The University of Alabama
Department of Computer Science
Colloquium Series

Dr. Christopher Jules White
Research Assistant Professor
Vanderbilt University

Techniques and Tools for Managing Cyber-Physical System Complexity

Friday, February 26th

Presentation at 11:00 a.m. in SEC 3437, refreshments across the hall in SEC 3438 at 10:45 a.m.

Abstract:
A cyber-physical system (CPS) involves close coordination between the system's computational and physical elements. CPS applications are essential in mission- and safety-critical domains, such as aerospace, automotive, chemical processes, civil infrastructure, energy, entertainment, healthcare, manufacturing, and transportation. Since CPS systems interact with--and increasing control--the physical world, they must adhere to strict quality of service (QoS) requirements, such as timeliness of computation and guarantees on security, which makes it hard to developed and validate CPS applications.

This talk presents model-driven techniques and tools that help developers construct CPS applications efficiently and correctly, focusing on hybrid heuristic/metaheuristic algorithms that optimize the mapping of CPS software to computer hardware. Results from case studies show how these techniques and tools substantially reduce processor and network resource utilization for production CPS applications, such as avionics mission computers. The talk will also discuss ongoing research using Internet devices to build novel mobile CPS applications, focusing on key challenges and solution approaches for developing applications to detect traffic accidents, monitor the symptoms of Parkinson's disease, and provide mobile augmented reality viewfinders.

Bio:
Jules White received his BA in Computer Science from Brown University, his MS from Vanderbilt University, and his Ph.D. from Vanderbilt University. His research focuses on Model-driven Engineering and Software Product-lines for distributed, real-time, and embedded systems. In conjunction with Siemens AG, Lockheed Martin, IBM, and others, Jules has developed scalable modeling and optimization techniques for managing the complexity of large-scale systems. Jules is the project-lead of the Eclipse Foundation's Generic Eclipse Modeling System (GEMS http://www.eclipse.org/gmt/gems).