

David M. Woollard

CONTACT INFORMATION

Cognizant Design Engineer

Office: 171-243H *Voice:* (818) 354-4291
Data Management Systems and *Fax:* (818) 393-1370
Technologies Group
NASA Jet Propulsion Laboratory *E-mail:* woollard@jpl.nasa.gov
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Ph.D. Candidate

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RESEARCH INTERESTS

High Performance Scientific Computing, Code Reuse and Reengineering, Process and Workflow Management, Software Engineering, Software Architecture, Distributed and Cluster Computing Platforms, Large-scale Distributed Systems, User Interface Design, Data modeling

EDUCATION

University of Southern California, Los Angeles, CA USA

Ph.D. Candidate, Computer Science, August 2005 (expected graduation date: December 2008)

- Dissertation Topic: "Supporting Scientific Workflows Through First-Class Connectors"
- Advisor: Nenad Medvidovic

M.S., Computer Science, August 2006

- Thesis Title: "Reducing Delivery and Load Balancing Costs in High Performance Computing: A Software Engineering Approach"
- Advisor: Nenad Medvidovic

B.S., Computer Engineering and Computer Science, May 2003

PROFESSIONAL EXPERIENCE

Data Management Systems and Technologies Group, NASA Jet Propulsion Laboratory, Pasadena, CA 91109 USA

Cognizant Design Engineer

September 2007 - Present

Staff Software Engineer

September 2007 - Present

Associate Software Engineer

July 2006 - August 2007

Developed science data processing system for the Orbiting Carbon Observatory Earth Science mission and NPOESS Preparatory Project (NPP) PEATE mission. System engineer on NPOESS Preparatory Project (NPP) PEATE mission. Authored a New Technology Proposal for Promoting Algorithm Reuse and System Ease-of-Use in Complex Data Intensive Processing Systems.

Laboratory for Neural Dynamics, University of Southern California, Los Angeles, CA USA *Research Assistant*

May 2003 - August 2005

Designed and built a 256 node Linux-based computational cluster for the Laboratory. Lead design engineer and software architect for high-performance software systems including research platforms for the Dynamic Synapse Neural Network and other neural simulations. Experience with middleware development, large-scale distributed, event-driven software, and software engineering management.

Engineering Writing Program, University of Southern California, Los Angeles, CA USA

Administrative Assistant

July 2003 - August 2005

Served as point of contact for faculty on all technical issues related to teaching Engineering Writing courses. Designed, administered, and analyzed student surveys both quantitatively and qualitatively.

Wrote and prepared various documents for the Director of the Program, including assisting the Director in the ABET departmental review process and writing grant applications.

HONORS AND AWARDS

NASA New Technology Report (NTR) NPO-44883, "Refining and Improving the OODT Catalog and Archive Service via Agile Component Refactoring," 2007.

Dean's Award for Academic Achievement, Viterbi School of Engineering, May 2003

Intel Undergraduate Research Award, Intel Corporation, 2002

Presidential Scholar, University of Southern California, 1999-2003

ACADEMIC EXPERIENCE

University of Southern California, Los Angeles, California USA

Graduate Student

August 2003 - present

Includes current Ph.D. research, Ph.D. and Masters level coursework and research projects. Active participant in proposal writing to funding agencies such as NSF, DOD and the NIH.

Teaching Assistant

Fall 2005 - Present

TA for graduate level courses on Software Architectures and User Interface Development. TA for an undergraduate course in Java with an emphasis of user interface development. Shared responsibility for lectures, exams, homework assignments, and grades.

- CSCI 105: Introduction to Java (now User Interface Design and Implementation), Fall 2005
- CSCI 578: Software Architectures, Spring 2006
- CSCI 588: Specification and Design for User Interface Software, Fall 2006

PUBLICATIONS

Refereed Journals

1. D. Woollard, N. Medvidovic, Y. Gil, and C. Mattmann. Scientific Software as Workflows: From Discovery to Distribution. Submitted to *IEEE Software - Special Issue on Developing Scientific Software*, 2008.
2. D. Woollard, C. Mattmann, D. Crichton, D. Freeborn, J. LaPointe, E. Hansen, M. McAuley, and N. Medvidovic. An Architectural Meta-Style for Large-scale, Distributed Ground Data Systems Software. Submitted to the *Journal of Systems and Software, Special Section on Software Architecture*, 2006.

Refereed Conferences and Workshops

1. D. Woollard, D. Freeborn, E. Kay-Im, S. LaVoie. Case Studies in Science Data Systems: Meeting Software Challenges in Competitive Environments. To appear in *Proceedings of the 10th International Conference on Space Operations (SpaceOps-2008)*, AIAA press, Heidelberg, Germany, May 2008.
2. C. Mattmann, D. Woollard, N. Medvidovic. Exploiting Connector Knowledge to Efficiently Disseminate Highly Voluminous Data Sets. To appear in *Proceedings of the ICSE 2008 Workshop on SHaring and Reusing architectural Knowledge - SHARK 2008*, Leipzig, Germany, May, 2008.
3. C. Mattmann, D. Woollard, N. Medvidovic and R. Mahjourian. Software Connector Classification and Selection for Data-intensive Systems. To appear in *Proceedings of the ICSE 2007 Workshop on Incorporating COTS Software into Software Systems: Tools and Techniques (IWICSS)*, Minneapolis, MN, May 22, 2007.
4. D. Woollard and N. Medvidovic. High Performance Software Architectures: A Connector-Oriented Approach. Proceedings of the *Institute for Software Research Graduate Research Symposium*, Irvine, California, June, 2006.

5. D. Woollard and N. Medvidovic. An Architectural Style for High-Performance Asymmetrical Parallel Computations. Proceedings of the *International Conference of Software Engineering (ICSE 2006)*, Shanghai, China, May, 2006.
6. D. Woollard, N. Medvidovic, W. Yamada, and T. Berger. ADaPT: An Event-Passing Protocol for Reducing Delivery Costs in Scatter-Gather Parallel Processes. Proceedings of the *Workshop for Patterns in High Performance Computing*, Urbana, Illinois, May, 2005.
7. D. Woollard, W. Yamada, and T. Berger. Software Engineering for Neural Dynamics: A Case Study. Proceedings of the *First International Workshop on Software Engineering for High Performance Computing System Applications*, Edinburgh, Scotland, May, 2004.

Technical and Non-Refereed Reports

1. C. Mattmann, D. Freeborn, D. Crichton, J. S. Hughes, P. Ramirez, S. Hardman, D. Woollard, and S. Kelly. Transformation of OODT CAS To Perform Larger Tasks. *NASA Tech Briefs*, to appear, 2007.
2. D. Woollard, C. Mattmann, M. Smyth, D. Freeborn, S. LaVoie, E. Kay-Im. Meeting the Challenges of Competitive Science Data Systems: An Approach Whitepaper. JPL Internal. March, 2007.
3. D. Woollard, C. Mattmann, and N. Medvidovic. Injecting Software Architectural Constraints into Legacy Scientific Applications. USC Center for Software Engineering Technical Report, USC-CSE-2007-701, January 2007.
4. X. Yan, D. Woollard, W. Yamada, and T. Berger. Programming With PS.LINDA: An Experience Report. University of Southern California Laboratory for Neural Dynamics Technical Report. August, 2004.

Qualifying Examination Report

1. D. Woollard. Supporting Scientific Workflows Through First-Class Connectors. Qualifying Examination Report, University of Southern California, May, 2007.

Master's Thesis

1. D. Woollard. Reducing Delivery and Load Balancing Costs in High Performance Computing: A Software Engineering Approach. Master's Thesis, University of Southern California, August 2006.

POSTERS AND FORMAL PRESENTATIONS

1. *Science Data System Architecture: Integrating Modeling Capabilities in a Production Environment to Further Forecasting and Decision Support*. D. Woollard, D. Freeborn, D. Crichton, C. Norton, and E. Kay-Im. Presented at NRC Decadal Study DESDynI Science Workshop, July 17-19, 2007.
2. *NPOESS Preparatory Project Sounder PEATE Preliminary Design Review*. S. Friedman, R. Ando, D. Woollard, E. Maning. June 19, 2007.
3. *Software Connector Classification and Selection for Data-intensive Systems*. C. Mattmann, D. Woollard, N. Medvidovic and R. Mahjourian. Presented at the ICSE 2007 Workshop on Incorporating COTS Software into Software Systems: Tools and Techniques (IWICSS), Minneapolis, Minnesota, May 22, 2007.
4. *GUI Building - Tools, Languages, and Architectures*. D. Woollard. Guest lecture, USC CSCI588: Specification and Design for User Interface Software, Los Angeles, California, November 14, 2006.

5. *Code Reuse in Workflows Via Software Architectural Wrappers*. D. Woollard. Invited Talk, Instruments Software and Science Data Systems Section, Jet Propulsion Laboratory, Pasadena, California, November 6, 2006.
6. *Endowing Legacy Applications with Software Architectural Capabilities*. D. Woollard and N. Medvidovic. Invited talk presented as part of the Computer Science Division Colloquium, Information Sciences Institute, Marina del Rey, California, October 30, 2006.
7. *High Performance Software Architectures: A Connector-Oriented Approach*. D. Woollard and N. Medvidovic. Presented at the 2006 UC Irvine ISR Research Forum, Irvine, California, June 2, 2006.
8. *An Architectural Style for High-Performance Asymmetrical Parallel Computations*. D. Woollard and N. Medvidovic. Presented at the 2006 UC Irvine ISR Research Forum, Irvine, California, June 2, 2006.
9. *An Architectural Style for High-Performance Asymmetrical Parallel Computations*. D. Woollard and N. Medvidovic. Presented at the 28th ACM/ IEEE International Conference on Software Engineering (ICSE) Emerging Results Track. May 24th, Shanghai, China, 2006.
10. *Teaching and Learning Through the Prism of Mentoring*. M. Jackson, D. Mihram, S. Bucher and D. Woollard. Presented at the Western Association of Schools and Colleges, San Diego, California, June 7, 2005.
11. *Exploiting Event Patterns to Reduce Delivery Costs in Scatter-Gather Parallel Processes*. D. Woollard, N. Medvidovic, and T. Berger. Presented at the 2005 UC Irvine ISR Research Forum, Irvine, California, June 3, 2005.
12. *Towards Large-scale Hippocampal Network Simulations*. D. Woollard, W. Yamada, and T. Berger. Presented at the National Science Foundation Engineering Research Center for Biomimetic Microelectronic Devices Annual Review, Los Angeles, California, May 26, 2005.
13. *ADaPT: An Event-Passing Protocol for Reducing Delivery Costs in Scatter-Gather Parallel Processes*. D. Woollard, N. Medvidovic, W. Yamada, and T. Berger. Presented at the Proceedings of the Workshop for Patterns in High Performance Computing, Urbana, Illinois. May 6, 2005.
14. *Software Engineering for Neural Dynamics: A Case Study*. D. Woollard, W. Yamada, and T. Berger. Presented at the First International Workshop on Software Engineering for High Performance Computing System Applications, Edinburgh, Scotland, May 24, 2004.

MENTORING

Project:Possibility Semester Project

Team Leader - SunSPOT Development Team, Spring 2008

Mentored a team of undergraduate and master's students developing open-source software for disabled persons utilizing the mobile sensor platform SunSPOT. Taught software development life cycle and team-based software development.

Sponsored by: Project:Possibility and Sun Microsystems.

University of Southern California - Undergraduate Directed Research

Advisor, Spring 2008

Advised a senior undergraduate computer science student during a semester of directed research. Responsible for project formulation, scheduling, solicitation of progress reports, etc.

Engineering Writing Program Mentoring Program

Program Manager, Spring 2005 - Spring 2006

Mentored a class of undergraduate engineering students during the Spring 2005, Fall 2006 and Spring 2006 semesters. Managed 20+ graduate students and practicing engineers who mentored more than 300 undergraduate students.

Sponsored by: Mellon Foundation Academic Mentoring Program.

PROFESSIONAL
SERVICE

Referee and Reviewer Service

1. External Reviewer, 7th Working IEEE/IFIP Conference on Software Architecture, 2008.
2. External Reviewer, 10th Intl' Symposium on Component-based Software Engineering, 2007.
3. External Reviewer, 1st IEEE Intl' Conf. on Self-Adaptive and Self-Organizing Systems, 2007.
4. External Reviewer, Workshop on Soft. Eng. for Adaptive and Self-Managing Systems, 2007.
5. External Reviewer, 8th Intl' Symposium on Component-based Software Engineering, 2005.

Open Source Software Contributions

Object Oriented Data Technology (OODT) - <http://oodt.jpl.nasa.gov>
Committer

Project:Possibility LunarTuner Software - <http://www.projectpossibility.org>
Committer

PROFESSIONAL
ASSOCIATIONS

IEEE Computer Society, Member
UPE Computer Science Honors Society, Member
HKN Electrical Engineering Honors Society, Member

COMPUTER SKILLS

- Languages: Java, C/C++, Perl, Python, SQL, XML, HTML, JavaScript, MPI, 68K & MIPS assembly.
- Applications: \LaTeX , common Windows database, spreadsheet, and presentation software.
- Operating Systems: Windows, Macintosh (OS-X), Unix (Solaris, Linux), COTS-based clusters.

REFERENCES

Available upon Request

CITIZENSHIP

United States Citizen