



# Software Engineering Research Center (SERC)

Ball State University (lead institution)

**International competition and the rapid growth of the computer software industry make it essential to develop new capabilities to produce software products**

*A National Science Foundation Industry/University Cooperative Research Center since 1986*

**Partner Institutions:**

- Ball State University
- Purdue University
- West Virginia University
- Oregon Associated Universities

**Center Mission and Rationale**

American companies currently own 65 percent of the global computer software market. To remain competitive, the software industry needs to keep pace with the productivity gains achieved in hardware development, produce the quantity of software needed for new computer applications, and develop the highly reliable software that is required in critical application areas. Existing software technologies have been pushed beyond their limitations due to complex new application systems and the demand for software to support new applications. Moreover, software costs continue to rise, and the demand for new software products far exceeds programmer productivity gains.

The research program of the Software Engineering Research Center (SERC) is focused on developing and assessing concepts, methods and tools to improve productivity and software quality throughout the software development life cycle. SERC performs basic and applied research designed to improve the management of the software engineering process, the productivity of software engineers, and the quality and timeliness of software engineering products.

**Research Program**

Software engineering — the technical design and production of software products — is a technology area that requires ongoing research and development. SERC's research thrusts are in the following areas —

- **Software Development Tools.** These tools are used in requirements engineering, scheduling for hard real-time systems, design engineering, user-interface generation, code analysis, software testing, debugging, and concurrency.
- **Software Maintenance Methods and Tools.** These tools help programmers understand and enhance existing software. Topics addressed include maintaining object-oriented programs, dependency analysis and designing maintenance environments.
- **Software Development in a Distributed Environment.** This research includes work on a multimedia, collaborative multi-user, software development application based on experimental distributed object technology.
- **Software Process Modeling and Metrics.** New techniques forecast the quality of software based on measurements recorded during the design stage. Also included in this area are the identification and

measurement of factors that affect productivity, the development of software process modeling and analysis techniques for process improvement, and the development and validation of metrics and models for software cost and size estimation, reliability assessment, and testing.

- **Software Applications.** In addition to generic software engineering research we also conduct application-specific research to reflect concerns and goals of the industrial membership that include but are not limited to : telecommunications, database, real-time applications, high assurance systems, and web applications

**Special Center Activities**

The Center has been extremely successful in transferring SERC-produced technology to the industrial arena. Examples include —

- Fourteen software prototypes demonstrated or delivered to affiliates for internal use
- The enhancement of ATAC, a Telcordia (formerly Bellcore Labs) software product, by Purdue University personnel in collaboration with Telcordia researchers
- SERC transaction processing technology, implemented in a real-time database product by Harris Corporation
- Collaboration by SERC researchers with Tivoli and Telcordia in Testing Distributed Systems,
- Dynamic Flow Visualization utilizing virtual reality technologies for FETC
- Development of new testing and evaluation techniques and procedures for Dynamix, a computer entertainment corporation.

In addition to the principal sites of Ball State University, Purdue University, West Virginia University, and the four campuses of the Oregon Associated Universities (University of Oregon, Oregon Graduate Institute, Portland State University, and Oregon State University), SERC has benefited from the involvement of researchers at the following universities: Indiana University, Butler University, IUPUI, George Mason University, Texas A&M University, University of West Florida, University of North Florida and Virginia Tech.

SERC researchers collaborate with colleagues around the world and transfer information on international activities to SERC sponsors via SERC's Window-on-the-World program, which includes a postgraduate training and research consortium headquartered in Padua, Italy.

SERC participates in the Women, Minority, and Disabled Undergraduate Engineering Research Assistants program, as well as educational programs that provide support for minority institutions.

SERC will soon embark upon the creation of a “technology watch” project, focused on issues within software engineering. SERC envisions that TechWatch will be a long-term, ongoing project that will fulfill our mission to serve our industrial affiliates’ needs and the needs of the software engineering discipline by providing information on marketing, research, and technology trends and forecasts.

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