

Pradeep Padala

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EDUCATION

- Ph.D., Computer Science and Engineering
University of Michigan, Ann Arbor, Michigan, USA. Advisor: Kang G. Shin. GPA: **7.65/8.0**
- M.S., Computer Science and Engineering, Dec 2003
University of Florida, Gainesville, Florida, USA. GPA: **4.0/4.0**
- Bachelor of Engineering, Computer Science and Engineering, Aug 2000
Motilal Nehru Regional Engineering College, Allahabad, Uttar Pradesh, India. Aggregate: 80.66%

AWARDS and HONORS

- HP labs open innovation research grant for large-scale data center management. Co-authored the proposal. Aug 2008 - Aug 2009
- Second prize at Yahoo's HackU event, 2009
- HP labs research grant including donation of 16 C-class blades for RTCL lab. Aug 2006 - Apr 2007
- Google Summer of Code 2005 grant.
- Allahabad University merit scholarship, 1996-2000
- Andhra Pradesh state scholarship for placing **7th in the state** in the XII class public examination (out of approximately 200,000 students), 1996-2000
- Mementos, medals and cash prizes for placing **4th in the state** in the X class public examination (out of approximately 500,000 students)

RESEARCH EXPERIENCE

- **Research Assistant, EECS, University of Michigan** **Sep 2004 – Current**
 - Developed a framework for automating the control of a virtualized data center. The framework combines all the controllers developed in previous years. Appeared in **Eurosys'09**.
 - Evaluated and analyzed the performance of virtualization technologies Xen and OpenVZ. This work focused on understanding the core differences in hypervisor-based and container-based virtualization. Our tech report on this work got **slashdotted** and received nearly **10,000 hits** in May'07.
 - Tested the adaptive control framework in a large-scale testbed consisting of at least 200 nodes. This is part of the **open innovation research proposal** to HP Labs.
- **Research Intern, HP Labs, Palo Alto** **May 2008 – Aug 2008**

Developed an adaptive MIMO controller for HP XP disk array. This work focused on developing mechanisms for controlling large scale shared storage systems to achieve certain application performance. This work is in the process of being transferred to **HP's storage works division**. Will appear in **FEBID'09**.
- **Research Intern, HP Labs, Palo Alto** **May 2007 – Aug 2007**

Developed a framework for MIMO control of multiple resources. This work focused on developing strong control theory based framework that allows control of multiple applications sharing multiple resources. Appeared in **CDC'07**.
- **Research Intern, HP Labs, Palo Alto** **May 2006 – Sep 2006**

Developed a CPU controller for controlling multiple multi-tier applications hosted in a shared virtualized environment. Appeared in **Eurosys'07**. A simpler version of the controller is implemented in **HP's WLM** (workload manager).
- **Summer of Code Participant, Google Summer of Code** **May 2005 – Sep 2005**

Developed a log-structured file system for Linux that supports snapshots. The traditional implementation of LogFS is extended to support snapshots and experimental evaluation is done to validate the benefits of LogFS over traditional file systems like ext2.
- **Research Assistant, Department of Physics, University of Florida** **May 2003 – Aug 2004**

Sphinx is a scheduling middleware that provides various features for scheduling jobs on a grid with

dynamic resources. It uses policy based execution and data scheduling to provide near optimal execution of work flows. This project is developed under the auspices of the **GriPhyN (Grid Physics Network)** project. A demonstration of the scheduler in a large-scale experimental testbed is shown in **SC'03**.

- **Masters Thesis Research - Design and Implementation of GridOS: Operating System Services for Grid Architectures** Developed operating system services for grid architectures that provide high performance using automatic buffer tuning and zero copy mechanisms in the kernel. A FTP client and server is developed to evaluate the performance of GridOS modules. Appeared in **HiPC'03**.
- **Primary Architect and Leader, OCEAN** OCEAN (Open Computation Exchange and Auctioning Network) provides software infrastructure to support automated commercial buying and selling of dynamic distributed computing resources over the Internet. Contributed and led the design of various components and have been instrumental in developing a prototype. Appeared in **ISPDC'03**.

PUBLICATIONS

- **Masters Thesis**
 - Pradeep Padala. Design and Implementation of GridOS: Operating System Services for the Grid. Master's Thesis, Department of Computer and Information Science and Engineering, University of Florida, Dec 2003.
- **Conference Publications**
 - Pradeep Padala, Karen Hou, Xiaoyun Zhu, Mustafa Uysal, Zhikui Wang, Sharad Singhal, Arif Merchant, Kang Shin. Automated Control of Multiple Virtualized Resources. In the proceedings of *EuroSys 2009*, Mar 2009.
 - Jin Heo, Xiaoyun Zhu, Pradeep Padala, Zhikui Wang. Memory Overbooking and Dynamic Control of Xen Virtual Machines in Consolidated Environments. *IFIP/IEEE Symposium on Integrated Management (IM'09)* mini-conference, June 2009
 - Xue Liu, Arif Merchant, Sharad Singhal, Pradeep Padala, Mustafa Uysal, Zhikui Wang, Xiaoyun Zhu. Adaptive Control Technique for Workload Management on a Shared Hosting Platform. *Hewlett-Packard Technical Conference (HP TechCon)*, May 2008.
 - Xue Liu, Xiaoyun Zhu, Padala Pradeep, Zhikui Wang, Sharad Singhal. Optimal Multivariate Control for Differentiated Services on a Shared Hosting Platform. In the proceedings of the *46th IEEE Conference on Decision and Control (CDC'07)*, Dec 2007.
 - Zhikui Wang, Xiaoyun Zhu, Pradeep Padala and Sharad Singhal. Capacity and Performance Overhead in Dynamic Resource Allocation for Virtual Servers, In the proceedings of the *IFIP/IEEE Symposium on Integrated Management (IM'07)*, May 2007
 - Pradeep Padala, Xiaoyun Zhu, Mustafa Uysal et al. Adaptive Control of Virtualized Resources in Utility Environments. In the proceedings of *EuroSys 2007*, Mar 2007
 - Pradeep Padala and Kang Shin. Gvu: A View-Oriented Framework for Data Management in Grid Environments. In the proceedings of the *International Symposium on High Performance Computing (HiPC'06)*, Dec, 2006
 - Pradeep Padala and Joseph N. Wilson. GridOS: Operating System Services for Grid Architectures. In the proceedings of the *International Symposium on High Performance Computing (HiPC'03)*, Dec, 2003
 - Pradeep Padala, Cyrus Harrison, Nicholas Pelfort, Erwin Jansen, Michael Frank and Chaitanya Chokkareddy. OCEAN: The Open Computation Exchange and Arbitration Network, A Market Approach to Meta computing. In the proceedings of the *International Symposium on Parallel and Distributed Computing (ISPDC'03)*, Oct, 2003
- **Invention Disclosures / Filed Patent Applications**
 - Providing Quality of Service Guarantees for Shared Storage Systems using an Adaptive MIMO Controller Arif Merchant, Mustafa Uysal, Pradeep Padala. Invention disclosure.
 - Dynamic Feedback Control Of Resources In Computing Environments. Mustafa Uysal, Pradeep Padala, Xiaoyun Zhu, Zhikui Wang, Sharad Singhal, Arif Merchant, Kenneth Salem. Patent filed.
- **Technical Reports (non overlapping with other papers)**

- Pradeep Padala, Xiaoyun Zhu, Zhikui Wang, Sharad Singhal, Kang G. Shin. Performance Evaluation of Virtualization Technologies for Server Consolidation. HP labs technical report HPL-2007-59, Apr 2007.

- **Posters/Short Papers/Work-in-Progress Reports**

- Pradeep Padala, Mustafa Uysal, Arif Merchant, Xiaoyun Zhu, Sharad Singhal and Kang G. Shin. Performance Differentiation for Multi-port Arrays: A Control-Theoretic Approach. In the proceedings of fourth *International Workshop on Feedback Control Implementation and Design in Computing Systems and Networks (FEBID'09)*, Apr 2009.
- Ajay Gulati, Arif Merchant, Mustafa Uysal, Pradeep Padala, Peter Varman. Efficient and Adaptive Proportional Share I/O Scheduling. Poster in *SIGMETRICS'09*, Jun 2009
- Xiaoyun Zhu, Mustafa Uysal, Zhikui Wang, Pradeep Padala, Sharad Singhal, Arif Merchant, Kang Shin. What Does Control Theory Bring to Systems Research? in *ACM SIGOPS Operating Systems Review*, Jan 2009.
- Jang-uk In, Laukik Chitnis, Richard Cavanaugh, Pradeep Padala, Sanjay Ranka, Mandar Kulkarni, Paul Avery. A Distributed Service Architecture for end-to-end Data Intensive Analysis. Appeared in *International Conference On High Performance Computing (HiPC'04)*, Dec 2004
- A. Diot, D.R. Karrels, A.R. Katebi, P. Padala, J.N. Wilson. UFLFS: A Log-Structured File System Supporting Snapshots, Appeared in the USENIX Conference on File and Storage Technologies (FAST'04)
- Pradeep Padala and Michael P. Frank. Design of a Self-evolving Scalable Matching Network for OCEAN. Appeared in *International Symposium on High Performance Computing (HiPC'03)*, Dec, 2003
- Pradeep Padala and Joseph N Wilson. Operating System Support for Grid Architectures. Appeared in *IEEE International Symposium on High Performance Distributed Computing (HPDC-12)*, Jun 2003

- **Unrefereed Papers / Articles**

- Pradeep Padala. A Survey of Grid File Systems. GGF Informational Document, Grid File System Working Group, Global Grid Forum
- V. Snader, W. Allcock, P. CongDuc, I. Monga, P. Padala, M. Tana and F. Travostino. Networking Issues of Grid Infrastructures. Grid Working Draft, Grid High Performance Networking Research Group, Global Grid Forum
- Pradeep Padala and Ravi Parimi. Network programming in the kernel. *Linux Journal*, 138:22–32, October 2005
- Pradeep Padala. Playing with ptrace, Part II. *Linux Journal*, 104:86–91, December 2002
- Pradeep Padala. Playing with ptrace, Part I. *Linux Journal*, 103:78–85, November 2002
- Pradeep Padala. Exploring perl modules - part 2: Creating charts with GD::Graph. *Linux Gazette*, (83), October 2002.
- Pradeep Padala. Exploring perl modules - part 1: On-the-fly graphics with perl GD module. *Linux Gazette*, (81), August 2002.
- Pradeep Padala. Mouse programming with libgpm. *Geek Culture, Linux Journal*, January 2002.
- Pradeep Padala and Prakash Bulusu. Content management with procmail. *Linux Gazette*, (73), December 2001.
- Pradeep Padala. So you like color !!! (the mysterious $\hat{[]}$ characters). *Linux Gazette*, (65), April 2001.
- Pradeep Padala. Booting Linux from the NT boot menu. *Linux Gazette*, (61), January 2001.

TEACHING AND OTHER EXPERIENCE

- *Teaching Assistant for Programming Language Principles* **Aug 2003 – Dec 2003**
Developed specification for a language called Garnet that is a subset of Ruby. Helped students in developing a lexer, parser, interpreter and compiler for the language.
- *Teaching Assistant for Introduction to Operating Systems* **Jan 2003 – Aug 2003**
Duties included leading a recitation section and helping students learn MINIX.
- *Teaching Assistant for Introduction to Software Engineering* **Aug 2001 – Jan 2003**
Duties included leading two recitation sections, administering the Sybase and Oracle databases. Guided

various projects involving Perl DBI and JSP, JDBC. Prepared Oracle and Sybase database resources and tutorials on programming.

- *Junior System Administrator* **Jan 2002 – Aug 2003**
- *Software Engineer, Hughes Software Systems, India* **Aug 2000 – Aug 2001**
Main Architect of the back end for the Web based network management.

INVITED TALKS

- Adaptive Control of Virtualized Resources in Utility Computing Environments, Presented at VMware, Aug 2007
- Building, Monitoring and Maintaining a Grid, Presented at the *SPI Grid Summer Workshop*, Brownsville, Jun, 2004

CONFERENCE PRESENTATIONS

- Adaptive Control of Virtualized Resources in Utility Computing Environments, Presented at the *Eurosys 2007 Conference*, Lisbon, Mar 2007
- GridOS: Operating System Support for Grid Architectures, Presented at the *International Symposium on High Performance Computing (HiPC'03)*, Hyderabad, Dec, 2003
- Distributed Services for Grid Enabled Data Analysis, Presented at the *Supercomputing Conference (SC'03)*, Phoenix, Nov, 2003.
- A Survey of Grid File Systems, Presented at the Global Grid Forum meeting (GGF9), Chicago, Oct, 2003
- Operating System Support for Grid Architectures, Presented at the *IEEE International Symposium on High Performance Distributed Computing (HPDC-12)*, Seattle, May 2003

OPEN SOURCE EXPERIENCE

- Developed *LogFS*, a log-structured file system for Linux that supports snapshots.
- *NCURSES Programming HOWTO*: Developed a comprehensive guide to programming with NCURSES. Ncurses and its sister libraries are explained in detail with a lot of ready-to-use examples.
- Developed *html2db*, a tool for converting HTML documents into docbook SGML or XML.
- Was a member of *The Linux Gazette Answer Gang*. Answered numerous questions and solved problems regarding Linux.
- Active contributor to TLDP (The Linux Documentation Project). Reviewed various HOWTOs, helped in converting documents to docbook and helped new writers with their ideas.

PROFESSIONAL ACTIVITIES

- Secretary for the GFS-WG (Grid File Systems Working Group)
- Reviewed papers for HiPC'02 (*International Conference on High Performance Computing*), DSOM'07 (*IFIP/IEEE International Workshop on Distributed Systems: Operations and Management*), OSDI'08 (*Operating System Design and Implementation*), JPDC (*Journal of Parallel and Distributed Computing*)

REFERENCES

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