

Phase I Project Summary

Firm: Tech-X Corporation

Contract Number: NASA SBIR # NNX10CE83P

Project Title: Fortran Testing and Refactoring Infrastructure



Identification and Significance of Innovation: (Limit 200 words or 2,000 characters whichever is less)

Tech-X proposes to develop a comprehensive Fortran testing and refactoring infrastructure that allows developers and scientists to leverage the benefits of comprehensive Integrated Developer Environment (IDE) tools. An intriguing aspect of the infrastructure is the integration of performance measurement, unit testing, and refactoring tools with the many other features of an IDE, which will allow developers to get immediate feedback about the overall application and reduce their development cycle time. The infrastructure will facilitate refactoring newly developed and legacy codes correctly and accurately for single and multi-processor applications. Major benefits to refactoring include creating robust codes that are more easily ported to different hardware and software platforms, promoting extensibility, facilitating better collaboration, and encouraging best software engineering practices. For example, refactoring code to remove common blocks allows porting to multi-core architectures with increased thread safety.

Technical Objectives and Work Plan: (Limit 200 words or 2,000 characters whichever is less)

The objectives of Phase I were: (1) extend pFUnit functionality to legacy applications by implementing a prototype parser that will scan subprogram signatures; (2) implement a prototype graphical user interface for pFUnit as an Eclipse plugin; and (3) add additional refactoring capability to Photran and test key prototype examples from two prominent climate codes (ModelE & CAM). The work plan include 3 tasks: (1) Integrate a prototype pFUnit parser to generate tests from legacy applications; (2) Design a prototype eclipse plugin for pFUnit; and (3) Implement additional prototype refactoring capability in Photran.

Technical Accomplishments: (Limit 200 words or 2,000 characters whichever is less)

During the Phase 1 performance period we were able to investigate parsing mechanisms and implement a prototype capability within Photran that allows a user to generate pFUnit tests (parsing a ModelE source file and code generating a new unit test source file that with the parsed subprograms as individual modules). We were also able to modify Photran in order to interact with pFUnit and provide step-by-step instructions for how to use the functionality and extend its refactoring capability. The Phase 1 results showed that we met the technical objects, which justifies that the project should continue to Phase 2.

NASA Application(s): (Limit 100 words or 1,000 characters whichever is less)

While process study missions are critical to improve underlying climate model physics, future mission observations are critical to determine the impact of those climate model improvements on the accuracy of predicting future climate change. Since the proposed tools will make it easier for NASA scientists to develop and optimize climate modeling codes, the proposed project in a sense supports all climate-related current and future missions.

Non-NASA Commercial Application(s): (Limit 200 words or 2,000 characters whichever is less)

Commercial applications are directed at all developers/maintainers of Fortran codes. As new computing architectures become available, the portability, maintainability, and scalability of legacy codes can negatively impact the productivity of users. Serial codes moving to multicore architectures and serial or parallel codes moving to hybrid architectures are targeted as benefiting from the proposed tools.

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