

RZ/T2H, RZ/N2H Evaluation Board

CODESYS Application Note

R11AN0823EJ0101 Rev.1.01 Dec. 23, 2024

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
- RZ/N2H Evaluation Board

Target Software

• RZ/T2H, RZ/N2H Board Support Package version 1.0.1 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. The picture of RZ/T2H is shown as an example.

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



Figure 1. Recommend environment



Equipment		Description			
Linux 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.			
Win	dows 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>			
USE	3 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.			
micr	o–SD Card	Use to boot the system, and store applications.			

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

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-t2h-n2h(Linux_Start-up_Guide_RZT2H_N2H).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_n2h_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.

```
$ MACHINE=<board> bitbake core-image-<target>
```

<board> can be selected by referring to the below table.

Table 2. List of platforms and the boards

Renesas MPU	<board></board>
RZ/T2H	rzt2h-dev
RZ/N2H	rzn2h-dev



<target> can be selected below. Please refer to the following table for supported image.

Table 3. List of platforms and the board

Target Image Name	Purpose
core-image-minimal	Minimal set of components.
core-image-bsp	Minimal component set with audio support and essential tools.

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 the following table will be generated by the bitbake command and will be located in the "~/rzt2h_n2h_bsp_<package version>/build/tmp/deploy/images" directory.

Table 4. Image files

RZ/T2H	Linux kernel	Image-rzt2h-dev.bin		
	Device tree file	Image-r9a09g077m44-dev.dtb		
	root filesystem	core-image- <target>-rzt2h-dev.tar.bz2</target>		
	Boot loader	bl2_bp_xspi0-rzt2h-dev.srec		
		fip-rzt2h-dev.srec		
	SD image	core-image- <target>-rzt2h-dev.wic.gz</target>		
		core-image- <target>-rzt2h-dev.wic.bmap</target>		
RZ/N2H	Linux kernel	Image-rzn2h-dev.bin		
	Device tree file	Image-r9a09g087m44-dev.dtb		
	root filesystem	core-image- <target> -rzn2h-dev.tar.bz2</target>		
	Boot loader	bl2_bp_xspi0-rzn2h-dev.srec		
		fip-rzn2h-dev.srec		
	SD image	core-image- <target>-rzn2h-dev.wic.gz</target>		
		core-image- <target>-rzn2h-dev.wic.bmap</target>		

If you want to know the components installed to the root filesystem, please check the manifest file. The manifest file is created to the following path after building the images:

~/rzt2h_n2h_bsp_<package version>/build/tmp/deploy/images/rzn2h-dev/core-image-<target>-rzn2h-dev.manifest

(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-t2h-n2h(Linux_Start-up_Guide_RZT2H_N2H).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	DESYS									
File	Edit	View	Project	Build	Online	Debug	Тоо	s Window	Help	
1		6 10	Ci X I	h (8.)	$\times M ^{\circ}$	后栖鸟	۲	CODESYS Inst	taller	
							1	Library Repos	itory	
Devices						▼ ‡	1	Device Repos	itory	
							-	Visualization	Element Repositor	y i

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

CODESYS Installer				>
Version CODESYS 64 3.5.19.40		_		
Location C:\Program Files\CODESYS 3.5.19.40\CODESYS				Browse
Channel for Setups Releases	Channel for Add-ons Releases 		→ Update Mode	
Add-ons				
Install Selected Unselect All Search	Example Sorting	ŀ	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	
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 - 4.255	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)
opyright © 2023 CODESYS Development GmbH About	Read-Only Mode (F	Restart as Administrator))	



• Read the license and push the "Continue".

Install packages			-	<
CODESYS Control for Linux ARM64 SL			CODESYS Control for Linux ARM64 SL 4.10.0.0	
	Rel	ease Notes	License Agreement Signature Third Party Licenses	
	00		limitation, in order to still be effective at the end of the current subscription period. If this does not take place or is done too late, the period of use is automatically extended by the period of the time limit agreed in the data sheet. After the end of the period of use, the functions of the software are no longer available or are only available to a very limited extent.	-
	§ 7	Govern	Ing Law This Leense Agreement shall be governed by the laws of the Federal Republic of Germany excluding CISC. The place of performance and the court of jurisdiction for all dial as arising from or in connection with this agreement is 87439 Kempten (Germany). Claims may also be asserted against each contracting party in its general place of jurisdiction.	
	§ 8	Severa	bility Clause Should one provision of this contract be or become invalid, or should the contract contain a gap, the validity of the remaining provisions shall remain unaffected. In place of the legality value, approaches the original intention of the contractual gathes as closely as possible, or what can be assumed to have been their intention if they had considered the point in question.	
÷ →	Versi	on 2.0		
I accept the license agreement(s)			Continue Cancel	

• 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.





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

Linux ARM64			•	• • ×		
Login credential	5					
Username	root					
Password						
SSH login based	on key					
🔺 Select target 🛛						
IPAddress	192.168.xxx.y	/y	Scan			
CODESYS Runtir	ne Package					
	1. 10.0.0 (linuxarr	n64, arm6	4)			
Version						
	Install		Remove	•		
Package directory	:¥Program Files¥	CODESYS	3.5.19.40			
Additional Packa	ges					
Install		M	anage			
⊿ System						
System Info Reboot Target						
A Runtime						
Start Stop						
	Disable Appli	ation				



(2) Create a CODESYS project

Click "New Project...".

CODESYS										
File	Edit	View	Project	Build	Online	Debug				
1	New Pr	oject			Ctrl+	N				
1	Open P	roject			Ctrl+	0				
	Close P	roject								

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

管 New Pro	ject				×
Categories			Templates		
	raries ojects		Empty project	HMI project	Standard project
			Standard project with Applicatio		
A project co	ontaining one dev	vice, one app	lication, and an empty	implementation for	r PLC_PRG
Name	rzt2h_test				
Location	C:¥Users¥a510)5347¥Docur	nents		~
				ОК	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

COENS Image: Coence of the set renergement is configured for the set renergement	

The installation of CODESYS Runtime is completed now.



5. Appendix

None.



6. Revision History

	Descript		ion
Rev.	Date	Page	Summary
1.00	Nov. 26, 2024	-	First edition issued.
1.01	Dec. 23, 2024	-	Add RZ/N2H Evaluation Board.



Website and Support

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

Inquiries

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

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