

# ARINI BALAKRISHNAN

## CONTACT INFORMATION

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## INTERESTS

File and Storage Systems, Operating Systems

## EDUCATION

### Computer Sciences Department, University of Wisconsin – Madison

M.S. in Computer Science, May 2007  
Master's Thesis: Refactoring Device Drivers for Reliability  
Advisors: Prof. Micheal.M.Swift and Prof. Somesh Jha  
GPA: 3.9/4

### PSG College of Technology, Coimbatore, India

B.E. in Computer Science and Engineering, May 2005  
GPA: 9.52/10

## AWARDS

- Received the **Institute Gold Medal** for the best academic record in Computer Science and Engineering at PSG College of Technology, Coimbatore, 2005
- Stood **first** in the class of 120 students
- Received the *Jawaharlal Nehru Center for Advanced Scientific Research (JNCASR)* Summer Fellowship for 2003.
- Attended the *Google Workshop for Women Engineers, 2006* at the Google Headquarters in Mountain View, California
- Received the student scholarship to attend the *Fifth USENIX conference on File and Storage Technologies, 2007* in San Jose, California.

## PUBLICATIONS

- V.Ganapathy, A. Balakrishnan, M.M.Swift, S. Jha: *Microdrivers: A New Architecture for Device Drivers*, XI workshop on Hot Topics in Operating Systems.
- V.Ganapathy, M.Renzleemann, A. Balakrishnan, M.M.Swift, S. Jha: *The Design and Implementation of Microdrivers*, XIII International Conference on Architectural Support for Programming Languages and Operating Systems.

## MASTER'S THESIS RESEARCH

**Title:** "Refactoring Device Drivers for Reliability"

Operating system reliability is often limited by the underlying device drivers running in the kernel address space. My master's thesis focused on refactoring device drivers to improve the reliability of the system. I worked on developing Microdrivers – a new device driver architecture where a part of the driver code runs in the kernel, called the microdriver and the other part of the driver runs in the user space, called the user driver. Unlike user mode drivers, microdrivers help achieve reliability while not compromising performance. I developed the framework to communicate and share data between the microdriver and user driver. I also worked on an object tracker that helps to synchronize the in-kernel and the user mode version of the shared data structures.

## EXPERIENCE

Research assistant with Prof. Michael.M.Swift, UW, Madison	Dec06 – May07
Teaching assistant for CS701(Compiler Construction) and CS752 (Advanced Computer Architecture), UW, Madison	Aug06 – May07
Summer Research Intern under Dr.David Chambliss and Dr.Guillermo Alvarez at IBM Almaden Research Center, San Jose	May06 – Aug06
Teaching assistant for CS302 (Introduction to Programming), UW Madison	Aug05 – May06
Software Development Engineer-Intern, Microsoft India	Dec04 – Jun05
Summer fellow under Prof. N. Balakrishnan and Prof. K.R. Ramakrishnan at Indian Institute of Science (IISc), Bangalore, India	May03 – Jul03

## INDUSTRY PROJECTS

<b>Member of Technical Staff – Sun Microsystems</b> I am currently working with the Performance and Applications Engineering team. My work at Sun Microsystems focuses on disk I/O performance and File System performance.	May07 - Present
<b>Summer Intern at IBM Almaden Research Center: Using Storage Controller cycles to handle mainframe data</b> Using storage controller cycles to handle the data helps exploit the proximity of data to the controller and also aids in using the idle cycles in the storage controller. The project involved developing a unix style ‘cat’ and unix style ‘find’ to view and find datasets on mainframe using the storage controller cycles.	May06 – Aug06
<b>Intern at Microsoft, India: Scenario based logging for Outlook Connector</b> I worked on designing a logging framework for Outlook Connector, a product which connects Microsoft Outlook to Hotmail. The logging framework logs the errors and groups them based on scenario using thread log local storage and memory mapped files. I also worked on the calendar feature and it involved handling exceptions in recurring events.	Dec04 – Jun05

## ACADEMIC PROJECTS

<b>Author Topic modeling of Bug Reports and Check-in Messages</b> Latent Concept models (e.g. pLSA, LDA) of natural language text compress the entire vocabulary into a small set of concepts (or topics). The Author-Topic model extends Latent Dirichlet Allocation (LDA) by including document authorship information into the generative model. In this project, we applied the author topic model to commit messages and bug reports of some software projects (Linux Kernel, Python and CBI).	Dec06-May07
<b>Log-based Transactions for Single Threaded Programs</b> Transactions are used for concurrency control in parallel programs. They allow programmers to identify sections of code as atomic, leaving the implementation to provide atomicity and isolation. Transactions on the other hand can also be used in exception recovery. Exception recovery involves restoring program state and invariants and freeing resources when an exception occurs. The atomicity guaranteed by transactions can simplify restoring program state and invariants. In this project, we developed a log-based transaction system for single threaded programs based on LogTM, a hardware transactional memory. Our system guarantees atomicity of transactions (and not isolation).	Jan06-May06

**Factorization of Device Driver Code between Kernel and User Spaces**

Jan06-May06

Device drivers, which are normally implemented as kernel code, pose stability problems since bugs in the drivers cause kernel crashes. Running device drivers as unprivileged user-level code has often been proposed as a solution to increase the robustness of the system. However, moving the entire driver to user space brings down the performance of the system. In this project, we proposed a scheme for factorization of driver code based on performance – leave the performance sensitive part in the kernel and move the less performance sensitive code to the user space.

**Simulation of RFID Platform on NS2:**

Sep05 – Dec05

RFID (Radio Frequency Identification) Systems have gained popularity in recent times and have found large-scale deployment in commercial and enterprise domains. However, there is a dearth of publicly available robust simulation platforms for RFID networks. In this project we extended the NS-2 platform to include support for RFID systems. We also implemented a load balancing algorithm on the platform developed.

**Global Register Allocation and Global Code Optimizations for SUIF Compiler:**

Sep05 – Dec05

The project involved implementing register allocation for a SUIF compiler. The register allocator allocates registers to local variables and parameters. Also, I implemented three optimizations on SUIF compiler, namely, loop invariant code motion, copy propagation, and removal of useless assignments.

**Literature Survey of Compiler Support for Code Obfuscation:**

Sep05 – Dec05

As a part of this project, we analyzed the different obfuscation techniques in relation to protection of intellectual property and hiding of malicious code. We focused our research on ways in which a compiler can support such mangling of software binaries so as to make them unintelligible to a human. The techniques we surveyed include control-flow transformations, data-flow transformations, jump table spoofing and symbol table mangling. We also provided a critical analysis of the different techniques with respect to their effectiveness in defending against attacks and the feasibility of implementation.

**Tunneling UDP Packets:**

May03 – Jul03

This project was done during my JNCASR summer fellowship at Super Computer Education and Research Center (SERC), IISc. The aim of the project was to share a broadband line among the IP telephones in various departments of IISc. A call server at SERC was connected to the broadband line and served call requests. This project involved establishing an IP tunnel to route the UDP packets generated from the IP phones through one of the gateways to the call server. This helped to deploy the IP phones in different departments of IISc.

**PERSONAL INFORMATION**

Visa Status: H1

Country of Citizenship: India

## REFERENCES

1. Michael Swift,  
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Dept. of Computer Sciences  
University of Wisconsin, Madison  
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2. Remzi H. Arpaci-Dusseau  
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