

MCUXSDKSOEMGSUG

Getting Started with MCUXpresso SDK for Simple Open EtherCAT Master

Rev. 2.12.1 — 30 September 2022

User guide

Document information

Information	Content
Keywords	Simple Open EtherCAT Master, SOEM, Getting Started, MCUXSDKSOEMGSUG
Abstract	This document describes the steps to get started with MCUXpresso SDK for Simple Open EtherCAT Master.



1 Overview

Simple Open EtherCAT Master (SOEM) is an open source EtherCAT master stack used to write custom EtherCAT Master applications. It provides a small footprint and is suited for embedded systems. For more information on SOEM, see <https://openethersociety.github.io/doc/soem/>.

The SOEM is integrated in MCUXpresso SDK version 2.12.1. A hardware abstraction layer is added to support the ENET Ethernet interface in the i.MX RT series. To support FreeRTOS and Baremetal, OS abstraction layers (OSAL) are added.

2 Hardware requirements

The SOEM applications in the MCUXpresso SDK require the following hardware components:

- General Purpose Timer (GPT) for scheduling tasks or as a system clock
- ENET Ethernet interface or two for cable redundancy

The SOEM applications support the following EVK boards in the MCUXpresso SDK:

- evkmimxrt1020
- evkmimxrt1040
- evkbimxrt1050
- evkbmimxrt1060
- evkmimxrt1060
- evkmimxrt1064
- evkmimxrt1160
- evkmimxrt1170

3 SOEM middleware in MCUXpresso SDK

In the MCUXpresso SDK, the SOEM middleware is in the directory, `middleware/soem`. To support the ENET Ethernet driver (`fsl_enet`) in the SDK, a hardware abstraction layer in the SOEM is integrated, which is located in the directory, `middleware/soem/oshw/mcux-sdk/`. Therefore, the SOEM middleware can support all i.MX RT MCUs integrated the ENET Ethernet interface.

For the cases where real-time high performance is a critical requirement, Baremetal is used. The OS abstraction layer (OSAL) for Baremetal is located in the directory, `middleware/soem/osal/baremetal/`. For the cases where multitasking is critical, FreeRTOS is used. The OS abstraction layer (OSAL) for FreeRTOS is located in the directory, `middleware/soem/osal/freertos/`.

4 SOEM example applications in MCUXpresso SDK

There are two examples in the MCUXpresso SDK based on the SOEM middleware. One is built based on Baremetal and the other is based on FreeRTOS.

These two examples are functionally the same to control an emulated linear rail system. The linear rail system consists of three EtherCAT devices, a linear rail, two limit switches, and a stepper motor.

- EK1100, a coupler, is one of the EtherCAT devices that connects EVK boards to the other EtherCAT IO devices.
- EL2008 supports 8 output IO ports connected to the stepper motor.
- EL1018, supports 8 input IO ports connected to the two limit switches.

The task of the examples controls the linear rail system using two output and two input remote IO signals:

- Output pulse: Output the pulse with a 200 μ s period and 50 % duty cycle via the EL2008 device. It is used to drive the stepper motor.
- Motor direction: Output via the EL2008 device to control the stepper motor rotation direction.
- Two limit signals: Two input signals via the EL1018 device connected to limit switches to indicate the status of the switches. A high level indicates that the limit switch is closed.

The task of the examples always outputs the Output pulse and Motor direction signals to drive the stepper motor. The Motor direction signal changes when one of the limit switches is closed.

5 Revision history

This table summarizes revisions to this document.

Rev.	Date	Description
2.12.1	30 September 2022	Initial release for MCUXpresso SDK 2.12.1

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