

Soft CPU demo

Altera Nios

Øyvind Harboe, General Manager, Zylind A



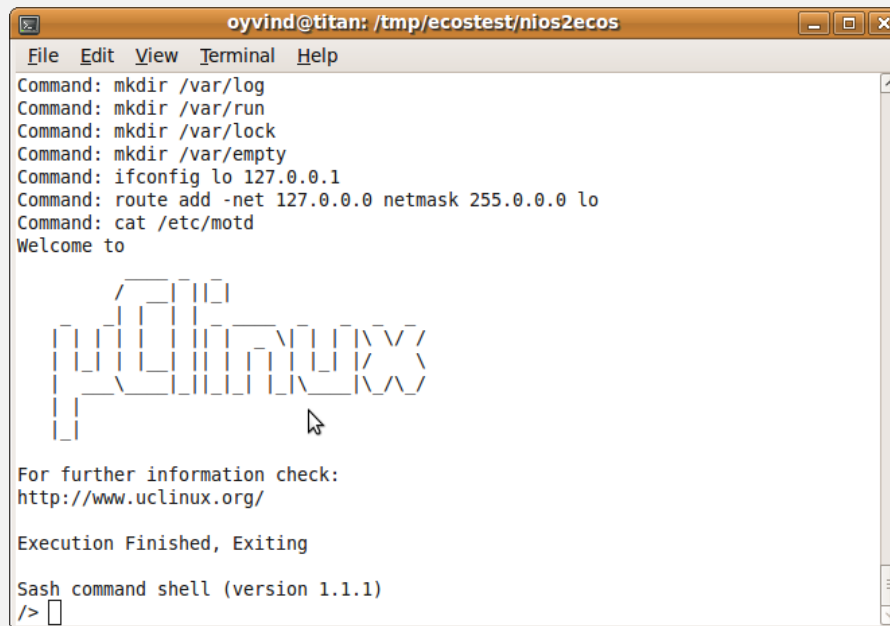
FPGA image

- FPGA tools produced two files
- sof – This file is programmed into the FPGA
- ptf – contains description of peripherals: names, interrupts, memory map, etc.



uCLinux example

- <http://opensource.zylin.com/niosuclinux.html>
- nios2-configure-sof demo.sof
- nios2-download zImage -r -g



A terminal window titled "oyvind@titan: /tmp/ecostest/nios2ecos" showing the execution of a script. The commands and their outputs are as follows:

```
oyvind@titan: /tmp/ecostest/nios2ecos
File Edit View Terminal Help
Command: mkdir /var/log
Command: mkdir /var/run
Command: mkdir /var/lock
Command: mkdir /var/empty
Command: ifconfig lo 127.0.0.1
Command: route add -net 127.0.0.0 netmask 255.0.0.0 lo
Command: cat /etc/motd
Welcome to

          /_/_/
         /_/_/_/
        /_/_/_/_/
       /_/_/_/_/_/
      /_/_/_/_/_/_/
     /_/_/_/_/_/_/_/
    /_/_/_/_/_/_/_/_/
   /_/_/_/_/_/_/_/_/_/
  /_/_/_/_/_/_/_/_/_/_/
 /_/_/_/_/_/_/_/_/_/_/_/
/_/_/_/_/_/_/_/_/_/_/_/_/

For further information check:
http://www.uclinux.org/

Execution Finished, Exiting

Sash command shell (version 1.1.1)
/>
```

Build Nios uCLinux

- www.nioswiki.com
- `make menuconfig`
- `make vendor_hwselect SYSPTF=<path to your system ptf>`
- `make`
- `zImage`



eCos example

- Zylin maintains open source eCos HAL
- <http://www.nioswiki.com/ecos>
- <http://www.altera.com/products/ip/processors/nios2/tools/embed-partners/zylin/emb-zylin.html>
- <http://opensource.zylin.com/niosecos.html>



Build eCos hello world

- Install eCos 3.0
- Install Quartus 9.0
- Cygwin and Linux supported
- Zylín uses Ubuntu mostly
- <http://opensource.zylin.com/niosecos.html#build>



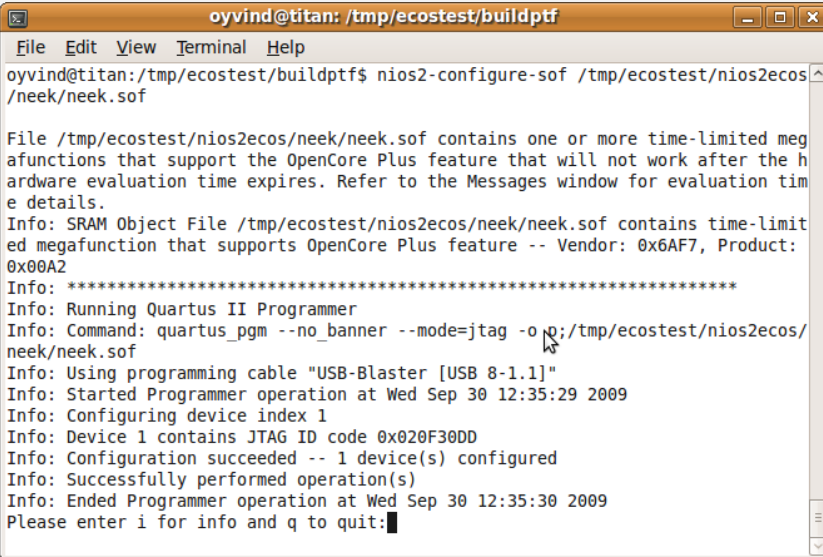
Build eCos hello world

- nios2configgen
 --ptf=/tmp/ecostest/buildptf/cycloneIII_3c25_niosll_standard_sopc.ptf -cpu=cpu
- ecosconfig new nios2_neek default
- ecosconfig tree
- make
- make tests



Upload sof to FPGA

- nios2-configure-sof
 /tmp/ecostest/nios2ecos/neek/neek.sof
- Tethered – without Altera license, then USB cable must remain attached



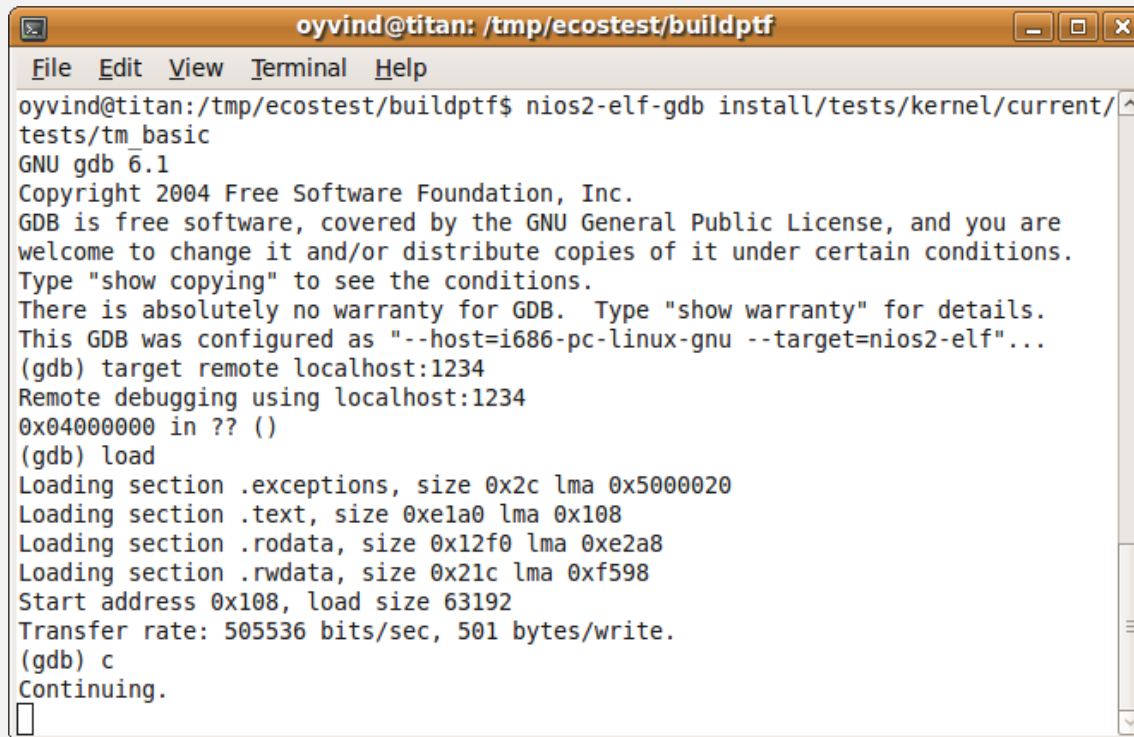
```
oyvind@titan: /tmp/ecostest/buildptf
File Edit View Terminal Help
oyvind@titan:/tmp/ecostest/buildptf$ nios2-configure-sof /tmp/ecostest/nios2ecos/neek/neek.sof

File /tmp/ecostest/nios2ecos/neek/neek.sof contains one or more time-limited megafunctions that support the OpenCore Plus feature that will not work after the hardware evaluation time expires. Refer to the Messages window for evaluation time details.
Info: SRAM Object File /tmp/ecostest/nios2ecos/neek/neek.sof contains time-limited megafunction that supports OpenCore Plus feature -- Vendor: 0x6AF7, Product: 0x00A2
Info: *****
Info: Running Quartus II Programmer
Info: Command: quartus_pgm --no_banner --mode=jtag -o /tmp/ecostest/nios2ecos/neek/neek.sof
Info: Using programming cable "USB-Blaster [USB 8-1.1]"
Info: Started Programmer operation at Wed Sep 30 12:35:29 2009
Info: Configuring device index 1
Info: Device 1 contains JTAG ID code 0x020F30DD
Info: Configuration succeeded -- 1 device(s) configured
Info: Successfully performed operation(s)
Info: Ended Programmer operation at Wed Sep 30 12:35:30 2009
Please enter i for info and q to quit:
```



nios2-elf-gdb

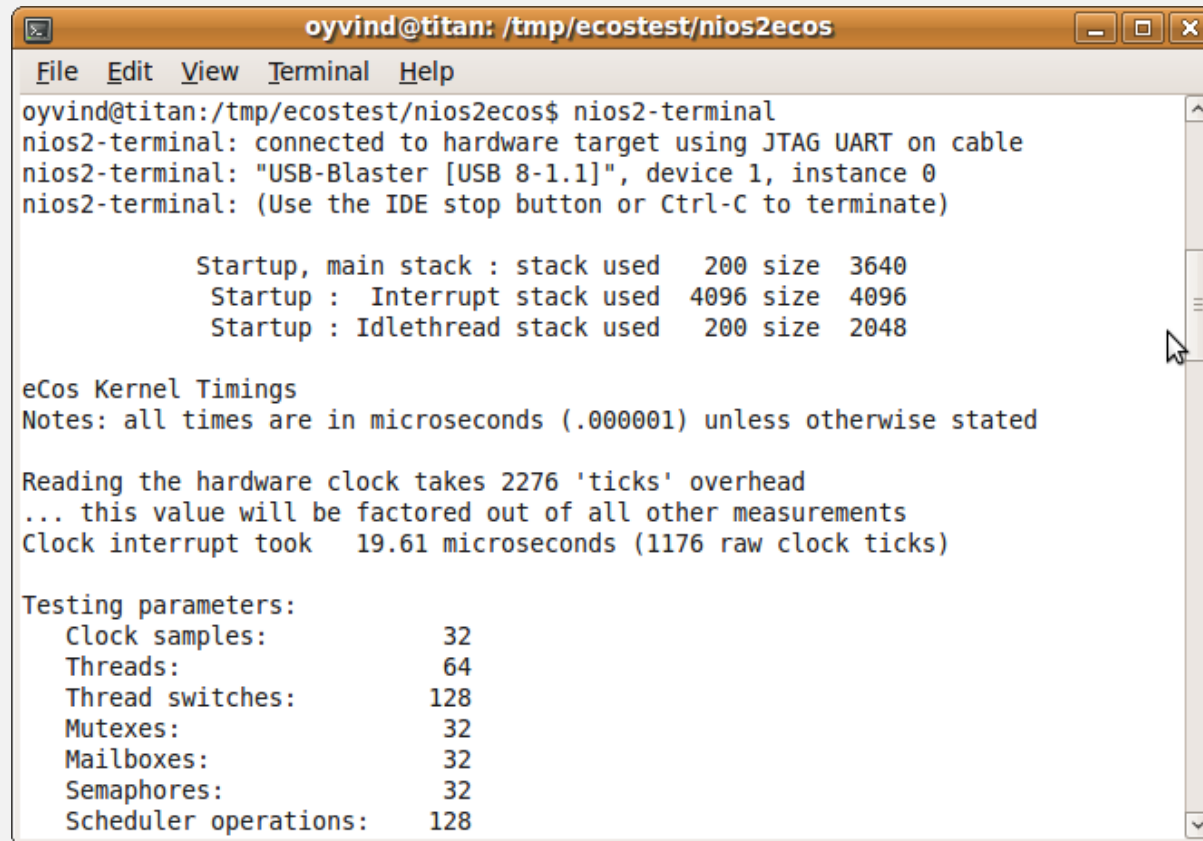
- Use your favourite GDB GUI, e.g. CDT/DDD



```
oyvind@titan: /tmp/ecostest/buildptf
File Edit View Terminal Help
oyvind@titan:/tmp/ecostest/buildptf$ nios2-elf-gdb install/tests/kernel/current/
tests/tm_basic
GNU gdb 6.1
Copyright 2004 Free Software Foundation, Inc.
GDB is free software, covered by the GNU General Public License, and you are
welcome to change it and/or distribute copies of it under certain conditions.
Type "show copying" to see the conditions.
There is absolutely no warranty for GDB. Type "show warranty" for details.
This GDB was configured as "--host=i686-pc-linux-gnu --target=nios2-elf"...
(gdb) target remote localhost:1234
Remote debugging using localhost:1234
0x04000000 in ?? ()
(gdb) load
Loading section .exceptions, size 0x2c lma 0x5000020
Loading section .text, size 0xe1a0 lma 0x108
Loading section .rodata, size 0x12f0 lma 0xe2a8
Loading section .rwdara, size 0x21c lma 0xf598
Start address 0x108, load size 63192
Transfer rate: 505536 bits/sec, 501 bytes/write.
(gdb) c
Continuing.
█
```

nios2-terminal

- nios2-terminal – JTAG serial port



The screenshot shows a terminal window titled "oyvind@titan: /tmp/ecostest/nios2ecos". The terminal output is as follows:

```
oyvind@titan:/tmp/ecostest/nios2ecos$ nios2-terminal
nios2-terminal: connected to hardware target using JTAG UART on cable
nios2-terminal: "USB-Blaster [USB 8-1.1]", device 1, instance 0
nios2-terminal: (Use the IDE stop button or Ctrl-C to terminate)

Startup, main stack : stack used 200 size 3640
Startup : Interrupt stack used 4096 size 4096
Startup : Idlethread stack used 200 size 2048

eCos Kernel Timings
Notes: all times are in microseconds (.000001) unless otherwise stated

Reading the hardware clock takes 2276 'ticks' overhead
... this value will be factored out of all other measurements
Clock interrupt took 19.61 microseconds (1176 raw clock ticks)

Testing parameters:
Clock samples:          32
Threads:                64
Thread switches:       128
Mutexes:                32
Mailboxes:              32
Semaphores:             32
Scheduler operations:   128
```

nios2-gdb-server

- `nios2-gdb-server --tcpport=1234 --tcppersist -r -g`



```
oyvind@titan: /tmp/ecostest/nios2ecos
File Edit View Terminal Help
oyvind@titan:/tmp/ecostest/nios2ecos$ nios2-gdb-server --tcpport=1234 --tcppersist -r -g
Ignoring --go option because --tcpport also specified
Using cable "USB-Blaster [USB 8-1.1]", device 1, instance 0x00
Resetting and pausing target processor: OK
Listening on port 1234 for connection from GDB: accepted
Exiting due to 'k' command from GDB
Leaving target processor paused
Resetting and pausing target processor: OK
Listening on port 1234 for connection from GDB: accepted
```



Zylin AS

Embedded services

Øyvind Harboe, General Manager, Zylin AS

