

Kenneth Dean Moreland

Computer Science and Mathematics Division, Visualization
Oak Ridge National Laboratory

<http://kennethmoreland.com/>
morelandkd@ornl.gov
(505) 440-6292 (cell)

August 22, 2024

Education

Doctor of Philosophy, Computer Science, University of New Mexico, July 2004
Master of Science, Computer Science, University of New Mexico, May 2000
Bachelor of Science, Computer Science, New Mexico Institute of Mining and Technology, May 1997
Bachelor of Science, Electrical Engineering, New Mexico Institute of Mining and Technology, May 1997

Employment

Oak Ridge National Laboratory (Oak Ridge, TN) 2021–Present
2021– Senior Research Scientist, Visualization, Computer Science and Mathematics Division

Sandia National Laboratories (Albuquerque, NM) 1995–2021
2013–2021 Principal Member of Technical Staff, Scalable Analysis and Visualization
2004–2013 Senior Member of Technical Staff, Scalable Analysis and Visualization
2000–2004 Member of Technical Staff, Data Analysis and Visualization
1999–2000 Member of Technical Staff, Distributed Systems Research
1997–1999 Limited Term Employee, Computer Applications for Manufacturing
1995–1997 Student Intern, Mechanical Process Engineering

Research Experience

RAPIDS2 2021–Present
Work with DOE Office of Science application teams in addressing visualization challenges for science discovery.
DOE Office of Science SciDAC Program
Role: Key personnel

ECP/VTK-m 2017–2023
Updating scientific visualization algorithms in the VTK-m framework for efficient visualization on multi- and many-core processor devices.
DOE Office of Science Exascale Computing Project
Role: PI
Total funding: \$9.7M

ATDM Scalable Visualization 2016–2021
Visualization support for mission-specific science applications for the Advanced Technology Development and Mitigation (ATDM) program.
DOE NNSA ASC Program
Role: PI
Funding: \$800K/year

- XVis: Visualization for the Extreme-Scale Scientific-Computation Ecosystem** 2014–2017
 Providing the foundational research for visualization software for scientific discovery with exascale computing. This work was foundational to start software projects like VTK-m and provide improvements to in situ libraries like Catalyst.
 DOE Office of Science ASCR Program
 Role: PI
 Total funding: \$4M
- SciDAC Scalable Data Analysis and Visualization Institute** 2013–2017
 Provide technical solutions in the data management, analysis, and visualization regimes that are broadly applicable in the computational science community for the DOE Office of Science SciDAC program.
 DOE Office of Science SciDAC Program
 Role: Co-PI
 Funding: \$875K
- Data Analysis at Extreme (Dax)** 2010–2014
 Creating a framework for visualization on exascale processors. Dax was one of the precursors to VTK-m.
 DOE Office of Science ASCR Program
 Role: PI
 Total Funding: \$1.5M
- SciDAC Institute for Ultrascale Visualization** 2006–2012
 Addressed visualization challenges for the DOE Scientific Discovery through Advanced Computing effort.
 DOE Office of Science SciDAC Program
 Role: Co-PI
 Funding: \$900K
- ParaView Development Lead** 2006–2021
 Lead the ASC funded development effort for ParaView, a large-scale general visualization solution. Today, ParaView is downloaded hundreds of thousands of times each year.
 DOE NNSA ASC Program
 Role: PI
 Funding: \$1.6M/year
- Massive Graph Visualization** 2005–2007
 Explored techniques for visualizing providing information in large graph structures.
 Sandia Laboratories LDRD Program
 Role: PI
 Funding: \$1.4M
- Scalable Rendering** 1999–2005
 Researched and developed parallel rendering codes targeted at performing scientific visualization on cluster computers. Software targeted for very large inputs and/or to very large displays.
 DOE NNSA ASC Program
 Role: Key personnel
- Product Realization Environment** 1996–1999
 Developed and deployed a CORBA-based middleware tool for distributing and connecting scientific modeling and simulation codes.
 DOE NNSA ASC Program
 Role: Key personnel

Publications

Google Scholar Statistics [citations: 4781, h-index: 32, i10-index: 56]

Ph.D. Thesis

- [1] Kenneth Moreland. *Fast High Accuracy Volume Rendering*. PhD thesis, University of New Mexico, July 2004.

Journal and Conference Papers

- [1] Francesca Samsel, W. Alan Scott, and Kenneth Moreland. A new default colormap for ParaView. *IEEE Computer Graphics and Applications*, 44(4):150–160, July 2024.
- [2] Kenneth Moreland, Tushar M. Athawale, Vicente Bolea, Mark Bolstad, Eric Brugger, Hank Childs, Axel Huebl, Li-Ta Lo, Berk Geveci, Nicole Marsaglia, Sujin Philip, David Pugmire, Silvio Rizzi, Zhe Wang, and Abhishek Yenpure. Visualization at exascale: Making it all work with VTK-m. *The International Journal of High Performance Computing Applications*, 2024. Preprint.
- [3] Kenneth Moreland, Robert Maynard, David Pugmire, Abhishek Yenpure, Allison Vacanti, Matthew Larsen, and Hank Childs. Minimizing development costs for efficient many-core visualization using MCD³. *Parallel Computing*, 108(102834), December 2021.
- [4] Kenneth Moreland and Hank Childs. Scientific visualization: New techniques in production software. *SIAM News*, November 2020.
- [5] Hank Childs et al. A terminology for in situ visualization and analysis systems. *The International Journal of High Performance Computing Applications*, August 2020.
- [6] J. Y. Choi, C. Chang, J. Dominski, S. Klasky, G. Merlo, E. Suchyta, M. Ainsworth, B. Allen, F. Cappello, M. Churchill, P. Davis, S. Di, G. Eisenhauer, S. Ethier, I. Foster, B. Geveci, H. Guo, K. Huck, F. Jenko, M. Kim, J. Kress, S. Ku, Q. Liu, J. Logan, A. Malony, K. Mehta, K. Moreland, T. Munson, M. Parashar, T. Peterka, N. Podhorszki, D. Pugmire, O. Tugluk, R. Wang, B. Whitney, M. Wolf, and C. Wood. Coupling exascale multiphysics applications: Methods and lessons learned. In *2018 IEEE 14th International Conference on e-Science (e-Science)*, pages 442–452, October 2018.
- [7] Ewa Deelman, Tom Peterka, Ilkay Altintas, Christopher D Carothers, Kerstin Kleese van Dam, Kenneth Moreland, Manish Parashar, Lavanya Ramakrishnan, Michela Taufer, and Jeffrey Vetter. The future of scientific workflows. *International Journal of High Performance Computing Applications*, 32(1):159–175, January 2018.
- [8] Andrew C. Bauer, Hasan Abbasi, James Ahrens, Hank Childs, Berk Geveci, Scott Klasky, Kenneth Moreland, Patrick O’Leary, Venkatram Vishwanath, Brad Whitlock, and E. Wes Bethel. In situ methods, infrastructures, and applications on high performance computing platforms. *Computer Graphics Forum*, 35(3):577–597, June 2016.
- [9] Kenneth Moreland, Christopher Sewell, William Usher, Li-Ta Lo, Jeremy Meredith, David Pugmire, James Kress, Hendrik Schroots, Kwan-Liu Ma, Hank Childs, Matthew Larsen, Chun-Ming Chen, Robert Maynard, and Berk Geveci. VTK-m: Accelerating the visualization toolkit for massively threaded architectures. *IEEE Computer Graphics and Applications*, 36(3):48–58, May/June 2016.
- [10] Kenneth Moreland. The tensions of in situ visualization. *IEEE Computer Graphics and Applications*, 36(2):5–9, March/April 2016.
- [11] Kenneth Moreland and Ron Oldfield. Formal metrics for large-scale parallel performance. In *ISC High Performance*, pages 488–496, June 2015.

- [12] Ron A. Oldfield, Kenneth Moreland, Nathan Fabian, and David Rogers. Evaluation of methods to integrate analysis into a large-scale shock physics code. In *Proceedings of the 28th ACM international Conference on Supercomputing (ICS '14)*, pages 83–92, June 2014.
- [13] Roselyne Tchoua, Jong Choi, Scott Klasky, Qing Liu, Jeremy Logan, Kenneth Moreland, Jingqing Mu, Manish Parashar, Norbert Podhorszki, David Pugmire, and Matthew Wolf. ADIOS visualization schema: A first step towards improving interdisciplinary collaboration in high performance computing. In *IEEE International Conference on eScience*, pages 27–34, October 2013.
- [14] Hank Childs, Berk Geveci, Will Schroeder, Jeremy Meredith, Kenneth Moreland, Christopher Sewell, Torsten Kuhlen, and E. Wes Bethel. Research challenges for visualization software. *IEEE Computer*, 46(5):34–42, May 2013.
- [15] Kenneth Moreland. A survey of visualization pipelines. *IEEE Transactions on Visualization and Computer Graphics*, 19(3):367–378, March 2013.
- [16] Kenneth Moreland, Wesley Kendall, Tom Peterka, and Jian Huang. An image compositing solution at scale. In *Proceedings of 2011 International Conference for High Performance Computing, Networking, Storage and Analysis (SC '11)*, November 2011.
- [17] John Biddiscombe, Berk Geveci, Ken Martin, Kenneth Moreland, and David Thompson. Time dependent processing in a parallel pipeline architecture. *IEEE Transactions on Visualization and Computer Graphics*, 13(6):1376–1383, November/December 2007.
- [18] Brian Wylie, Constantine Pavlakos, Vasily Lewis, and Kenneth Moreland. Scalable rendering on PC clusters. *IEEE Computer Graphics and Applications*, 21(4):62–70, July/August 2001.

Symposium, Workshop, and Invited Papers

- [1] David Pugmire, Jong Y. Choi, Scott Klasky, Kenneth Moreland, Eric Suchyta, Tushar M. Athawale, Zhe Wang, Choong-Seock Chang, Seung-Hoe Ku, and Robert Hager. Performance improvements of Poincaré analysis for exascale fusion simulations. In *VisGap - The Gap between Visualization Research and Visualization Software*, May 2024.
- [2] Spiros Tsalikis, Will Schroeder, Daniel Szafir, and Kenneth Moreland. An accelerated clip algorithm for unstructured meshes: A batch-driven approach. In *Eurographics Symposium on Parallel Graphics and Visualization (EGPGV)*, May 2024.
- [3] Zhe Wang, Tushar M. Athawale, Kenneth Moreland, Jieyang Chen, Chris R. Johnson, and David Pugmire. FunMC²: A filter for uncertainty visualization of marching cubes on multi-core devices. In *Eurographics Symposium on Parallel Graphics and Visualization (EGPGV)*, May 2023.
- [4] Kenneth Moreland, Andrew C. Bauer, Berk Geveci, Patrick O’Leary, and Brad Whitlock. Leveraging production visualization tools in situ. In Hank Childs, Janine C. Bennett, and Christoph Garth, editors, *In Situ Visualization for Computational Science*, pages 205–231. Springer, 2022.
- [5] Utkarsh Ayachit, Andrew C. Bauer, Ben Boeckel, Berk Geveci, Kenneth Moreland, Patrick O’Leary, and Tom Osika. Catalyst revised: Rethinking the paraview in situ analysis and visualization API. In *High Performance Computing*, pages 484–494, June 2021.
- [6] Sudhanshu Sane, Abhishek Yenpure, Roxana Bujack, Matthew Larsen, Kenneth Moreland, Christoph Garth, Chris R. Johnson, and Hank Childs. Scalable in situ computation of Lagrangian representations via local flow maps. In *Eurographics Symposium on Parallel Graphics and Visualization (EGPGV)*, June 2021. Winner best paper.
- [7] Abhishek Yenpure, Hank Childs, and Kenneth Moreland. Efficient point merging using data parallel techniques. In *Eurographics Symposium on Parallel Graphics and Visualization (EGPGV)*, June 2019.

- [8] Kenneth Moreland. Comparing binary-swap algorithms for odd factors of processes. In *Proceedings of the 8th IEEE Symposium on Large Data Analysis and Visualization (LDAV)*, October 2018.
- [9] Brenton Lessley, Kenneth Moreland, Matthew Larsen, and Hank Childs. Techniques for data-parallel searching for duplicate elements. In *IEEE Symposium on Large Data Analysis and Visualization (LDAV)*, October 2017.
- [10] Matthew Larsen, Kenneth Moreland, Chris Johnson, and Hank Childs. Optimizing multi-image sort-last parallel rendering. In *Proceedings of the IEEE Symposium on Large Data Analysis and Visualization (LDAV)*, October 2016.
- [11] Kenneth Moreland. Why we use bad color maps and what you can do about it. In *Proceedings of Human Vision and Electronic Imaging (HVEI)*, February 2016.
- [12] Utkarsh Ayachit, Andrew Bauer, Berk Geveci, Patrick O’Leary, Kenneth Moreland, Nathan Fabian, and Jeffrey Mauldin. Paraview catalyst: Enabling in situ data analysis and visualization. In *Proceedings of the First Workshop on In Situ Infrastructures for Enabling Extreme-Scale Analysis and Visualization (ISAV 2015)*, pages 25–29, November 2015.
- [13] Kenneth Moreland, Matthew Larsen, and Hank Childs. Visualization for exascale: Portable performance is critical. *Supercomputing Frontiers and Innovations*, 2(3), 2015.
- [14] Robert Miller, Kenneth Moreland, and Kwan-Liu Ma. Finely-threaded history-based topology computation. In *Eurographics Symposium on Parallel Graphics and Visualization*, 2014.
- [15] Kenneth Moreland, Berk Geveci, Kwan-Liu Ma, and Robert Maynard. A classification of scientific visualization algorithms for massive threading. In *Proceedings of Ultrascale Visualization Workshop*, November 2013.
- [16] Kenneth Moreland, Brad King, Robert Maynard, and Kwan-Liu Ma. Flexible analysis software for emerging architectures. In *2012 SC Companion (Petascale Data Analytics: Challenges and Opportunities)*, pages 821–826, November 2012.
- [17] Kenneth Moreland. Redirecting research in large-format displays for visualization. In *Proceedings of the IEEE Symposium on Large-Scale Data Analysis and Visualization*, pages 91–95, October 2012.
- [18] Kenneth Moreland, Ron Oldfield, Pat Marion, Sebastien Jourdain, Norbert Podhorszki, Venkatram Vishwanath, Nathan Fabian, Ciprian Docan, Manish Parashar, Mark Hereld, Michael E. Papka, and Scott Klasky. Examples of *in transit* visualization. In *Petascale Data Analytics: Challenges and Opportunities (PDAC-11)*, November 2011.
- [19] Nathan Fabian, Kenneth Moreland, David Thompson, Andrew C. Bauer, Pat Marion, Berk Geveci, Michel Rasquin, and Kenneth E. Jansen. The ParaView coprocessing library: A scalable, general purpose in situ visualization library. In *Proceedings of the IEEE Symposium on Large-Scale Data Analysis and Visualization*, pages 89–96, October 2011.
- [20] Kenneth Moreland, Utkarsh Ayachit, Berk Geveci, and Kwan-Liu Ma. Dax toolkit: A proposed framework for data analysis and visualization at extreme scale. In *Proceedings of the IEEE Symposium on Large-Scale Data Analysis and Visualization*, pages 97–104, October 2011.
- [21] Scott Klasky et al. In situ data processing for extreme scale computing. In *Proceedings of SciDAC 2011*, July 2011.
- [22] Kenneth Moreland. Diverging color maps for scientific visualization. In *Advances in Visual Computing (Proceedings of the 5th International Symposium on Visual Computing)*, volume 5876, pages 92–103, December 2009.
- [23] Kwan-Liu Ma, Chaoli Wang, Hongfeng Yu, Kenneth Moreland, Jian Huang, and Rob Ross. Next-generation visualization technologies: Enabling discoveries at extreme scale. *SciDAC Review*, (12):12–21, Spring 2009.

- [24] R B Ross, T Peterka, H-W Shen, Y Hong, K-L Ma, H Yu, and K Moreland. Visualization and parallel I/O at extreme scale. *Journal of Physics: Conference Series*, 125(012099), 2008.
- [25] Kenneth Moreland, Lisa Avila, and Lee Ann Fisk. Parallel unstructured volume rendering in paraview. In *Visualization and Data Analysis 2007, Proceedings of SPIE-IS&T Electronic Imaging*, pages 64950F–1–12, January 2007.
- [26] Kwan-Liu Ma, Robert Ross, Jian Huang, Greg Humphreys, Nelson Max, Kenneth Moreland, John D. Owens, and Han-Wei Shen. Ultra-scale visualization: Research and education. *Journal of Physics: Conference Series*, 78(012088), 2007.
- [27] Andy Cedilnik, Berk Geveci, Kenneth Moreland, James Ahrens, and Jean Farve. Remote large data visualization in the ParaView framework. In *Eurographics Parallel Graphics and Visualization 2006*, pages 163–170, May 2006.
- [28] Kenneth Moreland. *Fast High Accuracy Volume Rendering*. PhD thesis, University of New Mexico, July 2004.
- [29] Kenneth Moreland and David Thompson. From cluster to wall with VTK. In *Proceedings of IEEE Symposium on Parallel and Large-Data Visualization and Graphics*, pages 25–31, October 2003.
- [30] Kenneth Moreland and Edward Angel. The FFT on a GPU. In *SIGGRAPH/Eurographics Workshop on Graphics Hardware 2003 Proceedings*, pages 112–119, July 2003.
- [31] Brian Wylie, Kenneth Moreland, Lee Ann Fisk, and Patricia Crossno. Tetrahedral projection using vertex shaders. In *Proceedings of IEEE Volume Visualization and Graphics Symposium*, pages 7–12, October 2002.
- [32] Kenneth Moreland, Brian Wylie, and Constantine Pavlakos. Sort-last parallel rendering for viewing extremely large data sets on tile displays. In *Proceedings of the IEEE 2001 Symposium on Parallel and Large-Data Visualization and Graphics*, pages 85–92, October 2001.

Technical Reports and other Non Peer Reviewed

- [1] Kenneth Moreland. The VTK-m user’s guide, VTK-m version 2.2. Technical Report ORNL/TM-2024/3443, July 2024.
- [2] Kenneth Moreland. The VTK-m user’s guide, VTK-m version 2.1. Technical Report ORNL/TM-2023/3182, November 2023.
- [3] Kenneth Moreland. The VTK-m user’s guide, VTK-m version 2.0. Technical Report ORNL/TM-2023/2863, February 2023.
- [4] Sujin Philip, Kenneth Moreland, and Robert Maynard. VTK-m accelerated filters in VTK and ParaView. Kitware Source, 2023.
- [5] Kenneth Moreland. The VTK-m user’s guide, VTK-m version 1.9. Technical Report ORNL/TM-2022/2744, Oak Ridge National Laboratory, October 2022.
- [6] Kenneth Moreland, David Pugmire, Berk Geveci, Li-Ta Lo, Hank Childs, Mark Bolstad, Ruchi Shah, and Panruo Wu. The importance of scientific visualization on novel hardware. Technical Report ORNL/LTR-2022/415, Oak Ridge National Laboratory, September 2022.
- [7] Kenneth Moreland. The VTK-m user’s guide, VTK-m version 1.8. Technical Report ORNL/TM-2022/2516, Oak Ridge National Laboratory, August 2022.
- [8] Kenneth Moreland, David Pugmire, and Jieyang Chen. The exploitation of data reduction for visualization. Technical Report ORNL/LTR-2022/412, Oak Ridge National Laboratory, August 2022.

- [9] Kenneth Moreland. The VTK-m user’s guide, VTK-m version 1.7. Technical Report ORNL/TM-2021/2346, Oak Ridge National Laboratory, December 2021.
- [10] Kenneth Moreland. The VTK-m user’s guide, VTK-m version 1.6. Technical Report ORNL/TM-2021/2075, Oak Ridge National Laboratory, July 2021.
- [11] Kenneth Moreland. The VTK-m user’s guide, VTK-m version 1.5. Technical Report SAND 2019-12638 B, Sandia National Laboratories, October 2019.
- [12] Kenneth Moreland, David Pugmire, David Rogers, Hank Childs, Kwan-Liu Ma, and Berk Geveci. XVis: Visualization for the extreme-scale scientific computation ecosystem, final report. Technical Report SAND 2019-9297, Sandia National Laboratories, August 2019.
- [13] Kenneth Moreland. The VTK-m user’s guide, VTK-m version 1.4. Technical Report SAND 2019-8008 B, Sandia National Laboratories, July 2019.
- [14] Janine C. Bennett, Hank Childs, Christoph Garth, Bernd Hentschel, et al. In situ visualization for computational science (dagstuhl seminar 18271). *Dagstuhl Reports*, 8(7):1–43, 2019.
- [15] Kenneth Moreland. The VTK-m user’s guide, VTK-m version 1.3. Technical Report SAND 2018-13465 B, Sandia National Laboratories, November 2018.
- [16] Daniel Bourgeois, Michael Wolf, and Kenneth Moreland. Isosurface visualization miniapplication. Technical Report SAND2018-27800, Sandia National Laboratories, 2018.
- [17] Kenneth Moreland and Chuck Atkins. A need for better management of heterogenous hpc resources. Technical report, Sandia National Laboratories, 2018.
- [18] Jeffrey Vetter, Ann Almgren, Phil DeMar, Katherine Riley, Katie Antypas, Deborah Bard, Richard Coffey, Eli Dart, Sudip Dosanjh, Richard Gerber, James Hack, Inder Monga, Michael E. Papka, Lauren Rotman, Tjerk Straatsma, Jack Wells, David E. Bernholdt, Wes Bethel, George Bosilca, Frank Cappello, Todd Gamblin, Salman Habib, Judy Hill, Jeffrey K. Hollingsworth, Lois Curfman McInnes, Kathryn Mohror, Shirley Moore, Ken Moreland, Rob Roser, Sameer Shende, Galen Shipman, and Samuel Williams. Advanced scientific computing research exascale requirements review. Technical report, An Office of Science review sponsored by Advanced Scientific Computing Research, Rockville, Maryland, September 2016.
- [19] Ewa Dellman, Tom Peterka, et al. The future of scientific workflows. Report of the DOE NGNS/CS Scientific Workflows Workshop, April 2015.
- [20] Utkarsh Ayachit. *The ParaView Guide: A Parallel Visualization Application*. Kitware Inc., 4.3 edition, January 2015. (contributions).
- [21] Hendrik Schroots and Kenneth Moreland. Implementing parallel algorithms using the dax toolkit. Technical Report SAND 2015-3829 O, Sandia National Laboratories, December 2014. CR Summer Proceedings.
- [22] Kenneth Moreland. A pervasive parallel framework for visualization: Final report for fwp 10-014707. Technical Report SAND 2014-0047, Sandia National Laboratories, January 2014.
- [23] David Rogers, Kenneth Moreland, Ron Oldfield, and Nathan Fabian. Data co-processing for extreme scale analysis level II ASC milestone (4745). Technical Report SAND2013-1122, Sandia National Laboratories, 2013.
- [24] Kenneth Moreland, Jeremy Meredith, and Berk Geveci. Enabling production-quality scientific-discovery tools with data and execution models. techreport SAND 2012-10796P, Sandia National Laboratories, December 2012.

- [25] Kenneth Moreland. Oh, \$#!*@! Exascale! The effect of emerging architectures on scientific discovery. In *2012 SC Companion (Proceedings of the Ultrascale Visualization Workshop)*, pages 224–231, November 2012.
- [26] Christopher Sewell, Jeremy Meredith, Kenneth Moreland, Tom Peterka, Dave DeMarle, Li-Ta Lo, James Ahrens, Robert Maynard, and Berk Geveci. The SDAV software frameworks for visualization and analysis on next-generation multi-core and many-core architectures. In *2012 SC Companion (Proceedings of the Ultrascale Visualization Workshop)*, pages 206–214, November 2012.
- [27] Brian Barrett, Richard Barrett, James Brandt, Ron Brightwell, Matthew Curry, Nathan Fabian, Kurt Ferreira, Ann Gentile, Scott Hemmert, Suzanne Kelly, Ruth Klundt, James Laros III, Vitus Leung, Michael Levenhagen, Gerald Lofstead, Ken Moreland, Ron Oldfield, Kevin Pedretti, Arun Rodrigues, David Thompson, Tom Tucker, Lee Ward, John Van Dyke, Courtenay Vaughan, and Kyle Wheeler. Report of experiments and evidence for asc l2 milestone 4467 - demonstration of a legacy application’s path to exascale. techreport SAND 2012-1750, Sandia National Laboratories, March 2012.
- [28] Kenneth Moreland. IceT users’ guide and reference, version 2.1. Technical Report SAND2011-5011, Sandia National Laboratories, August 2011.
- [29] Sean Ahern, Arie Shoshani, Kwan-Liu Ma, et al. Scientific discovery at the exascale. Report from the DOE ASCR 2011 Workshop on Exascale Data Management, Analysis, and Visualization, February 2011.
- [30] Kenneth Moreland, Nathan Fabian, Pat Marion, and Berk Geveci. Visualization on supercomputing platform level ii asc milestone (3537-1b) results from sandia. Technical Report SAND 2010-6118, Sandia National Laboratories, September 2010.
- [31] Lisa Ice, Nathan Fabian, Kenneth D. Moreland, Janine C. Bennett, David C. Thompson, David B. Karelitz, and W. Alan Scott. Scalable analysis tools for sensitivity analysis and UQ (3160) results. Technical Report 2009-6032, Sandia National Laboratories, September 2009.
- [32] David Thompson, Nathan D. Fabian, Kenneth D. Moreland, and Lisa G. Ice. Design issues for performing *in situ* analysis of simulation data. Technical Report SAND2009-2014, Sandia National Laboratories, 2009.
- [33] Kenneth Moreland, C. Charles Law, Lisa Ice, and David Karelitz. Analysis of fragmentation in shock physics simulation. In *Proceedings of the 2008 Workshop on Ultrascale Visualization*, pages 40–46, November 2008.
- [34] David B. Karelitz, Lisa Ice, Jason Wilke, Stephen W. Attaway, and Kenneth Moreland. Post-processing V&V level II ASC milestone (2843) results. Technical Report SAND 2008-6183, Sandia National Laboratories, September 2008.
- [35] Kenneth Moreland, David Rogers, John Greenfield, Berk Geveci, Patrick Marion, Alexander Neundorf, and Kent Eschenberg. Large scale visualization on the Cray XT3 using paraview. In *Cray User Group*, 2008.
- [36] Patricia Crossno, Brian Wylie, Andrew Wilson, John Greenfield, Eric Stanton, Timothy Shead, Lisa Ice, Kenneth Moreland, Jeffrey Baumes, and Berk Geveci. Intelligence analysis using titan. In *IEEE Symposium on Visual Analytics Science and Technology*, October 2007.
- [37] Kenneth Moreland and Brian Wylie. Massive graph visualization: Ldrd final report. techreport SAND 2007-6307, Sandia National Laboratories, October 2007.
- [38] David B. Karelitz, Elmer Chavez, V. Gregory Weirs, Timothy M. Shead, Kenneth D. Moreland, Thomas A. Brunner, and Timothy G. Trucano. Post-processing V&V level II ASC milestone (2360) results. techreport SAND 2007-6006, Sandia National Laboratories, September 2007.
- [39] Kenneth Moreland. Using ghost cells in parallel filters. *Kitware Source*, pages 3–4, July 2006.

Posters

- [1] Robert Maynard, Kenneth Moreland, Utkarsh Ayachit, Berk Geveci, and Kwan-Liu Ma. Proceedings of spie visualization and data analysis. In *Optimizing Threshold for Extreme Scale Analysis*, 2013.
- [2] Kenneth Moreland, Utkarsh Ayachit, Berk Geveci, and Kwan-Liu Ma. Dax: Data analysis at extreme. In *Proceedings of SciDAC*, 2011.
- [3] T Peterka, W Kendall, D Goodell, B Nouanesengsey, H-W Shen, J Huang, K Moreland, R Thakur, and R B Ross. Performance of communication patterns for extreme-scale analysis and visualization. In *Proceedings of SciDAC*, 2010.
- [4] Kenneth Moreland, Daniel Lepage, David Koller, and Greg Humphreys. Remote rendering for ultrascale data. *Journal of Physics: Conference Series*, 125(012096), 2008.

Presentations

- [1] Using VTK-m in ParaView and Catalyst. Kenneth Moreland. *ParaView and Catalyst CASS Community BOF*, June 12, 2024.
- [2] Data Management, Workflow, and Visualization Solutions at ORNL. Kenneth Moreland, Scott Klasky, Norbert Podhorszki, and Qian Gong. *Software for the NASA Science Mission Directorate Workshop*, May 8, 2024.
- [3] VTK-m Update. Kenneth Moreland. *DOE Computer Graphics Forum*, April 23, 2024.
- [4] Enabling Visualization at the Exascale with VTK-m. Kenneth Moreland. *IEEE Symposium on Large Data Analysis and Visualization (LDAV) Keynote*, October 23, 2023.
- [5] VTK-m: Visualization for the Exascale Era and Beyond. Mark Bolstad, Kenneth Moreland, David Pugmire, David Rogers, Li-Ta Lo, Berk Geveci, Hank Childs, and Silvio Rizzi. *ACM SIGGRAPH 2023 Talks*, August 2023.
- [6] Color: What It Is and How to Use It to Show Data. Kenneth Moreland. LANL Data Science Summer School Seminar, July 18, 2023.
- [7] VTK-m Update. Kenneth Moreland. *DOE Computer Graphics Forum*, April 26, 2023.
- [8] DOE Visualization Tools and Capabilities. Kenneth Moreland and David Pugmire. PSI2 SciDAC All-Hands, February 22, 2023.
- [9] Performance Portability Pre-ECP and Post-ECP – VTK-m. Kenneth Moreland. ECP Annual Meeting, January 19, 2023.
- [10] VTK-m – A ToolKit for Scientific Visualization on Many-Core Processors. Tushar M. Athawale, Kenneth Moreland, David Pugmire, Silvio Rizzi, and Mark Bolstad. IEEE VIS, October 17, 2022.
- [11] Scientific Visualization on Supercomputers Kenneth Moreland. D&AI Section All Hands Meeting, ORNL, September 21, 2022.
- [12] ParaView OLCF Tutorial. Kenneth Moreland. *OLCF Training*, September 15, 2022.
- [13] VTK-m Update. Kenneth Moreland. *DOE Computer Graphics Forum*, August 31, 2022.
- [14] ECP Data Management, Data Analytics, and Visualization Overview: VTK-m. ECP Annual Meeting, May 2, 2022.
- [15] VTK-m: Accelerating Visualization on Massively Threaded Processors. Kenneth Moreland. SCI Institute Visualization Seminar, University of Utah, February 2, 2022.

- [16] Color: What it is and How to Use It to Show Data. Kenneth Moreland. VISTA Webinar, ORNL, September 9, 2021.
- [17] Enabling Visualization on Exascale Accelerators with VTK-m. Kenneth Moreland. RAPIDS2-DU Monthly Meeting, July 14, 2021.
- [18] Introduction to Scientific Visualization with ParaView 5.9. Kenneth Moreland. ORNL Software and Data Expo, May 20, 2021.
- [19] VTK-m Update. Kenneth Moreland. *DOE Computer Graphics Forum*, April 28, 2021.
- [20] ECP Data Management, Data Analytics, and Visualization Overview: VTK-m. ECP Annual Meeting, March 30, 2021.
- [21] A Winding Road to Exascale Visualization. Kenneth Moreland. Oak Ridge National Laboratories, February 2, 2020.
- [22] What's New in ParaView. Kenneth Moreland. *DOE Computer Graphics Forum*, April 28, 2020.
- [23] VTK-m Update. Kenneth Moreland. *DOE Computer Graphics Forum*, April 28, 2020.
- [24] In Situ Visualization and Analysis with Ascent: Using VTK-m. Kenneth Moreland. *ECP Annual Meeting Tutorial*, February 4, 2020.
- [25] VTK-m – A ToolKit for Scientific Visualization on Many-Core Processors. Hank Childs, Kenneth Moreland, David Pugmire, Robert Maynard. *IEEE VIS Tutorial*, October 2019.
- [26] Vis Capabilities at Sandia. Kenneth Moreland. Informal Review for 1540 Production Codes, June 10, 2019.
- [27] What's New in ParaView. Kenneth Moreland. *DOE Computer Graphics Forum*, April 23, 2019.
- [28] VTK-m Update. Kenneth Moreland. *DOE Computer Graphics Forum*, April 23, 2019.
- [29] In Situ Visualization and Analysis with Ascent: Using VTK-m. Kenneth Moreland. ECP Annual Meeting Tutorial, January 17, 2019.
- [30] Building Better Plots. Kenneth Moreland. CCR Summer Seminar Talk, July 2018.
- [31] A Brief History of Interactive Visualization. Kenneth Moreland. University of Stuttgart Colloquium, June 29, 2018.
- [32] Preparations for Exascale Visualization at DOE. Kenneth Moreland. *ISC High Performance*, June 25, 2018.
- [33] The Crazy Future of Vis. Kenneth Moreland, *DOE Computer Graphics Forum*, Panel: 10-year Prognostication and How Do We Get There?, April 25, 2018.
- [34] What's New in ParaView. Kenneth Moreland, *DOE Computer Graphics Forum*, April 24, 2018.
- [35] VTK-m Update. Kenneth Moreland, *DOE Computer Graphics Forum*, April 24, 2018.
- [36] VTK-m: Visualization on Modern Processors. Kenneth Moreland, Kitware Booth, *SC17*, November 15, 2017.
- [37] Large Scale Visualization with ParaView. Kenneth Moreland, W. Alan Scott, David E. DeMarle, Joe Insley, John Patchett, and Jon Woodring. Tutorial *Supercomputing 2017*, November 14, 2017.
- [38] Why You Don't Want to do In Situ Visualization, and Why You Have To. Kenneth Moreland, *Computational Science Seminar Series*, Sandia National Laboratories, October 31, 2017.

- [39] High Performance Visualization in the Many-Core Era. Kenneth Moreland, *Computing@PNNL Seminar*, August 2017.
- [40] Why You Don't Want to do In Situ Visualization, and Why You Have To. Kenneth Moreland. *ISC Workshop on In Situ Visualization*, June 2017.
- [41] The Many Faces and Solutions of In Situ Visualization. Kenneth Moreland. *ISC Workshop on Visualization at Scale*, June 2017.
- [42] Making Better Plots. Kenneth Moreland. Sandia Post-Doc Workshop, February 20, 2017.
- [43] VTK-m: Building a Visualization Toolkit for Massively Threaded Architectures. Kenneth Moreland. *Ultrascale Visualization Workshop*, November 17, 2015.
- [44] Large Scale Visualization with ParaView. Kenneth Moreland, W. Alan Scott. Tutorial *International Conference on Supercomputing (ICS)*, November 2015.
- [45] Large Scale Visualization with ParaView. Kenneth Moreland, W. Alan Scott, Sebastien Jourdain, David DeMarle, Robert Maynard, Li-Ta Lo, and Joseph Insley. Tutorial *Supercomputing 2014*, November 2014.
- [46] Dax: A Massively Threaded Visualization and Analysis Toolkit for Extreme Scale. *GPU Technology Conference*. March 2014.
- [47] Approaching Production In Situ Visualization for Extreme Scale Analysis. 16th *SIAM Conference on Parallel Processing for Scientific Computing*. February 2014.
- [48] 15 Years of Large-Scale Scientific Visualization. University of Oregon colloquium. January 2014.
- [49] Large Scale Visualization with ParaView. Kenneth Moreland, W. Alan Scott, David DeMarle, and Li-Ta Lo. Tutorial *Supercomputing 2013*, November 2013.
- [50] Large Scale Visualization with ParaView. Kenneth Moreland, W. Alan Scott, Nathan Fabian, Utkarsh Ayachit, and Robert Maynard. Tutorial *Supercomputing 2012*, November 2012.
- [51] Next-Generation Capabilities for Large-Scale Scientific Visualization. Kenneth Moreland, Nathan Fabian, Berk Geveci, Utkarsh Ayachit, and James Ahrens. *Massively Parallel, Scalable Algorithms and Softwares for Scientific Applications, 15th SIAM Conference on Parallel Processing for Scientific Computing*, February 2012.
- [52] Flexible In Situ with ParaView. Kenneth Moreland, Nathan Fabian, Scott Klasky, and Berk Geveci. *2011 Workshop on Ultrascale Visualization*, November 2011.
- [53] Large Scale Visualization with ParaView. Kenneth Moreland, W. Alan Scott, Nathan Fabian, Jeffrey Mauldin, Andrew C. Bauer, Robert Maynard, and Scott Klasky. Tutorial *Supercomputing 2011*, November 2011.
- [54] Large-Scale Interactive Visualization with ParaView. Kenneth Moreland. *2nd International Conference on Computational Engineering*, October 2011.
- [55] Large Scale Visualization with ParaView. Kenneth Moreland. Tutorial *SciDAC 2011*, July 2011.
- [56] In-Situ Visualization with the ParaView Coprocessing Library. Kenneth Moreland, Andrew Bauer, Pat Marion, and Nathan Fabian. Tutorial *Supercomputing 2010*, November 2010.
- [57] Large Scale Visualization with ParaView. Kenneth Moreland, Andrew Bauer. Tutorial *SciDAC 2010*, July 2010.
- [58] Large Scale Visualization with ParaView. Kenneth Moreland, John Greenfield, W. Alan Scott, Utkarsh Ayachit, and Berk Geveci. Tutorial *Supercomputing 2009*, November 2009.

- [59] Parallel Distributed-Memory Visualization with ParaView. Kenenth Moreland and David DeMarle. Tutorial *IEEE Cluster 2009*, August 2009.
- [60] Large Scale Visualization with ParaView. Kenneth Moreland, John Greenfield, W. Alan Scott, Utkarsh Ayachit, Berk Geveci, and David DeMarle. Tutorial *Supercomputing 2008*, November 2008.
- [61] Advanced ParaView Visualization. Kenneth Moreland, Utkarsh Ayachit, Timothy Shead, John Biddiscombe, and David Thompson. Tutorial *IEEE Visualization 2008*, October 2008.
- [62] Large Scale Visualization with ParaView 3. Kenneth Moreland and John Greenfield. Tutorial *Supercomputing 2007*, November 2007.
- [63] Parallel Visualization with ParaView. Kenneth Moreland and Berk Geveci. Tutorial *Supercomputing 2005*, November 2005.
- [64] Large Scale Visualization with Cluster Computing. Kenneth Moreland. *Linux Cluster Institute Workshop*, October 2004.
- [65] Big Data, Big Displays, and Cluster-Driven Interactive Visualization. Kenneth Moreland. Colloquium, University of New Mexico, November 2002.
- [66] Big Data, Big Displays, and Cluster-Driven Interactive Visualization. Kenneth Moreland. *Workshop on Commodity-Based Visualization Clusters*, October 2002.

Panels

- [1] Lessons Learned from Porting Codes to GPUs. ECP Annual Meeting, January 19, 2023.
- [2] Technical Advances in the Era of Big Data Analysis and Visualization: Large-Scale Visualization on Exascale Hardware. *Large Data Analysis and Visualization (LDAV)*, October 25, 2020.
- [3] How Ubiquitous Parallel Devices Affect Visualization. *Eurographics Symposium on Parallel Graphics and Visualization (EGPGV)*, 2020.
- [4] Color Mapping in Vis: Perspectives on Optimal Solutions. *IEEE Visualization*, October 2015.

Professional Activities

Institute of Electrical and Electronic Engineers (IEEE) Senior Member since 2023. Member since 1995.

Association for Computing Machinery (ACM) Member since 1998.

Editor

- Associate Editor, *IEEE Transactions on Visualization and Computer Graphics (TVCG)*: 2022–Present.
- Guest Editor, *Parallel Computing*: 2019.

Steering Committee Member

- *IEEE Symposium on Large Data Analysis and Visualization (LDAV)*: 2020–Present.
- *International Symposium on Visual Computing (ISVC)*: 2020–Present.
- *In Situ Infrastructures for Enabling Extreme-scale Analysis and Visualization (ISAV)*: 2020–Present.
- *Workshop on In Situ Visualization (WOIV)*: 2018–Present.

Event Chair/Co-Chair

- *IEEE Symposium on Large Data Analysis and Visualization (LDAV)*: 2018, 2019.

- In Situ Infrastructures for Enabling Extreme-scale Analysis and Visualization (ISAV): 2019.
- Scientific Visualization & Data Analytics Showcase, Supercomputing: 2018.
- VisLies: 2013, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022.

Program Chair/Co-Chair

- In Situ Infrastructures for Enabling Extreme-scale Analysis and Visualization (ISAV): 2017, 2018.
- IEEE Symposium on Large Data Analysis and Visualization (LDAV): 2016, 2017.
- Eurographics Symposium on Parallel Graphics and Visualization (EGPGV): 2013.

Program Committee Member

- IEEE VIS: 2023
- EuroVis: 2016, 2017, 2018, 2021, 2022, 2023.
- Scientific Visualization & Data Analytics Showcase, Supercomputing: 2017, 2023.
- International Conference on Information Visualization Theory and Applications (IVAPP): 2022, 2023.
- International Symposium on Visual Computing (ISVC): 2013, 2014, 2019, 2020, 2021, 2022, 2023.
- IEEE VIS Short Papers: 2022.
- IEEE Scientific Visualization: 2014, 2015, 2016, 2017, 2019, 2020, 2021.
- Eurographics Symposium on Parallel Graphics and Visualization (EGPGV): 2009, 2010, 2011, 2012, 2013, 2015, 2016, 2017, 2019, 2020, 2021.
- IEEE Cluster: 2015, 2016, 2021.
- IEEE TPDS special section on Innovative R&D toward the Exascale Era, 2021.
- VisGap: 2020.
- Symposium on Visualization: 2017.
- Visualization in High Performance Computing: 2015.
- Large Data Analysis and Visualization (LDAV): 2011, 2013, 2014.
- Ultrascale Visualization: 2013, 2014.
- International Conference for High Performance Computing, Networking, Storage, and Analysis (Supercomputing): 2012, 2013.
- Big Data Analytics: Challenges and Opportunities: 2012, 2013.
- Visualization Infrastructure & Systems Technology: 2014.

Review Panels

- DOE SBIR Phase I: 2010, 2011, 2023.
- NSF IIS Division: 2012, 2014, 2015, 2016, 2018.
- DOE SBIR Phase II: 2012, 2014.
- DOE ECRP: 2009, 2013.
- DOE ASCR: 2009, 2010, 2011, 2013.

Miscellaneous

- Best Reviewer Award, EuroVis 2022.
- VIS Doctoral Colloquium Panelist: 2017.

Software Artifacts

The following is selected software I contributed to over (either as a developer or a project manager) the course of my career.

ParaView A parallel scientific visualization application.

Catalyst An *in situ* visualization library built on top of the ParaView application.

VTK A visualization library on which many tools, including ParaView, are built on top of.

VTK-m A library of visualization algorithms designed to run on multi- and many-core processors such as GPUs.

IceT A parallel rendering library.