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I am a computer scientist and engineer fascinated with the design, implementation, and deployment of resilient and high performance distributed systems. My focus area for over two decades has been data and communication system software for high performance computing. In that time I have participated in and lead the development of a number of algorithms and open source software packages for scientific computing.

Professional Preparation

Clemson University, Clemson, SC	Computer Engineering, Focus: Computer Architecture	Ph.D., 2000
Clemson University, Clemson, SC	Computer Engineering, Minor in Math Science	B.S., 1994

Appointments

2023–present	Deputy Division Director for CS	Mathematics and Computer Science Division, Argonne National Laboratory
2014–present	Senior Computer Scientist	Mathematics and Computer Science Division, Argonne National Laboratory
2020–present	Senior Scientist At-Large	UChicago Consortium for Advanced Science and Engineering, University of Chicago
2012–present	Senior Fellow	Northwestern–Argonne Institute for Science and Engineering, Northwestern University and Argonne National Laboratory
2004–2020	Adjunct Assistant Professor	Department of Electrical and Computer Engineering, Clemson University
2011–2018	Senior Fellow	Computation Institute, The University of Chicago and Argonne National Laboratory
2016–2017	Interim Division Director	Mathematics and Computer Science Division, Argonne National Laboratory
2004–2014	Computer Scientist	Mathematics and Computer Science Division, Argonne National Laboratory

Current Activities

SciDAC RAPIDS Institute for Computer Science, Data, and Artificial Intelligence
Director, working with computational scientists and other experts in computer science and scientific data management and analysis to enable DOE computational science applications on large scale compute platforms.

Mochi Specialized Data Services for HPC
Research activity investigating composition-based approaches for rapid development of specialized data services for DOE mission needs. Collaborations with domain scientists in SciDAC and ECP.

Darshan I/O Characterization Tool
Lightweight tool for observing the I/O behavior of HPC applications at the largest scales, and analysis methods for extracting knowledge from this data.

CODES Simulation Framework
Parallel discrete event simulation framework, building on RPI's ROSS system, that enables high fidelity simulation of complex networking and storage architectures.

Honors and Awards

2024	Secretary of DOE Honor's Award
2021	Association for Computing Machinery Fellow
2021	R&D 100 Award for Mochi
2020	Department of Energy Ernest Orlando Lawrence Award
2018	R&D 100 Award for Darshan
2016	CCGrid 2016 Best Paper Award for "CLARISSE: A Middleware for Data-Staging Coordination and Control on Large-Scale HPC Platforms"
2011	LSAP 2011 Best Paper Award for "Visual Analysis of I/O System Behavior for High End Computing"
2011	MSST 2011 Best Paper Award for "Understanding and Improving Computational Science Storage Access through Continuous Characterization"
2009	EuroPVM/MPI 2009 Outstanding Paper Award for "Processing MPI Datatypes Outside MPI"
2008	Clemson University College of Engineering and Science Outstanding Young Alumni
2006	National Academy of Sciences Kavli Fellow
2005	R&D 100 Award Winner for MPICH2
2004	Presidential Early Career Award for Scientists and Engineers Dept. of Energy Office of Science Early Career Scientist and Engineer Award
2000–2002	Argonne National Laboratory Enrico Fermi Scholar
2000	USENIX Best Paper Award for "PVFS: A Parallel File System for Linux Clusters"
1996–1999	NASA Graduate Student Research Program Fellow

Professional Activities

DOE Office of Science Early Career program reviewer 2002,2024

DOE SBIR reviewer 2007, 2009, 2024

IEEE Conference on Massive Data Storage (MSST) PC 2013–2014, 2016–2017, 2019–2020,2024

USENIX Conference on File and Storage Technologies (FAST) PC 2011, 2020–2023; reviewer 2005

CHEOPS PC 2023

ICPP 2022 Software Track Co-Chair

SC storage chair 2018 and co-chair 2011; PC 2004, 2007–2009, 2012–2013, 2015, 2022–2023; reviewer 2003

NSF review panelist 2006, 2007, 2010, 2012, 2015, 2022

IEEE Cluster steering committee 2010–2020; PC Chair for Data, Storage, and Visualization 2016, 2020; PC 2003, 2006, 2009–2011, 2015, 2017, 2020–2021; reviewer 2002

ACM SIGSIM PADS PC 2019–2021

Parallel Data Storage Workshop (PDSW) General Chair 2013, Steering Committee 2013-2015, 2021; PC Chair 2012; PC 2009–2015

HPC I/O in the Datacenter (HPC-IODC) Workshop PC 2016–2021

HDF5 Technical Advisory Board member 2019–2021

Elsevier SoftwareX reviewer 2020

PDSW-DISCS Workshop Steering Committee 2016–2020; PC 2016–2018

High Performance Storage Workshop PC 2020

IEEE Transactions in Parallel and Distributed Systems reviewer 2003–2010, 2015, 2019–2020

IEEE Transactions on Computers reviewer 2013, 2017–2018, 2020

International Journal of High Performance Computing and Applications (IJHPCA) reviewer 2009, 2011–2012, 2015, 2019

International workshop on the Convergence of Extreme Scale Computing and Big Data Analysis (CEBDA) PC 2019

ACM Computing Surveys reviewer 2019

Hyperion Technical Computing Advisory Panel 2018

IPDPS PC 2014, 2018; reviewer 2002, 2007

Greater Chicago Area System Research Workshop Organizer 2014, Steering Committee 2015-2016

IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing (CCGrid) PC 2015–2017

IEEE Transactions on Storage (TOS) reviewer 2015

IEEE/ACM Big Data Computing PC 2015

International Conference on P2P, Parallel, Grid, Cloud and Internet Computing (3PGCIC) PC 2015

IEEE International Conference on Networking, Architecture, and Storage (NAS) PC 2016

IDC Technical Computing Advisory Panel 2014–2016

Workshop on Many-Task Computing on Clouds, Grids, and Supercomputers (MTAGS) PC 2014

International Workshop on Runtime and Operating Systems for Supercomputers (ROSS) PC 2011–2014

International Workshop on Data Intensive Computing in the Cloud (DataCloud) PC 2013, 2014

NSF PRObE steering committee 2011

Workshop on Big Data Management in Clouds PC 2013

IEEE Symposium on Large Scale Data Analysis and Visualization (LDAV) PC 2011–2012

EuroMPI PC 2010–2012; session chair 2006

HotStorage PC 2012

NSF external reviewer 2011

International Conference on Parallel Architectures and Compilation Techniques (PACT) reviewer 2012

SciDAC Center for Scalable Application Development Software (CScADS) Workshop organizer 2008–2011

International Conference on Distributed Computing Systems (ICDCS) PC 2010

International Conference on Parallel and Distributed Systems (ICPADS) PC 2010

SciDAC Conference PC 2006, 2009, 2010

Computational Science and Discovery editorial board 2010

Workshop on Interfaces and Abstractions for Scientific Data Storage (IASDS) workshop chair 2009

Programmable File Systems Workshop PC 2014

DOE/ASCR 2007 Visualization and Analytics Workshop co-chair

DOE Office of Science ASCR PI Meeting steering committee 2008

International Conference on Parallel Processing (ICPP) PC 2007, 2009, 2013

International Journal of Computers and Their Applications (IJCA) reviewer 2006

Journal of Parallel and Distributed Computing reviewer 2003, 2006

Journal of Parallel Computing reviewer 2005

High Performance Distributed Computing Conference reviewer 2005

DOE Office of Science Early Career Principal Investigator program reviewer 2005

NASA Computing, Networking, and Information Systems R&D activities reviewer 2004

Special issue of Cluster Computing Journal reviewer 2003

Supervisory and Mentoring Activities

- Ph.D. thesis committee member for Philip Carns (2005), Murali Vilayannur (2005), Avery Ching (2007), Dries Kimpe (2008), Sumit Narayan (2010), Arifa Nisar (2010), Jing Fu (2012), Zhiwei Sun (2013), Misbah Mubarak (2015), Huong Luu (2015), Noah Wolfe (2018), Caitlin Ross (2019), Neil McGlohon (2021), Xin Wang (2023), Amal Gueroudji (2023)

- Software programmer supervisor 2003–present

- Postdoctoral researcher supervisor 2004–present

- Summer student supervisor 2001–present

Book Chapters and Journal Articles

[1] E. Cruz-Camacho, K. Brown, X. Wang, X. Xu, K. Shu, Z. Lan, B. Ross, and C. Carothers. Hybrid pdes simulation of hpc networks using zombie packets. *ACM Trans. Model. Comput. Simul.*, July 2024.

[2] M. Dorier, Z. Wang, S. Ramesh, U. Ayachit, S. Snyder, R. Ross, and M. Parashar. Towards elastic in situ analysis for high-performance computing simulations. *Journal of Parallel and Distributed Computing*, 177:106–116, 2023.

[3] S. Lee, K.-y. Hou, K. Wang, S. Sehrish, M. Paterno, J. Kowalkowski, Q. Koziol, R. B. Ross, A. Agrawal, A. Choudhary, and W.-k. Liao. A case study on parallel hdf5 dataset concatenation for high energy physics data analysis. *Parallel Comput.*, 110(C), may 2022.

[4] Q. Kang, S. Lee, K. Hou, R. Ross, A. Agrawal, A. Choudhary, and W. Liao. Improving MPI collective I/O for high volume non-contiguous requests with intra-node aggregation. *IEEE Transactions on Parallel and Distributed Systems*, 31(11):1–1, November 2020.

[5] A. Brinkmann, K. Mohror, W. Yu, P. Carns, T. Cortes, S. A. Klasky, A. Miranda, F.-J. Pfreundt, R. B. Ross, M.-A. Vef, et al. Ad hoc file systems for high-performance computing. *Journal of Computer Science and Technology*, 35(1):4–26, 2020.

[6] R. B. Ross, G. Amvrosiadis, P. Carns, C. D. Cranor, M. Dorier, K. Harms, G. Ganger, G. Gibson, S. K. Gutierrez, R. Latham, et al. Mochi: Composing data services for high-performance computing environments. *Journal of Computer Science and Technology*, 35(1):121–144, 2020.

[7] D. Dai, Y. Chen, P. Carns, and R. Ross. Managing rich metadata in high-performance computing systems using a graph model. *IEEE Transactions on Parallel and Distributed Systems*, 2019.

[8] J. Wozniak, M. Dorier, R. Ross, T. Shu, T. Kurc, L. Tang, N. Podhorszki, and M. Wolf. Mpi jobs within mpi jobs: A practical way of enabling task-level fault-tolerance in hpc workflows. *Future Generation Computer Systems*, 101, 05 2019.

[9] H. S. Gunawi, R. O. Suminto, R. Sears, C. Golliher, S. Sundararaman, X. Lin, T. Emami, W. Sheng, N. Bidokhti, C. McCaffrey, D. Srinivasan, B. Panda, A. Baptist, G. Grider, P. M. Fields, K. Harms, R. B. Ross, A. Jacobson, R. Ricci, K. Webb, P. Alvaro, H. B. Runesha, M. Hao, and H. Li. Fail-slow at scale: Evidence of hardware performance faults in large production systems. *IEEE Transactions on Storage*, 14, October 2018.

[10] N. Wolfe, M. Mubarak, C. D. Carothers, R. B. Ross, and P. H. Carns. Modeling large-scale slim fly networks using parallel discrete-event simulation. *ACM Transactions on Modeling and Computer Simulation*, 28, October 2018.

[11] D. Dai, Y. Chen, D. Kimpe, and R. Ross. Trigger-based incremental data processing with unified sync and async model. *IEEE Transactions on Cloud Computing*, 2018.

[12] T. Fujiwara, J. Li, M. Mubarak, C. Ross, C. Carothers, R. Ross, and K. Ma. A visual analytics system for optimizing the performance of large-scale networks in supercomputing systems. *Visual Informatics*, pages 98–110, 2018.

[13] F. J. R. Duro, J. G. Blas, F. Isaila, J. Carretero, J. M. Wozniak, and R. Ross. Experimental evaluation of a flexible I/O architecture for accelerating workflow engines in ultrascale environments. *Parallel Computing*, 61:52–67, January 2017.

[14] F. Isaila, J. Garcia, J. Carretero, R. Ross, and D. Kimpe. Making the case for reforming the I/O software stack of extreme-scale systems. *Advances in Engineering Software*, 111:26–31, 2017.

[15] M. Mubarak, C. D. Carothers, R. B. Ross, and P. Carns. Enabling parallel simulation of large-scale HPC network systems. *IEEE Transactions on Parallel and Distributed Systems*, 28(1):87–100, 2017.

[16] D. Dai, P. Carns, R. B. Ross, J. Jenkins, N. Muirhead, and Y. Chen. An asynchronous traversal engine for graph-based rich metadata management. *Parallel Computing*, 2016.

[17] K. Padmanabhan, S. Lakshminarasimhan, Z. Gong, J. Jenkins, N. Shah, E. Schendel, I. Arkatkar, R. Ross, S. Klasky, and N. F. Samatova. In situ exploratory data analysis for scientific discovery. *Data-Intensive Science*, page 301, 2016.

[18] D. Zhao, N. Liu, D. Kimpe, R. Ross, X.-H. Sun, and I. Raicu. Towards exploring data-intensive scientific applications at extreme scales through systems and simulations. *IEEE Transactions on Parallel and Distributed Systems*, 2016.

[19] J. Deng, Y. S. Nashed, S. Chen, N. W. Phillips, T. Peterka, R. Ross, S. Vogt, C. Jacobsen, and D. J. Vine. Continuous motion scan ptychography: characterization for increased speed in coherent x-ray imaging. *Optics express*, 23(5):5438–5451, 2015.

[20] J. Deng, D. J. Vine, S. Chen, Y. S. Nashed, Q. Jin, N. W. Phillips, T. Peterka, R. Ross, S. Vogt, and C. J. Jacobsen. Simultaneous cryo x-ray ptychographic and fluorescence microscopy of green algae. *Proceedings of the National Academy of Sciences*, 112(8):2314–2319, 2015.

[21] J. Deng, D. J. Vine, S. Chen, Y. S. Nashed, T. Peterka, R. Ross, S. Vogt, and C. J. Jacobsen. Opportunities and limitations for combined fly-scan ptychography and fluorescence microscopy. In *SPIE Optical Engineering and Applications*, pages 95920U–95920U. International Society for Optics and Photonics, 2015.

[22] J. Jenkins, X. Zou, H. Tang, D. Kimpe, R. Ross, and N. F. Samatova. RADAR: Runtime asymmetric data-access driven scientific data replication. In *Supercomputing*, pages 296–313. Springer International Publishing, 2014.

[23] D. Kimpe and R. Ross. Storage models: Past, present, and future. *High Performance Parallel I/O*, 2014.

[24] Y. S. Nashed, D. J. Vine, T. Peterka, J. Deng, R. Ross, and C. Jacobsen. Parallel ptychographic reconstruction. *Optics express*, 22(26):32082–32097, 2014.

[25] T. Ilsche, J. Schuchart, J. Cope, D. Kimpe, T. Jones, A. Knupfer, K. Iskra, R. Ross, W. Nagel, and S. Poole. Optimizing I/O forwarding techniques for extreme-scale event tracing. *Cluster Computing*, pages 1–18, 2013.

[26] J. Jenkins, I. Arkatkar, S. Lakshminarasimhan, D. A. Boyuka II, E. R. Schendel, N. Shah, S. Ethier, C.-S. Chang, J. Chen, H. Kolla, et al. ALACRITY: Analytics-driven lossless data compression for rapid in-situ indexing, storing, and querying. In *Transactions on Large-Scale Data-and Knowledge-Centered Systems X*, pages 95–114. Springer Berlin Heidelberg, 2013.

[27] R. Latham and R. Ross. Parallel I/O basics. In *Earth System Modelling-Volume 4*, pages 3–12. Springer Berlin Heidelberg, 2013.

[28] N. Liu, C. Carothers, J. Cope, P. Carns, and R. Ross. Model and simulation of exascale communication networks. *Journal of Simulation*, March 2012.

[29] S. Lakshminarasimhan, N. Shah, S. Ethier, S.-H. Ku, C. Chang, S. Klasky, R. Latham, R. Ross, and N. F. Samatova. ISABELA for effective in situ compression of scientific data. *Concurrency and Computation: Practice and Experience*, 2012.

[30] R. Latham, C. Daley, W. keng Liao, K. Gao, R. Ross, A. Dubey, and A. Choudhary. A case study for scientific I/O: improving the FLASH astrophysics code. *Computational Science and Discovery*, 5(1):015001, 2012.

[31] P. Carns, K. Harms, W. Allcock, C. Bacon, S. Lang, R. Latham, and R. Ross. Understanding and improving computational science storage access through continuous characterization. *ACM Transactions on Storage*, 7(3), October 2011.

[32] R. Ross. Parallel file systems. In D. Padua, editor, *The Encyclopedia of Parallel Computing*. Springer, September 2011.

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[34] R. Ross, A. Choudhary, G. Gibson, and W.-K. Liao. Parallel data storage and access. In A. Shoshani and D. Rotem, editors, *Scientific Data Management: Challenges, Technology, and Deployment*. Chapman & Hall/CRC, 2010.

[35] R. Ross, P. Carns, and D. Metheney. Parallel file systems. In Y. Chan, J. Talburt, and T. Talley, editors, *Data Engineering: Mining, Information and Intelligence*. Springer, October 2009.

[36] R. Latham, R. B. Ross, and R. Thakur. Implementing MPI-IO atomic mode and shared file pointers using mpi one-sided communication. *Int'l Journal of High Performance Computing Applications*, 21(2):132–143, Summer 2007.

[37] A. Ching, A. Choudhary, W. K. Liao, R. Ross, and W. Gropp. Evaluating structured I/O methods for parallel file systems. *International Journal of High Performance Computing and Networking*, 2:133–145, 2004.

[38] R. B. Ross and W. B. L. III. Server-side scheduling in cluster parallel I/O systems. In C. Cerin and H. Jin, editors, *Parallel I/O for Cluster Computing*, pages 157–178. Kogan Page Science, Sterling, VA, 2004.

[39] W. B. L. III and R. B. Ross. Parallel I/O and the Parallel Virtual File System. In W. Gropp, E. Lusk, and T. Sterling, editors, *Beowulf Cluster Computing with Linux, second edition*, pages 493–534. MIT Press, Cambridge, MA, 2003.

[40] W. B. L. III and R. B. Ross. PVFS: Parallel Virtual File System. In T. Sterling, editor, *Beowulf Cluster Computing with Linux*, pages 391–429. MIT Press, Cambridge, MA, 2002.

Refereed Proceedings

[1] A. Gueroudji, C. Phelps, T. Z. Islam, P. Carns, S. Snyder, M. Dorier, R. B. Ross, and L. C. Pouchard. Performance characterization and provenance of distributed task-based workflows on HPC platforms. In *Proceedings of the 19th Workshop on Workflows in Support of Large-Scale Science*, November 2024. (to appear).

[2] R. Latham, R. B. Ross, P. Carns, S. Snyder, K. Harms, K. Velusamyi, P. Coffman, and G. McPheeters. Initial experiences with DAOS object storage on Aurora. In *Proceedings of the 9th International Parallel Data Systems Workshop*, November 2024.

[3] X. Xu, K. A. Brown, T. Mallick, X. Wang, E. Cruz-Camacho, R. B. Ross, C. D. Carothers, Z. Lan, and K. Shu. Surrogate modeling for hpc application iteration times forecasting with network features. In *Proceedings of the 38th ACM SIGSIM Conference on Principles of Advanced Discrete Simulation*, pages 93–97, June 2024.

[4] M. Dorier, P. Carns, R. Ross, S. Snyder, R. Latham, A. Gueroudji, G. Amvrosiadis, C. Cranor, and J. Soumagne. Extending the mochi methodology to enable dynamic hpc data services. In *Proceedings of teh 5th Workshop on Extreme-Scale Storage and Analysis*, pages 414–422. IEEE, May 2024.

[5] A. Gueroudji, J. Bigot, B. Raffin, and R. Ross. Dask-extended external tasks for hpc/ml in transit workflows. In *Proceedings of the Sixth Annual Workshop on Emerging Parallel and Distributed Runtime Systems and Middleware*, pages 831–838, November 2023.

[6] B. Nicolae, T. Z. Islam, R. Ross, H. Van Dam, K. Assogba, P. Shpilker, M. Titov, M. Turilli, T. Wang, O. O. Kilic, et al. Building the i (interoperability) of fair for performance reproducibility of large-scale composable workflows in recup. In *2023 IEEE 19th International Conference on e-Science (e-Science)*, pages 1–7. IEEE, October 2023.

[7] S. Ali, S. Calvez, P. Carns, M. Dorier, P. Ding, J. Kowalkowski, R. Latham, A. Norman, M. Paterno, R. Ross, et al. Hepnos: a specialized data service for high energy physics analysis. 2023.

[8] E. Cruz-Camacho, K. A. Brown, X. Wang, X. Xu, K. Shu, Z. Lan, R. B. Ross, and C. D. Carothers. Hybrid pdes simulation of hpc networks using zombie packets. In *Proceedings of the 2023 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation*, pages 128–132, 2023.

[9] Z. Huang, K. Hou, A. Agrawal, A. Choudhary, R. Ross, and W.-K. Liao. I/O in WRF: A case study in modern parallel I/O techniques. In *Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis*, pages 1–13, 2023.

[10] X. Xu, X. Wang, E. Cruz-Camacho, C. D. Carothers, K. A. Brown, R. B. Ross, Z. Lan, and K. Shu. Machine learning for interconnect network traffic forecasting: Investigation and exploitation. In *Proceedings of the 2023 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation*, pages 133–137, 2023.

[11] M. Dorier, Z. Wang, U. Ayachit, S. Snyder, R. Ross, and M. Parashar. Colza: Enabling elastic in situ visualization for high-performance computing simulations. In *2022 IEEE International Parallel and Distributed Processing Symposium (IPDPS)*, pages 538–548, June 2022.

[12] M. Dorier, R. Egele, P. Balaprakash, J. Koo, S. Madireddy, S. Ramesh, A. D. Malony, and R. Ross. HPC storage service autotuning using variational-autoencoder-guided asynchronous bayesian optimization. In *Proceedings of the 2022 IEEE International Conference on Cluster Computing (CLUSTER)*, 2022.

[13] M. Isakov, M. Currier, E. Del Rosario, S. Madireddy, P. Balaprakash, P. Carns, R. B. Ross, G. K. Lockwood, and M. A. Kinsy. A taxonomy of error sources in hpc i/o machine learning models. In *SC22: International Conference for High Performance Computing, Networking, Storage and Analysis*, pages 01–14. IEEE, 2022.

[14] R. A. Sinurat, A. Daram, H. S. Gunawi, R. B. Ross, and S. Madireddy. Towards continually learning application performance models. 2022.

[15] Q. Kang, S. Breitenfeld, K. Hou, W.-k. Liao, R. Ross, and S. Byna. Optimizing performance of parallel i/o accesses to non-contiguous blocks in multiple array variables. In *2021 IEEE International Conference on Big Data (Big Data)*, pages 98–108. IEEE, December 2021.

[16] S. Ramesh, R. Ross, M. Dorier, A. Malony, P. Carns, and K. Huck. Symbiomon: A high-performance, composable monitoring service. In *2021 IEEE 28th International Conference on High Performance Computing, Data, and Analytics (HiPC)*, pages 332–342, December 2021.

[17] J. L. Bez, H. Tang, B. Xie, D. Williams-Young, R. Latham, R. Ross, S. Oral, and S. Byna. I/o bottleneck detection and tuning: Connecting the dots using interactive log analysis. In *2021 IEEE/ACM Sixth International Parallel Data Systems Workshop (PDSW)*, pages 15–22. IEEE, November 2021.

[18] N. McGlohon, C. D. Carothers, K. S. Hemmert, M. Levenhagen, K. A. Brown, S. Chunduri, and R. B. Ross. Exploration of congestion control techniques on dragonfly-class hpc networks through simulation. In *2021 International Workshop on Performance Modeling, Benchmarking and Simulation of High Performance Computer Systems (PMBS)*, pages 40–50. IEEE, November 2021.

[19] P. Matri and R. Ross. Neon: Low-latency streaming pipelines for HPC. In *2021 IEEE World Congress on Services*, September 2021.

[20] K. A. Brown, N. McGlohon, S. Chunduri, E. Borch, R. B. Ross, C. D. Carothers, and K. Harms. A tunable implementation of quality-of-service classes for hpc networks. In *International Conference on High Performance Computing (ISC)*, pages 137–156. Springer, June 2021.

[21] S. Ramesh, A. D. Malony, P. Carns, R. B. Ross, M. Dorier, J. Soumagne, and S. Snyder. Symbiosys: A methodology for performance analysis of composable hpc data services. In *2021 IEEE International Parallel and Distributed Processing Symposium (IPDPS)*, pages 35–45, May 2021.

[22] P. Carns, K. Harms, B. W. Settlemyer, B. Atkinson, and R. B. Ross. Keeping it real: Why HPC data services don't achieve I/O microbenchmark performance. In *Proceedings of the 2020 International Parallel Data Systems Workshop*, November 2020.

[23] E. del Rosario, M. Currier, M. Isakov, S. Madireddy, P. Balaprakash, P. Carns, R. B. Ross, K. Harms, S. Snyder, and M. A. Kinsy. Gauge: An interactive data-driven visualization tool for HPC application I/O performance analysis. In *Proceedings of the 2020 International Parallel Data Systems Workshop*, November 2020.

[24] M. Isakov, E. del Rosario, S. Madireddy, P. Balaprakash, P. Carns, R. Ross, and M. Kinsy. Towards generalizable models of I/O throughput. In *Proceedings of the 10th International Workshop on Runtime and Operating Systems for Supercomputers*, November 2020.

[25] M. Isakov, E. del Rosario, S. Madireddy, P. Balaprakash, P. H. Carns, R. Ross, and M. A. Kinsy. HPC I/O throughput bottleneck analysis with explainable local models. In *Proceedings of the 2020 IEEE International Conference for High Performance Computing, Networking, Storage, and Analysis*, November 2020.

[26] Q. Kang, R. Ross, R. Latham, S. Lee, A. Choudhary, and W. keng Liao. Improving all-to-many personalized communication in two-phase I/O. In *Proceedings of the 2020 IEEE International Conference for High Performance Computing, Networking, Storage, and Analysis*, November 2020.

[27] N. McGlohon, R. B. Ross, and C. D. Carothers. Evaluation of link failure resilience in multirail dragonfly-class networks through simulation. In *Proceedings of the 2020 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation*, pages 105–116, June 2020.

[28] N. Cheriere, M. Dorier, G. Antoniu, S. M. Wild, S. Leyffer, and R. Ross. Pufferscale: Rescaling HPC data services for high energy physics applications. In *Proceedings of the IEEE/ACM International Symposium on Cluster, Cloud, and Internet Computing*, May 2020.

[29] X. Wang, M. Mubarak, Y. Kang, R. B. Ross, and Z. Lan. UNION: an automatic in situ workload manager for system simulation. In *Proceedings of the IEEE International Parallel and Distributed Processing Symposium*, May 2020.

[30] S. Kesavan, T. Fujiwara, J. K. Li, C. Ross, M. Mubarak, C. D. Carothers, R. B. Ross, and K.-L. Ma. A visual analytics framework for analyzing streaming performance data. In *Proceedings of the IEEE Pacific Visualization Symposium*, April 2020.

[31] T. Patel, S. Byna, G. K. Lockwood, N. J. Wright, P. Carns, R. Ross, and D. Tiwari. Uncovering access, reuse, and sharing characteristics of I/O-intensive files on large-scale production HPC systems. In *Proceedings of the USENIX Conference on File and Storage Technologies*, February 2020.

[32] S. Madireddy, P. Balaprakash, P. Carns, R. Latham, G. Lockwood, R. Ross, S. Snyder, and S. Wild. Adaptive learning for concept drift in application performance modeling. In *Proceedings of the International Conference on Parallel Processing (ICPP)*, August 2019.

[33] M. Mubarak, N. McGlohon, M. Musleh, E. Borch, R. Ross, R. Huggahalli, S. Chunduri, S. Parker, C. Carothers, and K. Kumaran. Evaluating quality of service traffic classes on the megafly network. In *Proceedings of the ISC High Performance Conference*, June 2019.

[34] C. Ross, N. Wolfe, M. Plagge, C. Carothers, M. Mubarak, and R. Ross. Using scientific visualization techniques to visualize parallel network simulations. In *Proceedings of the ACM SIGSIM-PADS Conference*, June 2019.

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[35] M. Dorier, O. Yildiz, T. Peterka, and R. Ross. The challenges of elastic in situ analysis and visualization. In *Proceedings of the Workshop on In Situ Infrastructures for Enabling Extreme-Scale Analysis and Visualization*, pages 23–28, 2019.

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Invited Talks at Major Conferences

[1] R. B. Ross. Keep your composure: HPC, data services, and the mochi project. Presented at the Workshop on Extreme-Scale Storage and Analysis (ESSA), held virtually, June 2022.

[2] R. B. Ross. Practical PDES: Using PDES to better understand HPC systems. Presented at the SIGSIM Conference on Principles of Advanced Discrete Simulation, Chicago, IL, June 2019.

[3] R. B. Ross. A renaissance for data management in HPC? Presented at the 29th International Conference on Scientific and Statistical Database Management, Chicago, IL, June 2017.

[4] R. B. Ross. From file systems to services: Changing the data management model in HPC. Presented at the Salishan Conference on High-Speed Computing, Gleneden Beach, OR, April 2016.

[5] R. B. Ross. Storage in an exascale world. Presented at the IEEE International Workshop on Storage Network Architecture and Parallel I/Os (SNAPI), Incline Village, NV, May 2010.

[6] R. B. Ross. Visualization and parallel I/O at extreme scale. Presented at the 2008 SciDAC Conference, Seattle, WA, July 2008.

[7] R. B. Ross. PVFS: The parallel virtual file system. Presented at the Storage Networking Industry Association Developer Solutions Conference & Showcase, San Jose, CA, August 2005.

[8] R. B. Ross. Achievements and challenges for I/O in computational science. Presented at the 2005 SciDAC Conference, San Francisco, CA, June 2005.

[9] R. B. Ross. The parallel I/O software crisis. Presented at ISC, Heidelberg, Germany, June 2005.

[10] R. B. Ross. PVFS2: Parallel I/O for scientific applications. Presented at ClusterWorld 2004, San Jose, CA, April 2004.

[11] R. B. Ross. Providing parallel I/O on linux clusters. Presented at the Second Annual Linux Storage Management Workshop, Miami, FL, October 2000.

Tutorials

[1] R. Latham, G. Lockwood, R. Ross, and B. Welch. Parallel I/O in practice. SC 2024, Atlanta, GA, November 2024.

[2] R. Latham, G. Lockwood, R. Ross, and B. Welch. Parallel I/O in practice. SC 2023, Denver, CO, November 2023.

[3] R. Latham, G. Lockwood, R. Ross, and B. Welch. Parallel I/O in practice. SC 2022, Dallas, TX, November 2022.

[4] R. Latham, G. Lockwood, R. Ross, and B. Welch. Parallel I/O in practice. SC 2021, presented virtually, November 2021.

[5] R. Latham, G. Lockwood, R. Ross, and B. Welch. Parallel I/O in practice. SC 2020, held virtually, November 2020.

[6] R. Latham, G. Lockwood, R. Ross, and B. Welch. Parallel I/O in practice. SC 2019, Denver, CO, November 2019.

[7] R. Latham, G. Lockwood, R. Ross, and B. Welch. Parallel I/O in practice. SC 2018, Dallas, TX, November 2018.

[8] R. Latham, K. Antypas, R. Ross, and B. Welch. Parallel I/O in practice. SC 2017, Denver, CO, November 2017.

[9] R. Latham, R. Ross, and B. Welch. Parallel I/O in practice. SC 2016, Salt Lake City, UT, November 2016.

[10] R. Latham, K. Antypas, R. Ross, and B. Welch. Parallel I/O in practice. SC 2015, Austin, TX, November 2015.

[11] R. Ross and M. Dorier. An introduction to HPC storage and I/O. JLESC/PUF Summer School, Barcelona, Spain, 2015.

[12] R. Latham, K. Antypas, R. Ross, and B. Welch. Parallel I/O in practice. SC 2014, New Orleans, LA, November 2014.

[13] R. Latham, R. Ross, and Q. Koziol. HPC I/O for computational scientists. Argonne Training Program on Extreme-Scale Computing (ATPESC), St. Charles, IL, August 2014.

[14] R. Latham, K. Antypas, R. Ross, and B. Welch. Parallel I/O in practice. SC 2013, Denver, CO, November 2013.

[15] R. Latham, R. Ross, and Q. Koziol. HPC I/O for computational scientists. Argonne Training Program on Extreme-Scale Computing (ATPESC), St. Charles, IL, August 2013.

[16] R. Ross. (Big) data in computational science. Short Course on The Materials Genome, Current Practice and Future Promise, NSF Summer Institute on Nanomechanics, Nanomaterials, and Micro/Nanomanufacturing, Evanston, IL, June 2013.

[17] W. Gropp, E. Lusk, R. Ross, and R. Thakur. Advanced MPI. SC2012, Salt Lake City, UT, November 2012.

[18] R. Latham, K. Antypas, R. Ross, and B. Welch. Parallel I/O in practice. SC 2012, Salt Lake City, UT, November 2012.

[19] W. Gropp, E. Lusk, R. Ross, and R. Thakur. Advanced MPI. SC2011, Seattle, WA, November 2011.

[20] R. Latham, K. Antypas, R. Ross, and B. Welch. Parallel I/O in practice. SC 2011, Seattle, WA, November 2011.

[21] W. Gropp, E. Lusk, R. Ross, and R. Thakur. Advanced MPI. SC2010, New Orleans, LA, November 2010.

[22] R. Latham, R. Ross, M. Unangst, and B. Welch. Parallel I/O in practice. SC 2010, New Orleans, LA, November 2010.

[23] W. Gropp, E. Lusk, R. Ross, and R. Thakur. Advanced MPI. SC2009, Portland, OR, November 2009.

[24] R. Latham, R. Ross, M. Unangst, and B. Welch. Parallel I/O in practice. SC 2009, Portland, OR, November 2009.

[25] R. Latham and R. Ross. Parallel I/O in practice. SciDAC Tutorials Day, San Diego, CA, June 2009.

[26] W. Gropp, E. Lusk, R. Ross, and R. Thakur. Advanced MPI. SC2008, Austin, TX, November 2008.

[27] R. Latham, R. Ross, M. Unangst, and B. Welch. Parallel I/O in practice. SC 2008, Austin, TX, November 2008.

[28] W. Gropp, E. Lusk, R. Ross, and R. Thakur. Advanced MPI. SC2007, Reno, NV, November 2007.

[29] R. Latham, W. Loewe, R. Ross, and R. Thakur. Parallel I/O in practice. SC2007, Reno, NV, November 2007.

[30] R. Latham and R. Ross. Parallel I/O: Not your job. CScADS Workshop on Petascale Architectures and Performance Strategies, Snowbird, UT, July 2007.

[31] R. Latham and R. Ross. Parallel I/O in practice. SciDAC 2007 Tutorials Workshop, Boston, MA, June 2007.

[32] W. Gropp, E. Lusk, R. Ross, and R. Thakur. Advanced MPI: I/O and one-sided communication. SC2006, Tampa, FL, November 2006.

[33] R. Latham, W. Loewe, R. Ross, and R. Thakur. Parallel I/O in practice. SC2006, Tampa, FL, November 2006.

[34] R. Latham and R. Ross. Parallel I/O in practice. Cluster 2006, Barcelona, Spain, September 2006.

[35] R. Ross and J. Worringen. High-performance parallel I/O. EuroPVM/MPI 2006, Bonn, Germany, September 2006.

[36] R. Ross. Parallel I/O in practice. Sandia National Laboratories, Albuquerque, NM, July 2006.

[37] W. Gropp, E. Lusk, R. Ross, and R. Thakur. Advanced MPI: I/O and one-sided communication. SC2005, Seattle, WA, November 2005.

[38] R. Latham, W. Loewe, R. Ross, and R. Thakur. Parallel I/O in practice. SC2005, Seattle, WA, November 2005.

[39] R. Latham and R. Ross. High-performance I/O for scientific applications. CCGrid 2005, Cardiff, UK, May 2005.

[40] W. Gropp, E. Lusk, R. Ross, and R. Thakur. Advanced MPI: I/O and one-sided communication. SC2004, Pittsburgh, PA, November 2004.

[41] R. B. Ross. High-performance I/O for scientific applications. ClusterWorld 2004, San Jose, CA, April 2004.

[42] R. B. Ross and R. Thakur. Using MPI-2: A tutorial on advanced features of the message-passing interface standard. CCGrid 2004, Chicago, April 2004.

[43] R. Ross and R. Thakur. Using MPI-2: A tutorial on advanced features of the message-passing interface standard. Grid and Cluster Computing Conference (GCC) 2003, Shanghai, China, December 2003.

[44] W. Gropp, E. Lusk, R. Ross, and R. Thakur. Using MPI-2: A tutorial on advanced features of the message-passing interface standard. SC2003, Phoenix, AZ, November 2003.

[45] W. Gropp, E. Lusk, R. Ross, and R. Thakur. High-level programming with MPI. EuroPVM/MPI 2003, Venice, September 2003.

[46] W. Gropp, E. Lusk, R. Ross, and R. Thakur. Using MPI-2: A tutorial on advanced features of the message-passing interface standard. SC2002, Baltimore, MD, November 2002.

[47] W. Gropp, E. Lusk, R. Ross, and R. Thakur. Using MPI-2: A tutorial on advanced features of the message-passing interface standard. SC2001, Denver, CO, November 2001.

[48] W. B. L. III and R. B. Ross. The parallel virtual file system for commodity clusters. IEEE Cluster 2001, Newport Beach, CA, October 2001.

[49] R. Pennington, P. Kovatch, B. Maccabe, D. Bader, and R. Ross. Design and analysis of high performance clusters. SC2000, Dallas, TX, November 2000.

Seminars

[1] R. B. Ross. Rapids2: The scidac institute for computer science, data, and artificial intelligence. Presented at the 2023 SciDAC PI Meeting, September 2023.

[2] R. B. Ross. A compositional approach to harnessing smart devices within elastic data services. Presented at the virtual ASCR Data Visualization and Data Management Kick-Off Meeting, February 2023.

[3] R. B. Ross. Building a proposal: team, budget, scope, and deliverables. Presented as part of the CELS Program Development Training Series, January 2023.

[4] R. B. Ross. Services and workflows in scientific computing. Presented at the Workshop on Clusters, Clouds, and Data for Scientific Computing, September 2022.

[5] R. B. Ross. Satisfying the data demands of doe science. Presented at the ASCR Advisory Committee Meeting, September 2021.

[6] R. B. Ross. Versatile data management services for future DOE science. Presented at the ASCR Virtual PI Meeting, June 2021.

[7] R. B. Ross. Computing research challenges: An informal view from the DOE trenches. Presented at the Center for Unstoppable Computing (CERES) Spring Research Summit, May 2021.

[8] R. B. Ross. How to get your idea funded. Presented at the Workshop on Women in HPC: Diversifying the HPC Community and Engaging Male Allies, November 2020.

[9] R. B. Ross. Storage technologies: Looking forward. Presented at the SC Panel on Exotic Storage and Data Technology: 2006 to 2020 and Beyond, November 2020.

[10] R. B. Ross. Distributed (data) services and HPC. Presented at the Meeting on a Structured Approach for Programming Extreme Scale and Heterogeneous Systems, ETH, Zurich, September 2019.

[11] R. B. Ross. RAPIDS: The SciDAC institute for computer science and data. Presented at the FASTMath All-Hands Meeting, Lemont, IL, June 2019.

[12] R. B. Ross. Software tools to address change in HPC systems. Presented at the Industry HPC Leaders Group Forum, Chicago, IL, May 2019.

[13] R. B. Ross. The 2018 DOE ASCR workshop on storage systems and I/O. Presented at the ASCR Advisory Committee Meeting, Rockville, MD, April 2019.

[14] R. B. Ross. Lowering the barriers to distributed services in HPC. Presented at Inria Rennes, Rennes, France, December 2018.

[15] R. B. Ross. It's the software. Presented at the 4th Annual International Symposium on Memory Systems, Panel Session, Oxon Hill, MD, October 2018.

[16] R. B. Ross. Versatile data services for computational science. Presented at the Workshop on Clusters, Clouds, and Data for Scientific Computing, Lyon, France, September 2018.

[17] R. B. Ross. Advances in the CODES/ROSS simulation suite. Presented at the Workshop on Modeling and Simulation of Systems and Applications, Seattle, WA, August 2018.

[18] R. B. Ross. ModSim for the era of extreme heterogeneity. Presented at the Workshop on Modeling and Simulation of Systems and Applications, Seattle, WA, August 2018.

[19] R. B. Ross. RAPIDS: The SciDAC institute for computer science and data. Presented at the SciDAC PI Meeting, Rockville, MD, July 2018.

[20] R. B. Ross. Versatile data services for computational science applications. Presented at the Scalable Tools Workshop, Solitude, UT, July 2018.

[21] R. B. Ross. Data and convergence at the department of energy. Presented at the National Academies' Workshop on Converged Simulation Science and Data-Driven Science, May 2018.

[22] R. B. Ross. RAPIDS: The SciDAC institute for computer science and data. Presented at the ASCR Advisory Committee Meeting, held online, December 2017.

[23] R. B. Ross. Using discrete-event simulation for understanding and improving high performance computing systems. Presented at Northern Illinois University, Dekalb, IL, November 2017.

[24] R. B. Ross. Work-life balance? Presented at the Skills to Thrive: Careers in HPC Workshop, Lemont, IL, September 2017.

[25] R. B. Ross. To FS or not to FS... Presented at the Dagstuhl Seminar on Challenges and Opportunities of User-Level File Systems for HPC, Wadern, Germany, May 2017.

[26] R. B. Ross. U.S. overview/update: Exascale project happenings. Presented at the Big Data and Extreme-Scale Computing Workshop, Wuxi, China, March 2017.

[27] R. B. Ross. From file systems to services: changing the data management model in HPC. Presented at the Workshop on Clusters, Clouds, and Data for Scientific Computing, Lyon, France, October 2016.

[28] R. B. Ross. From file systems to services: changing the data management model in HPC. Presented at the Joint Laboratory for Extreme-Scale Computing Workshop, Lyon, France, June 2016.

[29] R. B. Ross. HPC storage and I/O: Today and tomorrow. Presented at Electricite De France (EDF), Saclay, France, June 2016.

[30] R. B. Ross. Studying I/O in the datacenter: Observing and simulating I/O for fun and profit. Presented at the HPC I/O in the Data Center Workshop, Frankfurt, Germany, June 2016.

[31] R. B. Ross. DOE storage systems and input/output (SSIO) workshops. Presented at the DOE Advanced Scientific Computing Advisory Committee Meeting, Crystal City, VA, July 2015.

[32] R. B. Ross. Storage systems and input/output for extreme scale science. Presented to the High End Computing Interagency Working Group (HECIWG), Arlington, VA, July 2015.

[33] R. B. Ross. Scalable storage and I/O. Presented at the ECI Runtime Systems Workshop, Rockville, MD, March 2015.

[34] R. B. Ross. Scalable storage for exascale and high end data analysis. Presented at the NSA Federal Laboratory Symposium, College Park, MD, March 2015.

[35] R. B. Ross. Scalable storage for high end computing: An argonne view on approach and direction. Presented at Los Alamos National Laboratory, Los Alamos, NM, March 2015.

[36] R. B. Ross. Post-petascale system software: Applying lessons learned. Presented at the JST/CREST International Symposium on Post Petascale System Software, Kobe, Japan, December 2014.

[37] R. B. Ross. Big Data and DOE science. Presented at INRIA, Rennes, France, June 2014.

[38] R. B. Ross. I/O workloads... Presented at the 11th Workshop of the INRIA-Illinois-ANL Joint Laboratory on Petascale Computing, Sophia Antipolis, France, June 2014.

[39] R. B. Ross. Future HPC systems and some implications for storage software. Presented at the 2014 Lustre Users Group Meeting, Panel Session, Miami, FL, USA, April 2014.

[40] R. B. Ross. HPC storage and data: Current state and future directions. Presented at the 2014 High-Performance Computing and Data-Intensive Geospatial Analytics Workshop, Argonne, IL, April 2014.

[41] R. B. Ross and D. Kimpe. Argonne data/storage activities. Presented at Western Digital, Irvine, CA, April 2014.

[42] R. B. Ross. High performance computing I/O systems: Overview and recent developments. Presented at Illinois Institute of Technology, Chicago, IL, USA, November 2013.

[43] R. B. Ross. Thinking past POSIX: persistent storage in extreme scale systems. Presented at the INRIA-Illinois Joint Lab Workshop, Urbana, IL, November 2013.

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