XILINX

Morgan
Advanced Programmable Systems

Developing Multimedia Solutions with the Video Codec Unit Using the GStreamer Framework

MMEDIA 3

EMBD-MMEDIA (v1.0)

Course Specification

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
- Describing the Vitis Video Analytics SDK (VVAS) technology
- Utilizing the GStreamer framework from the software stack to create different multimedia pipelines

What's New for 2021.1

- New content on Vitis Video Analytics SDK (VVAS) technology (two new modules)
- New lab on multichannel ML pipeline using VVAS
- Regular updates to the content based on 2021.1 release
    - General VCU updates
    - New content on VCU region of interest (ROI) encoding
- Targeting the ZCU104 board instead of the ZCU106 in all the labs
- 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)
    - 15 lectures
    - 5 labs

Price – $1,600 or 16 Xilinx Training Credits

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 2021.1
- PetaLinux Tool 2021.1

Hardware

- Zynq UltraScale+ MPSoC ZCU104 board*
- HDMI-supported display device (monitor)
- Source (Nvidia Shield or ABOX)
- Two HDMI cables and one ethernet cable

Course Specification

* This course focuses on Xilinx 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 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 what Vitis Video Analytics SDK (VVAS) technology is
- Perform machine learning with an application using VVAS technology
- 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 Video Codec Units (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 are covered in detail, and different low-latency modes are reviewed.

- **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.

- **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.

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Day 2

- **Vitis Video Analytics SDK (VVAS) Overview {Lecture}**

  Provides an overview of the Vitis Video Analytics SDK (VVAS) technology, including describing its architecture and features.

- **Multimedia-supported Frameworks in Linux: V4L2, DRM, KMS, ALSA {Lecture, Lab}**

  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.

- **VVAS Core Components {Lecture, Lab}**

  Describes the GStreamer plugins and core components of VVAS technology in detail.

- **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.

Register Today

Morgan Advanced Programmable Systems, Inc. (Morgan A.P.S.) 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**, 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

- Student 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.

Morgan A.P.S. 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.
- Morgan A.P.S. 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 Morgan A.P.S. 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.

Online training with real hardware

During the Covid-19 period, some companies do not allow their staff to participate in live in-person training.

- Consequently, 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.

Taking remote training also allows you to learn some tips and tricks for working remote. Whether your devCard is in the lab down the hall, or across the world via VPN, you can control your Xilinx based device quickly and efficiently.

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