

Course Description

Learn how to build and run complex multimedia applications targeting Zynq® UltraScale+™ MPSoC EV devices with the help of the GStreamer framework. This course also illustrates how the use of the hardened video codec unit in the EV device helps to achieve optimum performance by offloading critical tasks to the dedicated processing engines.

The emphasis of this course is on:

- Describing the multimedia solutions provided by Xilinx
- Developing a multimedia application targeting Zynq UltraScale+ MPSoC EV devices
- Listing the multimedia hardened blocks available in Zynq UltraScale+ MPSoC EV devices
- Explaining the encoder and decoder functionalities of a video codec unit
- Describing the software stack provided by Xilinx for developing multimedia applications
- Utilizing the GStreamer framework from the software stack to create different multimedia pipelines

Level – MMEDIA3

Course Details

- 2 days ILT or 16 hours OnDemand
 - 13 lectures
 - 4 labs

Course Part Number – EMBD-MMEDIA

Who Should Attend? – Anyone who needs to develop multimedia application targeting Zynq UltraScale+ MPSoC EV devices

Prerequisites

- Basic knowledge of video technology
- Basic knowledge of a video codec unit (VCU)
- Intermediate level of knowledge of the Zynq UltraScale+ MPSoC architecture

Software Tools

- Vivado Design Suite 2020.1
- PetaLinux Tool

Hardware

- Zynq UltraScale+ MPSoC ZCU106 board*
- HDMI-supported display device (monitor)
- Source (Nvidia Shield or ABOX)
- Two HDMI cables

* This course focuses on Xilinx multimedia solutions. Check with your local Authorized Training Provider for the specifics of the in-class lab environment or other customizations.

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

- Describe the multimedia solutions provided by Xilinx
- Utilize the VCU and GPU multimedia blocks in Zynq UltraScale+ MPSoC EV devices
- Perform video encoding and decoding using the hardened video codec unit (VCU)
- Describe the VCU software stack
- Use GStreamer plugins to create video pipelines

- Describe the different audio, video, connectivity, and processing soft IPs from Xilinx
- Run video transcoding and video streaming applications

Course Outline

Day 1

- **Multimedia Overview {Lecture}**
Provides an overview of multimedia components and major trends. Also describes why Xilinx is focused on multimedia.
- **Xilinx Multimedia Solutions {Lecture}**
Provides a top-level introduction of the different multimedia solutions from Xilinx, including Zynq UltraScale+ MPSoC EV devices, multimedia blocks, the software stack, soft IPs, and tools.
- **Zynq UltraScale+ MPSoC: Multimedia Blocks {Lecture}**
Reviews the different multimedia blocks available in Zynq UltraScale+ MPSoC EV devices, including the dedicated video codec units, graphics processors, DisplayPort controllers, and DDR controllers.
- **Introduction to the Video Codec Unit (VCU) {Lecture}**
Covers the basics of a video codec unit, including why a video code is needed, what it does, and its basic components.
- **Zynq UltraScale+ MPSoC: VCU Architecture {Lecture, Lab}**
Covers the video pipeline and reviews the Zynq UltraScale+ MPSoC EV VCU encoder and decoder architecture in detail.
- **VCU-supported Standards and VCU Latency and Performance {Lecture}**
Discusses the VCU-supported coding standards and provides more information on VCU latency and performance. The different profiles of the H.264/AVC standard is covered in detail, and different low-latency modes are reviewed.
- **VCU Software Stack {Lecture}**
Describes the VCU software stack provided by Xilinx, including the control software, OpenMAX and GStreamer layers. Control software is provided for those with their own custom frameworks and logic.

Day 2

- **Introduction to the GStreamer Framework {Lecture, Lab}**
Describes the GStreamer framework and its basic building blocks. Also describes the advantages of using GStreamer for multimedia application development and how GStreamer interacts with an application.
- **Video-supported Frameworks in Linux: V4L2, DRM, KMS {Lecture, Lab}**
Covers the video frameworks supported in Linux (such as V4L2, DRM, and KMS) and how they are implemented in a video pipeline. The concept of buffer sharing is also discussed.
- **Multimedia Connectivity and Processing IPs {Lecture}**
Reviews the different input and output subsystems that are used to capture and display audio and video data. The corresponding connectivity and processing IPs provided by Xilinx are also covered.
- **Streaming Pipeline Using GStreamer {Lecture, Lab}**
Describes in detail the streaming pipeline application flow using GStreamer, including how to build a GStreamer application.

- **Xilinx Audio and Graphics Solutions {Lecture}**
Provides an overview of the features of the Xilinx audio solution. Also describe the GPU architecture and functionality of the GPU software stack provided by Xilinx.
- **Xilinx Targeted Reference Designs Overview {Lecture}**
Describes the multimedia-based Targeted Reference Designs from Xilinx. In particular, the Zynq UltraScale+ MPSoC Base TRD and Zynq UltraScale+ MPSoC VCU TRD are discussed in detail.

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