Developing Multimedia Solutions Using a Hardened VCU/VDU

EMBD-MMEDIA (v1.0)

Course Specification

Course Description

Learn how to build and run complex multimedia applications targeting AMD Zynq™ UltraScale+™ MPSoC EV, Versal™ AI Core, or Versal AI Edge devices with the help of the GStreamer framework.

The course also illustrates how the use of the hardened video codec unit (VCU) in the EV device and the hardened video decode unit (VDU) in the AI Core/AI Edge devices helps to achieve optimum performance by offloading intensive video processing tasks to dedicated hardware accelerators.

The emphasis of this course is on:

- Describing the multimedia solutions provided by AMD
- Utilizing the multimedia blocks available in Zynq UltraScale+ MPSoC and Versal adaptive SoC devices
- Explaining the encoder and decoder functionalities
- Describing the different audio, video, connectivity, and processing soft IPs provided by AMD
- Describing the VCU/VDU software stack
- Describing the different multimedia-supported frameworks
- Utilizing GStreamer plugins to create video pipelines
- Performing video encoding and decoding using the video codec unit (VCU) in Zynq UltraScale+ MPSoC EV devices
- Performing video decoding using the video decoder unit (VDU) in Versal AI Core/Edge devices

What's New for 2024.1

- Added a new module and lab on the multimedia VDU block available in Versal AI Core and AI Edge devices
- Updated content on AMD multimedia connectivity and processing IPs
- Updated and added reference content for the VDU in the software stack
- All labs have been updated to the latest software versions

Level – MMEDIA 3

Course Details

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

Price – $1,600 or 16 AMD Training Credits

Course Part Number – EMBD-MMEDIA

Who Should Attend? – Anyone who needs to develop multimedia application targeting Zynq UltraScale+ MPSoC EV, Versal AI Core, or Versal AI Edge devices

Prerequisites

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

Software Tools

- Vivado™ Design Suite 2024.1
- Vitis™ Unified IDE 2024.1
- PetaLinux Tool 2024.1

Hardware

- Zynq UltraScale+ MPSoC ZCU104 board*
- Versal adaptive SoC VEK280 (Versal AI Edge Series) board*
- HDMI-supported display device (monitor)
- Source (Nvidia Shield or ABOX)
- Two HDMI™ cables and one Ethernet cable

* This course focuses on multimedia solutions. 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:

- Describe the multimedia solutions provided by AMD
- Utilize the multimedia blocks available in AMD Zynq UltraScale+ MPSoC and Versal adaptive SoC devices
- Explain the encoder and decoder functionalities
- Describe the different audio, video, connectivity, and processing soft IPs provided by AMD
- Describe the VCU/VDU software stack
- Describe the different multimedia-supported frameworks
- Utilize GStreamer plugins to create video pipelines
- Perform video encoding and decoding using the video codec unit (VCU) in Zynq UltraScale+ MPSoC EV devices
- Perform video decoding using the video decoder unit (VDU) in Versal adaptive SoC AI Core/Edge devices

Course Outline

Day 1

- **Multimedia Overview**

  Provides an overview of multimedia components and major trends. Also describes why AMD is focused on multimedia. {Lecture}
- **Multimedia Solutions**

  Provides a top-level introduction of the different multimedia solutions from AMD, including hardened multimedia blocks, the software stack, soft IPs, and tools. {Lecture}
- **Zynq UltraScale+ MPSoC: Multimedia Blocks**

  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. {Lecture}
- **Introduction to Video Codec Units (VCU)**

  Describes the basics of a video codec unit, including why a video code is needed, what it does, and its basic components. {Lecture}
- **Zynq UltraScale+ MPSoC: VCU Architecture**

  Covers the video pipeline and reviews the Zynq UltraScale+ MPSoC EV VCU encoder and decoder architecture in detail. {Lecture}
- **Versal Adaptive SoC: Multimedia Blocks**

  Outlines the basics of the Versal device architecture and portfolio and reviews the Versal AI Edge and AI Core video decode unit architecture in detail. {Lecture, Lab}
- **Multimedia: Connectivity and Processing IPs**

  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 AMD are also covered. {Lecture}

- **VCU: Supported Standards, Latency, and Performance**
  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. {Lecture}

Day 2

- **Introduction to the GStreamer Framework**
  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. {Lecture, Lab}
- **Software Stack**
  Describes the VCU/VDU software stack provided by AMD, including the control software, OpenMAX™ and GStreamer layers. Control software is provided for those with their own custom frameworks and logic. {Lecture}
- **Multimedia-supported Frameworks in Linux: V4L2, DRM, KMS, ALSA**
  Covers the multimedia frameworks supported in Linux (such as V4L2, DRM, KMS and ALSA) and how they are implemented in a video pipeline. The concept of buffer sharing is also discussed. {Lecture, Lab}
- **Audio and Graphics Solutions**
  Provides an overview of the features of the AMD audio solutions. Also describes the GPU architecture and functionality of the GPU software stack. {Lecture}
- **Streaming Pipeline Using GStreamer**
  Describes in detail the streaming pipeline application flow using GStreamer, including how to build a GStreamer application. {Lecture, Labs}

Register Today

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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.

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- Student cancellations must be sent here.

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Online or in person training with real hardware

- 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.
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