GREGORY R. WATSON

CURRICULUM VITAE

EDUCATION

2000 Doctor of Philosophy, School of Computer Science and Software Engineering, Monash University

1985 Bachelor of Science with First Class Honours (Information Science), Department of Computer Science, University of Tasmania

1984 Bachelor of Science, Department of Computer Science, University of Tasmania

SUMMARY OF WORK EXPERIENCE

2016-	Senior Research Scientist, Computer Science Research Group, Oak Ridge National Laboratory
2014-2017	Adjunct Professor, NYU Center for Data Science
2010-2016	HPC Tools Architect, Cross Platform Software, System & Technology Group, IBM Corporation
2007-2010	Project Leader, Eclipse Parallel Tools Platform, High Productivity Computing Group, T.J. Watson Research Center, IBM Corporation
2006-2007	Team Leader, Cluster Research Team, Advanced Computing Laboratory, Los Alamos National Laboratory
2002-2006	Technical Staff Member, Advanced Computing Laboratory, Los Alamos National Laboratory
2000-2002	Senior Research Fellow, School of Computer Science and Software Engineering, Monash University
1997-2000	Research Fellow, School of Computer Science and Software Engineering, Monash University
1994-1997	General Manager, Queensland Parallel Supercomputing Facility
1991-1994	Manager, Corporate Computer Systems, Division of Information Services, Griffith University
1988-1991	UNIX and Networking Consultant, Information Technology Centre, Griffith University
1986-1988	Research Programmer, Department of Computer Science, University of Tasmania

AWARDS

- R&D 100 award for the "Clustermatic" project to develop the world's first 2000+ CPU cluster system (2004)
- Los Alamos Achievement Award (2003, 2004, 2006)
- ClusterWorld Excellence in Clustering Technology (2004)
- Defence Program Award of Excellence (2002, 2003)
- Prime Computer prize for the greatest proficiency in honors-level study in the subject of Information Science (1986)

RESEARCH CONTRACTS

- NFS award #1047956, October 2010 – September 2013, "SI2-SSI: A Productive and Accessible Development Workbench for HPC Applications Using the Eclipse Parallel Tools Platform", PI: Jay Alameda (NCSA), co-PI: Steven Brandt (LSU), co-PI: Allen D Maloney (UO), co-PI: Marc Snir (Illinois), co-PI: Gregory Watson (IBM). Amount awarded: $1,434,000
- DOE Office of Science award ER25928, January 2009 – December 2011, "A Scalable Development Environment for Peta-Scale Computing", PI: Gregory Watson, co-PI: Jeremy C. Smith (ORNL), co-PI: Randy Roberts (LANL), co-PI: Wolfgang Frings (JSC), co-PI: David Abramson (Monash). Amount awarded: $1,152,000

ACHIEVEMENTS AND COMMUNITY CONTRIBUTIONS

- Project Leader of the Eclipse Science Top Level Project (http://science.eclipse.org)
- Project Leader of the Eclipse Parallel Tools Platform project (http://eclipse.org/ptp)
- Member of the Eclipse Tools Project Management Committee (http://projects.eclipse.org/projects/tools/developers)
- Founding member of the Scalable Tools Communication Infrastructure project (http://stci.wikidot.com)
- Contributor of the PowerPC port to the Coreboot project (previously known as LinuxBIOS) (http://www.coreboot.org)
- Contributor to the v9fs project (http://v9fs.sourceforge.net)
- Past-Chair of the auDA Foundation (http://www.audafoundation.org.au)
- Founding board member and past-Chair of the auDA, the Australia Domain Name Administration (http://www.auda.org.au/board/members)
- Past-President and Director of the Internet Society of Australia (http://www.isoc-au.org.au/Organisation/PastDirs.html)

DETAILED EXPERIENCE

2016- Senior Research Scientist, Computer Science and Mathematics Division, Oak Ridge National Laboratory

Senior member of the Scientific Software Development Team. Responsible for initiating and leading significant software research and development projects. Undertakes computer science research relating to high performance computing tools and infrastructure. Lead role in designing, developing, and delivering high quality training courses for scientific programming in Python and C++.

2014-2017 Adjunct Professor, NYU Center for Data Science

Responsible for all aspects of designing, developing, and presenting the DS-GA Programming for Data Science course. This course aims to provide students with the skills necessary to use Python for data analysis in scientific computing.

2010-2016 HPC Tools Architect, Cross Platform Software, IBM System & Technology Group

Responsible for overall strategy, design and technical leadership of IBM's development tools for HPC and technical computing. Undertake a range of activities including:

- Define an end-to-end HPC Tools solution, including the development of a delivery model for providing tools education and consulting, gathering and processing customer tools requirements, and ensuring efficient collaboration with other parallel tools teams.
- Coordinate the development and integration of proprietary and open source development tools into an Eclipse-based environment for application development.
- Key technical design and development of performance monitoring and analysis tools
- Continue to grow and develop the Eclipse Parallel Tools Platform collaborative ecosystem.
- **Skills**: Strategic planning, project management, release management, Eclipse, SWT, Java, C, C++, Fortran, Perl, XML, UPC

2007-2010 Project Leader, Eclipse Parallel Tools Platform, High Productivity Computing Group, IBM T.J. Watson Research Center

Responsible for overall technical leadership of the Eclipse Parallel Tools Platform project, including the planning, coordination, and strategic activities required to ensure that that the ecosystem continues to grow, and project deliverables are met on time and within budget. Undertake key technical development activities including:

- Coordinate the integration of exemplary development tools into an Eclipse-based environment for peta-scale application development.
- Design and develop scalability and usability enhancements to the Eclipse user interface, data collection infrastructure, and parallel debugger infrastructure
- **Skills**: Eclipse, SWT, Java, C, Python, XML, UPC, project management, release management, testing

DETAILED EXPERIENCE

2006-2007 Team Leader, Cluster Research Team, Advanced Computing Laboratory, Los Alamos National Laboratory

Responsibility for coordinating a research group of 7 staff members undertaking research into techniques for improving the usability and productivity of very large-scale cluster computer systems. Undertook a broad range of research and development activities that encompassed all levels of the system software stack, from system firmware, to development tools and environments. Technical activities during this time included:

- Expansion of the Eclipse Parallel Tools Platform (PTP) project to a $1.5M/year project
- Implement a more flexible communication and control infrastructure for remote computer systems
- Design and implementation of a parallel debugger and demonstration of debugging of a 1000+ process parallel application
- Design and implement modifications to the Open MPI runtime to support Eclipse-based monitoring and execution
- Investigate the development of a new cluster management system based on Plan9 concepts
- **Skills**: Eclipse, SWT, Java, C, Python, XML, project management, budgeting, strategic planning

2002-2006 Technical Staff Member, Advanced Computing Laboratory, Los Alamos National Laboratory

Research and development of tools and system software for large-scale cluster computer systems. The primary goal of this research was to create a complete software stack for cluster-type architectures. Key activities included:

- Founding the Eclipse Parallel Tools Platform (PTP) project, and the design and development of the first prototype
- Development and enhancement of the open-source V9FS filesystem technology for cluster environments
- Design and development of an open-source parallel debugging platform for massive-scale parallel systems
- Construction and commissioning the world's first 2000+ CPU diskless cluster computer system utilizing the Clustermatic software stack
- Development of the PowerPC port of LinuxBIOS (now Coreboot), an open-source BIOS replacement
- **Skills**: Eclipse, SWT, Java, C, Python, XML, Linux kernel, x86 and PPC assembler, Matlab

DETAILED EXPERIENCE

2000-2002 Senior Research Fellow, School of Computer Science and Software Engineering, Monash University

A senior research position that was primarily focussed on exploring debugging technology, and in particular how to enhance the capabilities of parallel debuggers. This involved leading the ongoing development of the "Relative Debugging" debugging paradigm. Research and development activities included:

- Integration of relative debugging technology into the Visual Studio.NET development environment
- Development and support of an open-source parallel debugger for cluster computer systems
- Development of remote sensor and control networks for home automation ("Smart House" Project)
- **Skills**: VS.NET, C++, C, Python, TCL/TK

1997-2000 Research Fellow, School of Computer Science and Software Engineering, Monash University

The aim of my research was to extend the concept of relative debugging to support its application in a distributed memory parallel environment. There were four main aspects to the research:

- The development of a client/server debugger architecture to support parallel debugging
- The use of dataflow technology to automate the data comparison process
- The design of an architecture independent data format for the transport and manipulation of data from distinct architectures
- The definition of an algebra to describe the transformations applied to data in the parallelization process
- **Skills**: C, Python, MySQL, Linux, HDF, X11, OSF/Motif

1994-1997 Manager, Queensland Parallel Supercomputing Facility

This was a wide-ranging position that involved all aspects of establishing the facility, installation, operation and maintenance of infrastructure, and the provision of high performance computing services to the member institutions. Duties included the following:

- Support for development, porting, and performance optimization of parallel scientific codes
- Establishing acceptance testing criteria and an acceptance test plan for the installation of the supercomputer
- Overseeing installation and commissioning of the supercomputer
- Coordinating the development of policy and procedures for managing the facility
- Management and oversight of a team of support staff
- Development of annual budgets and budget forecasts
- Planning for additional hardware and software acquisitions and upgrades
- Coordinating support representatives from seven universities
- Oversight of the development and conducting of training courses
- **Skills**: C, Fortran, TCL/TK, AIX, Management, budgeting, training

DETAILED EXPERIENCE

1991-1994 Manager, Corporate Computer Systems, Division of Information Services, Griffith University

The Corporate Computer Systems Group was responsible for the provision of corporate computing services for the University, including student records, payroll, financial, and academic services. As manager of this group, it was my role to ensure that the group's responsibilities were carried out as efficiently and effectively as possible, with minimum disruption to computing and network services. Duties of this position included:

- Administration, operation, and maintenance of administrative and academic computer systems
- Development and support of administrative software and tools
- Development, implementation, and support of corporate network software services
- Capacity planning for hardware and software upgrades
- Managing and responding to issues relating to network and computer security
- Maintenance and administration of all software licences and documentation
- Budget forecasting and planning
- **Skills**: C, TCL/TK, HPUX, Solaris, Oracle, TCP/IP, management, planning, budgeting

1988-1991 UNIX and Networking Consultant, Information Technology Centre, Griffith University

This position was responsible for establishing and maintaining the computing and networking facilities across multiple university campuses. Responsibilities included:

- Providing systems administration support for the corporate administrative and academic computer systems
- Planning and design for the development of the backbone network infrastructure
- Development and implementation of a central printer spooling system, a distributed device administration system, and a user administration system
- Maintenance the University's external ACSnet (and in later years, Internet) network connection;
- Installation and maintenance of corporate Oracle databases
- Establishment and promotion of networking facilities to staff in the University, including the introduction of Ethernet and AppleTalk services to the desktop
- **Skills**: C, Solaris, Oracle, Ethernet, AppleTalk, TCP/IP

1986-1988 Research Programmer, Department of Computer Science, University of Tasmania

This position was to provide research programming support for academic staff in the Computer Science Department. The requirements of this position were varied, but some of the main activities included:

- Programming support for research activities within the department
- System administration of the departmental UNIX systems
- Administration and development of an Ingres database
- Administration of the campus networking facilities
- Development of a network infrastructure for the University
- Design, simulation, fabrication and testing of VLSI circuits
- Development of teaching software
- Development of compiler back-end systems
- **Skills**: C, VHDL, Pascal, OCCAM, Unix, assembler, Ingres, Petri nets, X.25

SELECTED PUBLICATIONS

- Jay Alameda, Wyatt Spear, Jeffrey L. Overbey, Kevin Huck, Gregory R. Watson, Beth Tibbitts, "The Eclipse parallel tools platform: toward an integrated development environment for XSEDE resources", *Proceedings of the 1st Conference of the Extreme Science and Engineering Discovery Environment*, July 2012

- Gregory R. Watson, Wolfgang Frings, Claudia Knobloch, Carsten Karbach, Albert L. Rossi, "A Scalable Control and Monitoring Framework to Aid the Development of Supercomputer Applications", *Proceedings of the 2nd International Workshop on High-performance Infrastructure for Scalable Tools (WHIST 2012)*, Venice, Italy, June 2012

- Gregory R. Watson, Wolfgang Frings, Claudia Knobloch, Carsten Karbach, Albert L. Rossi, "Scalable Control and Monitoring of Supercomputer Applications Using an Integrated Tool Framework", *Proceedings of the 2011 40th International Conference on Parallel Processing Workshops*, Taipei City, Taiwan, Sep 2011

- G. R. Watson, C. E Rasmussen, and B. R. Tibbitts, "An Integrated Approach To Improving The Parallel Application Development Process", *Proceedings of the 14th International Workshop on High-Level Parallel Programming Models and Supportive Environments,* Rome, Italy, May 2009

- G. R. Watson and C. E Rasmussen, "An Integrated Environment for the Development of Parallel Applications", *Proceedings of the 2nd International Workshop on Parallel Tools for High Performance Computing*, HLRS, Stuttgart, Germany, July 2008.

- D. Buntinas, G. Bosilca and R. L. Graham, G. Vallee and G. R. Watson "A Scalable Tools Communication Infrastructure", *Proceedings of the 6th Annual Symposium on OSCAR and HPC Cluster Systems*, Quebec City, Canada, June 2008

- G. R. Watson and N. A. DeBardeleben, "A Model-Based Framework for the Integration of Parallel Tools", *Proceedings of the IEEE International Conference on Cluster Computing*, Barcelona, September 2006

- G. R. Watson and N. A. DeBardeleben, "Developing Scientific Applications Using Eclipse", *Computing in Science and Engineering*, Vol 9, No 4, pp 50-61, July/August 2006

- L. Lo, G. R. Watson, R. G. Minnich, "FreeVGA: Architecture Independent Video Graphics Initialization for LinuxBIOS", *USENIX 2005*, Anaheim, CA, April 2005

- G. R. Watson, S. Choi, E. A. Hendriks, R. G. Minnich, M. J. Sottile, "Pink: A 1024-node Single-System Image Linux Cluster", *Proceedings of the 7th International Conference on High Performance Computing and Grid in Asia Pacific Region – HPC Asia 2004*, Tokyo, Japan, July 2004

SELECTED PUBLICATIONS

- D. Abramson, R. Finkel, D. Kurniawan, V. Kowalenko and G. Watson, "Parallel Relative Debugging with Dynamic Data Structures", *Proceedings of the 16th International Conference on Parallel and Distributed Computing Systems – PDCS 2003*, Reno, Nevada, August 2003

- D. Abramson and G. Watson, "Debugging Scientific Applications in the .NET Framework", *Future Generation Computer Systems*, Vol 19, No 5, pp 665-678, June 2003

- D. Abramson, G. Watson, and L. Dung, "Guard: A Tool for Migrating Scientific Applications to the .NET Framework", *Proceedings of the 2002 International Conference on Computational Science – ICCS 2002*, Amsterdam, Netherlands, April 2002

- G. Watson and D. Abramson, "Parallel Relative Debugging For Distributed Memory Applications: A Case Study", *Proceedings of the 2001 International Conference on Parallel and Distributed Processing Techniques and Applications – PDPTA 2001*, Las Vegas, Nevada, June 2001

- G. Watson and D. Abramson, "The Architecture of a Parallel Relative Debugger", *Proceedings of the 13th International Conference on Parallel and Distributed Computer Systems – PDCS 2000*, Las Vegas, Nevada, August 2000

- D. Abramson and G. Watson, "Relative Debugging for Parallel Systems", *Proceedings of the Parallel Computing Workshop '97*, Canberra, ACT, September 1997

- D. Abramson, R. Sosic and G. Watson, "Implementation Techniques for a Parallel Relative Debugger ", *Proceedings of the International Conference on Parallel Architectures and Compilation Techniques – PACT '96*, Boston, MA, 1996