MPM4CPS Working Group 1
Call for Short Term Scientific Missions

1   Context

The proposed tasks will be performed in the context of Working Group 1 (WG 1) of MPM4CPS. The objectives of WG 1 consist of developing Multi-Paradigm Modeling (MPM) foundations for Cyber-Physical Systems (CPS). In order to achieve this objective, WG 1 must characterize / categorize existing modelling languages used in the different disciplines of CPS development starting from typical industrial CPS development scenarios. From there, common formalisms and ontologies used shall be identified and a state-of-the-art report on the current used formalisms shall be produced.

In order to derive the catalogue of languages and tools for CPS (D1.1), WG 1 is currently establishing an ontology serving as base classification for the development of CPS using MPM. This ontology defines a first set of named classes for classifying artifacts used in CPS development with MPM such as languages, formalisms, tools, etc. Existing MPM for CPS development environments and processes are tentatively classified using the first draft ontology, which is iteratively refined following the discoveries made from the classified case studies thanks to reasoning capabilities provided by the ontology approach.

These ontologies will support the production the deliverables of WG1 and some of those of WG2. From the set of developed ontologies, model transformations will be developed to automatically derive a first draft version of deliverable D1.1. Such transformation must take care of preserving any manual editions of the document.

The developed ontologies will be subject of publication(s) in good quality CPS conference(s) and journal(s).

2   Objectives

We request scientists to contribute to the development of the MPM4CPS ontologies presented above by participating to any of the following tasks.

2.1 Tasks

2.1.1 Classification of Modeling Languages and Tools for CPS

2.1.1.1 Description

The first part of this task consists of using the core ontologies to classify existing modeling languages and tools for CPS development. The Protégé tool and OWL language will be used including reasoning capabilities of the tool to iteratively improve the classification. Such task will probably trigger revisions of the current core ontologies by identifying its shortcomings. Therefore, some development of these ontologies is also expected in collaboration with the committee that has been defined for WG 1 and WG 2 to approve such important changes.

The second part of this task consists of generating a catalog of modeling languages and tools for CPS from the core ontologies and previous modeling languages and tools classification. This document is

to be released as deliverable D 1.1. A model to text transformation will be developed using the Acceleo tool. Execution of this transformation will produce a Latex document for the catalog according to a predefined template.

2.1.2 Modeling of Existing CPS Development Environments

2.1.2.1 Description

This task consists of using the core and catalog ontologies to model existing MPM4CPS development environments. Instances of megamodels as defined in the core MPM ontology will be created to define the involved models and model operation links and integrate all other elements of the informal characterization of the environments. From these results a case study for model management that can be made publicly available with mega models (languages specification, model integration, model operations, integration views, semantic domains, development processes, etc.) should be developed that is sufficient to study the challenges for MPM for CPS.

The Protégé tool and OWL language will be used including the reasoning capabilities of the tool. Such task will probably trigger revisions of the current core ontologies and catalog by identifying its shortcomings. Therefore, some development of these ontologies is also expected in collaboration with the committee that has been defined for WG 1 and WG 2 to approve such changes.

2.1.2.2 Required Knowledge

- Some experience in modeling and / or CPS development
- Protégé and OWL would be a plus

2.2 Organization

The tasks are to be executed at the Telecom ParisTech engineering school in Paris under the supervision of Dr. Dominique Blouin. The duration of missions can be between one to four weeks.