Department of Computer Science
University of Houston

DISTINGUISHED LECTURERS SEMINAR
FALL 2010

WHEN: **MONDAY, OCTOBER 11, 2010**
WHERE: **PGH 232**
TIME: **11:00 AM**

SPEAKER: Dr. Andrew Lumsdaine, Indiana University

Host: Dr. Barbara Chapman

TITLE: The Parallel BGL: A High-Performance Parallel Graph Algorithms Library

Abstract: The increasing complexity of parallel architectures, coupled with the growing importance of new classes of parallel applications, calls for new tools and new development paradigms. Of particular importance is the need to develop software in an architecture-independent fashion while still being able to take advantage of architecture-specific features. In this talk, we present the design and implementation of the Parallel Boost Graph Library, a library of high-performance reusable software components for distributed graph computation. Like the sequential Boost Graph Library (BGL) upon which it is based, the Parallel BGL applies the paradigm of generic programming to the domain of graph computations. To illustrate how the Parallel BGL was built from the sequential BGL, we revisit the abstractions comprising the BGL in the context of distributed-memory parallelism, and lift away the implicit requirements of sequential execution and a single shared address space. With this process, we are able to create generic algorithms having a sequential expression and requiring only the introduction of external (distributed) data structures for parallel execution. More importantly, the generic implementation retains its sequential interface and semantics, such that other distributed algorithms can be built upon it, just as algorithms are layered in the sequential case. By characterizing these extensions as well as the extension process, we develop general principles and patterns for using (and reusing) generic parallel software libraries. We demonstrate that the resulting algorithm implementations are both efficient and scalable with performance results for several algorithms implemented in the open-source Parallel Boost Graph Library. We conclude by discussing on-going and future work, most notably the approaches being taken by PBGL to operate efficiently on multi-core and hybrid architectures.

Biography: Andrew Lumsdaine is a professor in the School of Informatics & Computing at Indiana University, and an Associate Director of the Digital Science Center and Director of the Open Systems Lab at the Pervasive Technology Institute. Lumsdaine received his Ph.D. from MIT in 1992, and from 1992 through 2001, he was a faculty member in the Department of Computer Science and Engineering at the University of Notre Dame. His research interests include computational science and engineering, parallel and distributed computing, software engineering, generic programming, mathematical software, numerical analysis, and computational photography. Lumsdaine is a member of ACM, IEEE, and SIAM, as well as the MPI Forum, and the ISO C++ standards committee. In 1995, he received the Career Development Award from the National Science Foundation.