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1. Professional Experience and Projects

SiCure Mobile, 2009-present, VP of Research and Development.

Security, authentication, mobile software, and cloud computing. I cofounded SiCure Mobile in order to develop new two factor authentication solutions using mobile devices, specifically smart phones. I developed a new method of performing mobile authentication and implemented a prototype product. I designed the security architecture of the system, validated the security architecture in collaboration with a security consulting company, implemented the server that performs authentication, wrote iPhone and Android applications that implement the authentication protocol and contact the authentication server, implemented model customer client systems that use the authentication server, built a package for open source platforms (specifically Linux) that uses the authentication server to authenticate users, and coordinated development by other developers.

Kestrel Technology, 2006-2008, Senior Research Scientist.

Program analysis and high assurance software. As principal investigator of a Department of Defense program analysis project I led a team that developed an Eclipse-based analysis tool that supports program testing and lightweight verification. The tool uses a new implementation of abstract interpretation that is both flexible and efficient, and incorporates innovative ideas on how to present analysis information to the user. I was also the co-PI of a DARPA project that investigated synthesizing efficient programs for multicore processors through abstraction and refinement.

Sun Microsystems Laboratories, 2000-2006, Senior Scientist.

Programming language implementation, security, and small devices. I was the principal investigator leading a group exploring Java technology on various small platforms. This work included a secure version of Java for high security devices (specifically cryptographic modules) and a small version of Java for sensors and next generation smart cards. I was also a co-investigator on a project to develop a high assurance Java platform for NASA. I received patents for various concepts involving small devices, virtual machine implementation, and garbage collection, and worked on a cross-division team that analyzed Java performance on the UltraSPARC V architecture.

Sun Microsystems Laboratories, 1996-2000, Staff Scientist.

Programming language implementation, small devices, and technology transfer. I collaborated with Antero Taivalsaari on a small Java virtual machine for the Palm Connected Organizer. We worked with Sun's Consumer and Embedded Division to turn this virtual machine into the CLDC/KVM product, which was the original basis of Java Micro Edition. The CLDC has been adopted by many major small device manufacturers, and has been deployed on millions of devices worldwide.

Intrinsa Corporation, 1993-1996, Founder and Principal Scientist.

Program analysis and product development. Jon Pincus (the Chief Technical Officer) and I developed a new analytic technique for automatically detecting programming errors, such as pointer errors, that previously were found either by runtime testing or by user-supplied assertions. The technique traces execution paths through source code, inferring values, modeling memory, and detecting inconsistencies. The technique was patented and is described in a widely referenced article in Software Practice and Experience. We founded a venture-backed company that was ultimately acquired by Microsoft, which uses our tool, called PREfix, to improve the quality and security of its products, including Windows and Office.

UC Berkeley, 1992-1993, Postdoctoral Researcher.

CAD, software development, and technology transfer. After completing my dissertation I managed the development of the Octtools, a collection of some 135 widely-used CAD tools produced at Berkeley (which performed, among other activities, logic synthesis, standard cell place and route, global routing, and interactive graphical editing). I was responsible for the technology transfer of the tools (about 750K lines of C code) from academic projects to robust multi-platform software, and for coordinating the work of graduate students on the system. I also continued my dissertation work on hardware synthesis as principal investigator of a project with the Air Force.

UC Berkeley, 1985-1991, Graduate Researcher (Ph.D.).

CAD, computer architecture, and Prolog. My dissertation, *The High-Level Synthesis of Microprocessors Using Instruction Frequency Statistics*, explored the boundary between computer architecture and computer aided design. The work was based on a high-level CAD system I constructed that automatically synthesized microprocessors, using instruction frequency information to control optimization. Within the context of global design constraints, the technique allocated resources to more frequently used instructions in order to improve the overall throughput of the synthesized design. The system also generated specialized microprocessors, omitting the hardware required only by unused instructions.

I was also the senior graduate student and project manager of an ARPA-sponsored effort by Professor Alvin Despain to build a full-range VLSI CAD system in Prolog. The system generated VLSI masks from instruction set level specifications. Additionally, in a related project I contributed to the architecture of the Berkeley Abstract Machine (BAM) microprocessor, a RISC processor optimized for Prolog.

UC Berkeley, 1983-1985, Graduate Researcher (M.S.).

Compilation, Smalltalk, and RISC processors. I designed and implemented the Smalltalk compiler for Berkeley's Smalltalk On A RISC (SOAR) machine, a Berkeley RISC microprocessor extended to support Xerox's Smalltalk-80 language. The compiler translated Smalltalk bytecodes into machine instructions in a manner similar to subsequent just-in-time compilers for Java.

Harvard University, 1977-1982, Research Programmer.

Software engineering. I worked on an ARPA-funded software engineering project led by Professor Thomas Cheatham that explored a program specification and development methodology based on abstraction and stepwise refinement. We constructed a system that transformed platform independent abstract models into platform-dependent system software.

Computer Corporation of America, 1973-1977, Computer Scientist.

Network database systems. I worked in and then led the team that designed and implemented the data definition and access language of the Datacomputer, the first large-scale database server on the ARPA network. I also created the Datacomputer File Transfer Program (DFTP), an early cloud computing backup application that ran on various host computers on the ARPA network and stored local files on the Datacomputer.

2. Publications and Patents

Selected publications are available at http://www.grundu.net/papers.

"Authentication Using a Mobile Device"; William Bush, Henry Daseking; Provisional Patent Application Number 61/330,270 filed 30 April 2010.

"Thread suspension system and method in a multi-threaded environment"; Bill Bush, Mario Wolczko; U.S. Patent Number 7,376,940, filed 4 June 2004, issued 20 May 2008.

"A Platform for Wireless Networked Transducers"; Bernard Horan, Bill Bush, John Nolan, Dave Cleal; *Sun Microsystems Laboratories Report TR-2007-172*, September 2007.

"Software, Regulation, and Domain Specificity"; William R. Bush; *Information and Software Technology*, Volume 49, Issue 1, January 2007, pp. 44-54.

"A Mechanism for Secure, Fine-Grained Dynamic Provisioning of Applications on Small Devices"; William R. Bush, Antony Ng, Doug Simon, Bernd Mathiske; *Proceedings of the 2004 Workshop on the Construction and Analysis of Safe, Secure and Interoperable Smart devices (CASSIS04); Lecture Notes in Computer Science*, Volume 3362 / 2005, Springer Verlag, January 2005, p. 86.

"Thread suspension system and method [using register window violations]"; Bill Bush, Mario Wolczko; U.S. Patent Number 6,842,853, filed 13 January 1999, issued 11 January 2005.

"A Java Virtual Machine Architecture for Very Small Devices"; Nik Shaylor, Doug Simon, Bill Bush; *Proceedings of the 2003 ACM SIGPLAN conference on Languages, Compilers, and Tools for Embedded Systems*, June 2003, pp. 34-41.

"Towards a Java-Based Enterprise Client for Small Devices"; Bill Bush, Bernard Horan, Vipul Gupta, Phillip Yelland, Patrick Chi; *Sun Microsystems Laboratories Report TR-120-2002*, December 2002.

"Analysis of the effect of program execution of calling components with data variable checkpointing and resource allocation analysis"; Jonathan D. Pincus, William R. Bush, Matthew A. Haley; U.S. Patent Number 6,154,876, filed 30 July 1997, issued 28 November 2000.

"A Static Analyzer for Finding Dynamic Programming Errors"; William R. Bush, Jonathan D. Pincus, David J. Sielaff; *Software Practice and Experience*, 30:775-802 (June 2000).

"The Spotless System: Implementing a Java[tm] System for the Palm Connected Organizer"; Antero Taivalsaari, Bill Bush, Doug Simon; *Sun Microsystems Laboratories Report TR-99-73*, February 1999.

"Thread suspension system and method using trapping instructions"; Bill Bush, Mario Wolczko, Marc Tremblay; U.S. Patent Number 7,013,454, continuation in part filed 22 October 2001, issued 14 March 2006.

"Thread suspension system and method using trapping instructions in delay slots"; Bill Bush, Mario Wolczko; U.S. Patent Number 6,308,319, filed 17 February 1999, issued 23 October 2001.

"Method and apparatus for managing class files on devices without a file system"; Antero Taivalsaari, Bill Bush; U.S. Patent Number 6,366,898, filed 21 September 1998, issued 2 April 2002.

"Simulated Program Execution Error Detection Method and Apparatus"; William R. Bush, Jonathan D. Pincus, Richard E. Wilbur, Debby Majors-Degnan, David Jon Sielaff; U.S. Patent Number 5,790,778, filed 7 August 1996, issued 4 August 1998.

"Computer Process Resource Modelling Method and Apparatus"; Jonathan D. Pincus, William R. Bush, Matthew A. Haley; U.S. Patent Number 5,694,539, filed 10 August 1994, issued 2 December 1997; U.S. Patent Number 5,857,071, issued 5 January 1999; U.S. Patent Number 5,968,113, issued 19 October 1999; U.S. Patent Number 6,079,031, issued 20 June 2000.

"Application Specific Electronic Design Synthesis"; William R. Bush; *AKM Associates Technical Report AKMA-FR-94-C-29-1* (for the U.S. Air Force), July 1994.

"Polymorphism Considered Harmful"; Carl Ponder, Bill Bush; *ACM SIGPLAN Notices*, Volume 27, Number 6, June 1992, 76-79.

The High-Level Synthesis of Microprocessors Using Instruction Frequency Statistics; William R. Bush; Ph.D. dissertation, University of California, Berkeley; and *UC Berkeley Electronics Research Laboratory Memorandum No. UCB/ERL M92/109*, May 1992.

"Fast Prolog with an Extended General Purpose Architecture"; Bruce K. Holmer, Barton Sano, Michael Carlton, Peter Van Roy, Ralph Haygood, William R. Bush, Alvin M. Despain, Joan M. Pendleton, Tep Dobry; *Seventeenth International Symposium on Computer Architecture*, May 1990.

"Telecommuting: The Case of Research Software Development"; William R. Bush; *Technological Forecasting and Social Change* 37(3), 58-73 (1990).

"A CAD Design Environment Based On Prolog"; Gino Cheng, William R. Bush, Alvin M. Despain; *ICCAS 1989*, July 1989, pp. 322-325.

"Layering Expertise in a Full-Range Hardware Synthesis System"; William R. Bush, Gino Cheng, Alvin M. Despain; *IFIP WG10.2 Working Conference on CAD Systems using AI Techniques*, June 1989.

"A Prototype Silicon Compiler in Prolog"; William R. Bush, Gino Cheng, Patrick C. McGeer, Alvin M. Despain; *UC Berkeley CS Division Report UCB/CSD 88/476*, December 1988.

"An Advanced Silicon Compiler in Prolog"; William R. Bush, Gino Cheng, Patrick C. McGeer, Alvin M. Despain; *1987 IEEE International Conference on Computer Design: VLSI in Computers and Processors*, October 1987, pp. 27-31.

"Compiling Smalltalk-80 to a RISC"; William R. Bush, A. Dain Samples, David Ungar, Paul N. Hilfinger; *Second International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS II)*, October 1987, pp. 112-116.

"Experience with Prolog as a Hardware Specification Language"; William R. Bush, Gino Cheng, Patrick C. McGeer, Alvin M. Despain; *Fourth Symposium on Logic Programming*, September 1987, pp. 490-498.

"Prolog for VLSI Layout: Experiences in the Design and Implementation of Topolog, a Prolog-Based Module Generation and Layout System"; Patrick C. McGeer, William R. Bush, Gino Cheng, Alvin M. Despain; *UC Berkeley CS Division Report UCB/CSD 87/363*, July 1987.

"Smalltalk-80 to SOAR Code"; William R. Bush; *UC Berkeley CS Division Report UCB/CSD 86/297*, June 1986.

"Translating EL1 into Ada"; William R. Bush; *Harvard University Center for Research in Computing Technology TR-28-82*, August 1982.

"User-Server Communication in MSG: An Example of Abstraction and Refinement"; William R. Bush; *Harvard University Center for Research in Computing Technology TR-27-81*, February 1982.

"Refinement of an Abstract Model of MSG"; William R. Bush; *Harvard University Center for Research in Computing Technology TR-06-80*, April 1980.

"Abstract Model of MSG: First Phase of an Experiment in Software Development"; Glenn H. Holloway, William R. Bush, George H. Mealy; *Harvard University Center for Research in Computing Technology TR-25-78*, October 1978.

"Datacomputer File Transfer Program User's Guide"; W.R. Bush; *Computer Corporation of America Technical Bulletin 1*, April 1977.

3. Education

University of California, Berkeley, Ph.D. (Computer Science) 1992
University of California, Berkeley, M.S. (Computer Science) 1985
Boston University Law School, J.D. 1977
Harvard College, A.B. 1972 cum laude in General Studies
(with a double major in English and Engineering and Applied Physics)