High Performance Reconfigurable Computing for Science and Engineering Applications

by

Peter Leonard McMahon

Submitted to the Department of Electrical Engineering
in partial fulfillment of the requirements for the degree of

Bachelor of Science in Electrical and Computer Engineering

at the

University of Cape Town

October 2006

Advisor: Professor Michael R. Inggs

This thesis investigates the feasibility of using reconfigurable computers for scientific applications. We review recent developments in reconfigurable high performance computing. We then present designs and implementation details of various scientific applications that we developed for the SRC-6 reconfigurable computer. We present performance measurements and analysis of the results obtained.

We chose a selection of applications from bioinformatics, physics and financial mathematics, including automatic docking of molecular models into electron density maps, lattice gas fluid dynamics simulations, edge detection in images and Monte Carlo options pricing simulations.

We conclude that reconfigurable computing is a maturing field that may provide considerable benefit to scientific applications in the future. At present the performance gains offered by reconfigurable computers are not sufficient to justify the expense of the systems, and the software development environment lacks the language features and library support that application developers require so that they can focus on developing correct software rather than on software infrastructure.

Contents

DOCKET ALARM

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts

Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research

With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips

Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS
Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS
Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS
Sync your system to PACER to automate legal marketing.