

# Status report OpenCL setup, board test

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# PLATFORM

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## SYSTEM

- Core i7 6500u, 8GB RAM
- Windows 10 Pro x64
- Windows Subsystem for Linux
- PuTTY

## QUARTUS STACK

- Quartus 2 14.1.0.186
- AOCL 14.1.0.186
- SoC EDS 14.1.0.186

## PREQUISITES

- 1) Setup Altera Quartus stack
- 2) Setup USER<sup>1</sup> environment variables
  - a. Altera OpenCL License (Create LM\_LICENSE\_FILE)
  - b. Altera OpenCL binaries (Add to PATH)
  - c. Altera Board package path (AOCL\_BOARD\_PACKAGE\_ROOT)

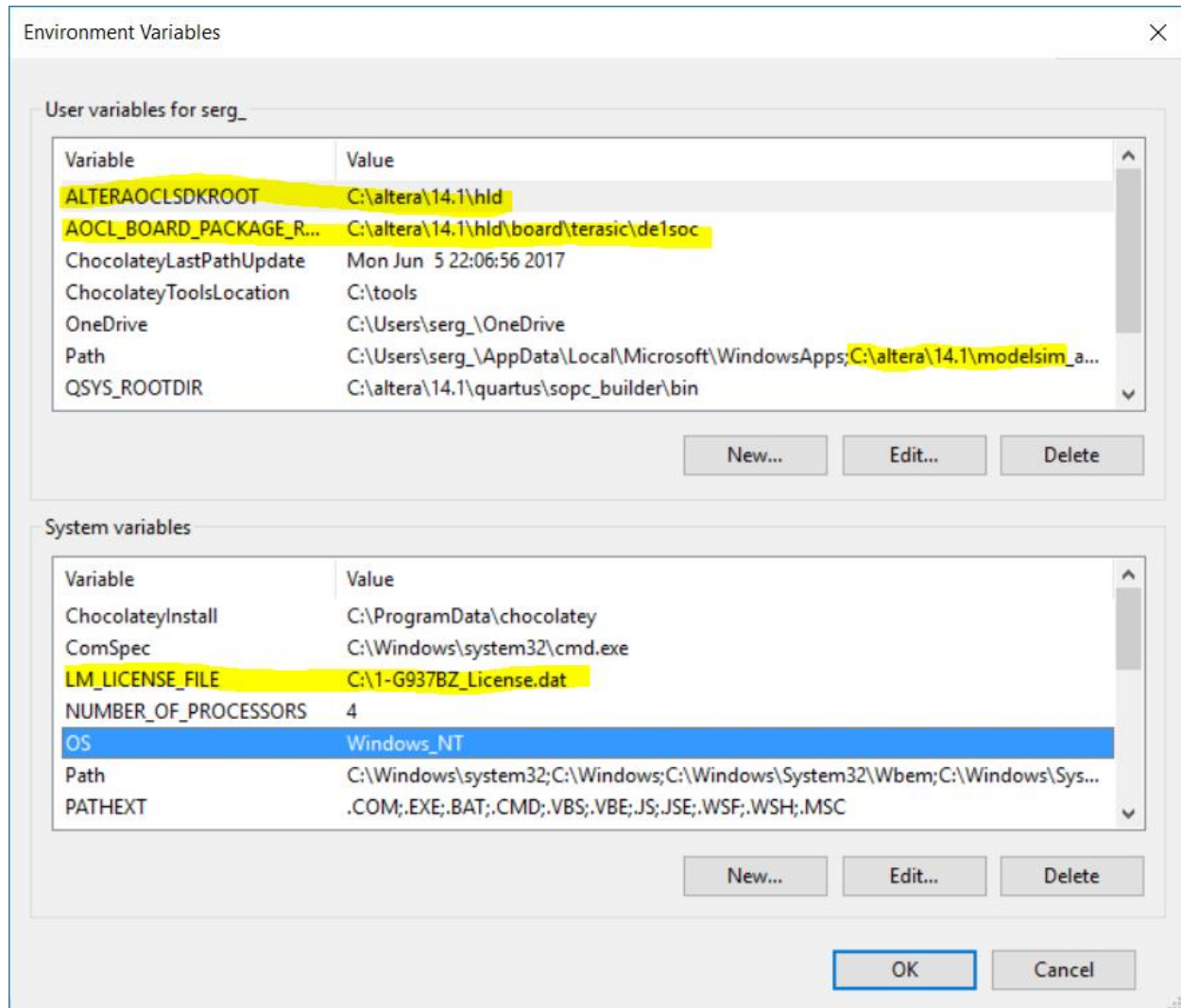
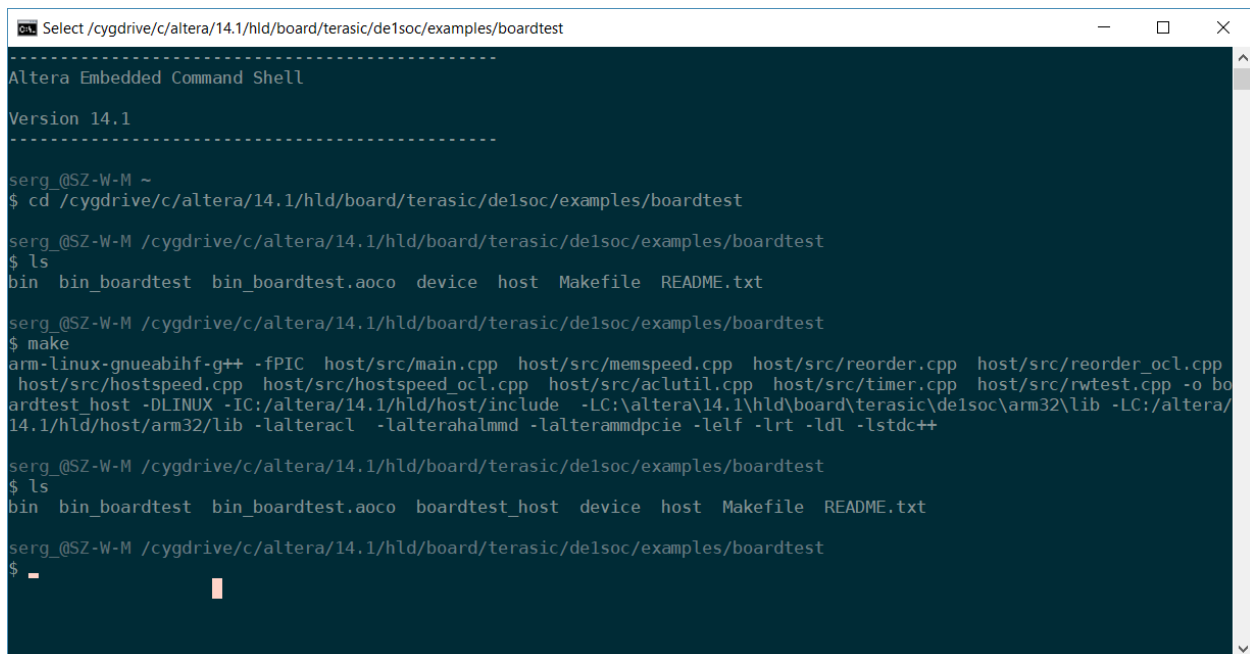


Figure 1 Environment variables required for Altera OpenCL

<sup>1</sup> Systemwide variables won't work without adapting Altera's own environment variables

## COMPILATION (BOARD TEST)

- 1) Go to "C:\altera\14.0\hld\board\terasic\de1soc\examples\boardtest"
- 2) Prompt> aoc device/boardtest.cl --sw-dimm-partition -o bin/boardtest.aocx
- 3) Open "C:\altera\14.1\embedded\Embedded\_Command\_Shell.bat" embedded shell
  - a. A Cygwin <sup>2</sup>shell opens [<https://www.cygwin.com/>]
  - b. Go to /cygdrive/c/altera/14.1/hld/board/terasic/de1soc/examples/boardtest<sup>3</sup>
  - c. Build the board test project (See image x)



```
Select /cygdrive/c/altera/14.1/hld/board/terasic/de1soc/examples/boardtest
-----
Altera Embedded Command Shell
Version 14.1
-----
serg_@SZ-W-M ~
$ cd /cygdrive/c/altera/14.1/hld/board/terasic/de1soc/examples/boardtest
serg_@SZ-W-M /cygdrive/c/altera/14.1/hld/board/terasic/de1soc/examples/boardtest
$ ls
bin bin_boardtest bin_boardtest.aoco device host Makefile README.txt
serg_@SZ-W-M /cygdrive/c/altera/14.1/hld/board/terasic/de1soc/examples/boardtest
$ make
arm-linux-gnueabi-g++ -fPIC host/src/main.cpp host/src/memspeed.cpp host/src/reorder.cpp host/src/reorder_ocl.cpp
host/src/hostspeed.cpp host/src/hostspeed_ocl.cpp host/src/aclutil.cpp host/src/timer.cpp host/src/rwtest.cpp -o bo
ardtest_host -DLINUX -IC:/altera/14.1/hld/host/include -LC:/altera/14.1/hld/board/terasic/de1soc/arm32/lib -LC:/altera/
14.1/hld/host/arm32/lib -lalteracl -lalterahalmmd -lalterammdpcie -lelf -lrt -ldl -lstdc++
serg_@SZ-W-M /cygdrive/c/altera/14.1/hld/board/terasic/de1soc/examples/boardtest
$ ls
bin bin_boardtest bin_boardtest.aoco boardtest_host device host Makefile README.txt
serg_@SZ-W-M /cygdrive/c/altera/14.1/hld/board/terasic/de1soc/examples/boardtest
$
```

Figure 2 Altera Embedded Command Shell

<sup>2</sup> POSIX emulation layer + tools for windows, <https://www.cygwin.com/>

<sup>3</sup> To access a host path via Cygwin shell /cygdrive "prefix" is required (mountpoint)

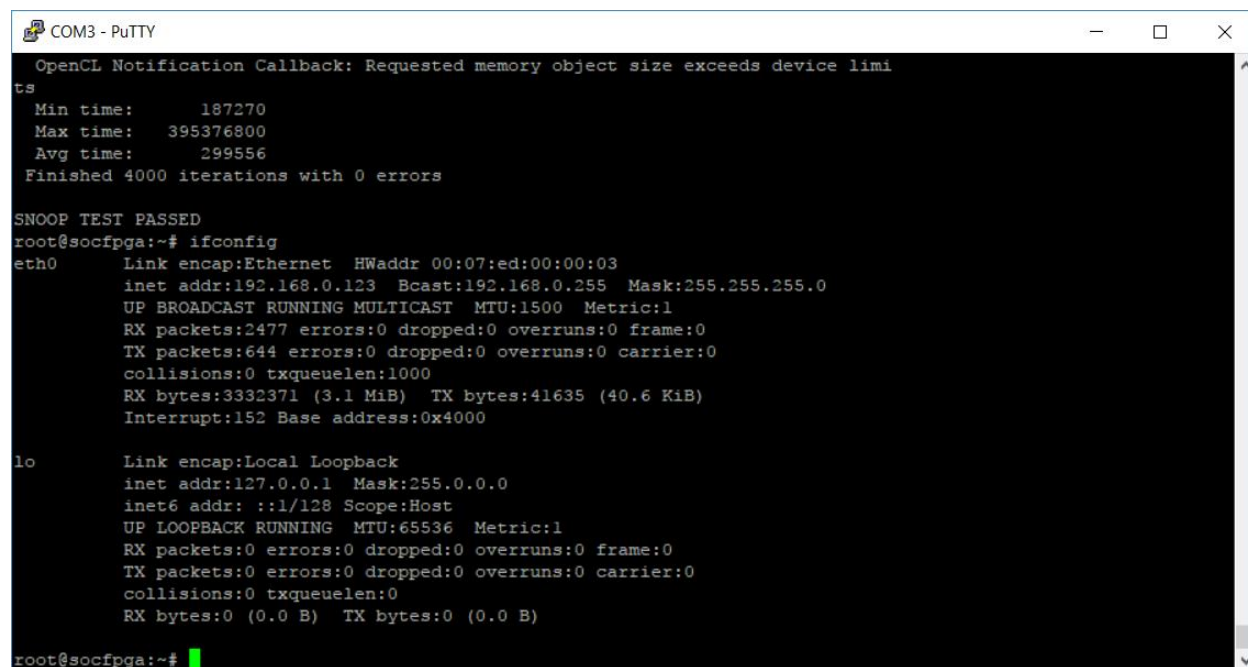
## BOARD PREPARATION

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Prior to deployment the DE1-SoC has to be up and running.

A prepared flash card with a linux base system is required.

- 1) Connect the power, USB/UART and Ethernet connectors.
- 2) Start PuTTY, select the proper COM port and set the baudrate to 115200
- 3) Log in as "root". A password is not required.
- 4) Set up a (static) ip address, e.g 192.168.0.123



```
COM3 - PuTTY
OpenCL Notification Callback: Requested memory object size exceeds device limi
ts
Min time:      187270
Max time:      395376800
Avg time:      299556
Finished 4000 iterations with 0 errors

SNOOP TEST PASSED
root@socfpga:~# ifconfig
eth0      Link encap:Ethernet  HWaddr 00:07:ed:00:00:03
          inet addr:192.168.0.123  Bcast:192.168.0.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:2477 errors:0 dropped:0 overruns:0 frame:0
          TX packets:644 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:3332371 (3.1 MiB)  TX bytes:41635 (40.6 KiB)
          Interrupt:152 Base address:0x4000

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

root@socfpga:~#
```

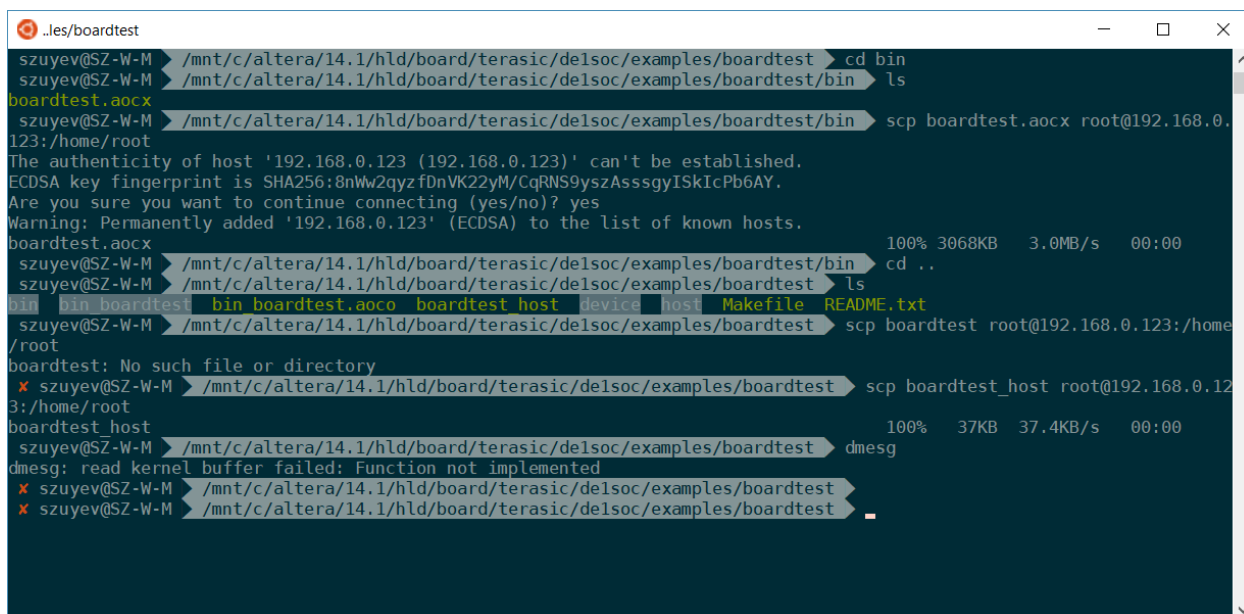
Figure 3 Board's IP configuration

## DEPLOYMENT

From a terminal:

- Copy ACL device configuration: `scp bin/boardtest.aocx root@192.168.0.123:/home/root`
- Copy OpenCL host application: `scp boardtest_host root@192.168.0.123:/home/root`

These commandos copy files to the target board via SSH<sup>4</sup>.



```
..les/boardtest
szuyev@SZ-W-M > /mnt/c/altera/14.1/hld/board/terasic/delsoc/examples/boardtest > cd bin
szuyev@SZ-W-M > /mnt/c/altera/14.1/hld/board/terasic/delsoc/examples/boardtest/bin > ls
boardtest.aocx
szuyev@SZ-W-M > /mnt/c/altera/14.1/hld/board/terasic/delsoc/examples/boardtest/bin > scp boardtest.aocx root@192.168.0.123:/home/root
The authenticity of host '192.168.0.123 (192.168.0.123)' can't be established.
ECDSA key fingerprint is SHA256:8nWw2qyzfDnVK22yM/CqRNS9yszAssgyISkIcPb6AY.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '192.168.0.123' (ECDSA) to the list of known hosts.
boardtest.aocx 100% 3068KB 3.0MB/s 00:00
szuyev@SZ-W-M > /mnt/c/altera/14.1/hld/board/terasic/delsoc/examples/boardtest/bin > cd ..
szuyev@SZ-W-M > /mnt/c/altera/14.1/hld/board/terasic/delsoc/examples/boardtest > ls
bin bin boardtest bin boardtest.aoco boardtest host Device host Makefile README.txt
szuyev@SZ-W-M > /mnt/c/altera/14.1/hld/board/terasic/delsoc/examples/boardtest > scp boardtest root@192.168.0.123:/home/root
boardtest: No such file or directory
X szuyev@SZ-W-M > /mnt/c/altera/14.1/hld/board/terasic/delsoc/examples/boardtest > scp boardtest_host root@192.168.0.123:/home/root
boardtest_host 100% 37KB 37.4KB/s 00:00
szuyev@SZ-W-M > /mnt/c/altera/14.1/hld/board/terasic/delsoc/examples/boardtest > dmesg
dmesg: read kernel buffer failed: Function not implemented
X szuyev@SZ-W-M > /mnt/c/altera/14.1/hld/board/terasic/delsoc/examples/boardtest
X szuyev@SZ-W-M > /mnt/c/altera/14.1/hld/board/terasic/delsoc/examples/boardtest
```

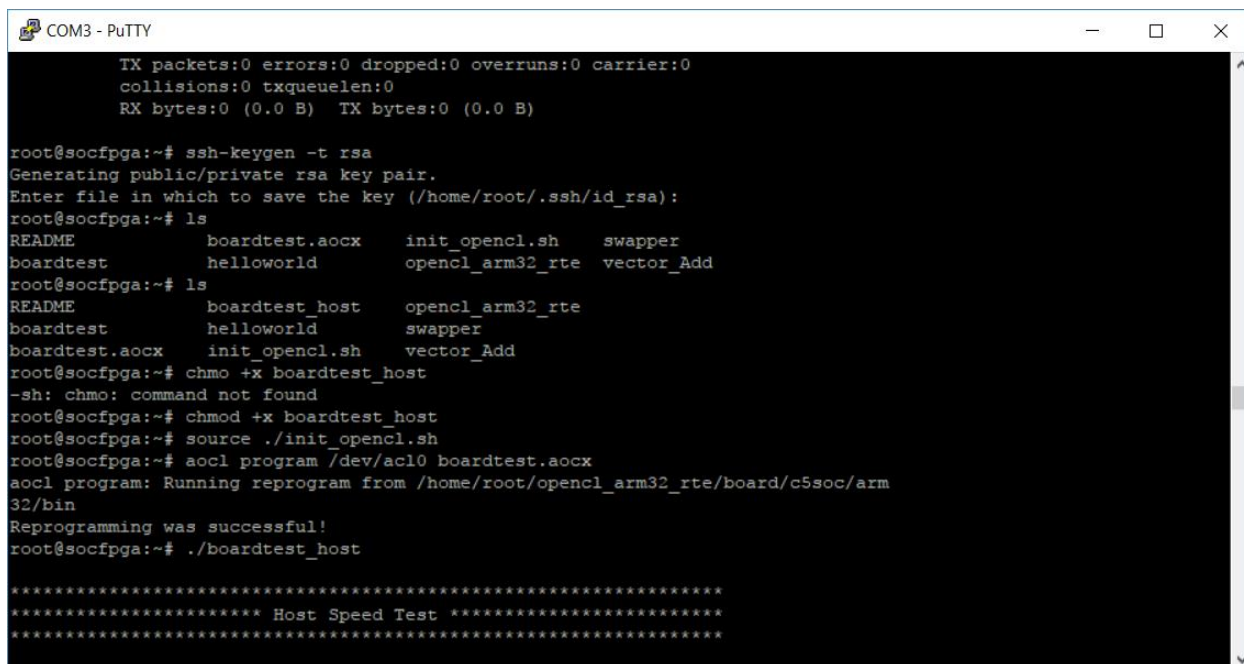
Figure 4 Copy necessary files to the board

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<sup>4</sup> Secure Shell

## EXECUTION

- Make boardtest\_host executable: `chmod +x ./boardtest_host`
- Prepare the OpenCL environment: `source ./init_opencl.sh`
- Program the device: `aocl program /dev/acl0 boardtest.aocx`
- Execute the OpenCL host application: `./boardtest_host`

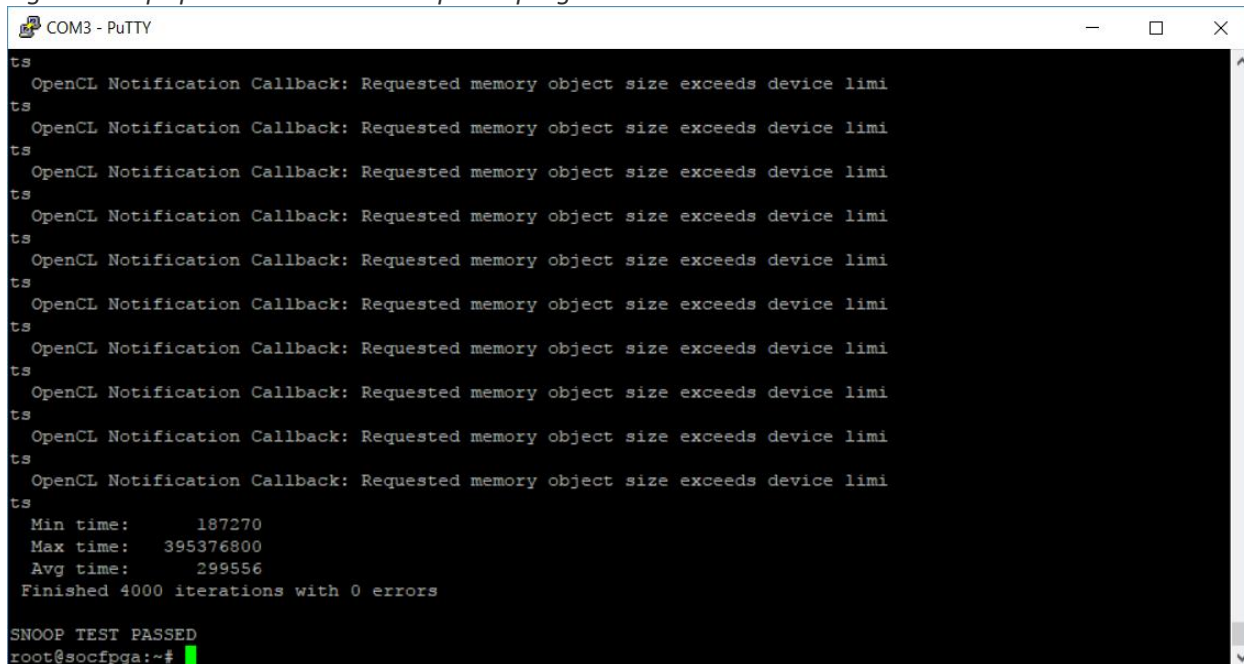


```
COM3 - PuTTY
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:0
RX bytes:0 (0.0 B) TX bytes:0 (0.0 B)

root@socfpga:~# ssh-keygen -t rsa
Generating public/private rsa key pair.
Enter file in which to save the key (/home/root/.ssh/id_rsa):
root@socfpga:~# ls
README          boardtest.aocx  init_opencl.sh  swapper
boardtest       helloworld     openc1_arm32_rte  vector_Add
root@socfpga:~# ls
README          boardtest_host  openc1_arm32_rte
boardtest       helloworld     swapper
boardtest.aocx  init_opencl.sh  vector_Add
root@socfpga:~# chmo +x boardtest_host
-sh: chmo: command not found
root@socfpga:~# chmod +x boardtest_host
root@socfpga:~# source ./init_opencl.sh
root@socfpga:~# aocl program /dev/acl0 boardtest.aocx
aocl program: Running reprogram from /home/root/openc1_arm32_rte/board/c5soc/arm
32/bin
Reprogramming was successful!
root@socfpga:~# ./boardtest_host

*****
***** Host Speed Test *****
*****
```

Figure 5 Steps prior to execute the OpenCL program on the board



```
COM3 - PuTTY
ts
OpenCL Notification Callback: Requested memory object size exceeds device limi
ts
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OpenCL Notification Callback: Requested memory object size exceeds device limi
ts
OpenCL Notification Callback: Requested memory object size exceeds device limi
ts
OpenCL Notification Callback: Requested memory object size exceeds device limi
ts
OpenCL Notification Callback: Requested memory object size exceeds device limi
ts
Min time:      187270
Max time:      395376800
Avg time:      299556
Finished 4000 iterations with 0 errors

SNOOP TEST PASSED
root@socfpga:~#
```

Figure 6 OpenCL board test passed

## CONCLUSION

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- At least one system (Sergej Zuyev's) is properly configured.
- We can deploy and run OpenCL programs on the provided DE1-SoC
- We can use this knowledge for our own LBP-Operator implementation