acontis technologies GmbH

SOFTWARE

EC-Simulator

Quick Start Guide

Version 3.2

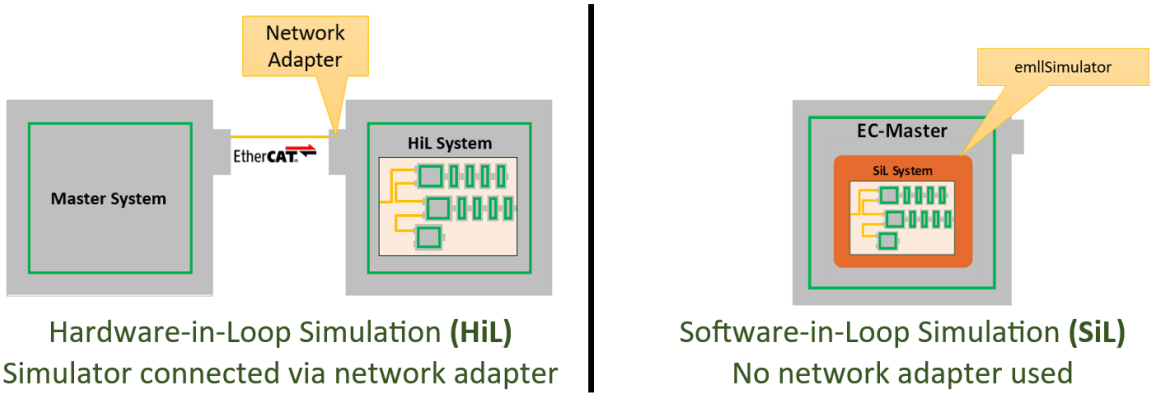
AT3504 **Edition: December 5, 2025**

Contents

1 About

The EC-Simulator virtualizes EtherCAT® networks to run Master systems without real slaves to test and develop EtherCAT® systems.

The EC-Simulator is available in two editions, HiL and SiL, depending on the connection between Master and Simulator:



This Quick Start Guide is about EC-Simulator HiL. It briefly shows how to install and run the included example program. The EC-Simulator's User Manual contains information that is more detailed and is available at https://developer.acontis.com/ec-simulator.html.

The EC-Simulator can be obtained from https://www.acontis.com/en/ecdownloads.html.

If you have questions, please contact us at https://www.acontis.com/en/contactform.html.

2 Get Your License Key

A valid license key is needed to run EC-Simulator HiL, see chapter "*Protected version*" in the EC-Simulator HiL User Manual for how to obtain it.

It is possible to continue this Quick Start Guide without a valid license key with limited functionality.

The license key **must match the network adapter** used by EC-Simulator HiL!

3 Install EC-Simulator HiL

The EC-Simulator SDK including its examples is contained in the installation package named e.g. `EC-Simulator-HiL-V3.2.1.01-Windows-x86_64Bit-Eval.zip`.

The procedure is generally the same for all operating systems supported by the EC-Simulator.

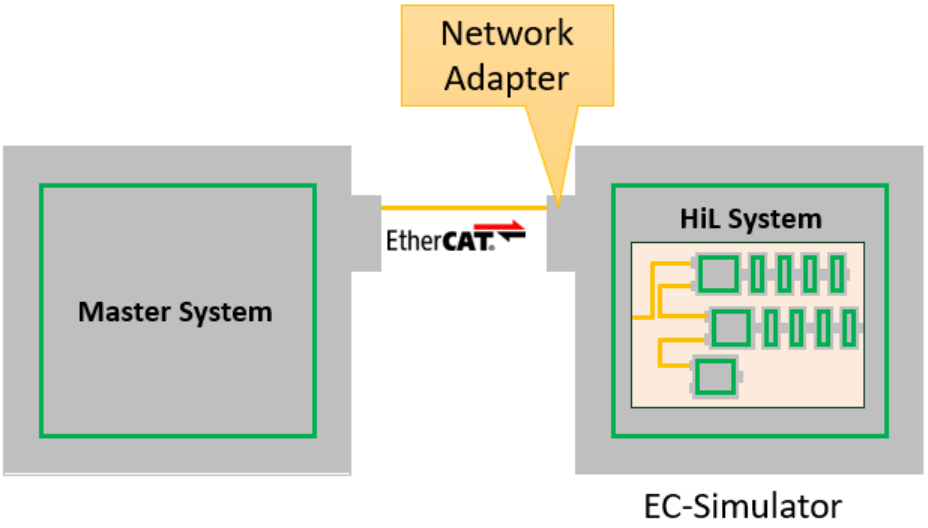
The installation of EC-Simulator for Windows contains the installer `setup.exe` guiding through the installation process.

For non-Windows operating systems, the files of the SDK to be extracted are directly contained within the installation package.

It is recommended to copy the files to a folder where the user has write access.

3.1 Prepare the EtherCAT® Simulator Device

When running, the EC-Simulator HiL listens on a specific network adapter for EtherCAT® frames sent by the Master, simulates the network and sends them back to the Master:



The Ethernet network adapter must be dedicated to be used by EC-Simulator HiL **and may not be mixed with other devices, i.e. LAN infrastructure!**

It is recommended to add an Intel Gigabit PCIe NIC used for EC-Simulator to the EtherCAT® Simulator Device for this purpose.

3.2 Prepare the Operating System (Windows)

The command “ipconfig” shows the IP settings of the installed network adapters, including the IP address of the dedicated Ethernet network adapter for EC-Simulator HiL e.g., “192.168.99.1”.

3.3 Prepare the Operating System (Linux)

EC-Simulator HiL supports different Ethernet adapter types.

It is recommended to use an Intel Pro/1000 handled by the acontis emllIntelGbe driver. Other network adapter types are supported too and described in the EC-Simulator HiL User Manual.

1. The acontis atemsys Linux Kernel driver must be downloaded and applied to the Linux system: See https://github.com/acontis/atemsys.
2. The commands “lshw -short -c network” and “lspci | grep Ethernet” show the hardware information of the installed network adapters, including the PCI bus address of the dedicated Ethernet network adapter for EC-Simulator HiL, e.g. “01:00.0” (bus 01, device 00, function 0 as needed below):

   ```
   $ sudo bash
   $ lshw -short -c network
   $
   $ H/W path        Device      Class          Description
   $ ============================================================
   $ /0/100/1/0      enp1s0f0    network        I350 Gigabit Network Connection
   $ /0/100/19       lan         network        Ethernet Connection I217-LM
   $
   $ lspci | grep Ethernet
   $ 00:19.0 Ethernet controller: Intel Corporation Ethernet Connection I217-LM
   $ 01:00.0 Ethernet controller: I350 Gigabit Network Connection
   ```

   The PCI bus address is used to specify the network adapter adapter used by EcSimulatorHiLDemo and is formatted as 0x01bbddff:

   - *bb* Bus Number
   - *dd* Device Number
   - *ff* Function Number

3. The dedicated network adapter to be used must be unbound from the Linux Kernel and atemsys loaded:

   root@myLinuxTarget:~# echo “0000:01:00.0” > /sys/bus/pci/drivers/igb/unbind

   root@myLinuxTarget:~# modprobe atemsys

   Unbinding the network adapter instance from the Linux Kernel and loading the atemsys Kernel driver is non-persistent and **must be redone after reboot.**

4 EtherCAT® Network Configuration (ENI/EXI)

The EC-Simulator needs knowledge about the network to be simulated which must be configured using a configuration file in the EtherCAT® Network Information Format (ENI) or the Extended Network Information Format (EXI).

It is strongly recommended to use the same configuration file at Master and Simulator!

The EtherCAT® Network can be configured using EC-Engineer, which can be obtained from https://www.acontis.com/en/ecdownloads.html.

The User Manuals of EC-Simulator and EC-Engineer contain information that is more detailed. They are available at https://developer.acontis.com/manuals.html.

If you have questions, please contact us at https://www.acontis.com/en/contactform.html.

4.1 Use an Existing EtherCAT® Network Configuration

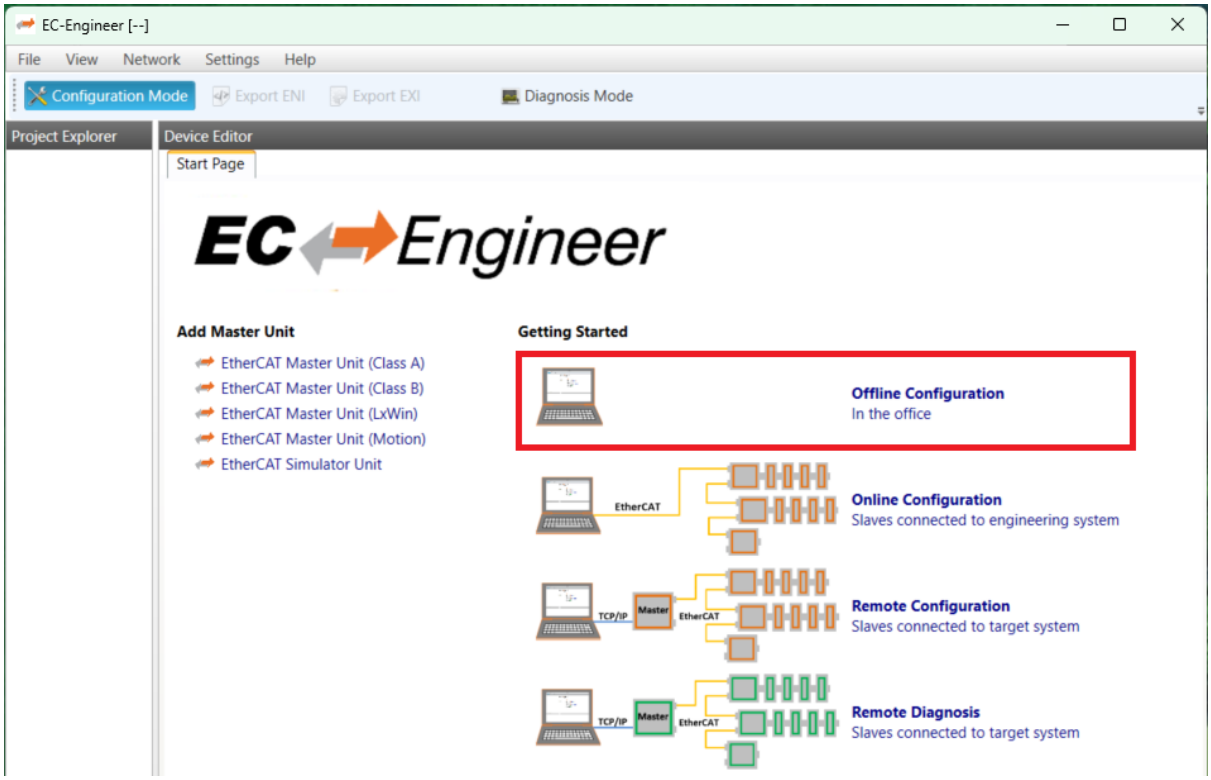
The configuration file is typically already available or can be exported from the configuration tool used to configure the EtherCAT® Master.

In any other case, a new EtherCAT® Network must be configured, see below.

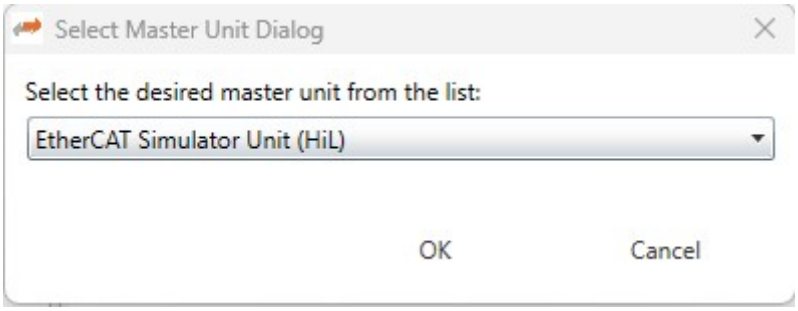
4.2 Configure a New EtherCAT® Network (Offline Configuration)

The new EtherCAT® Network to be simulated can be configured using EC-Engineer as described below.

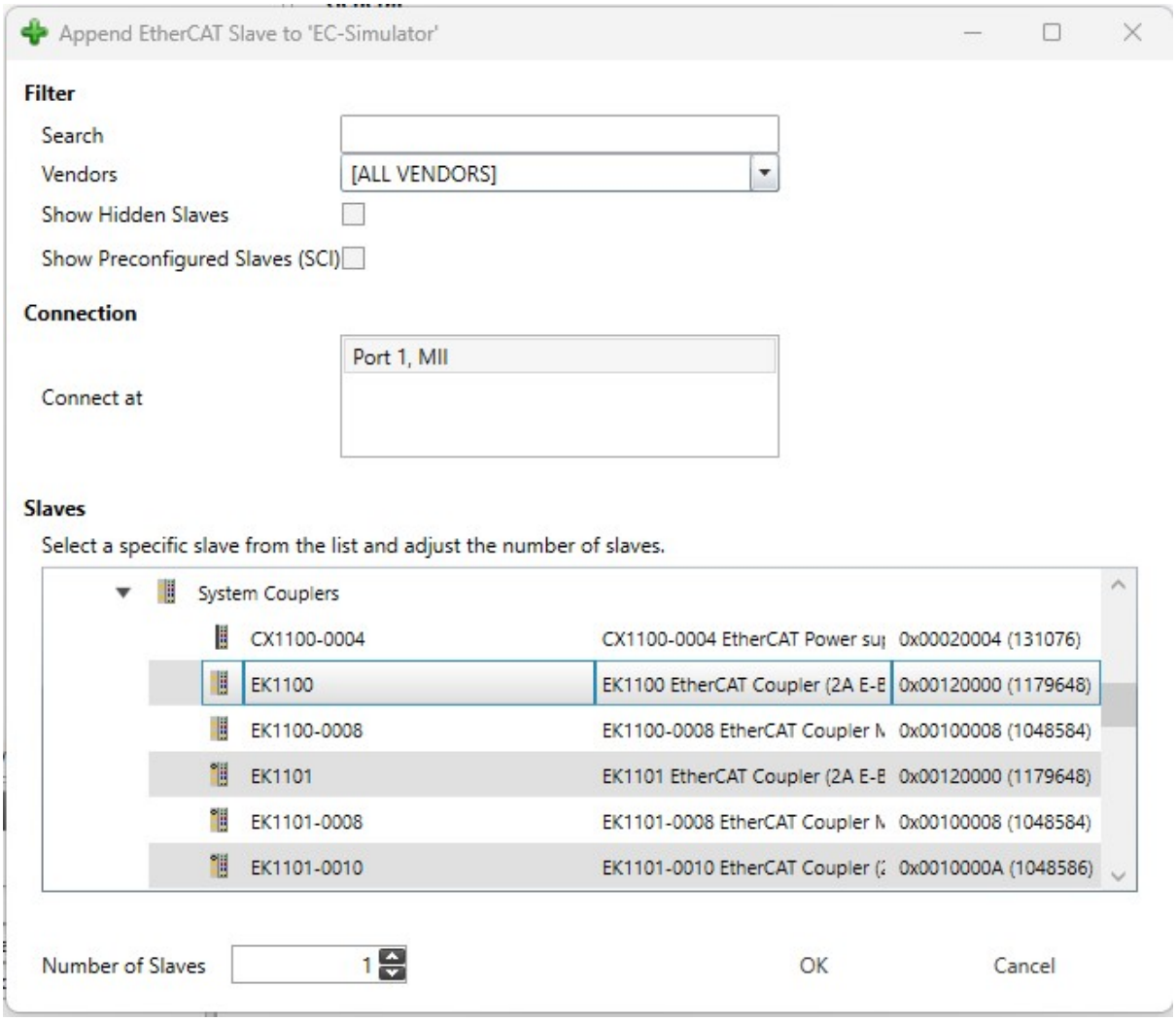
1. Start EC-Engineer. Select "*Offline Configuration*" within the "*Start Page*" tab:



2. In the following dialog, select “EtherCAT Simulator Unit (HiL)” and press “*OK*”:

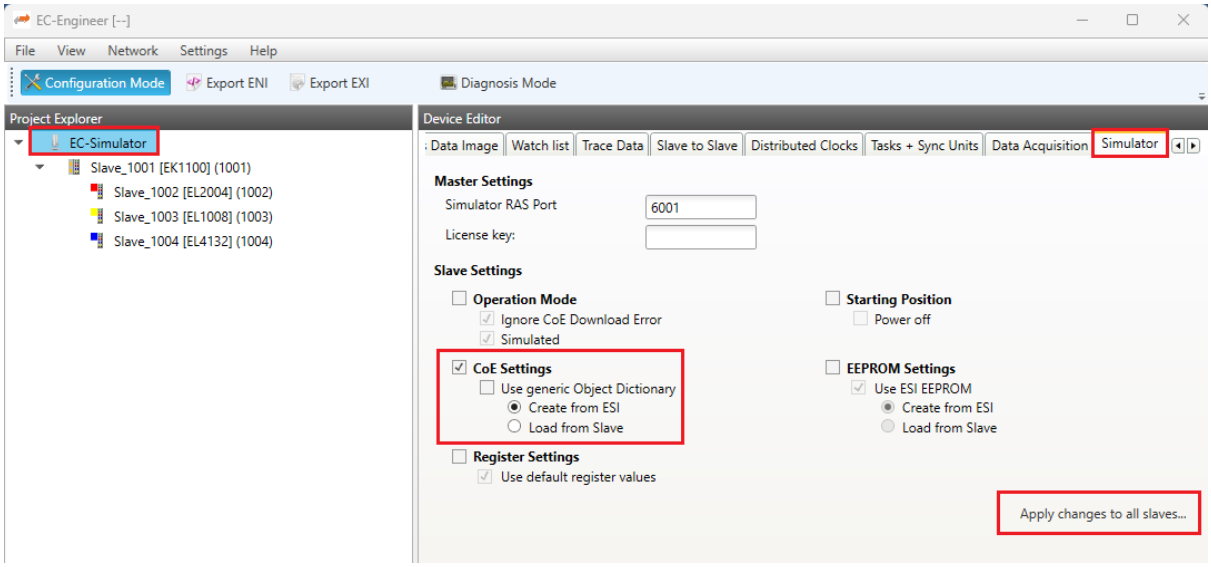


3. Append desired slaves e.g., EK1100 + EL2004 + EL1008 + EL4132 and press “*OK*”:

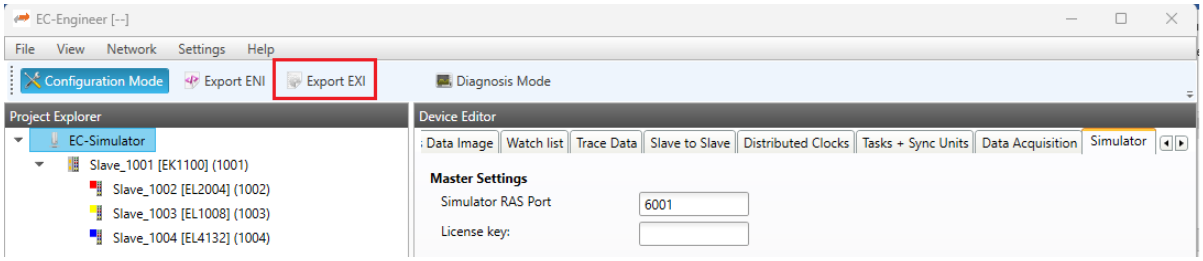


Hint: The EC-Engineer needs to know about all slave types that are going to be configured. Slave descriptions (ESI files) can be added by “File > ESI Manager” from the menu bar.

4. Select Object Directories to be created from ESI files and click "*Apply changes to all slaves…*" (optional):



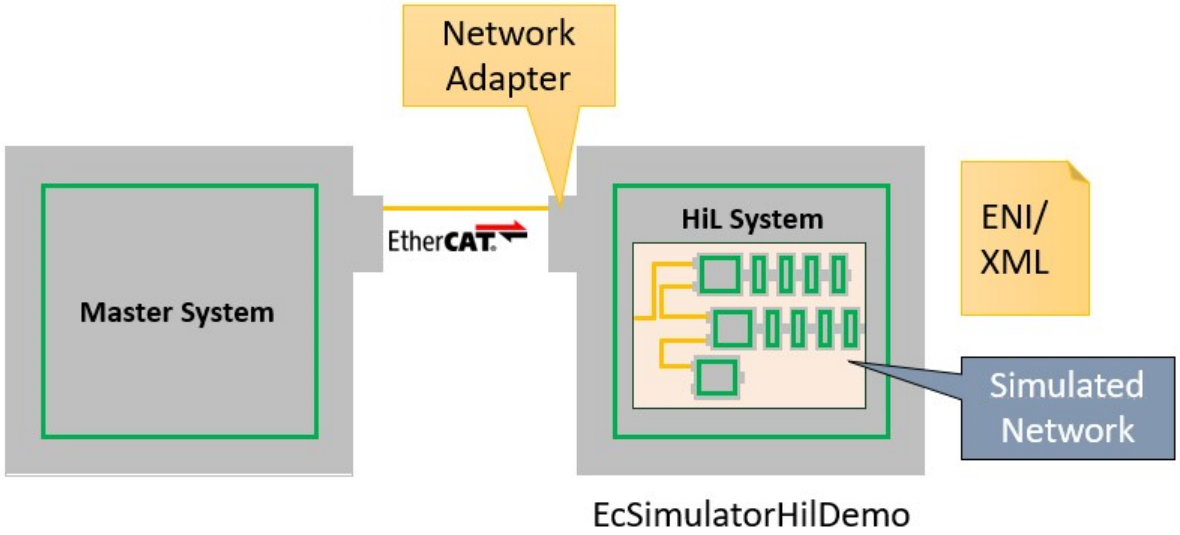
5. Finally click to "*Export EXI*" to store the configuration file e.g., "exi.xml":



This configuration can now be loaded by the EcSimulatorHilDemo.

5 Running EcSimulatorHilDemo

The `EcSimulatorHilDemo` is an EC-Simulator example application that initializes the EC-Simulator HiL to listen on a specific network adapter for EtherCAT® frames sent by the Master, simulate the network and send them back to the Master. At least the **network adapter** and the **configuration file** (ENI/EXI) for the network to be simulated must be known to run the `EcSimulatorHilDemo`:



While `EcSimulatorHilDemo` runs, the Master System can scan and operate the simulated EtherCAT® network.

Most EtherCAT® systems require modifications to the HiL System if real-time constraints must be kept, else the Master may fail switching to the EtherCAT® PREOP or SAFE-OP state.

The EC-Simulator HiL license key can be given to the `EcSimulatorHilDemo` as parameter "-lic …".

5.1 Setting Up and Running EcSimulatorHiLDemo (Windows)

Copy all of the example application files into one directory, i.e. the application `EcSimulatorHilDemo.exe` and all DLLs from within `Bin\Windows\x64`, as well as the EtherCAT® network configuration file (ENI/EXI) EXI file.

The following command starts `EcSimulatorHilDemo`:

```
$ EcSimulatorHilDemo.exe -ndis 192.168.99.1 0 -f exi.xml -t 0 -v 3 -sp
```

5.2 Setting Up and Running EcSimulatorHiLDemo (Linux)

The following command starts EcSimulatorHilDemo after preparing the system as described above:

```
.. prompt:: bash
```

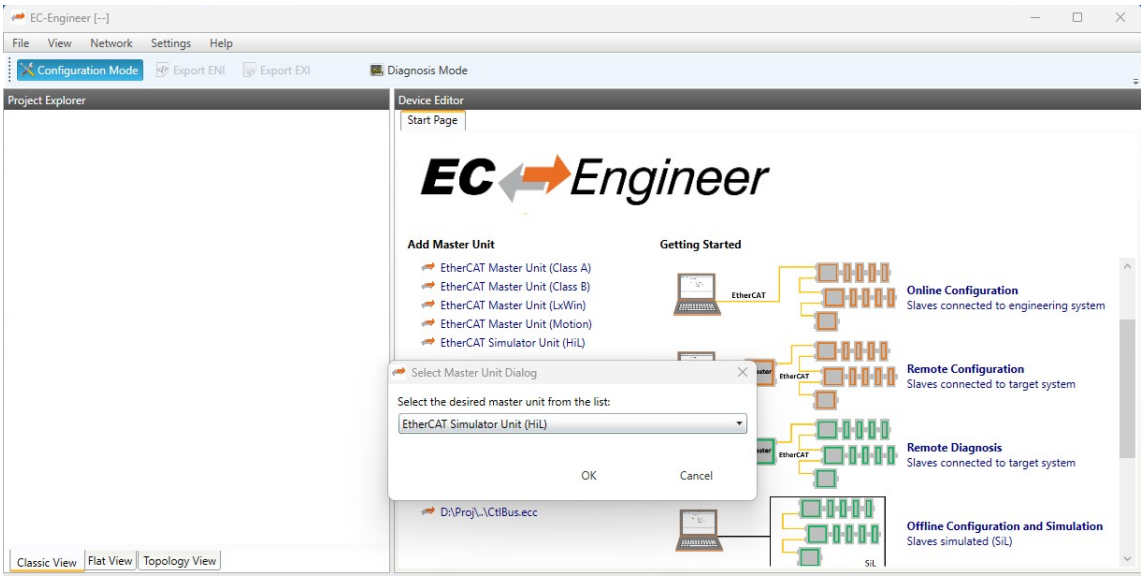
root@myLinuxTarget: # cd Bin/Linux/x64

… # export LD_LIBRARY_PATH=.

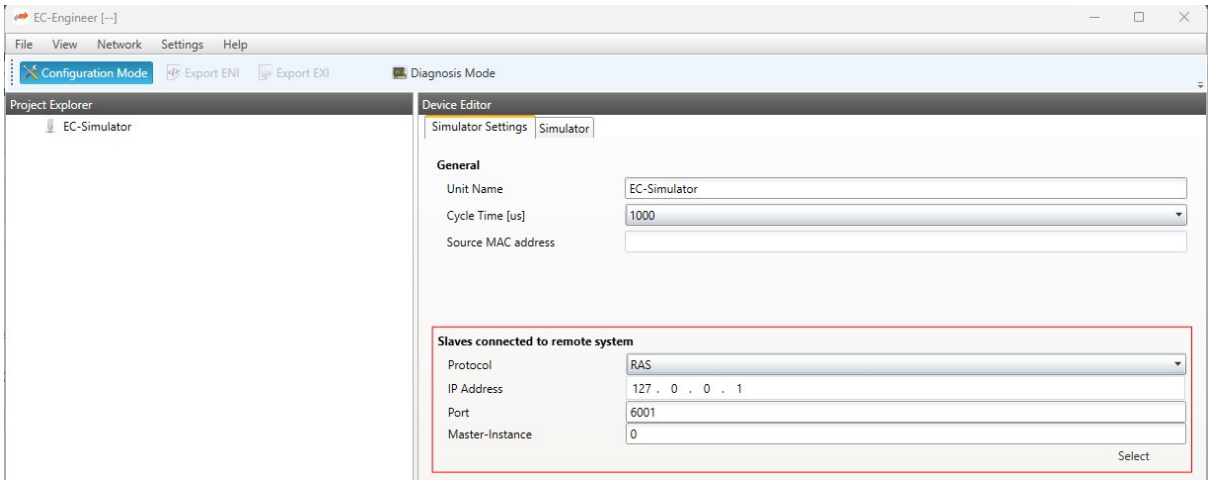
… # ./EcSimulatorHilDemo -f exi.xml -intelgbe 0x01010000 1 -t 0 -v 3 -sp

5.3 Online Diagnosis (EC-Engineer Diagnosis Mode)

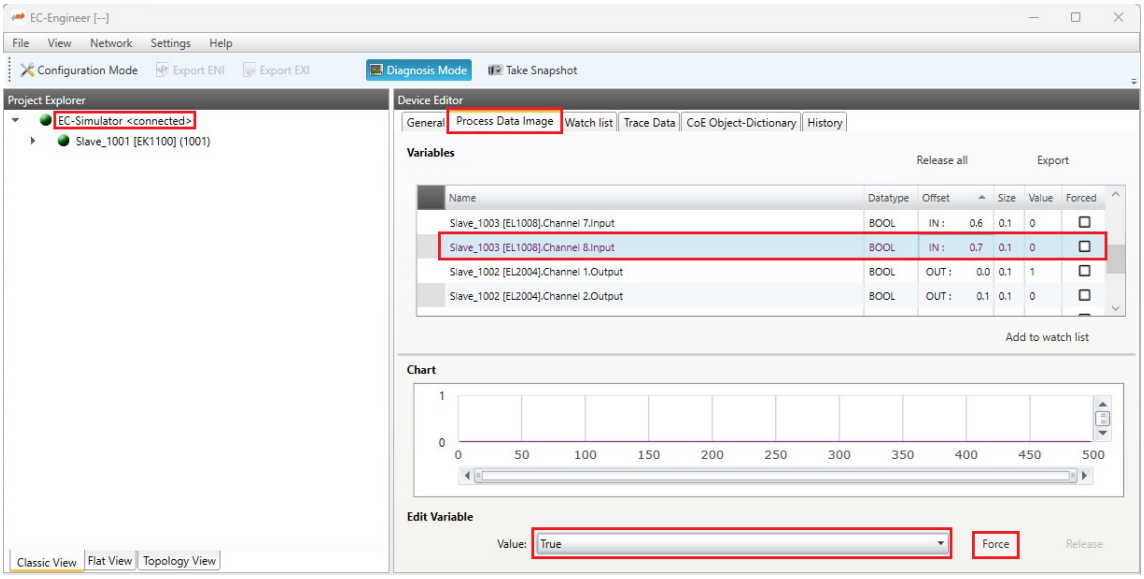
1. Start EC-Engineer. Enter "*Remote Diagnosis*" within the "*Start Page*" tab and select "EtherCAT Simulator Unit (HiL)":



2. Enter the LAN IP address of the system running the EcSimulatorHilDemo and press "Select"



3. Process Data OUTPUTs from the Master can be inspected and Process Data INPUTs to the Master can be forced at the "*Process Data Image*" tab of the EC-Simulator Device:



6 Next Steps

The EC-Simulator's User Manual is located in the "Doc" folder of the SDK installation and available online at https://developer.acontis.com/manuals.html .

It contains information that is more detailed and helps with the next steps i.e.:

- Check-out the "-flash" parameter of EcSimulatorHiLDemo and inspect the values in EC-Engineer as an example for setting Process Data INPUTs programmatically
- Learn about EC-Simulator's features
- Learn using the API: See "EC-Simulator Software Development Kit (SDK)" in the User Manual.

Define your application:

- Check what is required by the EtherCAT® Master application
- Create the system design of EtherCAT® Master and EtherCAT® Simulator
- Define your use cases of EC-Simulator's and design your own EC-Simulator's application.
- Create the EtherCAT® Network Configurations for your Use Cases
- Implement your own EC-Simulator's application in C / C++ / Python / .NET

If you have questions, please contact us at https://www.acontis.com/en/contactform.html .