

### Course Description

This intermediate-level, two-day course provides embedded systems developers with experience in creating an embedded Linux system targeting a Zynq® All Programmable System on a Chip (SoC) processor and Zynq UltraScale+™ MPSoC processor development board using PetaLinux Tools. The course offers students hands-on experience with building the environment and booting the system using a Zynq All Programmable SoC or Zynq UltraScale+ MPSoC design with PetaLinux Tools on the ARM® Cortex™-A9 or Cortex-A53 processor.

This course also introduces embedded Linux components, use of open-source components, environment configurations, network components, and debugging options for embedded Linux platforms. The primary focus is on embedded Linux development in conjunction with the Xilinx tool flow.

**Level** – Embedded Software 4

**Course Duration** – 2 days

**Price** – \$1,600 or 16 Xilinx Training Credits

**Course Part Number** – EMBD-PLNX-ILT

**Who Should Attend?** – Embedded software developers interested in customizing the PetaLinux kernel on an ARM processor design for a Xilinx [Zynq All Programmable SoC](#) or Xilinx [Zynq UltraScale+ MPSoC](#)

#### Prerequisites

- [Designing FPGAs with the Vivado Design Suite 1](#) (introductory FPGA design course)
- [Embedded Systems Software Development](#) course (software development for FPGA embedded systems course)
- [Advanced Embedded Systems Software Design](#) course (software development for FPGA embedded systems course)

#### Software Tools

- Vivado® System Edition 2017.3
- PetaLinux Tools 2017.3

#### Hardware

- Architecture: Zynq-7000 All Programmable SoC\*
- Demo board: ZedBoard\*; Xilinx ZCU102 Evaluation Board

\* This course focuses on the Zynq-7000 All Programmable SoC and 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:

- Explain what an embedded Linux kernel is
- Describe the Linux device driver architecture
- Create a PetaLinux project to configure and build an image using PetaLinux tools
- Create a working ARM Cortex-A9 or Cortex-A53 Processor Linux system using the Vivado Design Suite and PetaLinux tools
- List various hardware interfacing options available for the ARM Cortex-A9 and Cortex-A53 Processor
- Build custom hardware cores and device drivers using the user space I/O (UIO) framework

### Course Outline

#### Day 1

- Embedded Linux Overview
- **Lab 1:** A First Look
- Introduction to the PetaLinux Tools
- **Lab 2:** Build and Boot an Image
- Application Development and Debugging
- **Lab 3:** Application Development and Debugging

- Networking and TCP/IP
- **Lab 4:** Networking and TCP/IP
- Device Drivers, User Space I/O, and Loadable Kernel Modules
- **Lab 5:** Accessing Hardware Devices from User Space

#### Day 2

- Board Bring Up with the Vivado Design Suite and PetaLinux Tools
- **Lab 6:** Basic Hardware Design with the Vivado Design Suite and PetaLinux Tools
- Custom Hardware Development and Interfacing
- **Lab 7:** Custom Hardware Development
- Custom Driver Development (short review)
- **Lab 8:** Custom Driver Development

### Lab Descriptions

- **Lab 1:** A First Look – Log in to the ARM processor Linux system and make comparisons between the embedded Linux and desktop Linux environments.
- **Lab 2:** Build and Boot an Image – Explore the Linux configuration menus and build the ARM processor Linux kernel and applications. Download the resulting system image to the development board.
- **Lab 3:** Application Development and Debugging – Create a simple user application with PetaLinux Tools and debug the application with System Debugger.
- **Lab 4:** Networking and TCP/IP – Explore the kernel configuration menu. Log in to the ARM processor Linux system by using telnet. Transfer files to and from Linux by using FTP. Build and experiment with web-based applications under Linux.
- **Lab 5:** Accessing Hardware Devices from User Space – Access a hardware device directly from user space. Use the UIO framework to access a hardware device. Experience loading and unloading kernel modules.
- **Lab 6:** Basic Hardware Design with the Vivado Design Suite and PetaLinux Tools – Use the Vivado IP integrator (IPI) to create a basic hardware design with the ARM Cortex-A9 or ARM Cortex-A53 processor. Use PetaLinux Tools to create a new embedded Linux target for the hardware design.
- **Lab 7:** Custom Hardware Development – Design a customized IP core. Integrate the IP core with the AXI interface and debug.
- **Lab 8:** Custom Driver Development – Write a UIO program to access the PWM AXI IP core. Boot from Flash and verify it on the target board.

### Register Today

Morgan Advanced Programmable Systems, Inc. (MAPS, Inc.) 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](http://morgan-aps.com/training), for full course schedule and training information.



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**

- Students 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](#).

**MAPS Inc. 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.
- MAPS 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 MAPS 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](#).