# Zylin AS Nios Linux MMU 2010

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# Zylin AS

- Established 1.1.2002
- Primary business: embedded consultancy
- 2010 : 5 employees
- Currently customers in Stavanger, Oslo, USA, France, Germany
- Products: ZY1000 JTAG debugger
- Wholly owned by employees
- Robust customer base and profitable since day 1





# Nios Linux MMU

- uCLinux has been around for a while
- Linux with MMU is "regular linux"
- Nios Linux MMU is still a fork
- Some applications require MMU
  - Memory fragmentation / protection?
  - Compatibility? fork support.
  - Migration?
  - Regulations?
  - Competition?





# What do you need to learn?

- Git. If you are going to do serious Linux development, then you have to learn about DVCS.
- Develop under Linux, Quartus works fine under Linux(we're using Ubuntu 9.10).
- Windows is not a usable environment for Linux embedded development





# What do you need?

- Linux needs megabytes of ram & flash, i.e. DRAM
- High bandwidth internet connection and a modern development PC
- Linux development regularly deals with 100's of thousands of files and gigabytes of repositories
- Tried with 32 bit x86 Ubuntu 9.10, other combinations should probably work as well.
- GCC Nios MMU binaries for 64 bit hosts?





# Which Linux MMU for Nios?

 There are different branches / distributions, including commercial and open source efforts

www.zylin

Fork of uClinux on nioswiki http://www.nioswiki.com/linux



### Quickstart

- Perhaps resetting expectations is a good place to start... this takes time. Set aside a few days to avoid frustration and dissapointment.
- http://www.nioswiki.com/Linux/Linux\_Quick\_Start

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Rebuild Nios w/MMU(option in SOPC)



#### **Essential steps**

- Try with eval kit first
- Build FPGA w/Linux support for your FPGA. This requires both hardware and software knowledge
- Build Linux + test
- Best case: software engineer is trained sufficiently to do test cycles using SOPC + Linux build procedure

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#### FPGA w/MMU

- Create Nios w/MMU and tightly coupled memory for TLB
- Generate headers based on FPGA memory map
- http://www.nioswiki.com/Linux/Creating\_a\_Nios\_II \_Design\_with\_an\_MMU



## custom\_fpga.h

 If you get errors, modify custom\_fpga.h to handle differences in SOPC names

- #define IGOR\_MAC\_BASE OEM\_BASE
- #define UART0\_BASE UART\_0\_BASE
- etc.



# Building

- Make menuconfig
- Remember to configur w/custom\_fpga via kernel settings

- Disable unused devices, e.g. TSE MAC
- Make



### Altera Nios MMU

#### make

#### nios2-download -r -g images/zImage

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#### Altera Nios MMU

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# User space debugging

- No JTAG debugger currently
- Enable TCP/IP networking
- Make menuconfig gdbserver (old)
- gdbserver localhost:9999 /bin/dhcpcd
- http://www.nioswiki.com/OperatingSystems/UClin ux/DebugApps





### **OpenCores** ethermac

- Altera TSE MAC is perhaps more mainstream
- make menuconfig
- ifconfig eth0 10.0.0.137 netmask 255.255.255.0 up
- passwd root
- ftp performance figures on ~NEEK
- 3770069 bytes sent in 1.63 secs (2257.5 kB/s)
- 3770069 bytes received in 1.69 secs (2177.9 kB/s)





#### Bootloader and remote update

 One FPGA bit file for bootloader and another for uClinux

- Requires Remote System Update capable bootloader
- No obvious choices
- Nios2ecos bootloader?



# Is Linux easy?

- Could be...
- Check that drivers are available for your peripherals
- Linux is easier when it works, but what about when it doesn't?
- Do you need the latest version of Linux?
- Track branch when making modifications?
- Contribute back patches?





# Zylin AS Embedded services 2010

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