Project: Concurrency

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April 7, 2014

Abstract

The goal of the project is to apply the notions you have learned during this course. In order to realize the project, you will need the following documents: i) this project subject ii) the course iii) the JAVADOC iv) Some notions of Eclipse Modelling Framework (EMF) as given by prof. Mallet.

This assignment has to be done in a team of 5 persons. One of you has to be the project lead. Its technical workload will be lower but this one will have the charge of coordinating the project.

The purpose of this project is to do a multi languages code generator from data flow process networks. The generator accepts, as an input, the data flow description of an application in one of these three models: *marked graph*, *synchronous data flow*, and k-periodically routed graph.

The generator provides, as an output, the executable code of the application with respect to any of these four programming model: JAVA, MPI4Lectures, C Posix Thread, Open MPI.

1 Eclipse Modelling Framework (EMF)

EMF will be used to do the meta models of the inputs models. Thanks to this, the textual syntax (with xText) and the structure of the pretty printer will be easy to generate.

2 MG, SDF, and KRG

These model are used to perform abstract analyses of the application. Liveness, safety and flow preservation. Make sure these properties can be checked.

3 Implementation

When going from a model of computation to executable code, some additional informations should be introduced:

- The internal code of the computing blocks (transitions in MG, agents in SDF and KRG) has to be given as runnable class in Java or function in C. Consider this code as given with the description of the application. However, the association rules 'code with agent' have to be clearly defined.
- The input and output of the transition (or agents) has to be ordered to make the data flow consistents. Make sure transitions have port with a type.
- The values of the initial tokens has to be given. Here also, consider these values to be given.
- The places are implemented as FIFO buffers. The notion of FIFO has to be defined in the output langages when required (at least in POSIX).
- Models of computation assume inifinite execution but it is not often the case in reality. Make sure the generated code terminates.

4 Validation

Provide at least one example of application for each model of computation with the required code for the agents in every targeted language.

5 Deployment

The implementation should be presented as an eclipse plugin that can be imported in any existing eclipse. This plugin will contain the required libraries. The execution of the generated code is done outside of the plugin.

6 Deliverable

The first deliverable is a synthesis report which presents the realizations of the project and an overview of the implementation. The second deliverable is the Eclipse/JAVA implementation of the project.

The mark will be based on the following criteria:

- The clarity and usefulness of the report.
- The functionality! The program should work properly.
- The usage of EMF.
- Your creativity: feel free to extend this subject into a pertinent direction.
- The clarity and simplicity of your implementation. A javadoc or at least some comments are expected in the source file.
- The correct usage of the models of computations
- The correct usage of the programming languages and their multithreading APIs
- Your honesty! If you take a piece of code somewhere, say it and give credit.
- The ease of deploying the plugin

An archive containing the report plus the source code has to be sent to `jean-vivien.millo@inria.fr` before May, 8th 2014 at 23:59 (French time).

The defense will take place on Monday, May 12, 2014, from 9 to 10:30 am. You will have 75 minutes to present the projet followed by questions. Some slides and a demo are expected.

The goal is to present the purpose and the results of the project but also the team organization, the expected and actual agenda and finally the individual contributions.

Concerning each: each of you will have 15 minutes (as part of the 75 minutes but not necessary in one shoot) to present its contribution into the project. An overview of your contribution is expected and a deep focus on a technical aspect specific to your role are expected.