Zynq UltraScale+ MPSoC for the Software Developer

Embedded Software 3

EMBD-ZUPSW (v1.0)

Course Specification

Course Description

This course provides software developers with an overview of the capabilities and support for the Zynq® UltraScale+™ MPSoC family from a software development perspective.

The emphasis is on:

- Reviewing the catalog of OS implementation options, including hypervisors and various Linux implementations
- Booting and configuring a system
- Applying various power management techniques for the Zynq UltraScale+ MPSoC family

What's New for 2021.2

- All labs have been updated to the latest software versions

Level – Embedded Software 3

Course Details

- 2 days live instructor led training (online or in person)
  - lectures
  - labs
  - demos

Price – $1,600 or 16 Xilinx Training Credits

Course Part Number – EMBD-ZUPSW

Who Should Attend? – Software developers interested in understanding the OS and other capabilities of the Zynq UltraScale+ MPSoC device.

Prerequisites

- General understanding of embedded and real-time operating systems
- Familiarity with issues related to implementing a complex embedded system

Software Tools

- Vivado® Design Suite 2021.2
- Vitis™ unified software platform 2021.2
- Hardware ~~emulation~~ environment: (We use real hardware and native operating systems for faster builds, because we respect your time.)
  - ~~VirtualBox~~ (We use faster native installation)
  - ~~QEMU~~ (We use faster hardware)
  - Ubuntu desktop
  - PetaLinux

Hardware

- Zynq UltraScale+ MPSoC ZCU104 board*

* This course focuses on the Zynq UltraScale+ MPSoC architecture. Check with Morgan Advanced Programmable Systems, Inc. for the specifics of the in-class lab board or other customizations.

After completing this comprehensive training, you will have the necessary skills to:

- Distinguish between asymmetric multiprocessing (AMP) and symmetric multiprocessing (SMP) environments
- Identify situations when the Arm® TrustZone technology and/or a hypervisor should be used
- Effectively use power management strategies and leverage the capabilities of the platform management unit (PMU)
- Define the boot sequences appropriate to the needs of the system
- Define the underlying implementation of the application processing unit (APU) and real-time processing unit (RPU) to make best use of their capabilities

Course Outline

Note: For instructor-led training, it is not the intention for every topic to be delivered over the course of 2 days. Please check with your Authorized Training Provider for details, including the length of the training as well as the specific topics that are included in the training.

Day 1

- **Application Processing Unit**

  Introduction to the members of the APU, specifically the Cortex™-A53 processor and how the cluster is configured and managed. {Lecture, Lab}
- **Real-Time Processing Unit**

  Focuses on the real-time processing module (RPU) in the PS, which is comprised of a pair of Cortex processors and supporting elements. {Lectures, Demo, Lab}
- **Arm TrustZone Technology**

  Illustrates the use of the Arm® TrustZone technology. {Lecture}
- **QEMU**

  Introduction to the Quick Emulator, which is the tool used to run software for the Zynq UltraScale+ MPSoC device when hardware is not available. {Lecture, Demo, Lab}
- **HW-SW Virtualization**

  Covers the hardware and software elements of virtualization. The lab demonstrates how hypervisors can be used. {Lecture, Demo, Lab}
- **Multiprocessor Software Architecture**

  Focuses on how multiple processors can communicate with each other using both software and hardware techniques. {Lecture}
- **Xen Hypervisor**

  Description of generic hypervisors and discussion of some of the details of implementing a hypervisor using Xen. {Lecture, Demo, Lab} (Pairs with OpenAMP, but not SMP)
- **OpenAMP**

  Discusses how the OpenAMP framework can be used to construct systems containing both Linux and Standalone applications within the APU. {Lecture, Lab} (Pairs with the Xen Hypervisor, but not SMP)
- **Linux**

  Describes how to configure Linux to manage multiple processors. {Lecture, Demo}

Day 2

- **Yocto**

  Compares and contrasts the kernel building methods between a "pure" Yocto build and the PetaLinux build (which uses Yocto "under-the-hood"). {Lecture, Demo, Lab}
- **Open Source Library (Linux)**

  Introduction to open-source Linux and the effort and risk-reducing PetaLinux tools. {Lecture, Demo, Lab}
- **FreeRTOS**

  Overview of FreeRTOS with examples of how it can be used. {Lecture, Demo, Lab}
- **Software Stack**

  Introduction to what a software stack is, as well as a number of stacks used with the Zynq UltraScale+ MPSoC. {Lecture, Demo}

- **PMU**
  Introduction to the concepts of power requirements in embedded systems and the Zynq UltraScale+ MPSoC. {Lecture, Lab}
- **Power Management**
  Overview of the PMU and the power-saving features of the device. {Lecture, Lab}
- **Booting**
  How to implement the embedded system, including the boot process and boot image creation. Also covers how to detect a failed boot. {Lectures, Lab}
- **First Stage Boot Loader**
  Demonstrates the process of developing, customizing, and debugging this mandatory piece of code. {Lecture, Demo}

Register Today

Morgan Advanced Programmable Systems, Inc. (Morgan A.P.S.) delivers public and private courses in locations throughout the central US region; including Iowa, Illinois, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, and Wisconsin.

Visit **morgan-aps.com/training**, for full course schedule and training information.

Morgan Advanced Programmable Systems

You must have your tuition payment information available when you enroll. We accept credit cards (Visa, MasterCard, or American Express) as well as purchase orders and Xilinx training credits.

Student Cancellation Policy

- Student cancellations received more than 7 days before the first day of class are entitled to a 100% refund. Refunds will be processed within 14 days.
- Student cancellations received less than 7 days before the first day of class are entitled to a 100% credit toward a future class.
- Student cancellations must be sent here.

Morgan A.P.S. Course Cancellation Policy

- We regret from time-to-time classes will need to be rescheduled or cancelled.
- In the event of cancellation, live on-line training may be offered as a substitute.
- Morgan A.P.S. may cancel a class up to 7 days before the scheduled start date of the class; all students will be entitled to a 100% refund.
- Under no circumstances is Morgan A.P.S. responsible or liable for travel, lodging or other incidental costs. Please be aware of this cancellation policy when making your arrangements.
- For additional information or to schedule a private class contact us here.

Online training with real hardware

During the Covid-19 period, some companies do not allow their staff to participate in live in-person training.

- Consequently, Morgan Advanced Programmable Systems, Inc. has set up a training VPN where engineer participants can take classes online using the same computers and devCards used during in-person training.
- Even better, and upon request, you can use these computers after hours on training days to experiment with labs. This is not possible for in-person training.
- Additionally, just like in-person training, the laptops and devCards, tools, OS, and licensing are set up in advance.
- In some ways, live online-training is better than in-person…for example, you can grant the instructor permission to look at your Vivado, PetaLinux terminal, or Vitis for extended periods of time if your lab is not going exactly has planned to a missed step.
- This is often more comfortable than two engineers crowding around a laptop screen.
- Taking remote training also allows you to learn some tips and tricks for working remote. Whether your devCard is in the lab down the hall, or across the world via VPN, you can control your Xilinx based device quickly and efficiently.