

# VISHAKHA GUPTA

---

## PERSONAL INFORMATION:

Research Interests : Embedded Systems (Subsuming embedded operating systems, distributed embedded systems, real time systems), Virtualization and High Performance Computing  
Homepage : <http://www.cc.gatech.edu/~vishakha>  
Email : [vishakha@cc.gatech.edu](mailto:vishakha@cc.gatech.edu)

## EDUCATION

<b>Georgia Institute of Technology, Atlanta, GA</b> PhD Computer Science	GPA: 4.0/4.0	Current
<b>Carnegie Mellon University, Pittsburgh, PA</b> MS Information Networking	GPA: 3.58/4.0	May, 2006
<b>Birla Institute of Technology and Science, Pilani, India</b> Bachelor of Engineering (Hons.) Computer Science	GPA: 3.81/4.0	June 2004

## TEACHING EXPERIENCE

- **Carnegie Mellon University**, Pittsburgh - *Teaching Assistant* (for Prof. Greg Ganger and Dr. Tina Wong) Jan 2006 – May 2006  
Project mentor for three teams taking **18-842: Distributed Systems**
- **Carnegie Mellon University**, Pittsburgh - *Teaching Assistant* (for Prof. Rajeev Gandhi) August 2005 – December 2005  
Designed lab assignment, conducted demos, evaluated components and delivered lectures for **18-342: Embedded Systems**
- **Carnegie Mellon University**, Pittsburgh - *Teaching Assistant* (for Prof. Peter Steenkiste) August 2004 – December 2004  
Designed lab assignment, provided help and delivered lectures for **18-544: Network Design and Evaluation**

## PROFESSIONAL EXPERIENCE

- **IBM TJ Watson Research Center**, Yorktown, USA - *Internship* (Adv Operating Systems Group) May 2007 - Aug 2007
  - Implemented *Cellule* which is a prototype for lightweight execution of applications for the IBM Cell processors and presents a new and simpler software model for virtualization of Cell and other accelerators (*Work still ongoing*)
  - Ported IBM's research hypervisor (rHype) to Cell and implemented SPE library wrappers to run benchmarks like matrix multiplication, Black Scholes etc in a lightweight partition created by the Controller partition on rHype
- **Microsoft Corporation**, Redmond, USA - *Internship* (Mobile and Embedded Division) May 2005 - July 2005
  - Tested Tasks Smart phone feature parity with Pocket PC, added features to the Tasks area library and the overall application
  - Developed a power-toy to link Tasks with Outlook Calendar on smart phone and Pocket PC
  - Received an offer for Software Development Engineer position based on managerial review and interviews conducted
- **Techlead Software Engineering Private Limited**, Pune, India - *Internship* January 2004 - June 2004  
Developed modules for Reflexis Workforce Scheduler, a workforce scheduling product for retail store chains
- **Bhabha Atomic Research Center**, Mumbai, India - *Internship* May 2001 - July 2001  
Developed software for Canny Edge Detection and establishing Correspondence of Features in Images

## PUBLICATION/PRESENTATIONS

- “*Cellule*: Lightweight Execution Environments for Virtualized Accelerators”, Vishakha Gupta, Jimi Xenidis, Karsten Schwan. Submitted to USENIX 2008 as short paper
- “Execution Environment Support for Many Core Heterogeneous Accelerator Platforms”, Vishakha Gupta, Sudhakar Yalamanchili, Jose Duato. Submitted to PPABS 2008 to be held in conjunction with PPoPP 2008
- “High Performance Hypervisor Architectures: Virtualization in HPC Systems”, A. Gavrilovska, S. Kumar, H. Raj, K. Schwan, V. Gupta et. al., *1st Workshop on System-level Virtualization for High Performance Computing (HPCVirt)*, in conjunction with *EuroSys 2007*, Lisbon, Portugal, Mar. 2007
- “Virtualizing Heterogeneous Many-core Platforms”, Greg Diamos, Ada Gavrilovska, Vishakha Gupta, Sanjay Kumar, Himanshu Raj, Karsten Schwan, Sudhakar Yalamanchili, *EuroSys 2007 Poster*, Lisbon, Portugal, Mar. 2007
- “Wireless Ad-hoc Lattice Computer (WAdL)”, Vishakha Gupta, Gaurav Mathur, Anil Shende, *Journal of Parallel and Distributed Computing*. Volume 66. Issue 4. April 2006. pp 531-541
- “Wireless Ad-hoc Lattice Computer (WAdL) for Analogical Simulation of Physical Phenomena”. Vishakha Gupta, Gaurav Mathur, Anil Shende, Student Research Contest, *CCSCSE*. Nov 5, 04, Spartanburg, SC. This paper won the **first prize**.
- “Lattice formation in a WAdL (Wireless Ad-hoc Lattice Computer)”. Vishakha Gupta, Gaurav Mathur, Anil M. Shende, *Algorithms for Wireless and Mobile Networks (ASWAN)*, Aug 26, 2004, Boston

## RESEARCH EXPERIENCE

### Executing with Virtualized Accelerators: Providing for Heterogeneous Virtual Machines (Current)

- Design and implement extension to the hypervisor to accommodate heterogeneous multicores and improve I/O performance
- Participate in designing the Virtualized Accelerator Abstraction Layer to provide a uniform interface to guests for accessing the pool of heterogeneous devices

### Real Time Performance Analysis in Xen for Mobile and/or Embedded Workloads

- Studied the QoS guarantees provided by the Xen Credit Based Scheduler by running different workloads on guest domains.

- Suggested possible changes for improving the performance of I/O intensive guests.

#### **Infrastructure for Area Driven Pervasive Computing Applications (Master's Thesis under Prof. Peter Steenkiste)**

- Developed an infrastructure for area-driven applications enabling them to specify area-based user tracking requirements.
- The implementation utilized existing infrastructure of wireless access points to determine the area where a user is.

#### **A Novel Architecture for Distributed Computing (Wireless Ad Hoc Lattice Computer – ref: publication section above)**

- Designed and simulated a computer architecture that utilizes mobile nodes to form a lattice computer
- Presented during the final round of *Intel India Student Research Contest* (2003-2004)

### **PROJECT SUMMARY**

#### **A Functional Network Simulator for IBM Cell based Multiprocessor Systems (Current)**

- The aim is to design a complete network simulator utilizing IBM's Mambo simulator for a single Cell system
- Programmers of parallel applications should be able to seamlessly utilize the multi-Cell simulator for developing and testing parallel applications. The project also targets developing execution and latency models for the Cell based parallel applications.

#### **MyOS – A Real Time Operating System**

- Designed and implemented a real time operating system using a Rate Monotonic Scheduling Policy and the principle of Highest Locker Priority for synchronization constructs on an XScale processor.

#### **Implementation of a (Unix-like) Kernel**

- Wrote a pre-emptive kernel for x86 platform with memory management, synchronization and kernel thread support
- Implemented fork(), exec(), exit(), wait(), sleep(), yield(), new\_pages(), remove\_pages(), deschedule() and other system calls
- Implemented handlers for keyboard, timer and various other exceptions like general protection fault, page fault etc.

#### **User Level Thread Library**

- Implemented user level thread primitives such as thread creation, destruction and join for kernel & user level threads
- Implemented synchronization constructs such as mutexes, condition variables, semaphores and reader-writer locks
- Implemented various scheduling policies ranging from uniprocessor round robin scheme to a multi-processor scheme taking advantage of scheduling affinities (for an m:n thread library)

#### **Distributed Embedded System Simulating an Elevator**

- Implemented a fault tolerant distributed elevator running on a simulator with emphasis on performance, efficiency and fairness. Software engineering design and principles occupied a major part of the development process.
- Adjudged *the best performing elevator in class* on all kinds of workloads tested by the instructor.

#### **CruiseControl - Optimal Routing on Roads using Dynamic Traffic Balancing**

- Enabled users to find the shortest or least congested route to reach their destination and the most convenient meeting spot.
- Implemented the core route computation servers and load balancing among these servers
- Selected for the Unites States final round of *Imagine Cup 2005* conducted by Microsoft Corporation

### **GRADUATE COURSES:**

**Systems:** High Perf. Comp Architecture, Compiler Design, Adv Operating Systems, Operating Systems, Distributed Systems, Embedded Systems, Distributed Embedded Systems, Design & Analysis of Algorithms, Adv Database Systems

**Networking:** High Performance Communication, Wireless Networking, Packet Switching & Data Networks, Computer Security

**Management:** Managerial Economics, Business Management, Principles of Management, Information Systems Modeling

### **ACADEMIC HONORS**

- Recipient of **Verizon Fellowship** for outstanding performance as an MSIN student at the Information Networking Institute, CMU
- Recipient of CMU Merit Scholarship and BITS Merit Fellowship
- Recipient of **SOSP 07** Travel Scholarship
- Awarded scholarships by Govt. of Maharashtra, India and Dhirubhai Ambani Foundation for standing 1st among over 1.3 million students in 10th grade and standing 2nd among 1.2 million students in 12th grade

### **SKILLS**

**Languages** : C, JAVA, C#, Verilog HDL, LISP, SQL, JSP, HTML, ASP.NET

**Microprocessors** : 8085, 80x86, IXP 2400, ARM7TDMI and MIPS

**Platforms** : Xen, UNIX, Linux, MS DOS, WINDOWS, rHype

**Software Packages** : VS.NET, Visual Age for Java, ORACLE-9I, Network Simulator (ns2), OPNET, CodeWarrior, Rational Rose

### **REFERENCES:**

#### **1. Prof. Karsten Schwan**

Professor & CERCS Director, College of Computing  
Georgia Institute of Technology, Atlanta, GA  
Email: schwan@cc.gatech.edu

#### **2. Prof. Sudhakar Yalamanchilli**

Professor, School of Electrical and Computer Engineering  
Georgia Institute of Technology, Atlanta, GA  
Email: sudha@ece.gatech.edu

#### **3. Prof. Peter Steenkiste**

Professor of ECE and CS, School of Computer Science and Department of Electrical and Computer Engineering  
Carnegie Mellon University, Pittsburgh, Pennsylvania  
Email: prs@cs.cmu.edu