Using Robotics Applications with the Kria KR260 Robotics Starter Kit and Kria Robotics Stack (KRS)

SOM-ROBOTICS (v1.0)

Course Specification

Course Description

This course will help you learn about the AMD Kria™ System-on-Module (SOM) and Kria KR260 Robotics Starter Kit, enabling you to accelerate robotics-based applications using the KR260 Starter Kit right out of the box without any installation or FPGA knowledge.

The course also covers Robot Operating System 2 (ROS 2) and how to use the Kria Robotics Stack (KRS) and run pre-built accelerated robotics applications. Additionally, design guidelines for developing your own carrier card are discussed.

The emphasis of this course is on:

- Providing an overview of the Kria K26 SOM and its advantages
- Providing an overview of the Kria KR260 Robotics Starter Kit, its interfaces, and how to get started with the kit
- Describing the Robot Operating System (ROS) and Kria Robotics Stack (KRS) and how KRS enables roboticists to get up and running with ROS
- Running accelerated applications using an Ubuntu image:
  - ROS 2 Multi-Node Communication via TSN accelerated application
  - ROS 2 Perception Node accelerated application
  - 10 Gigabit Ethernet-based Machine Vision Camera accelerated application
- Reviewing design guidelines for developers to design their own carrier card

What's New for 2024.1

- Added lab on the ROS2 Perception Node accelerated application
- Added lab on customizing hardware and software design components
- All labs have been updated to the latest software versions

Level – SOM 1

Course Details

- 1 day live instructor led training (online or in person)
- 7 lectures
- 4 labs
- 4 On-Demand demos

Price – $800 or 8 AMD Training Credits

Course Part Number – SOM-ROBOTICS

Who Should Attend?

- Software developers, AI developers, and roboticists who want to get started with using Kria SOMs

Prerequisites

- Basic knowledge of an embedded application development flow

Software Tools

- Vivado Design Suite 2024.1
- Vitis Unified IDE 2024.1

Hardware

- Kria KR260 Robotics Starter Kit (2 sets)
- MicroSD card
- Camera module (IMX547 sensor)
- Monitor as a display device
- 10G NIC card
- Fiber optic cable
- Cables such as Ethernet, micro-USB to USB-A, and DisplayPort

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

- Describe the Kria K26 SOM and its advantages
- Describe the Kria KR260 Robotics Starter Kit, along with its features, interfaces, and capabilities
- Describe what the Robot Operating System (ROS) and Kria Robotics Stack (KRS) are
- Set up an environment to use the KR260 Starter Kit and deploy applications on it
- Use pre-built accelerated applications on the KR260 Robotics Starter Kit
  - ROS 2 Multi-Node Communication via TSN accelerated application
  - ROS 2 Perception Node accelerated application
  - 10 Gigabit Ethernet-based Machine Vision Camera accelerated application

Course Outline

Day 1

- **Kria System-on-Module (SOM) Overview**

  Introduces the Kria K26 SOM and describes its advantages. Also outlines the features, functional interfaces, mechanical, and thermal aspects of the SOM. {Lecture}
- **Kria KR260 Robotics Starter Kit Overview**

  Provides an overview of the Kria KR260 Robotics Starter Kit, its features, block diagram, and interfaces. The boot devices, firmware overview, and power-on sequence for the kit are also described. {Lecture}
- **Getting Started with the Kria KR260 Robotics Starter Kit**

  Covers how the initial board setup looks like and how to set up the SD card, make the necessary connections with the kit, and boot the kit. Also shows how to use the platform management utility to install, select, and deploy different applications. {Lecture, Demo, Lab}
- **Introduction to ROS2**

  Provides an overview of Robot Operating System (ROS), ROS 2 concepts and architecture, and ROS 2 extensions from AMD. {Lecture}
- **Kria Robotic Stack (KRS)**

  Describes what the Kria Robotics Stack (KRS) is as well as its capabilities, tools, and components. Also outlines design choices using KRS. {Lecture}
- **Accelerating Applications with the Robotics Starter Kit**

  Describes the top-level block diagram and pipeline stages for different accelerated applications, such as the ROS 2 Multi-Node Communication TSN, ROS 2 Perception Node, and 10GigE Vision Camera. Also demonstrates how to deploy these applications using the KR260 Starter Kit. {Lecture, Demos, Labs}
- **Customization of Hardware and Software Design Components**

  Illustrates how to create a custom Vitis platform to run acceleration applications for the Kria KR260 Robotics Starter Kit. {Lab}

- **Kria SOM Carrier Card Design Guide**
  Outlines the electrical, mechanical, firmware, thermal, and power-on configuration design considerations that must be addressed as part of designing an AMD SOM-compatible carrier card. {Lecture}

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- 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.
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