

# Surendar Chandra

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## Research Interests

Experimental system topics in multimedia, storage, networks, security and sensor systems.

## Educational history

- Ph.D., Computer Science, July 2000  
Duke University, Durham, NC  
Dissertation: “Quality Aware Transcoding: An Application Level Technique to Dynamically Adapt Multimedia Content”, supervised by Carla Schlatter Ellis.
- M.S., Computer Science, August 1993  
Worcester Polytechnic Institute, Worcester, MA  
Thesis: “Adaptive Resource Management”, supervised by Craig Wills.
- B.E., Computer Science and Engineering, May 1988  
Anna University, Madras, India

## Previous positions

- Assistant Professor, Computer Science and Engineering, University of Notre Dame, August 2002 –
- Assistant Professor, Computer Science, University of Georgia, August 2000 – August 2002
- Software Engineer, Hindustan Computers Ltd (HCL), Madras, India. July 1988 – December 1990
- Software Consultant, Sybase Inc., Emeryville, CA. July 1989 – January 1990
- Research Internships:
  - IBM T. J. Watson Research Center, June 1997 – August 1998, Summer 1999
  - Glaxo Wellcome Inc., August 1995 – May 1997
  - Xerox Palo Alto Research Center, Summer 1995
  - Center for High Performance Computing of WPI, Summer 1992 and 1993

## Honors and Awards

- National Science Foundation Early CAREER Award (2004)
- Certificate of appreciation, IEEE Computer Society (conference activity, 2004)
- North Carolina Networking Initiative Graduate Fellowship ('99-'00)
- IBM Research Dissertation Graduate Fellowship ('97-'98)
- Duke University, Department of Computer Science Fellowship ('93-'94)

## Professional memberships

- ACM (SIG-OPS and SIG-Multimedia) (since 1993)
- USENIX (since 1999)

## Refereed Publications

- **Book Chapter**

32. *Surendar Chandra*, “The Practical Handbook of Internet Computing”, *Chapter 42. Content Adaptation and Transcoding*, Chapman Hall & CRC Press, Baton Rouge, June 2004. (citations<sup>1</sup>: 9)

- **Journals**

31. *Yong Wei* and *Suchendra M. Bhandarkar* and *Surendar Chandra*, “A Client-Side Statistical Prediction Scheme for Energy Aware Multimedia Data Streaming”. In *IEEE Transactions on Multimedia*, Volume 8(4), pages 866–874, August 2006. (JCR<sup>2</sup>: 28)
30. *Surendar Chandra*, “Wireless Network Interface Energy Consumption: Implications for Popular Streaming Formats”. In *ACM Multimedia Systems Journal* 9(2), pages 185–201, Springer-Verlag Heidelberg, August 2003. (JCR: 74) citations: 49)
29. *Surendar Chandra*, *Carla Schlatter Ellis* and *Amin Vahdat*, “Application-Level Differentiated Multimedia Web Services Using Quality Aware Transcoding”. *IEEE JSAC - Special Issue on QoS in the Internet*, Vol 18, No. 12, pages 2544–2565, December 2000. (citations: 116)

- **Conferences and other refereed venues**

28. *William Acosta* and *Surendar Chandra*, “Understanding the Practical Limits of the Gnutella P2P System: An Analysis of Query Terms and Object Name Distributions”. In *Fifteenth ACM/SPIE Multimedia Computing and Networking (MMCN '08)*, San Jose, CA, January, 2008. (acceptance rate: 26%)

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<sup>1</sup>Google scholar

<sup>2</sup>JCR: Journal Citation Rank

27. *Xuwen Yu and Surendar Chandra*, “Campus-wide asynchronous lecture distribution using wireless laptops” (short paper). In *Fifteenth ACM/SPIE Multimedia Computing and Networking (MMCN '08)*, San Jose, CA, January, 2008. (acceptance rate: 42%)
26. *Adam Lusch, Adele Fleury and Surendar Chandra*, “Do Nintendo handhelds play nice? An analysis of its wireless behavior”. In *6th ACM Annual Workshop on Network and Systems Support for Games (Netgames '07)*, Melbourne, Australia, September, 2007. (acceptance rate: 60%)
25. *Ashish Gehani and Surendar Chandra*, “Parameterizing Access Control for Heterogeneous Peer-to-Peer Applications”. In *3rd IEEE International Conference on Security and Privacy in Communication Networks (SECURECOMM '07)*, Nice, France, September, 2007. (acceptance rate: 26%)
24. *William Acosta and Surendar Chandra*, “Improving Search Using a Fault-Tolerant Overlay in Unstructured P2P Systems”. In *International Conference on Parallel Processing (ICPP'07)*, XiAn, China, September, 2007. (acceptance rate: 27%)
23. *Surendar Chandra, Ashish Gehani and Xuwen Yu*, “Automated Storage Reclamation Using Temporal Importance Annotations”. In *27th IEEE International Conference on Distributed Computing Systems (ICDCS 2007)*, pages 12–24, Toronto, Canada, June 2007. (acceptance rate: 13%)
22. *Surendar Chandra*, “Lecture video capture for the masses”. In *ACM 12th Annual conference on Innovation and Technology in Computer Science Education (iTiCSE 2007)*, pages 276–280, Dundee, Scotland, June, 2007. (acceptance rate: 28%)
21. *Chris Boehnen, Allison Regier, Deborah Thomas, Surendar Chandra and Patrick Flynn*, “Mosaicing videos to stream over multiple independent channels”. In *17th ACM Workshop on Network and Operating Systems Support for Digital Audio & Video (NOSSDAV '07)*, pages 3–8, Urbana-Champaign, IL, June, 2007. (acceptance rate: 33%)
20. *William Acosta and Surendar Chandra*, “Trace Driven Analysis of the Long Term Evolution of Gnutella Peer-to-Peer Traffic”. In *Eighth Passive and Active Measurement conference (PAM 2007)*, Louvain-la-neuve, Belgium, April 2007. (acceptance rate: 26%)
19. *Surendar Chandra and Xuwen Yu*, “Share with Thy Neighbors”. In *ACM/SPIE Multimedia Computing and Networking (MMCN '07)*, San Jose, CA, January 2007. (acceptance rate: 25%)
18. *Ashish Gehani and Surendar Chandra*, “PAST: Probabilistic Authentication of Sensor Timestamps”. In *22nd Annual Computer Security Applications Conference*, pages 439–448, Miami, FL, December 2006. (acceptance rate: 26%)
17. *Srinivas Sridharan, Brett Keck, Richard C. Murphy, Surendar Chandra and Peter M. Kogge*, “Thread Migration to Improve Synchronization Performance”. In *IEEE/ACM Workshop on Operating System Interference In High Performance Applications (OS-IHPA '06)*, (held in conjunction with PACT '06), Seattle, WA, September 2006. (acceptance rate: unavailable) (citation: 1)

16. *Peng Xue and Surendar Chandra*, “Revisiting multimedia streaming in mobile ad hoc networks”. In *ACM Network and Operating Systems Support for Digital Audio and Video (NOSSDAV '06)*, Newport, RI, USA, May 2006. (acceptance rate: 31%)
15. *Ashish Gehani, Surendar Chandra and Gershon Kedem*, “Augmenting Storage with an Intrusion Response Primitive to Ensure the Security of Critical Data”. In *ACM Symposium on Information, Computer and Communications Security (ASIACCS '06)*, pages 114–124, Taipei, Taiwan, March 2006. (acceptance rate: 17%)
14. *Michael Gundlach, Sarah Doster, Haijin Yan, David K. Lowenthal, Scott A. Watterson and Surendar Chandra*, “Dynamic, Power-Aware Scheduling for Mobile Clients Using a Transparent Proxy”. In *International Conference on Parallel Processing (ICPP '04)*, pages 557–565, Montreal, Canada, August 2004. (acceptance rate: 34%) (citations: 5)
13. *Yong Wei, Surendar Chandra and Suchendra M. Bhandarkar* “A Statistical Prediction-based Scheme for Energy Aware Multimedia Data Streaming”. In *IEEE Wireless Communications and Networking Conference (WCNC 2004)*, Atlanta, GA, March 2004. (acceptance rate: 30%) (citations: 2)
12. *Surendar Chandra*, “Energy Conservation in Ad Hoc Multimedia Networks using Traffic-Shaping Mechanisms”. In *SPIE Multimedia Computing and Networking '04 - (MMCN '04)*, pages 40–54, San Jose, CA, January 2004. (acceptance rate: 23%) (citations: 3)
11. *Surendar Chandra*, “Beacond: A Peer-to-Peer System to Teach Ubiquitous Computing”. *ACM SIGCSE Technical Symposium on Computer Science Education*, pages 257–261, Reno, NV, February 2003. (acceptance rate: 32%) (citations: 4)
10. *Surendar Chandra and Amin Vahdat*, “Application-specific network management for energy-aware streaming of popular multimedia formats”. In *USENIX Annual Technical Conference*, pages 329–342, Monterey, CA, June 2002. (acceptance rate: 23%) (citations: 52)
9. *Surendar Chandra*, “Wireless Network Interface Energy Consumption Implications of Popular Streaming Formats”. In *SPIE Multimedia Computing and Networking - 2002 (MMCN '02)*, Vol 4673, pages 85–99, San Jose, CA, January 2002. (acceptance rate: 27%)
8. *Raghunath Gannamaraju and Surendar Chandra*, “Palmist: A Tool to log Palm System Activity”. In *IEEE 4th Annual Workshop on Workload Characterization (WWC4)*, pages 111–119, Austin, TX, December 2001. (acceptance rate: 50%) (citation: 1)
7. *Surendar Chandra, Ashish Gehani, Carla Schlatter Ellis and Amin Vahdat*, “Transcoding Characteristics of Web Images”. In *SPIE Multimedia Computing and Networking - 2001 (MMCN '01)*, Vol 4312, pages 135–149, San Jose, CA, January 2001. (citations: 41)
6. *Surendar Chandra, Carla Schlatter Ellis and Amin Vahdat*, “Managing the Storage and Battery Resources in an Image Capture Device (Digital Camera) using Dynamic Transcoding”. In *Third ACM International Workshop on Wireless and Mobile Multimedia (WoWMoM'00)*, pages 73–82, Boston, MA, August 2000. (citations: 8)

5. *Surendar Chandra, Carla Schlatter Ellis and Amin Vahdat*, “Differentiated Multimedia Web Services Using Quality Aware Transcoding”. In *Nineteenth Annual Joint Conference of the IEEE Computer And Communications Societies (INFOCOM 2000)*, pages 961-969, Tel Aviv, Israel, March 2000. (acceptance rate: 26%)
4. *Surendar Chandra and Carla Schlatter Ellis*, “JPEG Compression Metric as a Quality Aware Image Transcoding”. In *Second Usenix Symposium on Internet Technologies and Systems (USITS '99)*, pages 81–92, Boulder, CO, October 1999. (acceptance rate: 33%) (citations: 61)
3. *Surendar Chandra, Carla Schlatter Ellis and Amin Vahdat*, “Multimedia Web Services for Mobile Clients Using Quality Aware Transcoding”. In *Second ACM International Workshop on Wireless and Mobile Multimedia (WoWMoM'99)*, pages 99-108, Seattle, WA, August 1999. (acceptance rate: 38%) (citations: 27)
2. *Craig E. Wills and Surendar Chandra*, “Adaptive Resource Management”. In *IEEE Modeling, Analysis, and Simulation of Computer and Telecommunication Systems (MAS-COTS)*, pages 173–177, Durham, NC, January 1995. (acceptance rate: unavailable)
1. *David Finkel and Surendar Chandra*, “NetCp - A Project Environment for an Undergraduate Computer Networks Course”. In *Twenty-fifth annual ACM Technical Symposium on Computer Science Education*, pages 174–177, Phoenix, AZ, March 1994. (acceptance rate: unavailable) (citations: 6)

- **Miscellaneous refereed publications**

- *Surendar Chandra, Ashish Gehani and Xuwen Yu*, “Diamonds are forever, files are not”. Refereed Work-In-Progress in *USENIX Conference on File and Storage Technologies (FAST '07)*, San Jose, CA , February 2007.
- *William Acosta and Surendar Chandra*, “Unstructured Peer-to-Peer Networks - Next Generation of Performance and Reliability”. Refereed poster in *IEEE INFOCOM*, March 2005. (citations: 3)
- *David Salyers, Xiaolong Li, Aaron Striegel and Surendar Chandra*, “Wireless Stealth Multicast: Bandwidth Conservation for Last-Mile Wireless Clients”. Refereed poster in *IEEE Infocom*, March 2005.
- *Surendar Chandra, Carla Schlatter Ellis and Amin Vahdat*, “Differentiated QoS through Quality Aware Transformation of Web Content”. Refereed poster in *17th ACM Symposium on Operating Systems Principles (SOSP)*, December 1999. Also in *ACM SIGOPS Operating Systems Review*, Volume 34, Issue 2, page 36, April 2000.

- **Non-refereed publication**

- *Surendar Chandra*, “Making Sense of Multiple Technologies: Book review”. *IEEE Multimedia*, Vol 9, No 2, pages 77–87, April 2002.
- **Public source code release**

- Quality aware JPEG transcoder
- NetCP - educational Computer Networks project environment
- **Public release of lecture audio/videos**
  - **Undergrad Operating Systems - Spring 2006:**
    - \* Podcast subscriptions: 2,722
    - \* Downloaded video/audio by nd.edu users: 2,507 and from elsewhere: 99,040
    - \* Access from Google video: 24,261
  - **Multimedia Systems: Fall 2006:**
    - \* Podcast subscriptions: 828
    - \* Downloaded video/audio by nd.edu users: 267 and from elsewhere: 7,883
    - \* Access from Google video: 2,330
  - **Undergrad Operating Systems: Spring 2007:**
    - \* Podcast subscriptions: 1,356
    - \* Downloaded video/audio by nd.edu: 823 and from elsewhere: 134,054
    - \* Access from Google video: 2,403

### Work submitted

- *William Acosta and Surendar Chandra*, “Peer-to-peer object annotations follow a Zipf distribution: unstructured peer-to-peer systems are therefore impractical” (ACM Hotnets ’07).
- *William Acosta and Surendar Chandra*, “Exploiting the Properties of Query Workload and File Name Distributions to Improve P2P Synopsis-based Searches” (IEEE INFOCOM ’08).
- *Xuwen Yu and Surendar Chandra*, “Delay tolerant collaborations among campus-wide wireless users” (IEEE INFOCOM ’08).
- *Nathan Regola and Surendar Chandra*, “When two is better than one: reducing storage energy consumption by adding more disks” (SOSP WIP/Poster ’07).
- *William Acosta and Surendar Chandra*, “The world is Zipf but current P2P systems are not ready to face the world...yet” (SOSP WIP/Poster ’07).
- *Surendar Chandra*, “Contemporary Operating Systems are not ready for Peer Computing: Peer systems should be treated as second class citizens” (SOSP WIP/Poster ’07).
- *Ashish Gehani and Surendar Chandra*, “Design and Implementation of a Peer-to-Peer Reference Monitor”.

## Grants and Sponsored Programs

- VMware Academic Program. *VMware Technology Network Subscription* donation for research.
- ND Faculty Research Program. *On the feasibility of temperature aware storage systems*, Jan 2007 - Dec 2007 (\$10,000)
- National Science Foundation. *CAREER: Scalable Self Managing Multimedia Storage*, Feb 2005 - Jan 2010 (\$451,229, including a \$50,000 supplemental award)
- Defense Intelligence Agency (DIA-MASINT). *Hydra: A Robust and Self Managing Video Sensing System for Retrospective Surveillance*, (PI Surendar Chandra, co-PI Pat Flynn) Mar 2005-Mar 2006 (\$ 238,414)
- HP Mobility Technology for Teaching grant, (PI John Uhran, Co-PI Steve Silliman, Surendar Chandra, Jeff Talley, Michael Lemmon), May 2004 (\$90,000) with additional software donation from Microsoft
- HP Philanthropy and Education. *Server resources for Experimental Systems Lab*, (PI Surendar Chandra), Apr 2004 (\$110,316) with additional \$1,000 supplement (acceptance rate: 12%)
- Yamacraw Research Initiative, State of Georgia. *An Integrated Scalable Client-Server System for Energy Aware Computing*, (PI's Surendar Chandra and David Lowenthal. Co-PIs Benjamin Bishop, Suchendra Bhandarkar and Scott Watterson), Sep 2000-Jul 2003 (\$460,296)

## Invited Lectures and Addresses

- *Podcasting - How does it work and can I use it in my course?* (with Chris Clark), Kaneb Center for teaching and learning, University of Notre Dame, IN, March 2007
- *Getting in touch with the real world*, panelist, ACM/SPIE MMCN, January 2007
- *Collaborative Multimedia Storage in a Campus Environment*, Multimedia Workshop (held in conjunction with ACM Multimedia TPC meeting), Microsoft Research, Redmond, WA, June 2006
- *Roles for Optical and Wireless in Tomorrow's Broadband Service Networks*, academic panel, IEEE Broadnets, October 2005
- *Wireless Broadband*, industry panel with Craig J. Mathias (Farpoint), Dev Gupta (NewLANS), Fanny Mlinarsky (Azimuth), Pierre Humblet (Airvana) and Asa Kalavade (Tatara), IEEE Broadnets, October 2005
- *Hydra: A robust and self managing video sensing system for retrospective surveillance*, National Consortium for MASINT Research, Pacific Northwest National Laboratory, Sequim, WA, August 2005

- *Efficiently searchable overlay for multimedia sensor storage*, Michigan State University, MI, April 2005
- *Multimedia Sensor Research*, Western Michigan University, MI, April 2005
- *Multimedia Sensor research*, DIA MASINT consortium meeting, Maui, HI, March 2005
- *Energy Aware Mobile Multimedia*, Invited talk, HP Labs, Palo Alto, CA, March 2004
- *Energy Aware Mobile Multimedia*, Invited talk, Stanford University, CA, March 2004
- *Power Aware P2P Multimedia Systems*, panel chair with panelists Carsten Griwodz (Oslo), Rajesh Gupta (UCSD) and Alan Smith (Berkeley), ACM/SPIE MMCN, January 2004
- *Energy Aware Mobile Information Access* Yamacraw Industry Affiliates Board meeting (IAB), October 2001
- *Towards Energy Aware Mobile Multimedia* Invited talk, Intel Multimedia Research laboratory, San Jose, CA, March 2001
- *Towards Energy Aware Mobile Multimedia* Invited talk, Ricoh Innovations laboratory, Palo Alto, CA, March 2001

### **Master's Theses Directed**

- William Acosta (May 2005)  
Thesis: "Constructing Efficient and Fault-Tolerant Unstructured Peer-to-Peer Networks" (continuing for a Ph.D. at Notre Dame)
- Raghunath Gannamaraju (Nov 2001)  
Thesis: "Palmist: A Tool to Log Palm System Activity" (Current position: Senior Technical Specialist, NXP Semiconductors, Bangalore, India)

### **Professional External Service**

- **Organizing committee**
  - **Program committee co-chair** - ACM/SPIE - Multimedia Computing and Networking (MMCN '05, MMCN '06)
  - **Guest co-editor** - ACM/Springer Verlag Multimedia Systems Journal 2005, 2006
  - Session chair - ACM Multimedia 2006 and 2003, IEEE Broadnets 2004, ACM/SPIE MMCN 2002 and 2004, ACM WSNA 2002
  - Registration chair - IEEE International Conference on Mobile Data Management (MDM 2004)
  - Publicity chair - IEEE SECON 2004, Trusted Internet Workshop (TIW) 2003, ACM WSNA 2002

– Tutorials co-chair - IEEE Broadnets 2004

• **Technical program committees**

– **Multimedia Systems:**

- \* ACM - Multimedia (MM '03, '06, '07)
- \* ACM/SPIE - Multimedia Computing and Networking (MMCN '03, '04, '05, '06, '07, '08)
- \* International Workshop on Network and Operating Systems Support for Digital Audio and Video (NOSSDAV '05, '07, '08)
- \* IEEE International Conference on Multimedia & Expo (ICME '05)
- \* SPIE - Mobile Multimedia Devices ('05, '06, '07)

– **Operating Systems and Middleware:**

- \* IEEE International Conference on Distributed Computing Systems (ICDCS '08)
- \* Passive and Active Measurement Conference (PAM '08)
- \* IEEE Mobile Data Management (MDM '04, '06)

– **Mobility and Networking**

- \* IEEE Infocom '08
- \* Broadnets ('04, '05, '07)
- \* IEEE Globecom ('06, '07)
- \* Chinacom ('06, '07)
- \* International Conference on Parallel Processing (ICPP '07)
- \* IEEE Wireless Communications and Networking Conference
- \* Conference on e-Business Engineering (ICEBE '05, '07)
- \* International Conference on Computer Communications and Networks (ICCCN '07)
- \* IEEE International Conference on Communications (ICC '03, '07, '08)
- \* International Conference on E-business and Telecommunication Networks (ICETE '05)

– **Sensor Networks:**

- \* IEEE Sensor and Ad hoc Communications and Networks (SECON '04, '05, '06)
- \* IEEE Mobile Adhoc and Sensor Systems (MASS '05)
- \* ACM - Wireless Sensor Networks and Applications (WSNA '02, '03)
- \* IASTED Wireless Sensor Networks '06
- \* International Conference on Sensor Technologies and Applications (SENSOR-COMM '07)

– **Security:**

- \* International Wireless Communications and Mobile Computing Conference (IWCMC '07)
- \* International Conference on Availability, Reliability and Security (ARES '07)
- \* Trusted Internet Workshop (TIW '03, '04)

- **Grant panels**

- US Civilian Research and Development Foundation
- National Science Foundation (twice in '04, twice in '05, twice in '06, thrice in '07)
- DIA-MASINT

- **Reviewer** Various ACM, IEEE, USENIX and other conferences and journals including OSDI, SOSP, Mobicom, Mobisys

### **Institutional Service**

- Department seminar coordinator, 2006-
- Member, WWW committee, 2006-2007
- Member, Faculty recruiting committee, 2000-2001, 2002-2003
- Member, Graduate studies committee, 2003-2006
- Notre Dame PI for Planetlab Consortium ([www.planet-lab.org](http://www.planet-lab.org)) (July 2003 - ) (donate and maintain two servers, planetlab{1,2}.cse.nd.edu, in lieu of access (to ND community) to over 399 sites spread across the world for wide area experimentation purposes)
- USENIX University Liaison ([www.nd.edu/~usenix/](http://www.nd.edu/~usenix/)) (2001 - ) (coordinate student conference travel scholarships, maintain USENIX and SAGE proceedings and publications for ND community (electronic and print))
- Faculty advisor, ASHA, 2001-2002
- Student representative, Systems lab committee, 1994-1996
- Creator USENET newsgroup soc.college.teaching-asst, 1993

### **Teaching and Course Development**

- Operating Systems (CSE 30341): Spr 2006, Spr 2007 (core junior level course)
- Graduate Operating Systems (CSE 542): Fall 2002, Fall 2003, Fall 2004 (core graduate course)
- Computer Networks (CSE 364): Spr 2005
- Graduate Computer Networks (CSE 498N/598N): Spr 2002, Spr 2003, Spr 2004

- Networked Sensor Systems (CSE 40484/60484): Fall 2007 (developing: a one-time graduate-level offering)
- Multimedia Systems (CSE 40373/40373): Fall 2006 (developed: a one-time graduate-level offering)
- Distributed Storage (CSE 70481): Fall 2005 (developed: a one-time graduate-level offering)
- Ubiquitous Computing (CSCI 4770/6770): Spr 2001, Spr 2002 (developed a graduate-level course)

### **Research supervision**

- **Visitors:** Prof. Cheul Woo Ro, Silla University, Korea (Jul 2006 - Jul 2007)
- **Postdoctoral associate:** Ashish Gehani (Mar 2005 - Jun 2006)
- **PhD students completed preliminary examination:** William Acosta (since Fall '02)
- **PhD students completed qualifying examination:** Xuwen Yu (since Fall '05)
- **PhD students:** Nathan Regola (since fall '07)
- **Minority mentoring**
  - Female African-American: Summer Ugrad Research Program (Summer 2002)
  - Vietnamese-American: Building Bridges (2003-)
  - Filipino-American: Building Bridges (2004-)
  - Hispanic: McNair Scholar (Summer 2004)
  - African-American: McNair Scholar (Summer 2005)

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<sup>2</sup>Last Updated: August 30, 2007