PIRE 2009 Project Proposal

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ee**Student Expected Graduation Date:** Fall 2011

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Name of the PIRE International Partner's Institution: The Triskell team, INRIA/ University of Rennes 1, Britanny, France

Supervisor's Name and Title at the PIRE International Partner's Institution: Dr. Jean-Marc Jézéquel, Professor and Team Leader

Collaborators: Jean-Marc Jézéquel, Benoit Baudry and Loic Lesage

Keywords: Model-driven development, Software Testing, Meta-modeling, Domain Specific Language

Project Title: Investigating the relationship between the test adequacy criteria for meta-models and their specific instances.

Problem Statement:
To date most of the methodologies and tool support for MDSD have targeted software development with little emphasis on testing. However, since testing remains the primary means of validation used in the software industry, it is also expected to play a key role in MDSD. The notion of test adequacy criteria is a fundamental concept in software testing, and provides the software tester with: (a) a means for measuring the effectiveness of the testing process; and (b) a stopping rule for knowing when sufficient testing has been performed. This PIRE project involves establishing the relationships between test adequacy criteria for meta-models and their concrete derived models. The purpose is to investigate how validating aspects of the static/dynamic semantics of different elements of a meta-model correlates to the elements of the concrete model that is derived from it.

Motivation and Impact:
The findings of this PIRE project can have profound implications for the modeling and software testing communities. For example, if it can be found that assertions can be made about the behavior of the concrete models after validating certain aspects of their meta-model, testing efforts can be greatly optimized to save valuable time, money, and resources. Researchers in the Triskell team at the University of Rennes 1 have developed a meta-modeling framework called Kermeta, which provides programmatic constructs for specifying meta-models. The Kermeta framework, built on Eclipse, also facilitates model and meta-model prototyping and simulation. This study can help to extend Kermeta's features to include model validation and behavioral

analysis. Furthermore, the CVM team at FIU has developed a Communication Modeling Language (CML) that allows the specification of user-centric communication needs. As specified in the research roadmap section of this proposal, CML will be used as the case study for this project and hence the CVM team will also directly benefit from its findings.

Current Status:
Yanelis Hernandez, the PIRE participant who will be involved in this project, has been working in the area of software testing and model-driven software development. More specifically, she has developed a meta-model to support regression testing and facilitate transformation of platform specific tests to various platforms. Her work on testing as relates to model-driven software development has provided the initial insight into the viability of this PIRE project proposal.

Research Roadmap:
The milestones of my research are as follows:

1. *(2 weeks)* - Identify Test Adequacy Criteria for domain specific meta-models.
2. *(5 weeks)*- Generate test cases based on the meta-model to satisfy the Test Adequacy Criteria.
3. *(3 weeks)*- Perform experiments to find the relationship between the specified criteria for the meta-model and the instantiated model. Use the CML as the case study for the domain specific model.

Relation to PIRE Core Research Projects:
This project fits into the "CI Enablement Layer", more specifically "Communication Virtual Machine". The outlined project will do a comparison of the test adequacy criteria results at the meta-model level as well as the concrete instantiated model. Furthermore the project used as the case study in this research will be CVM.