Microblaze running uClinux

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Outline

• Introduction
• Implementation
• Progress
• Conclusion

Introduction

• Project aim:
  To instantiate the microblaze processor on an FPGA board, then run the uClinux OS on the microblaze

Introduction

• Microblaze – a softcore processor
  • Instantiate on FPGA
• 32-bit risc architecture
• 32, 32-bit registers
• 3 stage pipeline
• load/store architecture
  • Big endian
**Introduction**

- uClinux – a ported linux OS
  - For systems without MMUs
  - Includes a small linux kernel
- Comes with libraries, applications and toolchains
- Used in embedded systems
  - PDAs, microcontrollers and lots of other systems

**Implementation**

- Most of the work done in this area by Dr John Williams from UQ
- Not trivial
  - Awkward development environment
  - Linux box for kernel compilation
  - Windows box for hardware target configuration
- The process done in discrete stages

**Introduction**

- Digilent Spartan-3 starter board
  - Xilinx Spartan-3 FPGA
  - 200K gates
- Plenty of I/O
- 1MB SRAM
- Small flash RAM
- Expansion connectors

**Implementation**

- Instantiating the microblaze
  - Xilinx Platform Studio generates system
  - Use the tool to instantiate the processor
- Build the uClinux kernel
  - Requires toolchain, user distribution and kernel source
  - Some configuration from menu
  - Build into image
**Implementation**

- Build the hardware target
  - This is what we are really porting
  - Make kernel changes afterwards
  - Change things to fit the board
    * Pin constraints, memory controller parameters
  - Download the hardware target

- Then download the kernel image

**Progress**

- Microblaze successfully instantiated
  - No serial output (despite many attempts to solve this problem)
  - Tested with LED/switch program

- Kernel and hardware target compiled
  - Unable to upload the hardware target to the board (may also be a serial issue)

**Implementation**

- Problems:
  - Configuring the hardware target correctly
  - 1MB memory - too small for kernel image
  - Getting no output through serial port (this is an unexpected problem)
  - Takes a while to get a suitable development environment
    * Samba mapped linux directories etc.
  - Not much support available

**Conclusion**

- Lots of time spent on unnecessary things
  - Tutorial should help others avoid this

- Still work to be done
  - Determined to get it running
  - 1MB RAM may be too much of a problem
    * May require RAM expansion card
  - Once setup, easy to work on this framework
    * Play with uClinux apps etc.
Bibliography

- http://www.uclinux.org/
- http://www.digilentinc.com/Data/Products/S3BOARD/S3BOARD-brochure.pdf