Alex Cole.

Hardware/Software Co-Design Language Development,
An EngD Introduction

WoTUG CPA Fringe 2009
2 November 2009

Dr Alistair A. McEwan
Embedded Systems Lab - Applied Formal Methods Group

Dr Satnam Singh
Microsoft Research, Cambridge
Main Research

- Hardware/software co-design language development
- Formal methods and verification
- Bespoke HW/SW
- Target abstraction
- Communications
Project Areas

- Using Esterel in HW and SW simultaneously
- FPGAs and GPUs – Data-parallel and code-parallel hardware in computers
- Software and hardware tradeoffs for maximum energy efficiency
Project Areas

\[ a = a \oplus b; \]
\[ b = b \oplus a; \]
\[ a = a \oplus b; \]

\[ c = a; \]
\[ a = b; \]
\[ b = c; \]

\[ \text{SWAP}(a, b); \]

- Number of reads
- Number of writes
- Number of operations
- Number of registers
- Speed, Space, Power
Project Areas

- Using Esterel in HW and SW simultaneously

- FPGAs and GPUs – Data-parallel and code-parallel hardware in computers

- Software and hardware tradeoffs for maximum energy efficiency

- .NET native processor
.NET Native Processor

- Execute CIL on a custom FPGA soft core
- Code portability
- Abstract stack
- Tiny subset of .NET features
.NET Native Processor

- Parallel garbage collection and memory management
- Multiple cores for processes
- Hardware process communication
- CSP style interface
Thank You