

Verification of MPI Programs Using Spin

Steven Barrus, Ganesh Gopalakrishnan,
Robert M. Kirby, Robert Palmer

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School of Computing
University of Utah
Salt Lake City, Utah 84112

Abstract

Verification of distributed systems is a complex yet important process. Concurrent systems are vulnerable to problems such as deadlock, starvation, and race conditions. Parallel programs written using the MPI (Message Passing Interface) Standard are no exception. Spin can be used to formally verify a parallel program if it is given an accurate model written in Spin's process meta language (Promela). In this paper, we describe a generalized framework for verification of MPI-based parallel programs using the Spin model checker. Only select MPI calls are covered, but this framework could potentially be extended to include all of the MPI Standard. Our reduced MPI implementation (written in Promela) is designed to follow the MPI Standard as well as allow for the flexibility provided in certain aspects (like buffering). We also present a few examples to illustrate the use of our MPI implementation in Promela.