Software Development
Tools for
Soft Multiprocessors

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Introduction

- One billion transistor FPGAs available (2006)
- FPGA design becoming complex
- Emerging trend: *soft multiprocessors*
  - Large, programmable IP blocks (CPUs)
  - Hundreds of CPUs / thousands of MIPS

2002 Soft CPU  2006 Soft CPU  2006 Soft MP
Processor Level Modeling

- Models (dynamically) built from:
  - **Processors**: Store and process data
  - **Memory**: Local or shared memory
  - **Links**: Transfer data between processors
  - **Networks**: A collection of links
- Simulates at the *processor* level
- Executes at up to 2M instructions / sec
- Quickly change architecture
- Executes software
The Multiprocessor Model

- CPU Model
- Memory Model
- Link Model
- Network Model

Cmpware IDE

Cmpware Multiprocessor Simulation Engine
Filtering Example: Task Level Parallelism

```
volatile int *x, *in, *tmp, *out;
*x = fft(*in);
*tmp = f(x);
*out = ifft(tmp);
```
Filter Example: Sub-Task Level Parallelism
Conclusions

- Soft multiprocessing solves HW design problems (but creates SW design problems!)
- Good SW development tools essential
- Cmpware CMP-DK:
  - Quickly build and program multiprocessors
  - Redefine multiprocessor in seconds
  - Speeds simulation (2M+ instructions / second)
  - Complete Eclipse development environment
  - Standard models for NIOS, MicroBlaze, Sparc (LEON), MIPS32 and more