

## *Curriculum Vitae - Anand Padmanabhan*

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### **Research Interests**

CyberInfrastructure, Grid Computing, High Performance Computing (HPC), Multi-Agent Systems, P2P Systems, Ontology Merging, Semantic Web

### **Education**

**Ph.D. Computer Science, December 2006**

**The University of Iowa, USA**

*Dissertation:* SOG: A Self-Organized Grouping Infrastructure for Grid Resource Discovery

*Advisors:* Dr. Sukumar Ghosh, Dr. Shaowen Wang

*GPA:* 4.0/4.0

**M.S. Computer Science, May 2003**

**The University of Iowa, USA**

*Thesis:* Building Local Consensus Ontologies Via Autonomous Merging Using a Lexical Database

*Advisors:* Dr. Andrew Williams, Dr. Sukumar Ghosh

*GPA:* 4.0/4.0

**B.E. Computer Engineering, June 2000**

**University of Mumbai, India**

*Project:* Transaction Processing on Multi-databases

### **Professional Experience**

**Research Scientist**

*CIGI, NCSA*

**07/01/2007 – present**

*University of Illinois at Urbana Champaign,  
Urbana, USA*

My main responsibility is to conduct research and development on cyberinfrastructure related technologies. I serve as the technical lead responsible for coordinating activities in the area of the infrastructure management, security, troubleshooting and information services at the CyberInfrastructure and Geospatial Information (CIGI) laboratory. My work involves both hands on software development/system administration as well as writing academic peer-reviewed scientific papers. I am a member of the security team in the Open Science Grid (OSG) and affiliated with National Center for Supercomputing Applications (NCSA).

**Assistant Research Scientist**

**12/01/2006 – 06/30/2007**

*The University of Iowa, Iowa City, USA*

I was involved in conducting research and development on computational Grids at GROW (Grid Research and education group @ ioWa). This involved writing technical reports and scientific papers in the emerging field of cyberinfrastructure. I led the technical work on troubleshooting cyberinfrastructure and developing Grid information services. I was also a member of the Open Science Grid (OSG) troubleshooting team.

### Graduate Research Assistant

01/01/2003 – 11/30/2006

*The University of Iowa, Iowa City, USA*

My primary responsibility included, developing cyberinfrastructure tools, writing scientific papers and technical reports. I served as the technical lead for the development of production quality monitoring and information services software. I was involved in deploying and troubleshooting cyberinfrastructure services and was the lead developer of the Generic Information Provider (GIP) in the Open Science Grid (OSG).

### Software Developer

05/20/2002 – 08/09/2002

*Summer Internship*

*UBS Warburg, Chicago, IL, USA*

Design, development and deployment of financial services tools on an Oracle Portal Infrastructure.

### Software Design Engineer in Test

05/15/2001 – 08/03/2001

*Summer Internship*

*Microsoft Co., Redmond, WA, USA*

Development and testing of the tools for benchmarking transport layer performance on Windows XP.

### Teaching Experience

- Teaching Assistant, Autonomous Agents and Multi-Agent Systems (Graduate), Department of Electrical and Computer Engineering, The University of Iowa, Spring 2003.
- Teaching Assistant, Software Engineering Foundations (Graduate), Department of Computer Science, The University of Iowa, Fall 2002.
- Teaching Assistant, Object-Oriented Software Development (Undergrad), Department of Computer Science, The University of Iowa, Spring 2002.
- Teaching Assistant, Programming Language Foundations (Graduate), Department of Computer Science, The University of Iowa, Fall 2001.
- Teaching Assistant, Object-Oriented Software Development (Undergrad), Department of Computer Science, The University of Iowa, Spring 2001.
- Teaching Assistant, Introduction to Computer Programming (Undergrad), Department of Computer Science, The University of Iowa, Fall 2000.

### Peer-reviewed Publications

#### Book Chapter

1. **Anand Padmanabhan**, Eric Shook, Yan Liu, and Shaowen Wang . An Interoperable Information Service Solution for Grids. In: *Cyberinfrastructure Technologies and Applications*, Junwei Cao (Ed.). Nova Science Publishers, Inc. 2009.

#### Journal Publications

2. **Anand Padmanabhan**, Sukumar Ghosh and Shaowen Wang. A Self-Organized Grouping (SOG) Framework for Efficient Grid Resource Discovery. *Journal of Grid Computing*, vol. 8, no. 3, pp. 365-389, Sept 2010.
3. Andrew B Williams, **Anand Padmanabhan** and Brian M Blake. Experimentation with Local Consensus Ontologies with Implications for Automated Service Composition. *IEEE Transactions on Knowledge and Data Engineering*, vol. 17, no. 7, pp. 969-981, July 2005.

## Conference Proceedings

4. **Anand Padmanabhan** and Shaowen Wang. A Distributed Resource Broker for Spatial Middleware Using Adaptive Space-Filling Curve. In *Proceedings of the ACM SIGSPATIAL International Workshop on High Performance and Distributed Geographic Information Systems (ACM HPDGIS 2010)*, San Jose, CA, USA, November 2, 2010.
5. Shaowen Wang, **Anand Padmanabhan**, James D Myers, Wenwu Tang and Yong Liu. Towards Provenance-aware Geographic Information Systems. In *Proceedings of 16th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (ACM GIS 2008)*, Irvine, CA, USA, November, 2008.
6. Shaowen Wang, Eric Shook, Ransom Briggs, **Anand Padmanabhan** and Thomas Hansen. Modular Information Provider: A Grid-Independent Approach. In *Proceedings of TeraGrid07*, Madison, WI, USA, June 2007.
7. Shaowen Wang, Eric Shook, **Anand Padmanabhan**, Ransom Briggs and Laura Pearlman. Developing the Modular Information Provider (MIP) to Support Interoperable Grid Information Services. In *Proceeding of 5th International Workshop of Grid and Cooperative Computing (GCC2006)*, Hunan, China, October 2006.
8. **Anand Padmanabhan**, Shaowen Wang, Sukumar Ghosh and Ransom Briggs. A Self-Organized Grouping (SOG) Method for Efficient Grid Resource Discovery. In *Proceedings of Grid 2005 Workshop (in conjunction with Supercomputing 2005 Conference)*, Seattle, WA, USA, November 2005.
9. Shaowen Wang, **Anand Padmanabhan**, Yan Liu, Ransom Briggs, Jun Ni, Tao He, Boyd M Knosp and Yasar Onel. A Multi-Agent System Architecture for End-User Level Grid Monitoring Using Geographic Information Systems (MAGGIS): Architecture and Implementation. In *Proceedings of 2nd International Workshop of Grid and Cooperative Computing (GCC2003)*, Lecture Notes in Computer Science, LNCS vol. 3032, pp. 536-543, 2004.
10. Andrew B Williams, **Anand Padmanabhan** and Brian M Blake. Local Consensus Ontologies for B2B-Oriented Service Discovery. In *Proceedings of Second International Joint Conference on Autonomous Agents and Multi-Agent Systems*, Melbourne, Australia, 2003.

## Posters

11. **Anand Padmanabhan**. SOG: A Self-Organized Grouping Infrastructure for Grid Resource Discovery. In *EDAA/DATE (Design Automation Test in Europe) Ph.D. Forum*, Acropolis, Nice, France, April 16-20, 2007.
12. Shaowen Wang, Eric Shook, **Anand Padmanabhan**, Ransom Briggs and Laura Pearlman. Developing the Modular Information Provider (MIP) to Support Interoperable Production-Level Grid Information Services. In *TeraGrid 06*, Indianapolis, IN, USA, June 2006.

## Others

13. **Anand Padmanabhan**, Wenwu Tang, and Shaowen Wang. Agent-based Modeling of Agricultural Land Use on TeraGrid. Abstract in *Proceedings of TeraGrid 2010 conference*, Pittsburgh, PA, USA, August 1-5, 2010.

## Other Publications

### Technical Reports

14. **Anand Padmanabhan**, Sukumar Ghosh and Shaowen Wang. A Self-Organized Grouping (SOG) Method for Resource Discovery in Grids. *Technical Report 05-12*, Department of Computer Science, The University of Iowa, 2005.

## Thesis

15. SOG: A Self-Organized Grouping Infrastructure for Grid Resource Discovery. **Anand Padmanabhan**. Advisors: Dr. Sukumar Ghosh, Dr. Shaowen Wang. *PhD Thesis*, Department of Computer Science, The University of Iowa, 2006
16. Building local consensus ontologies via autonomous merging using a lexical database. **Anand Padmanabhan**. Advisors: Dr. Andrew Williams, Dr. Sukumar Ghosh. *MS Thesis*, Department of Computer Science, The University of Iowa, 2003

## Selected Presentations

### Invited Lectures

1. **Anand Padmanabhan**. Comparing ArcGIS and Open-source Solutions using Malaria Map Application. Invited Lecture (Graduate class on Principle of GIS), Department of Geography, The University of Illinois at Urbana Champaign, Urbana, IL, April 2010.
2. **Anand Padmanabhan**. An Hands on Introduction to Open Source GIS Software (Post-GIS, Geoserver and Openlayers). Invited Lecture (Graduate class on Principle of GIS), Department of Geography, The University of Illinois at Urbana Champaign, Urbana, IL, April 2009.
3. **Anand Padmanabhan**. An Introduction to Grid Computing. Invited Lecture (Graduate class on peer-to-peer networks), Department of Computer Science, The University of Iowa, Iowa City, IA, March 2007.

### Other Presentations

3. **Anand Padmanabhan**, Wenwu Tang and Shaowen Wang. Agent-based modeling of agricultural land use on TeraGrid, The 5th Annual TeraGrid Conference, TG10, Pittsburgh, PA, August 2-5, 2010.
4. **Anand Padmanabhan**. Pakiti: A Patching Status Monitoring Tool. OSG All-Hands Meeting, Fermilab, Batavia, IL, Mar 2010.
5. **Anand Padmanabhan**, Shaowen Wang, Ian Brooks and Kathrine Tan. Malaria Map Application. CDC Malaria Branch Meeting, Atlanta, GA, Sept 2009 and Conference of American Association of Blood Banks (AABB), New Orleans, LA, Oct 2009.
6. **Anand Padmanabhan**. Incident Response Forensics and Review OSG Security Drill. OSG Site Administrators Workshop. Indianapolis, IN, Aug 2009.
7. **Anand Padmanabhan** and Jim Basney. Security Best Practices. OSG All-Hands Meeting, Baton Rouge, LA, Mar 2009.
8. **Anand Padmanabhan**. Command Line Tool for Certificate Management. OSG Site Administrators Meeting. Stanford Linear Accelerator Center (SLAC), Stanford, CA, Nov 2008.
9. **Anand Padmanabhan** and Shaowen Wang. OSG Troubleshooting: A User-Centric Perspective. OSG User's Meeting. Brookhaven National Laboratory, Upton, NY, June 2008.

10. **Anand Padmanabhan** and Shaowen Wang. Logging and Troubleshooting An OSG Perspective. OSG Consortium All Hands Meeting, Chapel Hill, NC, March 2008.
11. **Anand Padmanabhan**. OSG Information Services A Discussion. OSG Site Administrators Meeting. Fermilab, IL, Dec 2007.
12. Shaowen Wang, **Anand Padmanabhan** and Eric Shook. Grid Interoperability. International ICFA Workshop on HEP Networking, Grid and Digital Divide Issues for Global e-Science, Oct 2007.
13. Shaowen Wang, **Anand Padmanabhan** and Wayne Betts. Troubleshooting - STAR Experience. OSG Consortium All Hands Meeting, San Diego, CA, March 2007.
14. **Anand Padmanabhan**, Shaowen Wang and Sukumar Ghosh. SOG: A Self-Organized Grouping Infrastructure for Grid Resource Discovery. The University of Iowa Research Booth at IEEE/ACM Supercomputing Conference 2006 (IEEE/ACM SC2006), Tampa, FL, November 11-17, 2006.
15. **Anand Padmanabhan** and Shaowen Wang. Using MonALISA Repository. Open Science Grid (OSG) Operations and Support Center Meeting, IUPUI Campus, Indianapolis, IN, May 16-17 2006.
16. Eric Shook and **Anand Padmanabhan**. Grid User Management System (GUMS). Open Science Grid (OSG) Operations and Support Center Meeting , IUPUI Campus, Indianapolis, IN, May 16-17 2006.
17. **Anand Padmanabhan** and Shaowen Wang. State of Generic Information Provider (GIP) in Open Science Grid (OSG). Open Science Grid Integration Workshop, Fermilab, IL November 30 - December 1, 2005.
18. **Anand Padmanabhan**, Shaowen Wang, Sukumar Ghosh and Ransom Briggs. A Self-Organized Grouping (SOG) Method for Efficient Grid Resource Discovery. The University of Iowa Research Booth at IEEE/ACM Supercomputing Conference 2005 (IEEE/ACM SC2005), Seattle, WA, November 12-18, 2005.
19. Shaowen Wang, Ransom Briggs and **Anand Padmanabhan**. HawkGrid Technologies Current Status and Future. The First HawkGrid Workshop, Iowa City, IA, November 10, 2005.
20. **Anand Padmanabhan** and Shaowen Wang. Resource Discovery and Monitoring - Managing Grid Complexity for End Users. The CMS UIowa Tier-2 Workshop, Iowa City, IA, July 22, 2004.
21. Andrew B Williams, **Anand Padmanabhan** and Brian M Blake. Local Consensus Ontologies for B2B-Oriented Service Discovery. The Second International Joint Conference on Autonomous Agents and Multi-Agent Systems, Melbourne, Australia, 2003.

## Grants

- 2010-2011 Co-PI, NSF TeraGrid Supercomputing Resource Award: Extending and Sustaining GISolve as a GIScience Gateway Toolkit for Geographic Information Analysis, PI: Shaowen Wang (University of Illinois at Urbana-Champaign);1,240,950 Service Units (equivalent to normalized CPU hours)]

## Selected Research Projects

- *Security Probes for Open Science Grid - Resource and Service Validation (OSG-RSV)*. I am the lead technical developer of the security probes for the OSG-RSV framework that are deployed both centrally and on every OSG site to monitor and validate the status the OSG security infrastructure.
- *Malaria Map Application*. I was the technical lead and the principle developer of a project to design a web-based GIS (Geographic Information Systems) to manage and access Malaria data. We developed an interactive map, that presents world wide malaria endemicity information intelligently, and in a manner that is easily understood, so as to be accessible to general audience of travelers as well as experts users like health professionals and blood-banks. This project was developed for the CDC's (Center for Disease Control and Prevention) Malaria branch, using the latest versions of the open-source technologies, and its production deployment is actively used by 100's of users daily. (<http://cdc-malaria.ncsa.uiuc.edu/>(verified Apr 2010)).
- *SOG: A Self-Organized Grouping Infrastructure for Grid Resource Discovery*. I tackled the important problem of Grid resource discovery in my PhD thesis research. I proposed a self-organizing solution to this problem that is designed specifically for handling dynamically available Grid resources. The method groups together resources into dynamic groups based on resource availability, thereby achieving excellent query performance.
- *Open Science Grid - Generic Information Provider (OSG-GIP)*. I was a lead developer of this widely deployed information provider, that forms a core piece of the OSG's information services infrastructure. It enables Grid interoperability, OSG resource selection services.
- *Modular Information Provider (MIP)*. I actively participated in the development of this next generation Grid independent information provider, that works with the latest version of Globus Monitoring and Discovery Service (MDS-4).
- *HawkGrid*. I was involved in the development, deployment and education activities of HawkGrid, a campus wide Grid computing infrastructure at The University of Iowa.
- *Multi-Agent System Architecture for End-User Level Grid Monitoring Using Geographic Information Systems (MAGGIS)*. I was involved as the main developer for implementing an end user Grid monitoring service using a multi-agent architecture.

## Professional Service

- *Communication Chair*. ACM SIGSPATIAL International Workshop on High Performance and Distributed Geographic Information Systems (HPDGIS) 2010, San Jose, CA, US, Nov, 2010.
- *Program Committee Member*. 1st International Conference on Parallel, Distributed and Grid Computing (PDGC-2010). Wagnaghat, Solan (HP), India, Oct, 2010.
- *Technical Program Committee Member*. GridNets 2010, Chicago, IL, US, Sept, 2010.
- *Technical Program Committee Member*. GridNets 2009, Athens, Greece, Sept, 2009.
- *Program Committee Member*. GridNets 2007, Lyon, France, October, 2007.
- *Program Committee Member*. The 2007 International Workshop on Internet Computing for Science and Engineering, Beijing, P. R. China, May, 2007.

- *Program Committee Member.* The 2006 International Workshop on Web-based Internet Computing for Science and Engineering, Harbin, P. R. China, January, 2006.
- *Reviewer.* International Conference on Distributed Computing System (ICDCS), Toronto, Canada, June 25-29, 2007.
- *Reviewer.* TeraGrid07, Madison WI, USA, June, 2007.
- *Reviewer.* Journal of Grid Computing, 2005, 2006.
- *Reviewer.* Eighth International Symposium on Stabilization, Safety, and Security of Distributed Systems (SSS 2006), Dallas, Texas, USA, November 17-19, 2006.

#### **Selected Awards and Scholarships**

- Departmental (Computer Science) Nominee for University of Iowa's D.C. Spriestersbach Dissertation Prize, The University of Iowa, 2007.
- Student Scholar, Global Grid Forum (GGF-14), 2005.
- Graduate Travel Support, Information Technology Services, The University of Iowa, 2005, 2006.
- Travel Scholarship, Department of Computer Science, The University of Iowa, 2005.