

Andrew S. Grimshaw

I. Personal and Professional Information

Education

Ph.D. in Computer Science, University of Illinois at Urbana-Champaign, 1988.

M.S. in Computer Science, University of Illinois at Urbana-Champaign, 1986.

B.A. in Political Science and Economics, University of California San Diego, 1981.

Work Experience

Founder and Chief Technical Officer, Avaki Corporation, (known as Applied MetaComputing until 2001), 1999-2005.

Chairman of the Board, Avaki Corporation, 1999-2003.

Professor, Department of Computer Science, University of Virginia, 1999-present.

Associate Professor, Department of Computer Science, University of Virginia, 1994-1999.

Assistant Professor, Department of Computer Science, University of Virginia, 1988-94.

Visiting Assistant Professor, Department of Computer Science, University of Illinois at Urbana-Champaign, 1988.

Research Assistant, University of Illinois, at Urbana-Champaign, under Dr. Jane W.S. Liu, 1985-88.

Research Assistant, University of Illinois at Urbana-Champaign, under Dr. A.B. Baskin, 1984-85.

Systems Programmer, Austrian Philips GmbH, Vienna, Austria, 1983.

Vice President-Engineering, Software Products International, 1982.

Section Head-Systems Programming, Software Products International, 1981-82.

Programmer/Project Leader, Software Products International, 1980.

Consulting

Avaki Corporation

Professional Society Memberships

Global Grid Forum

Peer-2-Peer Working Group

II. Professional Activities

Editorships and Program Committees

General Chair, HPDC 14
Program Co-Chair, PPOPP, 2005.
Workshop on Adaptive Grid Middleware (AgridM2003 held in conjunction with the 12th International Conference on Parallel Architectures and Compilers Techniques
Grid 2003
Global Grid Forum 8.
CCCGrid 2002, 2003, 2004
Reflection 2001
IPDPS 2001
SC'2000 Technical Papers Committee, 2000
SC'99 Technical Papers Committee, 1999
SC '98 Tutorials Committee, 1998
Associate Editor, IEEE Transactions on Parallel and Distributed Systems, 1997
Heterogeneous Computing Workshop Program Committee, 1996
Frontiers of Massively Parallel Computation Program Committee, 1996, 1997
International Conference on Configurable Distributed Systems, 1996
Program Chair, Symposium on High Performance Distributed Computing (HPDC-4), 1995
Program Vice-Chair, 15th International Conference on Distributed Computing Systems, 1995
Steering Committee Symposium on High Performance Distributed Computing, 1993-2000
Program committee for Symposium on High Performance Distributed Computing, 1993-2003
Seventh Scalable High Performance Computing Conference, 1992
Symposium on High Performance Distributed Computing (HPDC-1), 1992
Minnowbrook Workshop on Software Engineering for Parallel Computing, 1992
11th International Conference on Distributed Computing Systems, 1991
11th Real-Time Systems Symposium, 1990

Professional Panels and Working Groups

Global Grid Forum OGSi and OGSA working groups
I3C Technical Advisory Board, 2003 - 2004
Global Grid Forum Steering Committee, 1999-present
Peer-2-Peer Working Group Steering Committee
Peer-2-Peer Working Group Technical Architecture Committee
NSF Beta-Grids Workshop, March 20-21, 2000, La Jolla, CA
Chairman, ASCI-DRM External Review Committee, January, 1999
NPACI Executive Committee, 1996-2001
CESDIS Science Council, 1998-present
Member NASA Information Power Grid Proposal Team, 1998
Member review panel for NASA Information Power Grid Readiness Review, 1997
Member DoD HPCMOD PET Executive Committee, 1997-present
NSF Career Awards Panel, Arlington, VA, December, 1996
NSF Academic Research Infrastructure Panel, Arlington, VA, June, 1996
Delphi 2010 Working Group, MIT, April, 1996
PetaFLOPS 2: Applications and Algorithm Challenges for PetaFLOPS Computing, NASA, DOE, ARPA, 1995
NSF vBNS Workshop, Washington, DC, June, 1995
System Software and Tools for High-Performance Computing Environments, NASA, DOE, ARPA, 1995

NRC Review Panel for Information Technology, Board on Assessment of NIST Programs, 1995-present

Health Care and High Performance Computing, Washington, DC, NSF, ARPA, NLM, December 1994.

Workshop on Enabling Technologies for PetaFLOPS Computing Systems, invited attendee, Pasadena, CA, February, 1994

ARPA Parallel C++ Workshop, invited attendee, Los Angeles, CA, May, 1993

Panelist, NSF Postdoctoral Fellowship Panel, NSF-CISE-ASC, 1993, 1994

Air Force CRDA, on Parallel Software Engineering, Rome Labs, 1991-1993

Conference Panels

"Managing and Analyzing Scientific Data with IT Tools", EPA Science Forum 2005, Washington, DC, May, 2005.

"High Performance Computing", IEEE Bioinformatics Conference , Stanford, CA, August, 2004.

"The Future of Grid", Comdex 2003, Las Vegas, NV, November 18, 2003.

"The simplification of supercomputing: Clustering, Appliances and Grid Computing," November 21, SC 2003, Phoenix, AZ

"Grids: The Next Big Thing", InfoTech 2003, RTP NC, October 27, 2003.

"Enterprise Data Grids," GGF 8 panel on standards, June, 2003, Seattle, WA.

"Grid Computing: The Next 3-5 Years" Future In Review (FIRe), May 2003, Hotel Del Coronado, San Diego, CA.

"The State of the Grid: Hype versus Reality", GGF 7, Tokyo Japan, March, 2003.

"Open Issues in Grid," GlobusWorld, San Diego CA, January 2003.

"How to Grid?", BIOGRIDS: Advancing Life Science Computing, Baltimore MD, December, 2002.

"From A to B round", Charlottesville Venture Forum, Charlottesville VA, November 2002.

"Life Sciences Roundtable", GSAC, Boston MA, October 2002.

"Understanding Grid Standards", Grid Computing Planet, Boston MA, October, 2002.

"Grid Standards", Grid Planet, San Jose, CA, June 2002.

"The Future (through the past) of PTP: *PTP is Grid Computing is Metasystems is Distributed Systems*," ACI P2P Conference, March, 2001, Boston, MA.

"Peer-to-Peer: What's In It For B2B?" E=B2 Forum, October, 2000, Boston, MA.

"The Era of Megacomputers - What Can you do with a Million Processors?", SC 2000, 11/2000, Dallas, TX.

Adoption and Deployment of Grid Technologies, Workshop on HPC, June 2000, Cetraro, Italy.

Grid Development and Deployment Strategies, Workshop on HPC, June 2000, Cetraro, Italy.

System Software for PetaFLOPS, PetaFLOPS II, Santa Barbara, CA, February, 1999

Computational Grids, PPOPP, Atlanta, GA, May, 1999.

Information Power Grid, IPPS, San Juan, Puerto Rico, May, 1999.

Building the Grid, Grids 98, Chicago, IL, July, 1998.

Enabling Software Environments and Tools, Scalable Clusters Workshop, Monterey, CA, November 22, 1997.

Concordance or Discordance between Parallel, Distributed Computing and Web Technologies (HPDC-4), Washington DC, August, 1995.

Panelist, "Efficient Implementation: Issues and Challenges," Workshop on Efficient Implementation of Concurrent Object-Oriented Programs, OOPSLA '93, Washington, D.C., September, 1993.

Panelist, "Programming Parallel Systems: The 50's Revisited," 1991 Minnowbrook Workshop on Software Engineering for Parallel Computing, July 16-19, 1991.

Panelist, "Tools and Environments for Parallel Processing," 1991 Minnowbrook Workshop on Software Engineering for Parallel Computing, July 16-19, 1991.

III. Publications and Lectures

Journals

“The Global Bio Grid,” submitted to special issue of the International Journal of High Performance Computer Applications.

A.S. Grimshaw, A. Natrajan, “Legion: Lessons Learned Building a Grid Operating System”, *Proceedings of the IEEE*, vol. 93, number 3, March, 2005, pp. 589-603.

A.S. Grimshaw, A. Natrajan, and M.A. Humphrey, “A philosophical and technical comparison of Legion and Globus,” *IBM Systems Journal*, Vol. 48, no. 2, pp. 233-254, March, 2004.

Natrajan, A., Crowley, M., Wilkins-Diehr, N., Humphrey, M. A., Fox, A. D., Grimshaw, A. S., Brooks, C. L. III, “Studying Protein Folding on the Grid: Experiences using CHARMM on NPACI Resources under Legion,” *Grid Computing Environments 2004, Concurrency and Computation: Practice and Experience*, vol. 16, no. 4, pp. 386-397, 2004.

A.S. Grimshaw and S. Tuecke, “Grid Services Extend Web Services,” *Web Services Journal*, August 2003.

Michael J. Lewis, Adam J. Ferrari, Marty A. Humphrey, John F. Karpovich, Mark M. Morgan, Anand Natrajan, Anh Nguyen-Tuong, Glenn S. Wasson and Andrew S. Grimshaw, "Support for Extensibility and Site Autonomy in the Legion Grid System Object Model" *Journal of Parallel and Distributed Computing*, Volume 63, pp. 525-38, 2003.

A.S. Grimshaw, “The ROI Case for Grids,” *Grid Today*, Vol. 1, No. 27, December 16, 2002.

A.S. Grimshaw, “What is a Grid?,” *Grid Today*, Vol. 1, No. 26, December 9, 2002.

A.S. Grimshaw, “The Evolution of Grid Standards,” *Grid Today*, Vol. 1, No. 25, December 2, 2002.

A. Natrajan, M. Humphrey, and A.S. Grimshaw, “The Legion support for advanced parameter-space studies on a grid,” *Future Generation Computing Systems*, vol. 18, pp. 1033-1052, 2002.

A. Natrajan, A. Nguyen-Tuong, M.A. Humphrey, M. Herrick, B.P. Clarke and A.S. Grimshaw, “The Legion Grid Portal”, *Grid Computing Environments, Concurrency and Computation: Practice and Experience*, vol. 14, pp 1365-1394, 2001 .

A.J. Ferrari, S.J. Chapin, and A.S. Grimshaw, “Heterogeneous Process State Capture and Recovery Through Process Introspection,” *Cluster Computing 3 (2000) 2*, pp. 63-73.

A. Nguyen-Tuong and A.S. Grimshaw, “Using Reflection for Incorporating Fault-Tolerance Techniques into Distributed Applications,” *Parallel Processing Letters*, vol. 9, No. 2 (1999), 291-301.

S.J. Chapin, D. Katramatos, J.F. Karpovich, and A.S. Grimshaw, “Resource Management in Legion,” *Journal of Future Generation Computing Systems*, vol. 15, pp. 583-594, 1999.

S.J. Chapin, C. Wang, W.A. Wulf, F.C. Knabe, and A.S. Grimshaw, “A New Model of Security for Metasystems,” *Journal of Future Generation Computing Systems*, vol. 15, pp. 713-722, 1999.

A.S. Grimshaw, A. Ferrari, F.C. Knabe, and M. Humphrey, “Wide-Area Computing: Resource Sharing on a Large Scale,” *IEEE Computer*, 32(5): 29-37, May 1999.

A.S. Grimshaw, A. Ferrari, G. Lindahl, and K. Holcomb, "Metasystems," *Communications of the ACM*, 41(11): 46-55, Nov 1998.

A.S. Grimshaw, A. Nguyen-Tuong, M.J. Lewis, and M. Hyett, "Campus-Wide Computing: Early Results Using Legion at the University of Virginia," *International Journal of Supercomputing Applications*, 11(2): 129-143, Summer 1997.

A.S. Grimshaw and W.A. Wulf, "The Legion Vision of a Worldwide Virtual Computer," *Communications of the ACM*, 40(1): 39-45, Jan 1997.

A.S. Grimshaw, "Object-Oriented Parallel Processing with Mentat," *Information Sciences*, 93: 9-34, 1996.

A.S. Grimshaw, J.B. Weissman, and W.T. Strayer, "Portable Run-Time Support for Dynamic Object-Oriented Parallel Processing," *ACM Transactions on Computer Systems*, 14(2): 139-170, May 1996.

A.S. Grimshaw, "Parallel Processing and Object Technology," *IEEE Computer*, 28(10): 63-64, Oct 1995.

J.B. Weissman and A.S. Grimshaw, "A Framework for Partitioning Parallel Computations in Heterogeneous Environments," *Concurrency: Practice and Experience*, 7(5): 455-478, Aug 1995.

A.S. Grimshaw, "Enterprise-Wide Computing," *Science*, 256: 892-894, Aug 12, 1994.

A.S. Grimshaw, J. B. Weissman, E. A. West, and E. Loyot, "Metasystems: An Approach Combining Parallel Processing And Heterogeneous Distributed Computing Systems," *Journal of Parallel and Distributed Computing*, 21(3): 257-270, June 1994.

J. B. Weissman, A.S. Grimshaw, and R. Ferraro, "Parallel Object-Oriented Computation Applied to a Finite 2D Element Problem," *Scientific Computing*, 2(4): 133-144, Feb 1994.

A.S. Grimshaw, E. A. West and W. R. Pearson, "No Pain and Gain! -Experiences with 20 Mentat on a Biological Application," *Concurrency: Practice & Experience*, 5(4): 309-328, June 1993.

A.S. Grimshaw, "Easy to Use Object-Oriented Parallel Programming with Mentat," *IEEE Computer*, 26(5): 39-51, May 1993.

A.S. Grimshaw, W.T. Strayer, and P. Narayan, "Dynamic Object-Oriented Parallel Processing," *IEEE Parallel & Distributed Technology: Systems Applications*, 1(2): 33-47, May 1993.

Books and Book Chapters

Andrew Grimshaw, "Avaki Data Grid – Secure Transparent Access to Data," in, *Grid Computing: A Practical Guide To Technology And Applications*, Ahmar Abbas, editor, Charles River Media, 2003.

A. Natrajan, M.A. Humphrey, and A.S. Grimshaw, "Grid Resource Management in Legion", in *Resource Management for Grid Computing*, eds. Jennifer Schopf and Jaroslaw Nabrzyski, 2003.

A.S. Grimshaw, A. Natrajan, M.A. Humphrey and M.J. Lewis, A. Nguyen-Tuong, J.F. Karpovich, M.M. Morgan, A.J. Ferrari, "From Legion to Avaki: The Persistence of Vision", *Grid Computing: Making the Global Infrastructure a Reality*, eds. Fran Berman, Geoffrey Fox and Tony Hey, 2003.

A.S. Grimshaw and D. Gannon, "Object-Based Approaches," in I. Foster and C. Kesselman, eds., *The Grid: Blueprint for a New Computing Infrastructure*, Morgan Kaufmann, 1998.

J. Ortega, A.S. Grimshaw, *An Introduction to C++ and Numerical Methods*, Oxford University Press, 1998.

A.S. Grimshaw, A.J. Ferrari, and E. A. West, "Mentat" in Greg Wilson, ed., *Parallel Programming Using C++*, MIT Press, 1996.

Contrib., T. Sterling, P. Messina, and P.H. Smith, *Enabling Technologies for Petaflops Computing*, MIT Press, 1995.

A.S. Grimshaw, "Mentat--Applying the Object-Oriented Paradigm to Parallel Processing," in J. Dongarra, L. Grandinetti, G. Joubert, and J. Kowalik, eds., *High Performance Computing: Technology and Applications*, Amsterdam, The Netherlands: Elsevier Science, 1995.

A.S. Grimshaw, "Easy to Use Object-Oriented Parallel Programming with Mentat," in V. Sunderam, ed., *Landmark Contributions in Distributed & Concurrent Computing*, London: Chapman & Hall, London, 1994, reprinted from *IEEE Computer*, 26(5): 39-51, May 1993.

A.S. Grimshaw, "Easy to Use Object-Oriented Parallel Programming with Mentat," in D. Rine, ed., *Readings in Object-Oriented Systems and Applications*, IEEE Press, 1994 reprinted from *IEEE Computer*, 26(5): 39-51, May 1993.

A.S. Grimshaw, "Easy to Use Object-Oriented Parallel Programming with Mentat," in D. Skillicorn and D. Talia, eds., *Parallel Languages for Parallel Processing*, IEEE Press, 1995, reprinted from *IEEE Computer*, 26(5): 39-51, May 1993.

Awards

Avaki and A. S. Grimshaw, Frost & Sullivan Technology Innovation Award, November, 2003.

Avaki and A. S. Grimshaw, Bio-IT World Best-of-Show Award, March, 2003.

Avaki and A. S. Grimshaw, Top Ten Start-ups to Watch, Network World, 2003.

Avaki and A. S. Grimshaw, Top Ten Vendors to Watch in 2003, Light Reading, 2003.

Avaki and A.S. Grimshaw, Computer World R&D Gems, 2003

Avaki and S.S. Grimshaw, MIT Tech Review "Ten technologies that will change the world", Jan 2003.

A.S. Grimshaw et al, "HPC Challenge Award," Supercomputing '98, Orlando, FL, November, 1998.

A.S. Grimshaw et al, "HPC Challenge Award for Overall System Interface and Functionality," *Supercomputing '95*, Dec 1995, San Diego, CA.

Refereed Proceedings

A. Grimshaw, M. Humphrey, J.C. Knight, A. Nguyen-Tuong, J. Rowanhill, G. Wasson, and J. Basney. The Development of Dependable and Survivable Grids. 2005 Workshop on Dynamic Data Driven Applications (associated with the 2005 International Conference on Computational Science). Emory University, Atlanta, GA. May 22-25, 2005.

D. Katramatos, M. Humphrey, A. Grimshaw, and S. Chapin, "JobQueue: A Computational Grid-wide Queuing System," *International Workshop on Grid Computing*, pp. 99-110, November 2001.

B. White, M. Walker, M. Humphrey, and A. Grimshaw "LegionFS: A Secure and Scalable File System Supporting Cross-Domain High-Performance Applications", *Proceedings SC 01*, Denver, CO. www.sc2001.org/papers/pap.pap324.pdf

- A. Natrajan, A. Fox, M. Humphrey, A. Grimshaw, M. Crowley, N. Wilkins-Diere, "Protein Folding on the Grid: Experiences using CHARMM under Legion on NPACI Resources," *International Symposium on High Performance Distributed Computing (HPDC)*, pp. 14-21, San Francisco, California, August 7-9, 2001.
- A. Natrajan, M.A. Humphrey and A.S. Grimshaw, "Grids: Harnessing Geographically-Separated Resources in a Multi-Organisational Context", *High Performance Computing Systems*, June 2001.
- M. Humphrey, N. Beekwilder, K. Holcomb, and A. Grimshaw, "Legion MPI: High Performance in Secure, Cross-MSRC, Cross-Architecture MPI Applications," 2001 *DoD HPC Users Group Conference*, Biloxi, Mississippi, June 2001.
- A. Natrajan, M. Humphrey, and A. Grimshaw, "Capacity and Capability Computing using Legion," *Proceedings of the 2001 International Conference on Computational Science*, pp. 273-283, San Francisco, CA, May 2001.
- L. Jin, and A. Grimshaw, "From MetaComputing to Metabusiness Processing," *proceedings IEEE International Conference on Cluster Computing - Cluster 2000*, Saxony, Germany, December 2000.
- B. White, A. Grimshaw, and A. Nguyen-Tuong, "Grid Based File Access: The Legion I/O Model," to *Proceedings of the Symposium on High Performance Distributed Computing (HPDC-9)*, Aug 2000, Pittsburgh, PA.
- H. Dail, G. Obertelli, F. Berman, R. Wolski, and A. Grimshaw, "Application-Aware Scheduling of a Magnetohydrodynamics Application in the Legion Metasystems," *Proceedings International Parallel Processing Symposium Workshop on Heterogeneous Processing*, Cancun, May 2000.
- A.S. Grimshaw, M.J. Lewis, A.J. Ferrari and J.F. Karpovich, "Architectural Support for Extensibility and Autonomy in Wide-Area Distributed Object Systems", *Proceedings of the 2000 Network and Distributed Systems Security Conference (NDSS'00)*, San Diego, California, February 2000.
- M. Humphrey, F. Knabe, A. Ferrari, and A. Grimshaw, "Accountability and Control of Process Creation in Metasystems," in *Proceedings of the 2000 Network and Distributed Systems Security Conference (NDSS'00)*, pp. 209-220, San Diego, CA, February 2000.
- S.J. Chapin, D. Katramatos, J.F. Karpovich and A.S. Grimshaw, "The Legion Resource Management System", *Proceedings of the 5th Workshop on Job Scheduling Strategies for Parallel Processing* in conjunction with the *International Parallel and Distributed Processing Symposium*, April 1999.
- A.J. Ferrari, F.C. Knabe, M. Humphrey, S.J. Chapin, and A.S. Grimshaw, "A Flexible Security System for Metacomputing Environments," *7th International Conference on High-Performance Computing and Networking Europe (HPCN'99)*, April 1999, Amsterdam: 370-380.
- C.L. Viles, M.J. Lewis, A.J. Ferrari, A. Nguyen-Tuong, and A.S. Grimshaw, "Enabling Flexibility in the Legion Run-Time Library," H.R. Arabnia, ed., *Proceedings of the International Conference on Parallel and Distributed Processing Techniques and Applications (PDPTA'97)*, June 30-July 2 1997, Las Vegas, NV: 265-274.
- A. Nguyen-Tuong, A.S. Grimshaw, and M. Hyett, "Exploiting Data-Flow for Fault-Tolerance in a Wide-Area Parallel System," *Proceedings of the 5th International Symposium on Reliable and Distributed Systems*, Oct 1996: 1-11.
- M. Lewis and A.S. Grimshaw, "The Core Legion Object Model," *Proceedings of the Symposium on High Performance Distributed Computing (HPDC-5)*, Aug 1996, Syracuse, NY: 551-561.

- Andrew S Grimshaw and William A. Wulf, "Legion flexible support for wide-area computing," *In Proceedings of the Seventh ACM SIGOPS European Workshop*, pages 205--212, Connemara, Ireland, September 1996.
- J.B. Weissman and A.S. Grimshaw, "A Federated Model for Scheduling in Wide-Area Systems," *Fifth International Symposium on High Performance Distributed Computing (HPDC-5)*, Aug 1996.
- A.S. Grimshaw and W. M. Wulf, "Legion--A View From 50,000 Feet," *Proceedings of the Symposium on High Performance Distributed Computing (HPDC-5)*, Aug 1996, Syracuse, NY: 89-99.
- A. Nguyen-Tuong, A.S. Grimshaw, and J.F. Karpovich, "Fault-Tolerance in Coarse Grain Data Flow," *Proceedings Workshop on Parallel Symbolic Languages and Systems*, Beaune, France, Oct 1995.
- E.A. West and A.S. Grimshaw, "Braid: Integrating Task and Data Parallelism," *Proceedings of Frontiers '95* Feb 1995: 211-219.
- J.F. Karpovich, A.S. Grimshaw, and J. C. French, "Extensible File Systems (ELFS): An Object-Oriented Approach to High Performance File I/O," *Proceedings of OOPSLA '94*, Portland, OR, Oct 1994: 191-204.
- J.F. Karpovich, J. C. French, and A.S. Grimshaw, "High Performance Access to Radio Astronomy Data: A Case Study," *Proceedings of the 7th International Conference on Scientific and Statistical Database Management*, Charlottesville, VA, Sept 1994: 240-249.
- J. B. Weissman and A.S. Grimshaw, "Network Partitioning of Data Parallel Computations," *Proceedings of the Symposium on High-Performance Distributed Computing (HPDC-3)*, San Francisco, CA, Aug 1994: 149-256.
- L. MacCallum and A.S. Grimshaw, "A Parallel Object-Oriented Linear Algebra Library," *Proceedings Object-Oriented Numerics Conference*, Sun River, OR, April 25-27, 1994: 233-249.
- A.S. Grimshaw, J. B. Weissman, and E. A. West, "Overhead versus Application Granularity in Mentat," *Proceedings of the Workshop on Efficient Implementation of Concurrent object-Oriented Programs, OOPSLA '93*, Washington, D.C., Sept 1993: a1-a5.
- J.F. Karpovich, M. Judd, W. T. Strayer, and A.S. Grimshaw, "A Parallel Object-Oriented Framework for Stencil Algorithms," *Proceedings of the Second Symposium on High-Performance Distributed Computing*, July 1993: 34-41.
- J. B. Weissman, A.S. Grimshaw, and R. Ferraro, "Parallel Object-Oriented Computation Applied to a Finite Element Problem," *Proceedings Object-Oriented Numerics Conference*, Sun River, OR, April 1993: 90-107.
- E. Loyot and A.S. Grimshaw, "VMPP: A Virtual Machine for Parallel Processing," *Proceedings 1993 International Parallel Processing Symposium*, Newport Beach, CA, April 1993: 735-740.
- R. Ferraro, A.S. Grimshaw, and J. B. Weissman, "Object-Oriented Parallelism Applied to a Finite-Element Code," poster session at Supercomputing '92, Nov 1992.
- A.S. Grimshaw, E. A. West, and W. R. Pearson, "No Pain and Gain! -Experiences with Mentat on a Biological Application," *Proceedings of the First Symposium on High-Performance Distributed Computing*, Syracuse, NY, Sept 1992: 57-66.
- A.S. Grimshaw, "Meta-Systems: An Approach Combining Parallel Processing and Heterogeneous Distributed Computing Systems," *Proceedings Sixth International Parallel Processing Symposium Workshop on Heterogeneous Processing*, Beverly Hills, CA, March 1992: 54-59.

J. L. Pfaltz, J. C. French, A.S. Grimshaw, and R. D. McElrath, "Functional Data Representation in Scientific Information Systems," *Intl. Space Year Conference on Earth and Space Science Information Systems (ESSIS)*, Pasadena, CA, Feb 1992: 788-799.

A.S. Grimshaw and E.C. Loyot Jr., "ELFS: Object- Oriented Extensible File Systems," *Proceedings 1991 Parallel and Distributed Information Systems Conference*, Miami, FL, Dec 1991: 510-513.

A.S. Grimshaw and J. Prem, "High Performance Parallel File Objects," *Proceedings of the Sixth Distributed Memory Computing Conference*, Portland, OR, April 1991: 720-723.

A.S. Grimshaw and V. E. Vivas, "FALCON: A Distributed Scheduler for MIMD Architectures," *Proceedings of the Symposium on Experiences with Distributed and Multiprocessor Systems*, Atlanta, GA, March 1991: 149-163.

A.S. Grimshaw, A. Silberman, and J. W. S. Liu, "Real-Time Mentat Programming Language and Architecture," *Proceedings of the 7th IEEE Workshop on Real-Time Operating Systems and Software*, Charlottesville, VA, May 1990: 82-87.

A.S. Grimshaw, D. Mack, and W. T. Strayer, "MMPS Portable Message Passing Support for Parallel Computing," *Proceedings of the Fifth Distributed Memory Computing Conference*, Charleston, SC, April 1990: 784-789.

A.S. Grimshaw, "The Mentat Run-Time System: Support for Medium Grain Parallel Computation," *Proceedings of the Fifth Distributed Memory Computing Conference*, Charleston, SC, April 1990: 1064-1073.

A.S. Grimshaw, J. L. Pfaltz, J. C. French, and S. H. Son, "Exploiting Coarse-Grained Parallelism in Database Applications," *Proceedings PARBASE-90: International Conference on Database, Parallel Architectures, and their Applications*, IEEE, Miami, FL, March 1990: 510-512.

A.S. Grimshaw, A. Silberman, and J. W. S. Liu, "Real-Time Mentat Programming Language and Architecture," *Proceedings of GLOBECOM 89*, Dallas, TX, Nov 1989: 7 pages.

A.S. Grimshaw and J. W. S. Liu, "The Mentat Programming Language and Architecture," *Proceedings Workshop on Future Trends of Distributed Computing Systems*, Hong Kong, Sept 1988: 426-437.

A.S. Grimshaw, J. W. S. Liu, and M. Thomas "Mentat: A Prototype Macro Data-Flow System," *Proceedings of the 2nd Workshop on Large Grain Parallelism*, Oct 1987: 2 pages.

A.S. Grimshaw and J. W. S. Liu, "Mentat: An Object- Oriented Data-Flow System," *Proceedings of the 1987 Object-Oriented Programming Systems, Languages and Applications Conference*, ACM, Oct 1987: 35-47.

J. W. S. Liu and A.S. Grimshaw, "An Object-Oriented Macro Data Flow Architecture," *Proceedings of the 1986 National Communications Forum*, Sept 1986: 15 pages.

J. W. S. Liu and A.S. Grimshaw, "A Distributed System Architecture Based on Macro Data Flow Model," *Proceedings Workshop on Future Directions in Architecture and Software*, South Carolina, May 1986: 8 pages.

Invited Lectures (does not include over 100 sales presentations at Avaki customers)

"Grids are Real – Grids in the Life Sciences", EPA Annual Conference, May 2005, Washington, DC.

“The Future of Grids – Data”, CIO/CTO Roundtable, April, 2005, Charlottesville, VA.

“OGSA – A View from the Trenches”, UK e-Sciences meeting, January, 2005, London, UK.

“Grids in Support of the Life Sciences”, EPA Office of Environmental Information Annual Conference, December, 2004, Miami, FL.

“Complexity Matters”, International Conference on Service Oriented Computing, November, 2004, New York, New York.

“The Next Cool Thing,” Dow Jones VentureOne Innovation and Growth Exchange, October, 2004, Boston, MA.

“The Global Bio Grid”, Workshop on Clusters and Computational Grids for Scientific Computing, September 2004, Le Chateau de Faverges de la Tour, France.

“The Global Bio-Grid”, University of Manchester, August, 2004, Manchester, UK.

“The Global Bio-Grid”, Microsoft Research, May, 2004, Seattle, WA.

“The Future of Data – Grid”, Woodrow Wilson International Center for Scholars, February, 2004, Washington, DC.

“From Clusters to Grids,” Keynote address, *Linux Clusters for Supercomputing*, October 2003, Linkoping, Sweden.

“Enterprise Information Integration, Powered by Grid,” NIST workshop *Information Science Standards to Enable Biomedical Research*, November 5, 2003, Bethesda, MD.

“P2P and Grid,” GGF 9, October 2003, Chicago, IL.

“Data on Tap: A Fresh Approach to Collaborative Research”, *Drug Discovery Technology*, Boston, MA, August 13, 2003.

“Avaki Data Grid: Enterprise data provisioning, access, and integration”, *Application Development Technology*, Boston, MA, August, 2003.

“Legion: Extensibility Through Naming,” University of Texas, July 2003, Austin, TX.

“Enterprise Data Grids,” GGF 8 tutorial, June 2003, Seattle, WA.

“Enterprise Data Grids,” GGF 8, June 2003, Seattle, WA.

“Improving Multi-site/Multi-departmental Cluster Computing Through Data Grids in the Automotive and Aerospace Industries,” *ClusterWorld 2003*, June 2003, San Jose, CA.

“Grid Computing and Legion, *Tokyo Institute of Technology*, Tokyo, Japan, May 2003.

“Avaki Data Grid,” *Oxford University e-Science Center*, April 2003, Oxford, UK.

“Avaki Data Grid,” *Cambridge University e-Science Center*, April 2003, Cambridge, UK.

“Grid Computing and Legion”, *University of Texas*, Austin, Texas, April 2003.

“Grid Enabled Drug Discovery”, InfoTechPharma 2003, London UK, February 2003.

"Enterprise Data Grids", GlobusWorld, San Diego CA, January 2003.

"Grid Technology as a Competitive Weapon", Inaugural Lecture National Grid Project Seminar Series, Singapore, January 2003.

"Grid Technology in the Life Sciences", Singapore Genomics Institute, Singapore, January 2003.

"Grid Technology as a Competitive Weapon," BIOGRIDS: Advancing Life Science Computing, Baltimore MD, December, 2002.

"Grid Technology as a Competitive Weapon", Grid Computing Planet, Boston MA, October, 2002.

"Grids are Real: Avaki in the Life Sciences Sector", Workshop on Clusters and Computational Grids for Scientific Computing, Le Chateau de Faverges de la Tour, France, September, 2002.

"Bringing Grid Technology to Market", IBM Grid University, Montpellier France, September 2002.

"Strategies in Grid Computing", Executive IT Life Sciences Forum, New York NY, August 2002.

"From Clusters to Grids", IEEE Conference on Policy in Distributed Systems and Networks, Monterey, CA, June 2002.

"Grids are Here", Grid Planet, San Jose, CA, June 2002.

"Data Grids", StoreWidth, 2002, Laguna Niguel, CA, March 2002.

"Grid Tools for the Future: What is needed to move ahead?," Sun HPC Workshop, SC 2001, Denver, CO, November 2001.

"Distributed Computing in the New World Order," O'Reilly PTP Conference, Washington, DC, October 2001.

"GRIDS : Harnessing Geographically Separated Resources in a Multi-Organizational Context," University of Texas-Austin, Austin, TX, July 2001.

"Avaki and JXTA," Global Grid Forum, Washington, DC. July 2001.

"GRIDS : Harnessing Geographically Separated Resources in a Multi-Organizational Context," Cray Users Group, Indian Springs, CA, May 2001.

"Building Robust, Scalable, Secure, and Successful P2P Applications: The *Importance of Underlying Architecture Choices*," P2P: The Salvation of e-Business, Munich, Germany, May 2001.

"Building Robust, Scalable, Secure, and Successful P2P Applications : *The Importance of Underlying Architecture Choices*," DCI Conference on Peer-to-Peer Computing, San Francisco, CA, March, 2001.

"Building Robust, Scalable, Secure, and Successful P2P Applications : *The Importance of Underlying Architecture Choices*," *European Forum on Peer-to-Peer Networks*, Amsterdam, Netherlands, February, 2001.

"Protein Folding Landscapes in a Distributed Environment", NPACI All-Hands Meeting, San Diego, CA, February 2001.

"NPACI and the Grid - Bringing Distributed Computing to the Scientific Community", NPACI All-Hands Meeting, San Diego, CA, February 2001.

"Object-Based Grids," Grid Forum, Seattle, WA, July 2000.

"Grid Computing and Legion – the Future of High-Performance Computing," Supercomputing 2000, Mannheim, Germany, June 2000.

"Grid Computing and Legion – the Future of High-Performance Computing," Advanced Workshop on High-Performance Computing, Cetraro, Italy.

"Legion, Grids, and Clusters – the Future of High-Performance Computing," Workshop on Global and Cluster Computing, Tsukuba, Japan, March 2000.

"Legion, Grids, and Clusters – the Future of High-Performance Computing," Boeing, Seattle WA, October 1999.

"The Legion System Architecture," *UNICORE/NRW Metacomputing Symposium*, Juelich, Germany, September 1999.

"Wide Area Supercomputing," Joint US-Russian Symposium on Supercomputing, Moscow, Russia, September 1999.

"Legion: A Quick View," *1999 GRIDS Forum*, Mountain View, CA, June 1999.

"Legion: A Quick View," *1999 DoD Users Group Meeting*, Monterey, CA, June 1999.

"System Software for PetaFLOPS," *PetaFLOPS II*, Santa Barbara, CA, Feb 1999.

"Computational Grids," *PPoPP*, Atlanta, GA, May 1999.

"Information Power Grid," *IPPS*, San Juan, Puerto Rico, May 1999.

"Legion," *SGI*, Mountain View, CA, March 1999.

"Legion – The Alternative to Globus," *NASA CAS Workshop on Computational Grids*, Hampton, VA, March 1999.

"Petaflops and the Grid," *Petaflops II*, Santa Barbara, CA, Feb 1999.

"Legion--An Applications Perspective," NASA AMES, Mountain View, CA, Dec 1998.

"Legion--A View From 50,000 Feet," Georgia Tech, Dec 1998.

"Legion--An Applications Perspective," *LLNL*, Livermore, CA, June 1998.

"Fault-Tolerance in the RGE Model," Programming Environments, Clusters, and Computational Grids For Scientific Computing, The Inn at Blackberry Farm, TN, Sept 1998.

"Legion--A View From 50,000 Feet," Purdue University, IN, Sept 1998.

"Legion--An Applications Perspective," *NPACI Summer Institute*, La Jolla, CA, Aug 1998.

"Legion--A View From 50,000 Feet," *Symposium on Global Distributed Computing*, Waseda University, Tokyo, Japan, June 1998.

"Legion--An Applications Perspective," *High Performance Computing Workshop*, Cetraro, Italy, June 1998.

"Metacomputing Support at NAVO and Other MSRCs," Army Research Lab, Aberdeen, MD, May 1998.

"Metasystems--An Applications Perspective," *ICASE/LaRC/ARO/NSF Workshop on Computational Aerosciences in the 21st Century*, Hampton, VA, April 1998.

"Legion--A View From 50,000 Feet," *DAS Symposium*, Amsterdam, The Netherlands, March 1998.

"Legion--A View From 50,000 Feet," Ohio State University, Columbus, OH, Feb 1998.

"Metasystems: What are they and what use are they?" *Signal and Image Processing Forum*, Aberdeen, MA, Feb 1998.

"Legion--A View From 50,000 Feet," IBM Research, Yorktown Heights, NY, Nov 1997.

"Legion--A View From 50,000 Feet," University of Texas San Antonio, San Antonio, TX, Oct 1997.

"Legion--A View From 50,000 Feet," Rice University, Houston, TX, Oct 1997.

"Legion--A View From 100,000 Feet," *Workshop on Seamless Computing*, ECMWF, Reading, UK, Sept 1997.

"Legion--A View From 50,000 Feet," NASA AMES Mountain View, CA, Aug 1997.

"Legion--A View From 50,000 Feet," HP Research Labs, Palo Alto, CA, Aug 1997.

"Metasystems: The WAVE of the Future (Wide Area Virtual Environment)," *NPACI Summer Institute*, La Jolla, CA, Aug 1997.

"Metasystems: What are they and what use are they?" *1997 DoD HPC Users Group Meeting*, San Diego, CA, June 1997.

"Meta-applications in Legion," Keynote address at *MAPINT 1997*, Dayton, OH, June 1997.

"Supporting Diversity and Performance in Wide Area Metasystems," *Cluster Computing Conference*, Atlanta, GA, March 1997.

"Supporting Diversity and Performance in Wide Area Metasystems," *Workshop on Software Tools for High-Performance Computing Systems*, Chatham, MA, Oct 1996.

"Legion--A View From 50,000 Feet," San Diego Supercomputing Center, San Diego, CA, Oct 1996.

"Legion: The Next Step Toward a World-Wide Virtual Computer," *International Conference on Supercomputing*, Philadelphia, PA, May 1996.

"Legion--A View From 50,000 Feet," *DOE 2000 Meeting*, Berkeley, CA, May 1996.

"Legion--The Next Logical Step Towards a World Wide Virtual Computer," *Workshop on Object-Oriented Computing*, Kanazawa, Japan, March 1996.

"From Mentat to Legion: The Evolution of a High Performance Parallel Processing System," *International Workshop on Parallel C++*, Kanazawa, Japan, March 1996.

"Multi-language Support and Interoperability," *Parallel Object Oriented Methods and Applications (POOMA -96)*, Santa Fe, NM, Feb 28-March 1, 1996.

"The Legion Core Object Model," University of California San Diego, La Jolla, CA, Feb 1996.

"Object-Oriented Parallel Processing with Mentat," *Joint Conference on Information Sciences*, Wrightsville Beach, NC, Sept 1995.

"Legion--The Next Logical Step Towards a World Wide Virtual Computer," Sandia National Labs, Livermore, CA, Aug 1995.

"Legion as a PetaFLOP Computer--Does it Make Sense?" *PetaFLOPS : Applications and Algorithm Challenges for PetaFLOPS Computing*, Bodega Bay, CA, Aug 1995.

"Legion--The Next Logical Step Towards a World Wide Virtual Computer," *Cross-Industry Working Team (XIWT) Meeting*, Corporation for National Research Initiatives, Reston, VA, June 1995.

"From Mentat to Legion: The Evolution of a High Performance Parallel Processing System," University of California San Diego, La Jolla, CA, March 1995.

"From Mentat to Legion: The Evolution of a High Performance Parallel Processing System," Dartmouth College, Hanover, NH, Feb 1995.

"From Mentat to Legion: The Evolution of a High Performance Parallel Processing System," University of Arizona, Tucson, AZ, Sept 1994.

"From Mentat to Legion: The Evolution of a High Performance Parallel Processing System," Indiana University, Bloomington, IN, Aug 1994.

"From Mentat to Legion: The Evolution of a High Performance Parallel Processing System," NASA AMES Research Center, Moffet Field, CA, Aug 1994.

"High-Performance Object-Oriented Computing," *High Performance Computing Workshop*, Cetraro, Italy, June 1994.

"From Mentat to Legion: The Evolution of a High Performance Parallel Processing System," Intel SSD, Beaverton, OR, April 1994.

"Compiler and Run-Time Support for Dynamic Object-Oriented Parallel Processing," Hewlett Packard, Chelmsford, MA, March 1994.

"Mentat: High-Performance Object-Oriented Parallel Processing," Hewlett Packard, Chelmsford, MA, March 1994.

"Using Application Templates for Scientific Computing," invited talk for "Frameworks for Parallel Scientific Computing" session of the *1993 Workshop on Cluster Computing*, Tallahassee, FL, Dec 1993.

"From Mentat to Legion: The Evolution of a High-performance Parallel Processing System," ICASE, NASA Langley Research Center, Nov 1993.

"Mentat: A Software Environment for High-Performance Parallel Computing," Tutorial, Symposium on High Performance Distributed Computing (HPDC-2), July 1993.

"The Mentat Metasystems Testbed--High-Performance Heterogeneous Computing," Oregon State University, Corvallis, OR, April 1993.

"Mentat: A Software Environment for High-Performance Parallel Computing," Los Alamos National Laboratory, Los Alamos, NM, April 1993.

"The Mentat Metasystems Testbed--High-Performance Heterogeneous Computing," Emory University, Atlanta, GA, March 1993.

"Mentat: A Software Environment for High-Performance Parallel Computing," Los Alamos National Laboratory, Los Alamos, NM, July 1992.

"An Introduction to Object-Oriented Parallel Programming with Mentat," National Cancer Institute, Frederick, MD, Aug 1991.

"Parallel Object-Oriented Programming: The Mentat Approach," MITRE-Washington Software Center, McLean, VA, Aug 1991.

"Object-Oriented Design in C++," University of Virginia Medical School, Charlottesville, VA, June 1991.

"Programming in C++," National Radio Astronomy Observatory, Charlottesville, VA, Feb 1991.

"Object-Oriented Design Principles," National Radio Astronomy Observatory, Charlottesville, VA, Feb 1991.

"The WM Computer Architecture," Department of Computer Science, University of Illinois, Urbana, IL, Aug 1989.

"The WM Computer Architecture," Information Processing Technical Branch, NASA LaRC Hampton, VA, August 16, 1989.

"Mentat: Medium Grain Parallel Processing," Information Processing Technical Branch, NASA LaRC Hampton, VA, August 16, 1989.

Non-refereed Publications

Humphrey, M.; Knabe, F.; Ferrari, A.; Grimshaw, A., *Accountability and Control of Process Creation in the Legion Metasystem*, Technical Report 99-16, May 24, 1999.

A.S. Grimshaw, A.J. Ferrari, F.C. Knabe, and M. Humphrey, "Legion: An Operating System for Wide-Area Computing," Technical Report CS-99-12, Department of Computer Science, University of Virginia, March 1999.

A.J. Ferrari, F.C. Knabe, M. Humphrey, S.J. Chapin, and A.S. Grimshaw, "A Flexible Security System for Metacomputing Environments," Technical Report CS-98-36, Department of Computer Science, University of Virginia, Dec 1998.

Nguyen-Tuong, A.; Grimshaw, A.S., Using Reflection for Incorporating Fault-Tolerance Techniques into Distributed Applications, Technical Report 98-34, November 5, 1998.

Nguyen-Tuong, A.; Chapin, S. J.; Grimshaw, A. S.; Viles, C., *Using Reflection for Flexibility and Extensibility in a Metacomputing Environment*, Technical Report 98-33, November 19, 1998.

Lindahl, G.; Chapin, S. J.; Beekwilder, N.; Grimshaw, A., *Experiences with Legion on the Centurion Cluster*, Technical Report 98-27, August 17, 1998.

A.S. Grimshaw, M.J. Lewis, A.J. Ferrari, and J.F. Karpovich, "Architectural Support for Extensibility and Autonomy in Wide-Area Distributed Object Systems," Technical Report CS-98-12, Department of Computer Science, University of Virginia, June 1998.

A.J. Ferrari and A.S. Grimshaw, "Basic Fortran Support in Legion," Technical Report CS-98-11, Department of Computer Science, University of Virginia, March 1998.

Beekwilder, N, Grimshaw, A.S. *Parallelization of an Axially Symmetric Steady Flow Program*, Technical Report 98-10, May 29, 1998.

Chapin, S. J.; Katramatos, D.; Karpovich, J.; Grimshaw, A.S. *Resource Management in Legion*, Technical Report 98-09, Feb 11, 1998.

Nguyen-Tuong, A.; Grimshaw, A.S., *Building Robust Distributed Applications With Reflective Transformations*, Technical Report 97-26, November 14, 1997.

A.J. Ferrari, S.J. Chapin, and A.S. Grimshaw "Process Introspection: A Heterogeneous Checkpoint/Restart Mechanism Based on Automatic Code Modification," Technical Report CS-97-05, Department of Computer Science, University of Virginia, March 1997.

Lewis, M. J.; Grimshaw, A. S., *Using Dynamic Configurability to Support Object-Oriented in Legion*, Technical Report 96-19, December 4, 1996.

Ferrari, A. J.; Lewis, M. J.; Viles, C. L.; Nguyen-Tuong, A.; Grimshaw, A., *Implementation of the Legion Library*, Technical Report 96-16, November 26, 1996.

Karpovich, J. F., *Support for Object Placement in Wide-Area Heterogeneous Distributed Systems*, Technical Report 96-03, January 16, 1996.

Nguyen-Tuong, A.; Grimshaw, A. S.; Karpovich, J. F., *Fault-Tolerance in Coarse Grain Data Flow*, Technical Report 95-38, Aug. 28 1995.

Ferrari, A.; Grimshaw, A., *Persistent Object State Management in Legion*, Technical Report 95-36, August 1995.

M.J. Lewis and A.S. Grimshaw, "The Core Legion Object Model," Technical Report CS-95-35, Department of Computer Science, University of Virginia, Aug 1995.

Nguyen-Tuong, A.; Grimshaw, A. S.. *Exploiting Sequential Debuggers in a Parallel Environment: An Introduction to the Mentat Assistant Debugger*, Technical Report 95-32, May 1, 1995.

Grimshaw, A. S.; Nguyen-Tuong, A.; Wulf, W. A., *Campus-Wide Computing: Early Results Using Legion at The University of Virginia*, Technical Report 95-19, March 27, 1995.

West, Emily A.; Grimshaw, Andrew S.. *Braid: Integrating Task and Data Parallelism*, Technical Report 94-45, November 11, 1994.

Karpovich, J. F.; Grimshaw, A. S.; French, J. C., *Breaking the I/O Bottleneck at the National Radio Astronomy Observatory (NRAO)*, Technical Report 94-37, September 1994.

Karpovich, J. F.; Grimshaw, A. S.; French, J. C.. *Extensible File Systems (ELFS): An Object-Oriented Approach to High Performance File I/O*, Technical Report 94-28, July 22, 1994.

Karpovich, J. F.; French, J. C.; Grimshaw, A. S., *High Performance Access to Radio Astronomy Data: A Case Study*, Technical Report 94-25, July 11, 1994.

Grimshaw, A. S.; Wulf, W. A.; French, J. C.; Weaver, A. C.; Reynolds Jr., P. F., *Legion: The Next Logical Step Toward a Nationwide Virtual Computer*, Technical Report 94-21, June 08, 1994.

Grimshaw, A. S.; Wulf, William A.; French, J. C.; Weaver, A. C.; Reynolds Jr., P. F., *A Synopsis of the Legion Project*, Technical Report 94-20, June 08, 1994.

Weissman, J. B.; Grimshaw, A. S., *Network Partitioning of Data Parallel Computations*, Technical Report 94-17, May 25, 1994.

West, Emily A., *Combining Control and Data Parallelism: Data Parallel Extensions to the Mentat Programming Language*, Technical Report 94-16, May 18, 1994.

The Mentat Research Group. *Mentat 2.5 User's Manual*, Technical Report 94-06 February 17, 1994.

The Mentat Research Group. *Mentat 2.5 Programming Language Reference Manual*, Technical Report 94-05, February 17, 1994.

Nguyen-Tuong, A., A.S. Grimshaw, and J.F. Karpovich, "Fault-Tolerance in Coarse Grain Data Flow," Technical Report CS-95-38, Department of Computer Science, University of Virginia, Aug 1995.

Nguyen-Tuong, A. and A.S. Grimshaw, "*Exploiting Sequential Debuggers in a Parallel Environment: An Introduction to the Mentat Assistant Debugger*," Technical Report CS-95-22, Department of Computer Science, University of Virginia, May 1995.

M.J. Lewis and A.S. Grimshaw, "*The Core Legion Object Model*," Technical Report CS-95-35, Department of Computer Science, University of Virginia, Aug 1995.

A.S. Grimshaw, A. Nguyen-Tuong, and W.A. Wulf, "*Campus-Wide Computing: Early Results Using Legion at The University of Virginia*," Technical Report CS-95-19, Department of Computer Science, University of Virginia, March 1995.

"Mentat: An Object-Oriented Parallel Processing System," Release 3.1, for Sun, Silicon Graphics, IBM RS 6000, Intel x88 (Linux), IBM SP-2, and Convex Exemplar. Mentat has been distributed world-wide.

T. Sterling et al, "Enabling Technologies for PetaFLOPS Computing," final report of the workshop, *TR CCSF-45*, Caltech Concurrent Supercomputing Facilities, California Institute of Technology, 1994.

A.S. Grimshaw, "Heterogeneous Workstation Support in Mentat," *1993 Workshop on Cluster Computing*, Tallahassee, FL, Dec 1993.

A.S. Grimshaw, J. B. Weissman, and E. A. West, "Experiences with the Mentat Metasystems Testbed," *1992 Workshop on Cluster Computing*, Tallahassee, FL, Dec 1992.

P. Narayan, S. Smoot, A. Sarkar, E. West, and A.S. Grimshaw, "Portability and Performance: Mentat Applications on Diverse Architectures," *Proceedings 1992 Minnowbrook Workshop on Software Engineering for Parallel Computing*, Aug 1992.

E. Loyot and A.S. Grimshaw, "VMPP: A Proposal for a Virtual Machine for Parallel Processing," *Proceedings 1992 Minnowbrook Workshop on Software Engineering for Parallel Computing*, Aug 1992.

A.S. Grimshaw, "A Software Environment for High-Performance Parallel Computing," *Proceedings 1991 Minnowbrook Workshop on Software Engineering for Parallel Computing*, July 1991.

L. MacCallum and A.S. Grimshaw, "A Linear Algebra Library for Mentat Applications,," Technical Report CS-93-43, Department of Computer Science, University of Virginia, Aug 1993.

Grimshaw, A. S.; Weissman, J. B.; Strayer, W. T., *Portable Run-Time Support for Dynamic Object-Oriented Parallel Processing*, Technical Report 93-40, July 14, 1993.

J. B. Weissman and A.S. Grimshaw, "Multigranular Scheduling of Data Parallel Programs," Technical Report CS-93-38, Department of Computer Science, University of Virginia, July 1993.

A.S. Grimshaw, "The Mentat Computation Model--Data-Driven Support for Dynamic Object-Oriented Parallel Processing," Technical Report CS-93-30, Department of Computer Science, University of Virginia, May 1993.

Karpovich, J. F.; Judd, M.; Strayer, W. T.; Grimshaw, A. S., *A Parallel Object-Oriented Framework for Stencil Algorithms*, Technical Report 93-13, January 27, 1993.

Grimshaw, A. S.; Weissman, J. B.; West, E. A.; Loyot Jr., E., *MetaSystems: An Approach Combining Parallel Processing and Heterogeneous Distributed Computing Systems*, Technical Report 92-43, December 29, 1992.

Grimshaw, A. S.; Strayer, W. T.; Narayan, P., *The Good News About Dynamic Object-Oriented Parallel Processing*, Technical Report 92-41, December 17, 1992.

Grimshaw, A. S., *Easy-to-use Object-Oriented Parallel Processing with Mentat*, Technical Report 92-32, October 12, 1992.

Narayan, P.; Smoot, S.; Sarkar, A.; West, E.; Grimshaw, A.; Strayer, T., *Portability and Performance: Mentat Applications on Diverse Architectures*, Technical Report 92-22, July 22, 1992.

A.S. Grimshaw, E.C. Loyot Jr., and J.B. Weissman, "Mentat Programming Language (MPL) Reference Manual," Technical Report TR-91-31, Department of Computer Science, University of Virginia, Nov 1991.

A.S. Grimshaw et al, "Mentat User's Manual," Technical Report TR-91-32, Department of Computer Science, University of Virginia, Nov 1991.

A.S. Grimshaw and E. C. Loyot Jr., "ELFS: Object- Oriented Extensible File Systems," Technical Report TR-91-14, Department of Computer Science, University of Virginia, April 1991.

A.S. Grimshaw, "An Introduction to Parallel Object-Oriented Programming with Mentat," Technical Report TR-91-07, Department of Computer Science, University of Virginia, April 1991.

A.S. Grimshaw et al, "Implementation-Independent Architectural Comparison," Technical Report TR-90-12, Department of Computer Science, University of Virginia, June 1990.

J.L. Pfaltz, J.C. French, A.S. Grimshaw, and S.H. Son, "The ADAMS Database Language," IPC Technical Report 89-002, University of Virginia, Feb 1989.

V. Sponsored Research

Grimshaw's major source of funding was the Legion project. Legion is, or has been, funded by DARPA, DOE, NSF, NASA, and DoD at a rate of between one to two million dollars a year. For example, in FY 2000, Legion was funded at the rate of \$1.4 million. That is exclusive of infrastructure grants and application grants in information retrieval and biochemistry. Note: In July 2001 Grimshaw went on leave and all grants were transferred to Marty Humphrey. The numbers below do not include the \$25M raised by Grimshaw for Avaki.

Dependable Grids, NSF ITR #0426972, \$2,100,000, 9/1/04-8/31/07.

Metacomputing Support for the DoD MSRCs, DoD HPCMOD office via the PET program at NAVO and Grumman Data systems, \$460,000, 2001.

Supporting Wide-Area Computational Science, NSF-CISE via NPACI, \$609,000, 2001, includes \$65,880 in matching from Virginia, and \$83,000 supplement from NASA..

Metacomputing Support for the DoD MSRCs, DoD HPCMOD office via the PET program at NAVO and Grumman Data systems, \$460,000, 2000.

Supporting Wide-Area Computational Science, NSF-CISE via NPACI, \$526,000, 2000, includes \$65,880 in matching from Virginia.

Supporting Complex Application Requirements in Metasystems, with M. Humphrey, NSF-CISE, \$1,000,000, Oct 1, 1999 - Sept 30, 2002.

Supporting Enhanced Security Requirements of Lawrence Livermore National Laboratory in the Legion Metasystems Project, Marty Humphrey and Andrew Grimshaw, Sandia National Lab \$99,995, 8/1/99-1/31/2000.

Supporting Enhanced Security Requirements of Sandia National Laboratory in the Legion Metasystems Project, Marty Humphrey and Andrew Grimshaw, Sandia National Lab \$50,000, 6/1/99-9/15/99.

Supporting Wide-Area Computational Science, NSF-CISE via NPACI, \$760,000, includes \$205,000 supplement from NASA IPG program, Oct 1, 1997 - Sept 30, 1999, expected annual renewal.

Networks, Middleware, and Applications for Next Generation Metasystems, with J. Jokl, J. French, and A. Weaver, NSF connections program, \$350,000, Feb 1, 1997 - January 31, 1999.

Metacomputing Support for the DoD MSRCs, DoD HPCMOD office via the PET program at NAVO and Grumman Data systems, \$1,014,620, May 1997 - June 1999..

Centurion--a 50 GigaFLOP machine from COTS, ONR DURIP MRI grant, \$451,026, May 1998 - July 1999.

Centurion--a 25 GigaFLOP machine, NSF MRI grant, \$280,000 (NSF), \$50,000 (Grumman Data Systems), \$120,000 University of Virginia matching, September 1997 - July 1999.

Personalized Information Environments, J. C. French and A.S. Grimshaw, DARPA/ITO, \$627,899, June 1997 - June 2000.

Legion Core Development, with W. Wulf, J. French, A. Weaver, and P. Reynolds, DARPA, \$2,414,473, Aug 1996 - July 1999.

Legion Core Development, with W. Wulf and J. French, DOE, three grants, totaling \$400,000/yr., March 1996 - Feb 1999.

Legion Support for the Intelligent Metacomputer Center, with W. Wulf and J. French, DARPA via SDSC, \$300,000, July 15, 1996 - Dec 1997.

Comparison of Protein Sequences and Structures, with W. Pearson, Biochemistry, and G. Robins, Health and Human Services, Public Health Service, \$1,175,089, includes 8.8% CY support for A. Grimshaw, Aug 1995 - July 2001.

Real Time Distributed Computation and Communication, with A. Weaver, NRaD, ONR, \$200,000, includes support for one student and 10% CY for Grimshaw, April 1995 - March 1996.

Legion, AT&T gift, \$25,000, Sept 1994.

High Performance Databases for Scientific Applications, with J. French, NASA CESDIS, \$50,000/yr, total: \$150,000, June 1993 - May 1996.

A Software Environment for High-Performance Parallel Computing, National Science Foundation, \$142,502/yr, total: \$453,105, Aug 1992 - July 1995.

QUEST II: Integrated Simulation, Synthesis and ATPG of Large Scale VHDL Descriptions, with J. Aylor, R. Williams, and R. Waxman, ARPA, total: \$1,077,000, includes 10% CY support for A. Grimshaw plus student support, Sept 1993 - Aug 1996.

Real Time Distributed Computation and Communication, with A. Weaver, NRaD, ONR, \$365,000, March 1994 - Dec 1994.

Comparison of Protein Sequences and Structures, with W. Pearson, Biochemistry, Health and Human Services, Public Health Service, \$131,484, includes 8.8% CY support for A. Grimshaw, Aug 1994 - July 1995.

Comparison of Protein Sequences and Structures, with W. Pearson, Biochemistry, Health and Human Services, Public Health Service, \$130,559, includes 16% CY support for A. Grimshaw, plus one student, Aug 1993 - July 1994.

Integrated Task and Data Parallel Programming Language Design, NASA/LARC, Graduate student fellowship, \$22,000/yr, \$66,000 total, July 1995 - June 1998.

High Performance Databases for Scientific Applications, NASA/JPL, Graduate student fellowship, \$22,000/yr, \$66,000 total, July 1993 - June 1996.

Parallel Object-Oriented Programming for Scientific Computing, NASA/JPL, \$28,000, April 1992 - March 1993.

Applying Parallel Object-Oriented Programming to Scientific Computing, NASA/JPL, Graduate student fellowship, \$22,000/yr, \$66,000 total, July 1992 - June 1995.

The VMPP--A Virtual Machine for Parallel Processing, Grumman Data Systems, \$34,909, June 1992 - Dec 1993.

Mentat/A: Medium Grain Parallel Processing, NASA LaRC, \$49,994, Sept 1990 - Aug 1991.

Supporting Data Intensive Applications with Medium Grained Parallelism, with J. Pfaltz, J. French, and S Son., DOE, \$796,423 (includes one summer month for Grimshaw, 1991, 1992, 1993), July 1991 - June 1994.

Mentat: Object-Oriented Data-Driven Computation, University of Virginia, SEAS, \$6,160, Dec 1988 - Nov 1989.

VI. Graduate Students

Ph.D.

M.J. Lewis		5/2000
A. Nguyen-Tuong		8/2000
Adam Ferrari		10/97
Jon Weissman	8/95	

Master of Science (Thesis)

Ellen Stackpole		8/2003
Mike Walker		5/2001
Mark Morgan		5/99
Emily West		5/94
Padmini Narayan		8/93
Virgilio Vivas		5/90

Master of Science, Computer Science (Project)

Matt Suhocki		5/2005
Brian White		1/2002
Norm Beekwilder		5/99
Roger Harper	5/95	
A. Nguyen-Tuong		5/95
Laurie MacCallum		5/94
J.F. Karpovich		1/95
Tony Chang		8/93
Brian Pane		6/92
Dave Chisholm		5/91
Doug Coppage		8/90
Jeff Prem		8/90
Gorrell P. Cheek		5/90
David A. Mack	5/90	

IV. University Service

University Wide

ITC Committee on Information Technology for Research	1995-1997
ITC Administrative Services Subcommittee	1992-95
ITC Electronic Mail Subcommittee	1992-93

Health Sciences Center

Information Sciences Interest Group	1993-94
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School of Engineering and Applied Science

Undergraduate Design Symposium	1992-97
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Department of Computer Science

Infrastructure planning Committee	1995
Graduate Program Ad Hoc Committee	1995
Graduate Fellowship Committee	1990-1997
CS 1XX Design Committee	1990
Engineering Open House	1989-95
Technical Report Format and Distribution	1988-89

Library
Parents Day

1988-90
1992

VI. Teaching

CS 101--Introduction to Computer Science	1994
CS 201--Software Development Methods	1995 (2X)
CS 308--Computer Architecture	1996, 1997
ENGR 208--Digital Logic Design	1990,1991
CS 414 Operating Systems	1999
CS 456--Operating Systems	1990
CS 656--Operating Systems	1989,1991, 92, 93, 97, 99, 2000
CS 651/644--Introduction to Parallel Processing	1992-96, 98, 99
CS 856--Advanced Operating Systems	1989, 1991
CS 851--Introduction to Parallel Computing	1988, 1990, 1991
CS 851--Compilers for Wide Area Parallel Processing Systems	1992