

CPA-SEL-T: Collaborative Research: Traceability⁺: a Service Oriented Framework to Support Value-Added Software Traceability

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1 PROJECT SUMMARY

Traceability plays an important role in the development and assurance of software systems that permeate our society. It helps to assure that an as-built system correctly implements all requirements by supporting change impact assessment, re-engineering of applications, and other critical software engineering activities. Previously, researchers have focused on delivering point solutions that address specific traceability issues. In contrast, the proposed research will develop a new and powerful traceability model, named *Traceability⁺*, that will deliver value-added traceability *services* designed to support diverse stakeholders as they perform critical software engineering activities. For example, an independent verification and validation (IV&V) analyst can use our value-enhanced traceability services to determine if the elements of a design satisfy the requirements, while the developer of an embedded pacemaker controller can determine the scope of a proposed change as well as the amount of effort required to implement the change. *Traceability⁺* will support the needs of a broad spectrum of stakeholders including requirements analysts, reverse engineers, developers, architects, maintainers, and IV&V analysts.

2 INTELLECTUAL MERIT

The proposed work represents a significantly challenging research project. The research will involve developing a unified traceability query language and underlying query mechanism, identifying stakeholders' roles and associated tasks, devising techniques for automating or semi-automating those tasks, developing traceability services and a service oriented architecture to deploy the services and enable users to generate enhanced-value queries, designing a knowledge base that promotes reuse of knowledge and services, and, finally, developing an underlying traceability mechanism for dealing with heterogeneous artifacts. The work will be extensively and empirically validated through rigorous experiments and industrial studies. Industrial involvement is made possible by the industry participants serving as senior personnel on the project.

3 BROADER IMPACT

The research is anticipated to have broad impact for tracing practitioners in both industry and government. The proposed *Traceability⁺* framework and related services will significantly increase the practical benefits of creating and maintaining a traceability matrix and will provide useful support for higher level software engineering activities. To maximize industry impact, papers will be published in practitioner-targeted venues and top academic conferences and journals. Results will also be disseminated broadly through outreach endeavors by the Center of Excellence for Software Traceability. In addition to the concrete benefits to industry, this project also serves to unite research that cross-cuts the maintenance, testing, requirements, and visualization research communities. This in itself is a benefit that is anticipated to create opportunities for further collaborations and increase our ability to address traceability problems. Finally, the research will proactively empower the next generation of traceability researchers by providing ongoing opportunities for students to participate in related conferences and workshops, developing training materials, and providing research opportunities for a broad spectrum of students.