

Microblaze running uClinux

Presentation by Kynan Fraser
For Advanced Computer Architectures

Outline

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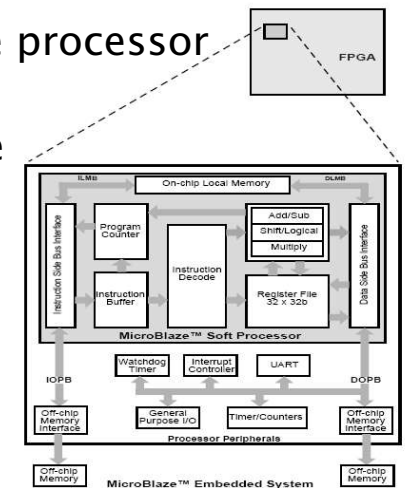
Introduction

- **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
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Introduction

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



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
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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
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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
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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
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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)
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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.
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Bibliography

- http://www.xilinx.com/ipcenter/catalog/logicore/docs/microblaze_risc_32bit_proc_final.pdf
- <http://www.uclinux.org/>
- <http://www.digilentinc.com/Data/Products/S3BOARD/S3BOARD-brochure.pdf>
- <http://www.itee.uq.edu.au/~jwilliams/mblaze-uclinux>.

