MAP-I PhD Dissertation Proposal

Test Automation for Concurrent, Distributed and Real-Time Systems based on UML Interaction Diagrams

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Thematic Area: Software Engineering / Software Test Automation

Research Unit hosting the proposed PhD project: INESC Porto

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Description and research Questions:

In previous work (see https://blogs.fe.up.pt/sdbt/) , we developed a novel toolset supporting the automatic (1-click) conformance testing of standalone Java implementations against partial behavioral models constituted by test-ready UML sequence diagrams (a kind of interaction diagrams). The toolset comprises a front-end for the modeling environment, a run-time tracing engine based on AOP, and a run-time conformance checking engine based on the translation of sequence diagrams to acceptance automata.

The extension of the approach for concurrent, distributed and real time systems, poses important new challenges, which may require radical changes in the approach followed so far.

Some of the research questions are:

- How to design a tracing engine, based on AOP, for capturing execution events and execution traces of concurrent, distributed and real-time systems?

- How to design an incremental conformance checking engine, for checking the conformance of the captured execution traces against interaction specifications in UML?

- Can the translation of test-ready UML sequence diagrams to Timed Event-Driven Colored Petri Nets provide a solution to the previous question?

- How to prove the correctness of the conformance checking engine?

- How to support all the features in UML interaction diagrams?

- How to support the testing of heterogeneous distributed systems, with components implemented in diverse technologies?