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EDUCATION:
1986 Ph.D., Mechanical Engineering, University of California, Berkeley, CA
1984 M.S., Mechanical Engineering, University of California, Berkeley, CA
1982 B.S., Mechanical Engineering, University of Illinois, Urbana, IL
1981 B.A., Physics, Grinnell College, Grinnell, IA

HPC PROFESSIONAL SERVICE:

November 2009 – present President and Founding Board Member,
Association for High Speed Computing
The Association for High Speed Computing (AHSC) is a 501(c)(6) professional non-for-profit organization established to host conferences, workshops, and technical exchange events among, national laboratory, industry, university and other government agency representatives. These technical exchange events are focused on high performance computing-related topics and may include other activities authorized by the AHSC Board of Directors.

SANDIA WORK EXPERIENCE:

October, 2015 – present Org. 1421, Technical Manager, and
Hardware Technology Director for the DOE Exascale Computing Project
In the fall of 2015, Jim was asked to take on the role of the Hardware Technology Director for the DOE's Exascale Computing Project (ECP). A major factor in the decision to accept this was that Jim has been working for over 7 years to help DOE and NNSA Federal Program Managers prepare for the launch of the Exascale Computing Initiative and this was a great opportunity to make a difference to DOE's Exascale Computing Project. Of particular interest is the opportunity to launch a project to deliver Exascale systems in the 2023 timeframe with a project that is starting in 2016. This gives ECP the time and the resources to really have input in the design of the Exascale hardware node and system architectures.

As the ECP's Hardware Technology Director, Jim's primary role and responsibility is the development and definition of the DOE ECP's hardware R&D strategy. The key elements of the strategy include: 1) Establish a portfolio of *PathForward* vendor-led hardware R&D projects for component, node and system architecture design, 2) Create a Design Space Evaluation team to provide ECP with independent architectural analysis of the PathForward vendors' designs and the ability to facilitate co-design communication among the PathForward vendors and the ECP's application and system software development teams, and 3) Define an alternate technology path effort that leverages the System-on-Chip (SoC) eco-system.

Jim selected a hardware technology focus area deputy and together they established a team of subject matter experts from the six labs (E6), ANL, LANL, LBNL, LLNL. ORNL and SNL to write the technical specifications for the PathForward request for proposals (RFP). Jim and his team led an information meeting with potential PathForward bidders, issued the RFP, provided technical evaluations of PathForward proposals, and completed a source selection process to identify the top vendors for further negotiation. As of October, 2016, detailed negotiations are underway between PathForward vendors and selected technical representatives from the E6 labs.

Jim has presented the ECP Hardware Technology Strategy to formal reviews of the ECP to meet the requirements for the Critical Decision process for DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets*. Jim's Hardware Technology presentations have been part of the overall ECP reviews, including the Independent Cost Review, Independent Design Review, and CD1/3a project management review.

May 23, 2014 – October 2015 Org. 1422 Technical Manager
Once the Director of the Center for Computing Research returned to Sandia, Jim returned to his Scalable Computer Architectures Department in May 2014. Primary goals for his department remain the research and development of advanced architectures for scientific and informatics applications. While the question of a unified architecture for both application domains remains open, it is very likely that future HPC systems will be developed from the integration of computing components that are targeted at the much larger Big Data market. This research into advanced architectures is based on a co-design methodology with four key elements: proxy applications, HPC architectural simulation framework, advanced and prototype architecture test-beds, and abstract machine models/proxy architectures.

Jim's department has spearheaded investigations into ARM technology and System on Chip impact on high performance computing. Jim has co-organized a series of System-on-Chip for HPC workshops on behalf of a multi-agency steering committee. Jim has also attended the last three ARM Partner meetings as a representative of the HPC user community. Jim maintains his programmatic responsibilities which include: serving as the Sandia NNSA/ASC Platform Executive, the co-director of the DOE Exascale Computer Architecture Nexus, and Sandia lead for the DOE Fast Forward and Design Forward industry-led exascale architecture R&D efforts.

August 30, 2013 – May 22, 2014 Org. 1420 Senior Technical Manager (acting)
The director of the Center for Computing Research, had an important opportunity to help the U.S. Government establish the National Strategic Computing Initiative. To support this temporary assignment, Jim's senior manager, served as the acting Center Director and once again, Jim was asked to serve as the senior manager of the Extreme-scale computing group in August 2013. His responsibilities were largely the same, but his programmatic responsibilities include serving as the acting Sandia ASC Computational Systems and Software Environments (CSSE) Program Element Lead; Jim continued to serve as the Co-director of the Architecture Nexus for the DOE Exascale Computing Initiative (ECI); and Sandia point of contact for the DOE Industry R&D projects.

April 26, 2013 – August 29, 2013 Org. 1422 Technical Manager
Once the new senior manager of the Extreme-scale computing group was named, Jim returned to his Scalable Computer Architectures Department in April 2013. Primary goals for his department remained the research and development of advanced architectures for scientific and informatics applications. The Extreme-scale Computing Grand Challenge project adopted the goal to define a unified architecture that is capable of addressing the requirements for both application types – or to determine why such a unified architecture is not feasible. This research into advanced architectures is based on a co-design methodology with four key elements: proxy applications, HPC architectural simulation framework, advanced and prototype architecture test-beds, and proxy architecture models. Jim maintained his programmatic responsibilities which include: serving as the Sandia NNSA/ASC Platform Executive, the co-director of the DOE Exascale Computer Architecture Nexus, and serving as the Sandia point of contact for the DOE Fast Forward and Design Forward R&D projects with industry.

Oct. 12, 2012 – April 25, 2013 Org. 1420 Senior Technical Manager (acting)
When Jim's boss left Sandia to take a position as the Director of NERSC at LBNL, Jim was asked to serve as the acting senior manager of the Extreme-scale computing group in October 2012. Jim was responsible for the implementation of the Sandia Computing Research Center's Exascale Strategy. This group has four technical departments. In addition to the Scalable Computer Architectures department, there are Scalable System Software, Scalable Algorithms and Advanced Device Technology Departments. Programmatic responsibilities include serving as the Sandia ASC Platform Exec; Co-director of the Architecture Nexus for the DOE Exascale Computing Initiative (ECI); and Sandia lead for the DOE ECI Design Forward RFP.

Apr. 13, 2007 – Oct. 11, 2012 Org. 1422 Technical Manager
Once the new director of Jim's Center for Computing Research was found in April 2007, Jim returned to the new Scalable Computer Architectures department. Most of the staff in the former Scalable Systems Integration department stayed in Jim's new department, but there was some exchange of staff with the new Scalable System Software department. Jim's department supports the development of future supercomputer systems through research and development efforts on hardware technologies for leading edge high performance scientific and data-intensive computing systems. Areas of active research include: HPC system architectures, advanced multi-threaded processor designs, advanced memory subsystems, interconnection network technology, large-scale system reliability and fault tolerance capabilities, low energy computing concepts, and application performance analysis and simulators for advanced architectures.

At the recommendation of NNSA's ASC Program Office Director, Jim joined a Tri-Lab team for the November 2007, UK Ministry of Defence formal review of AWE's High Performance Computing (HPC) Technical Strategy and Capability Assessment. Jim was on the team to represent NNSA/ASC's computer systems expertise. A key outcome of this review was that AWE's *Redwood* system was suffering from reliability and performance issues. Since *Redwood* was based on Cray's XT3, the product version of

Red Storm, a subsequent meeting was held in the summer of 2008 between AWE and staff in Jim's department and the sister System Software department to help address AWE's *Redwood* issues.

The DOE-SC ASCR Office established the Institute for Advanced Architectures and Algorithms (IAA), with centers at both SNL and ORNL. Jim's department played a leading role in Sandia's efforts, with his staff organizing a series of IAA workshops on 1) Memory Opportunities for HPC, 2) Advanced Interconnection Networks, 3) HPC Architectural Simulators, and 4) Custom, Commodity, and Co-design. All of these topics were focus areas for Jim's department. The IAA funding ran from FY08-FY11, and it helped establish a technical foundation for follow-on projects, including our DARPA/UHPC X-caliber project, the Extreme-scale Computing Grand Challenge LDRD project, and a number of additional HPC Architecture projects.

Jim is very active with recruiting to hire a team of computer architects with backgrounds in computer/electrical engineering, or computer science. This department is unique among all the DOE National Labs for its focus on computer architectures for HPC.

Between 2007 and 2009, Jim wrote successful proposals for ASC and Sandia institutional capital equipment investments in a set of advanced architecture informatics platforms. These included two Netezza systems, two Cray XMT systems. The Netezza systems were used to demonstrate key benefits to Sandia's cybersecurity efforts, the XMT systems were critical for several DS&A projects. These investigations and experience with commercial informatics architectures are also informing our development of advanced concepts for informatics architectures in our X-caliber and Extreme-scale Computing Grand Challenge LDRD projects.

In 2010, Sandia was the only FFRDC to lead a winning award under the DARPA Ubiquitous High Performance Computing (UHPC) program. The other winning teams were led by Intel, Nvidia, and MIT. The PI for this proposal was one of Jim's new hires in 2007, and Jim was directly engaged in the development of the proposal, specifically to address the rationale for how and why Sandia, as an FFRDC, had unique capabilities to offer for the DARPA/UHPC program.

Between 2010 and 2012, Jim was directly engaged as Sudip Dosanjh's deputy in the DOE-wide efforts to establish the Exascale Computing Initiative and the NNSA/ASC and SC/ASCR interest in Co-design as the methodology for guiding the development of exascale architectures and applications that will meet our energy and performance requirements.

In FY2011, Jim began working with NNSA/ASC establish a Cooperative Agreement with Micron Technology. Sandia's role would be to provide technical oversight for this research and development project on stacked DRAM for HPC. This is a role that Sandia and Jim's department is uniquely qualified for, as his staff started reaching out to Micron back in 2006. Those discussions seeded a collaboration under a CRADA which led to a joint Sandia-Micron Technical Advance. This project was on hold between 2011 and

2013, with both ASC and ASCR funding parked at Sandia, pending Micron's decision of whether or not to establish a Micron Federal division.

In FY2011, Jim submitted a successful proposal for Sandia's ASC program office to procure advanced architecture testbeds. Upon reviewing the technology options, Jim settled on systems based on Intel's Many Integrated Core (MIC) architecture and AMD's Fusion Accelerated Processing Unit (APU) architecture. These testbeds are both first-of-a-kind advanced architecture systems. *Arthur* is our MIC cluster that has 84 Intel Knights Ferry co-processors and 84 Intel Westmere host CPUs. *Teller* is our Fusion cluster that has 104 AMD Llano APUs. In FY12, Sandia is receiving *Curie*, a Cray XK6 testbed with 52 Nvidia Fermi GP-GPUs and 52 AMD Interlagos host CPUs. These testbeds provided Sandia with the resources to develop and test our Mantevo proxy applications, provide validation for our SST HPC architectural simulators, and support for our co-design efforts. In subsequent years the NNSA/ASC and Sandia effort to formalize the acquisition of pre-production, rack scale testbeds has grown with an expanding number of industry collaborators and a growing number of external and internal users.

Dec. 15, 2006 – Apr. 12, 2007 Org. 1420 Senior Technical Manager (acting)
Jim served as the acting Senior Manager for this group while his Senior Manager was serving as our acting Center Director. This group had four departments: Computational Modeling Sciences, Data Analysis and Visualization, Scalable Computing Systems, and Scalable System Integration. During this assignment, Jim worked with the acting Center Director, and the manager of the Scalable Computing Systems department, to redefine the roles and responsibilities for his department to focus more on computer hardware, and for the Scalable Computing Systems department to focus more on system software. As a result of this reorganization, Jim's new department would be Scalable Computer Architectures, and there was another new sister department that would be Scalable System Software.

July 2, 2004 – Dec. 14, 2006 Org. 9224 Technical Manager
Jim was promoted to technical management to lead the Scalable System Integration department. This department was responsible for the integration of first-of-a-kind systems, both production systems and experimental testbeds. The highest priority activity in Jim's department at this time was the Red Storm risk mitigation project and support of the partnership with the Computing and Network Operations Center to integrate Red Storm into the ASC capability computing environment.

In 2005 Jim was asked to support to the ASC program office, working with Bob Meisner and Charlie Slocomb on the Total Cost of Ownership for Linux/Open Source Whitepaper. This document was issued as a formal ASC Program Document in July 2006.

During the summer of 2005, Jim hosted a Netezza testbed at Sandia's CSRI facility for a two month period of testing. While Sandia was not able to purchase this system, Sandia staff were able to complete a series of tests and publish a Sandia Technical report to

summarize their findings. This experience planted a seed that would lead to future work (and procurements) with Netezza.

The ASCI Red system, the first HPC system to achieve a sustained TeraFLOP/sec, was retired in early 2006. During the final years of operation, Sandia was responsible for the maintenance of the system dealing with both hardware failures and system software issues. Jim's department owned the responsibility for ASCI Red's system software including bug fixes and regression testing. Over its life, the ASCI Red system appeared in 13 Top500 lists.

The FY06 platform funding did not look good for Sandia. In early 2006, Jim volunteered to help establish better communications between Sandia and the ASC program office, NA-114, by spending one week per month at NNSA/HQ. Jim's efforts yielded several results: 1) Secured funding for the Red Storm dual-core upgrade, 2) re-engaged HQ with a recognition of Sandia's capabilities for petascale computing through Jim's leadership and input into several documents including: ASC Capability System Governance Model, Capability Performance Indicator, CSSE/FOUS Integration Strategy Plan, and the ASC Platform Strategy. Jim was also asked by an ASC program manager, Bob Meisner and an ASCR program manager, Walt Polansky to develop a first draft of the ASC/ASCR Memorandum of Understanding (MOU) document with a focus on CSSE areas. While this MOU was not used at that time, in the long run it established a foundation for the DOE Institute for Advanced Architectures and Algorithms, an ASCR collaboration between Sandia and ORNL, and future ASC/ASCR partnerships in Exascale computing.

Mar. 23, 2001 – July 1, 2004 Org. 09220 Business Development, Principal MTS
Cplant Capability Release/Cplant Management Team
At the beginning of 2002, Jim took on the challenge of applying the Capability Release (CR) process to Cplant. Cplant was Sandia's early effort to develop commodity Linux clusters for scientific computing. A primary issue for Cplant was tension about the priorities for Cplant. Cplant was largely and perhaps concurrently, an R&D effort, a development platform to explore scalability of commodity interconnection network technology, and a production computing resource. In the early Cplant CR forum discussions, many of the identified issues were related to uncertainty in the role for Cplant and the lack of corresponding usage and operating policies. A related issue arose from balancing the conflicting needs of using Cplant for R&D vs. integration testing, vs. production computing.

CSRF Program Management Support
In August 2002, Jim began providing support to help one of the Center senior managers organize the 9200 Computer Science Research Foundations (CSRF) portfolio. The highest priority for Jim was to establish a formal review process for CSRF projects. Jim also helped establish an ongoing process to help Center Managers shield our CSRF PIs from the need to respond to higher level program office action items, by ensuring that their requests for information are provided in a timely manner.

Tri-Lab Expedited Priority Run (EPR) support

During this period, Jim has represented Sandia's priority needs for ASCI White (and subsequently for ASCI Q) with LLNL and LANL at the weekly EPR meeting. The priorities for Sandia's user community were driven by the need to support programmatic milestones and mission-driven modeling and simulation requirements for Sandia's nuclear weapons program commitments. In previous years, Jim helped coordinate and communicate Sandia's ASCI White needs for nuclear weapons program milestones. To help understand the SNL users needs, Jim has drawn from his experience with the Cplant CR Forums, as well as attending simulation science seminars, and ASCI Advanced Application Seminars. As the SNL EPR representative, Jim hosted the LANL Q-road show visit to SNL in April 2003 and coordinated SNL's participation in LANL's QSC scalability testing with the Alegra team in June 2002. In FY04 Jim (with participation from Sandia's production scientific computing manager), began to provide status reports on Red Storm at this meeting.

Oct. 1, 1998 – Mar. 23, 2001 Org. 09224 Business Development, Principal MTS
DisCom2 Capability Release Process
Jim returned to Sandia from DOE/HQ to work on the DisCom2 ASCI Program Element. His responsibilities included helping to set programmatic direction and establishing priorities for technical activities of DisCom2 and integrating of those activities with other ASCI Program Elements. Jim shared responsibility and ownership for the Capability Release (CR) Process with Martha Ernest, from the Computing and Network Operations Center. Together they organized and led a number of workshops and meetings to define, develop, and implement our CR process. Through Jim & Martha's leadership, the Capability Release Process addressed two key questions: first, how do we integrate, deploy and support ASCI-developed technologies, (i.e. transition new technology into production), and second, how do we coordinate the integration and operation of the Tri-Lab production computing environment.

In FY01, DisCom2 held an external review of its distance computing environment for remote usage of the ASCI White platform. The External Review Panel's comments on the DC-1.1 Milepost "*Passed with flying colors*". The panel also had very positive comments about how the CR Process contributed to the DisCom2 Milepost success, "*We are impressed with the excellent coordination described by the presenters such as weekly prioritization of workflow and the linking of support across the labs. We believe that the Capability Release Process, as described, is sound and holding reviews every six months appears appropriate.*" While the review panel also had suggestions for areas for improvement specifically to improve the communication and feedback from the user community, these comments validated that the CR process was having a positive impact.

Oct. 1, 1997 – Sept. 30, 1998 Org. 05134 Business Development, Principal MTS
Sept. 10, 1996 – Sept. 30, 1997 Org. 05209 Business Development, Principal MTS
In September 1996, Jim moved to Washington, D.C. to serve as Sandia's laboratory detailee in the DOE/HQ ASCI Program Office. Early during FY97, Jim found several opportunities to ensure Sandia's interests were appropriately represented in the ASCI program. For example, when he first arrived at DP-50 both Gil Weigand and Alex Larzelere were using a viewgraph with a so-called "Button to Boom" timeline. This

viewgraph did not reflect the entire story because it portrayed a timeline that began at High Explosive detonation. Many of the weapon subsystems that Sandia designs and develops were neglected. To address this issue, Jim developed and assembled a new set of viewgraphs for Gil and Alex that represented a more accurate picture of the entire "Button to Boom" sequence and included many of Sandia's components and subsystems.

For most of FY97 and FY98, Jim worked with Gary Kent, the ASCI Platforms Strategy Manager, to help establish the PathForward Initiative. The initial goal of the PathForward Initiative was to work with a cross section of the U.S. Computer industry to tackle problems dealing with the scalability of high performance interconnects. This initiative was an outgrowth of an interagency study on the current state of the U.S. High Performance computing industry that Jim participated in when he first arrived at DP-50. This project gave Jim the opportunity to learn about the technical and economic issues facing the U.S. computer industry, and thereby better assess its strengths and weaknesses. In later years, the portfolio of PathForward projects expanded to include a cross section of software tools, visualization, and storage technologies.

In FY98, Jim led DP-50's effort to initiate the Validation and Verification Program. He served as the editor to create the V&V Program Plan and the Tri-Lab V&V Implementation Plan. Jim prepared and gave briefings on DP-50's V&V initiative for the Nuclear Weapons Information Archiving Group, Joint Army Navy NASA Air Force (JANNAF) Workshop on Verification, Validation and Accreditation, the DP-50 IP Kickoff meeting and the DP-50 IP Integration meeting. The these briefings were also used by Gil Weigand, Charlie Stuart, and Tom D'Agostino in their talks about DP-50's V&V Program.

Apr. 5, 1996 – Sept. 9, 1996 Org. 09215 Senior MTS
Jim joined the Center's Computer Architecture department to focus on implications of Web technology for TIE-In. Of particular interest was the potential for Java to make Sandia high performance computing applications available over the World Wide Web. Jim worked with a small team including summer student interns that completed a working prototype by summer 1996. The major benefit of this extension was to allow users to access and use massively parallel (Paragon) computing application for agent-based economic modeling through a Web browser user interface.

Oct. 2, 1995 – Apr. 4, 1996 Org. 09204 Senior MTS
Apr. 1, 1992 – Oct. 1, 1995 Org. 01404 Senior MTS
Jim co-led the development of the Technology Information Environment for Industry (TIE-In), a system that was designed to make National Laboratory computer simulation-based resources available to external users as a technology transfer user facility and a way to reach out to the nuclear weapons manufacturing community that produce components for the DOE. A number of information and computer security technologies were integrated in TIE-In to help make applications easier to use, support collaboration with laboratory scientists and engineers and provide robust mechanisms for user authentication and resource access control. The TIE-In effort provided Jim with his first experience with the management of a large project that spanned many departments and

centers across the laboratory. To manage the integration of over a dozen subproject teams, Jim organized the development of the TIE-In system around the adoption several information technology standards, e.g., X/Windows, and Kerberos authentication. TIE-In subproject teams were either focused on the infrastructure or the packaging of applications with X/Windows based graphical user interfaces. There were a few core infrastructure subprojects that worked on developing and deploying the TIE-In system architecture. Jim's primary role was the coordination of interfaces between this core TIE-In infrastructure development and the work of the application-packaging subprojects. Jim also established TIE-In as a Technology Deployment Center and User Facility with interfaces to Sandia's financial system to perform cost recovery, etc.

[Postscript: While the TIE-In system no longer exists, elements of the original TIE-In security infrastructure continue to this day to support authenticated access of ASC resources among the Tri-Lab user community. In addition, while the TIE-In concept preceded the Web by a couple years, examples of the concept can be found today with design simulators and among enterprises that are providing Cloud Computing hosting of application-as-a-service.]

Nov. 1, 1991 – Mar. 31, 1992 Org. 01430 Senior MTS
Aug. 16, 1991 – Oct., 31, 1991 Org. 01540 Senior MTS
Jim established a program development office to support the shock-physics research organization. His program development activities included defining fragmentation and debris technology support for Sandia's soft x-ray lithography program, definition of reverse ballistics test capabilities to support the development of a controlled penetration ammunition WFO activity, and initiating a test program with DNA and SDIO to establish the viability of impact flash signatures for kill assessment of kinetic energy weapon intercepts.

Jim began and led the Pulsed Holography Diagnostics (PHD) Project to use a frequency doubled, pulsed Nd-YAG laser to capture holographic images of impact generated debris fields. This test capability provided high-resolution test data to support development of fragmentation models. The project ended with the demonstration of the ability to collect holographic images with at least 5 micron spatial resolution. Some key system improvements were also identified to further improve image quality and contrast however, at the time, the image resolution was already beyond the capability of Sandia's hydrocode simulations and fragmentation models.

[Postscript: Advances in computational performance fostered by the ASCI (now known as ASC) program may provide a new demand for this high-resolution experimental data down to the 5 micron resolution. The next bottleneck may be the development of visualization tools to make useful comparisons of 3D validation test data with 3D simulation results.]

Nov 1, 1990 – Aug. 15, 1991 Org. 01543 Senior MTS
Dec 4, 1989 – Oct. 31, 1990 Org. 01534 Senior MTS

Jim joined Sandia National Laboratories in an experimental shock physics group to work on a railgun project. The purpose of this project was to develop a capability to perform high-pressure equation of state experiments by using a two-stage light-gas gun to inject a projectile into an electromagnetic railgun for subsequent acceleration to over 8 km/s. Jim performed an analytical analysis that established how asymmetric pre-loading of the railgun structure led to consistent, un-desirable bowing of the railgun launch bore. Jim also developed advanced fabrication techniques for the molding of polycarbonate to provide more robust attachment of fuses to railgun projectiles.

Jim continued his study of impact flash phenomena at Sandia. He worked with EGG/Princeton Applied Research to acquire and test a prototype Optical Multi-channel Analyzer (OMA) to collect time resolved impact flash spectra. Jim established and led a project with Defense Nuclear Agency (DNA) and the Strategic Defense Initiative Organization (SDIO) to develop impact flash-based kill assessment methodologies for strategic defense kinetic energy weapon intercepts. Jim also supported the DNA kill assessment program by fielding this time-resolved spectrometry instrumentation on hypervelocity impact tests against scaled high explosive targets. These measurements demonstrated some easily identified signatures that can be used to establish high-confidence kill assessments.

NON-SANDIA WORK EXPERIENCE:

Oct. 1, 1986 – Dec. 1, 1989 Staff Scientist, Kinetic Energy Weapons Group
General Research Corporation, Santa Barbara, CA
Jim performed experimental and analytical studies of hypervelocity impact phenomena including impact flash, thermal response, and momentum transfer. Of particular interest were applications of hypervelocity impact to interactive discrimination and kill assessment. A notable product of Jim's research was the development of the Jet Initiation Model (JIM), an analytical model that explains the dependence of impact flash phenomena on impact velocity and material shock properties. The primary customers for this work were SDIO, DNA, and DARPA. Jim also worked on the development, analysis and evaluation of advanced kinetic energy weapon concepts with technology assessments and systems effectiveness modeling. In 1988, Jim led GRC's systems engineering study for DARPA on a viability assessment of electric energy guns for air defense and fire support missions.

July 1, 1983 – Sept. 1, 1986 Research Assistant, Mechanical Engineering
University of California, Berkeley
Jim's graduate research was focused on understanding the fire hazard of soot producing liquid and solid fuels. For his dissertation, Jim developed a perturbation approach for introducing the physical effects of thermal radiation from soot, buoyancy, and thermal cracking of fuel, into the classic similarity solutions for a boundary layer diffusion flame. Jim also collected experimental measurements of temperature profiles in soot producing diffusion flames. This work was supported by the National Bureau of Standards [now known as the National Institute of Standards and Technology (NIST)], Center for Fire Research.

Dec. 1, 1980 – May 1, 1982 Undergraduate Research Assistant, Mechanical Engineering
University of Illinois, Urbana-Champaign
Jim provided technical support for an experimental study of the decomposition of ethylene in an internal combustion engine exhaust gas environment. His tasks included design work and the use of a plug flow reactor with a gas chromatograph, NOx, HC, CO, and thermal instrumentation.

SPECIAL SKILLS:

Attended MIT Sloan School of Management, Center for Information Systems Research short course "Current Issues on Managing Information Technology: The Distributed IT Organization of the 1990's," summer 1993.

SUPPLEMENTARY ACHIEVEMENTS:

NNSA Defense Program Award of Excellence 2011: *Sandia Red Storm Supercomputer Operating System Team*
National Science Foundation Graduate Fellow 1982-1985
Honor Societies: Tau Beta Pi, Pi Tau Sigma
Professional Memberships: Association for High Speed Computing–President and Board Member, IEEE-Computer Society, AIAA, Hypervelocity Impact Society

PUBLICATIONS:

High Performance Computing Papers and Invited Talks:

Low Latency, High Bisection-Bandwidth Networks for Exascale Memory Systems, Shang Li, Po-Chun Huang, David Banks, Max DePalma, Ahmed Elshaarany, Scott Hemmert, Arun Rodrigues, Emily Ruppel, Yitian Wang, Jim Ang, Bruce Jacob, In Proceedings of the Second ACM International Symposium on Memory Systems (2016), October 3-6, 2016, Washington, DC.

Exascale System and Node Architectures: The Summit and Beyond, James A. Ang, High Performance Computing: Clouds and Big Data to Exascale and Beyond, June 27-July 1, 2016, Cetraro, Italy, SAND2016-5876C.

Abstract Machine Models and Proxy Architectures for Exascale Computing, Rev. 2.0, J.A. Ang, R.F. Barrett, R.E. Benner, D. Burke, C. Chan, J. Cook, C.S. Daly, D. Donofrio, S.D. Hammond, K.S. Hemmert, R.J. Hoekstra, K. Ibrahim, S.M. Kelly, H. Le, V.J. Leung, G. Michelogiannakis, D.R. Resnick, A.F. Rodrigues, J. Shalf, D. Stark, D. Unat, N.J. Wright, and G.R. Voskuilen, Technical report, Department of Energy Computer Architecture Laboratory (Sandia National Laboratories and Lawrence Berkeley National Laboratory), June 2016.

Advanced Simulation and Computing: Co-design Strategy, James A. Ang, Thuc T. Hoang, Suzanne M. Kelly, Allen McPherson, Rob Neely, February 2016, SAND2015-9821R.

Beyond the Summit: NSCI/ECI Connections, James A. Ang, Random Access talk at the Chesapeake Large Scale Analytics Conference, October 12-15, 2015, Annapolis, MD, SAND2015-8960C.

High Performance Computing Co-design Strategies, James A. Ang, In Proceedings of the ACM International Symposium on Memory Systems (2015), SAND2015-6387 C.

Impact of ECI on DOE Co-Design Strategies, James A. Ang, Random Access talk at the Salishan Conference on High Speed Computing, April 27-30, 2015, Gleneden Beach, OR, SAND2015-3380 PE.

ARM as an Enabler for HPC Co-Design, James A. Ang, Invited Talk at Applied Microcircuits Corp. discussion of ARM 64-bit in HPC at ISC'14, June 2014, Leipzig, Germany, SAND2014-15336PE.

Abstract Machine Models and Proxy Architectures for Exascale Computing, Rev. 1.1, J.A. Ang, R.F. Barrett, D. Burke, C. Chan, D. Donofrio, S.D. Hammond, K.S. Hemmert, S.M. Kelly, H. Le, V. J. Leung, D.R. Resnick, A.F. Rodrigues, J. Shalf, D. Stark, D. Unat, and N.J. Wright, May 16, 2014, http://crd.lbl.gov/assets/pubs_presos/CALAbstractMachineModelsv1.1.pdf

Exascale Co-Design Paths, James A. Ang, Random Access talk at the Salishan Conference on High Speed Computing, April 21-24, 2014, Gleneden Beach, OR, SAND2014-3277P.

Performance on Advanced Systems Test Beds, Christian R. Trott, Simon D. Hammond, James H. Laros III, Suzanne M. Kelly, and James A. Ang, DOE and NNSA Extreme Scale Research PI Meeting, October 9-11, 2013, Washington, D.C., SAND2013-8523P.

Design Space Exploration with Proxy/Proto Architecture Models and miniApps, Invited Talk at ASCR Modeling and Simulation of Exascale Systems and Applications Workshop, September 18-19, 2013, Seattle, WA, SAND2013-8026P.

NNSA/ASC Testbed Update, Simon D. Hammond, Richard F. Barrett, Courtenay T. Vaughan, Jagan Jayaraj, Christian R. Trott, James H. Laros III, Suzanne M. Kelly, James A. Ang, NNSA/ASC - CEA/DAM Computer Science Collaboration Meeting, June 4-6, 2013, Santa Fe, NM, SAND2013-6462P.

SST and Test-bed Hack-a-thon, S.D. Hammond, A.F. Rodrigues, S.M. Kelly, J.A. Ang, and J. Belak, Presentation at SC/ASCR Computer Architecture Lab Project Review, July 10-11, 2013, Oakland, CA, SAND2013-5487P.

Proxy and Proto miniApps for Exascale Co-design, James A. Ang, and Richard F. Barrett, International Supercomputing Conference, June 17-20, 2013, Leipzig, Germany, SAND2013-4868C.

What is the True Cost of Linpack?, James A. Ang, Random Access talk at the Salishan Conference on High Speed Computing, April 22-25, 2013, Gleneden Beach, OR, SAND2013-3351P.

Advanced Simulation and Computing: Computing Strategy, Jim Ang, Paul Henning, Thuc Hoang, Rob Neely, April 2013, SAND2013-3196P

Computer Architecture Laboratory: Design Space Exploration, CAL Goals and Objectives, James Ang and John Shalf, X-Stack PI Meeting, March 20-22, 2013, Berkeley, CA, SAND2013-2357P.

Emerging HPC Systems and Next Generation FE Engineering Analysis Applications, James A. Ang, Richard F. Barrett, Simon D. Hammond, and Arun F. Rodrigues, Invited Talk at The Pacific Rim Workshop on Innovations in Civil Infrastructure Engineering, Taipei, Taiwan, January 2013, SAND2012-8693P.

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