RZ/T2H, RZ/N2H Evaluation Board

CODESYS Application Note

R11AN0823EJ0101
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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
- RZ/N2H Evaluation Board

Target Software

- RZ/T2H, RZ/N2H Board Support Package version 1.0.1 or later. (hereinafter referred to as “BSP”)

Contents

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.

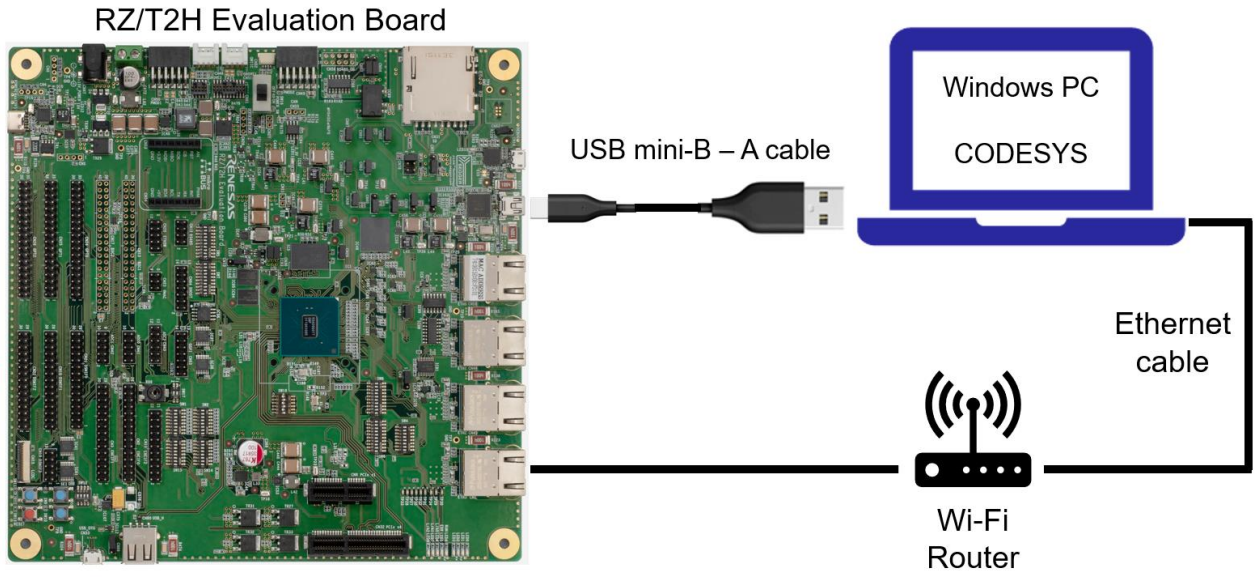


Figure 1. Recommend environment

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

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.
Windows 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: http://www.ftdichip.com/Drivers/VCP.htm
USB serial to Mini–USB Cable		Serial communication (UART) between the Evaluation Board Kit and Windows PC. The type of USB serial connector on the Evaluation Board Kit is Mini USB type B.
micro–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-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>
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
	Boot loader	bl2_bp_xspi0-rzt2h-dev.srec fip-rzt2h-dev.srec
	SD image	core-image-<target>-rzt2h-dev.wic.gz core-image-<target>-rzt2h-dev.wic.bmap
RZ/N2H	**Linux kernel**	Image-rzn2h-dev.bin
	Device tree file	Image-r9a09g087m44-dev.dtb
	root filesystem	core-image-<target> -rzn2h-dev.tar.bz2
	Boot loader	bl2_bp_xspi0-rzn2h-dev.srec fip-rzn2h-dev.srec
	SD image	core-image-<target>-rzn2h-dev.wic.gz core-image-<target>-rzn2h-dev.wic.bmap

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/rzt2h-dev/core-image-<target>-rzt2h-dev.manifest

~/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.

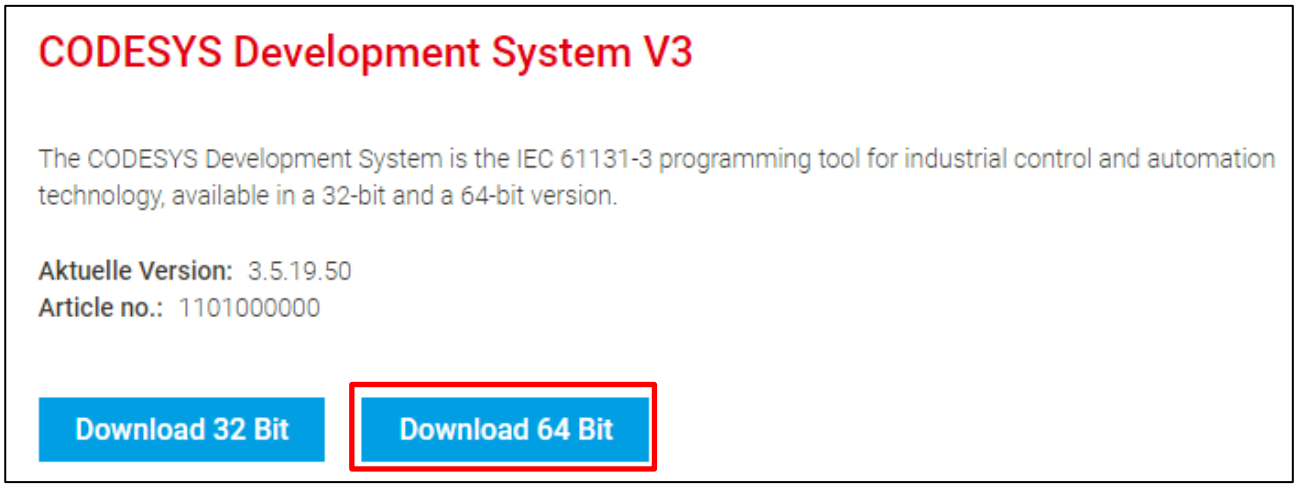
3. Download CODESYS to the Windows PC

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

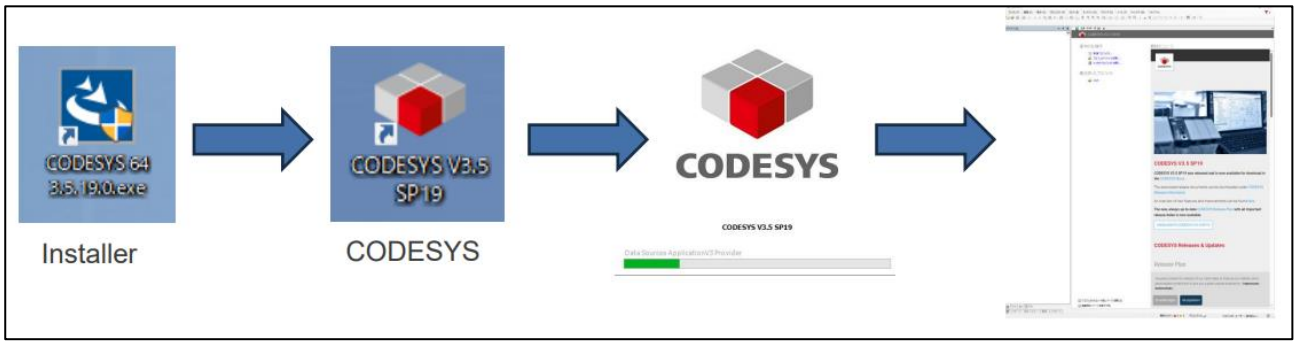
Visit the site below and download the installer:

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.

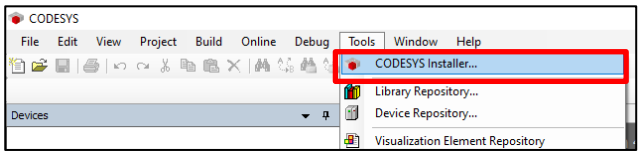


4. Install the CODESYS Runtime to the evaluation board

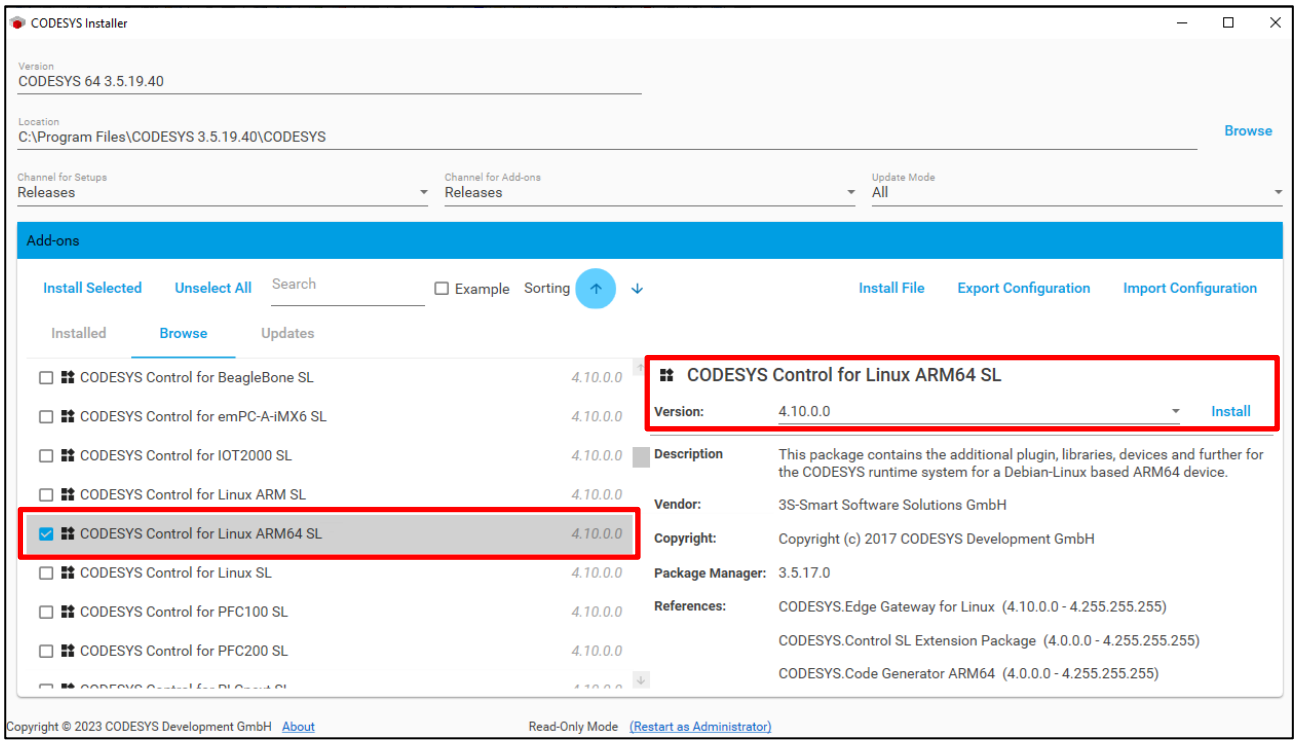
This chapter describes how to install the CODESYS Runtime to the evaluation board from the CODESYS application on the Windows PC.

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

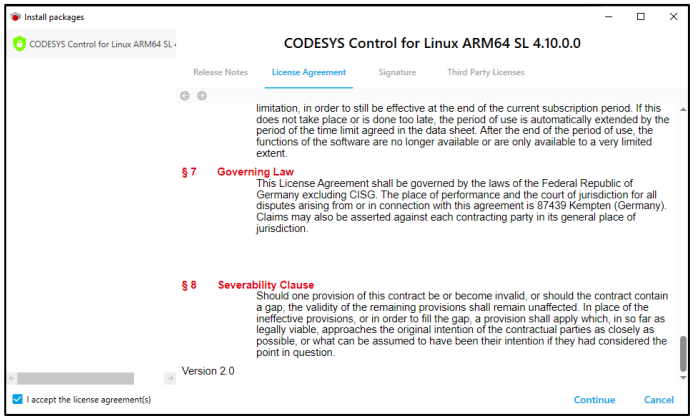
- Open the CODESYS application on the Windows PC.
- Click “CODESYS Installer…” in the “Tools”.



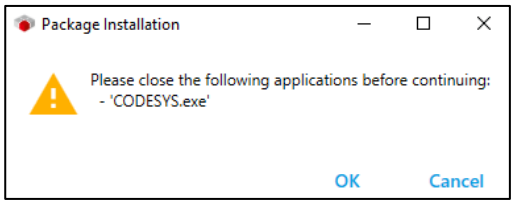
- Select “CODESYS Control for Linux ARM64 SL” and install it.

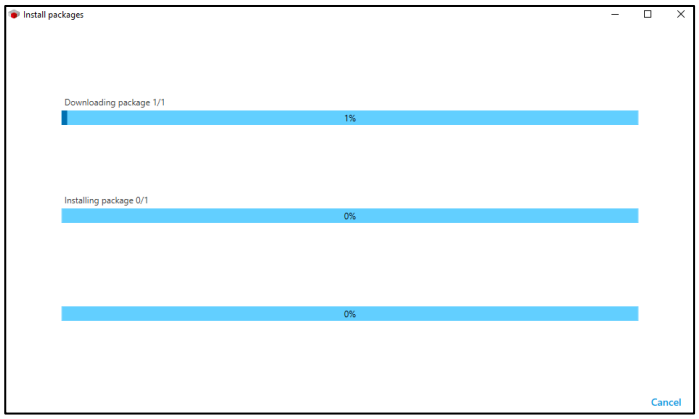


- Read the license and push the "Continue".



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





- 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.

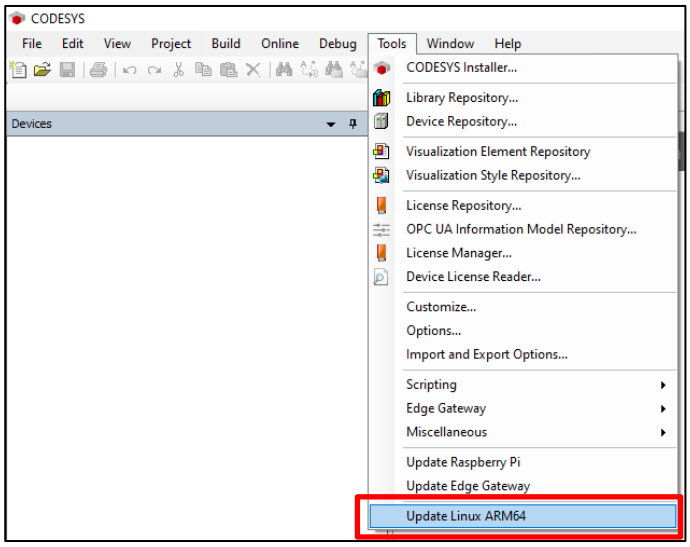
  Install “codesyscontrol_linuxarm64_4.10.0.0_arm64.deb”:

```
$ 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 usr/* /usr
$ cp -r var/* /var
$ chmod a+rw /etc/CODESYSControl.cfg
$ chmod a+rw /etc/CODESYSControl_User.cfg
$ groupadd codesysuser
$ cd ..
```

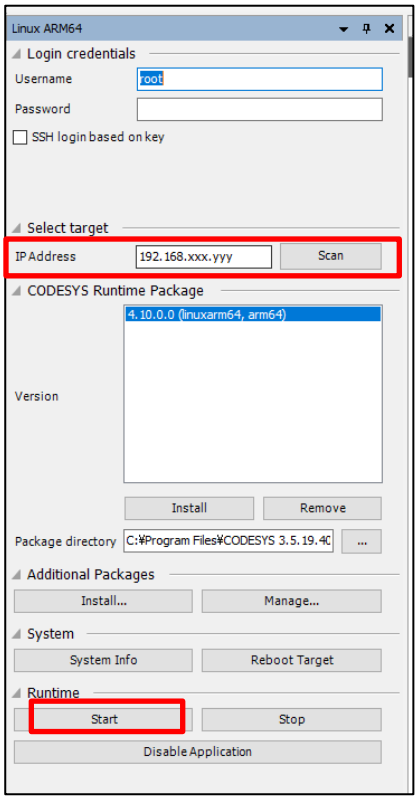
Install “codemeter-lite_7.60.5625.503_arm64.deb”:

```
$ 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.

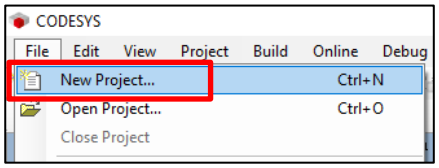


- Input the IP address of the evaluation board to “IP Adress” and click “Start” button to start the CODESYS runtime.

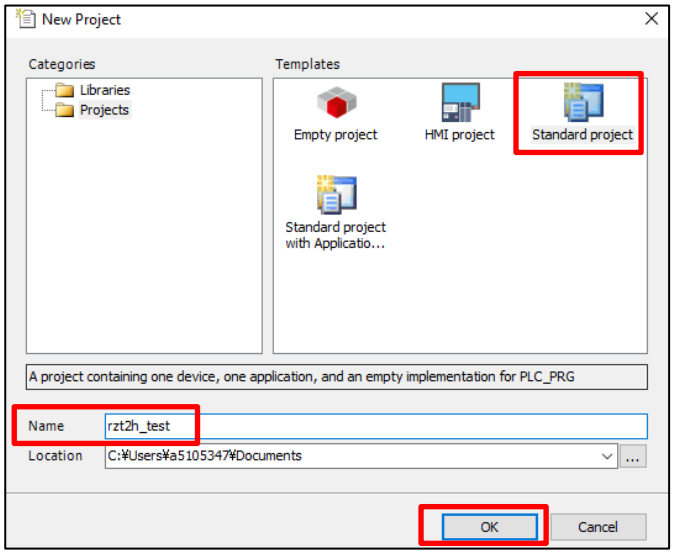


(2) Create a CODESYS project

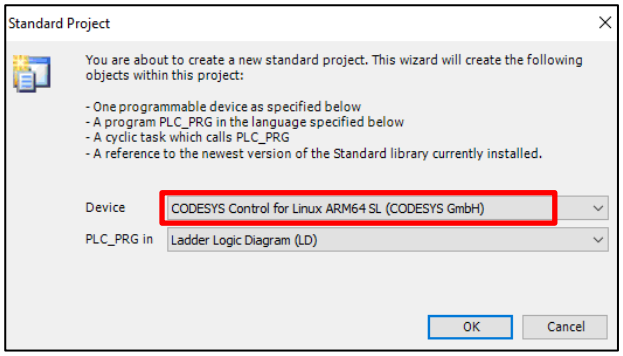
- Click “New Project…”.



- Select “Standard project”, set “Name”, and click “OK”.

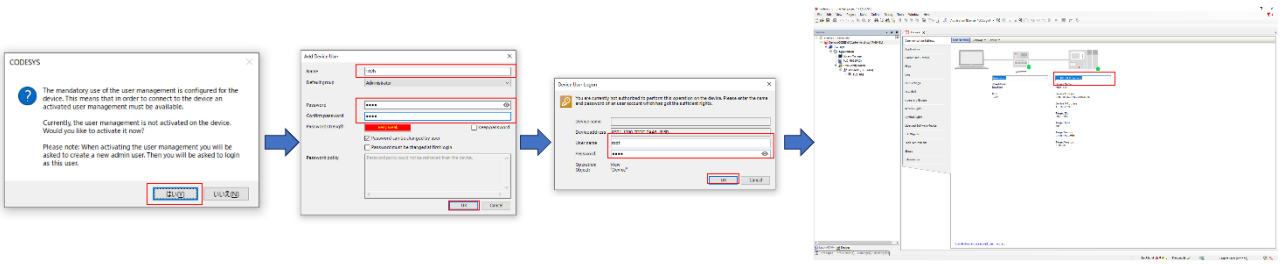


- Select “CODESYS Control for Linux based ARM64 SL”.



(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.



The installation of CODESYS Runtime is completed now.

5. Appendix

None.

6. Revision History

		Description	
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/