

Abhishek Dubey

*Research Scientist,
Institute for Software Integrated Systems,
Vanderbilt University*

Senior Member, IEEE

*1025 16th Avenue
Nashville, TN*

☎ 615-322-8775

✉ dabhishe@isis.vanderbilt.edu

Permanent Resident, USA

Educational Background

- 2009 Ph.D., Electrical Engineering, Vanderbilt University, Nashville, TN
 - Dissertation: Using model-based techniques for improving performance and reliability in high-performance scientific computing.
- 2005 M.S., Electrical Engineering, Vanderbilt University, Nashville, TN
 - Thesis: Metamodel Based Language and Computation Platform for Algorithmic Analysis of Hybrid Systems.
- 2001 B.Tech. (Bachelor of Technology), Electrical Engineering, Indian Institute of Technology, Banaras Hindu University, Varanasi, India

Professional Experience

- 2009-Present Research Scientist, Institute for Software Integrated Systems, Vanderbilt University
 - Conducting research on patterns, diagnostic techniques and mitigation strategies for resilient cyber-physical systems and model-driven architectures for designing and analyzing properties of dynamic distributed real-time systems.
- 2003-2009 Research Assistant, Department of Electrical Engineering and Computer Science, Vanderbilt University
 - Research in real-time reflex and healing architectures for large-scale computing clusters.
- Summer 2008 Research Intern, IBM T.J Watson Research Center, Hawthorne, NY
 - Research in performance modeling and analysis of multi-tier web applications.
- Summer 2003 Research Intern, General Motors, Technical Center, Warren, MI
 - Research in model-based design of cruise control applications.
- 2001-2003 Software Engineer, IBM Global Services, India

Sponsored Research Funding (2009-2015)

- As Vanderbilt PI - \$ 526,294
 - As Vanderbilt Co-PI - \$19,119,180
 - Total funding for the period - \$19,645,474
-
- 2015–2017 NSF. “Experiments with Smart City Hubs: Integration Platform for Human Cyber-Physical Systems In Smart Cities”. PI:Abhishek Dubey. Role:PI. Other Collaborators: Jules Whites; Sandeep Neema. \$197,556.00
 - Building a smart decision support system for public transit using smart city hub framework.

- 2014–2015 DARPA. “Support for System of Systems Integration Technology and Experimentation”. PI:Gabor Karsai. Role:Co-PI. Other Collaborators: Daniel Balasubramanian. \$104,782.00
- Solving the integration and validation challenges for large scale systems of systems.
- 2014–2015 Siemens. “Building Resilient Distributed Systems for Next Generation Mobile Adhoc Cyber Physical Systems”. PI:Abhishek Dubey. Role:PI. Other Collaborators: Douglas Schmidt; William Otte. \$238,188.00
- Addressing the challenges stemming from the need to resolve various challenges within extensible CPS.
- 2013–2014 DARPA. “Adaptive Vehicle Make”. PI:Ted Baptý. Role:Research Scientist (2014). Other Collaborators: Janos Sztipanovits; Sandeep Neema. \$10,534,174.00
- Studing reliability analysis of component-based systems.
- 2013–2016 NSF. “Diagnostics and Prognostics Using Temporal Causal Models for Cyber Physical Systems- A case of Smart Electric Grid”. PI:Gabor Karsai. Role:Co-PI. Other Collaborators: Anurag Srivastava; Srdjan Lukic. \$399,951.00
- Developing temporal causal diagram based reasoning approach that can be used for understanding failures in transmission and distribution systems.
- 2013–2015 NavAir. “Future Airborne Capability Environment”. PI:Ted Baptý. Role:Co-PI. Other Collaborators: James Davis; Jason Scott. \$6,370,047.00
- Building the next generation Avionics Platform Standard and Reference Implementation.
- 2012–2013 NavAir. “Future Airborne Capability Environment”. PI:Ted Baptý. Role:Co-PI. Other Collaborators: Sandeep Neema; Jason Scott; James Davis. \$3,573,021.00
- Building the next generation Avionics Platform Standard and Reference Implementation.
- 2012–2013 ONR. “Domain Specific Languages for Designing Electrical Ships”. PI:Abhishek Dubey. Role:PI. Other Collaborators: . \$40,580.00
- Solving simulation and design challenges for micro grids in electrical ships.
- 2012–2014 AFRL. “Resilient Software Systems”. PI:Gabor Karsai. Role:Co-PI. Other Collaborators: . \$699,570.00
- Addressing the challenges stemming from resilience requirements in extensible CPS.
- 2011–2011 NavAir. “Future Airborne Capability Environment”. PI:Ted Baptý. Role:Co-PI. Other Collaborators: Sandeep Neema; Jason Scott. \$311,047.00
- Building the next generation Avionics Platform Standard and Reference Implementation.
- 2011–2012 NavAir. “Future Airborne Capability Environment”. PI:Ted Baptý. Role:Co-PI. Other Collaborators: Sandeep Neema; Jason Scott; James Davis. \$733,715.00
- Building the next generation Avionics Platform Standard and Reference Implementation.
- 2011–2014 DARPA. “F6 Model Driven Development Kit (F6MDK) ”. PI:Gabor Karsai. Role:Co-PI. Other Collaborators: Aniruddha Gokhale. \$6,245,040.00
- Design and Implementation of a Secure Information Architecture for Extensible CPS.
- 2010–2012 NSF. “Autonomic Computing”. PI:Abhishek Dubey. Role:PI. Other Collaborators: . \$49,970
- Performance Modeling and Management of Multitier Systems.
- 2010–2011 NavAir. “Future Airborne Capability Environment”. PI:Ted Baptý. Role:Co-PI. Other Collaborators: Gabor Karsai; Sandeep Neema; Jason Scott. \$59,957.00
- Building the next generation Avionics Platform Standard and Reference Implementation.
- 2010–2011 NavAir. “Future Airborne Capability Environment”. PI:Ted Baptý. Role:Co-PI. Other Collaborators: Gabor Karsai; Sandeep Neema; Jason Scott. \$281,076.00
- Building the next generation Avionics Platform Standard and Reference Implementation.

- 2009–2012 DOE. “Optimization of Fault Mitigation for Large Commodity Clusters”. PI:Ted Bapty. Role:Co-PI. Other Collaborators: James Kwalkowski. \$340,974.00
- Building model-based hierarchical reflex and healing framework for large computing clusters.
- 2008–2011 NASA. “Model-Based Software Health Management”. PI:Gabor Karsai. Role:Research Scientist (2009–2011). Other Collaborators: Nagabhushan Mahadevan. \$574,351.00
- Designing detection, diagnosis and mitigation techniques for software intensive CPS
- 2006–2011 ARMY. “Future Combat Systems”. PI:Janos Sztipanovits. Role:Research Scientist (2009–2010). Other Collaborators: Ted Bapty; Sandeep Neema; Jason Scott. \$11,553,859.00
- Designing Model-based Architectures for Complex distributed systems.

Research Interests

- Energy Cyber Physical Systems
- Algorithms and Application frameworks at scale for Cyber Physical Systems
- Self-Reconfiguration in Resilient Cyber Physical Systems
- Model-based Fault diagnosis and Systems health Management

Teaching Interests

- Operating Systems
- Real-Time systems: foundations, models of computation, design and analysis
- Resilient Cyber-Physical Systems

Teaching Experience

- Fall 2015 CS 3281/5281- Principles of Operating Systems I, 49 students
- Spring 2015 CS 281- Principles of Operating Systems I, 38 students
- Fall 2014 CS 281- Principles of Operating Systems I, 40 students
- Spring 2014 CS 281- Principles of Operating Systems I, 29 students

Graduate Students Mentored

- Subhav Pradhan, CS
- Shweta Khare, CS
- Ajay Chokra, EE
- Saqib Hasan, EE
- William Emfinger, EE
- Pranav S. Kumar, EE
- Akshay Dabholkar, CS
- Saideep Nannapaneni, Civil

Publications

Refereed Journal Publications

1. Daniel Balasubramanian, Abhishek Dubey, William Otte, Tihamer Levendovszky, Aniruddha Gokhale, Pranav Kumar, William Emfinger, and Gabor Karsai. DREMS ML: A Wide Spectrum Architecture Design Language for Distributed Computing Platform. *Sci. Comput. Program.*, 106(C):3–29, August 2015.

2. N. Mahadevan, A. Dubey, A. Chhokra, H. Guo, and G. Karsai. Using temporal causal models to isolate failures in power system protection devices. *Instrumentation Measurement Magazine, IEEE*, 18(4):28–39, August 2015.
3. Martin Goncalo, Arul Moondra, Abhishek Dubey, Anirban Bhattacharjee, and Xenofon Koutsoukos. Computation and communication evaluation of an authentication mechanism for time-triggered networked control systems: An empirical study. *Computers and Security*, 2015. (Under review).
4. Tihamer Levendovszky, Abhishek Dubey, William R. Otte, William Balasubramanian, Daniel andand Emfinger, Pranav Kumar, and Gabor Karsai. Achieving resilience in distributed software systems via self-reconfiguration. *Elsevier Journal of Systems and Software*, 2015. (Under review).
5. Saideep Nannapaneni, Abhishek Dubey, Sherif Abdelwahed, Sankaran Mahadevan, Sandeep Neema, and Ted Bapty. Mission-based reliability prediction in component-based systems. *International Journal of Prognostics and Health Management*, 2015. (Under Review).
6. Tihamer Levendovszky, Abhishek Dubey, William R. Otte, Daniel Balasubramanian, Alessandro Coglio, Sandor Nyako, William Emfinger, Pranav Kumar, Aniruddha Gokhale, and Gabor Karsai. Distributed real-time managed systems: A model-driven distributed secure information architecture platform for managed embedded systems. *Software, IEEE*, 31(2):62–69, Mar 2014.
7. Nagabhushan Mahadevan, Abhishek Dubey, Daniel Balasubramanian, and Gabor Karsai. Deliberative, search-based mitigation strategies for model-based software health management. *Innovations in Systems and Software Engineering*, 9(4):293–318, 2013.
8. Abhishek Dubey, Gabor Karsai, and Nagabhushan Mahadevan. A Component Model for Hard Real-time Systems: CCM with ARINC-653. *Software: Practice and Experience*, 41(12):1517–1550, 2011.
9. Steve Nordstrom, Abhishek Dubey, Turker Keskinpala, Sandeep Neema, and Theodore Bapty. Autonomic healing of model-based systems. *Journal of Aerospace Computing, Information, and Communication*, 8(4):87–99, 2011.
10. Luciano Piccoli, Abhishek Dubey, James N Simone, and James B Kowalkowski. Lqcd workflow execution framework: Models, provenance and fault-tolerance. *Journal of Physics: Conference Series*, 219(7):072047, 2010.
11. Abhishek Dubey, Rajat Mehrotra, Sherif Abdelwahed, and Asser Tantawi. Performance modeling of distributed multi-tier enterprise systems. *SIGMETRICS Perform. Eval. Rev.*, 37(2):9–11, October 2009.
12. Abhishek Dubey, Steve Nordstrom, Turker Keskinpala, Sandeep Neema, Ted Bapty, and Gabor Karsai. Towards a verifiable real-time, autonomic, fault mitigation framework for large scale real-time systems. *Innovations in Systems and Software Engineering*, 3(1):33–52, 2007.
13. Abhishek Dubey, Xianbin Wu, Hang Su, and Takkuen John Koo. Computation platform for automatic analysis of embedded software systems using model based approach. *Lecture Notes in Computer Science*, 3707:114–128, 2005.

Book Chapters

1. William Emfinger, Pranav Kumar, Abhishek Dubey, and Gabor Karsai. Towards assurances in self-adaptive, dynamic, distributed real-time embedded systems. In *Software Engineering for Self-Adaptive Systems III*, Lecture Notes in Computer Science. Springer Berlin Heidelberg, 2015. (Under review).

2. Abhishek Dubey, Gabor Karsai, and Nagabhushan Mahadevan. Fault-adaptivity in hard real-time component-based software systems. In Rogerio Lemos, Holger Giese, HausiA. Muller, and Mary Shaw, editors, *Software Engineering for Self-Adaptive Systems II*, volume 7475 of *Lecture Notes in Computer Science*, pages 294–323. Springer Berlin Heidelberg, 2013.
3. Sherif Abdelwahed, Abhishek Dubey, Gabor Karsai, and Nagabhushan Mahadevan. *Machine learning and knowledge discovery for engineering systems health management*, chapter Model-based Tools and Techniques for Real-Time System and Software Health Management. Chapman and Hall/CRC Press, November 2011.
4. Rajat Mehrotra, Abhishek Dubey, Sherif Abdelwahed, and Asser Tantawi. A power-aware modeling and autonomic management framework for distributed computing systems. *Handbook of Energy-Aware and Green Computing*, 2, 2011.

Refereed Conference (Highly Selective Publications: Acceptance Rate < 40%)

1. Rishabh Jain, Srdjan Lukic, Ajay Chokra, Nag Mahadevan, Abhishek Dubey, and Gabor Karsai. An improved distance relay model with directional element, and memory polarization for tcd based fault propagation studies. In *North American Power Symposium (NAPS)*, pages 1–6, October 2015.
2. Ajay Chhokra, Sherif Abdelwahed, Abhishek Dubey, Sandeep Neema, and Gabor Karsai. From system modeling to formal verification. *The 2015 Electronic System Level Synthesis Conference*, 07/01/2015 2015.
3. G. Martins, A. Bhattacharjee, A. Dubey, and X.D. Koutsoukos. Performance evaluation of an authentication mechanism in time-triggered networked control systems. In *Resilient Control Systems (ISRCS), 2014 7th International Symposium on*, pages 1–6, Aug 2014.
4. Gabor Karsai, Daniel Balasubramanian, Abhishek Dubey, and William R Otte. Distributed and managed: Research challenges and opportunities of the next generation cyber-physical systems. In *17th IEEE Symposium on Object/Component/Service-oriented Real-time Distributed Computing*, June 2014.
5. Daniel Balasubramanian, Abhishek Dubey, William R. Otte, William Emfinger, Pranav Srinivas Kumar, and Gabor Karsai. A rapid testing framework for a mobile cloud. In *25nd IEEE International Symposium on Rapid System Prototyping, RSP 2014, New Delhi, India, October 16-17, 2014*, pages 128–134, 2014.
6. Abhishek Dubey, William Otte, and Gabor Karsai. An information architecture platform for mobile, secure, and resilient distributed systems. In *High Confidence Software and Systems Conference*, 2014.
7. Nagabhushan Mahadevan, Abhishek Dubey, Gabor Karsai, Anurag Srivastava, and Chen-Ching Liu. Temporal causal diagrams for diagnosing failures in cyber-physical systems. *Annual Conference of the Prognostics and Health Management Society*, 2014.
8. Saideep Nannapaneni, Abhishek Dubey, Sherif Abdelwahed, Sankaran Mahadevan, and Sandeep Neema. A model-based approach for reliability assessment in component-based systems. *Annual Conference of the Prognostics and Health Management Society*, 2014.
9. W.R. Otte, A. Dubey, S. Pradhan, P. Patil, A. Gokhale, G. Karsai, and J. Willemsen. F6com: A component model for resource-constrained and dynamic space-based computing environments. In *Object/Component/Service-Oriented Real-Time Distributed Computing (ISORC), 2013 IEEE 16th International Symposium on*, pages 1–8, June 2013.
10. Abhishek Dubey, Aniruddha Gokhale, Gabor Karsai, William Otte, and Johnny Willemsen. A Model-Driven Software Component Framework for Fractionated Spacecraft. In *Proceedings of the 5th International Conference on Spacecraft Formation Flying Missions and Technologies (SFFMT)*, Munich, Germany, May 2013. IEEE.

11. Jian Shi, R. Amgai, S. Abdelwahed, A. Dubey, J. Humphreys, M. Alattar, and R. Jia. Generic modeling and analysis framework for shipboard system design. In *Electric Ship Technologies Symposium (ESTS), 2013 IEEE*, pages 420–428, April 2013.
12. A. Dabholkar, A. Dubey, A. Gokhale, G. Karsai, and N. Mahadevan. Reliable distributed real-time and embedded systems through safe middleware adaptation. In *Reliable Distributed Systems (SRDS), 2012 IEEE 31st Symposium on*, pages 362–371, Oct 2012.
13. Nag Mahadevan, Abhishek Dubey, and Gabor Karsai. Architecting health management into software component assemblies: Lessons learned from the arinc-653 component model. In *Object/Component/Service-Oriented Real-Time Distributed Computing (ISORC), 2012 IEEE 15th International Symposium on*, pages 79–86, April 2012.
14. Abhishek Dubey, Nagabhushan Mahadevan, and Gabor Karsai. A deliberative reasoner for model-based software health management. In *The Eighth International Conference on Automatic and Autonomous Systems*, pages 86–92, 2012. Best Paper Award.
15. Nilabja Roy, Abhishek Dubey, and Aniruddha Gokhale. Efficient autoscaling in the cloud using predictive models for workload forecasting. In *Cloud Computing (CLOUD), 2011 IEEE International Conference on*, pages 500–507, July 2011.
16. Nagabhushan Mahadevan, Abhishek Dubey, and Gabor Karsai. Application of software health management techniques. In *Proceedings of the 6th International Symposium on Software Engineering for Adaptive and Self-Managing Systems, SEAMS '11*, pages 1–10, New York, NY, USA, 2011. ACM.
17. Nilabja Roy, Abhishek Dubey, Aniruddha Gokhale, and Larry Dowdy. A Capacity Planning Process for Performance Assurance of Component-based Distributed Systems. In *Proceeding of the second joint WOSP/SIPEW international conference on Performance engineering, ICPE '11*, pages 259–270, New York, NY, USA, 2011. ACM.
18. Jaiganesh Balasubramanian, Aniruddha Gokhale, Abhishek Dubey, Friedhelm Wolf, Chenyang Lu, Chris Gill, and Douglas Schmidt. Middleware for resource-aware deployment and configuration of fault-tolerant real-time systems. In *RTAS '10: Proceedings of the 2010 16th IEEE Real-Time and Embedded Technology and Applications Symposium*, pages 69–78, Washington, DC, USA, 2010. IEEE Computer Society.
19. Abhishek Dubey, Gabor Karsai, Robert Kereskenyi, and Nagabhushan Mahadevan. A real-time component framework: Experience with ccm and arinc-653. In *IEEE International Symposium on Object-Oriented Real-Time Distributed Computing*, pages 143–150, Los Alamitos, CA, USA, 2010. IEEE Computer Society.
20. Rajat Mehrotra, Abhishek Dubey, Sherif Abdelwahed, and Asser Tantawi. Integrated monitoring and control for performance management of distributed enterprise systems. In *International Symposium on Modeling, Analysis, and Simulation of Computer Systems*, pages 424–426, Los Alamitos, CA, USA, 2010. IEEE Computer Society.
21. Abhishek Dubey, Gabor Karsai, and Sherif Abdelwahed. Compensating for timing jitter in computing systems with general-purpose operating systems. In *IEEE International Symposium on Object-Oriented Real-Time Distributed Computing*, pages 55–62, Los Alamitos, CA, USA, 2009. IEEE Computer Society.
22. Abhishek Dubey, Sandeep Neema, Jim Kowalkowski, and Amitoj Singh. Scientific computing autonomic reliability framework. In *ESCIENCE '08: Proceedings of the 2008 Fourth IEEE International Conference on eScience*, pages 352–353, Washington, DC, USA, 2008. IEEE Computer Society.
23. Takkuen John Koo, Xianbin Wu, Hang Su, Jie Chen, and Abhishek Dubey. Reachlab: Computation platform for the analysis of hybrid automata. In *9th International Workshop on Hybrid Systems: Computation and Control (HSCC'06)*, 2006.

Refereed Conference Publications (Selective)

1. S. Pradhan, W. Emfinger, A. Dubey, W.R. Otte, D. Balasubramanian, A. Gokhale, G. Karsai, and A. Coglio. Establishing secure interactions across distributed applications in satellite clusters. In *Space Mission Challenges for Information Technology (SMC-IT), 2014 IEEE International Conference on*, pages 67–74, Sept 2014.
2. Nagabhushan Mahadevan, Abhishek Dubey, Huangcheng Guo, and Gabor Karsai. Using temporal causal models to isolate failures in power system protection devices. In *AUTOTESTCON, 2014 IEEE*, pages 270–279. IEEE, 2014.
3. William R. Otte, Abhishek Dubey, and Gabor Karsai. A resilient and secure software platform and architecture for distributed spacecraft. In *SPIE Defense, Security, and Sensing*, 2014.
4. Subhav Pradhan, William Otte, Abhishek Dubey, Aniruddha Gokhale, and Gabor Karsai. Key considerations for a resilient and autonomous deployment and configuration infrastructure for cyber-physical systems. In *11th IEEE International Conference and Workshops on the Engineering of Autonomic and Autonomous Systems (EASe-2014)*, Laurel, MD, USE, 2014. IEEE.
5. A. Dubey, W. Emfinger, A. Gokhale, G. Karsai, W.R. Otte, J. Parsons, C. Szabo, A. Coglio, E. Smith, and P. Bose. A software platform for fractionated spacecraft. In *Aerospace Conference, 2012 IEEE*, pages 1–20, March 2012.
6. Rajat Mehrotra, Abhishek Dubey, Sherif Abdelwahed, and Rowland Krisa. Rfdmon: A real-time and fault-tolerant distributed system monitoring approach. In *The Eighth International Conference on Autonomic and Autonomous Systems*, pages 57–63, 2012.
7. R. Mehrotra, A. Dubey, S. Abdelwahed, and W. Monceaux. Large scale monitoring and online analysis in a distributed virtualized environment. In *Engineering of Autonomic and Autonomous Systems (EASe), 2011 8th IEEE International Conference and Workshops on*, pages 1–9, April 2011.
8. Abhishek Dubey, Gabor Karsai, and Nagabhushan Mahadevan. Model-based software health management for real-time systems. In *Aerospace Conference, 2011 IEEE*, pages 1–18, March 2011.
9. N. Mahadevan, S. Abdelwahed, A. Dubey, and G. Karsai. Distributed diagnosis of complex systems using timed failure propagation graph models. In *AUTOTESTCON, 2010 IEEE*, pages 1–6, Sept 2010.
10. Pan Pan, Abhishek Dubey, and Luciano Piccoli. Dynamic workflow management and monitoring using dds. In *Engineering of Autonomic and Autonomous Systems (EASe), 2010 Seventh IEEE International Conference and Workshops on*, pages 20–29, March 2010.
11. Tripti Saxena, Abhishek Dubey, Daniel Balasubramanian, and Gabor Karsai. Enabling self-management by using model-based design space exploration. In *7th IEEE International Workshop on Engineering of Autonomic & Autonomous Systems (EASe)*, pages 137–144, Los Alamitos, CA, USA, 2010. IEEE Computer Society.
12. Abhishek Dubey. Algorithms for synthesizing safe sets of operation for embedded systems. In *ECBS '09: Proceedings of the 2009 16th Annual IEEE International Conference and Workshop on the Engineering of Computer Based Systems*, pages 149–155, Washington, DC, USA, 2009. IEEE Computer Society.
13. Abhishek Dubey, Luciano Piccoli, James B. Kowalkowski, James N. Simone, Xian-He Sun, Gabor Karsai, and Sandeep Neema. Using runtime verification to design a reliable execution framework for scientific workflows. In *EASE '09: Proceedings of the 2009 Sixth IEEE Conference and Workshops on Engineering of Autonomic and Autonomous Systems*, pages 87–96, Washington, DC, USA, 2009. IEEE Computer Society.
14. Abhishek Dubey, Derek Riley, Sherif Abdelwahed, and Ted Baptý. Modeling and analysis of probabilistic timed systems. In *IEEE International Conference on the Engineering of Computer-Based Systems*, pages 69–78, Los Alamitos, CA, USA, 2009. IEEE Computer Society.

15. Abhishek Dubey, Steve Nordstrom, Turker Keskinpala, Sandeep Neema, Ted Bapty, and Gabor Karsai. Towards a model-based autonomic reliability framework for computing clusters. In *5th IEEE International Workshop on Engineering of Autonomic & Autonomous Systems (EASe)*, pages 75–85, 2008.
16. Steve Nordstrom, Abhishek Dubey, Turker Keskinpala, Rahul Datta, Sandeep Neema, and Ted Bapty. Model predictive analysis for autonomic workflow management in large-scale scientific computing environments. In *4th IEEE International Workshop on Engineering of Autonomic & Autonomous Systems (EASe)*, pages 37–42, 2007.
17. Steve Nordstrom, Ted Bapty, Sandeep Neema, Abhishek Dubey, and Turker Keskinpala. A guided explorative approach for autonomic healing of model based systems. In *Second IEEE conference on Space Mission Challenges for Information Technology (SMC-IT)*, July 2006.
18. Abhishek Dubey, Steve Nordstrom, Turker Keskinpala, Sandeep Neema, and Ted Bapty. Verifying autonomic fault mitigation strategies in large scale real-time systems. In *3rd IEEE International Workshop on Engineering of Autonomic & Autonomous Systems (EASe)*, pages 129–140, 2006.
19. Steve Nordstrom, Abhishek Dubey, Turker Keskinpala, Ted Bapty, and Sandeep Neema. Ghost: Guided healing and optimization search technique for healing large-scale embedded systems. In *3rd IEEE International Workshop on Engineering of Autonomic & Autonomous Systems (EASe)*, pages 129–140, 2006.

Refereed Workshop Publications

1. Subhav Pradhan, Abhishek Dubey, Aniruddha Gokhale, and Martin Lehofer. CHARIOT: A Domain Specific Language for Extensible Cyber-Physical Systems. In *The 15th Workshop on Domain-Specific Modeling*, Pittsburgh, Pennsylvania, United States, october 2015.
2. A. Chhokra, A. Dubey, N. Mahadevan, and G. Karsai. A component-based approach for modeling failure propagations in power systems. In *Modeling and Simulation of Cyber-Physical Energy Systems (MSCPES), 2015 Workshop on*, pages 1–6, April 2015.
3. Abhishek Dubey, Monika Sturm, Martin Lehofer, and Janos Sztipanovits. Smart city hubs: Opportunities for integrating and studying human cps at scale. *Workshop on Big Data Analytics in CPS: Enabling the Move from IoT to Real-Time Control*, 2015.
4. William Otte, Martin Lehofer, and Abhishek Dubey. Challenges for application platforms for integrated cyber physical systems. *Workshop on Big Data Analytics in CPS: Enabling the Move from IoT to Real-Time Control*, 2015.
5. Shashank Shekhar, Subhav Pradhan, Fangzhou Sun, Annirudha Gokhale , and Abhishek Dubey. Empowering the next generation city-scale smart systems. In *Workshops on Dynamic Data Driven Applications Systems(DDDAS) In conjunction with 22nd International Conference on High Performance Computing (HiPC)*, 2015.
6. Daniel Balasubramanian, Tihamer Levendovszky, Abhishek Dubey, and Gabor Karsai. Taming multi-paradigm integration in a software architecture description language. In *Proceedings of the 8th Workshop on Multi-Paradigm Modeling co-located with the 17th International Conference on Model Driven Engineering Languages and Systems, MPM@MODELS 2014, Valencia, Spain*, pages 67–76, 2014.
7. William Emfinger, Gabor Karsai, Abhishek Dubey, and Aniruddha Gokhale. Analysis, verification, and management toolsuite for cyber-physical applications on time-varying networks. In *Proceedings of the 4th ACM SIGBED International Workshop on Design, Modeling, and Evaluation of Cyber-Physical Systems, CyPhy '14*, pages 44–47, New York, NY, USA, 2014. ACM.

8. Pranav Srinivas Kumar, Abhishek Dubey, and Gabor Karsai. Colored petri net-based modeling and formal analysis of component-based applications. In *Proceedings of the 11th Workshop on Model-Driven Engineering, Verification and Validation co-located with 17th International Conference on Model Driven Engineering Languages and Systems, MoDeVVe@MODELS 2014, Valencia, Spain, September 30, 2014.*, pages 79–88, 2014.
9. Subhav Pradhan, William Otte, Abhishek Dubey, Aniruddha Gokhale, and Gabor Karsai. Towards a Resilient Deployment and Configuration Infrastructure for Fractionated Spacecraft. In *Proceedings of the 5th Workshop on Adaptive and Reconfigurable Embedded Systems (APRES '13), CPSWeek, Philadelphia, PA, USA, April 2013.* IEEE.
10. Daniel Balasubramanian, William Emfinger, Pranav Kumar, William Otte, Abhishek Dubey, and Gabor Karsai. An application development and deployment platform for satellite clusters. In *Workshop on Spacecraft Flight Software*, 2013.
11. Abhishek Dubey, Nagabhushan Mahadevan, and Robert Kereskenyi. Reflex and healing architecture for software health management. In *International Workshop on Software Health Management, IEEE conference on Space Mission Challenges for Information Technology*, 07/2009 2009.
12. Turker Keskinpala, Abhishek Dubey, Steve Nordstrom, Ted Bapty, and Sandeep Neema. A model driven tool for automated system level testing of middleware. In *Fourth System Testing and Validation Workshop (STV)*, 2006.

Technical Reports

1. Subhav Pradhan, Abhishek Dubey, , William Otte, Gabor Karsai, and Aniruddha Gokhale. Towards a product line of heterogeneous distributed applications. (ISIS-15-117), 04/2015 2015.
2. Subhav Pradhan, William Otte, Abhishek Dubey, Csanad Szabo, Aniruddha Gokhale, and Gabor Karsai. Towards a self-adaptive deployment and configuration infrastructure for cyber-physical systems. (ISIS-13-101), 06/2014 2014.
3. Nagabhushan Mahadevan, Abhishek Dubey, Daniel Balasubramanian, and Gabor Karsai. Deliberative reasoning in software health management. (ISIS-13-101), 04/2013 2013.
4. Abhishek Dubey, Gabor Karsai, and Nagabhushan Mahadevan. Formalization of a component model for real-time systems. 04/2012 2012.
5. Abhishek Dubey, Nagabhushan Mahadevan, and Gabor Karsai. The inertial measurement unit example: A software health management case study. (ISIS-12-101), 02/2012 2012.
6. Weston P Monceaux, Deland E Evans, Keith N Rappold, Cary D Butler, Sherif Abdelwahed, Rajat Mehrotra, and Abhishek Dubey. Implementing autonomic computing methods to improve attack resilience in web services. page 422, 2012.
7. Nagabhushan Mahadevan, Abhishek Dubey, and Gabor Karsai. A case study on the application of software health management techniques. (ISIS-11-101), 01/2011 2011.
8. Rajat Mehrotra, Abhishek Dubey, Jim Kwalkowski, Marc Paterno, Amitoj Singh, Randolph Herber, and Sherif Abdelwahed. Rfdmon: A real-time and fault-tolerant distributed system monitoring approach. 10/2011 2011.
9. Tripti Saxena and Abhishek Dubey. Meta-tools for designing scientific workflow management systems: Part-i, survey. (ISIS-11-105), 2011.
10. Abhishek Dubey, Gabor Karsai, and Nagabhushan Mahadevan. Towards model-based software health management for real-time systems. 2010.
11. Rajat Mehrotra, Abhishek Dubey, Sherif Abdelwahed, and Asser Tantawi. Model identification for performance management of distributed enterprise systems. (ISIS-10-104), 2010.
12. Himanshu Neema, Abhishek Dubey, and Gabor Karsai. A report on simulating external applications with soamanet in the loop. (ISIS-10-108), 08/2010 2010.

13. Jaiganesh Balasubramanian, Aniruddha Gokhale, Friedhelm Wolf, Abhishek Dubey, Chenyang Lu, Chris Gill, and Douglas C. Schmidt. Resource-aware deployment and configuration of fault-tolerant real-time systems. (ISIS-09-109), 10/2009 2009.
14. Abhishek Dubey. A discussion on supervisory control theory in real-time discrete event systems. (ISIS-09-112), 11/2009 2009.
15. Abhishek Dubey. Towards dynamic cpu demand estimation in multi-tiered web setup. 2009.
16. Abhishek Dubey, Gabor Karsai, Robert Kereskenyi, and Nagabhushan Mahadevan. Towards a real-time component framework for software health management. (ISIS-09-111), 11/2009 2009.

Newsletter Publications

1. "Strong Wi-Fi network can solve Nashville congestion woes", The Tennessean August 12, 2015.
2. "Solving commuter traffic with Internet traffic", Providence Journal, August 17, 2015

Presentations

1. Verifying autonomic fault mitigation strategies in large scale real-time systems. In *3rd IEEE International Workshop on Engineering of Autonomic & Autonomous Systems (EASe)*.
2. Challenges for application platforms for integrated cyber physical systems. *Workshop on Big Data Analytics in CPS: Enabling the Move from IoT to Real-Time Control*, 2015.
3. Smart city hubs: Opportunities for integrating and studying human cps at scale. *Workshop on Big Data Analytics in CPS: Enabling the Move from IoT to Real-Time Control*, 2015.
4. Distributed and managed: Research challenges and opportunities of the next generation cyber-physical systems. In *17th IEEE Symposium on Object/Component/Service-oriented Real-time Distributed Computing*, June 2014.
5. An information architecture platform for mobile, secure, and resilient distributed systems. In *High Confidence Software and Systems Conference*, 2014.
6. A rapid testing framework for a mobile cloud. In *25nd IEEE International Symposium on Rapid System Prototyping, RSP 2014, New Delhi, India, October 16-17, 2014*, 2014.
7. A resilient and secure software platform and architecture for distributed spacecraft. In *SPIE Defense, Security, and Sensing*, 2014.
8. Temporal causal diagrams for diagnosing failures in cyber-physical systems. *Annual Conference of the Prognostics and Health Management Society*, 2014.
9. Using temporal causal models to isolate failures in power system protection devices. In *AUTOTESTCON*, 2014.
10. A Software Platform for Fractionated Spacecraft. In *Proceedings of the IEEE Aerospace Conference, 2012*, Big Sky, MT, USA, March 2012. IEEE.
11. A deliberative reasoner for model-based software health management. In *The Eighth International Conference on Autonomic and Autonomous Systems*, 2012.
12. Rfdmon: A real-time and fault-tolerant distributed system monitoring approach. In *The Eighth International Conference on Autonomic and Autonomous Systems*, 2012.
13. Model-based software health management for real-time systems. In *Aerospace Conference, 2011 IEEE*, March 2011.
14. Application of software health management techniques. In *Proceedings of the 6th International Symposium on Software Engineering for Adaptive and Self-Managing Systems, SEAMS '11*, New York, NY, USA, 2011. ACM.

15. Dynamic workflow management and monitoring using dds. In *Engineering of Autonomic and Autonomous Systems (EASe)*, 2010 Seventh IEEE International Conference and Workshops on, March 2010.
16. Distributed diagnosis of complex systems using timed failure propagation graph models. In *AUTOTESTCON, 2010 IEEE*. IEEE, 2010.
17. Integrated monitoring and control for performance management of distributed enterprise systems. In *International Symposium on Modeling, Analysis, and Simulation of Computer Systems*, Los Alamitos, CA, USA, 2010. IEEE Computer Society.
18. Model based design. In *Talk at Fermi National Laboratory*, 2010.
19. A real-time component framework: Experience with ccm and arinc-653. In *IEEE International Symposium on Object-Oriented Real-Time Distributed Computing*, Los Alamitos, CA, USA, 2010. IEEE Computer Society.
20. Algorithms for synthesizing safe sets of operation for embedded systems. In *ECBS '09: Proceedings of the 2009 16th Annual IEEE International Conference and Workshop on the Engineering of Computer Based Systems*, Washington, DC, USA, 2009. IEEE Computer Society.
21. Compensating for timing jitter in computing systems with general-purpose operating systems. In *IEEE International Symposium on Object-Oriented Real-Time Distributed Computing*, Los Alamitos, CA, USA, 2009. IEEE Computer Society.
22. Modeling and analysis of probabilistic timed systems. In *IEEE International Conference on the Engineering of Computer-Based Systems*, Los Alamitos, CA, USA, 2009. IEEE Computer Society.
23. Reflex and healing architecture for software health management. In *International Workshop on Software Health Management, IEEE conference on Space Mission Challenges for Information Technology*, 07/2009 2009.
24. Using runtime verification to design a reliable execution framework for scientific workflows. In *EASE '09: Proceedings of the 2009 Sixth IEEE Conference and Workshops on Engineering of Autonomic and Autonomous Systems*, Washington, DC, USA, 2009. IEEE Computer Society.
25. Scientific computing autonomic reliability framework. In *ESCIENCE '08: Proceedings of the 2008 Fourth IEEE International Conference on eScience*, Washington, DC, USA, 2008. IEEE Computer Society.
26. Towards a model-based autonomic reliability framework for computing clusters. In *5th IEEE International Workshop on Engineering of Autonomic & Autonomous Systems (EASe)*, 2008.
27. Model predictive analysis for autonomic workflow management in large-scale scientific computing environments. In *4th IEEE International Workshop on Engineering of Autonomic & Autonomous Systems (EASe)*, 2007.

Invited Talks

1. "Transit Hub - Smart Decision Support System for Public Transportation", Panel on Smart City Champions, Smart Cities Week, September 2015
2. "Transit Hub - Empowering Shared Mobility with Smart Analytics", Panel on Shared Mobility, Smart Cities Week, September 2015
3. "Smart Grid Diagnostics", Workshop on Resilience CPS, Siemens Corporation, Corporate Technology, September 2015

Professional Activities

Societies

- 2014-Present Senior Member, IEEE
2013-Present Member, IEEE Power and Energy Society
2004-2014 Member, IEEE
- 2006-Present IEEE Technical Committee on Autonomous and Autonomic Systems (TCAAS).

Conference and Workshops

- 2015 Program committee member for Workshop on Wild and Crazy Ideas on the interplay between IoT and Big Data
- 2015 Program committee member for 31st ACM/SIGAPP Symposium on Applied Computing, Reliable Software Technologies and Communication Middleware Track
- 2015 Chair, SPLC Conference, Tools and Demonstration Track
- 2015 Action Cluster Lead, NIST Global City Team Challenge
- 2014 Program committee member for International Symposium on Object-oriented Real-time Distributed Computing
- 2013 Guest Editor: Special Issue on Software Health Management, Springer-Verlag
- 2013 Program committee member for International Symposium on Object-oriented Real-time Distributed Computing
- 2012 Program Committee Member: 9th IEEE Workshop on Model-Based Development for Computer-Based Systems
- 2011 Co-Chair, Second International Workshop on Software Health Management
- 2011 Program committee member for 9th IEEE/IFIP International Conference on Embedded and Ubiquitous Computing
- 2011 Program committee member for International Symposium on Object-oriented Real-time Distributed Computing

Reviewer

- International Journal on Prognostics and Health Management
- IEEE Transactions on System Man and Cybernetics
- Journal on Cluster Computing
- ACM Transactions on Cyber Physical Systems
- Journal of Aerospace Computing, Information, and Communication
- Journal of Universal Computer Science
- IEEE Conference on Decision and Control (CDC)
- IEEE International Performance Computing and Communications Conference
- IEEE Conference on Engineering of Computer Based Systems
- IEEE International Conference on Computational Science and Engineering
- International Symposium on Object-oriented Real-time Distributed Computing

Selected Research Projects

- CHARIOT The CHARIOT (Cyber-pHysical Application aRchitecture with Objective-based reconfiguration) project, aims to address the challenges stemming from the need to resolve various challenges within extensible CPS. CHARIOT is an application architecture that enables design, analysis, deployment, and maintenance of extensible CPS by using a novel design-time modeling tool and run-time computation infrastructure. In addition to physical properties, timing properties and resource requirements, CHARIOT also considers heterogeneity and resilience of these systems.

Key Papers:

- Subhav Pradhan, Abhishek Dubey, Aniruddha Gokhale, and Martin Lehofer. CHARIOT: A Domain Specific Language for Extensible Cyber-Physical Systems. In *The 15th Workshop on Domain-Specific Modeling*, Pittsburgh, Pennsylvania, United States, October 2015.

Transit Hub This is an ongoing project for developing a smart integrated solution for improving resident engagement with the public transit system. It is achieved by providing incentives and improved individualized travel planning. It also provides improved transit rider experience by providing smart and predictive routing planning service that uses a scalable simulator-based decision support system that can evaluate several scenarios in parallel to provide the best option in near-real time. More information is available on <https://gctc.isis.vanderbilt.edu/>.

Acknowledgment: This project is funded by a National Science Foundation Grant #1528799

Key Papers:

- Abhishek Dubey, Monika Sturm, Martin Lehofer, and Janos Sztipanovits. Smart city hubs: Opportunities for integrating and studying human cps at scale. *Workshop on Big Data Analytics in CPS: Enabling the Move from IoT to Real-Time Control*, 2015.

Diagnostic and Prognostic Techniques for Electric Grid This is an ongoing project for developing temporal causal diagram based reasoning approach that can be used for complex transmission and distribution systems. This approach relies on a discrete abstraction that captures the causal and temporal relationships between failure modes (causes) and discrepancies (effects) in a system, thereby modeling the failure cascades taking into account propagation constraints imposed by operating modes, protection elements, and timing delays. More information is available on <https://power-cps.isis.vanderbilt.edu/>.

Key Papers:

- Nagabhushan Mahadevan, Abhishek Dubey, Huangcheng Guo, and Gabor Karsai. Using temporal causal models to isolate failures in power system protection devices. In *AUTOTEST-CON, 2014 IEEE*, pages 270–279. IEEE, 2014.
- Nagabhushan Mahadevan, Abhishek Dubey, Gabor Karsai, Anurag Srivastava, and Chen-Ching Liu. Temporal causal diagrams for diagnosing failures in cyber-physical systems. *Annual Conference of the Prognostics and Health Management Society*, 2014.

Resilient Software Systems Mapping distributed application configuration models to reliability block diagrams and using the redundancy information to compute resilience metrics used for comparing alternative deployments. More information and the tools are available on <https://phab.resos.isis.vanderbilt.edu/>

Key Papers:

- William Emfinger, Pranav Kumar, Abhishek Dubey, and Gabor Karsai. Towards assurances in self-adaptive, dynamic, distributed real-time embedded systems. In *Software Engineering for Self-Adaptive Systems III*, Lecture Notes in Computer Science. Springer Berlin Heidelberg, 2015. (Under review).
- Tihamer Levendovszky, Abhishek Dubey, William R. Otte, William Balasubramanian, Daniel andand Emfinger, Pranav Kumar, and Gabor Karsai. Achieving resilience in distributed software systems via self-reconfiguration. *Elsevier Journal of Systems and Software*, 2015. (Under review).

System F6 Design and Implementation of a Secure Information Architecture for the DARPA F6 program. The information architecture platform is a layered stack containing a novel real-time operating system, middleware and a component layer. This work further enabled Distributed Real-time Embedded Managed Systems (DREMS), a special class of distributed embedded computing systems that are remotely controlled and managed, but they operate in and are integrated into a local physical environment. The complete software platform and a model-driven software development toolchain that can be used to design, implement, and operate DREMS can be obtained from <https://drems.isis.vanderbilt.edu/>.

Key Papers:

- Tihamer Levendovszky, Abhishek Dubey, William R. Otte, Daniel Balasubramanian, Alessandro Coglio, Sandor Nyako, William Emfinger, Pranav Kumar, Aniruddha Gokhale, and Gabor Karsai. Distributed real-time managed systems: A model-driven distributed secure information architecture platform for managed embedded systems. *Software, IEEE*, 31(2):62–69, Mar 2014.
- Daniel Balasubramanian, Abhishek Dubey, William Otte, Tihamer Levendovszky, Aniruddha Gokhale, and Gabor Karsai. DREMS ML: A Wide Spectrum Architecture Design Language for Distributed Computing Platforms. *Submitted to Elsevier Science of Computer Programming*, 2014.

Model-Based Software Health Management

This project developed an emulator for ARINC-653, the state of the art standard for implementing Integrated Modular Architecture in aerospace domain. This emulator was then extended to build a component middleware and software health management framework for ARINC-653 systems. This approach borrowed concepts and principles from the field of 'Systems Health Management' for complex aerospace systems and resulted in a novel two level health management architecture that can be applied in the context of a model-based software development process. The emulator and the design environment can be downloaded from https://wiki.isis.vanderbilt.edu/mbsmh/index.php/Main_Page.

Key Papers:

- Abhishek Dubey, Gabor Karsai, and Nagabhushan Mahadevan. Fault-adaptivity in hard real-time component-based software systems. In Rogerio Lemos, Holger Giese, HausiA. Muller, and Mary Shaw, editors, *Software Engineering for Self-Adaptive Systems II*, volume 7475 of *Lecture Notes in Computer Science*, pages 294–323. Springer Berlin Heidelberg, 2013.
- Nagabhushan Mahadevan, Abhishek Dubey, Daniel Balasubramanian, and Gabor Karsai. Deliberative, search-based mitigation strategies for model-based software health management. *Innovations in Systems and Software Engineering*, 9(4):293–318, 2013.
- Abhishek Dubey, Gabor Karsai, and Nagabhushan Mahadevan. A Component Model for Hard Real-time Systems: CCM with ARINC-653. *Software: Practice and Experience*, 41(12):1517–1550, 2011.

SCIDAC-II

Developed model-based hierarchical reflex and healing framework for large computing clusters. This system was developed with researchers at Fermi National Accelerator Laboratory. It is used by the researchers in the Lattice Quantum Chromodynamics Clusters.

Key Papers:

- Luciano Piccoli, Abhishek Dubey, James N Simone, and James B Kowalkowski. Lqcd workflow execution framework: Models, provenance and fault-tolerance. *Journal of Physics: Conference Series*, 219(7):072047, 2010.
- Abhishek Dubey, Steve Nordstrom, Turker Keskinpala, Sandeep Neema, Ted Bapty, and Gabor Karsai. Towards a verifiable real-time, autonomic, fault mitigation framework for large scale real-time systems. *Innovations in Systems and Software Engineering*, 3(1):33–52, 2007.

Computation Platform for Algorithmic Analysis of Hybrid Systems

We developed a model integrated platform called Reach Lab for specifying and analyzing complex hybrid systems with discrete and continuous dynamics during 2003-2005. The platform separated the concerns of design and implementation of analysis algorithms by providing abstractions of basic analytical operators that can be used to model sophisticated algorithms in a tool-neutral manner. These algorithms could then be translated to generate implementations for different hybrid system analysis tools.

Key Paper:

- Abhishek Dubey, Xianbin Wu, Hang Su, and Takkuen John Koo. Computation platform for automatic analysis of embedded software systems using model based approach. *Lecture Notes in Computer Science*, 3707:114–128, 2005.

Bayesian regression and queuing models based techniques for automatically learning the structure of multi-tier enterprise applications online. These models allowed us to identify the bottleneck resource inside an application server, predict the average response time and predict the power consumption of each physical machine in the enterprise.

Key Paper:

- Abhishek Dubey, Rajat Mehrotra, Sherif Abdelwahed, and Asser Tantawi. Performance modeling of distributed multi-tier enterprise systems. *SIGMETRICS Perform. Eval. Rev.*, 37(2):9–11, October 2009.

Active Collaborators

- Dr. Sankaran Mahadevan - Professor, Civil and Environmental Engineering, Vanderbilt University.
- Dr. Gautam Biswas - Professor, Electrical Engineering and Computer Science Department, Vanderbilt University.
- Dr. Douglas Schmidt - Professor, Electrical Engineering and Computer Science Department, Vanderbilt University.
- Dr. Janos Sallai - Research Scientist, Electrical Engineering and Computer Science Department, Vanderbilt University.
- Dr. William Otte - Research Scientist, Electrical Engineering and Computer Science Department, Vanderbilt University.
- Dr. Daniel Balasubramanian - Research Scientist, Electrical Engineering and Computer Science Department, Vanderbilt University.
- Dr. Jules White - Assistant Professor, Electrical Engineering and Computer Science Department, Vanderbilt University.
- Dr. Hiba Baroud - Assistant Professor, Civil and Environmental Engineering, Vanderbilt University, Vanderbilt University.
- Dr. David Kosson - Professor, Civil and Environmental Engineering, Vanderbilt University, Vanderbilt University.
- Dr. Craig Philips -Research Professor, Civil and Environmental Engineering, Vanderbilt University, Vanderbilt University.
- Dr. Aniruddha Gokhale -Associate Professor, Electrical Engineering and Computer Science Department, Vanderbilt University.
- Dr. Anurag Srivastava - Assistant Professor, School of Electrical Engineering and Computer Science, WSU.
- Dr. Srdjan Lukic - Assistant Professor, School of Electrical and Computer Engineering, NCSU.
- Dr. Sandeep Neema - Research Assistant Professor, Electrical Engineering and Computer Science Department, Vanderbilt University.
- Dr. Gabor Karsai - Professor, Electrical Engineering and Computer Science Department, Vanderbilt University.
- Dr. Sherif Abdelwahed - Assistant Professor, Electrical and Computer Engineering Dept., Mississippi State University.
- Dr. Ted Bapty- Research Associate Professor, Electrical Engineering and Computer Science Department, Vanderbilt University.
- Dr. Asser Tantawi - Research Staff Member, IBM TJ Watson Research Center, Yorktown Heights, NY.
- Dr. Lee Pike - Galois, Inc., Palo, OR.
- Mr. Alessandro Coglio - Kestrel, Institute., Palo Alto, CA.