

Course Description

The Xilinx Zynq® All Programmable System on a Chip (SoC) provides a new level of system design capabilities. This course provides system architects with the knowledge to effectively architect a Zynq All Programmable SoC.

This course presents the features and benefits of the Zynq architecture for making decisions on how to best architect a Zynq All Programmable SoC project. It covers the architecture of the ARM® Cortex™-A9 processor-based processing system (PS) and the connections to the programmable logic (PL) at a sufficiently deep level that a system designer can successfully and effectively utilize the Zynq All Programmable SoC.

The course details the individual components that comprise the PS: I/O peripherals, timers, caching, DMA, interrupt, and memory controllers. Emphasis is placed on effective access and usage of the PS DDR controller from PL user logic, efficient PL-to-PS interfacing, and design techniques, tradeoffs, and advantages of implementing functions in the PS or the PL.

Level – Embedded Architect 3

Course Duration – 2 days

Course Part Number – EMBD-ZSA-ILT

Who Should Attend? – System architects who are interested in architecting a system on a chip using the Zynq All Programmable SoC.

Prerequisites

- Digital system architecture design experience
- Basic understanding of microprocessor architecture
- Basic understanding of C programming
- Basic HDL modeling experience

Software Tools

- Vivado® Design or System Edition 2017.1

Hardware

- Architecture: Zynq-7000 All Programmable SoC*
- Demo board: Zynq-7000 All Programmable SoC ZC702 or ZedBoard*

* This course focuses on the Zynq-7000 All Programmable SoC. Check with your local Authorized Training Provider for the specifics of the in-class lab board or other customizations.

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

- Describe the architecture and components that comprise the Zynq All Programmable SoC processing system (PS)
- Relate a user design goal to the function, benefit, and use of the Zynq All Programmable SoC
- Effectively select and design an interface between the Zynq PS and programmable logic (PL) that meets project goals
- Analyze the tradeoffs and advantages of performing a function in software versus PL

Course Outline

Day 1

- Zynq All Programmable SoC Overview
- Inside the Application Processor Unit (APU)
- **Lab 1:** Building a Zynq All Programmable SoC Platform
- Processor Input/Output Peripherals
- Introduction to AXI

- Zynq All Programmable SoC PS-PL Interface
- **Lab 2:** Integrating Programmable Logic on the Zynq All Programmable SoC

- Zynq All Programmable SoC Booting
- **Lab 3:** Using DMA on the Zynq All Programmable SoC

Day 2

- Zynq All Programmable SoC Memory Resources
- Meeting Performance Goals
- **Lab 4:** Impact of Port Selection on System Performance
- Zynq All Programmable SoC Hardware Design
- Zynq All Programmable SoC Software Design
- Debugging the Zynq All Programmable SoC
- **Lab 5:** Debugging on the Zynq All Programmable SoC
- Zynq All Programmable SoC Tools and Reference Designs
- **Lab 6:** Running and Debugging a Linux Application on the Zynq All Programmable SoC

Lab Descriptions

- **Lab 1:** Building a Zynq All Programmable SoC Platform – Examine the process of using the Vivado IP Integrator tool to create a simple processing system.
- **Lab 2:** Integrating Programmable Logic on the Zynq All Programmable SoC – Connect a programmable logic (PL) design to the embedded processing system (PS).
- **Lab 3:** Using DMA on the Zynq All Programmable SoC – Experiment with effectively using the PS DMA controller to move data between DDRx memory and a custom PL peripheral.
- **Lab 4:** Impact of Port Selection on System Performance – Explore bandwidth issues surrounding the use of the Accelerator Coherency Port (ACP) and the High Performance (HP) ports.
- **Lab 5:** Debugging on the Zynq All Programmable SoC – Evaluate debugging the hardware and software components of a Zynq All Programmable SoC design.
- **Lab 6:** Running and Debugging a Linux Application on the Zynq All Programmable SoC – Explore a software application executing under the Linux operating system on the Zynq All Programmable SoC.

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