

Mahesh Balakrishnan

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Education

- 2003 - :** | PhD Candidate in Computer Science, Cornell University.
Thesis Title: *Reliable Communication Within and Across Datacenters.*
Advisor: Ken Birman.
Expected Graduation Date: May 2008. Minor in Business.
Obtained MS in Computer Science in Dec 2006.
- 2000 - 2003 :** | BS in Computer Science, Georgia Institute of Technology.
Completed coursework between 8/2000 — 12/2002.

Research Interests

- Broad Areas* | Distributed Systems and Networking.
- Relevant Foci* | Datacenters, Clustering, TCP/IP, Forward Error Correction (FEC), Long-haul Networks, IP and Reliable Multicast, Gossip, Distributed Filesystems, Overlay Networks, Message Ordering, Mobile Ad-Hoc Networks.

Research Experience

- Fall 2006 –* | **Maelstrom: Reliable Communication over Lambda Networks** — Conceived, designed and built the Maelstrom appliance, a transparent gateway proxy that uses Forward Error Correction (FEC) to recover from losses in optical links. User-space and Linux kernel versions of Maelstrom have been implemented and evaluated. Also collaborating in the SMFS project, a distributed filesystem layered over Maelstrom, and KyotoFS, a filesystem for saving power within and across datacenters.
At Cornell University — Project Lead *In NSDI 2008, HotOS 2007*
- Fall 2004 –
Fall 2006* | **Ricochet: Time-Critical Reliable Multicast for Datacenters** — Invented and built Ricochet, a reliable multicast protocol that uses receiver-based FEC to rapidly recover lost packets. Offshoots of Ricochet include Mistral, an application of receiver-based FEC to mobile ad-hoc networks, PLATO, a total ordering protocol for datacenters, and Tempest, a run-time environment for clustered services.
At Cornell University — Project Lead *In NSDI 2007, MobiHoc 2006, SRDS 2006*
- Summer 2006* | **Sequoia: Support for Latency-Aware Applications** — Collaborated in the design and development of a system for predicting Internet latencies using tree structures.
At Microsoft Research Silicon Valley — Research Intern *In PODC 2007*

2002

DUSC: Dynamic Updating of Software Classes — Co-wrote a byte-code manipulator that modifies Java classes to enable hot-swapping during execution.
At Georgia Tech — Undergraduate Research Assistant

Refereed Conference Publications

- [1] | *Tempest: Soft State Replication in the Service Tier.*
Tudor Marian, Mahesh Balakrishnan, Ken Birman, Robbert van Renesse.
To Appear in DSN 2008: The 38th Annual IEEE/IFIP International Conference on Dependable Systems and Networks (DCCS Symposium), Anchorage, AK.

- [2] | *Maelstrom: Transparent Error Correction for Lambda Networks.*
Mahesh Balakrishnan, Tudor Marian, Ken Birman, Hakim Weatherspoon, Einar Vollset.
To Appear in NSDI 2008: Fifth Usenix Symposium on Networked Systems Design and Implementation, San Francisco, CA.

- [3] | *Ricochet: Lateral Error Correction for Time-Critical Multicast.*
Mahesh Balakrishnan, Ken Birman, Amar Phanishayee, Stefan Pleisch.
NSDI 2007: Fourth Usenix Symposium on Networked Systems Design and Implementation, Cambridge, MA.

- [4] | *Reconstructing Approximate Tree Metrics.*
Ittai Abraham, Mahesh Balakrishnan, Fabian Kuhn, Dahlia Malkhi, Kunal Talwar, Rama Ramasubramanian.
PODC 2007: 26th Annual ACM SIGACT-SIGOPS Symposium on Principles of Distributed Computing, Portland, OR.

- [5] | *Scalable Multicast Platforms for a New Generation of Robust Distributed Applications.*
Ken Birman, Mahesh Balakrishnan, Danny Dolev, Tudor Marian, Krzysztof Ostrowski, Amar Phanishayee.
Comsware 2007: 2nd IEEE/Create-Net/ICST International Conference on Communication System Software and Middleware, Bangalore, India.

- [6] | *PLATO: Predictive Latency-Aware Total Ordering.*
Mahesh Balakrishnan, Ken Birman, Amar Phanishayee.
SRDS 2006: 25th IEEE Symposium on Reliable Distributed Systems, Leeds, UK.

- [7] | *Mistral: Efficient Flooding in Mobile Ad-hoc Networks.*
Stefan Pleisch, Mahesh Balakrishnan, Ken Birman, Robbert Van Renesse.
Mobihoc 2006: 7th ACM International Symposium on Mobile Ad Hoc Networking and Computing, Florence, Italy.

- [8] | *Slingshot: Time-Critical Multicast for Clustered Applications.*
Mahesh Balakrishnan, Stefan Pleisch, Ken Birman.
NCA 2005: 5th IEEE Symposium on Network Computing and Applications, Boston, MA.

Refereed Workshop Publications

- [9] | *Optimizing Power Consumption in Large Scale Storage Systems.*
Lakshmi Ganesh, Hakim Weatherspoon, Mahesh Balakrishnan, Ken Birman.
HotOS 2007: 11th Workshop on Hot Topics in Operating Systems, San Diego, CA.

- [10] | *Reliable Multicast for Time-Critical Systems.*
Mahesh Balakrishnan and Ken Birman.
WASR 2006: 1st IEEE Workshop on Applied Software Reliability, Philadelphia, PA.

Conference Papers in Submission

- [11] | *Message Scheduling for Mobile Ad-Hoc Networks.* (title changed for blinding)
Yogeshwer Sharma, Lukas Kroc, Mahesh Balakrishnan, Ken Birman.
In Submission

- [12] | *Smoke and Mirrors: Shadowing Files at Remote Locations without Performance Loss.*
Hakim Weatherspoon, Lakshmi Ganesh, Tudor Marian, Mahesh Balakrishnan, Ken Birman.
In Submission

Patents Under Review

- [13] | *Lateral Error Correction for Time-Critical Multicast.*
Mahesh Balakrishnan and Ken Birman.
Application Number: 11/513,006. Filed August 30, 2006.

- [14] | *Internet Latencies through Prediction Trees.*
Rama Ramasubramanian, Dalia Malkhi, Mahesh Balakrishnan, Fabian Kuhn, Ittai Abraham.
Application Number: 11/759,473. Filed June 7, 2007.

Software Artifacts

- [15] | Maelstrom Performance-Enhancing Proxy (PEP) Implementation.
Mahesh Balakrishnan and Tudor Marian.

- [16] | The Ricochet Java Multicast Toolkit.
Mahesh Balakrishnan.

Manuscripts in Preparation and Other Reports

- [17] | *Performance Characteristics of FEC under TCP/IP.*
Tudor Marian, Mahesh Balakrishnan, Hakim Weatherspoon, Ken Birman.
- [18] | *KyotoFS: A Power-Aware Global Filesystem for Networks of Datacenters.*
Lakshmi Ganesh, Mahesh Balakrishnan, Hakim Weatherspoon, Ken Birman.
- [19] | *Virtual-Tree Models for Internet Path Metrics.*
Archit Gupta, Mahesh Balakrishnan, Aditya Akella, Dahlia Malkhi, Rama Ramasubramanian.
- [20] | *Chameleon: Survivable Overlay Multicast using Harary Graphs.*
Mahesh Balakrishnan.
- [21] | *A Scalable Multi-Group Membership Service.*
Mahesh Balakrishnan and Ken Birman.

Selected Presentations and Posters

- [22] | *Reliable Communication for Datacenters.*
Colloquium Talk at the University of Illinois, Urbana-Champaign, Mar 2008.
- [23] | *Reliable Communication for Datacenters.*
Invited Talk at Google, Seattle, Dec 2007.
- [24] | *Maelstrom: Transparent Reliability for Lambda Networks.*
Invited Talk at Google, Mountain View, CA, Dec 2007.
- [25] | *Maelstrom: Transparent Reliability for Lambda Networks.*
Invited Talk at Bell Labs, NJ, Oct 2007.
- [26] | *Maelstrom: Transparent Reliability for Lambda Networks.*
Poster at NSF Trust Retreat Fall 2007, Ithaca, NY, Oct 2007.
- [27] | *Ricochet: Lateral Error Correction for Time-Critical Multicast.*
Conference Talk at NSDI 2007, Boston, MA, Apr 2007.
- [28] | *Scalable Multicast Platforms for a New Generation of Robust Distributed Applications.*
Conference Talk at Comsware 2007, Bangalore, India, Dec 2006.
- [29] | *Reliable Multicast for Time-Critical Systems.*
A-Exam Thesis Proposal Talk, Ithaca, NY, Dec 2006.

- [30] | *Sequoia: Predicting Internet Latencies using Tree Structures.*
End-of-Internship Talk at Microsoft Research, Silicon Valley, CA, Aug 2006.
- [31] | *Reliable Multicast for Time-Critical Systems.*
Workshop Talk at WASR 2006, Philadelphia, PA, Jun 2006.
- [32] | *Slingshot: Time-Critical Multicast for Clustered Applications.*
Conference Talk at NCA 2005, Boston, MA, Mar 2005.

Professional Activities

- Reviewer for IEEE Transactions on Parallel and Distributed Systems (TPDS).
- External Reviewer for DISC 2005, ICDCS 2006 and SSS 2006.
- Session Scribe for IPTPS 2006, General Volunteer for SOSP 2007.
- Member of IEEE and ACM.

Teaching Experience

<i>Spring 2007</i>	Teaching Assistant, CS514 Intermediate Distributed Systems.
<i>Fall 2006</i>	Teaching Assistant, CS614 Advanced Distributed Systems.
<i>Spring 2005</i>	Teaching Assistant, CS514 Intermediate Distributed Systems.
<i>Spring 2004</i>	Teaching Assistant, CS280 Discrete Mathematics.
<i>Fall 2003</i>	Teaching Assistant, CS100M Introductory Computer Science.

Industry Experience

<i>Summer 2006</i>	Research Intern, Microsoft Research (SVC) with Rama Ramasubramanian and Dahlia Malkhi.
<i>Summer 2000</i>	Co-founded <i>private-i</i> , a startup aimed at tracking Internet advertising metrics.
<i>1996</i>	At age 14, created a contacts management package designed around scanned images of business cards. Co-founded family-owned <i>ImageSoft</i> to sell product in then-nascent Indian software market.

Awards

<i>2007</i>	Travel Grant Awards: for SOSP 2007 and NSDI 2007.
<i>Fall 2002</i>	Georgia Tech President's Undergraduate Research Award.
<i>2000–2003</i>	Georgia Tech Faculty Honors for 3 semesters, Dean's List all semesters.
<i>2002</i>	Member of Topcoder.com; highest attained rank #32.
<i>2002</i>	3rd in ACM Programming Contest South-East Regionals, 2002.

2000 | Perfect score in Computer Science in India's CBSE High School Graduation Exam.
1999 | Led team for SEARCC programming contest: won nationals, represented India at internationals.
1998 | Microsoft Certified Systems Engineer at age 16 — at the time, one of the youngest in the world.

Course Work

Cornell | *CS614* Advanced Systems, *CS681* Analysis of Algorithms, *CS612* Compiler Design for High-Performance Architectures, *CS714* P2P Systems Seminar, *CS616* Self-Stabilization, *CS411* Programming Languages, *CS481* Automata Theory.

Gatech | *CS4230/6236* Parallel and Distributed Simulation Systems, *CS4290/6290* High Performance Computer Architecture, *CS4451* Graphics, *CS4600* Artificial Intelligence.

References

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