icECAT. EtherCAT Slave SDK (TI AM335x)

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Software Modules for Industrial Communication & Networking

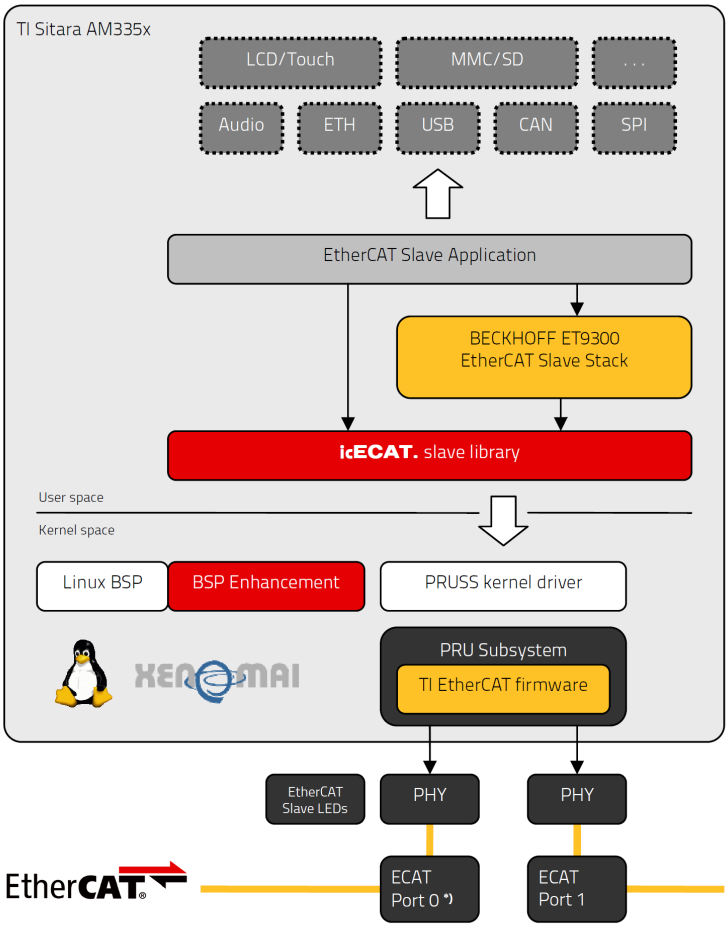
Introduction

The Texas Instruments Sitara AM335x ARM Cortex-A8 microcontroller contains the Programmable Real-Time Unit (PRU) Subsystem which enables the controller to implement industrial communication protocols with real-time requirements such as EtherCAT. It offers an optimized solution for complex applications like Human Machine Interfaces (HMIs), intelligent sensors, high-speed I/O and communication applications where the key is simple design and minimal cost. Due to the PRU subsystem no external ASIC or FPGA and no communication interface like SPI for data exchange are necessary to implement an EtherCAT slave device. The EtherCAT slave application can be started on the ARM Cortex-A8 processor. With help of the Linux operating system it is easy to support interfaces like LCD, touch, audio, USB, Gigabit Ethernet, Wi-Fi, CAN, MMC/SD card and others.

The icECAT. Slave SDK is a solution for the implementation of an EtherCAT slave device on the TI Sitara AM335x running the Linux operating system. The SDK also supports the Xenomai real-time framework extension to develop an EtherCAT slave application with real-time capabilities and low cycle times.

Characteristics

- Easy application integration: The SDK provides a simple API for the integration of the EtherCAT slave functionality in a custom application.
- The library interfaces with the Beckhoff ET9300 EtherCAT slave stack which is available for free to members of the EtherCAT Technology Group (ETG).
- Project based license, no royalties



*) if LCD display is used only ECAT Port 1 is available

Architecture

The block diagram illustrates the hardware and software architecture of an EtherCAT slave device based on the TI AM335x and the icECAT. Slave SDK: The PRU subsystem interfaces with two dedicated Ethernet PHYs for the connection to the EtherCAT network. TI provides firmware for the PRU subsystem which handles the EtherCAT MAC layer similar to an EtherCAT slave ASIC. The PRU performs the time critical functions of EtherCAT protocol handling: Frame parsing and decoding and frame forwarding to the next EtherCAT device in the network.

The Software Development Kit contains the icECAT slave library for AM335x which interfaces with the PRU from user space. It initializes the PRU and downloads the EtherCAT slave firmware to it. The library interacts with the Beckhoff ET9300 EtherCAT slave stack. The specific EtherCAT slave application can run as a user space process and accesses the slave stack directly. The icECAT slave library itself is passive - all threads can be driven by the application.

The SDK additionally contains the necessary enhancements of the Linux resp. Xenomai board support package to support the EtherCAT ports of the PRU.

Supported Platforms

- Operating System: Linux Kernel 3.2 or 3.14
  Xenomai 2.6.4 (contact IBV for a Board Support Package)
  newer versions possible on request
- CPU: Texas Instruments Sitara AM335x
- Boards: PHYTEC phyCORE-AM335x
  The adaption of the SDK to other boards is possible and described in the User Manual
- Please contact IBV for the complete and detailed list of supported hardware and software platforms

Licensing

- The icECAT. Slave SDK is offered under a project based license (without royalties).
- Two license types are available: source and binary

Shipment and Integration

icECAT. Slave SDK consists of:

- icECAT slave library for TI AM335x
- Patch for TI Industrial SDK (TI SDK with PRU firmware is available as download from TI website)
- Patch for Beckhoff ET9300 EtherCAT Slave Stack (full source code is available at ETG to members)
- Necessary enhancement of the Linux BSP (prepared for supported boards, description for other boards)
- EtherCAT slave demo project with Qt based user interface (source and binary)
- User Manual containing a guide how to integrate the software to build an EtherCAT slave device
- Reference Manual
- Integration service: IBV supports the integration of the different components from TI, Beckhoff and IBV.
  The integration workflow is explained in the Release Notes of the icECAT. Slave SDK.

For more details about the icECAT. Slave SDK, please contact icecat@ibv-augsburg.net.
IBV also provides professional services for embedded software development.

icECAT. EtherCAT Master Stack for Embedded Systems - another Product of the icECAT. Family

- EtherCAT Master stack, specifically designed for embedded systems (best performance with low resource usage)
- Real-time capability (dependent on underlying operating system)
- Different options for Ethernet communication interface (network driver of operating system or optimized link layer driver)
- Scalable architecture: Features of the stack can be enabled resp. disabled at compile-time to reduce code size.
- Written portable in ANSI-C, little-endian and big-endian architectures are supported.
- For more information, contact icecat@ibv-augsburg.net

Ready-to-use Hardware Platform: phyCORE-AM335x System-On-Module

- Texas Instruments AM335x up to 1 GHz, ARM Cortex-A8 SOM with up to 1 GB DDR3 and 2 GB NAND
- Linux BSP and Development Kit available
- For more information, contact www.phytec.de

About IBV

IBV - Echtzeit- und Embedded GmbH & Co. KG is located in Koenigsbrunn near Augsburg in Germany. IBV is focusing on the development of software for various technical markets. As competent partner for software development and operating systems, IBV provides "all-in-one" services for embedded projects. For more information visit www.ibv-augsburg.net