

# Real-Time Multicore OS RTEMS User Program guide

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Intelligent Embedded SW 연구실

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# WAF

- Open terminal and enter the command

```
$ export PATH="/opt/rtems-6-sparc-gr740-smp-5/bin:$PATH"
```

..... (1) To set the Environment Variable PATH

- Move directory where “waf” is exist

```
$ cd /opt/rtems-6-sparc-gr740-smp-5/src/rtems
```

..... (1) change directory

```
root@5120731066da:/opt/rtems-6-sparc-gr740-smp-5/src/rtems# ls
bsps  cpukit  INSTALL  LICENSE.BSD-3-Clause  LICENSE.GPL-2.0  LICENSE.RPCXDR  make  README  spec  wscript
build Doxyfile  LICENSE  LICENSE.CC-BY-SA-4.0  LICENSE.JFFS2  long_gcc.py  Makefile.maint  rtems-bsps  testsuites  yaml
c     gccdeps.py  LICENSE.BSD-2-Clause  LICENSE.Freescale  LICENSE.NET  MAINTAINERS  __pycache__  rtemslogo.png  waf
root@5120731066da:/opt/rtems-6-sparc-gr740-smp-5/src/rtems#
```

- Enter the command to make .ini file

```
$ ./waf bspdefaults --rtems-bsps=sparc/gr740 \
| sed -r 's/\x1B\[([0-9;]*[mK])//g' > bsp_defaults.ini
```


..... (1) to extract default gr740 configure

- Change yellow part to extract the .ini file for another BSP

```
root@5120731066da:/opt/rtems-6-sparc-gr740-smp-5/src/rtems# ls
bsp_defaults.ini  c      gccdeps.py  LICENSE  LICENSE.CC-BY-SA-4.0  LICENSE.JFFS2  long_gcc.py  Makefile.maint  rtems-bsps  testsuites  yaml
bsps              cpukit  gr740.defaults.ini  LICENSE.BSD-2-Clause  LICENSE.Freescale  LICENSE.NET  MAINTAINERS  __pycache__  rtemslogo.png  waf
build            Doxyfile  INSTALL  LICENSE.BSD-3-Clause  LICENSE.GPL-2.0  LICENSE.RPCXDR  make  README  spec  wscript
```

# WAF

- You can find descriptions of the options in `bsp_defaults.ini`
- It is initially set to default
- Find and set the options required for your code
- It is recommended to erase all the contents except the necessary settings

```
items-6-sparc-gr740-smp-5 > src > rtems >  bsp_defaults.ini
1  [sparc/gr740]
2  # Selects the compiler used to build the BSP (allowed values are "gcc" and
3  # "clang"). Please note that the values of some options depend on the compiler
4  # selection and changing the compiler may lead to unpredictable behaviour if
5  # these options are not adjusted as well. Use the --rtems-compiler command line
6  # option to get the default values for a particular compiler via
7  # ./waf bsp_defaults.
8  COMPILER = gcc
9  # Enable the Clang Static Analyzer support.
10 REMS_CLANG_STATIC_ANALYZER = False
11 # Flags passed to the library archiver
12 ARFLAGS = crD
13 # Warning flags passed to the C and C++ compiler
14 WARNING_FLAGS = -Wall
15 # Warning flags passed to the C compiler
16 CC_WARNING_FLAGS = -Wmissing-prototypes -Wimplicit-function-declaration -Wstrict-prototypes -Wnested-externs
17 # Warning flags passed to the C++ compiler
18 CXX_WARNING_FLAGS =
19 # Enable the Ada support
20 __RTEMS_ADA__ = False
21 # Defines the build label returned by rtems_get_build_label().
22 RTEMS_BUILD_LABEL = DEFAULT
23 # Enable the code coverage support.
24 RTEMS_COVERAGE = False
25 # Enable the RTEMS internal debug support
26 RTEMS_DEBUG = False
27 # Enable the Driver Manager startup
28 RTEMS_DRVMGR_STARTUP = False
29 # If set to "True", then the message passing based multiprocessing
30 # support (MPCI) is enabled, otherwise it is disabled. Do not confuse
31 # this with the SMP support which is enabled by the RTEMS_SMP option.
32 RTEMS_MULTIPROCESSING = False
33 # Enable the Newlib C library support
34 RTEMS_NEWLIB = True
35 # Enable the para-virtualization support
36 RTEMS_PARAVIRT = False
37 # Enable support for POSIX signals
38 RTEMS_POSIX_API = False
39 # Enable the SMP lock profiling support
40 RTEMS_PROFILING = False
```

[ bsp\_defaults.ini ]

# WAF

- Enter the command in terminal

```
$ ./waf configure \  
--rtems-bsps=sparc/gr740 \  
--rtems-tools=/opt/rtems-6-sparc-gr740-smp-5 \  
--prefix=/rtems_ws \  
--rtems-config=bsp_defaults.ini
```

..... (1) To configure the settings as follows...

..... (2) To specify BSP

..... (3) To specify RTEMS toolchain path (bin, include, etc)

..... (4) Installation path when ./waf install is executed after building

..... (5) To specify BSP default settings

```
root@5120731066da:/opt/rtems-6-sparc-gr740-smp-5/src/rtems# ./waf configure \  
> --rtems-bsps=sparc/gr740 \  
> --rtems-tools=/opt/rtems-6-sparc-gr740-smp-5 \  
> --prefix=/rtems_ws \  
> --rtems-config=bsp_defaults.ini  
Setting top to : /opt/rtems-6-sparc-gr740-smp-5/src/rtems  
Setting out to : /opt/rtems-6-sparc-gr740-smp-5/src/rtems/build  
Configure board support package (BSP) : sparc/gr740  
Checking for program 'sparc-rtems6-gcc' : /opt/rtems-6-sparc-gr740-smp-5/bin/sparc-rtems6-gcc  
Checking for program 'sparc-rtems6-g++' : /opt/rtems-6-sparc-gr740-smp-5/bin/sparc-rtems6-g++  
Checking for program 'sparc-rtems6-ar' : /opt/rtems-6-sparc-gr740-smp-5/bin/sparc-rtems6-ar  
Checking for program 'sparc-rtems6-ld' : /opt/rtems-6-sparc-gr740-smp-5/bin/sparc-rtems6-ld  
Checking for program 'ar' : /opt/rtems-6-sparc-gr740-smp-5/bin/sparc-rtems6-ar  
Checking for program 'g++, c++' : /opt/rtems-6-sparc-gr740-smp-5/bin/sparc-rtems6-g++  
Checking for program 'ar' : /opt/rtems-6-sparc-gr740-smp-5/bin/sparc-rtems6-ar  
Checking for program 'gas, gcc' : /opt/rtems-6-sparc-gr740-smp-5/bin/sparc-rtems6-gcc  
Checking for program 'ar' : /opt/rtems-6-sparc-gr740-smp-5/bin/sparc-rtems6-ar  
Checking for program 'gcc, cc' : /opt/rtems-6-sparc-gr740-smp-5/bin/sparc-rtems6-gcc  
Checking for program 'ar' : /opt/rtems-6-sparc-gr740-smp-5/bin/sparc-rtems6-ar  
Checking for asm flags '-MMD' : yes  
Checking for c flags '-MMD' : yes  
Checking for cxx flags '-MMD' : yes  
'configure' finished successfully (11.512s)  
root@5120731066da:/opt/rtems-6-sparc-gr740-smp-5/src/rtems#
```

Just do  
ctrl+c, ctrl + v

# WAF

- Enter the command in terminal

```
$ ./waf
```

..... (1) To convert source code to executable binary

```
[ 123/1559] Compiling bsps/shared/dev/rtc/m48t08_reg8.c
[ 124/1559] Compiling bsps/shared/dev/rtc/m48t08_reg2.c
[ 125/1559] Compiling bsps/shared/dev/rtc/m48t08_reg4.c
[ 126/1559] Compiling bsps/shared/start/wkspacinitone.c
[ 127/1559] Compiling bsps/sparc/shared/start/bspgetworkarea.c
[ 128/1559] Compiling bsps/shared/start/mallocinitone.c
[ 129/1559] Compiling bsps/sparc/shared/pci/gr_leon4_n2x.c
[ 130/1559] Compiling bsps/sparc/leon3/start/amba.c
[ 131/1559] Compiling bsps/sparc/leon3/gnatsupp/gnatsupp.c
[ 132/1559] Compiling bsps/sparc/leon3/console/console.c
[ 133/1559] Compiling bsps/sparc/leon3/btimer/watchdog.c
[ 134/1559] Compiling bsps/sparc/leon3/btimer/btimer.c
[ 135/1559] Compiling bsps/shared/start/sbrk.c
[ 136/1559] Compiling bsps/shared/start/bspreset-empty.c
[ 137/1559] Compiling bsps/shared/dev/serial/console-termios.c
[ 138/1559] Compiling bsps/sparc/leon3/start/bspdelay.c
[ 139/1559] Compiling bsps/shared/dev/getentropy/getentropy-cpucounter.c
[ 140/1559] Compiling bsps/sparc/shared/start/bsp_fatal_exit.c
[ 141/1559] Compiling bsps/sparc/shared/pci/pci_memreg_sparc_be.c
[ 142/1559] Compiling bsps/sparc/shared/pci/pci_memreg_sparc_le.c
[ 143/1559] Compiling bsps/sparc/shared/pci/gr_cpci_gr740.c
[ 144/1559] Compiling bsps/sparc/shared/gnatcommon.c
[ 145/1559] Compiling bsps/sparc/leon3/start/cpucounter.c
[ 146/1559] Compiling bsps/sparc/shared/irq/irq-shared.c
[ 147/1559] Compiling bsps/sparc/leon3/start/setvec.c
[ 148/1559] Compiling bsps/sparc/leon3/start/drvmgr_def_drivers.c
[ 149/1559] Compiling bsps/sparc/leon3/start/gettargethash.c
```

# WAF

- Enter the command in terminal

```
$ sparc-rtems6-sis -gr740 -m 4 -dumbio -r  
s ./build/sparc/gr740/testsuites/samples/hello.exe
```

..... (1) Run the executable on SIS

- -gr740: select bsp
- -m 4: 4 cpus
- -dumbio: minimal I/O mode
- -r s: run mode setting to s
- ./build/sparc/gr740/testsuites/samples/hello.exe: executable file location

```
root@5120731066da:/opt/rtems-6-sparc-gr740-smp-5/src/rtems# sparc-rtems6-sis -gr740 -m 4 -dumbio -r s ./build/sparc/gr740/testsuites/samples/hello.exe

SIS - SPARC/RISCV instruction simulator 2.29, copyright Jiri Gaisler 2020
Bug-reports to jiri@gaisler.se

GR740/LEON4 emulation enabled, 4 cpus online, delta 50 clocks

Loaded ./build/sparc/gr740/testsuites/samples/hello.exe, entry 0x00000000

*** BEGIN OF TEST HELLO WORLD ***
*** TEST VERSION: 6.0.0.89499c4002fb5f8b0e1cfd7c1edac2e78076c835
*** TEST STATE: EXPECTED_PASS
*** TEST BUILD:
*** TEST TOOLS: 10.3.1 20210409 (RTEMS 6, RSB 889cf95db0122bd1a6b21598569620c40ff2069d, Newlib eb03ac1)
Hello World

*** END OF TEST HELLO WORLD ***

cpu 0 in error mode (tt = 0x80)
66800 00001f20: 91d02000 ta 0x0
root@5120731066da:/opt/rtems-6-sparc-gr740-smp-5/src/rtems#
```

# WAF

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## 【 Technical note 1 】

- If you change “bsp\_defaults.ini”(3p),  
you must do ./waf configure ...(4p), ./waf(5p) again before execute code
- Please check .ini carefully as the requirements may vary depending on the code.

## 【 Technical note 2 】

- If you get a “command not found” error, check if you have added the PATH(2p)