Patrick G. Bridges

Curriculum Vitae

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Professional Preparation

December 2002 — **Ph.D. in Computer Science**, *University of Arizona*, Tucson, AZ.
Dissertation Title: "Composing and Coordinating Adaptations in Cholla"

May 1994 — **B.S. in Computer Science**, *Mississippi State University*, Mississippi State, MS.

Appointments

June 2018 – present — **Director**, *University of New Mexico*, Center for Advanced Research Computing, Albuquerque, NM.

June 2019 – present — **Special Assistant to the VPR for Research IT**, *University of New Mexico*, Office of the Vice President for Research, Albuquerque, NM.

July 2017 – present — **Full Professor**, *University of New Mexico*, Department of Computer Science, Albuquerque, NM.

September 2016 – May 2018 — **Interim Director**, *University of New Mexico*, Center for Advanced Research Computing, Albuquerque, NM.

August 2015 – August 2017 — **Associate Department Chair**, *University of New Mexico*, Department of Computer Science, Albuquerque, NM.

July 2009 – June 2017 — **Associate Professor**, *University of New Mexico*, Department of Computer Science, Albuquerque, NM.

July 2010 – June 2011 — **Faculty Sabbatical Appointment**, *Sandia National Laboratories*, Scalable System Software Department, Albuquerque, NM.

January 2003 – June 2009 — **Assistant Professor**, *University of New Mexico*, Department of Computer Science, Albuquerque, NM.

Dissertations Directed

[D1] Matthew G. F. Dosanjh. "Improving HPC Communication Library Performance on Modern Architectures". PhD thesis. Albuquerque, NM 87131: University of New Mexico, 2017.

[D2] Oscar H. Mondragón. "Scheduling Heterogeneous HPC Applications for Next-Generation Exascale Systems". PhD thesis. Albuquerque, NM 87131: University of New Mexico, 2016.

[D3] Scott Levy. "Using Rollback Avoidance to Mitigate Failures in Next-Generation Extreme-Scale Systems". PhD thesis. Albuquerque, NM 87131: University of New Mexico, 2015.

[D4] Zheng Cui. "Enhancing HPC on Virtual Systems in Clouds through Optimizing Virtual Overlay Networks". PhD thesis. Albuquerque, NM 87131: University of New Mexico, 2013.

[D5] Ricardo Villalón. "Fault-Tolerant Wireless Sensor Networking using Evolutionary Games". PhD thesis. Albuquerque, NM 87131: University of New Mexico, 2012.

[D6] Kurt B. Ferreira. "Keeping Checkpointing Viable for Exascale Systems". PhD thesis. Albuquerque, NM 87131: University of New Mexico, 2011.

[D7] Donour Sizemore. "Parallel Network Protocol Stacks using Replication". PhD thesis. Albuquerque, NM 87131: University of New Mexico, 2011.

[D8] Manjunath Gorentla Venkata. "A Protocol Reconfiguration and Optimization System for MPI". PhD thesis. Albuquerque, NM 87131: University of New Mexico, 2010.

[D9] Wenbin Zhu. "Lightweight Online Perfomance Monitoring and Tuning with Embedded Gossip". PhD thesis. Albuquerque, NM 87131: University of New Mexico, 2007.

Books and Journal Publications

[J1] W. Pepper Marts, Matthew G. F. Dosanjh, Whit Schonbein, Scott Levy, and Patrick G. Bridges. "Measuring Thread Timing to Assess the Feasibility of Early-Bird Message Delivery Across Systems and Scales". In: *Concurrency and Computation: Practice and Experience* 37.1 (Jan. 10, 2025), e8342. ISSN: 1532-0626, 1532-0634. DOI: 10.1002/cpe.8342. URL: https://onlinelibrary.wiley.com/doi/10.1002/cpe.8342 (visited on 02/03/2025).

[J2] Matthew G. F. Dosanjh, Ryan E. Grant, Whit Schonbein, and Patrick G. Bridges. "Tail Queues: A Multi-threaded Matching Architecture". In: *Concurrency and Computation: Practice and Experience* 32.3 (2020).

[J3] D. Dunning, W. Marts, R. W. Robey, and P. G. Bridges. "Adaptive Mesh Refinement in the Fast Lane". In: *Journal of Computational Physics* 406 (2020).

[J4] Terry Jones, George Ostrouchov, Gregory A. Koenig, Oscar H. Mondragón, and Patrick G. Bridges. "An evaluation of the state of time synchronization on leadership class supercomputers". In: *Concurrency and Computation: Practice and Experience* 30.4 (2018).

[J5] Scott Levy, Kurt B. Ferreira, Patrick G. Bridges, Aidan P. Thompson, and Christian Trott. "A study of the viability of exploiting memory content similarity to improve resilience to memory errors". In: *International Journal of High Performance Computing Applications* 29.1 (2015). Publisher: SAGE Publications, pp. 5–20.

[J6] Kurt B Ferreira, Rolf Riesen, Patrick Bridges, Dorian Arnold, and Ron Brightwell. "Accelerating incremental checkpointing for extreme-scale computing". In: *Future Generation Computer Systems* 30 (2014). Publisher: North-Holland, pp. 66–77.

[J7] Lei Xia, Zheng Cui, John Lange, Yuan Tang, Peter Dinda, and Patrick G. Bridges. "Fast VMM-based overlay networking for bridging the cloud and high performance computing". In: *Cluster Computing* 17.1 (2014). Publisher: Springer US, pp. 39–59.

[J8] Kurt B. Ferreira, Patrick G. Bridges, Ron Brightwell, and Kevin Pedretti. "Impact of System Design Parameters on Application Noise Sensitivity". In: *Journal of Cluster Computing* 16.1 (Mar. 2013).

[J9] Patrick G. Bridges, Dorian Arnold, Kevin T. Pedretti, Madhav Suresh, Feng Lu, Peter Dinda, Russ Joseph, and Jack Lange. "Virtual machine-based emulation of future generation high-performance computing systems". In: *International Journal of High Performance Computing Applications* 26.2 (May 2012), pp. 125–135.

[J10] Patrick M. Widener, Matthew Wolf, Hasan Abbasi, Scott McManus, Mary Payne, Patrick G. Bridges, and Karsten Schwan. "Exploiting Latent I/O Asynchrony in Petascale Science Applications". In: *International Journal of High Performance Computing Applications* 25.2 (May 2011).

[J11] Patrick G. Bridges, Matti A. Hiltunen, and Richard D. Schlichting. "Cholla: A Framework for Composing and Coordinating Adaptations in Networked Systems". In: *IEEE Transactions on Computers, Special Issue on Autonomic Network Computing* 58.11 (Nov. 2009), pp. 1456–1469.

[J12] Rolf Riesen, Ron Brightwell, Patrick G. Bridges, Trammell Hudson, Arthur B. Maccabe, Patrick M. Widener, and Kurt B. Ferreira. "Designing and Implementing Lightweight Kernels for Capability Computing". In: *Concurrency and Computation: Practice and Experience* 21.6 (Apr. 2009), pp. 791–817.

[J13] Wenbin Zhu, Patrick G. Bridges, and Arthur B. Maccabe. "Lightweight Application Monitoring and Tuning with Embedded Gossip". In: *IEEE Transactions of Parallel and Distributed Systems* 20.7 (July 2009), pp. 1038–1049.

[J14] Patrick G. Bridges, Matti A. Hiltunen, Richard D. Schlichting, Gary T. Wong, and Matthew Barrick. "A Configurable and Extensible Transport Protocol". In: *ACM/IEEE Transactions on Networking* 15.6 (Dec. 2007), pp. 1254–1265.

[J15] Patrick G. Bridges, Arthur B. Maccabe, and Orran Krieger. "System Software for High-End Computing". In: *Operating Systems Review: Special Issue on System Software for High-End Computing Systems* 40.2 (Apr. 2006).

[J16] Jean-Charles Tournier, Patrick G. Bridges, Arthur B. Maccabe, Patrick M. Widener, Zaid Abudayyeh, Ron Brightwell, Rolf Riesen, and Trammell Hudson. "Towards a Framework for Dedicated Operating Systems Development in High-End Computing". In: *Operating Systems Review: Special Issue on System Software for High-End Computing Systems* 40.2 (Apr. 2006), pp. 16–21.

[J17] John H. Hartman, Larry L. Peterson, Andrew C. Bavier, Peter A. Bigot, Patrick G. Bridges, A. Brady Montz, Robert Piltz, Todd A. Proebsting, and Oliver Spatscheck. "Experiences building a communication-oriented JavaOS". In: *Software: Practice and Experience* 30.10 (2000), pp. 1107–1126.

[J18] John H. Hartman, Peter A. Bigot, Patrick G. Bridges, A. Brady Montz, Robert Piltz, Oliver Spatscheck, Todd A. Proebsting, Larry L. Peterson, and Andrew C. Bavier. "Joust: A Platform for Liquid Software". In: *Computer* 32.4 (1999), pp. 50–56.

Peer-Reviewed Archival Conference Publications

[C1] Patrick G. Bridges, Anthony Skjellum, Evan D. Suggs, Derek Schafer, and Purushotham V. Bangalore. "Understanding GPU Triggering APIs for MPI+X Communication". In: *Recent Advances in the Message Passing Interface*. Ed. by Claudia Blaas-Schenner, Christoph Niethammer, and Tobias Haas. Vol. 15267. Cham: Springer Nature Switzerland, 2025, pp. 39–55. ISBN: 978-3-031-73369-7 978-3-031-73370-3. DOI: 10.1007/978-3-031-73370-3_3. URL: https://link.springer.com/10.1007/978-3-031-73370-3_3 (visited on 11/14/2024).

[C2] Gerald Collom, Derek Schafer, Amanda Bienz, Patrick Bridges, and Galen Shipman. "Optimizing Neighbor Collectives with Topology Objects". In: *2024 IEEE International Conference on Cluster Computing (CLUSTER)*. 2024 IEEE International Conference on Cluster Computing (CLUSTER). Kobe, Japan: IEEE, Sept. 24, 2024, pp. 120–130. ISBN: 9798350358711. DOI: 10.1109/CLUSTER59578.2024.00018. URL: https://ieeexplore.ieee.org/document/10740912/ (visited on 02/03/2025).

[C3] W. Pepper Marts, Donald A. Kruse, Matthew G. F. Dosanjh, Whit Schonbein, Scott Levy, and Patrick G. Bridges. "CMB: A Configurable Messaging Benchmark to Explore Fine-Grained Communication". In: *2024 IEEE 24th International Symposium on Cluster, Cloud and Internet Computing (CCGrid)*. 2024 IEEE 24th International Symposium on Cluster, Cloud and Internet Computing (CCGrid). Philadelphia, PA, USA: IEEE, May 6, 2024, pp. 28–38. ISBN: 9798350395662. DOI: 10.1109/CCGrid59990.2024.00013. URL: https://ieeexplore.ieee.org/document/10701378/ (visited on 11/14/2024).

[C4] Carson Woods, Derek Schafer, Patrick G. Bridges, and Anthony Skjellum. "Quantifying and Modeling Irregular MPI Communication". In: *2024 IEEE 24th International Symposium on Cluster, Cloud and Internet Computing (CCGrid)*. 2024 IEEE 24th International Symposium on Cluster, Cloud and Internet Computing (CCGrid). Philadelphia, PA, USA: IEEE, May 6, 2024, pp. 525–533. ISBN: 9798350395662. DOI: 10.1109/CCGrid59990.2024.00065. URL: https://ieeexplore.ieee.org/document/10701328/ (visited on 11/14/2024).

[C5] Nicholas H Bacon, Patrick Bridges, Scott Levy, Kurt Ferreira, and Amanda Bienz. "Evaluating the Viability of LogGP for Modeling MPI Performance with Non-contiguous Datatypes on Modern Architectures". In: *Proceedings of the 30th European MPI Users' Group Meeting*. EUROMPI '23: 30th European MPI Users' Group Meeting. Bristol United Kingdom: ACM, Sept. 11, 2023, pp. 1–10. ISBN: 9798400709135. DOI: 10.1145/3615318.3615326. URL: https://dl.acm.org/doi/10.1145/3615318.3615326 (visited on 11/14/2024).

[C6] Patrick G. Bridges, Zeinab Akhavan, Jonathan Wheeler, Hussein Al-Azzawi, Orlando Albillar, and Grace Faustino. "SAMPRA: Scalable Analysis, Management, Protection of Research Artifacts". In: *2021 IEEE 17th International Conference on eScience (eScience)*. 2021 IEEE 17th International Conference on eScience (eScience). Innsbruck, Austria: IEEE, Sept. 2021, pp. 177–185. ISBN: 978-1-66540-361-0. DOI: 10.1109/eScience51609.2021.00028. URL: https://ieeexplore.ieee.org/document/9582327/ (visited on 11/14/2024).

[C7] W. Pepper Marts, Matthew G. F. Dosanjh, Scott Levy, Whit Schonbein, Ryan E. Grant, and Patrick G. Bridges. "MiniMod: A Modular Miniapplication Benchmarking Framework for HPC". In: *2021 IEEE International Conference on Cluster Computing (CLUSTER)*. 2021 IEEE International Conference on Cluster Computing (CLUSTER). Portland, OR, USA: IEEE, Sept. 2021, pp. 12–22. ISBN: 978-1-72819-666-4. DOI: 10.1109/Cluster48925.2021.00028. URL: https://ieeexplore.ieee.org/document/9556020/ (visited on 11/14/2024).

[C8] Matthew G.F. Dosanjh, Whit Schonbein, Ryan Grant, Patrick G. Bridges, S. Mahdieh Gazimirsaeed, and Ahmad Afsahi. "Fuzzy Matching: Hardware Accelerated MPI Communication Middleware". In: *Proceedings of the 2019 19th IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing (CCGRID)*. May 2019, pp. 210–220. DOI: 10.1109/CCGRID.2019.00035.

[C9] Matthew G. F. Dosanjh, S. Mahdieh Ghazimirsaeed, Ryan E. Grant, Whit Schonbein, Michael J. Levenhagen, Patrick G. Bridges, and Ahmad Afsahi. "The Case for Semi-Permanent Cache Occupancy". In: *Proceedings of the International Conference on Parallel Processing (ICPP 2018)*. Eugene, Oregon, 2018.

[C10] Nathan Hjelm, Matthew G. F. Dosanjh, Ryan Grant, Taylor Groves, Patrick G. Bridges, and Dorian Arnold. "Improving MPI Multi-threaded RMA Communication Performance". In: *Proceedings of the International Conference on Parallel Processing (ICPP 2018)*. Eugene, Oregon, 2018.

[C11] Whit Schonbein, Matthew G. F. Dosanjh, Ryan E. Grant, and Patrick G. Bridges. "Measuring multithreaded message matching misery". In: *Proceedings of the 2018 European Conference on Parallel Processing (EuroPar 2018)*. Springer, Cham, 2018, pp. 480–491.

[C12] Scott Levy, Kurt B. Ferreira, and Patrick G. Bridges. "Evaluating the Viability of Using Compression to Mitigate Silent Corruption of Read-Mostly Application Data". In: *Proceedings of the 2017 IEEE International Conference on Cluster Computing*. 2017.

[C13] Matthew G. F. Dosanjh, Taylor Groves, Ryan E. Grant, Ron Brightwell, and Patrick G. Bridges. "RMA-MT: A Benchmark Suite for Assessing MPI Multi-threaded RMA Performance". In: *Proceedings of the 16th IEEE/ACM International Symposium on Cluster, Cloud, and Grid Computing (CCGrid'16)*. Cartagena, Colombia, 2016.

[C14] Scott Levy, Kurt B. Ferreira, and Patrick G. Bridges. "Improving Application Resilience to Memory Errors with Lightweight Compression". In: *Proceedings of the 2016 ACM/IEEE Conference on Supercomputing (SC'16)*. Salt Lake City, UT, Nov. 2016.

[C15] Scott Levy, Kurt B. Ferreira, Patrick Widener, Patrick G. Bridges, and Oscar H. Mondragón. "How I learned to stop worrying and love in situ analytics: Leveraging latent synchronization in MPI collective algorithms". In: *Proceedings of the 23rd EuroMPI Conference*. Edinburgh, Scotland, Sept. 2016.

[C16] Oscar Mondragón, Patrick G. Bridges, Kurt B. Ferreira, Scot Levy, and Patrick M. Widener. "Understanding Performance Interference in Next-generation HPC Systems". In: *Proceedings of the 2016 ACM/IEEE Conference on Supercomputing (SC'16)*. Salt Lake City, UT, Nov. 2016.

[C17] Oscar H. Mondragón, Patrick G. Bridges, Scott Levy, Kurt B. Ferreira, and Patrick Widener. "Scheduling In-situ Analytics in Next-Generation Applications". In: *Proceedings of the 16th IEEE/ACM International Symposium on Cluster, Cloud, and Grid Computing (CCGrid'16)*. Cartagena, Colombia, 2016.

[C18] Matthew G. F. Dosanjh, Ryan E. Grant, Patrick G. Bridges, and Ron Brightwell. "Re-evaluating network onload vs. offload for the many-core era". In: *2015 IEEE International Conference on Cluster Computing (Cluster 2015)*. 2015, pp. 342–350.

[C19] Scott Levy, Kurt B. Ferreira, and Patrick G. Bridges. "Characterizing the Impact of Rollback Avoidance at Extreme-Scale: A Modeling Approach". In: *Proceedings of the 2014 International Conference on Parallel Processing (ICPP-2014)*. 2014.

[C20] Zheng Cui, Patrick G. Bridges, John R. Lange, and Peter A. Dinda. "Virtual TCP offload: optimizing Ethernet overlay performance on advanced interconnects". In: *Proceedings of the 22nd International Symposium on High-performance Parallel and Distributed Computing (HPDC'13)*. ACM, 2013, pp. 49–60.

[C21] Zheng Cui, Lei Xia, Patrick G. Bridges, Peter A. Dinda, and Jack R. Lange. "Optimizing Overlay-based Virtual Networking Through Optimistic Interrupts and Cut-through Forwarding". In: *Proceedings of the 2012 ACM/IEEE Conference on Supercomputing (SC'12)*. Salt Lake City, UT, Nov. 2012.

[C22] Rolf Riesen, Kurt B. Ferreira, Dilma Da Silva, Pierre Lemarinie, Dorian Arnold, and Patrick G. Bridges. "Alleviating scalability issues of checkpointing protocols". In: *Proceedings of the 2012 ACM/IEEE Conference on Supercomputing (SC'12)*. Salt Lake City, UT, Nov. 2012.

[C23] Lei Xia, Zheng Cui, John Lange, Yuabn Tang, Peter Dinda, and Patrick G. Bridges. "VNET/P: Bridging the Cloud and High Performance Computing through Fast Overlay Networking". In: *Proceedings of the 21st International ACM Symposium on High-Performance Parallel and Distributed Computing (HPDC'12)*. June 2012.

[C24] Kurt B. Ferreira, Rolf Riesen, Patrick G. Bridges, Dorian Arnold, Jon Stearley, James H. Laros, Ron A. Oldfield, Kevin Pedretti, and Ron Brightwell. "Evaluating the Viability of Process Replication Reliability for Exascale Systems". In: *Proceedings of the 2011 ACM/IEEE Conference on Supercomputing (SC'11)*. Seattle, WA, Nov. 2011.

[C25] Jack Lange, Kevin Pedretti, Peter Dinda, Patrick G. Bridges, Chang Bae, Philip Soltero, and Alexander Merritt. "Minimal-overhead virtualization of a large scale supercomputer". In: *Proceedings of the 2011 ACM SIGPLAN/SIGOPS International Conference on Virtual Execution Environments (VEE 2011)*. Newport Beach, CA, Mar. 2011.

[C26] Fan Zhang, Wenbo He, Xue Liu, and Patrick G. Bridges. "Inferring Users' Online Activities through Traffic Analysis". In: *Proceedings of the Fourth ACM Conference on Wireless Network Security*. Hamburg, Germany, June 2011.

[C27] Kurt B. Ferreira, Patrick G. Bridges, Ron Brightwell, and Kevin Pedretti. "Impact of System Design Parameters on Application Noise Sensitivity". In: *Proceedings of the 2010 IEEE International Conference on Cluster Computing (Cluster 2010)*. Sept. 2010.

[C28] Jack Lange, Kevin Pedretti, Trammell Hudson, Peter Dinda, Zheng Cui, Lei Xia, Patrick Bridges, Andy Gocke, Steven Jaconette, Mike Levenhagen, and Ron Brightwell. "Palacios and Kitten: New High Performance Operating Systems For Scalable Virtualized and Native Supercomputing". In: *Proceedings of the 24th IEEE International Parallel and Distributed Processing Symposium*. eventplace: Atlanta, GA. Apr. 2010.

[C29] Edgar A. León, Rolf Riesen, Arthur B. Maccabe, and Patrick G. Bridges. "Instruction-Level Simulation of a Cluster at Scale". In: *Proceedings of the 2009 ACM/IEEE International Conference on Supercomputing (SC'09)*. Nov. 2009.

[C30] Mohammed I. Al-Saleh, Patrick G. Bridges, and Jedidiah R. Crandall. "Architectural Support for Securing Sensor Networks Against Remote Attacks". In: *Proceedings of the First Conference on First International Conference on Sensor Network and Applications*. event-place: San Francisco, CA. Nov. 2009.

[C31] Kurt B. Ferreira, Ron Brightwell, and Patrick G. Bridges. "Characterizing Application Sensitivity to OS Interference Using Kernel-Level Noise Injection". In: *Proceedings of the 2008 ACM/IEEE Conference on Supercomputing (SC'08)*. Nov. 2008.

[C32] Wenbin Zhu, Patrick G. Bridges, and Arthur B. Maccabe. "Embedded Gossiping: Lightweight Online Measurement for Large-Scale Applications". In: *Proceedings of the 2007 IEEE International Conference on Distributed Computing Systems (ICDCS)*. June 2007.

[C33] Galen M. Shipman, Timothy S. Woodall, Richard L. Graham, Arthur B. Maccabe, and Patrick G. Bridges. "Infiniband scalability in OpenMPI". In: *Proceedings of the 20th IEEE International Parallel and Distributed Processing Symposium (IPDPS)*. 2006.

[C34] Manjunath Gorentla Venkata and Patrick G. Bridges. "MPI/CTP: A Reconfigurable MPI for HPC Applications". In: *Recent Advances in Parallel Virtual Machine and Message Passing Interface: 13th European PVM/MPI Users' Group Meeting*. Vol. 4192. Lecture Notes in Computer Science. Springer-Verlag, 2006.

[C35] Wenbin Zhu, Patrick G. Bridges, and Arthur B. Maccabe. "Online Critical Path Profiling for Parallel Applications". In: *Proceedings of the 2005 IEEE International Conference on Cluster Computing (Cluster 2005)*. Boston, MA, Sept. 2005.

[C36] Ron Brightwell, Rolf Riesen, Keith Underwood, Patrick G. Bridges, Arthur B. Maccabe, and Trammell Hudson. "A Performance Comparison of Linux and a Lightweight Kernel". In: *Proceedings of the 2003 IEEE International Conference on Cluster Computing (Cluster 2003)*. Hong Kong, China, Dec. 2003.

[C37] Todd A. Proebsting, Gregg Townsend, Patrick G. Bridges, John H. Hartman, Timothy Newsham, and Scott A. Watterson. "Toba: Java for applications–A way ahead of time (WAT) compiler". In: *Proceedings of the Third USENIX Conference on Object-Oriented Technologies and Systems (COOTS'97)*. event-place: Portland, Oregon. 1997, pp. 41–53.

[C38] David Mosberger, Larry L. Peterson, Patrick G. Bridges, and Sean O'Malley. "Analysis of Techniques to Improve Protocol Latency". In: *Proceedings of SIGCOMM '96*. 1996.

Workshop, Poster, and Other Short Refereed Publications

[W1] Jason A. Stewart and Patrick G. Bridges. "Beatnik: A Novel Global Communication Mini-Application". In: *Proceedings of the 2024 Workshop on Extreme Scale MPI (ExaMPI24)*. Atlanta, Georgia, Nov. 17, 2024.

[W2] Muna Tageldin, Majeed M. Hayat, Jered Dominguez-Trujillo, and Patrick G. Bridges. "A Stochastic Composite Model to Understand the Impact of Rare, Colossal Interference in HPC Systems". In: *2024 IEEE International Parallel and Distributed Processing Symposium Workshops (IPDPSW)*. 2024 IEEE International Parallel and Distributed Processing Symposium Workshops (IPDPSW). San Francisco, CA, USA: IEEE, May 27, 2024, pp. 1153–1155. ISBN: 9798350364606. DOI: 10.1109/IPDPSW63119.2024.00189. URL: https://ieeexplore.ieee.org/document/10596543/ (visited on 11/14/2024).

[W3] William Pepper Marts, Matthew G. F. Dosanjh, Whit Schonbein, Scott Levy, and Patrick G. Bridges. "Measuring Thread Timing to Assess the Feasibility of Early-bird Message Delivery". In: *Proceedings of the 52nd International Conference on Parallel Processing Workshops*. ICPP-W 2023: 52nd International Conference on Parallel Processing Workshops. Salt Lake City UT USA: ACM, Aug. 7, 2023, pp. 119–126. ISBN: 9798400708428. DOI: 10.1145/3605731.3605884. URL: https://dl.acm.org/doi/10.1145/3605731.3605884 (visited on 11/14/2024).

[W4] Quincy Wofford, James Hurd, Hugh Greenberg, Patrick G. Bridges, and James Ahrens. "Complete Provenance for Application Experiments with Containers and Hardware Interface Metadata". In: *2022 IEEE/ACM 4th International Workshop on Containers and New Orchestration Paradigms for Isolated Environments in HPC (CANOPIE-HPC)*. 2022 IEEE/ACM 4th International Workshop on Containers and New Orchestration Paradigms for Isolated Environments in HPC (CANOPIE-HPC). Dallas, TX, USA: IEEE, Nov. 2022, pp. 12–24. ISBN: 978-1-66546-331-7. DOI: 10.1109/CANOPIE-HPC56864.2022.00007. URL: https://ieeexplore.ieee.org/document/10029967/ (visited on 11/14/2024).

[W5] Jered Dominguez-Trujillo, Keira Haskins, Soheila Jafari Khouzani, Christopher Leap, Sahba Tashakkori, Quincy Wofford, Trilce Estrada, Patrick G. Bridges, and Patrick M. Widener. "Lightweight Measurement and Analysis of HPC Performance Variability". In: *2020 IEEE/ACM Performance Modeling, Benchmarking and Simulation of High Performance Computer Systems (PMBS)*. 2020 IEEE/ACM Performance Modeling, Benchmarking and Simulation of High Performance Computer Systems (PMBS). GA, USA: IEEE, Nov. 2020, pp. 50–60. ISBN: 978-1-66542-265-9. DOI: 10.1109/PMBS51919.2020.00011. URL: https://ieeexplore.ieee.org/document/9307925/ (visited on 11/14/2024).

[W6] Quincy Wofford, Patrick G. Bridges, and Patrick Widener. "A Layered Approach for Modular Container Construction and Orchestration in HPC Environments". In: *Proceedings of the 11th Workshop on Scientific Cloud Computing*. HPDC '21: The 30th International Symposium on High-Performance Parallel and Distributed Computing. Virtual Event Sweden: ACM, June 21, 2020, pp. 1–8. ISBN: 978-1-4503-8385-1. DOI: 10.1145/3452370.3466001. URL: https://dl.acm.org/doi/10.1145/3452370.3466001 (visited on 11/14/2024).

[W7] Hussein Al-Azzawi, Damion Terrell, Shuang Yang, and Patrick G. Bridges. "HPC Hyper-Converged Virtualized Software-Defined Storage Framework (poster)". In: *Proceedings of the Conference on Practice and Experience in Advanced Research Computing (PEARC'18)*. Pittsburgh, Pennsylvania, 2018.

[W8] Noah Evans, Kevin Pedretti, Brian Kocoloski, John Lange, Michael Lang, and Patrick G. Bridges. "A Cross-Enclave Composition Mechanism for Exascale System Software". In: *Proceedings of the 6th International Workshop on Runtime and Operating Systems for Supercomputers*. ACM, 2016, p. 3.

[W9] Hans Weeks, Matthew GF Dosanjh, Patrick G. Bridges, and Ryan E. Grant. "SHMEM-MT: A Benchmark Suite for Assessing Multi-threaded SHMEM Performance". In: *Proceedings of the Workshop on OpenSHMEM and Related Technologies*. 2016.

[W10] Patrick G. Bridges, Matthew G. F. Dosanjh, Ryan Grant, Anthony Skjellum, Shane Farmer, and Ron Brightwell. "Preparing for exascale: Modeling MPI for many-core systems using fine-grain queues". In: *Proceedings of the 3rd Workshop on Exascale MPI*. 2015.

[W11] Brian Kocoloski, John Lange, Hasan Abbasi, David E. Bernholdt, Terry R. Jones, Jai Dayal, Noah Evans, Michael Lang, Jay Lofstead, Kevin Pedretti, and Patrick G. Bridges. "System-Level Support for Composition of Applications". In: *Proceedings of the 5th International Workshop on Runtime and Operating Systems for Supercomputers*. ROSS '15: International Workshop on Runtime and Operating Systems for Supercomputers. Portland OR USA: ACM, June 16, 2015, pp. 1–8. ISBN: 978-1-4503-3606-2. DOI: 10.1145/2768405.2768412. URL: https://dl.acm.org/doi/10.1145/2768405.2768412 (visited on 11/14/2024).

[W12] Oscar H. Mondragón, Patrick G. Bridges, and Terry Jones. "Quantifying Scheduling Challenges for Exascale System Software". In: *Proceedings of the 5th International Workshop on Runtime and Operating Systems for Supercomputers*. 2015.

[W13] Matthew G.F. Dosanjh, Patrick G. Bridges, Suzanne M. Kelly, James H. Laros III, and Courtenay T. Vaughan. "An evaluation of BitTorrent's performance in HPC environments". In: *Proceedings of the 4th International Workshop on Runtime and Operating Systems for Supercomputers*. ACM, 2014, p. 8.

[W14] Scott Levy, Patrick G. Bridges, Kurt B. Ferreira, Aidan P. Thompson, and Christian Trott. "Evaluating the feasibility of using memory content similarity to improve system resilience". In: *Proceedings of the 3rd International Workshop on Runtime and Operating Systems for Supercomputers (ROSS'13)*. ACM, 2013, p. 7.

[W15] Scott Levy, Matthew G.F. Dosanjh, Patrick G. Bridges, and Kurt B. Ferreira. "Using Unreliable Virtual Hardware to Inject Errors in Extreme-Scale Systems." In: *Proceedings of the 3rd Workshop on Fault-tolerance for HPC at extreme scale*. ACM, 2013, pp. 21–26.

[W16] Philip Soltero, Patrick G. Bridges, Dorian Arnold, and Michael Lang. "A gossip-based approach to exascale system services". In: *Proceedings of the 3rd International Workshop on Runtime and Operating Systems for Supercomputers (ROSS'13)*. ACM, 2013, p. 3.

[W17] Patrick Widener, Kurt Brian Ferreira, Scott N. Levy, Ronald B Brightwell, Patrick G. Bridges, and Dorian Arnold. "Asking the right questions: benchmarking fault-tolerant extreme-scale systems." In: *Proceedings of the 6th Workshop on Resiliency in High Performance Computing in Clusters, Clouds, and Grids (Resilience'13)*. 2013.

[W18] Patrick G. Bridges, Dorian Arnold, Kevin T. Pedretti, Madhav Suresh, Feng Lu, Peter Dinda, Russ Joseph, and Jack Lange. "Virtual machine-based emulation of future generation high-performance computing systems". In: *International Journal of High Performance Computing Applications* 26.2 (May 2012), pp. 125–135.

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[W22] Patrick G. Bridges, Mark Hoemmen, Kurt B. Ferreira, Michael A. Heroux, and Ron Brightwell. "Cooperative Application/OS DRAM Fault Recovery". In: *Fourth Workshop on Resiliency in High Performance Computing in Clusters, Clouds, and Grids (Resilience'11)*. Bordeaux, France, Aug. 2011.

[W23] Patrick G. Bridges, Donour Sizemore, and Scott Levy. "Exploiting MISD Performance Opportunities in Multi-core Systems". In: *Proceedings of the 13th Workshop on Hot Topics in Operating Systems (HotOS XIII)*. Napa, CA, May 2011.

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[W26] Kevin T. Pedretti and Patrick G. Bridges. "Opportunities for Leveraging OS Virtualization in High-End Supercomputing". In: *Proceedings of the Workshop on Micro Architectural Support for Virtualization, Data Center Computing, and Clouds (MASVDC'10)*. Atlanta, Georgia, Dec. 2010.

[W27] Manjunath Gorentla Venkata and Patrick G. Bridges. "Using Application Communication Characteristics to Drive Dynamic MPI Reconfiguration". In: *Proceedings of the 2009 Workshop on Communication Architectures for Clusters (CAC 2009)*. May 2009.

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[W29] Donour Sizemore and Patrick G. Bridges. "Dominoes: A Scalable Architecture for Parallel Protocol Processing (poster)". In: *Proceedings of 2007 European Conference on System Software (EuroSys 2007)*. 2007.

[W30] Patrick M. Widener, Matthew Barrick, Jack Pullikotil, Patrick G. Bridges, and Arthur B. Maccabe. "Metabots: A Framework for Out-of-Band Processing in Large-Scale Data Flows (poster)". In: *Proc. 2007 International Conference on Grid Computing (Grid 2007)*. Austin, Texas, Sept. 2007.

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[W32] Kurt B. Ferreira, Ron Brightwell, and Patrick G. Bridges. "An Infrastructure for Characterizing the Sensitivity of Parallel Applications to OS Noise". In: *Proceedings of the 2006 Symposium on Operating System Design and Implementation*. 2006.

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[W35] Patrick G. Bridges and Arthur B. Maccabe. "IMPuLSE: Integrated Monitoring and Profiling for Large-Scale Environments". In: *Proceedings of the Seventh Workshop on Languages, Compilers, and Run-time Support for Scalable Systems*. Oct. 2004.

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Other Publications

[O1] Patrick G. Bridges, Anthony Skjellum, Evan D. Suggs, Derek Schafer, and Purushotham V. Bangalore. *Understanding GPU Triggering APIs for MPI+X Communication*. 2024. DOI: 10.48550/ARXIV.2406.05594. URL: https://arxiv.org/abs/2406.05594 (visited on 11/14/2024).

[O2] Jason A. Stewart and Patrick G. Bridges. *Beatnik: A Novel Global Communication Mini-Application*. 2024. DOI: 10.48550/ARXIV.2406.05490. URL: https://arxiv.org/abs/2406.05490 (visited on 11/14/2024).

[O3] H. J. H. Edgar, S. Daneshvari Berry, E. Moes, N. L. Adolphi, P. G. Bridges, and K. B. Nolte. *New Mexico Decedent Image Database*. 2020. DOI: https://doi.org/10.25827/5s8c-n515. URL: https://doi.org/10.25827/5s8c-n515.

[O4] Patrick G. Bridges, Arthur B. Maccabe, and Orran Krieger. "System Software for High-End Computing". In: *Operating Systems Review: Special Issue on System Software for High-End Computing Systems* 40.2 (Apr. 2006).

[O5] Kurt B. Ferreira, Ron Brightwell, and Patrick G. Bridges. "An Infrastructure for Characterizing the Sensitivity of Parallel Applications to OS Noise". In: *Proceedings of the 2006 Symposium on Operating System Design and Implementation*. 2006.

[O6] Ewing Lusk, William Gropp, Edward Karrels, Patrick G. Bridges, Nathan Doss, and Anthony Skjellum. *Users' guide to mpich, a portable implementation of MPI*. Argonne, IL: Mathematics and Computer Science Division, Argonne National Laboratory, 1994.

External Funding

Award amounts are for the portion of funding under Dr. Bridges's control.

Current Funding

2025-2030 **PSAAP-IV (FIC): Center for Optimized Modern Parallel Adaptive System Software (COMPASS)**, *Department of Energy National Nuclear Security Agency*, $5,000,000.

2025-2030 **PSAAP-IV Cost Share Award**, *State of New Mexico Department of Finance and Administration*, $430,555.

2023-2026 **Cybersecurity and Data Science Education and Workforce Development**, *Department of Education*, $1,500,000.

2022-2026 **MPI Support for Next-Generation Computational Frameworks**, *Los Alamos National Laboratory*, $532,310.

2020-2025 **PSAAP-III (FIC): Center for Understandable, Performant Exascale Communication Systems (CUP-ECS)**, *Department of Energy National Nuclear Security Agency*, $4,411,355.
Lead PI of collaborative research center with Anthony Skjellum (Tennessee Technological University) and Puri Bangalore (University of Alabama).

2021-2025 **OAC Core: Small: Improving Utilization of HPC Systems via Intelligent Co-scheduling**, *National Science Foundation*, $247,461.
Lead PI of collaborative proposal with David Lowenthal (University of Arizona)

Previously Funded

2018-2023 **CDS&E: Optimization of Advanced Cyberinfrastructure through Data-driven Computational Modeling**, *National Science Foundation*, $523,664.

2019-2022 **CRII: SATC: Identifying Fraud in the Cryptocurrency Ecosystem**, *National Science Foundation*, $174,576.

2020-2021 **All services necessary to perform research on HPC application**, *Los Alamos National Laboratory*, $76,855.

2018-2021 **CICI: RDP: SAMPRA: Scalable Analysis, Management, and Protection of Research Artifacts**, *National Science Foundation*, $598,594.

2017-2020 **Academic Services in Support of Comp. Sciences, High Performance Computing, and Computer Science**, *Los Alamos National Laboratory*, $359,057.

2015-2019 **FAROS: Beyond All-Or-Nothing DIFT via Context-Aware Self-Tuning Operation**, *Defence Advanced Research Projects Agency*, $894,937.
Lead principal investigator (PI) of DARPA contract with subawards to Daniela Oliveira (UFL), Michalis Faloustos (UCR), and Xuetao Wei (Cincinatti)

2017-2018 **Student Travel Support for ACM HPDC 2017**, *National Science Foundation*, $15,000.

2016-2017 **Student Travel Support for ACM HPDC 2016**, *National Science Foundation*, $15,000.

2013-2017 **Hobbes: OS and Runtime Support for Application Composition**, *Department of Energy Office of Science*, $450,000.
UNM principal investigator of large collaborative proposal lead by Ron Brightwell (Sandia National Laboratories) and Barney Maccabe (Oak Ridge National Laboratories)

2014 **Power Management in MPI Implementations**, *RNET Technologies, Inc.*, $100,000.

2014 **Modeling MPI Networking Performance**, *Sandia National Laboratories*, $20,000.

2010–2013 **Enabling Exascale System Design through Scalable System Virtualization**, *Department of Energy Office of Science*, $625,000.
Lead principal investigator with co-PIs Peter Dinda (NWU), Kevin Pedretti (SNL), and Stephen Scott (ORNL)

2012–2013 **A peer-to-peer HPC shared library file system**, *Sandia National Laboratories*, $75,000.

2012–2013 **Resilience in HPC Networking and System Software**, *Sandia National Laboratories*, $55,000.

2010–2011 **Modeling and Mitigating Cascading Failures in Smart Grid Systems**, *Defense Threat Reduction Agency (DTRA)*, $350,000.
Co-PI with Majeed Hayat (UNM ECE)

2007–2011 **Community Resource Development: An Open Source Extensible VMM**, *National Science Foundation*, $300,000.
UNM principal investigator with co-PI Peter Dinda (NWU)

2007–2011 **Scalable Multi-core Network Protocol Stacks**, *Gift from Sun Microsystems*, $110,000.

2007–2010 **Collaborative Networks in the Presence of WMD Stressors**, *Defense Threat Reduction Agency (DTRA)*, $1,080,691.
Co-PI with Majeed Hayat (UNM ECE)

2005–2009 **A Framework for Adaptable Operating and Runtime Systems**, *Department of Energy Office of Science*, $750,000.
Co-PI with Barney Maccabe (UNM CS)

2005–2009 **High End Computing with K42**, *Lawrence Berkeley National Laboratory*, $225,000.

2003–2007 **Scalable Systems Software Research**, *Sandia National Laboratories*, $1,500,000.
Co-PI with Barney Maccabe (UNM CS)

2005–2006 **Intel Processor Support in the K42 Operating System**, *Gift from Intel Corporation*, $60,000.

2003–2006 **PERCS: Productive, Easy-to-use, Reliable Computing Systems**, *Subcontract from IBM on DARPA Contract*, $600,000.
Co-PI with David Bader (UNM ECE)

2003–2006 **High Performance Networks and Data Visualization**, *Los Alamos Computer Science Institute*, $600,000.
Co-PI with Deepak Kapur and Barney Maccabe (UNM CS)

2003–2005 **Enabling Custom Protocol Support for Scalable, High Performance Applications**, *Sandia National Labs University Research Program (SURP)*, $80,000.

Recent Invited Presentations

Oct. 31, 2024 **NNSA-CEA Co-design Symposium**, *Device-Initiated Communication: Challenges and Abstractions on Modern Systems*, Online.

Sept. 30, 2024 **New Mexico Legislature Science, Technology and Telecommunication Committee Meeting**, *AI and Data Center Resource Usage*, Albuquerque, NM.

Sept. 25, 2024 **EuroMPI 2024**, *Understanding MPI+X GPU Triggering*, Perth, Australia (Remote).

March 6, 2024 **SIAM-PP Mini-Symposium on Realistic Proxy Applications and Datasets for Heterogeneous Architecture Scalable Communication**, *Application-Based Communication System Benchmarking and Analysis*, Baltimore, MD.

Aug. 23, 2023 **UNM Computer Science Departmental Symposium**, *A Recent History of Computer Go Playing*, Albuquerque, NM.

June 3, 2023 **2023 PSAAP III Forum**, *HPC Communication System Assessment and Optimization: Midpoint Summary*, Albuquerque, NM.

April 13, 2023 **2023 Annual CARC User Meeting**, *Research Computing and Data: Needs/Gaps Assessment*, Albuquerque, NM.

Sept. 27, 2022 **EuroMPI 2022**, *Communication Middleware: Challenges, Opportunities, and the Future*, Chattanooga, TN.

June 16, 2022 **Universidad Autónoma de Occidentede Computer Science Colloquium**, *Portability, Communication, and Performance in Modern High-Performance Computing Systems*, Cali, Colombia.

June 17, 2022 **Universidad Autónoma de Occidentede Parallel Computing Tutorial**, *Portable Parallel Computing*, Cali,Colombia.

Sept. 19, 2021 **UNM Mechanical Engineering Student Symposium**, *UNM High-Performance Computing Research, Education, and Support*, Albuquerque, NM.

June 25, 2021 **University of Tennessee at Chattanooga SIGHPC Student Meeting**, *MPI Abstractions for Next-Generation Applications and Systems*, Chattanooga, TN (Remote).

May 17, 2021 **2021 ASC PI Meeting**, *Understandable, Performance Communication Systems for Exascale Applications*, Monterrey, CA.

April 22, 2021 **U.S. Naval Academy Class Guest Lecture**, *Optimizing MPI for Modern Applications and Systems*, Annapolis, MD (Remote).

Recent Professional Service

2024 **System Software Track Co-Chair**, *2025 ACM/IEEE International Parallel and Distributed Processing Symposium (IPDPS'25)*, Duties: Selecting members for, organizing, and managing the review process of system software papers submitted to to the conference.

2018-2020 **Steering Committee Member**, *IEEE Cluster Computing Steering Committee*, Duties: Provided professional guidance on direction for the IEEE Cluster Conference, including evaluating and participating in the selection conference proposals, and advising conference organizers on potential improvements for conference offerings.

2017–2020 **Board Member**, *Chameleon Cloud Science Advisory Board*, Duties: Advise Chameleon Cloud leadership on areas for improvement of the Chameleon Cloud system.

2019 **General Co-Chair**, *2019 IEEE International Cluster Conference (Cluster '19)*, Duties: Organized logistics for the 2019 conference in Albuquerque, New Mexico, including conference budget, social events, transportation, lodging, and coordination with technical program organizers.

2019 **System Software Track Co-Chair**, *2019 ACM/IEEE International Conference on Supercomputing (SC'19)*, Duties: Selecting members for, organizing, and managing the review process of system software papers submitted to to the conference.

2016–2018 **Travel Grants Chair**, *International ACM Symposium on High-Performance Parallel and Distributed Computing (HPDC)*, Duties: Obtaining funds, managing the review of applications and handling the disbursement of student travel grant funds for the conference.

2014–2018 **Program Co-chair**, *Workshop on Resiliency in High Performance Computing (Resilience)*, Duties: Selecting members for, organizing, and managing the review process of papers submitted to to the workshop.

2003–2025 **Panel Member**, *Assorted Federal Grant Review Panels*, Membership as requested by federal program managers on grant review panels conducted by the National Science Foundation and the U.S. Department of Energy.