Software Design and Productivity Coordinating Group

Interagency Working Group on Information Technology Research and Development

Call for White Papers

**Workshop on New Visions for Software Design and Productivity:
Research and Applications**

**December 13 – 14, 2001
Vanderbilt University
Nashville, Tennessee**

White Paper Submission Deadline October 31, 2001

Academic, industrial, and government researchers are invited to submit white papers on research ideas in software design technologies that can dramatically increase software productivity without compromising software quality. This workshop seeks informed and innovative inputs about the changing role of software and how researchers can evolve techniques, tools, and methods to obtain usable systems. Of particular interest are technology needs and promising solutions that can revolutionize the way we design and produce software in the coming decades, but that are currently beyond the scope of today's time-to-market and profit-driven research and development (R&D) programs.

Submitted papers will be considered for presentation and discussion at a forthcoming Workshop on New Visions for Software Design and Productivity: Research and Applications, to be held December 13-14, 2001, at Vanderbilt University in Nashville, Tennessee.[1]

The output of the workshop will be a public report prepared by the Federal government's Software Design and Productivity (SDP) Coordinating Group (CG) that summarizes the ideas identified in the workshop.

The workshop report will be used by Government agencies and policy makers in developing a broad, long-term Federal software design and productivity research agenda and guiding future software R&D programs. Such research is critical to the security and economic viability of the U.S. and is highly aligned with the President's Information Technology Advisory Committee (PITAC) recommendation that the U.S. "make fundamental software research an absolute priority."[2] The SDP CG briefed the PITAC in May 2001 about its efforts, including an April 18-19, 2001, planning workshop that laid the groundwork for the December 2001 workshop announced here. The PITAC briefing summarized challenges for software design, challenges for software productivity,

a representative goal space, and a representative solution space. The briefing and the planning workshop report can be found at http://www.itrd.gov/iwg/pca/sdp.html. The four major research areas addressed at that workshop and some key research questions considered were:

The Future of Software and Software Research

Software's rapid penetration throughout all sectors of the economy challenges both the fundamentals underlying software research and how that research is conducted. Today, an estimated 50 percent of large software projects fail, software applications cannot talk with each other, and the investment in legacy software cannot be abandoned.

- What will software and software development teams look like in the future?
- What will the role of programming languages be?
- Should research move to more empirical foundations, focus on support tools, divide into multiple, domain-based , develop whole new abstractions, or go in other new directions?
- How will we train future software practitioners, who range from scientists to implementers?

New Software Development Paradigms

Software is increasingly the universal integrator for large-scale systems, which are themselves network-centric, distributed "systems of systems." Paradigms are needed that include careful engineering processes and systematic validation methods.

- Will development become more dynamic and fluid or more rigid and rule-driven?
- What should be the balance between formal and informal methods; engineering and artistry; evolution and rebuild; correct by construction and correct by consensus?
- What will be the role of open software development? Of end-user programming? Of other radically different development models?
- What effect will legal and societal demands have on development paradigms?
- How will collaborative development environments impact the design and productivity of software?

Software for the Real World

There are vast numbers of embedded systems with behavior constrained by the physical world. We need principled methods for composition and integration of such constraints with conventional functional requirements and components.

- How can real-world physical constraints be integrated with orthogonal functional constraints in designing software?
- How can hardware-software co-design contribute to a solution?
- Models are possible solutions at many levels of software design, but are there other promising approaches?
- How can we handle the legacy systems that constitute a substantial portion of today's world?

Software for Network-Centric Distributed Systems

Next-generation applications will increasingly be run on networks, posing difficult configuration and workload issues. Challenges include latency hiding, partial failure, causal ordering, dynamic service partitioning, and distributed deadlock avoidance. Techniques for end-to-end quality of service frameworks, multi-level distributed resource management, and adaptive and reflexive middleware are also needed.

- What is the core set of problems to be solved in this emerging world?
- What analytical methods and tools are needed to design and implement "always running" systems?
- When risk management is part of the system, how will that affect software products?

White Paper Submission Guidelines

White papers should be at most five pages long, including figures, with font size 10 points or larger. The first of these five pages should be a cover page that includes:

- Title of paper about innovative long-term research ideas in software design technologies
- Name and affiliation of each author and/or a contact person
- Abstract that succinctly describes the paper's main ideas, innovative claims, and critical technical barriers

Papers should be submitted as Microsoft Word or Adobe PDF files to sdp-workshop@vanderbilt.edu by 5:00 p.m. Eastern Standard Time on Wednesday, October 31, 2001.

Workshop Invitations

The workshop will be by invitation only. Anyone interested in participating in the workshop should submit a white paper. Notice will be sent by November 15, 2001, to all those who submitted white papers letting them know whether they are invited to the workshop and, if so, what role they are asked to play.

Further Information

Future announcements about this workshop will be posted to:

http://www.isis.vanderbilt.edu/sdp

Please send inquiries about this workshop to: sdp-workshop@vanderbilt.edu

Workshop Co-Chairs

Janos Sztipanovits, Vanderbilt University
Adam Porter, University of Maryland

Program Committee

David Notkin, University of Washington
Benjamin Pierce, University of Pennsylvania
Bill Mark, SRI
Shankar Sastry, University of California, Berkeley
Rick Schantz, BBN Technologies
Don Winter, The Boeing Company
Charles Simonyi, Microsoft
John Vlissides, IBM Watson Research

Workshop Technical Sponsors

The technical sponsors of this workshop are the Software Design and Productivity (SDP) Coordinating Group (CG) of the Interagency Working Group (IWG) on Information Technology Research and Development (IT R&D), and the National Coordination Office (NCO) for Information Technology Research and Development. Both the IWG and the NCO are part of the Office of Science and Technology Policy of the Executive Office of the President. The SDP agencies are:

DARPA
DOE/National Nuclear Security Administration
NASA
NIH
NIST
NSF
Office of the Deputy Undersecretary for Defense (Science and Technology)

[1] This workshop is funded by the National Science Foundation under grant, CCR-0138554, and is hosted by Vanderbilt University. The Software Design and Productivity Coordinating Group thanks both NSF and Vanderbilt for their contributions toward the success of this workshop.
[2] "Information Technology Research: Investing in Our Future," President's Information Technology Advisory Committee, page 32. The report is available from the National Coordination Office for Information Technology Research and Development, Arlington, Virginia, and at http://www.itrd.gov/ac/report/.