

CSAIL - Seminar

Finding Race Conditions in Industrial Erlang Code by Property-Based Testing

Speaker: John Hughes, Chalmers University, Gothenburg and Quviq AB, Gothenburg

Date: Tuesday, March 29, 2011

Time: 3:30 pm

Refreshments: 3:15PM

Location: 32-G8th floor reading room

Host: Professor Arvind, CSG-CSAIL-MIT

Abstract:

Race conditions bedevil concurrent programs, leading to hard-to-replicate Heisenbugs that are near impossible to find. The Erlang programming language mitigates the problem by restricting data-structures to be immutable, and outlawing shared data between processes, but race conditions can and do still occur in real systems. In this talk I shall explain our approach to the problem using QuickCheck, our property-based testing tool, which uses a formal specification to generate test cases and as a test oracle, and simplifies failing tests to minimal counterexamples to aid fault diagnosis. Using a form of serializability as the specification, QuickCheck is able to find minimal examples that provoke races with relatively little work.

QuickCheck was recently applied to the data storage layer of mnesia, the database management system distributed together with Erlang, which is heavily used in real applications. Our approach quickly revealed five separate race conditions, some of which may explain Heisenbugs that are known to occur every month or two in production systems.

If time permits, I shall also discuss current work on controlling the scheduling of Erlang programs to make race conditions easier to detect.

John Hughes

John Hughes is a long-time researcher in the area of functional programming, a contributor to the design of Haskell, and author of "Why Functional Programming Matters", one of the most widely read articles in the area. In 2000 he and Koen Claessen developed QuickCheck, an influential specification-based testing tool which last year received the ACM SIGPLAN Award for Most Influential Paper of ICFP 2000. In 2006 he founded Quviq AB, which develops and markets a commercial version of QuickCheck for Erlang, and in 2007 received the Erlang User of the Year award as a result. Today he divides his time between Quviq and a Chair at Chalmers University of Technology in Gothenburg, with a research focus on the interplay of functional programming and software testing.