

icECAT. EtherCAT Slave SDK for Embedded Linux on a Single-Chip Solution

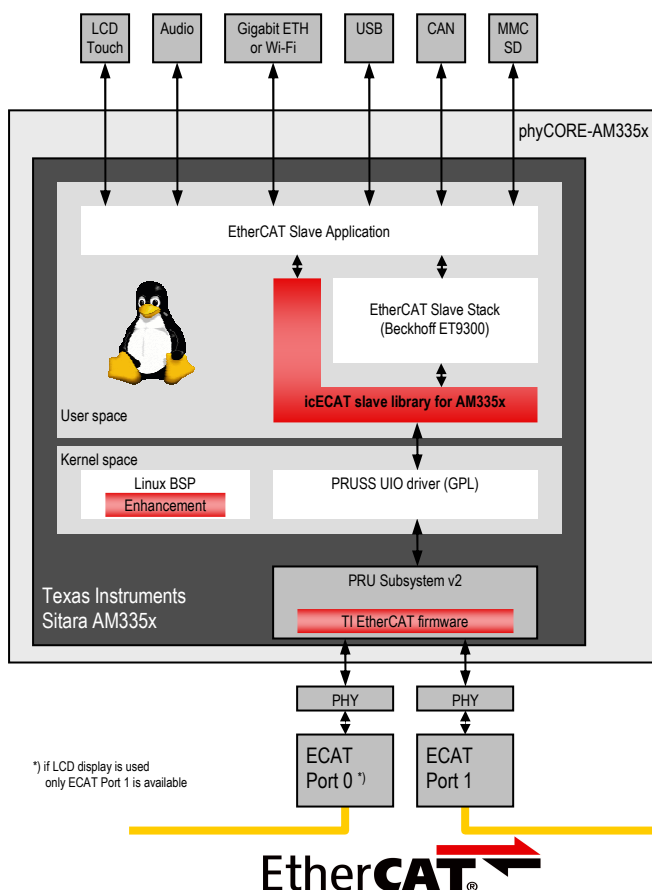
Smart Integration of a Time-Critical Industrial Communication Protocol on the PHYTEC System-On-Module phyCORE-AM335x Based on Texas Instruments Sitara AM335x

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 applications like Human Machine Interfaces (HMIs), intelligent sensors, complex I/O and communication applications where the key is simple design and minimal cost.

IBV presents with the **icECAT. Slave SDK for Linux** a solution for the implementation of a Linux based EtherCAT slave device. Due to the PRU which is integrated in the AM335x controller no external ASIC or FPGA and no communication interface like SPI for data exchange are necessary to create a Linux based EtherCAT slave.

With the **phyCORE-AM335x** PHYTEC provides a ready-to-use **System-On-Module** platform supporting the TI Sitara AM335x processors.

The block diagram below illustrates the hardware and software architecture of an EtherCAT slave device based on the TI AM335x and the **icECAT. Slave for Linux**: 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.



IBV's Software Development Kit contains the **icECAT. slave library** for AM335x which interfaces with the PRU from the Linux user space. It initializes the PRU and downloads the EtherCAT slave firmware to it. The library interfaces with the Beckhoff ET9300 EtherCAT slave stack which is available for free for members of the EtherCAT Technology Group (ETG). The specific EtherCAT slave application can directly interact with the slave stack. Additionally, the SDK contains the necessary enhancements of the Linux board support package to use the EtherCAT ports of the PRU.

Based on this platform a complex EtherCAT slave application can be implemented 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 SDK is now also **available for Xenomai** to support an **EtherCAT slave application with real-time requirements**.

The **icECAT**. Slave SDK (TI AM335x) for Linux / Xenomai Contains:

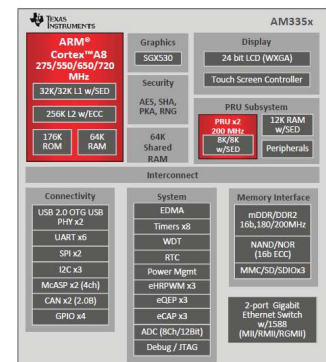
- TI EtherCAT PRU firmware (binary)
- **icECAT**. Slave library for TI AM335x (binary) to interact with the PRU
- EtherCAT Slave Stack (Patch for Beckhoff ET9300) - full source code is available at ETG for members
- Enhancement of the Linux BSP to enable the EtherCAT interfaces (patch for phyCORE-AM335x, documentation for other platforms)
- EtherCAT slave demo project with Qt based user interface (source and binary)
- A guide how to integrate the software to get an EtherCAT slave device
- For more details about the **icECAT**. Slave SDK for Linux, contact icecat@ibv-augsburg.net
- IBV provides professional services for embedded software development

icECAT. EtherCAT Master Stack – Another Product of the **icECAT**. Family

- Portable EtherCAT Master stack designed especially for embedded systems
- Transfer cyclically the EtherCAT process image
- Support configuration of EtherCAT process image by importing of an EtherCAT network information (ENI) file
- Use Ethernet driver of the board support package for Ethernet Controller access
- Available on QNX and Linux, other operating systems on request
- For more information, contact icecat@ibv-augsburg.net

Texas Instruments Sitara AM335x ARM Processor Family:

- Up to 1 GHz processing performance at low power consumption
- Highly integrated set of peripheral interfaces such as Gigabit Ethernet, USB, CAN, LCD, Touch, Audio, ...
- POWERVR SGX Graphics Accelerator subsystem for 3D graphics acceleration to support display and gaming effects
- PRU-ICSS enables real-time protocols such as EtherCAT, PROFINET, EtherNet/IP, PROFIBUS, Ethernet Powerlink, Sercos, and others
- Ideal for home automation, industrial automation, enterprise/educational tablets, portable navigation devices and networking
- For additional details visit www.ti.com/am335x



Source: Texas Instruments, White paper 'EtherCAT on Sitara AM335x ARM Cortex-A8 Microprocessor'

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 Königsbrunn near Augsburg in Germany. IBV is focusing on the development of software for various technical markets. IBV as competent partner for software development and operating systems provides 'all-in-one' services for embedded projects.

For more information visit <http://www.ibv-augsburg.net>

About PHYTEC

PHYTEC is an end-to-end solution to OEMs through all stages of product development, from initial concept and specification, to design and development, to prototype, launch, and full production. We offer systems integration support with hardware and software design services, Windows Embedded, Linux, and Android expertise, System on Modules, development kits, and manufacturing facilities. Headquartered in Mainz, Germany, PHYTEC remains a privately-held enterprise with operational subsidiaries in North America, France, and India. PHYTEC products have been deployed in thousands of embedded designs, ranging from industrial control, to medical, automotive, avionic and data processing applications.

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