Lakshmi Ganesh

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Research Interests

Power-aware computing, cloud systems, operating systems, distributed systems.

Education

Ph.D. in Computer Science, Cornell University **2006 – present**
Advisors: Ken Birman and Hakim Weatherspoon.
Minor in Theater.
Dissertation topic: *Data Center Power Management*

M.S in Computer Science, University of California, Santa Barbara **2004 – 2006**
Advisor: Ben Zhao.
Masters project topic: *Security in Peer-to-Peer Systems*

B.E.(Honors) in Civil Engineering, BITS, Pilani, India. **2000 – 2004**

Research Experience

GeckoFS *Graduate RA, Cornell*
with Tudor Marian, and Hakim Weatherspoon **2011**
Collaborating in the evaluation of GeckoFS, a file system based on KyotoFS, that saves power by spinning down hard disks. It overlays a log abstraction over a fault-tolerant mirrored multi-disk array. A log-structured storage system writes only to the log head, hence it continuously and sequentially writes to the same set of striped, mirrored disks for long periods of time. Read requests are served from the primary disks, while the mirror disks can be powered down to trade off read throughput for power savings.

Power-Lean Cloud Storage *Graduate RA, Cornell*
with Hakim Weatherspoon, and Ken Birman **2010 – 2011**
Designed and evaluated power-lean storage system, where racks of servers, or even entire data center shipping containers can be powered down to save energy. We show that racks and containers are more than the sum of their servers, and demonstrate the feasibility of designing a system that powers them up and down on demand. Our simulation results using file system traces from the Internet Archive show an 8X improvement in energy savings over current disk-based power management systems, without performance impact.

Improving Cloud Resource Utilization *Intern, Microsoft Research, Cambridge*
with Dushyanth Narayanan, and Eno Thereska **2009 – 2010**
Explored ways to improve data center server utilization through server resizing, workload consolidation, and task rescheduling. Using server utilization data from several Microsoft data centers, we find considerable potential for server utilization improvement through these techniques.

RackPacker *Intern, Microsoft Research, Redmond*
with Jie Liu, Suman Nath, and Feng Zhao **2008 – 2009**
Designed an algorithm, called RackPacker, for server placement in data centers, with the goal of improving data center power utilization. We take advantage of the difference in utilization patterns of different servers in a data center, and group together dissimilar servers in each rack to reduce combined peak power needs. Our simulation results show substantially superior results than static packing.

Maelstrom *Graduate RA, Cornell*
with Mahesh Balakrishnan, Tudor Marian, Ken Birman, Hakim Weatherspoon **2007 – 2008**
Collaborated in applying and evaluating Maelstrom, a transparent network gateway that uses Forward Error Correction to recover loss in high latency/high bandwidth links.

Smoke and Mirrors File System (SMFS) *Graduate RA, Cornell*
with Hakim Weatherspoon, and Tudor Marian **2007 – 2008**
Collaborated in evaluating the SMFS mirroring file system, which uses Maelstrom to provide disaster fault tolerance with semi-synchronous performance and near-synchronous guarantees.

KyotoFS *Graduate RA, Cornell*
with Hakim Weatherspoon, Mahesh Balakrishnan, and Ken Birman **2006 – 2007**
Designed a power-aware, distributed file system that saves power by spinning down a large fraction of disks while maintaining acceptable performance. Our solution uses the log structured file system to localize write accesses to log-head disks, while the cache absorbs most read accesses. This results in minimal random disk accesses, leading to large idle times for most disks. Our simulation results show that KyotoFS has considerable power saving potential.

Identify Theft Protection in Structured Overlays *Graduate RA, UCSB*
with Ben Zhao **2004 – 2005**
Identified the main attack in structured overlays as a form of P2P identify theft, where a malicious node in the path of a message claims it is the desired destination. Designed a solution, where nodes sign proof-of-life certificates for partial node ids and distribute them to randomly chosen proof managers in the network; source nodes can then evade attackers by requesting proofs from multiple proof managers. We show that our solution is effective, and inexpensive.

PUBLICATIONS

[1] Ken Birman, **Lakshmi Ganesh**, Robbert van Renesse. *Running Smart Grid Control Software on Cloud Computing Architectures.* In Workshop on Computational Needs for the Next Generation Electric Grid, 2011.

[2] **Lakshmi Ganesh**, Hakim Weatherspoon, Tudor Marian and Ken Birman. *Practical Data Center Power Proportionality.* In submission, 2011.

[3] **Lakshmi Ganesh**, Hakim Weatherspoon, and Ken Birman. *Beyond Power Proportionality: Designing Power Lean Cloud Storage.* To appear in the IEEE International Symposium on Network Computing and Applications (NCA), 2011.

[4] Mahesh Balakrishnan, Tudor Marian, Ken Birman, Hakim Weatherspoon, and **Lakshmi Ganesh**. *Maelstrom: Transparent Error Correction for Communication between Data Centers.* In ACM Transactions on Networking (ToN), 2010.

[5] **Lakshmi Ganesh**, Jie Liu, Suman Nath, Galen Reeves, and Feng Zhao. *Unleash Stranded Power in Data Centers with RackPacker.* MSR Tech Report # MSR-TR-2009-21, 2009.

[6] Hakim Weatherspoon, **Lakshmi Ganesh**, Tudor Marian, Mahesh Balakrishnan, and Ken Birman. *Smoke and Mirrors: Reflecting Files at a Geographically Remote Location Without Loss of Performance.* In Proceedings of the 7th USENIX Conference on File and Storage Technologies (FAST), 2009.

[7] **Lakshmi Ganesh**, Hakim Weatherspoon, Mahesh Balakrishnan, and Ken Birman. *Optimizing Power Consumption in Large-Scale Storage Systems.* In Proceedings of HotOS, 2007.

[8] **Lakshmi Ganesh**, and Ben Zhao. *Identity Theft Protection in Structured Overlays.* In Proceedings of the first Workshop on Secure Network Protocols (NPSec), 2005.

Work Experience

Summer Intern, Microsoft Research, Cambridge, UK *Summer 2009*
Mentor: Dushyanth Narayanan
Worked with the Systems and Networking group on improving data center server utilization through server resizing, workload consolidation, and task rescheduling. Using server utilization data from several Microsoft data centers, we found considerable potential for server utilization through these techniques.

Summer Intern, Microsoft Research, Redmond, USA *Summer 2008*
Mentor: Jie Liu
Worked with the Networked Embedded Computing group on power capping and server placement solutions for data centers. Explored application-aware power capping, and workload-aware server placement to optimize power consumption.

Teaching Assistantships, UCSB & Cornell *2004 – 2008*
Have held teaching assistantships at UCSB (for undergraduate Java, and undergraduate Physics), and Cornell (for graduate Advanced Systems, and undergraduate Operating Systems).

Summer Intern, Citrix Online, Santa Barbara, USA *Summer 2005*
Mentor: Eirik Holm
Worked in the Broker Platform group at Citrix Online. Work involved development using Java, SQL, HTML, Servlets, Oracle DB. Added support for encryption in Broker configuration files; Explored different distributed caching solutions for the Broker. *Was given Awesome Citrix Intern award.*

Honors

MSR Graduate Research Fellowship **2009 – 2011**
Olin Fellowship **2006 – 2007**

Personal

Avid theater performer
Amateur musician
Languages: Fluent in: English, Hindi, Tamil. Working knowledge of: French, Bengali

References

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