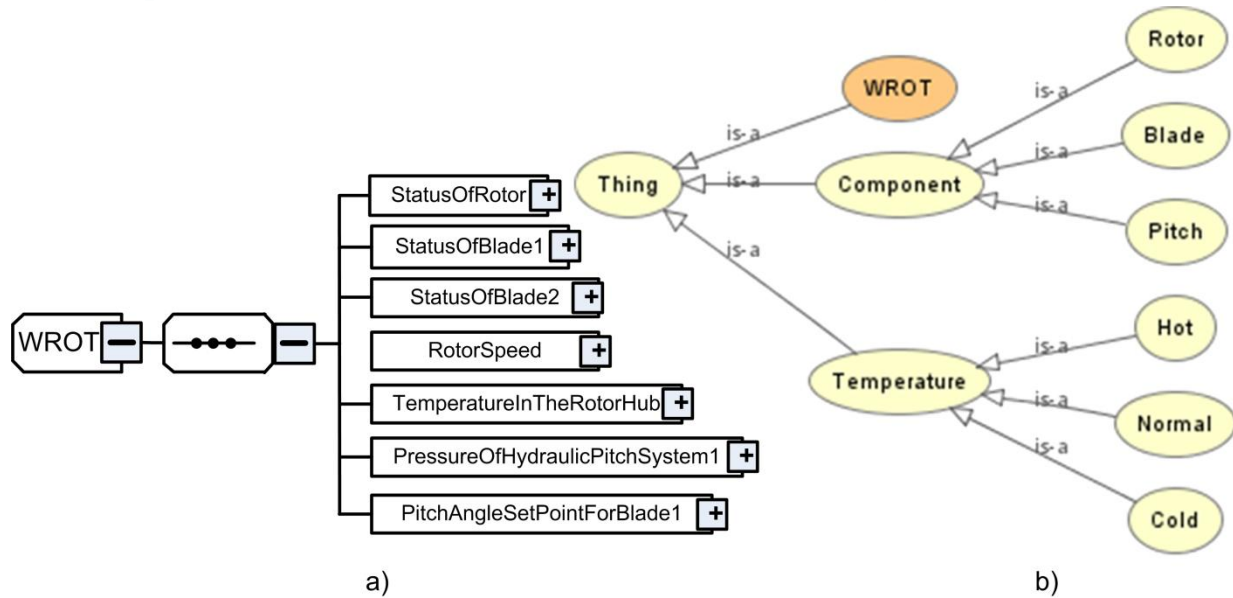


Step 2: Using methodology “METHONDOLOGY” and Protégé to develop the OWO based on the information model [2].



Step 3: Applying OWL API and Pellet to manipulate, serialize, and reason the developed ontology.

An example of Wind turbine ROTor information ontology



Outcome

A prototype of the offshore wind ontology is expected as the outcome of this project. The prototype will contain at least three logical nodes (e.g, WROT, WGEN, WTRM). In addition, some rules will be defined in order to establish reasoning over the developed ontology.

Reference

- [1] Nguyen, T.H., Prinz, A.: Using semantics to facilitate data integration of offshore wind farms, IEEE MELECON 2012, 25 - 28 Mar 2012, Tunisia.
- [2] Nguyen, T.H., Prinz, A., Friisø, T., Nossun, R.: Smart Grid for offshore wind farms: Towards an information model based on the IEC 61400-25, IEEE ISGT PES 2012, 16 - 19 Jan 2012, Washington D.C., USA