

# Joe Hoffert, Ph.D.

Assistant Professor

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## Summary

I have 25+ years industry and research experience in the areas of custom engineering software (*e.g.*, CAD/CAM/CAE), object-oriented technologies, middleware (*e.g.*, client/server, publish/subscribe), patterns (*e.g.*, architectural, design, idiomatic), computer simulations (*e.g.*, using the Distributed Interactive Simulation (DIS) protocol and the Test and training ENabling Architecture (TENA)), distributed realtime embedded (DRE) systems, and quality of service (QoS). In May of 2011, I received my Ph.D. in computer science from [Vanderbilt University](#) in Nashville, TN under the advisement of [Dr. Douglas Schmidt](#) and [Dr. Aniruddha Gokhale](#). I am currently a faculty member of [Indiana Wesleyan University](#) in Marion, Indiana where I teach computing science courses and conduct research.

My Ph.D. dissertation of [ADaptive Middleware And Network Transports \(ADAMANT\)](#) focused on the following areas of QoS for publish/subscribe middleware:

- Design time validation of QoS configurations via model-driven development (MDD) to manage the configuration complexity,
- Composite metrics to evaluate multiple QoS properties simultaneously and quantitatively (*e.g.*, data reliability and latency),
- Evaluation of QoS mechanisms for pub/sub middleware (*e.g.*, transport protocols) with respect to multiple QoS properties, and
- Run-time autonomic adaptation for QoS support of DRE systems operating in flexible (*e.g.*, cloud computing) and dynamic environments.

With the Hinds Research Fellowship at Indiana Wesleyan University awarded to me in 2014, I am extending my [ADAMANT](#) research. Starting the academic year of 2014-2015, IWU undergraduate CS students and I have been researching artificial intelligence (AI) approaches and their applicability for adaptive DRE systems.

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## Teaching Experience

### Courses taught at Indiana Wesleyan University:

- **Fall 2014:**
  - CIS117: Essential Foundations of Computing
  - CIS221: Data Structures
  - CIS330: Software Testing
- **Spring 2014:**
  - CIS125: Introduction to Computer Science I
  - CIS122: Introduction to Web Programming
  - CIS320: Introduction to Software Engineering
- **Fall 2013:**
  - CIS117: Essential Foundations of Computing
  - CIS122: Introduction to Web Programming
  - CIS221: Data Structures
  - CIS385: Theory of Computation

### Courses previously taught at King's University College:

- CMPT 415: Advanced Database Management Systems
- CMPT 400: Computer Networks
- CMPT 355: Computer Forensics
- CMPT 310: Database Management Systems
- CMPT 302: Data Structures
- CMPT 250: Introduction to Computing Science

### Courses previously taught at Vanderbilt University (as graduate student):

- **Spring 2010 : Instructor** for [CS 279: Software Projects](#)  
[Vanderbilt University](#), [Department of EE & CS](#), - Nashville, TN  
Designed course material, presented class lectures, mentored students, and graded assignments.
- **July 2006 - August 2007 : Teaching Assistant**  
[Vanderbilt University](#), [Department of EE & CS](#), - Nashville, TN  
Mentored students, graded assignments, and presented occasional class lectures for [Intermediate Software Design](#) (Spring 2007) and [Advanced Network Software Design](#) (Fall 2006)

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## Education

- **PhD from Vanderbilt's computer science program ([Vanderbilt University](#), [Department of EE & CS](#), [Nashville](#), Tennessee)**  
Successfully defended dissertation [Design and Runtime Quality of Service Management Techniques for Publish/Subscribe Distributed Real-time & Embedded Systems](#) February 2011 ([slides](#))

#### **Coursework:**

Preparation for Teaching, Fall 2010 (audited)

[Principles of Operating Systems II: Middleware for Distributed Real-time and Embedded Systems](#), Fall 2007

[Special Topics in Multimedia Systems and Applications](#), Fall 2007

Design and Analysis of Algorithms, Spring 2007

[Intermediate Software Design](#), Spring 2007

Model-Driven QoS Enabled Systems, Spring 2007

[Advanced Network Software Design](#), Fall 2006

[Advanced Operating Systems Principles](#), Fall 2006

Model Integrated Computing, Fall 2006

- **Computer Science Courses at [Washington University](#), [Department of Computer Science](#), [St. Louis](#), Missouri**

[Real-Time Systems](#), Fall 2005

[Protocols for Computer Networks](#), Spring 2005

[Digital Computers I: Organization and Logical Design](#), Fall 2004

[Introduction to Formal Languages and Automata](#), Spring 2004

Operating Systems Organization, Spring 2003

Advanced Algorithms, Fall 2002

Programming Systems and Languages, Fall 2001

- **M.S. Computer Science**, December 1990,  
[University of Cincinnati](#), [Department of Computer Science](#), [Cincinnati](#), Ohio
- **B.A. Mathematics and Computer Science**, May 1986,  
[Mount Vernon Nazarene College](#), Mt. Vernon, Ohio

## **Refereed Journal Publications**

1. Joe Hoffert, Aniruddha Gokhale, and Douglas Schmidt, "[Timely Autonomic Adaptation of Publish/Subscribe Middleware in Dynamic Environments](#)", International Journal of Adaptive, Resilient and Autonomic Systems; Vol 2, Issue 4 (2011), pp. 1-24.
2. Joe Hoffert, Douglas Schmidt, and Aniruddha Gokhale, "[Evaluating Timeliness and Accuracy Trade-offs of Supervised Machine Learning for Adapting Enterprise DRE Systems in Dynamic Environments](#)", International Journal of Computational Intelligence Systems, Volume 4, Issue 5 (2011), pp. 806-816.
3. Joe Hoffert, Daniel Mack, and Douglas Schmidt, "[Integrating Machine Learning Techniques to Adapt Protocols for QoS-enabled Distributed Real-time and Embedded Publish/Subscribe Middleware](#)", International Journal of Network Protocols and

## Technical Magazine Publications

1. Joe Hoffert, "[Resolving Design Problems in Distributed Programming Environments](#)", C++ Report, SIGS, Vol. 10, No. 7, July/August, 1998
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## Book Chapters

1. Joe Hoffert, Douglas Schmidt, and Aniruddha Gokhale, "[Quantitative Productivity Analysis of a Domain-Specific Modeling Language](#)" in [Handbook of Research on Innovations in Systems and Software Engineering](#), Ed. Dr. Vicente García Díaz (to be published fall 2014)
  2. Joe Hoffert, Douglas Schmidt, and Aniruddha Gokhale, "[Productivity Analysis of the Distributed QoS Modeling Language](#)" in [Model-Driven Domain Analysis & Software Development: Architectures & Functions](#), Ed. Dr. Janis Osis & Dr. Erika Asnina, chapter 8, pages 156-176, IGI Global Publishing, 2010
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## Refereed Conference Publications

1. Wendell Noordhof and Joe Hoffert, "[A Taxonomy of Protocol Frameworks and Gap Analysis for Adaptive Publish/Subscribe Distributed Realtime Embedded Systems](#)", 51st ACM Southeast Conference, Savannah, Georgia, April 2013
2. Joe Hoffert, "[Software Aesthetics and Human Flourishing in the Making of Technology](#)", 2012 Baylor Symposium on Faith and Culture, [Presentation Slides](#), Waco, Texas, October 2012
3. Joe Hoffert, Douglas Schmidt, and Aniruddha Gokhale, "[Adapting Distributed Real-time and Embedded Publish/Subscribe Middleware for Cloud-Computing Environments](#)", ACM/IFIP/USENIX 11th International Middleware Conference (Middleware 2010), Bangalore, India, November 2010
4. Joe Hoffert and Douglas Schmidt, "[Evaluating Supervised Machine Learning for Adapting Enterprise DRE Systems](#)", 2010 International Symposium on Intelligence Information Processing and Trusted Computing (IPTC 2010), Huanggang, China, October 2010
5. Joseph W. Hoffert, Douglas Schmidt, and Aniruddha Gokhale, "[Evaluating Transport Protocols for Real-time Event Stream Processing Middleware and Applications](#)", The 11th International Symposium on Distributed Objects, Middleware, and Applications (DOA '09), Algarve, Portugal, November 2009

6. Joseph W. Hoffert and Douglas Schmidt, "[Maintaining QoS for Publish/Subscribe Middleware in Dynamic Environments](#)", Fast abstract for the 3rd ACM International Conference on Distributed Event-Based Systems (DEBS '09), Nashville, TN, USA, July 2009
  7. Joseph W. Hoffert, Douglas Schmidt, and Aniruddha Gokhale, "[DQML: A Modeling Language for Configuring Distributed Publish/Subscribe Quality of Service Policies](#)", Proceedings of the 10th International Symposium on Distributed Objects, Middleware, and Applications (DOA '08), Monterrey, Mexico, November 2008
  8. Joseph W. Hoffert, Douglas Schmidt, and Aniruddha Gokhale, "[A QoS Policy Configuration Modeling Language for Publish/Subscribe Middleware Platforms](#)", The Inaugural International Conference on Distributed Event-Based Systems, Toronto, Ontario, Canada, June 20-22, 2007.
  9. Joseph W. Hoffert, Shanshan Jiang, and Douglas C. Schmidt, "[A Taxonomy of Discovery Services and Gap Analysis for Ultra-Large Scale Systems](#)", [2007 ACM Southeast Conference](#), Winston-Salem, North Carolina, USA, March 23 - 24, 2007.
  10. Christopher D. Gill, Joseph W. Hoffert, David C. Sharp, and Patrick H. Goertzen, "[An Evolution of QoS Context Propagation in Event-Mediated Avionics Software Architectures](#)", [20th IEEE/AIAA Digital Avionics System Conference \(DASC\)](#), Daytona Beach, Florida, 14-18 October 2001.
  11. Joe Hoffert and Kenneth Goldman, "[ControlMessage: An Object Behavioral Pattern for Managing Protocol Interactions](#)", Pattern Languages of Program Design (PLoPD) Conference, Monticello, IL, August, 1998.
  12. Joe Hoffert, "[Triggered Placeholder: An Object Creational Pattern for Delaying Object Creation](#)", Pattern Languages of Program Design (PLoPD) Conference, Monticello, IL, August, 1998
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## Tutorials

1. Joe Hoffert, "[Intelligent Event Processing in Quality of Service \(QoS\) Enabled Publish/Subscribe \(Pub/Sub\) Middleware](#)", presented at the 2010 International Symposium on Intelligence Information Processing and Trusted Computing (IPTC 2010), Huanggang, China, October 2010
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## Refereed Workshop Publications

1. Joe Hoffert, Douglas Schmidt, and Aniruddha Gokhale, "[Adapting and Evaluating Distributed Real-time and Embedded Systems in Dynamic Environments](#)", The 1st International Workshop on Data Dissemination for Large scale Complex Critical Infrastructures (DD4LCCI 2010), Valencia, Spain, April 2010
2. Joseph W. Hoffert, Daniel Mack, and Douglas Schmidt, "[Using Machine Learning to Maintain Pub/Sub System QoS in Dynamic Environments](#)", The 8th Workshop on

- Adaptive and Reflective Middleware (ARM) 2009, Urbana Champaign, IL, December 2009
3. Joseph W. Hoffert and Douglas Schmidt, "[FLEXible Middleware And Transports \(FLEXMAT\) for Real-time Event Stream Processing \(RT-ESP\) Applications](#)", Workshop on Distributed Object Computing for Real-time and Embedded Systems (OMG RTWS '09), Washington, D.C., USA, July 13-15, 2009.
  4. Joe Hoffert, Mahesh Balakrishnan, Douglas Schmidt, and Ken Birman, "[Supporting Large-scale Continuous Stream Datacenters via Pub/Sub Middleware and Adaptive Transport Protocols](#)" The 2nd Workshop on Large-Scale Distributed Systems and Middleware (LADIS 2008), Yorktown, New York, USA, September 15-17, 2008.
  5. Mahesh Balakrishnan, Joe Hoffert, Ken Birman, and Douglas Schmidt, "[Rethinking Reliable Transport for the Datacenter](#)" The 2nd Workshop on Large-Scale Distributed Systems and Middleware (LADIS 2008), Yorktown, New York, USA, September 15-17, 2008.
  6. Joe Hoffert, Mahesh Balakrishnan, Doug Schmidt, and Ken Birman, "[Supporting Scalability and Adaptability via ADaptive Middleware And Network Transports \(ADAMANT\)](#)", Workshop on Distributed Object Computing for Real-time and Embedded Systems (OMG RTWS '08), Washington, D.C., USA, July 14-16, 2008.
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## Posters, Presentations, and Technical Reports

1. Joe Hoffert, "[Evaluating and Adapting QoS for Distributed Real-time & Embedded Systems in Dynamic Environments](#)", EuroSys 2010 Conference, poster session, Paris, France, April 2010
2. Joseph W. Hoffert (Advisor: Douglas Schmidt), "[Maintaining Publish/Subscribe Middleware QoS in Dynamic Environments](#)", Doctoral and PhD Workshop for the 3rd ACM International Conference on Distributed Event-Based Systems (DEBS '09), Nashville, TN, USA, July 2009
3. Joseph W. Hoffert (Advisor: Douglas Schmidt), "[Maintaining QoS for Publish/Subscribe Middleware via Autonomic Adaptation](#)", Doctoral Consortium for the 6th International Conference on Autonomic Computing and Communications, Barcelona, Spain, June 2009
4. Joe Hoffert, Doug Schmidt, Mahesh Balakrishnan, and Ken Birman, "[Trustworthy Conferencing via Domain-specific Modeling and Low Latency Reliable Protocols](#)", Team for Research in Ubiquitous Secure Technology (TRUST) Spring 2008 Conference, poster session, Berkeley, California, April 2008
5. Joe Hoffert, Akshay Dabholkar, Douglas Schmidt, and Aniruddha Gokhale, "[Enhancing Security in Ultra-Large Scale \(ULS\) Systems using Domain-specific Modeling](#)", Team for Research in Ubiquitous Secure Technology (TRUST) Spring 2007 Conference, poster session, Berkeley, California, March 2007
6. Joseph W. Hoffert, Kevin Klues, and Obi Orjih, "[Configuring the IEEE 802.15.4 MAC Layer for Single-sink Wireless Sensor Network Applications](#)", Real-Time Systems class project, Washington University, St. Louis, Missouri, December 2005.

7. Joseph W. Hoffert and Jeremy Weatherford, "[Congestion Control and Synchronization in Bottleneck Routers](#)", Protocols for Computer Networks course presentation, Washington University, St. Louis, Missouri, April 2005.
  8. Joseph W. Hoffert, "[Instrumentation Overview](#)", Boeing internal technical presentation, St. Louis, Missouri, August 2003.
  9. Joseph W. Hoffert, "[Advanced Algorithms](#)", Boeing internal technical presentation, St. Louis, Missouri, January 2003.
  10. Kenneth J. Goldman, Joe Hoffert, T. Paul McCartney, J.Y. Plun, and Todd Rodgers, "[Building Interactive Distributed Applications in C++ with The Programmer's Playground](#)," Washington University, Department of Computer Science, Technical Report WUCS-97-14, February 1997
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## Academic Services

1. Conference technical submission reviewer for the 17th IEEE Real-Time and Embedded Technology and Applications Symposium 2011 ([RTAS 2011](#))
  2. Journal technical submission reviewer (2010) for the IEEE Journal on Selected Areas in Communications (JSAC) special issue: [Trading Rate for Delay at the Transport and Application Layers](#)
  3. Journal technical submission reviewer (2010) for the [Journal of Parallel and Distributed Computing](#)
  4. Conference technical submission reviewer for the 4th ACM International Conference on Distributed Event-Based Systems (2010) ([DEBS 2010](#))
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## Professional Experience

- **July 2013 - present : Assistant Professor**

[Indiana Wesleyan University](#)

4201 S. Washington St.

[Marion, Indiana](#) 46953

Teaching computing science courses, exploring research opportunities in the area of distributed realtime embedded systems.

- **July 2011 - June 2013 : Assistant Professor**

[The King's University College](#)

9125 50 St. NW

[Edmonton, Alberta](#) T6B 2H3

Taught computing science courses, conducted research in the area of adaptive publish/subscribe DRE systems.

- **February 2011 - May 2011 : Research Scientist,**  
[Institute for Software Integrated Systems - Vanderbilt University](#), Nashville, TN

Conducting research for model-based development of the [Future Airborne Capability Environment](#) consortium.

- **August 2007 - February 2011 : Research Assistant,**  
[Vanderbilt University](#), [Department of EE & CS](#), - Nashville, TN

Conducting research, writing and presenting technical papers in the area of QoS domain-specific modeling languages, flexible middleware with transport protocols, and adaptive middleware with networking frameworks.

- **August 2007 - February 2011 : Research Assistant**  
[Vanderbilt University](#), [Department of EE & CS](#), - Nashville, TN

Conducting research, writing and presenting technical papers.

- **May 2007 - August 2007 : Intern/Contractor**  
[PrismTech](#), - Newcastle, United Kingdom

Designed and implemented an Eclipse SWT-based tuning application for PrismTech's OpenSplice DDS implementation to be integrated with PrismTech's PowerTools modeling tool suite.

- **February 2002 - July 2006 : Embedded Software Engineer**  
[Boeing](#), - St. Louis, MO

[Integrated Defense Systems](#), [Center for Integrated Defense Simulation](#)

Worked on a small team to architect, design, and implement a framework for future scalable and higher fidelity distributed and network-centric operations simulations including publishing and subscribing of information and intelligent filtering of data to maximize networking resources. Designed, implemented, and maintained software in support of current distributed simulations.

[Phantom Works](#), Advanced Technologies & Processes - Open Systems Architectures  
Designed, implemented, and maintained an instrumentation interface to provide metrics feedback from real-time embedded avionics systems to application development tools (as a continuation of the contracting work done for Boeing). This was work in support of the Defense Advanced Research Project Agency's ([DARPA](#)) Model-Based Integration of Embedded Software ([MoBIES](#)) and Software Enabled Control ([SEC](#)) projects.

- **December 2001 - February 2002 : Contractor for Boeing - St. Louis**  
The Aviant Group, Maryland Heights, MO



Outlined instrumentation and a data interface to provide metrics feedback from real-time embedded avionics systems to application development tools. This was work on the Defense Advanced Research Project Agency's ([DARPA](#)) Model-Based Integration of Embedded Software ([MoBIES](#)) project.

- **Oct 1995 - November 2001 : Research Associate**  
Washington University, St. Louis, MO

#### [Distributed Object Computing Group](#)

Worked on the Adaptive Software Technology Development project phase 2 with [Chris Gill](#) which researched hybrid static/dynamic resource management in middleware (using a C++ CORBA ORB) for embedded real-time distributed object computing. Mostly involved with instrumenting metrics and porting the metrics infrastructure to VxWorks from NT. This was work done in conjunction with Boeing - St. Louis.

Co-authored white paper highlighting research opportunities for implementing [Statistical Rate Monotonic Scheduling](#), a superset of Rate Monotonic Scheduling, that allows for quality of service in task scheduling/dispatching. Involved with implementation and measurement of this adaptive scheduling paradigm in an embedded real-time system. As part of a team designed and developed PACE, a POSIX-like C wrapper to port POSIX functionality to OSes that have incomplete or non-existent POSIX support. The platforms currently supported are Solaris, LynxOS, NT, and VxWorks.

#### [Applied Research Laboratory](#)

Modified the [Vaudeville](#) videoconferencing application to use commercial off-the-shelf (COTS) ATM hardware and software and to use the [Adaptive Communication Environment](#) (ACE) middleware developed by the [DOC](#) group in Washington University. Modified [ACE](#) to add vendor-specific ATM support.

#### [Distributed Programming Environments Group](#)

Designed and developed base C++ class library to provide support for publishing, connecting, and updating variables for the [Programmer's Playground](#), a software library and run-time support system for the easy development of distributed applications. This DARPA/NSF-funded project was developed in C++ and is targeted for several environments (including Solaris, OSF/1, Windows NT, and NetBSD). Have developed and delivered technical presentations.

- **Feb 93 - Sep 95 : Software Development Engineer**  
Informix Software, Inc. (since bought by IBM), Lenexa, KS, Research and Development  
Member of a team responsible for the development and maintenance of an interactive debugger for Informix's NewEra 4GL. Developed and refined functional requirements for the debugger. Designed OO GUI classes using the OMT methodology and implemented them in C++ on UNIX workstation and PC. Evaluated expert system shells for use in products. Worked on committees to create a product development process. Developed and delivered presentation on artificial intelligence and its applicability to Informix.
- **Oct 91 - Dec 92 : Information Technologist**  
LTV/Vought Corp., Dallas, TX, Information Technology Group

Member of consortium for information standards development. Captured requirements and designed software in support of ISO's product data exchange standard (STEP) and other related standards. Implemented software in C/C++ on UNIX workstations. Developed and presented technical briefings to management.

- **Dec 90 - Sep 91 : Project Engineer**

Synetech, Inc., Dayton, OH

Performed consulting for the Air Force and Marine Corps on several different projects in the area of product data standards.

- **Jul 87 - Nov 90 : Program Manager**

[International TechneGroup Inc.](#), Milford, OH, Data Exchange Group

Marketed, managed, and developed product data software in support of computer-aided design and manufacturing applications (CAD/CAM). Software was written mostly in C on UNIX workstations.

- **Jun 86 - Jun 87 : Member of Technical Staff**

Information Control Corp., Mt. Vernon, OH

Enhanced and maintained custom software product for custom hollow metal door manufacturers. Software was written in Fortran on a VAX/VMS platform.

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## Personal Information

- Enjoy spending time with my wife and three children. Also enjoy outdoor activities (*e.g.*, sports, hiking/camping/backpacking), reading, woodworking, and singing.
- Interest in German language and culture. *Leider kann ich nur ein bißchen deutsch.*