

## **RTEMS Eclipse Manual**

*Release 4.11.3* ©Copyright 2016, RTEMS Project (built 15th February 2018)

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### Part I

# **RTEMS Eclipse Manual**

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The RTEMS Project is hosted at http://www. rtems.org/. Any inquiries concerning RTEMS, its related support components, or its documentation should be directed to the Community Project hosted at http://www.rtems.org/.

RTEMS Online Resources						
Home	https://www.rtems.org/					
Developers	https://devel.rtems.org/					
Documenta-	https://docs.rtems.org/					
tion						
Bug	https:					
Reporting	//devel.rtems.org/query					
Mailing Lists	https://lists.rtems.org/					
Git	https://git.rtems.org/					
Repositories						

Part II

# **Table of Contents**

## **OVERVIEW**

Welcome to the *RTEMS* Eclipse Manual.

This document covers using Eclipse with RTEMS.

RTEMS, Real-Time Executive for Multiprocessor Systems, is a real-time executive (kernel) which provides a high performance environment for embedded applications.

Eclipse is an Integrated Development Environment (IDE) for a wide range of languages and platforms.

RTEMS's eco-system provides all the tools and capabilities to integrate with Eclipse. You can build and develop RTEMS with Eclipse as well as build applications with Eclipse.

Unless otherwise stated this document refers to the Eclipse Mars release.

## **RTEMS DEVELOPMENT**

RTEMS can be developed using Eclipse. The RTEMS kernel is an *autotools* or *autoconf* and *automake* based package. You can create a project in Eclipse that lets you configure and build a BSP for an architecture. We assume you have already build and installed your tools using the RTEMS Source Builder.

### 2.1 Kernel Source

Download or clone the RTEMS Kernel source code. We will clone the source code:

```
1 $ git clone git://git.rtems.org/rtems.git_

→rtems.master

2 Cloning into 'rtems'...

3 remote: Counting objects: 483342, done.

4 remote: Compressing objects: 100% (88974/

→88974), done.

5 remote: Total 483342 (delta 390053), reused_

→475669 (delta 383809)

6 Receiving objects: 100% (483342/483342), 69.

→88 MiB | 1.37 MiB/s, done.

7 Resolving deltas: 100% (390053/390053), done.

8 Checking connectivity... done.
```

We need to *bootstrap* the kernel source code. A *botostrap* invokes the various *autotools* commands need to generate build system files. First we need to the path to our tools:

```
1 $ export PATH=/opt/rtems/4.12/bin:$PATH
```

Now run the *bootstrap* command:

```
1 $ cd rtems.master
```

```
2 $ ./bootstrap
```

Sit back, this can take a while. The Getting Started Guide talks about using the RSB's *sb*-*bootstrap* to run the bootstrap process in parallel on all available cores. The output of the bootstrap has not been copied into this documentment.

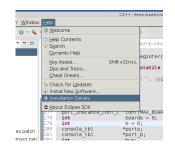
The source code is now ready.

### 2.2 Eclipse SDK Software

We need the following Eclipse SDK Software packages installed:

- C/C++ Autotools support
- C/C++ Development Tools
- C/C++ GCC Cross Compiler Support

Start Eclipse and check to see if you have the them installed via the **Help**, **Installation Details** menu item:



The dialog box shows the installed software packages and you can see the C/C++ Autotools support and the C/C++ Development Tools are installed:

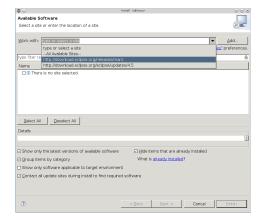
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C/C++ GCC Cross Compiler Support	8.8.1.20160205100	org.eclipse.cdt.build.crossgcc.feature.g	r Eclipse CDT	
C/C++ GDB Hardware Debugging	8.8.1.20160205100	org.eclipse.cdt.debug.gdbjtag.feature.g	Eclipse CDT	
Eclipse SDK	4.5.2.M20160212-1	. org.eclipse.sdk.ide	Eclipse.org	
1				2
				-

You can see some other software packages are installed in the figure. You can ignore those.

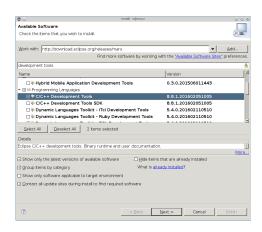
If you do not have the listed software packages install select **Help**, **Install New Software** and in the **Work with:** list box select **http://download.eclipse.org/releases/mars**.

Afer a small period of time a list of available packages will populate and you can select the ones we are interested in. Enter autotools in the search box and select the package:

Clear the search line and enter development tools in the search box and then scroll down to find C/C++ Development Tools:



• •	instal «@nano»	00
Available Software		
Check the items that you wish to install.		() <u> </u>
Work with: http://download.eclipse.org/releases/n	mars 👻	<u>A</u> dd
Find mor	e software by working with the "Available Software Ste	s" preference:
autotools		
Name	Version	
▼ 🗹 🕮 Programming Languages		
C/C++ Autotools support	8.8.1.201602051005	
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Again clear the search line and enter gcc cross in the search box and select the package:

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Available Software			
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Work with: Eclipse M	lars repository - http://download.e	clipse.org/releases/mars	▼ <u>A</u> dd
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gcc cross			
Name		Version	
🔻 🗹 💷 Mobile and Dev	vice Development		
🗹 🕸 C/C++ GCC	Cross Compiler Support	8.8.1.20160205	1005
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Click **Next** and once the **Install Details** have determined what is needed select **Finish** to install the packages.

### 2.3 Kernel Build Project

We create a project in Eclipse that can configure and build RTEMS for the pc686 BSP. This BSP is based on the pc386 BSP and is under the i386 architecture.

We assume you have built and installed the i386 RTEMS Tools, obtained the RTEMS kernel code and bootstrapped it if a git clone, and installed the required Eclipse Software packages.

The paths used in this project are:

#### /opt/work/rtems/4.11

The RTEMS Tools prefix the tools are install under.

/opt/work/chris/rtems/kernel/rtems.master
The RTEMS Kernel source code.

```
/opt/work/chris/rtems/kernel/4.12
The RTEMS Kernel prefix.
```

```
/opt/work/chris/rtems/kernel/bsp/pc
The RTEMS Kernel BSP build directory.
```

The menus shown here may vary from those you have as Eclipse changes them based on what you do.

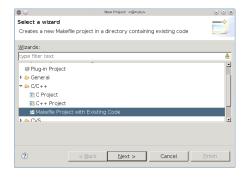
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gose		R C Project		 😫 Outline 🛱 🖲 Make Target		- 0
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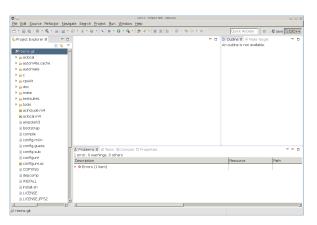
Click on C/C++ and select Makefile Project with Existing Code then select Next :

Enter the project name rtems-git into the **Project Name** field and select the **Browse...** button and the path to the RTEMS Kernel source code then click **Finish** :

Eclipse will show the RTEMS Kernel source code in the **Project Explorer** panel:



• •	New	v Project <@ruru>		008
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Create a new Mi directory	akefile project from ex	isting code in ti	nat same	
Project Name				
rtems-git				
Existing Code L	ocation			
/opt/work/chris	/rtems/kernel/rtems.r	naster		Browse
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<none></none>				
Cross GCC				
GNU Autotools	Toolchain			
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#### Select C Project then Finish :

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Candidates for co	nversion:	
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		Deselect All
Convert to C or (	C++	
⊙ C Project	O C++ Project	
0	< Back Next > Cancel	Finish
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We now configure the project's properties by right clicking on the rtems-git project title and then **Properties** :

			C/C++ - Edipte SDE <@varu>				
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e estsuites	Rename	F2					
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🐱 aciocal m4	Build Project						
🖹 ampolish3	Clean Project Refresh	ES					
🖹 bootstrap	Close Project	10					
compile	Close Unrelated Projects						
🗎 config-mi.in	Build Configurations						
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rtems-git	Properties	At+Enter					

Click on the Autotools item then Configure Settings and Platform specifiers and set the **Target platform** field with i386-rtems4.12:

the Arch-independent install directory Uncheck or clear the Use default build com-

• •	Properties for items-git <@ruru>	008
type fiter text 💧	Configure Settings	φ • φ • •
(ype fitter text:	Configure Settings Configuration: [default [ Active ] Configure	Kost platform (-host)  Buld platform (-host)  Target platform (-target)  Briget platform (-target
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(-prefix) to the RTEMS Kernel prefix of /opt/work/chris/rtems/kernel/4.12:

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We disable networking to use the external LibBSD package and set the BSP pc686. Select the Advanced and to the **Additional** in command-line options enter --disable-networking and --enable-rtemsbsps=pc686. You can add extra options you may need:

• •	Pri	operties for rtems-git <@runu>			008
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Ø				ore Defaults	Apply OK
0				Cancel	OK

Select Platform directories and enter Select C/C++ Build and Environment.

**mand** and add -j N where N is the number of cores you have in your machine. The figure has told *make* to run 8 jobs, one per core for an 8 core machine. Click on the **File system...** button and navigate to the BSP build directory. This is the location Eclipse builds the BSP. RTEMS requires you build outside the source tree and in this example we are forcing the build directory to something specific. Finish by pressing **Apply** :

• •	Properties for rtems-git «@nunu»	
type filter text 💧	C/C++ Build	<b>○</b> • ○ • •
<ul> <li>Resource</li> <li>Autotools</li> <li>Configure Settings</li> </ul>	Configuration: Default [ Active ]	Configurations
Conflayer Settings General Buldres OCC+- Buld Buld Variables Environment Logging Settings Settings OCC+- General Project References Ren/Oebug Settings	Bulder Setting: EBehavior   @Refrein Roloy  Bulder Bulder befault bulde	v Variables
	Restore Default	s <u>Apply</u>
0	Cancel	OK

Select **Environment** under C/C++ **Build** as we need to set the path to the RTEMS Tools. In this example we set the path in the Eclipse project so each project can have a specific set of tools. Press the **Add...** button:

		Propertie	es for rtems-git. «@ruru»		00
type fiter text 🛛 🛔	Environment				p · o · ·
<ul> <li>Resource</li> <li>Autotools</li> <li>Builders</li> </ul>	Configuration:	Default [ Active ]		Manage Conf	igurations
C/C++ Build	Environment va	ariables to set			Add
Build Variables	Variable	Value	Origin		
Environment	CWD	/opt/work/chris/r	te BUILD SYSTEM		Select
Logging	PWD	/opt/work/chris/n	te BUILD SYSTEM		Edit
Settings Tool Chain Editor					Delete
C/C++ General					Undefine
Project References					
Run/Debug Settings					
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	<ul> <li>Append varial</li> </ul>	ables to native environ	ment		
		ables to native environ ve environment with sp			
				Restore Defaults	Apply

Enter the path to the tools, in our case it is /opt/work/rtems/4.12/bin, then press Variables :

⊖ ⊙	Edit variable <@ruru>	
Name:	PATH	
Value:	/opt/work/rtems/4.12/bin	Variables
Cancel C	к	

Scroll down and select **PATH** and then press **OK** :

0	<ul> <li>Select build variable &lt;@ruru&gt;</li> </ul>	$\odot$ $\odot$ $\otimes$
(	<pre>2hoose a variable (? = any character, * = any string):</pre>	
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	selected resource name	•
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7	<u>/</u> ariable Description:	
	<not available=""></not>	*
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You will now see the path in the **Value:** field. Make sure you have a path separator between the end of the tools path and the path variable we have just added. In this case is a Unix host and the separator is :. Windows use ;. Press **OK** when you have a valid path:

● ◎		Edit variable <@ruru>	S (S)
Name:		PATH	
Value:		opt/work/rtems/4.12/bin:\${PATH}	Variables
Cancel	ОК		

The **Environment** panel will now show the added *PATH* variable. Click **Replace native environment with specified one** as shown and then press **Apply** :

● ⓒ type fiter text 🛔	Environment	Properties	for rtems-git «@ruru»			808 • • • •
Resource     Autotools     Builders     C/C++ Build	Configuration:	Default [ Active ]		•	Manage Conf	igurations
<ul> <li>C/C++ Build</li> <li>Build Variables</li> </ul>	Environment va	riables to set				Add
Environment	Variable	Value	Origin			Select
Logging	CWD	/opt/work/chris/rte				
Settings	PATH	/opt/work/rtems/4				Edit
Tool Chain Editor	PWD	/opt/work/chris/rte	BUILD SYSTEM			Delete
▶ C/C++ General						Undefine
Project References						
Run/Debug Settings						
	O Append varia	bles to native environn	nent			
	<ul> <li>Replace nativ</li> </ul>	e environment with sp	ecified one			
	Replace	native environment with	n specified one	Resto	re <u>D</u> efaults	Apply
?					Cancel	OK

Select **Settings** under **C/C++ Build** and check **Elf Parser** and **GNU Elf Parser** and then press **OK** :

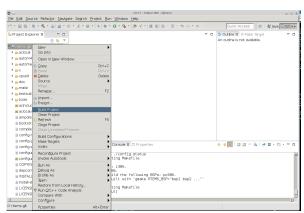
We are now ready to run configure using Eclipse. Right click on the project name rtems-git and then **Reconfigure Project** :

Select the **Console** tab in the output panel to view the configure process output. You will no-

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We can now build RTEMS using Eclipse. Right click on the project name rtems-git and then select **Build Project** :

A **Build Project** message box will appear showing the progress:

When finished click on the **Problems** output tab to view any errors or warnings:

If you get errors during the configure phase or building you will need to determine rea-

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son why. The main source of errors will be the path to the tools. Check the top of the config.log file configure generates. This file can be found in the top directory of you BSP build tree. The file will list the path components near the top and you should see the path to your tools listed first. While looking make sure the configure command matches what you expect and matches the documentation for configuring RTEMS.

If the contents of config.log look fine check the build log. The project's **Properties** dialog under C/C++ **Build**, **Logging** has a path to a build log. Open the build log and search for the error. If you cannot figure out the source of the error please ask on the Users Mailing List for help.

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### CHAPTER THREE

# GLOSSARY

#### Binutils

GNU Binary Utilities such as the assembler as, linker 1d and a range of other tools used in the development of software.

#### DLL

Dynamically Linker Library used on Windows.

#### GCC

GNU Compiler Tool chain. It is the GNU C/C++ compiler, binutils and GDB.

#### GDB

GNU Debugger

#### MinGW

Minimal GNU system for Windows that lets GCC built programs use the standard Windows operating system DLLs. It lets you build native Windows programs with the GNU GCC compiler.

#### MinGW64

Minimal GNU system for 64bit Windows. MinGW64 is not the MinGW project.

#### MSYS2

Minimal System 2 is a fork of the MinGW project's MSYS tool and the MinGW MSYS tool is a fork of Cygwin project. The Cygwin project provides a POSIX emulation layer for Windows so POSIX software can run on Windows. MSYS is a minimal version that is just enough to let configure scripts run. MSYS has a simplied path structure to make it easier to building native Windows programs.

#### POSIX

Portable Operating System Interface is a standard that lets software be portable between compliant operating systems.

#### prefix

A path used when building a package so all parts of the package reside under that path.

#### RSB

RTEMS Source Builder is part of the RTEMS Tools Project. It builds packages such as the tools for the RTEMS operating system.

#### RTEMS

The Real-Time Executive for Multiprocessor Systems or RTEMS is a open source fully featured Real Time Operating System or RTOS that supports a variety of open standard application programming interfaces (API) and interface standards such as POSIX and BSD sockets.

#### **Test Suite**

See Testsuite

#### Testsuite

RTEMS test suite located in the testsuites/ directory.

#### Waf

Waf build system. For more information see http://www.waf.io/

- genindex
- search

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