

RZ/T2H Evaluation Board

CODESYS Application Note

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Introduction

This document provides a guide to install CODESYS and CODESYS Runtime on the Windows PC and the evaluation board.

Target Reference Board

• RZ/T2H Evaluation Board

Target Software

• RZ/T2H Board Support Package version 1.0.0 or later. (hereinafter referred to as "BSP")

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1. Environment Requirement

The environment for preparing CODESYS environment is listed in **Table 1**. Refer to the below documents for details about setting up the environment:

Figure 1 shows the recommended environment.

A Windows PC can be used as the serial terminal interface with software such as TeraTerm.

RZ/T2H Evaluation Board



Figure 1. Recommend environment.



Table 1. Equipment and Software for Developing Environments of Linux Platform

Eq	uipment	Description				
Lin	ux Host PC	Used as build/debug environment				
		100GB free space on HDD or SSD is necessary				
	OS	Ubuntu 20.04 LTS				
		64 bit OS must be used.				
		20.04 inside a docker container also OK.				
Wir	ndows Host PC	Used as debug environment, controlling with terminal software				
	OS	Windows 10 or Windows 11				
	Terminal software	Used for controling serial console of the target board				
		Tera Term (latest version) is recommended				
		Available at https://ttssh2.osdn.jp/index.html.en				
	VCP Driver	Virtual COM Port driver which enables to communicate Windows Host PC				
		and the target board via USB which is virtually used as serial port. Available				
		at: <u>http://www.ftdichip.com/Drivers/VCP.htm</u>				
US	B serial to Mini–USB	Serial communication (UART) between the Evaluation Board Kit and				
Cable		Windows PC. The type of USB serial connector on the Evaluation Board Kit				
		is Mini USB type B.				
mic	ro–SD Card	Use to boot the system, and store applications.				

Note *1) Please note that the build fails when Ubuntu 22.04 is used.



2. Build and boot Instructions

This chapter describes how to build the BSP enabling the environment to use the CODESYS Runtime on the evaluation board. Basically, the build steps are almost the same as the Linux Start-up Guide (Document Number: R01US0682EJ), but an additional step is needed to use the CODESYS runtime.

(1) Build BSP with the Linux Start-up Guide

Read the below document and build BSP normally. After that, proceed to the next step. "xxx" means the document revision.

• r01us0682ej0xxx-rz-t(Linux_Start-up_Guide_RZT2H).pdf

(2) Build Initialize

Initialize a build using the 'oe-init-build-env' script in Poky and point TEMPLATECONF to platform conf path.

```
$ TEMPLATECONF=$PWD/meta-renesas/meta-rzt2h/docs/template/conf/ source \
poky/oe-init-build-env build
```

(3) Edit local.conf

Enable the below packages to use the CODESYS Runtime. Add the below lines in "~/rzt2h_bsp_<package version>/build/conf/local.conf".

- dpkg (for adding runtime with app)
- ssh (for adding runtime with app)
- opkg (for adding runtime manually)

```
#dkpg and opkg
PACKAGE_CLASSES = " package_ipk "
CORE_IMAGE_EXTRA_INSTALL += " dpkg "
EXTRA_IMAGE_FEATURES_append += " package-management "
#ssh
IMAGE_FEATURES_append = " ssh-server-openssh "
IMAGE_INSTALL_append = " openssh openssh-sftp-server "
IMAGE_INSTALL_append = " findutils libusb-compat "
```

(4) Start a build

Run the commands below to start a build. Building an image can take up to a few hours depending on the user's host system performance.

Build the target file system image using bitbake.

<pre>\$ MACHINE=<board> bitbake core-image-minimal</board></pre>	
<body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><body><b< td=""><td></td></b<></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body></body>	

Table 2. List of the platforms and the boards

Renesas MPU	<board></board>
RZ/T2H	rzt2h-dev

After the build is successfully completed, a similar output will be seen, and the command prompt will return.

NOTE: Tasks Summary: Attempted 3512 tasks of which 8 didn't need to be rerun and all s ucceeded.



All necessary files listed in Table 3 will be generated by the bitbake command and will be located in the "~/rzt2h_bsp_<package version>/build/tmp/deploy/images" directory.

Table 3. Image files

RZ/T2H	Linux kernel	Image-rzt2h-dev.bin		
Evaluation	Device tree file	Image-r9a09g077m44-dev.dtb		
Board WS3	WS3 root filesystem core-image-minimal-rzt2h-dev.tar.bz2			
	Boot loader	bl2_bp_xspi0-rzt2h-dev.srec		
fip-rzt2h-dev.srec		fip-rzt2h-dev.srec		
SD image core-image-minimal-rzt2h-dev.wic.gz		core-image-minimal-rzt2h-dev.wic.gz		
		core-image-minimal-rzt2h-dev.wic.bmap		

(5) Boot the evaluation board with the Linux Start-up Guide

Read the below document again and boot Linux on the evaluation board. Please ignore the building instructions in the guide because the building steps were completed in chapter 2 in this application note.

• r01us0682ej0xxx-rz-t(Linux_Start-up_Guide_RZT2H).pdf

The steps to boot the evaluation board are completed, so proceed with the next chapter.



3. Download CODESYS to the Windows PC

This chapter describes how to install CODESYS to the Windows PC. The steps may be changed by the vendor, so please follow the instructions of the official site.

(1) Download the installer of CODESYS

Visit the site below and download the installer:

CODESYS Development System V3 | CODESYS Store International



(2) Install CODESYS to the Windows PC

Please follow the installer, there is no problem with the installation if you press "Next>" to proceed. Once the installation is complete, press "Finish". After that, an icon will appear on your desktop. When you start it up, "CODESYS" will start up.





4. Install the CODESYS Runtime to the evaluation board

This chapter describes how to install the CODESYS Runtime to the evaluation board from the CODESYS application on the Windows PC.

(1) Setting on the CODESYS application on the Windows PC

- Open the CODESYS application on the Windows PC.
- Click "CODESYS Installer..." in the "Tools".

🍅 COE	CODESYS									
File	Edit	View	Project	Build	Online	Debug	Too	s Window	Help	
1		6 10	0 %	h (L)	\times M $^{\circ}$	后栖鸟	۲	CODESYS Inst	aller	
							1	Library Repos	itory	
Devices						▼ ‡	1	Device Repos	itory	
							B	Visualization	Element Repository	

• Select "CODESYS Control for Linux ARM64 SL" and install it.

CODESYS Installer				- 0
Version CODESYS 64 3.5.19.40		_		
<pre>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>></pre>				Brows
hannel for Setups eleases	Channel for Add-ons Releases		Update Mode ▼ All	
Add-ons				
Install Selected Unselect All Search	Example Sorting	\checkmark	Install File Export Configuration	Import Configuration
Installed Browse Updates				
CODESYS Control for BeagleBone SL	4.10.0.0	CODESYS	Control for Linux ARM64 SL	
CODESYS Control for emPC-A-iMX6 SL	4.10.0.0	Version:	4.10.0.0	· Install
CODESYS Control for IOT2000 SL	4.10.0.0	Description	This package contains the additional plugin, librarie the CODESYS runtime system for a Debian-Linux ba	es, devices and further for ased ARM64 device.
CODESYS Control for Linux ARM SL	4.10.0.0	Vendor:	3S-Smart Software Solutions GmbH	
CODESYS Control for Linux ARM64 SL	4.10.0.0	Copyright:	Copyright (c) 2017 CODESYS Development GmbH	
CODESYS Control for Linux SL	4.10.0.0	Package Manager:	3.5.17.0	
CODESYS Control for PFC100 SL	4.10.0.0	References:	CODESYS.Edge Gateway for Linux (4.10.0.0 - 4.25	5.255.255)
CODESYS Control for PFC200 SL	4.10.0.0		CODESYS.Control SL Extension Package (4.0.0.0 -	4.255.255.255)
	4 10 0 0	\downarrow	CODESYS.Code Generator ARM64 (4.0.0.0 - 4.255.	255.255)
avright © 2023 CODESYS Development GmbH About	Read-Only Mode	Restart as Administrator		



• Read the license and push the "Continue".



• When "Please close...CODESYS.exe" appears, close the CODESYS software and the download will begin.

Package Installation	_		×		
Please close the followin - 'CODESYS.exe'	g applications befo	ore contin	uing:		
	ОК	Car	ncel		
Install packages				 -	
Downloading package 1/1					
	1%				
Installing package 0/1					
	0%				
	0%				
					Cancel

- Open the CODESYS application on the Windows PC again.
- Find file "codemeter-lite_7.60.5625.503_arm64.deb" and "codesyscontrol_linuxarm64_4.10.0.0_arm64.deb" on Windows PC under path:

"<CODESYS_install_path>\CODESYS\CODESYS Control for Linux ARM64 SL\Dependency" and

"<CODESYS_install_path>\CODESYS\CODESYS Control for Linux ARM64 SL\Delivery\linuxarm64".

• Upload file "codemeter-lite_7.60.5625.503_arm64.deb" and "codesyscontrol_linuxarm64_4.10.0.0_arm64.deb" to Evaluation board and install with below instructions on Evaluation board. Install "codesyscontrol_linuxarm64_4.10.0.0_arm64.deb":



```
$ mkdir codesyscontrol
# Extract .deb file
$ dpkg -x codesyscontrol_linuxarm64_4.10.0.0_arm64.deb ./codesyscontrol
# Install codesyscontrol
$ cd codesyscontrol
$ cp -r etc/* /etc
$ mkdir /opt
$ cp -r opt/* /opt
$ cp -r opt/* /opt
$ cp -r var/* /usr
$ cp -r var/* /var
$ chmod a+rw /etc/CODESYSControl.cfg
$ chmod a+rw /etc/CODESYSControl_User.cfg
$ groupadd codesysuser
$ cd ..
```

Install "codemeter-lite_7.60.5625.503_arm64.deb":

```
$ mkdir codemeter
# Extract .deb file
$ dpkg -x codemeter-lite_7.60.5625.503_arm64.deb ./codemeter
# Install codemeter
$ cd codemeter
$ cp -r etc/* /etc
$ cp -r lib/* /lib
$ cp -r usr/* /usr
$ cp -r var/log/* /var/log/
$ cp -r var/lib/* /var/lib/
# perform some post-installation steps for codemeter to complete the installation.
$ udevadm trigger -vn --subsystem-match=usb --attr-match=idVendor=064f | xargs -rn1 \
-d\\n udevadm trigger -b
$ mkdir -p "/etc/systemd/system/multi-user.target.wants/"
$ ln -sT /lib/systemd/system/codemeter.service /etc/systemd/system/multi-user.\
target.wants/codemeter.service
# Verify the installation, No error log is the desired result
# It is good when there is no log after running below command
$ CodeMeterLin -x
```

• Update the IP address and start the CODESYS Runtime.



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File	Edit	View	Project	Build	Online	Debug	Tool	s Window Help
11 🖻		0 D	CH X	de (2)	× #4 0	s 🐴 😘	۲	CODESYS Installer
							1	Library Repository
Devices						▼ ‡	1	Device Repository
							B	Visualization Element Repository
							-	Visualization Style Repository
								License Repository
								OPC UA Information Model Repository
								License Manager
							Þ	Device License Reader
								Customize
								Options
								Import and Export Options
								Scripting +
								Edge Gateway
								Miscellaneous
								Update Raspberry Pi
						_		Update Edge Gateway
						_ [Update Linux ARM64
							-	

• Input the IP address of the evaluation board to "IP Adress" and click "Start" button to start the CODESYS runtime.

Linux ARM64			-	φ×	
🔺 Login credential	s				
Username	root				
Password					
SSH login based	on key				
🔺 Select target 🛛					
IP Address	192.168.x	хх.ууу	Scan		
CODESYS Runting	ne Packag	e ———			
	4.10.0.0 (lini	uxarm64, arm6	4)		
Version					
	Inst	all	Remove		
Package directory	C:¥Program i	Files¥CODESYS	3.5.19.40		
Additional Packa	iges —				
Install		М	anage		
⊿ System					
System Info Reboot Target					
A Runtime					
Start Stop					
	Disable A	pplication			



(2) Create a CODESYS project

• Click "New Project...".

CODESYS									
File	Edit	View	Project	Build	Online	Debug			
管	New Proj	ect			Ctrl+	N			
1	Open Pro	oject			Ctrl+	0			
	Close Pro	oject							

• Select "Standard project", set "Name", and click "OK".

管 New Project			×
Categories	Templates		
Libraries	<u> </u>		
	Empty project	HMI project	Standard project
	Standard project with Applicatio		
A project containing one dev	ice, one application, and an empty	implementation for	r PLC_PRG
Name rzt2h_test			
Location C:¥Users¥a510	5347¥Documents		~
		OK	Cancel

• Select "CODESYS Control for Linux based ARM64 SL".



(3) **Run the CODESYS for checking the connection**

- Click the "Device" tag and then double click "Device (CODESYS Control for Linux based ARM64 SL)"
- Add the IP address of the evaluation board in the furthest right of below image.
- Push "enter" key and set the name and password in the middle of below image.
- Input "root" as username and no password in the second image from right.
- When you see the two green marks shown in the blew figure, the connection is OK.



CODESYS Application Note



The installation of CODESYS Runtime is completed now.



5. Appendix

None.



6. Revision History

		Descript	ription	
Rev.	Date	Page	Summary	
1.00	Nov. 26, 2024	-	First edition issued.	



Website and Support

Renesas Electronics Website http://www.renesas.com/

Inquiries

http://www.renesas.com/contact/

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