

# Peter A. Dinda

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## Research Interests

Experimental computer systems, broadly construed, presently including: virtualization, empathic systems, distributed and parallel systems, languages and programming systems for parallel, distributed and sensor network computing, and performance analysis.

## Education

### Carnegie Mellon University

Ph.D. in Computer Science

*May, 2000*

Advisor: David R. O'Hallaron

Thesis: *Resource Signal Prediction and its Application to Real-time Scheduling Advisors*

M.S. in Computer Science

*May, 1996*

### University of Wisconsin — Madison

B.S. in Electrical and Computer Engineering

*May, 1993*

Second major in Computer Science, minor in History of Science

Dean's list, all semesters

## Employment

### Northwestern University, Department of Electrical Engineering and Computer Science

*Presently*

Associate Professor (tenured) of Electrical Engineering and Computer Science

Head of Computer Engineering and Systems Division (17 faculty)

Affiliation with the Northwestern Institute on Complex Systems

Affiliation with the Center for Ultra-scale Computing

### Northwestern University, Department of Electrical Engineering and Computer Science

*September,*

*2005 to August 2006*

Assistant Professor of Electrical Engineering and Computer Science

Lisa Wissner-Slivka and Benjamin Slivka Junior Professor of Computer Science

Affiliation with the Northwestern Institute on Complex Systems

- Northwestern University, Department of Computer Science** *September, 2000 to August, 2005.*  
 Assistant Professor of Computer Science  
 Lisa Wissner-Slivka and Benjamin Slivka Junior Professor of Computer Science  
 Courtesy appointment in Electrical and Computer Engineering  
 Affiliation with the Northwestern Institute on Complex Systems
- Consultant, Dizpersion Corporation and Votes Plus** *August 2001 to September 2002*  
 Under Non-disclosure agreement.
- Consultant, TimeLine Vista Corporation** *1996 to 1997*  
 Integration of MacFS filesystem (see below) into MX-2424 professional digital audio recorder
- Consultant (self-employed)** *1995 to present*
- IBM Austin, Advanced Workstations Division** *June, 1991 to December, 1991*  
 Timing analysis of Rios Single Chip and PowerPC 601 floating point; Hardware compiler transform prototyping; Design management software development
- IBM Rochester, Storage Products Division** *May, 1990 to September, 1990*  
 Vision system programming; Robot control hardware debugging; SPC system for shop floor terminals
- Madison Academic Computing Center** *January, 1989 to August 1993*  
 Microcomputing consultant
- Blue Moon Photography (self-employed)** *1987 to 1990*  
 Weddings, environmental portraiture, and custom black and white printing

## Teaching

- My Ph.D. Students**, Northwestern University (Computer Science unless otherwise noted)
- Dong Lu, June 2005
- Topic: Components of a Scalable Distributed Relational Information Service
  - Now at RBC Capital Markets
- Ananth Sundararaj, December 2006
- Topic: Automatic, Run-time, and Dynamic Adaptation of Distributed Applications Executing In Virtual Environments
  - Now senior Research Engineer, Microsoft
- Bin Lin, July 2007
- Topic: Human-directed Optimization
  - Now senior Research Engineer, Intel
- Ashish Gupta, March 2008
- Topic: Black Box Methods for Inferring Parallel Applications' Properties in Distributed Environments
  - Now at D.E. Shaw
- John Lange (6th year)  
 Stephen Tarzia (4th year, ECE)  
 J. Scott Miller (2nd year)  
 Lei Xia (2nd year)

Chang Bae (2nd year)  
James Swaine (1st year, joint with Robby Findler)  
Jed McClurg (1st year)  
Yuan Tang (visiting scholar)

**Committee Memberships (graduated students), Northwestern University**

Zhichun Li, September 2009 (Ph.D. in CS)

- Topic: Router-based Anomaly/Intrusion Detection and Mitigation

Yao Zhao, December 2008 (Ph.D. in CS)

- Topic: Internet Networking and Application Troubleshooting

Lei Yang, June 2008 (Ph.D. in ECE)

- Topic: On-line Data Memory Compression for Embedded Systems
- Now at Google

Stefan Birrer, December 2007 (Ph.D. in CS)

- Topic: Addressing the Limitations of Tree-based Approaches to High-Bandwidth Streaming Multicast
- Now at Neokast.com (co-founder)

Arindam Mallik, December 2007 (Ph.D. in ECE)

- Topic: Holistic Computer Architectures based on Application, User, and Process Characteristics

Pinku Surana, February 2006 (Ph.D. in CS)

- Topic: Meta-compilation of Language Abstractions

Aaron Khoo, April 2003 (Ph.D. in CS)

- Topic: Implementing Efficient Joint Beliefs on Multi-Robot Teams

Masters Committees: Lei Yang, Ai-Hsin Liu, Jack Cosgrove, James Swaine, Tim Zwiebel

Advisor for numerous undergraduate and graduate independent study projects. (CS 399/499 and REUs).

**Director, Computer Science Program in Weinberg College of Arts and Sciences**     *Fall 2008–present*

**Committee chair, Computer Science Undergraduate Curriculum**     *Fall 2006–Fall 2009*

Oversaw major revision of the Northwestern Computer Science curriculum

Available from <http://www.eecs.northwestern.edu/academics/undergraduate/degrees/cscurriculum/>

**Created EECS 395/495, Human-directed Approaches to Computer Systems Problems**, Northwestern University     *Winter 2008*

Graduate course on human interfaces as applied in computer systems

**Created EECS 101, An Introduction to Computer Science For Everyone**, Northwestern University  
*Spring 2007, 2008, 2009, 2010*

<http://www.nucs101.org>

**Created MSIT Short Course, Resource Virtualization and the Enterprise**, Northwestern University  
*Winter 2007, 2010*

Taught by my student, John Lange, in 2009.

**Created EECS 340, Introduction to Networking**, Northwestern University *Fall 2000, Winter 2002, Winter 2003*

Course developed from scratch.

Software developed: Minet user-level network stack.

Project-oriented (web server/tcp/routing) introduction to networking

Courseware and syllabus continues to be used.

**Created EECS 339, Introduction to Databases**, Northwestern University *Fall 2003, 2004, 2005, 2006, 2007*

Course developed from scratch.

Project-oriented (web application, btree+join) introduction to database systems.

**Created EECS 213, Introduction to Computer Systems**, Northwestern University *Fall 2001, Fall 2002, Spring 2005, Fall 2008, Fall 2009*

Course developed from scratch.

In-depth undergraduate introduction to computer systems practice.

Has become a required course in Northwestern CS

**Created EECS 395/495 / 442, Dynamic Behavior of Applications, Hosts, and Networks**, Northwestern University *Winter 2001, Spring 2002, Spring 2003, Spring 2006*

Graduate course in performance analysis of computer systems.

Focus on signal-processing approaches.

**Created EECS 395/495 / 441, Resource Virtualization**, Northwestern University *Winter 2004, Winter 2006, Winter 2009, Winter 2010*

Graduate course in virtual machine technologies.

Highly timely course, one of only a handful in the nation.

**Created (with Robert Dick) ECE 397, Introduction to Real-time Systems**, Northwestern University *Winter 2005*

Course developed from scratch

First ever joint CS/ECE course

Project orientation (sensor network combining pocket pcs and motes)

**Teaching assistant for operating systems**, Carnegie Mellon University *Spring 1995, Spring 1996*  
Designed homeworks, assisted students with programming projects, lectured on special topics

**Co-advisor for undergraduate projects**, Carnegie Mellon University

Advised five undergraduate projects on the iWarp supercomputer radio, HTML parsing, distributed object naming, and web design.

## Publications

## Editing

- R. Figueiredo, P. Dinda, J. Fortes, “Resource Virtualization Renaissance,” Guest Editors’ Introduction to *IEEE Computer Special Issue On Resource Virtualization*, May, 2005.

## Journal Articles

- L. Xia, J. Lange, P. Dinda, C. Bae, “Investigating Virtual Passthrough I/O on Commodity Devices”, *Operating Systems Review*, Volume 43, Number 3, July 2009.
- B. Lin, A. Sundararaj, P. Dinda, “Time-sharing Parallel Applications Through Performance-targetted Feedback-controlled Real-time Scheduling”, *Cluster Computing*, Volume 11, Number 3, September 2008.
- Y. Qiao, D. Lu, Fabian Bustamante, P. Dinda, S. Birrer, “Improving Peer-to-Peer Performance Through Server-Side Scheduling”, accepted by *ACM Transactions on Computer Systems*, Volume 26, Number 4, December, 2008.
- A. Mallik, B. Lin, G. Memik, P. Dinda, R. Dick, “User-driven Frequency Scaling”, *Computer Architecture Letters*, Volume 5, Number 2, July–December, 2006.
- R. Schweller, Z. Li, Y. Chen, Y. Gao, A. Gupta, E. Parsons, Y. Zhang, P. Dinda, M. Kao, G. Memik, “Reversible Sketches: Enabling Monitoring and Analysis over High-speed Data Streams”, *IEEE/ACM Transactions on Networking*, Volume 15, Number 5, October 2007.
- P. Dinda, “Design, Implementation, and Performance of an Extensible Toolkit for Resource Prediction In Distributed Systems,” *IEEE Transactions on Parallel and Distributed Systems*, Volume 17, Number 2, February, 2006.
- P. Dinda, D. Lu, “Fast Compositional Queries in a Relational Grid Information Service,” *Journal of Grid Computing*, Volume 3, Numbers 1-2, June, 2005.
- A. Sundararaj, M. Sanghi, J. Lange, P. Dinda, “An Optimization Problem in Adaptive Virtual Environments,” *Performance Evaluation Review*, Volume 33, Number 2, 2005.
- D. Lu, P. Dinda, “GridG: Generating Realistic Computational Grids,” *Performance Evaluation Review*, Volume 30, Number 4, pages 33–40, 2003.
- P. Dinda, “Online Prediction of the Running Time of Tasks,” *Cluster Computing*, Volume 5, Number 3, 2002, pages 225–236.
- P. Dinda, D. O’Hallaron, “Host Load Prediction Using Linear Models,” *Cluster Computing*, Volume 3, Number 4, Winter, 2000.
- P. Dinda, “The Statistical Properties of Host Load,” *Scientific Programming*, 7:3-4, pages 211–229, Winter, 1999.

## Refereed Conference and Workshop Publications

- J. S. Miller, P. A. Dinda, R. P. Dick, “Evaluating a BASIC Approach to Sensor Network Node Programming”, *Proceedings of 7th ACM Conference on Embedded Networked Sensor Systems (SenSys 2009)*, November, 2009.
- S. Tarzia, R. Dick, P. Dinda, G. Memik, “Sonar-Based Measurement of User Presence and Attention”, *Proceedings of the 11th International Conference on Ubiquitous Computing (UbiComp 2009)*, September, 2009.

- J. S. Miller, J. R. Lange, P. A. Dinda, “EmNet: Satisfying the Individual User Through Empathic Home Networks: Summary”, *Proceedings of the ACM SIGMETRICS '09 Conference on Measurement and Modeling of Computer Systems*, June, 2009.
- S. Tarzia, R. Dick, P. Dinda, G. Memik, “Sonar-Based Measurement of User Attention (poster)”, *Proceedings of the Usenix Annual Technical Confernece (USENIX 2009)*, June, 2009.
- B. Lin, P. Dinda, “Experiences With Scheduling and Mapping Games for Adaptive Distributed Systems: Summary”, *Proceedings of the 6th IEEE International Conference on Autonomic Computing (ICAC 2009)*, June, 2009.
- B. Lin, A. Mallik, P. Dinda, G. Memik, R. Dick, “User- and Process-driven Dynamic Voltage and Frequency Scaling”, *Proceedings of the 2009 IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS 2009)*, April, 2009.
- L. Bai, R. Dick, P. Dinda, “Archetype-Based Design: Sensor Network Programming for Application Experts, Not Just Programming Experts”, *Proceedings of the International Conference on Information Processing in Sensor Networks (IPSN 2009)*, April, 2009.
- L. Xia, J. Lange, P. Dinda, “Towards Virtual Passthrough I/O on Commodity Devices”, *Proceedings of the first Workshop on I/O Virtualization at OSDI (WIOV 2008)*, December, 2008.
- A. Shye, Y. Pan, B. Scholbrock, J. Miller, G. Memik, P. Dinda, R. Dick, “Power to the People: Leveraging Human Physiological Traits to Control Microprocessor Frequency,” *Proceedings of the 41st Annual IEEE/ACM International Symposium on Microarchitecture (MICRO 2008)*, November, 2008.
- J. Lange, P. Dinda, S. Rossoff, “Experiences With Client-based Speculative Remote Display,” *Proceedings of the USENIX Annual Technical Conference (USENIX 2008)*, June, 2008.
- A. Shye, B. Oziskyilmaz, A. Mallik, G. Memik, P. Dinda, R. Dick, A. Choudhary, “Learning and Leveraging the Relationship Between Architecture-level Measurements and Individual User Satisfaction,” *Proceedings of the 35th ACM/IEEE International Symposium on Computer Architecture (ISCA 2008)*, June, 2008.
- A. Mallik, J. Cosgrove, R. Dick, G. Memik, P. Dinda, “PICSEL: Measuring User-Perceived Performance to Control Dynamic Frequency Scaling,” *Proceedings of the 13th International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS 2008)*, March, 2008.
- A. Shye, L. Yang, X. Chen, B. Oziskyilmaz, A. Mallik, B. Lin, G. Memik, P. Dinda, R. Dick, “Empathic Computer Architectures and Systems”, *ASPLOS Wild and Crazy Ideas Session (WACI-VI)*, March, 2008.
- J. Lange, P. Dinda, F. Bustamante, “Vortex: Enabling Cooperative Selective Wormholing for Network Security Systems”, *Proceedings of the 10th International Symposium on Recent Advances in Intrusion Detection (RAID 2007)*, September, 2007.
- J. Lange, P. Dinda, “Transparent Network Services via a Virtual Traffic Layer for Virtual Machines”, *Proceedings of the 16th IEEE International Symposium on High Performance Distributed Computing (HPDC 2007)*, June, 2007.
- B. Lin, A. Sundararaj, P. Dinda, “Time-sharing Parallel Applications With Performance Isolation and Control”, *Proceedings of the 4th IEEE International Conference on Autonomic Computing (ICAC 2007)*, June, 2007.

- B. Lin, A. Mallik, P. Dinda, G. Memik, R. Dick, "Power Reduction Through Measurement and Modeling of Users and CPUs: Summary", *Proceedings of the ACM SIGMETRICS '07 Conference on Measurement and Modeling of Computer Systems*, June, 2007.
- P. Dinda, G. Memik, R. Dick, B. Lin, A. Mallik, A. Gupta, S. Rossoff, "The User In Experimental Computer Systems Research", *Proceedings of the 1st International Workshop on Experimental Computer Science (ExpCS 2007)*, June, 2007.
- S. Jevtic, M. Kotowsky, R. Dick, P. Dinda, C. Dowding, "Lucid Dreaming: Reliable Analog Event Detection for Energy-Constrained Applications," *Proceedings of the International Conference on Information Processing in Sensor Networks (IPSN/SPOTS 2007)*, April, 2007.
- B. Lin, and P. Dinda, "Towards Scheduling Virtual Machines Based On Direct User Input," *Proceedings of the IEEE/ACM Workshop on Virtualization Technologies in Distributed Computing (VTDC 2006)*, November, 2006.
- A. Sundararaj, M. Sanghi, J. Lange, and P. Dinda, "Hardness of Approximation and Greedy Algorithms for the Adaptation Problem In Virtual Environments (short paper)", *Proceedings of the 3rd IEEE International Conference on Autonomic Computing (ICAC 2006)*, June, 2006.
- A. Gupta, M. Zangrilli, A. Sundararaj, A. Huang, P. Dinda, and B. Lowekamp, "Free Network Measurement for Adaptive Virtualized Distributed Computing," *Proceedings of the 20th International Parallel and Distributed Processing Symposium (IPDPS 2006)*, April, 2006. (A poster appeared in ACM/IEEE SC 2005).
- R. Schweller, Z. Li, Y. Chen, Y. Gao, A. Gupta, Y. Zhang, P. Dinda, M. Kao, G. Memik, "Reverse Hashing for High-speed Network Monitoring: Algorithms, Evaluation, and Applications," *Proceedings of 25th Annual Joint Conference of the IEEE Computer and Communications Societies (Infocom 2006)*, April, 2006.
- B. Lin, P. Dinda, "VSched: Mixing Batch and Interactive Virtual Machines Using Periodic Real-time Scheduling," *Proceedings of ACM/IEEE SC (Supercomputing 2005)*, (Seattle, Washington), November, 2005.
- D. Lu, P. Dinda, Y. Qiao, H. Sheng, "Effects and Implications of File Size/Service Time Correlation on Web Server Scheduling Policies," *Proceedings of the 13th IEEE/ACM International Symposium on Modeling, Analysis, and Simulation of Computer and Telecommunication Systems (MASCOTS 2005)*, (Atlanta, Georgia), September, 2005.
- A. Gupta, P. Dinda, F. Bustamante, "Distributed Popularity Indices (poster)," *Proceedings of ACM SIGCOMM 2005*, (Philadelphia, Pennsylvania), August, 2005.
- A. Sundararaj, A. Gupta, P. Dinda, "Increasing Application Performance In Virtual Environments Through Run-time Inference and Adaptation," *Proceedings of the 14th IEEE International Symposium on High Performance Distributed Computing (HPDC 2005)*, (Research Triangle Park, North Carolina), July, 2005.
- J. Lange, A. Sundararaj, P. Dinda, "Automatic Dynamic Run-time Optical Network Reservations," *Proceedings of the 14th IEEE International Symposium on High Performance Distributed Computing (HPDC 2005)*, (Research Triangle Park, North Carolina), July, 2005.
- A. Sundararaj, M. Sanghi, J. Lange, P. Dinda, "An Optimization Problem in Adaptive Virtual Environments," *Proceedings of the Seventh Workshop on Mathematical Performance Modeling and Analysis (MAMA 2005)*, (Banff, Alberta), June, 2005.

- D. Lu, Y. Qiao, P. Dinda, F. Bustamante, "Characterizing and Predicting TCP Throughput on the Wide Area Network," *Proceedings of the 25th International Conference on Distributed Computing (ICDCS 2005)*, (Columbus, Ohio), June, 2005.
- A. Gupta, M. Sanghi, P. Dinda, F. Bustamante, "Magnolia: A Novel DHT Architecture For Keyword-based Searching (poster)," *Proceedings of the Second Symposium on Networked Systems Design and Implementation (NSDI 2005)*, (Boston, Massachusetts), May, 2005.
- S. Birrer, F. Bustamante, D. Lu, P. Dinda, and Y. Qiao, "FatNemo: Multi-Source Multicast Overlay Fat-Tree (poster)," *Proceedings of the Second Symposium on Networked Systems Design and Implementation (NSDI 2005)*, (Boston, Massachusetts), May, 2005.
- D. Lu, Y. Qiao, P. Dinda, F. Bustamante, "Modeling and Taming Parallel TCP on the Wide Area Network," *Proceedings of the 19th IEEE International Parallel and Distributed Processing Symposium (IPDPS 2005)*, (Denver, Colorado), April, 2005.
- B. Lin, P. Dinda, D. Lu, "User-driven Scheduling of Interactive Virtual Machines," *Proceedings of the Fifth International Workshop on Grid Computing (Grid 2004)*, (Pittsburgh, Pennsylvania), November, 2004.
- P. Dinda, "Addressing the Trust Asymmetry Problem In Grid Computing With Encrypted Computation," *Proceedings of the Seventh Workshop on Languages, Compilers and Run-time Support for Scalable Systems (LCR 2004)*, (Houston, Texas), October, 2004.
- A. Sundararaj, A. Gupta, P. Dinda, "Dynamic Topology Adaptation of Virtual Networks of Virtual Machines," *Proceedings of the Seventh Workshop on Languages, Compilers and Run-time Support for Scalable Systems (LCR 2004)*, (Houston, Texas), October, 2004.
- Y. Qiao, D. Lu, F. Bustamante, P. Dinda, "Looking at the Server Side of Peer-to-Peer System," *Proceedings of the Seventh Workshop on Languages, Compilers and Run-time Support for Scalable Systems (LCR 2004)*, (Houston, Texas), October, 2004.
- D. Lu, H. Sheng, P. Dinda, "Size-based Scheduling Policies With Inaccurate Scheduling Information," *Proceedings of the 12th IEEE/ACM International Symposium on Modeling, Analysis, and Simulation of Computer and Telecommunication Systems (MASCOTS 2004)* (Vollendam, Netherlands), October, 2004. (Top 9% of accepted papers.)
- D. Lu, P. Dinda, Y. Qiao, H. Sheng, and F. Bustamante, "Applications of SRPT Scheduling with Inaccurate Information" (short publication), *Proceedings of the 12th IEEE/ACM International Symposium on Modeling, Analysis, and Simulation of Computer and Telecommunication Systems (MASCOTS 2004)*, (Vollendam, Netherlands), October, 2004.
- S. Birrer, D. Lu, F. Bustamante, Y. Qiao, P. Dinda, "FatNemo: Building a Resilient Multi-Source Multicast Fat-Tree", *Proceedings of the 9th International Workshop on Web Content Caching and Distribution (WCCD 2004)*, (Beijing, China), October, 2004.
- A. Gupta, B. Lin, P. Dinda, "Measuring and Understanding User Comfort with Resource Borrowing", *Proceedings of the 13th IEEE Symposium on High-Performance Distributed Computing (HPDC 2004)*, (Honolulu, Hawaii), June, 2004.
- Y. Qiao, J. Skicewicz, P. Dinda, "An Empirical Study of the Multiscale Predictability of Network Traffic", *Proceedings of the 13th IEEE Symposium on High-Performance Distributed Computing (HPDC 2004)*, (Honolulu, Hawaii), June, 2004.

- B. Cornell, P. Dinda, F. Bustamante, “Wayback: A User-level Versioning File System For Linux”, *Proceedings of the 2004 USENIX Technical Conference*, (Boston, Massachusetts), June, 2004. (Voted Best Paper of the Freenix Track)
- A. Sundararaj, P. Dinda, “Towards Virtual Networks for Virtual Machine Grid Computing”, *Proceedings of the Third USENIX Virtual Machine Research and Technology Symposium (VM 2004)*, (San Jose, California), May, 2004.
- D. Lu, P. Dinda, J. Skicewicz “Scoped and Approximate Queries in a Relational Grid Information Service”, *Proceedings of the Fourth Workshop on Grid Computing (Grid 2003)*, (Phoenix, Arizona), November, 2003.
- P. Dinda, D. Lu, “Nondeterministic Queries in a Relational Grid Information Service”, *Proceedings of Supercomputing 2003*, (Phoenix, Arizona), November, 2003.
- D. Lu, P. Dinda “Synthesizing Realistic Computational Grids”, *Proceedings of Supercomputing 2003*, (Phoenix, Arizona), November, 2003.
- R. Figueiredo, P. Dinda, J. Fortes, “A Case For Grid Computing On Virtual Machines,” *Proceedings of the 23rd International Conference on Distributed Computing Systems (ICDCS 2003)*, (Providence, Rhode Island), May, 2003.
- P. Dinda, B. Plale, “A Unified Relational Approach to Grid Information Services (short publication),” *Proceedings of the 23rd International Conference on Distributed Computing Systems (ICDCS 2003)*, (Providence, Rhode Island), May, 2003.
- B. Plale, P. Dinda, G. von Laszewski, “Key Concepts and Services of a Grid Information Service”, *Proceedings of the 15th International Conference on Parallel and Distributed Computing Systems (PDCS 2002)*, (Louisville, Kentucky), September, 2002.
- M. Knop, J. Schopf, P. Dinda, “Windows Performance Monitoring and Data Reduction Using Watch-Tower”, *Proceedings of the Workshop on Self-Healing, Adaptive, and sel-Managed Systems (SHAMAN 2002)*, (New York, New York), June, 2002.
- P. Dinda, “A Prediction-based Real-time Scheduling Advisor”, *Proceedings of the 2002 International Parallel and Distributed Processing Symposium (IPDPS 2002)*, (Fort Lauderdale, Florida), pages 10–, April, 2002.
- P. Dinda, “Exploiting Packet Header Redundancy for Zero Cost Dissemination of Dynamic Resource Information”, *Proceedings of the 6th Workshop on Languages, Compilers, and Run-time Systems for Scalable Computers (LCR 2002)*, (Washington, DC), Springer LNCS, March, 2002.
- D. Lu, P. Dinda, “Virtualized Audio: A Highly Adaptive Interactive High Performance Computing Application”, *Proceedings of the 6th Workshop on Languages, Compilers, and Run-time Systems for Scalable Computers (LCR 2002)*, (Washington, DC), Springer LNCS, March, 2002.
- M. Knop, P. Paritosh, P. Dinda, J. Schopf, “Windows Performance Monitoring and Data Reduction Using WatchTower and Argus (short publication)”, *Proceedings of Supercomputing 2001*, (Denver, Colorado), November, 2001.
- P. Dinda, “Online Prediction of the Running Time of Tasks”, *Proceedings of the 10th IEEE Symposium on High-Performance Distributed Computing (HPDC '01)*, (San Francisco, California), pages 383–394, August, 2001.
- P. Dinda, B. Garcia, K. Leung, “The Measured Network Traffic of Compiler-Parallelized Programs, *Proceedings of the 30th International Conference on Parallel Processing (ICPP 2001)*, (Valencia, Spain), pages 175–184, September, 2001.

- J. Skicewicz, P. Dinda, J. Schopf, “Multi-resolution Resource Behavior Queries Using Wavelets”, *Proceedings of the 10th IEEE Symposium on High-Performance Distributed Computing (HPDC '01)*, (San Francisco, California), pages 395–405, August, 2001.
- P. Dinda, T. Gross, R. Karrer, B. Lowekamp, N. Miller, P. Steenkiste, D. Sutherland, “The Architecture of the Remos System”, *Proceedings of the 10th IEEE Symposium on High-Performance Distributed Computing (HPDC '01)*, (San Francisco, California), pages 252–265, August 2001.
- P. Dinda, “Online Prediction of the Running Time of Tasks: Summary”, *Proceedings of the ACM SIGMETRICS '01 Conference on Measurement and Modeling of Computer Systems*, (Boston, Massachusetts), pages 336–337, June, 2001.
- P. Dinda, D. O'Hallaron, “Realistic CPU Workloads Through Host Load Trace Playback”, *Proceedings of the 5th Workshop on Languages, Compilers, and Run-time Systems for Scalable Computers (LCR 2000)*, (Rochester, NY), Springer LNCS 1915, pages 265–280, May, 2000.
- P. Dinda, D. O'Hallaron, “An Evaluation of Linear Models for Host Load Prediction,” *Proceedings of the 8th IEEE Symposium on High-Performance Distributed Computing (HPDC '99)* (Redondo Beach, California), pages 87–96, August, 1999.
- A. Myers, P. Dinda, H. Zhang, “Performance Characteristics of Mirror Servers on the Internet,” *Proceedings of Eighteenth Annual Joint Conference of the IEEE Computer and Communications Societies (Infocom 1999)* (New York, New York), pages 304–312, March, 1999.
- P. Dinda, B. Lowekamp, L. Kallivokas, D. O'Hallaron, “The Case for Prediction-based Best-effort Real-time Systems,” *Proceedings of the 7th International Workshop on Parallel and Distributed Real-time Systems (WPDRTS '99)* (San Juan, Puerto Rico), pages 309–318, March, 1999.
- P. Dinda, “The Statistical Properties of Host Load,” *Proceedings of the 4th Workshop on Languages, Compilers, and Run-time Systems for Scalable Computers (LCR '98)* (Pittsburgh, Pennsylvania), pages 319–334, May, 1998.
- P. Dinda, D. O'Hallaron, “Fast Message Assembly Using Compact Address Relations,” *Proceedings of the ACM SIGMETRICS '96 Conference on Measurement and Modeling of Computer Systems* (Philadelphia, Pennsylvania), pages 47–56, May, 1996.
- P. Dinda, D. O'Hallaron, J. Subhlok, J. Webb, B. Yang, “Language and Run-time Support for Network Parallel Computing,” *Proceedings of the 8th International Workshop on Languages and Compilers for Parallel Computing (LCPC '95)* (Columbus, Ohio), pages 534–550, August, 1995.
- P. Dinda, D. O'Hallaron, “The Performance Impact of Address Relation Caching,” *Proceedings of the 3rd Workshop on Languages, Compilers, and Run-time Systems for Scaleable Computers (LCR '95)* (Troy, New York), pages 213–226, May, 1995.
- J. Subhlok, D. O'Hallaron, T. Gross, P. Dinda, J. Webb, “Communication and Memory Requirements as the Basis for Mapping Task and Data Parallel Programs,” *Proceedings of Supercomputing '94* (Washington, DC), pages 330–339, November, 1994.

#### **Invited Papers**

- P. Dinda, “Virtualized Audio as a Distributed Interactive Application,” *Proceedings of the Access Grid Technical Retreat 2001*, (Argonne, IL), January, 2001.

M. Aeschlimann, P. Dinda, L. Kallivokas, J. Lopez, B. Lowekamp, D. O'Hallaron, "Preliminary Report on the Design of a Framework for Distributed Visualization," *Proceedings of the International Conference on Parallel and Distributed Processing Techniques and Applications (PDPTA'99)* (Las Vegas, Nevada), pages 1833–1839, June, 1999.

P. Dinda, "Network Personal Computing for World Simulation," Intel Fellowship Forum, 1996.

#### **Standards-related Documents**

P. Dinda, B. Plale, "A Unified Relational Approach to Grid Information Services," Global Grid Forum Informational Draft GWD-GIS-012-1.

#### **Non-overlapping Technical Reports**

J. Lange, K. Pedretti, T. Hudson, P. Dinda, Z. Cui, L. Xia, P. Bridges, S. Jaconette, M. Levenhagen, R. Brightwell, P. Widener, "Palacios and Kitten: High Performance Operating Systems For Scalable Virtualized and Native Supercomputing", Technical Report NWU-EECS-09-14, Department of Electrical Engineering and Computer Science, Northwestern University, July, 2009.

J. Lange, P. Dinda, "An Introduction to the Palacios Virtual Machine Monitor—Release 1.0", Technical Report NWU-EECS-08-11, Department of Electrical Engineering and Computer Science, Northwestern University, November, 2008.

S. Rossoff, P. Dinda, "Prospects for Speculative Remote Display", Technical Report NWU-EECS-06-08, Department of Electrical Engineering and Computer Science, Northwestern University, August, 2006.

B. Lin, P. Dinda, "Putting the User in Direct Control of CPU Scheduling", Technical Report NWU-EECS-06-07, Department of Electrical Engineering and Computer Science, Northwestern University, July, 2006.

A. Sundararaj, M. Sanghi, J. Lange, P. Dinda, "Hardness of Approximation and Greedy Algorithms for the Adaptation Problem In Virtual Environments", Technical Report NWU-EECS-06-06, Department of Electrical Engineering and Computer Science, Northwestern University, July, 2006,

A. Shoykhet, J. Lange, P. Dinda, "Virtuoso: A System For Virtual Machine Marketplaces", Technical Report NWU-CS-04-39, Department of Computer Science, Northwestern University, August, 2004.

A. Gupta, B. Lin, P. Dinda, "A Framework and Toolkit for Understanding User Comfort with Resource Borrowing", Technical Report NWU-CS-04-28, Department of Computer Science, Northwestern University, February, 2004.

J. Skicewicz, P. Dinda, "Tsunami: A Wavelet Toolkit for Distributed Systems", Technical Report NWU-CS-03-16, Department of Computer Science, Northwestern University, September, 2003.

Y. Qiao, P. Dinda, "Network Traffic Analysis, Classification, and Prediction", Technical Report NWU-CS-02-11, Department of Computer Science, Northwestern University, January, 2003.

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- P. Dinda, "The Minet User-level Network Stack," Technical Report NWU-CS-02-08, Department of Computer Science, Northwestern University, January, 2002.
- M. Knop, P. Paritosh, P. Dinda, J. Schopf, "Windows Performance Monitoring and Data Reduction Using WatchTower and Argus," Technical Report NWU-CS-01-06, Department of Computer Science, Northwestern University, July, 2001.
- P. Dinda, D. O'Hallaron, "An Extensible Toolkit for Resource Prediction In Distributed Systems," Technical Report CMU-CS-99-138, School of Computer Science, Carnegie Mellon University, July, 1999.
- P. Dinda, G. Necula, M. Price, "MacFS: A Portable Macintosh File System Library," Technical Report CMU-CS-98-145, School of computer Science, Carnegie Mellon University, July, 1998.
- P. Dinda, T. Gross, D. O'Hallaron, E. Segall, J. Stichnoth, J. Subhlok, J. Webb, B. Yang, "The CMU task parallel program suite," Technical Report CMU-CS-94-131, School of Computer Science, Carnegie Mellon University, March, 1994

## Presentations

### Contributed Presentations

- "User- and Process-Driven Dynamic Voltage and Frequency Scaling", *ISPASS 2009*, April, 2009.
- "The User in Experimental Computer Systems Research", *ExpCS 2007*, June 2007.
- "Characterizing and Predicting TCP Throughput on the Wide Area Network", *ICDCS 2005*, June, 2005.
- "Addressing the Trust Asymmetry Problem in Grid Computing With Encrypted Computation", *LCR 2004*, October, 2004.
- "Nondeterministic Queries in a Relational Grid Information Service", *Supercomputing 2003*, November, 2003.
- "A Unified Relational Approach to Grid Information Services", *23rd International Conference on Distributed Computing Systems (ICDCS 2003)*, Providence, Rhode Island, May, 2003.
- "A Prediction-based Real-time Scheduling Advisor," *2002 International Parallel and Distributed Processing Symposium (IPDPS 2002)*, Fort Lauderdale, Florida, April, 2002.
- "Exploiting Packet Header Redundancy for Zero Cost Dissemination of Dynamic Resource Information," *6th Workshop on Languages, Compilers, and Run-time Systems for Scalable Computers (LCR 2002)*, Washington, D.C., March, 2002.
- "The Measured Network Traffic of Compiler-parallelized Programs," *30th International Conference on Parallel Processing (ICPP 2001)*, Valencia, Spain, September 5, 2001.
- "Online Prediction of the Running Time of Tasks," *10th IEEE Symposium on High-Performance Distributed Computing (HPDC '01)*, San Francisco, California, August 9, 2001.
- "Online Prediction of the Running Time of Tasks: Summary," *ACM SIGMETRICS '01 Conference on Measurement and Modeling of Computer Systems*, Boston, Massachusetts, June 19, 2001.
- "Realistic CPU Workloads Through Host Load Trace Playback," *5th Workshop on Languages, Compilers, and Run-time Systems for Scalable Computers (LCR 2000)*, Rochester, NY, May 20, 2000.

- “An Evaluation of Linear Models for Host Load Prediction,” *8th IEEE Symposium on High-Performance Distributed Computing (HPDC '99)*, Redondo Beach, California, August 3, 1999.
- “The Case for Prediction-based Best-effort Real-time Systems,” *7th International Workshop on Parallel and Distributed Real-time Systems (WPDRTS '99)*, San Juan, Puerto Rico, April 13, 1999.
- “The Statistical Properties of Host Load,” *4th Workshop on Languages, Compilers, and Run-time Systems for Scalable Computers (LCR '98)*, Pittsburgh, Pennsylvania, May 30, 1998.
- “Fast Message Assembly Using Compact Address Relations,” *ACM SIGMETRICS '96 Conference on Measurement and Modeling of Computer Systems*, Philadelphia, Pennsylvania, May 24, 1996.
- “Language and Run-time Support for Network Parallel Computing,” *8th International Workshop on Languages and Compilers for Parallel Computing (LCPC '95)*, Columbus, Ohio, August 12, 1995.
- “The Performance Impact of Address Relation Caching,” *3rd Workshop on Languages, Compilers, and Run-time Systems for Scalable Computers (LCR '95)*, Troy, New York, May 23, 1995.

### **Invited Presentations**

- “From Autonomic Systems to Empathic Autonomic Systems”, HotAC III Workshop, 2008.
- “The User in Experimental Computer Systems Research”, Iowa State University, 2007.
- “The User in Experimental Computer Systems Research”, University of California, Santa Barbara, 2007.
- “The User in Experimental Computer Systems Research”, DSL Workshop, University of Chicago, 2007.
- “Adaptive Virtual Networking For Virtual Machine Distributed Computing”, University of Florida, August, 2004.
- “Virtuoso: Distributed Computing Using Virtual Machines”, Toyota Technological Institute, University of Chicago, Chicago, Illinois, May, 2004.
- “Virtuoso: Distributed Computing Using Virtual Machines”, Fermilab, Batavia, Illinois, August, 2003.
- “Virtuoso: Distributed Computing Using Virtual Machines”, Purdue University, West Lafayette, Indiana, June, 2003.
- “An Introduction to the Prescience Lab”, University of Chicago, Chicago, Illinois, December, 2002.
- “An Introduction to the Prescience Lab”, Indiana University, Bloomington, Indiana, December, 2002.
- “A Prediction-based Approach to Distributed Interactive Applications”, Illinois Institute of Technology, Chicago, Illinois, November 5, 2001.
- “A Unified Relational Approach to Grid Information Services,” First Global Grid Forum, Amsterdam, March 6, 2001.
- “Virtualized Audio as a Distributed Interactive Application,” Access Grid Technical Retreat 2001, Argonne, IL, January 30, 2001.
- “Load Prediction for Best-effort Real-time,” *Poster for ARPA Quorum PI Meeting*, San Diego, CA, July 11, 1998.

“Load Analysis and Prediction for Responsive Interactive Applications,” *ARPA Site visit (Gary Koob)*, Pittsburgh, PA, April 14, 1998.

“Responsive Interactive Applications by Dynamic Mapping of Activation Trees,” *BBN Technologies*, Cambridge, Massachusetts, February 20, 1998.

“Distributed User-centric Applications,” *Intel Fellowship Forum*, Santa Clara, California, May, 1996.

“PVM-based Implementations of Fx and Archimedes,” *PVM Users’ Group Meeting*, Pittsburgh, Pennsylvania, May 7, 1995.

## Grants

“CSR-PDOS: Optimizing the Client/Server Environment Subject to User Satisfaction”, NSF CNS-0720691, September 2007 through August, 2010, \$742,000. (Includes \$22K in REU funds. This project is in collaboration with Gokhan Memik at Northwestern and Robert Dick at University of Michigan).

“Collaborative Research: Community Resource Development: An Open Source Extensible Virtual Machine Monitor”, NSF CNS-0709168, September 2007 through August, 2011, \$528,000. (Includes \$28K in REU funds. This project is in collaboration with Fabian Bustamante and Russ Joseph at Northwestern, and Patrick Bridges at the University of New Mexico. The total amount is approximately \$828,000).

“Collaborative Research: NeTS-NOSS: Sensor Network Synthesis—Opening the Use of Sensor Networks to Application Experts”, NSF CNS-0721978, September 2007 through August, 2010, \$462,000. (Includes \$12K in REU funds. This project is in collaboration with Charles Dowding, and Larry Henschen at Northwestern, Robert Dick at the University of Michigan, and Pai Chou at the University of California Irvine. The total amount is approximately \$612,000).

“Towards an Extensible Virtual Machine Monitor for Modern Architectures”, Subcontract, via ORNL, of DOE DE-AC05-00OR22725, March, 2007 through September, 2007, \$25,000.

“Graduate Research Seminar in Computer Science and Computer Engineering”, Symantec Corporation. Amount confidential.

“Integrated Modular Trustworthy Computing Curriculum Development”, Microsoft Trustworthy Computing Award, March, 2006, \$50,000. (This project is in collaboration with Fabian Bustamante, Yan Chen, and Aleksander Kuzmanovic).

“A Virtual Lab for Experimental Systems Education”, Northwestern University Murphy Society Award, October, 2005, \$35,750. (This project is in collaboration with Fabian Bustamante, Yan Chen, Brian Dennis, and Aleksandar Kuzmanovic).

“Collaborative Research on Wide Area Network Computing using Virtual Machines”, NSF EIA (Equipment) award EIA-0224449, November 15, 2002 to November 14, 2005, \$182,000. (Includes \$25K in REU funds. This grant is in collaboration with Jose Fortes and Renato Figueiredo at the University of Florida. The total amount is approximately \$500,000.)

Equipment gift from Dell Corporation, October, 2002, \$20,000.

“DOT — Distributed Optical Testbed to Facilitate the Development of Techniques for Efficient Execution of Distributed Applications”, NSF EIA (Equipment) Award EIA-0224427, \$279,000, September 1, 2002 to August 31, 2005. (This grant is in collaboration with Valerie Taylor and Alok Choudhary of Northwestern’s Electrical and Computer Engineering Department and Joel Mambretti of the International Center for Advanced Internet Research.)

“Collaborative Research: Resource and Data Management for Virtualized End-resources on Computational Grids,” NSF Middleware Initiative Award (NSF NMI) ANI-0222749, November 15, 2002 to August 31, 2006, \$250,000. (This grant is in collaboration with Jose Fortes and Renato Figueiredo at the University of Florida. This figure represents my portion of a total of over \$700,000.)

“A Unified Relational Approach to Grid Information Services,” NSF ITR Award ACI-0112891, September 15, 2001 to September 14, 2005, \$267,000. (This is one of two collaborative research grants on this topic. My collaborator is Beth Plale at Indiana University. The figure represents my portion of a total of over \$460,000. Funds include \$38K in REU funds.)

“A Shared Data Cluster for Real Time Interaction With Massive Datasets,” NSF EIA (Equipment) Award EIA-0130869, \$158,000, September 1, 2001 to August 31, 2003. (In collaboration with Ben Watson and Brian Dennis.)

“A Prediction-based Approach to Distributed Interactive Applications,” NSF CAREER Award ANI-0093221, September 1, 2001 to August 31, 2006, \$572,000. (This figure includes REU funds of 572 approximately \$72,000.)

## **Service**

Program committee chair, HPDC 2010

Program committee member, MTAGS 2009

Program committee member, CCGrid 2009

Program committee member, Cluster 2009

Program committee member, MMCS 2009

Program committee member, HPDC 2009

Program committee member, ICAC 2009

Program committee member, CCGrid 2009

Program committee member, VTDC 2009

Program committee member, HPCVirt 2009

Program committee member, MTAGS 2008

Program committee member, HPDC 2008

Program committee member, CCGrid 2008

Program committee member, VTDC 2007

Program committee member, XHPC/VHPC 2007

Program committee member, HPCVirt 2007

Program committee member, IWQoS 2007

Program committee member, CCGrid 2007

Program committee member, ICPP 2007

Program committee member, VTDC 2006

Program committee member, GridNets 2006

Program committee member, IEEE Cluster 2006

Program committee member of Supercomputing 2006 (SC 2006)

Program committee member of HPDC 2006

Panelist, Whole System Virtualization in High End Computing Systems, HPDC 2005

Program vice-chair, IEEE Cluster 2005

Program committee member of VECPAR 2005

Member, National Science Foundation Major Research Instrumentation Panel, 2005.

Program committee member of ICGNS 2005

Program committee member of Supercomputing 2005 (SC 2005)

Program committee member of HPDC 2005

Guest Editor, IEEE Computer special issue on virtualization (May, 2005)

Program committee member of LCR 2004

Program committee member of IEEE Cluster 2004

Program committee member of HPDC 2004

Member, Department of Energy Middleware and Networking Review Panel, Summer, 2003.

Co-founder and co-chair of the Relational Grid Information Services Research Group in the Global Grid Forum (GGF RGIS RG).

Program committee member of Grid 2003

Program committee member of Supercomputing 2003 (SC 2003)

Session chair, Resource Monitoring, HPDC 2003

Program committee member of HPDC 2003

Member, National Science Foundation Advanced Computing Research Panel, Fall 2002.

Program committee member of IEEE Cluster 2002

Session chair, Reliable Systems and Networks, ICPP 2001

Program committee member of ICPP 2001

Program committee member for CMU's SOCS Conference 1999

Reviewer for SIGMETRICS, HPDC, IPDPS, IPPS, ICPP, Supercomputing, SPAA, ISCA, IEEE Network, SIGMM, IEEE TON, IEEE TOC, JPDC, TPDS, MASCOTS, Parallel Computing, and others.

Proposal review for NSF, DOE, NWO (Dutch National Science Foundation)

Contributor to two ARPA Quorum PI Meetings.

Northwestern University Faculty Reappointment, Promotion, and Tenure Denial Appeal Panel

Northwestern McCormick School Curriculum Committee

Northwestern McCormick School Space and Strategic Resources Committee

Northwestern EECS Department, Chair of CS Curriculum Committee

Northwestern EECS Department committees: CS Curriculum, Computing, Distinguished Lecture Series

Northwestern CS Department committees: Space, Computing, Chair Search, Faculty Search

Participant in Carnegie Mellon University's Immigration Course Research Symposium, 1994–1996.

Member of ACM, IEEE, and History of Science Society.

Co-founder and secretary of CMU Photographic Society, 1993-1995.

## **Honors**

Coach of ACM ICPC World Finalist Team 2007–2008

Invitee, NAE U.S Frontiers of Engineering Conference, 2007

Best Teacher of the 2006–2007 academic year, Department of EECS, Northwestern University

Coach of ACM ICPC World Finalist Team 2006–2007

Best paper of the Freenix Track of USENIX 2004 (with Brian Cornell and Fabian Bustamante)

Lisa Wissner-Slivka and Benjamin Slivka Junior Professor of Computer Science, 2003-2006.

NSF CAREER, 2001.

Intel Foundation Fellowship, 1996-1997

Carnegie Mellon School of Computer Science Fellowship, 1993–1999

George P. Ryan Scholarship, 1988–1992

Alexander DeLorenzo Scholarship, 1988–1989

Villas Scholarship, 1988

## **Collaborators**

Fabian Bustmante, Northwestern University

Yan Chen, Northwestern University

Gokhan Memik, Northwestern University

Russ Joseph, Northwestern University

Aleksander Kuzmanovic, Northwestern University

Robby Findler, Northwestern University

Charles Dowding, Northwestern University

Ben Watson, Northwestern University

Robert Dick, University of Michigan

Pai Chou, University of California, Santa Barbara

Arthur Maccabe, Oak Ridge National Labs

Patrick Bridges, University of New Mexico

Bruce Lowekamp, College of William and Mary

Valerie Taylor, Texas A&M

Renato Figuerido, University of Florida

Jose Fortes, University of Florida

Beth Plale, Indiana University

David O'Hallaron, Carnegie Mellon University

Jennifer Schopf, Argonne National Labs

## **References**

Available on request.

October, 2009