



acontis technologies GmbH

SOFTWARE

HV-Codesys+RT-Linux-Guide

acontis Real-time Hypervisor running Codesys on RT-Linux

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1 Introduction

This guide describes how to set up CODESYS on RT-Linux for the acontis Hypervisor. It is assumed, the steps listed in the Hypervisor Quick Start guide and the Windows Guest Guide have been successfully executed.

2 CODESYS Support Package for the Hypervisor

The CODESYS Support Package for the Hypervisor is located in
`/hv/guests/etc/rt-linux/files/codesys.`

If you get an update, please copy it to this folder.

Hint: Update CODESYS Control version (optional)

The CODESYS Support Package may contain a specific version of the CODESYS Control for Linux SL package (e.g. “codesyscontrol_linux_4.5.0.0_amd64.deb”). Please follow the steps described in this chapter only in case you want to use a newer version of this package or if this package is missing.

You need to go to the CODESYS webstore (store.codesys.com) and search for “CODESYS Control for Linux SL” and download the respective package. Unzip the package. As a result, the folder “Delivery” will contain the CODESYS control debian package (e.g. “codesyscontrol_linux_4.5.0.0_amd64.deb”). Please transfer the file you got from the webstore to the PC where the hypervisor is running into folder `/hv/guests/examples/rt-linux/files/codesys.`

3 Extract CODESYS Control

CODESYS Control is shipped as a debian package. Its content has to be extracted before it can be used. After extracting the debian package can be removed.

```
$ cd /hv/guests/etc/rt-linux/files/codesys
$ dpkg-deb -x codesyscontrol_linux_4.5.0.0_amd64.deb files
$ dpkg-deb -e codesyscontrol_linux_4.5.0.0_amd64.deb control
```

4 Adjust CODESYS Configuration

You need to adjust some configuration files. Adjust the `CODESYSControl.cfg` file to assure the user configuration file is stored at the hard disk:

```
$ cd /hv/guests/etc/rt-linux/files/codesys/files/etc
$ gedit CODESYSControl.cfg
```

Adjust the `FileReference.1` setting:

```
[CmpSettings]
IsWriteProtected=1
FileReference.0=SysFileMap.cfg, SysFileMap
FileReference.1=/mnt/rtfiles/codesys/files/etc/CODESYSControl_User.cfg
```

If you want to automatically start the PLC application, adjust the `CODESYSControl_User.cfg` file:

```
$ cd /hv/guests/etc/rt-linux/files/codesys/files/etc
$ gedit CODESYSControl_User.cfg
```

Add the `Application.1` entry:

```
[CmpApp]
Bootproject.RetainMismatch.Init=1
;RetainType.Applications=InSRAM
Application.1=Application
```

5 Codemeter support

CODESYS is software protected via a Codemeter USB dongle. This dongle has to be exposed from the Hypervisor Host to RT-Linux.

Hint: How to expose USB devices is described in the [Hypervisor Manual](#) in section “USB device access for RT-Linux guests”.

The standard Linux image shipped with the hypervisor does not support usbip. You need to exchange this image by the separately provided `rtlinux515.x64-usbip.bin` image file. This file is part of the CODESYS package and located in `/hv/guests/etc/rt-linux/files/codesys/rtlinux`. You need to adjust the configuration:

```
$ cd /hv/guests/examples/rt-linux
$ gedit guest_config.sh
```

Adjust the following line:

```
export osImage=$HV_ROOT/guests/etc/rt-linux/files/codesys/rtlinux/
↪rtlinux515.x64-usbip.bin
```


6 CODESYS autostart

You may want to automatically start CODESYS after RT-Linux has booted.

In case a Real-time Ethernet fieldbus like Ethernet/IP or EtherCAT shall be used, you must enable the Ethernet driver of RT-Linux.

For protocols like Ethernet/IP you need also to set an IP address to this Ethernet port.

Insert or uncomment the following lines in

```
/hv/guests/examples/rt-linux/files/autostart.sh
```

```
# load Ethernet drivers if required
modprobe e1000e
modprobe igb
modprobe igc
modprobe r8169
ifconfig eth0 up
```

Add the following commands at the end of the file

```
/hv/guests/examples/rt-linux/files/autostart.sh
```

The example below assumes, an IP address is needed, it is set to 192.168.10.10

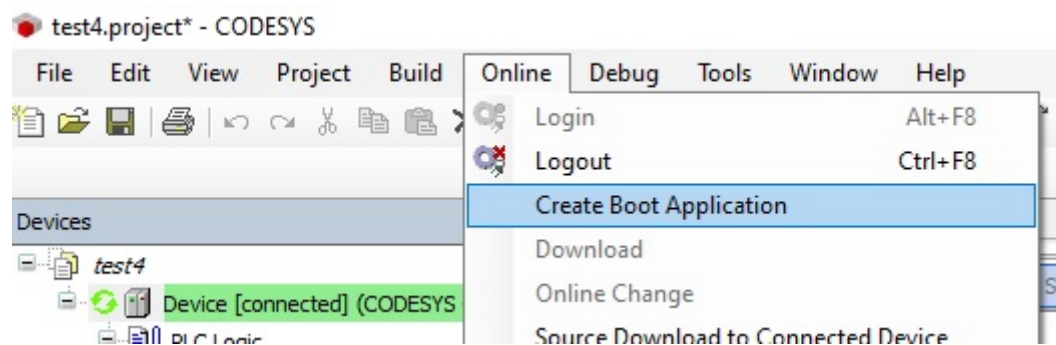
You may have to adjust this address according to your needs.

Set the IP address to 0.0.0.0 or omit setting the IP address if no IP address is required

```
# set IP address
ifconfig eth0 192.168.10.10

# run codesys
cd /mnt/rtfiles/etc/rt-linux/files/codesys
./installcodesys.sh
```

If you want the PLC application to run automatically after CODESYS is started, you need to create a Boot Application. You need select the PLC application, log in into the PLC, download and run the application. Then create the Boot Application.



7 CODESYS PLC logfile

In case of PLC issues, you may take a look into the log file. It is located in RT-Linux, so you need to log in into RT-Linux or get it via ssh.

The following command will store the log file from within RT-Linux into the local filesystem into file `plc.log`. The requested password is *root*:

```
$ ssh root@192.168.157.2 cat /tmp/codesyscontrol.log >plc.log
```

8 Windows Guest

8.1 CODESYS Windows VM Port Forwarding

If the CODESYS development system shall be connected with the PLC runtime system, this can be accomplished using the Windows VM IP address and enabling port forwarding. The following steps have to be executed (in the Hypervisor Host).

- Replace the file `guest_gateway.config` in the windows guest folder `/hv/guests/examples/windows`

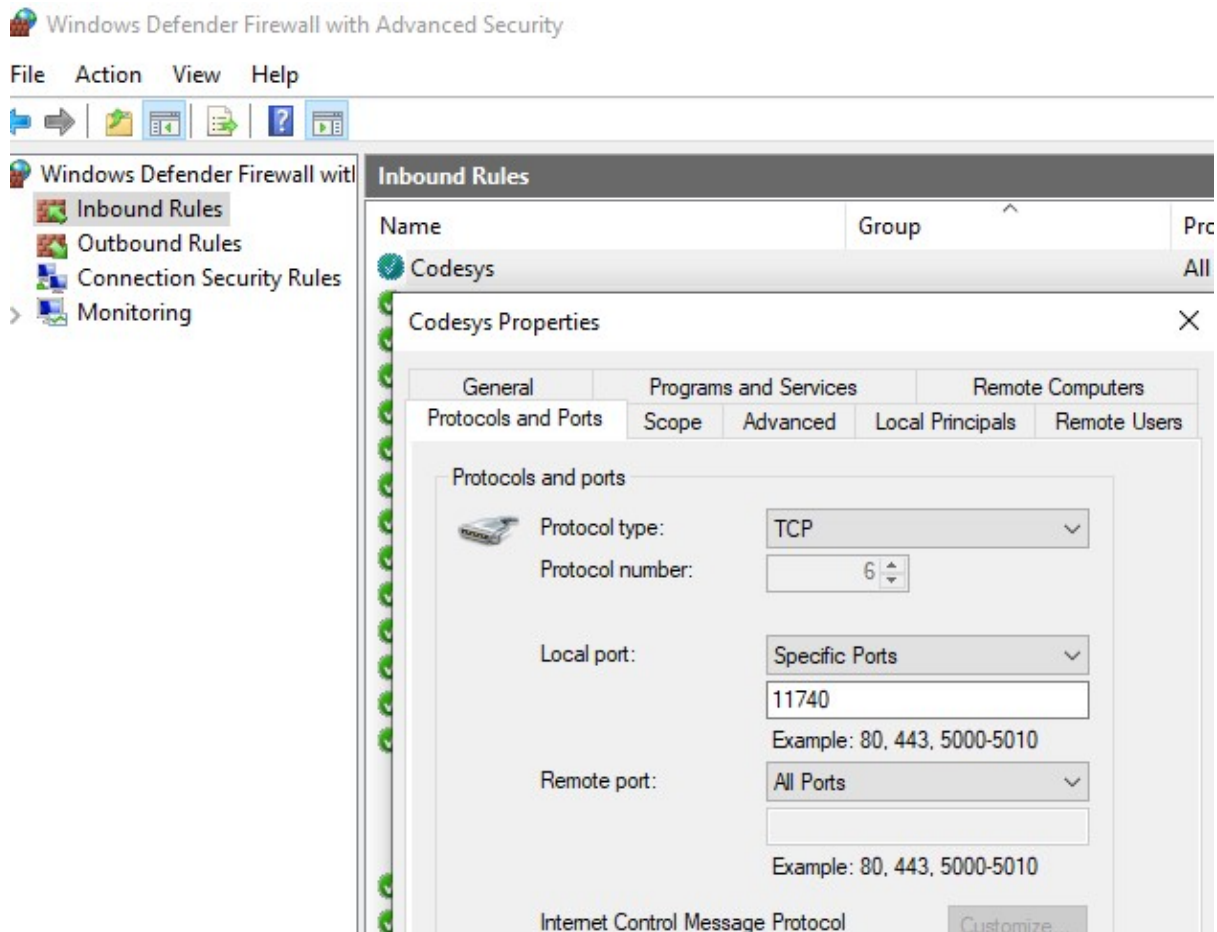
```
$ cd /hv/guests/examples/windows
$ [ ! -f guest_gateway.config.orig ] && mv guest_gateway.config
↪ guest_gateway.config.orig
$ cp /hv/guests/etc/rt-linux/files/codesys/guest_gateway.config .
```

- Assure the following line exists in `/hv/guests/examples/rt-linux/hv.config` (by default, this should be the case)

```
#include "../windows/guest_gateway.config"
```

Then you need to start the Windows guest.

You need to create a firewall rule to accept incoming TCP packets on port 11740 (the CODESYS port)



8.2 Diagnosis shortcuts

For diagnosis purposes additional shortcuts can be placed on the Windows desktop.

- Start the Windows guest

```
$ cd /hv/guests/examples/windows
$ hv_guest_start -view
```

- Open the Explorer
- Switch to folder `\\10.0.2.4\qemu\etc\rt-linux\files\codesys\CodesysDesktopShortcuts`
- Copy all the shortcuts onto your desktop (you may have to adjust the shortcuts based on your Windows version and language)

Hint: To avoid being asked to allow execution any time you start such shortcut, you may adjust the related Windows settings.

- Open the Control Panel
- select Internet Options
- select security
- select local intranet

- select sites
- select advanced
- add \\10.0.2.4\qemu

8.3 Connection to RT-Linux

It is required to attach the Windows guest with the hypervisor communication layer. This is accomplished with the command executed in the “*Hypervisor Attach*” shortcut

Hint: This shortcut executes the following command.

```
%RTE_ROOT%\RtosUpload.exe -attach -osid 1
```

To automatically attach the communication layer, please copy this shortcut into the Windows startup folder.

- Press the Windows key as well as the R key
- Enter the following command: shell:startup
- Copy the shortcut

Running this command can be accelerated by adding the following registry key:

```
[HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Explorer\  
→Serialize]  
"StartupDelayInMSec"=dword:00000000
```

8.4 Execute PLC commands

This section shows how to execute PLC control commands (e.g. PLC status check).

Caution: This requires the putty ssh client application being installed and security keys being exchanged.

- Download and install .. <https://www.putty.org/>
- Open putty and connect to 192.168.157.2, accept the connection (do **not** login)
- Close putty (we only need to execute this step to accept the security keys, they are needed to run the RT-Linux application)

Execute the “*PLC Status*” shortcut

Then the current PLC status should be shown.

8.5 Remove Power Button

To avoid Windows being accidentally shutdown by the user, the power button can be disabled.

- run the group policy editor: gpedit
- Select User Configuration > Administrative Templates > Start Menu and Taskbar
- set “Remove and prevent access to the Shut Down, Restart, Sleep, and Hibernate commands” to Enabled

The whole system then can be shutdown or rebooted as shown in the Windows Guest Guide Tutorial.