

# Umesh Bellur

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## CONTACT INFORMATION

Dept of Computer Science  
Kanwal Rekhi Building  
IIT Bombay  
Powai, Mumbai 400076, India

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## RESEARCH INTERESTS

Topics in virtualization and Cloud computing - energy aware scheduling, VM Migration, cloud simulation etc. QoS issues in Distributed Event Based Systems and Complex event Processing.

## EDUCATION

**Syracuse University**, Syracuse, NY USA  
*Department of Computer Science and Engineering*  
Ph.D., June 1994

- Dissertation Topic: "Clustering in distributed object systems"
- Advisor: Professor Douglas Lea

**BMS College of Engineering, Bangalore University**, Bangalore, India  
*Department of Electronics Engineering*  
B.E., Electronics and Communication Engineering, May, 1988

## HONORS AND AWARDS

MW4SOC 2010, Most Promising Research Paper Award  
SAP Research and Innovation Awards 2008  
IBM Faculty Award, 2006  
Syracuse University Graduate Fellowship, 1992

## ACADEMIC EXPERIENCE

**Dept. of Computer Science & Engineering, Indian Institute of Technology Bombay, Mumbai, India**

*Professor*

**January, 2011 - present**

Participate in academic policy decisions for the institute apart from advising Doctoral and Masters research candidates, Doctoral, Masters and Bachelors level coursework, research/consulting projects with industry/government and curricular development at all levels.

*Associate Professor*

**February, 2003 - December 2010**

Includes advising Doctoral and Masters research candidates, Doctoral, Masters and Bachelors level coursework, research/consulting projects with industry/government and curricular development at all levels.

**Dept. of Computer Engineering, Syracuse University, Syracuse, NY**

*Teaching/Research Assistant*

**August, 1989 - 1993**

Duties at various times have included assisting funded research, grading, office hours and leading weekly computer lab exercises.

## BOOK CHAPTERS AND JOURNAL PUBLICATIONS

1. QoS Elements of Web Services: Taxonomies, Ontologies, and Classifications: Manish Godse, Umesh Bellur, Rajendra Sonar, IJCNDS, Volume 6, Issue 2, 2011, DOI: 10.1504/IJCNDS.2011.038521
2. Safe Online Update of Concurrent Object Oriented Programs, Umesh Bellur and Yogesh Murarka, Communicated to IEEE Transactions on Software Engineering.
3. Semantic Matchmaking Algorithms for Web Services Matching, Umesh Bellur and Harin Vadodaria, Book Chapter in Advances in Greedy Algorithms, ISBN 978-953-7619-27-5, IN-TECH Publications.

4. Incorporating Underlay Awareness into Highly Available P2P Networks, Umesh Bellur and Madhu Kumar, International Journal of Communication Networks and Distributed Systems, Vol 4, No. 2, pp 133-160, InderScience Publishers.
5. Practice-Relevant Pedagogy for Mining Software Engineering Curricula Assets, Rajiv Ramanath, Jay Ramanathan & Umesh Bellur. Technical Report, OSU, Dept. of Computer Science and Engineering, OSU-CISRC-5/07-TR36. Also submitted to IEEE Journal of Engineering Education.
6. A taxonomy and classification of Adaptive event dissemination middleware with support for service guarantees. Shruti Mahambre, Madhu Kumar and Umesh Bellur, IEEE Internet Computing, Special Issue on Data Dissemination, Vol. 11, No. 4, PP 35-44, July 2007
7. Java & CORBA, Umesh Bellur, Book Chapter in Java Network Programming: Manning Publications, ISBN Number 1-884777-49-X
8. A Strategic Weapon for Data CLECs in Challenging Conditions. Umesh Bellur and Nagaraju Bandaru, Book chapter in Operations Support Systems 2002: Enabling the Next-Generation Network. ISBN: 1-931695-05-9, IEC Press

REFEREED  
CONFERENCE  
PUBLICATIONS

1. Resource availability based performance benchmarking of virtual machine migrations., Senthil Nathan, Purushottam Kulkarni and Umesh Bellur, ICPE 2013.
2. Minimizing Latency in Serving Requests through Differential Template Caching in a Cloud, Deepak Jeswani, Manish Gupta, Pradipta De, Arpit Malani and Umesh Bellur, IEEE International Conference on Cloud Computing, IEEE CLOUD 2012, July 2012, Maui, Hawaii, USA.
3. Risk Aware Provisioning and Resource Aggregation Based Consolidation of Virtual Machines, Kishalay Halder, Umesh Bellur and Purushottam Kulkarni, IEEE International Conference on Cloud Computing, July 2012, Maui, Hawaii, USA.
4. VirtPerf, A Performance Profiling tool for Virtual Environments, Prajakta Patil, Puru Kulkarni and Umesh Bellur, Accepted at the IEEE International Conference on Cloud Computing, 2011, Washington DC, July 2011.
5. A Middleware For Adaptive Service Orientation In Pervasive Computing Environments, Narendra Nanjangud and Umesh Bellur, Middleware for Service Oriented Computing (MW4SOC 2010) workshop, Middleware 2010, Dec 2010, Bengaluru, India.
6. QoS based Service Selection, Manish Godse, Umesh Bellur, Rajendra Sonar, ICWS 2010, July 2010, Miami, USA.
7. On Using Network Tomography for Overlay Availability, Umesh Bellur and Mahak Patidar, ICDCN 2010, Kolkata, India,
8. Automated Web Service Composition Using Semantic Descriptions, Umesh Bellur and Tanmay Mande, APSCC 2009, Singapore.
9. Decentralized Adaptive Routing for Reliability in Event Broker Networks, Shruti P. Mahambre & Umesh Bellur, ICPADS 2009, Shenzhen, China.
10. On Using Network Tomography for Overlay Availability, Umesh Bellur and Mahak Patidar, ICDCN 2010, Kolkata, India.
11. TSAR - Type Specific Adaptive Routing for Reliability in Event Based Middleware, Shruti P. Mahambre & Umesh Bellur, Poster at DEBS 2009, Nashville, USA.
12. Web Service Ranking Using Semantic Profile Information, Umesh Bellur and Harin Vadodaria, Accepted for publication in the Proceedings of IEEE ICWS 2009, Los Angeles, CA, July 2009.
13. Underlay Aware Resiliency in P2P Overlays, Madhu Kumar S.D, Umesh Bellur, and V. K. Govindan, Proceedings of the 10th International Conference on Distributed Computing and Networking - ICDCN 2009, Hyderabad, India.

14. Correctness of Request Executions in Online Updates of Concurrent Programs, Yogesh Murarka and Umesh Bellur, Proceedings of the 14th APSEC, Beijing, China, Dec 2008
15. On Extending Semantic Matchmaking to Include Preconditions and Effects, Umesh Bellur and Harin Vadodaria, Proceedings of The International Conference on Web Services (ICWS) 2008, Beijing, China, Sept 2008
16. An adaptive approach for ensuring reliability in event based middleware, Shruti P. Mahambre, Umesh Bellur, Second Conference on Distributed Event Based Systems, Rome, Italy, July 2008
17. Availability models for underlay aware overlay networks, Madhu Kumar SD, Umesh Bellur, Second Conference on Distributed Event Based Systems, Rome, Italy, July 2008
18. Towards seamless user mobility in service oriented environments via context awareness, Umesh Bellur, Siddharth Bondre, Proceedings of the 6th International Conference on Pervasive Services, Sorrento, Italy, July 2008
19. Adding Underlay Aware Fault Tolerance to Event Broker Networks, Umesh Bellur and Madhu Kumar, ICSOFT 2007, Barcelona, Spain, July 2007
20. A Methodology and Tool for Determining Inter-component Dependencies Dynamically in J2EE Environments, Umesh Bellur, The Third International Conference on Autonomic and Autonomous Systems, Athens, Greece. June 2007.
21. Root Cause Isolation for Self Healing in J2EE Environments, Umesh Bellur and Amar Agrawal, First International Conference on Self Adaptive and Self Organizing Systems (SASO) 2007, Cambridge, USA.
22. An Improved Semantic Matchmaking Algorithm, Umesh Bellur and Roshan Kulkarni, International Conference on Web Services 2007, July 2007, Salt Lake City, USA
23. A Distributed Algorithm for Underlay Aware and Available Overlay Formation in Event Broker Networks for Publish/Subscribe Systems, Madhu Kumar and Umesh Bellur, DEPSA 2007, a workshop of ICDCS 2007, June 2007, Toronto, Canada
24. Reliable Routing of Event Notifications over P2P Overlay Routing Substrate in Event Based Middleware, Shruti Mahambre and Umesh Bellur, Proceedings of Hot P2P '07, a workshop of IPDPS 2007, March 2007, Long Beach, CA, USA.
25. Adaptive Overlays for Event Based Middleware- A case for Chordal Reliability Rings: Madhukumar S.D., Umesh Bellur and V.K. Govindan, ADCOM 2006, India, Dec 2006
26. Power Aware Duty Scheduling for Wireless Sensor Networks, Umesh Bellur and Nishant Jaiswal., ICDCN, India, Dec 2006
27. A Versioning Scheme for Consistent Evolution of OO Applications, Umesh Bellur and Vallieswaran V., 13th APSEC, India, Dec 2006
28. Safety Analysis for Dynamic Update of Object Oriented Programs, Yogesh Murarka, Umesh Bellur and Rushikesh Joshi., 13th APSEC, India, Dec 2006
29. An Underlay Aware, Adaptive Overlay for Event Broker Networks, Madhu Kumar S.D., Umesh Bellur, Adaptive and Reflective Middleware Workshop, Middleware 2006, Melbourne, Australia, Nov 2006
30. An Academic Perspective on Globalization in the Software Industry. Umesh Bellur, Short paper at Compsac 2006, Chicago, USA, Sept 2006
31. Transformation of UML Design Model into Performance Model - A Model-Driven Framework., Ramrao Wagh, Umesh Bellur, Bernard Menezes., ICEIS (3) 2006: 576-580
32. On OO Design Consistency in Iterative Development, Umesh Bellur and Vallieswaran V., Software Engineering track of ITNG 2006, Las Vegas, USA, April 2006
33. On Using OO Techniques to Establish Workflow Conformance, Umesh Bellur, Poster Paper in OOPS Track of ACM SAC 2006, Dijon, France, April 2006

34. xSpace - A Tuple space for XML and its application in Orchestration of Web Services, Umesh Bellur and Siddharth Bondre, Distributed and Grid Computing Track of ACM SAC 2006, Dijon, France, April 2006
35. Towards a Programming Model and Middleware Architecture for Self-configuring systems, Umesh Bellur and Narendra Nanjangud, COMSWARE 2006, New Delhi, India, January 2006
36. Functional and Architectural Adaptation in Pervasive Computing Environments, Umesh Bellur, S.K. Nandy, K.Kalapriya and Narendra Nanjangud, MPAC, Middleware 2005, Grenoble, France, Nov 2005
37. Towards Service Orientation in Pervasive Computing Systems, Umesh Bellur and Narendra Nanjangud, ITCC 2005, Las Vegas, USA, April 2005
38. A Declarative Framework to create Differentiated Service Levels in Component Based Middleware, PDCS 2004, Cambridge, MA, Nov 2004
39. Performance Prediction and Physical Design of J2EE based Web applications, WSEAS CSCC 2004, Athens, Greece., July 2004
40. Autonomic Computing Platform for Distributed Enterprise Computing, Umesh Bellur, Position paper at Workshop on Software Performance (WOSP), January 2004.
41. Discovery in distributed object environments - Umesh Bellur, NCOOT August 2003.
42. The Role of Components and Standards in Software Reuse, Umesh Bellur, Workshop on Compositional Software Architectures. 1998, Monterey CA.
43. Musings of an Engine Builder, Umesh Bellur, Position paper at the OOSPLA '95 Workshop on Object Engines.
44. Building Large Scale Distributed Systems, Umesh Bellur and Swami Venkates, Position paper at the OOPSLA '95 workshop on "Building Large Scale Distributed Object Systems".
45. CORBA and Beyond - Frameworks for distributed object system development, Umesh Bellur, OOPSLA '94 workshop on CORBA.
46. Clustering - Composition for Active Object systems, Umesh Bellur, Gary Craig, Doug Lea, Proceedings of the 27th Hawaii International conference on System Sciences.(01/94)
47. DIAMONDS - Principles and Philosophy, Umesh Bellur, Gary Craig, Kevin Shank, Doug Lea and Vaughn Combs, CASE Center Technical Report No. 9313, Syracuse University, 06/93
48. Clusters: A Pragmatic Approach towards Supporting a Fine Grained Active Object Model in Distributed Systems, Gary Craig, Umesh Bellur, Kevin Shank and Doug Lea, Proceedings of the Ninth International Conference on Systems Engineering, UNLV, 07/93
49. A Shared Memory Programming Environment for Distributed Systems, Umesh Bellur & Sumana Srinivasan, Proceedings of OpenForum '92 Technical Conference, Utrecht, The Netherlands, 11/92
50. A C++ Class Flattening Tool, Umesh Bellur & Imran Bashir, Proceedings of C++ at Work, Santa Clara, CA, 11/91
51. Transparent Load Sharing on UNIX, Umesh Bellur, Gary Craig, Kevin Shank, CASE Center Technical Report, Syracuse University, 05/92

#### PATENTS GRANTED

1. US Patent # 7,337,184 Topology mapping of a multitier compute infrastructure
2. US Patent # 7,281,046 Application program interface for automating high speed network access ordering and provisioning processes
3. US Patent # 7,243,306 Service descriptor for a multitier compute infrastructure
4. US Patent # 7,210,143 Deployment of applications in a multitier compute infrastructure
5. US Patent # 6,463,079 Processing orders for high bandwidth connections

## INVITED TALKS

- Keynote speaker at the 2nd International Conference on Emerging Technology Trends in Cloud Computing (ICETT 2011) March 2011, Kerala, India.
- Panelist at Skoch Annual Summit, 2010, Mumbai, India.
- Keynote speaker at the Redhat Service Oriented Architectures summit, Mumbai, India, Dec 2008.
- Keynote speaker at the Economic Times Intelligence Group forum on Business Process Management. Chennai & Mumbai, India - July 2007
- Keynote speaker at the CIO Club, Computer Society of India, Mumbai, India June 2007
- Department Colloquim, Department of Computer Science and Engineering, Ohio State University, Columbus, OH, USA, May 2007
- Invited expert speaker at IDC India Two City Knowledge Conference on Service Oriented Architectures, New Delhi and Bangalore, February 2007
- Invited Speaker at SAIG conference of Siemens Research, Mumbai, India, Jan 2007
- Keynote Speaker at ADCOM 2006, Surathkal, India, Dec 2006
- Invited Panelist at COMPSAC 2006 panel on "How to prepare students for the global environment?", Chicago, August 2006
- Department Colloquim talk at Marquette University, Dept of MSCS, Milwaukee, WI, USA, Sept 2006
- Keynote at L and T Infotech COE Day, Mumbai, India, June 2005
- IBM IRL, Stochastic Methods in Autonomic Computing, New Delhi, India, May 2005
- SAP Innovation Congress, Autonomic Computing - problems and approaches, Miami, FL, USA, March 2004,
- Seminar on Oss for Broadband Networks and Services. Delivered to WIPRO. Bangalore, India, Oct 2003.
- Hewlett Packard Labs, Lights out Management of Distributed Applications, Palo Alto, CA, June 2003
- Fourth IITB-Persistent Workshop on Data Management, Security Technologies underlying Databases, 2003, IITB, India
- Invited Speaker at Marcus Evans Telecom CIO Summit, Lake Geneva, WI, USA, May 2001.
- Panel chair for OSS at new generation networks at OSS Summit, Miami, FL, USA, Feb 2001.
- Enterprise Application Integration at Next Generation OSS, Denver, USA Sept 2000
- Workshop on Compositional Software Architectures, The Role of Components and Standards in Software Reuse. June 1998, Monterey, CA

## GRANTS SECURED

- IBM Shared University Research (SUR) grant for Cloud Collaboratory - \$75000 with Prof. Purushottam Kulkarni, June 2013
- Informatica research grant for research into Complex Event Processing, US \$10000, June 2012
- IBM CAS Grant for research into Cloud Computing, US \$20000, with Profs. Varsha Apte and Puru Kulkarni, Jan 2010
- Yahoo Inc, Unrestricted grant of Rs 5 Lakh with Prof. Puru Kulkarni, Dec 2009
- SAP Research and Innovation Award, \$22000, Oct. 2008.
- Motorola Research grant for research into seamless mobility in service oriented environments., \$ 14000 for 2006-2007, Sept 2006.
- IBM Faculty Award for research into self-configuration and self-healing in Autonomic Computing; \$ 26000 July 2006

- Intel IT Research Council, Continuing Grant for research into Self healing and Performance Modeling of Enterprise Applications, \$ 24000 along with Prof. Varsha Apte of CSE, IIT Bombay, January 2006
- Intel Corp, Linux Based Video Learning Solution for Distance Education, \$60,000 along with Prof. Deepak Phatak, January 2005
- Department of Science and Technology, Govt. of India - Service Oriented Architectures for NRDMs Applications, Rs 15 Lakh, April 2005
- Intel IT Research Council, Follow up grant for research into Autonomic Computing issues, \$ 24000 along with Prof. Varsha Apte of CSE, IIT Bombay, March 2005
- L and T Infotech - Enterprise Integration Architectures with Service Orientation, Rs 12 Lakh, June 2004
- Intel IT Research Council, Dynamic Determination of Topology for Distributed enterprise applications, \$ 12000 along with Prof. Varsha Apte of CSE, IIT Bombay, July 2004
- IRCC at IIT Bombay - Autonomic Computing Infrastructure, Rs 2 Lakh, Seed Grant, July 2003

#### TEACHING PROFILE

1. Distributed Algorithms, Graduate, Spring 2008, 2007, 2006, 2005, 2004 - 30-45 students.
2. Introduction to Distributed Systems - Undergraduate - Spring 2008, 2009
3. SOA and Semantic Web Services, Graduate, Fall 2008
4. Database Systems, Under Graduate, Fall 2007 (current), 65 students.
5. Software engineering, Graduate, Fall 2006, 22 students.
6. OO Design - Fall 2005, 2005, 2003 - 30 students.
7. Seminar Series on eCommerce & eBusiness Architectures - Summer 2003
8. Short course on Service Oriented Architectures (Continuing Education Program) - Summer 2006
9. Short course on OO Design (Continuing education program at Pune University) - Summer 2005

#### STUDENTS GUIDED

##### MASTERS

- Akhilesh Shirabate - Performance Modeling of Apache using Queueing Petri nets - 2004 - Yahoo India
- Sudhir G. - Topology Determination in J2EE based distributed systems - 2005 - Yahoo India
- Sudeep Goyal - Mapping Application QoS to Network Configurations on DiffServ over MPLS networks - 2005, Founder of a startup currently in stealth mode.
- Nishant N. - Towards Energy Optimizing Middleware for Wireless Sensor Networks - 2006 - Yahoo India
- Amar Agrawal - Topology Aware Failure Diagnosis for Distributed Systems - 2006 - Webaroo
- Vallieswaran N. - On supporting Design Evolution and Traceability - 2006 - Currently a Ph.D. student at IIT Bombay and employee at Yahoo India
- Roshan Kulkarni - Semantic Matchmaking with P2P Discovery of Web services - 2007 - Webaroo
- Kautilya Jain - Performance Modeling of J2EE based Distributed Component systems - 2007 - Symantec India.

- Siddharth Bondre - Middleware for Pervasive SOA environments - 2008 - Merrill Lynch, London.
- Harin Vadodaria - Extending Semantic Matchmaking to include Preconditions - 2008 - Sybase India.
- Tanmay Mandev - Automated Service composition using Semantic descriptions - 2009 - Symantec India.

#### PH.D.

- Yogesh Murakka - Graduated Aug 2010, Currently at Samsung Research Labs.
- Shruti Mahambre - Graduated March 2011, Currently at Xerox Labs, India.
- Madhu Kumar - Graduated July 2009, Currently a faculty member at NIT Calicut.

#### ACADEMIC SERVICE **Program Committees**

- Chair of the Doctoral Symposium at IEEE Cloud 2013.
- Associate Editor for IEEE Transactions on Cloud Computing, since January 2012
- Associate Editor for the CSI Transactions on ICT since June 2010.
- Track Chair for Cloud Computing, ACM SAC 2011.
- PC Chair for the 4th Indian Software Engineering Conference, 2010.
- Workshops chair for ICWS 2009
- Distributed Event Based Systems DEBS 2007, 2008, 2009
- PC member for ICPADS 2008, ICDCIT 2008
- Poster Chair for SASO 2008
- Track Chair for Autonomic and Cloud Computing track of ACM SAC 2007, ACM SAC 2008, ACM SAC 2009
- IEEE International Conference on Autonomic Computing ICAC 2007
- IEEE Self Adaptive and Self Organizing Systems SASO 2007
- ICDCS DEPSA 2007
- International Workshop on Pervasive Systems and Applications, 4th IEEE ICCSA, 2006
- ITNG 2007, ITNG 2005, ITNG 2005
- International Conference on Data Engineering ICDE 2006
- Object-Oriented Programming Languages and Systems - Special Track at the 21st ACM Symposium on Applied Computing, SAC 2005, 2006
- International Workshop on Managing Context Information in Mobile and Pervasive Environments, MCMP 2005
- Hawaii International Conference on System Sciences (HICSS) 05
- National Conference on OO Technologies (NCOOT) 03, 04
- ACM Sigmetrics Workshop on Software Performance (WOSP) 04
- Object-Oriented Programming Languages and Systems - Special Track at the 19th ACM Symposium on Applied Computing, SAC 2004
- International Conference on High Performance Computing - HiPC 2003

PROFESSIONAL  
EXPERIENCE

**Collation Inc.**, Palo Alto, CA, USA

*Vice President of Research and Development*

**July, 2000 - Feb, 2003**

Founded in June of 01, Collation Inc. focused on building software products for managing enterprise data centers. Specifically, they delivered products that achieve operational automation of large-scale enterprise software deployments that are based on J2EE technologies. As a founding member (one of 4), I helped conceptualize the product, do the market research and build a business plan that raised more than \$ 6M in round A funding from venture capital firms in an extremely difficult funding climate. Collation Inc. was subsequently acquired by the IBM Tivoli Group in 2004.

**Covad Communications Grp.**, Santa Clara, CA USA

*Vice President of Software Engineering*

**July, 1997 - July, 2001**

Responsible for managing over 165 engineers and a budget of over \$ 30M. Accountable for all of Covad's business process automation as well as that of its supply chain. Achieved integration of 2 different software engineering groups and products obtained via acquisitions

**Oracle Corp**, Redwood Shores, CA, USA

*Standards Manager*

**July, 1995 - July, 1997**

Evangelist of OMG and W3C standards within Oracle Corp and Oracles representative to these bodies. Chief Editor for the CORBA Component model - joint submission to the OMG with SUN, IBM, Oracle, Netscape and Visigenic.

**TCSI Corp**, Berkeley, CA, USA

*Principal Engineer*

**April, 1993 - July, 1995**

Delivered a high performance, distributed object infrastructure (ORB, Services and Frameworks) for telecommunication applications. Responsible for technical leadership as well as project management in this role. Architected CORBA compliance into TCSI's proprietary infrastructure and managed development of the ORB, the interoperability modules and some OMG Cos services.