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HUNT ENGINEERING

Mysl Server/Loader Example

For VxWorks

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The mysl example is a Server/Loader example program that shows how to use the Server/Loader library. This example re-creates the 'standard' Server/Loader, but, as said, uses the library to do so. Mysl will boot the first processor in the system with "stdio.out". This booted program will then request mysl (which is running on VxWorks) to execute a number of standard I/O functions, such as printf, fwrite, fread and ftell.

(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

Compiling/Linking the Example

The Server/Loader is delivered as a 'vxwsl.o' file. This file contains both the Server/Loader library ('hesl' interface), the Server/Loader executable ('vxwsl') and HeartConf. The file is located in the 'vxworks' directory of your HUNT ENGINEERING API installation (default 'c:\heapi').

The 3 components in 'vxwsl.o' are also available separately as 'main.o' (Server/Loader executable) in the 'hesl\bin' sub-directory of your Server/Loader installation, 'vxwsl.lib.o' (Server/Loader library) in the 'hesl\lib' sub-directory, and 'heartconf.o' (HeartConf) in the 'heartconf\vxworks' sub-directory.

An environment variable 'HESL_DIR' points to the 'hesl' installation sub-directory. 'HESL_DIR' has been created and initialised by the HUNT CD installation program. Include files are located in the 'inc' directory of 'HESL_DIR'.

An executable example program is present in the example directory, named 'mysl.o'. To build your own 'mysl.o', you can use the 'make.sl.bat' batch file (which uses a Makefile), also present in the example directory: In a DOS-box, in the example directory, type:

```
make.sl
```

However, the Makefile assumes HEAPI_DIR to be 'c:\heapi' and HESL_DIR to be 'c:\heapi\hesl'. If this is not the case, you must edit the Makefile and change HEAPI_DIR and HESL_DIR to your installation directory.

Running the example

The mysl application needs file access to the network file and the DSP executables (the *.out files) and the 'stdio.c' file. Copy the network file, the *.out files, and 'stdio.c' onto a floppy disk, or copy them onto a hard disk if you have a VxWorks boot image with support for that. To be able to run the example successfully you must have included the dosfs module in your VxWorks BOOT ROM configuration. Set your default path to the location of the *.out files using the VxWorks system command `ioDefPathSet("location")`, where `location` is the VxWorks style path to the *.out file.

Make sure you have loaded the API, hrn_fpga, and mysl.

```
ld<heapi.o
ld<hrn_fpga.o
ld<vxwsl.o
ld<mysl.o
```

The reason for loading hrn_fpga.o as well is that the Server/Loader library supports loading of FPGA bit-streams. But the implementation of the Server/Loader library uses hrn_fpga to do the actual loading. Given that hrn_fpga is also a stand-alone utility, we have chosen to supply the Server/Loader library and hrn_fpga as two separate items.

Next, for a HEPC9, run the example as follows:

```
sp myvxwsl,"-rlsv network"
```

With an HEPC8 use the HEPC8 specific files:

```
sp myvxwsl,"-rlsv netw4pc8"
```

The example assumes a HERON4 in slot 1. If you don't use a HERON4 module, but a different HERON module such as HERON1, you will have to change the *.out file used in the network file. Some standard *.out files are supplied: stdio4.out (HERON4 on HEPC9), stdio48 (HERON4 on HEPC8) and stdio18.out (HERON1 on HEPC8). For any other configuration, create a new project and build a new *.out file.

You should see something that ends like:

```
...
fread : 2048 / 2048  feof: 0
fread :    1 / 4096  feof: 16
WRITE 64Kbytes BLOCK
Written 64 kBytes
SYSTEM test
Trying "dir "
float  (1.2e-4): 0.000120, 0.00012
double (2.4e-8): 0.000000, 2.4e-008
Leaving server mode
```

The Server/Loader command line

The Server/Loader uses a command line so that a user can specify the name of a network file and a number of parameters. The most common parameters are `-r`, (reset), `-l` (load), `-s` (serve) and `-v` (verbose), but there are others as well (please have a look at the Server/Loader manual). The VxWorks Server/Loader has a default command line of:

```
sp vxwsl, "-rlsv networkfile"
```

With this command line the Server/Loader will expect to find a network description file on the drive specified by `ioDefPathSet`. (In addition, it will then expect to find the `*.out` files and bit-streams as specified in the network file on the same drive.) By default, this will reset the system, boot all processors, and then serve standard I/O requests (`printf`, `frwrite`, etc) coming from the first processor in the system. The verbose option will cause booting information to be show on the screen.

The VxWorks network file

Note that a VxWorks network file uses a few extra parameters in board definitions.

The usual way to define a board, for example a HEPC9, you would write:

```
BD API HEP9A 0 0
```

But for VxWorks you need to add three parameters:

```
BD API HEP9A 0 0 on on 12
```

The three extra parameters need to be there for any board type, whether 'hep9a', 'hep8a', 'hep3b', 'hep2e' or any other. The first extra parameter is the master mode switch, "on" in this example. The second extra parameter is interrupts, "on" in this example. The third extra parameter is the IRQ, "12" in this example. The extra third parameter is not used with PCI boards, such as the HEPC9, HEPC8 and HEPC3. But the syntax requires there's a value anyway.

Note that with an HEPC8, master mode is not supported, so you would define: -

```
BD API HEP8A 0 0 off on 12
```

Apart from this, a VxWorks network file is identical to the 'standard' network file.

Include file

Programs using the Server/Loader library must know where the 'heapi.h' and 'hesl.h' include files are located. In the Makefile we define two variables:

```
HEAPI_DIR      = c:/heapi
HESL_DIR       = c:/heapi/hesl
```

The HEAPI_DIR and HESL_DIR variables are then used in the options list to make sure the compiler finds the include files in the appropriate directory:

```
ARGS = (options) -I$(HEAPI_DIR) -I$(HESL_DIR)/inc (options)
```

You have to make sure that HEAPI_DIR is equal to your HUNT ENGINEERING API&Tools installation directory. Edit the makefile to do so, if your installation directory is not 'c:\heapi'. HESL_DIR is the 'hesl' sub-directory of HEAPI_DIR. The installation program will have created environment variables HEAPI_DIR and HESL_DIR pointing at the installation directory.

Libraries

There are several ways to use programs using the Server/Loader library. First, you can simply load the HUNT ENGINEERING API ('heapi.o'), hrn_fpga ('hrnfpga.o') and the Server/Loader bundle ('vxwsl.o'), and then load the 'mysl.o' program. When doing this, there's no need to link 'mysl.o' with any library. This method is used with the supplied example Makefile.

Alternatively, you could link 'mysl.o' with the Server/Loader bundle 'vxwsl.o'. For example, you could change the Makefile linker entry to: -

```
mysl : $(objects)
      $(ld) -o mysl.o -r $(objects) $(HEAPI_DIR)/vxwsl.o
```

The 'vxwsl.o' file also contains the Server/Loader executable 'stub' and the HeartConf 'stub'. If you don't want this with your executable, you can link with just the Server/Loader library, as follows: -

```
mysl : $(objects)
      $(ld) -o mysl.o -r $(objects) $(HESL_DIR)/lib/vxworks/vxwsl.lib.o
```

When explicitly linked in the above way, to run the resulting executable, there's no longer a need to first load the 'vxwsl.o' library. Naturally, you can extend this and also link hrn_fpga and the API into a single executable. However, in this example we have chosen to use and load the different parts ('heapi.o', 'hrnfpga.o', 'vxwsl.o' and 'mysl.o') separately.

Compile Parameters

The Hunt Engineering Server/Loader support several different types of Operating System. The 'heapi.h' and 'hesl.h' include files have a compiler option that need to be selected properly for a particular Operating System. For VxWorks, compiler option _VXWORKS need to be set to 1.

```
ARGS = (options) -D_VXWORKS
```

Legacy Compile Parameters

The legacy interface of the Server/Loader library uses 'network.h', 'common.h', and 'ccif.h' (which is only actually used on Windows systems). The 'network.h' file is different based on two environment variables CMDLINE and PC. The actual choice of CMDLINE and PC depends on the Operating System of choice. For VxWorks, both need to be set to 1.

In addition, the `_VXWORKS` variable needs to be set in order to select the correct Operating System. Thus, for VxWorks, we use compiler options `_VXWORKS`, `CMDLINE` and `PC`, and they need to be set to 1: -

```
ARGS = (options) -D_VXWORKS -DCMDLINE -DPC
```

The legacy interface ('network.h') should only be used for existing applications that use 'network.h', 'common.h' and/or 'ccif.h'. If you create a new application that will use the Server/Loader library, you are strongly recommended to use the 'hesl.h' interface.

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