Samuel K. Gutiérrez

High Performance Computing Division (HPC), Los Alamos National Laboratory (LANL)

Education

Ph.D., Computer Science, University of New Mexico, Advised by Professor Dorian C. Arnold 2018
Dissertation: *Adaptive Parallelism for Coupled, Multithreaded Message-Passing Programs*

M.S., Computer Science, University of New Mexico, Advised by Professor Dorian C. Arnold 2009

B.S., Computer Science, New Mexico Highlands University, Mathematics minor, *magna cum laude* 2006

Employment

Los Alamos National Laboratory, Los Alamos, NM

Scientist, High Performance Computing Division	Since December 2018
Scientist, Computer, Computational, and Statistical Sciences Division	December 2013–December 2018
Scientist, High Performance Computing Division	April 2010–December 2013
Research Assistant, High Performance Computing Division	May 2006–April 2010

University of New Mexico, Albuquerque, NM

Research Assistant, Department of Computer Science	January 2009–May 2009

New Mexico Highlands University, Las Vegas, NM

Programming Instructor, Department of Math, Engineering, & Physics	August 2005–May 2006

Activities, Awards, & Accomplishments

Program Committee, IEEE IPDPS 2021 (System Software), IEEE Cluster 2019 (Programming and System Software), IEEE IPDPS 2017 (Multidisciplinary).

Outstanding Contribution in Mentoring Interns During COVID-19, Los Alamos Spot Award Program, 2020.

Technical Referee, IEEE Transactions on Parallel and Distributed Systems 2020, 2019, IEEE Cluster 2015.

Crossroads Technical Advisory Team, April 2019.

Defense Programs Awards of Excellence, National Nuclear Security Administration, 2010, 2016, 2018.

Outstanding Contribution to the ASC Trinity Runs, Los Alamos Awards Program, 2018.

NSF Scholar, ACM Richard Tapia Celebration of Diversity in Computing Conference, 2017.

Crossroads/NERSC-9 Technical Advisory Team, December 2016.

Outstanding Contribution to the ASC ATS-1 Runs, Los Alamos Awards Program, 2016.

Outstanding Contribution to Quo, Los Alamos Awards Program, 2014.

Co-PI, Common Computing Environment MPI Scaling/Integration Project, February 2010–December 2013.

Trinity/NERSC-8 Technical Advisory Team, September 2013.

Outstanding Contribution to the Cray XE/XK Port of Open MPI, Los Alamos Awards Program, 2012.

Large Team Distinguished Performance Member, Los Alamos National Laboratory, 2010.

Roadrunner Core Team Member, Los Alamos Awards Program, 2009.

Broader Engagement Scholar, Supercomputing, 2007, 2009.

Outstanding Presentation in Computing, Los Alamos National Laboratory, 2006, 2008.

Distinguished Performance Award Nominee, Los Alamos National Laboratory, 2008.

Student Ambassador, Los Alamos National Laboratory, 2006.

Mentoring

Mathis Martin, Diplôme d'ingénieur, ENSIIE, Graduate student appointment co-advised by Edgar A. León, 2023. *Jacob Dickens*, B.S., New Mexico State University, Post-baccalaureate appointment co-advised by Howard Pritchard, 2020. *Florian Weik*, Ph.D. student, University of Stuttgart, Summer internship co-advised by Christoph Junghans, 2016. *Alexandra Gendreau*, Ph.D. student, University of Colorado, Summer internship co-advised by Pat McCormick, 2015. *Evan Samanas*, B.S., University of Wisconsin-Madison, Post-baccalaureate appointment, 2011.

Refereed Papers

[1] Robert Ross, George Amvrosiadis, Philip Carns, Charles D. Cranor, Matthieu Dorier, Kevin Harms, Greg Ganger, Garth Gibson, Samuel K. Gutierrez, Robert Latham, Bob Robey, Dana Robinson, Bradley Settlemyer, Galen Shipman, Shane Snyder, Jerome Soumagne, and Qing Zheng. Mochi: Composing Data Services for High-Performance Computing Environments. *Journal of Computer Science and Technology*, October 2019.

[2] Nathan Hjelm, Howard Pritchard, Samuel K. Gutiérrez, Daniel J. Holmes, Ralph Castain, and Anthony Skjellum. MPI Sessions: Evaluation of an Implementation in Open MPI. In *2019 IEEE International Conference on Cluster Computing (CLUSTER)*, pages 1–11, September 2019.

[3] Samuel K. Gutiérrez, Dorian C. Arnold, Kei Davis, and Patrick McCormick. On the Memory Attribution Problem: A Solution and Case Study Using MPI. *Journal on Concurrency and Computation: Practice and Experience*, page e5159, February 2019.

[4] Matthieu Dorier, Philip Carns, Kevin Harms, Robert Latham, Robert Ross, Shane Snyder, Justin Wozniak, Samuel K. Gutiérrez, Brad Settlemyer Bob Robey, Galen Shipman, Jerome Soumagne, James Kowalkowski, Marc Paterno, and Saba Sehrish. Methodology for the Rapid Development of Scalable HPC Data Services. In *Proceedings of the 3rd Joint International Workshop on Parallel Data Storage & Data Intensive Scalable Computing Systems*, Dallas, Texas, 2018. ACM.

[5] Samuel K. Gutiérrez, Dorian C. Arnold, Kei Davis, and Patrick McCormick. On the Memory Attribution Problem: A Solution and Case Study Using MPI. In *ExaMPI 2017—Workshop on Exascale MPI*, Denver, Colorado, November 2017.

[6] Samuel K. Gutiérrez, Kei Davis, Dorian C. Arnold, Randal S. Baker, Robert W. Robey, Patrick McCormick, Daniel Holladay, Jon A. Dahl, R. Joe Zerr, Florian Weik, and Christoph Junghans. Accommodating Thread-Level Heterogeneity in Coupled Parallel Applications. In *2017 IEEE International Parallel & Distributed Processing Symposium (IPDPS)*, Orlando, Florida, 2017.

[7] Taylor Groves, Samuel K. Gutierrez, and Dorian Arnold. A LogP Extension for Modeling Tree Aggregation Networks. In *HPCMASPA in association with 2015 IEEE International Conference on Cluster Computing*, pages 666–673, September 2015.

[8] Patrick McCormick, Christine Sweeney, Nick Moss, Dean Prichard, Samuel K. Gutierrez, Kei Davis, and Jamaludin Mohd-Yusof. Exploring the Construction of a Domain-Aware Toolchain for High-Performance Computing. In *Proceedings of the Fourth International Workshop on Domain-Specific Languages and High-Level Frameworks for High Performance Computing*, WOLFHPC '14, pages 1–10, New Orleans, Louisiana, 2014.

[9] Nathan T. Hjelm, Samuel K. Gutierrez, and Manjunath Gorentla Venkata. On the Current State of Open MPI on Cray Systems. In *2014 Cray User Group Annual Technical Conference*, Lugano, Switzerland, May 2014.

[10] Manjunath Gorentla Venkata, Richard L. Graham, Joshua Ladd, Pavel Shamis, Nathan T. Hjelm, and Samuel K. Gutierrez. Exploiting Atomic Operations for Barrier on Cray XE/XK Systems. In *Recent Advances in the Message Passing Interface - 19th European MPI Users' Group Meeting, EuroMPI, Vienna, Austria, 2012*, pages 78–88, 2012.

[11] Samuel K. Gutierrez, Nathan T. Hjelm, Manjunath Gorentla Venkata, and Richard L. Graham. Performance Evaluation of Open MPI on Cray XE/XK Systems. In *Hot Interconnects (HOTI), 2012 IEEE 20th Annual Symposium on High Performance Interconnects*, pages 40–47, August 2012.

[12] Manjunath Gorentla Venkata, Richard L. Graham, Nathan T. Hjelm, and Samuel K. Gutierrez. Open MPI for Cray XE/XK Systems. In *2012 Cray User Group Annual Technical Conference*, Stuttgart, Germany, May 2012.

Selected Technical Reports

[1] Samuel K. Gutierrez and Howard P. Pritchard. A Shared-Memory Approach for Reducing OpenPMIx Memory Consumption. Technical report, Los Alamos National Laboratory, Los Alamos, NM (United States), 2022. LA-UR-22-25596.

[2] Samuel K. Gutierrez and Howard P. Pritchard. Establishing a Memory Usage Baseline for OpenPMIx. Technical report, Los Alamos National Laboratory, Los Alamos, NM (United States), 2021. LA-UR-21-32132.

[3] Samuel K. Gutierrez and Howard P. Pritchard. Toward Well-Provenanced Computer System Benchmarking: An Update. Technical report, Los Alamos National Laboratory, Los Alamos, NM (United States), 2021. LA-UR-21-29427.

[4] Howard P. Pritchard Jr, Samuel K. Gutierrez, Nathan Hjelm, Daniel Holmes, and Ralph Castain. MPI Sessions: Second Demonstration and Evaluation of MPI Sessions Prototype. Technical report, Los Alamos National Laboratory, Los Alamos, NM (United States), 2019. LA-UR-19-29588.

[5] Samuel K. Gutiérrez. A Memory Consumption Benchmark for MPI Implementations. Technical report, Los Alamos National Laboratory, Los Alamos, NM, November 2018. LA-UR-18-30898.

[6] Janine Bennett, Gavin Baker, Marc Gamell, David Hollman, Samuel Knight, Hemanth Kolla, Gregory Sjaardema, Nicole Slattengren, Keita Teranishi, Jeremiah Wilke, et al. ASC ATDM Level 2 Milestone #5325: Asynchronous Many-Task Runtime System Analysis and Assessment for Next Generation Platforms. Technical report, 2015.

[7] Patrick McCormick, Kei Davis, Samuel K. Gutierrez, Charles Ferenbaugh, Dean Prichard, Scott Pakin, and Eric Anger. A Case Study of Highly Concurrent Programming Methods for ASC Codes. Technical report, Los Alamos National Laboratory, Los Alamos, NM, September 2014.

Selected Talks

[1] Adaptive Parallelism for Coupled, Hybrid Programs. Fifth Workshop on Coupling Technologies for Earth System Models (CW2020), September 2020.

[2] Gladius: An Extensible Framework for Online Distributed Heap Analysis. Workshop on Exascale Technologies (WEST), Albuquerque, New Mexico, January 2016.

[3] Quo: Accommodating Thread-Level Heterogeneity in Coupled MPI Applications. Workshop on Exascale Technologies (WEST), Albuquerque, New Mexico, January 2016.

[4] Data-Centric Models for Multilevel Algorithms. Seventeenth Copper Mountain Conference on Multigrid Methods, Copper Mountain, Colorado, March 2015.

[5] Building Abstractions for Legion Applications. Legion Bootcamp, Stanford University, Stanford, California, December 2014.

[6] On Coding and Computer Science. New Mexico Highlands University, Las Vegas, New Mexico, October 2014.

[7] Data-Centric Parallel Programming in Legion. Programming Models and Applications (PMAPP) Workshop, Sandia National Laboratories, Albuquerque, New Mexico, August 2014.

[8] Heuristic-Based Task Mapping for MPI Applications. University of New Mexico, Albuquerque, New Mexico, November 2009.

Invited Panels

[1] The Legion Model and Runtime. Panel on Task-Based Runtime Systems—from Programming Models to Scheduling at Heterogeneity in Computing Workshop (HCW), Orlando, Florida, May 2017.

[2] Blurring the Line Between Memory and Storage Hierarchies by Exploiting Strong Data Models. ISC Workshop on Building a European-American Community for the Development of Dynamic Runtimes in Extreme-Scale Systems, Frankfurt, Germany, June 2016.

Selected Poster Presentations

[1] Edgar León and Samuel K. Gutiérrez. Quo Vadis: Helping Applications Manage On-Node Resources on Modern Systems. PASC24, Zurich, Switzerland, June 2024.

[2] Samuel K. Gutiérrez. memnesia: A Message-Driven Memory Profiler. Exascale Computing Project (ECP) Annual Meeting, Knoxville, Tennessee, February 2018.

[3] Samuel K. Gutiérrez. Accommodating Thread-Level Heterogeneity in Coupled MPI Applications. Exascale Computing Project (ECP) Annual Meeting, Knoxville, Tennessee, February 2017.

[4] Samuel K. Gutiérrez. Open MPI for the Cray XE6/XK6. Computer and Computational Sciences Capability Review, Los Alamos, New Mexico, May 2012.

[5] Samuel K. Gutiérrez. Open|SpeedShop: A Scalable Parallel Performance Analysis Framework. The Salishan Conference on High-Speed Computing, Gleneden Beach, Oregon, April 2009.

[6] Samuel K. Gutiérrez. Open|SpeedShop: A Scalable Parallel Performance Analysis Framework. Los Alamos National Laboratory Student Symposium, Los Alamos, New Mexico, August 2008.

[7] Samuel K. Gutiérrez. Increasing the Long-Term Viability of Open Source Performance Analysis Software. Los Alamos National Laboratory Student Symposium, Los Alamos, New Mexico, August 2007.

[8] Samuel K. Gutiérrez. Dynamic Instrumentation Using Open|SpeedShop. Los Alamos National Laboratory Student Symposium, Los Alamos, New Mexico, August 2006.

Tutorials

[1] Martin Schulz, Jim Galarowicz, Samuel K. Gutierrez, and Scott Cranford. Parallel Performance Analysis with Open|SpeedShop. DoD High Performance Computing Modernization Program Users Meeting, Seattle, WA, July 2008.

Software Development

OpenPMIx, process management for exascale environments	Developer, Since March 2022
Quo-Vadis, infrastructure for dynamic computer resource arbitration	Author, Since June 2020
bueno, a framework for experimental reproducibility in computer benchmarking	Author, Since June 2019
memnesia, an event-driven memory profiler for MPI programs	Author, Since August 2017
Legion-HPCG, a Legion implementation of the HPCG benchmark	Author, Since February 2014
Quo, dynamic execution environments for coupled MPI+X programs	Author, Since January 2013
mpimemu, a memory consumption benchmark for MPI libraries	Author, Since September 2011
sdsdkv, a configurable distributed key-value service	Author, March 2018–December 2018
Legion, a data-centric parallel programming system	Contributor, February 2014–May 2017
Open MPI, a high-performance message passing library	Developer, August 2009–December 2013
PLFS, a parallel log-structured file system	Contributor, July 2010–July 2012
Open|SpeedShop, a parallel performance analysis framework	Contributor, May 2006–August 2009