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# ***HUNT ENGINEERING***

## ***Reads API Example***

### ***For RTOS-32***

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***J.Thie 26-01-04***

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# TABLE OF CONTENTS

<b>THE READS EXAMPLE.....</b>	<b>4</b>
<b>COMPILING, LINKING AND RUNNING THE EXAMPLE.....</b>	<b>5</b>
COMPILING/LINKING THE EXAMPLE .....	5
RUNNING THE EXAMPLE .....	5
<b>MAKEFILE .....</b>	<b>6</b>
THE MAKEFILE.....	6
INCLUDE FILE .....	6
LIBRARIES .....	6
COMPILE PARAMETERS .....	7
INITIALISATION .....	7
<b>CONFIGURATION FILES .....</b>	<b>8</b>
THE READS.CFG CONFIGURATION FILE .....	8
READS.CFG: COMMANDLINE.....	8
READS.CFG: FLOPPY ACCESS .....	8
<b>TECHNICAL SUPPORT .....</b>	<b>9</b>

The reads example is an example program that tests the PCI FIFO and HSB interface of a HERON carrier board. The example will try to boot a small and simple program onto the first processor (on the module in slot 1). This program will send a stream of known data to the host via the PCI interface. The host example program will read back the stream of data, verify it, and tell you if everything worked or not.

(This example will **not** work with TIM-40 carrier boards such as the HEPC2E, HEPC3, HEPC4 or HECPCI1. It will also **not** work with the HEPC6, a one 'C6x processor board.)

## Compiling, linking and running the example

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### Compiling/Linking the Example

To compile and link the example, please use the 'makefile' that is present in this directory. This makefile is set-up to use a Microsoft 32-bit C/C++ compiler. You can only execute the makefile in a DOS-box prepared by On Time for any of the Microsoft C/C++ command line examples ('Visual C++ (Command Line) Demos'). Or, if you execute from a standard DOS-box, please execute the standard RTOS-32 'varsvc.bat' first.

To execute the 'makefile':

```
nmake makefile
```

The example is prepared for use with an HEPC9. To change this, edit the 'reads.cfg' file, the 'Commandline' entry towards the bottom of the file.

### Running the example

To run the example, prepare a floppy disk and insert it into the 'a:' drive. Then type:

```
bootdisk reads a:
```

Next, copy the \*.out files to the floppy disk as well:

```
copy ..\*.out a:
```

This will copy 'reads.out' and 'reads4.out' onto the floppy disk. After completion, remove the floppy disk and insert it into the target machine's floppy disk. Reboot. The target machine should boot from disk. You should see something like:

```
Start at 1000, inc 1000, end at 10000, BlockSize=250 on hep9a (0: Comporta)
Resetting...
Serial bus: slot 1: HERON1-C6201, rom version 4.
Resetting...
Booting a:\reads.out...
Testing...
Reads Transfer size 1000 DWORDS in 1 ticks, Speed: 3906.25 KBytes/sec
Reads Transfer size 2000 DWORDS in 1 ticks, Speed: 7812.50 KBytes/sec
Reads Transfer size 3000 DWORDS in 1 ticks, Speed: 11718.75 KBytes/sec
Reads Transfer size 4000 DWORDS in 1 ticks, Speed: 15625.00 KBytes/sec
Reads Transfer size 5000 DWORDS in 1 ticks, Speed: 19531.25 KBytes/sec
Reads Transfer size 6000 DWORDS in 1 ticks, Speed: 23437.50 KBytes/sec
Reads Transfer size 7000 DWORDS in 1 ticks, Speed: 27343.75 KBytes/sec
Reads Transfer size 8000 DWORDS in 1 ticks, Speed: 31250.00 KBytes/sec
Reads Transfer size 9000 DWORDS in 1 ticks, Speed: 35156.25 KBytes/sec
Reads Transfer size 10000 DWORDS in 1 ticks, Speed: 39062.50 KBytes/sec
Check whether any interrupts were used: read 1, write 0, master mode 0.
```

If you have any other response than this, please first test if the 'testint' example works. If this example doesn't work as well, there is likely an interrupt problem. With the HEPC8, check the 'routing jumpers' on the HERON module in slot 1. These jumpers need to be set to select 'FIFO 0' for both the 'in' and 'out' FIFO. Please refer to the 'Troubleshooting' section in the RTOS-32 Installation & User Manual.

## The Makefile

What changes have been made to the original RTOS-32 example makefile? This section will explain what needs to be changed (or added) in a makefile to compile/link successfully the Hunt Engineering API programs

### Include file

All Hunt Engineering API programs must include 'heapi.h'. This file is located in the Hunt Engineering API installation directory. The installation program will have created an environment variable 'HEAPI\_DIR' that points to the installation directory. To have the makefile understand where 'heapi.h' lives, the following line must be in your makefile:

```
INCLUDE = $(RTTARGET)\include;$(HEAPI_DIR) ;$(INCLUDE)
```

The bold italic part is the part added by us.

### Libraries

The Hunt Engineering API is delivered as a static library ('rtosdrv.lib'). It must be linked with RTTARGET-32, RTFILES-32 and RTKERNEL-32. In the lines following your '.exe' declaration 'rtosdrv.lib' must be linked in first, before all of the RTOS-32 libraries:

```
reads.exe: ..\main.c ..\cload.c Init.c
    cl /MT /Fm /Zi -D_RTOS32=1 -oreads.exe \
        ..\main.c \
        ..\cload.c \
        init.c \
        $(HEAPI_DIR)\rtos32\rtosdrv.lib \
        rtk32.lib \
        drvrt32.lib \
        rtfiles.lib \
        rtfsrtt.lib \
        rtt32.lib \
        rttheap.lib \
        $(LNKOPT)
```

The bold italic part is the part added by us.

The necessary RTFILES-32 libraries are 'rtfiles.lib' and 'rtfsk32.lib'. Note that the latter is the RTKERNEL-32 version of the RTFILES-32 library.

The necessary RTKERNEL-32 libraries are 'rtk32.lib' (debug version) and 'drvrt32.lib', as the Hunt Engineering API uses multi-threading. (The HeRead and HeWrite will spawn separate threads to do the actual reading and writing. HeTestIo and HeWaitForIo 'test' the thread to see whether it has completed a transfer.)

The RTTARGET-32 library is 'rtt32.lib'. Library 'rttheap.lib' is optional. Please refer to the RTOS-32 manual (for example, ch.7 page 106 and 107).

## Compile Parameters

The Hunt Engineering API supports several different types of Operating Systems. To select RTOS-32 support, you need to #define a variable '\_RTOS32'. The easiest way to do this is in the makefile. Also, as the Hunt Engineering API is multi-threaded, you need to use the '/MT' option of the Microsoft C/C++ compiler.

```
reads.exe: ..\main.c ..\cload.c Init.c
    cl /MT /Fm /Zi -D_RTOS32=1 -oreads.exe \
        ..\main.c \
        ..\cload.c \
        init.c \
        $(HEAPI_DIR)\rtosdrv.lib \
        rtk32.lib \
        drvrt32.lib \
        rtfiles.lib \
        rtfsrtt.lib \
        rtt32.lib \
        rttheap.lib \
        $(LNKOPT)
```

## Initialisation

A file 'init.c' is included in the project. This is a 'standard' file from On Time, which they use for projects that use RTFILES-32. I have simply copied it into the Hunt Engineering API examples the reads example uses file support. On Time's comment in 'init.c':

```
/* Some standard initializations for RTFiles-32 programs.

   This file is linked with most RTFiles-32 demo programs. It provides a
   convenient place to configure RTTarget-32 and RTFiles-32.
*/
```

### The reads.cfg configuration file

What changes have been made to the original RTOS-32 example configuration file? This section will explain what needs to be changed (or added) in a configuration file to compile and link successfully the Hunt Engineering API programs

#### Reads.cfg: commandline

RTOS-32 programs have the possibility to carry a command line. This is done by specifying a command line in one of the configuration files (we just chose 'reads.cfg'). The 'reads' example needs to use a command line, as you need to specify the board type ('hep9a' or 'hep8a'), the board number ('0'), the device to be used, and program parameters. The command line is further just as you would expect with a normal DOS or win32 program. The following line must be added to a configuration file, for the 'reads' example to work properly:

```
CommandLine "a:\reads.exe hep9a 0 a 1000 1000 10000"
```

The directory ('a:\') is significant. The 'reads' program will search the command line, and will assume that argv[0] is the path that also contains the \*.out files ('reads.out' for a HERON1 or 'reads4.out' for a HERON4).

#### Reads.cfg: floppy access

To access files on a floppy disk, not only do you need to link with RTFILES-32 libraries, you also need to allocate a DMA buffer for the floppy driver in your configuration file. We added the following line to the 'reads.cfg' configuration file:

```
Locate Nothing FloppyDMA HighMem 18k 32k ReadWrite
```

Please refer to the RTOS-32 manual (Part III, ch. 7, page 300) for more information.

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