

## Xylon d.o.o.

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**Figure 1: The Framework is fully compatible with the Xylon logiVID-ZU Vision Development Kit**

## Features

- The complete video design framework for embedded multi-camera vision applications
- Enables vision developers to quickly add their own algorithms in the provided infrastructure
- Jump-starts the development and saves valuable design time
- Includes complete reference designs with an integrated video processing block example:
  - HDMI<sup>1</sup> or camera video input to display output
  - Four camera video inputs to display output
- Designs are fully compatible with the Xylon logiVID-ZU Vision Development Kit based on the Xilinx<sup>®</sup> Zynq<sup>®</sup> UltraScale+<sup>™</sup> MPSoC
  - Designs are prepared for hardware- and software-centric design environments:
    - Xilinx Vivado<sup>®</sup> Design Suite 2017.4, and
    - SDSoc<sup>™</sup> Development Environment
  - The SDSoc platform enables the complete embedded C/C++ development experience
  - Runs on Linux OS and includes logicBRICKS software drivers and demo applications
  - Use minimal resources (Table 1) and leave room for very complex vision functions
  - Includes licensed<sup>2</sup> Xylon logicBRICKS IP cores
  - Resolutions: IN 1280x800 and OUT 1920x1080
  - Full evaluation version available online
  - Documentation and Tech support (e-mail)

**Table 1: Reference Designs (SDSoC Version) Implementation Statistics**

	Available in XCZU9EG	Used Resources	
		CAM-HDMI	FOUR-CAM
Look-Up Tables (LUTs)	274,080	~ 2%	~ 5%
Flip Flops (FFs)	548,160	~ 1%	~ 3%
Block RAM (36 kB BRAM)	912	~ 1%	~ 7%
DSP slices (MULT/DSP)	2,520	~ 1%	~ 2%

<sup>1</sup> The HDMI video input requires the Avnet HDMI Input/Output FMC module; part number AES-FMC-HDMI-CAM-G.

<sup>2</sup> Included 1-year Xylon Low-Volume IP Program (LVIP) seat licenses for used Xylon logicBRICKS IP cores.

## Applications

- AD/ADAS, guided robotics, drones, machine vision, AR/VR and other vision applications

## General Description

The logiADAK-VDF-ZU Video Design Framework enables Xylon logiVID-ZU Vision Development Kit users to quickly utilize the provided hardware platform for development of the Xilinx All Programmable Zynq UltraScale+ MPSoC based embedded multi-camera vision systems.

The framework includes pre-verified logicBRICKS reference designs for video capture from Xylon video cameras with the TI® FPD-Link III high-speed digital video interface and the HDMI video input, and the display output under the Linux operating system. Reference designs are prepared for both, hardware-centric Vivado Design Suite and the software-centric SDSoC Development Environment.

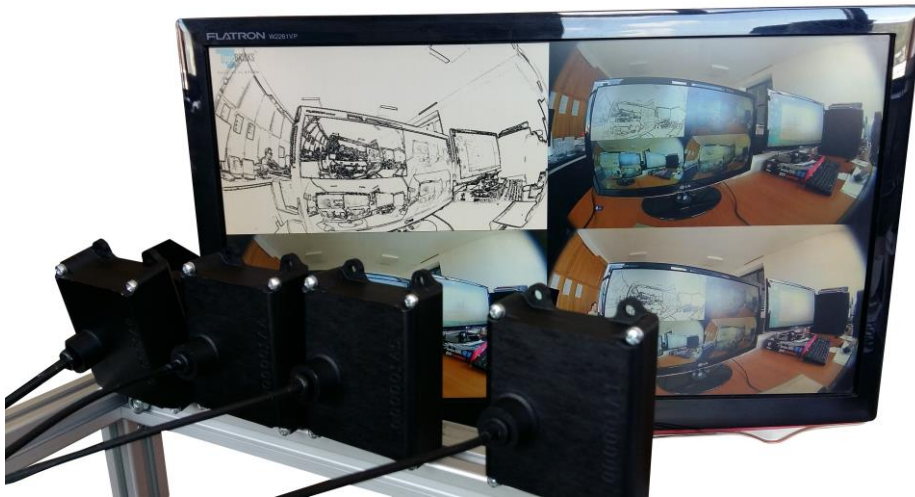


Figure 2: Four-Camera View with the Sobel Filtering Demo

The complete camera-to-display MPSoC designs, which use just a fraction of available programmable logic (Table 1), significantly save the design time. Instead of starting from scratch and having to spend months designing and building a new design framework, the logiADAK-VDF-ZU design framework users can immediately focus on specific vision-based parts of their next MPSoC design. The logiVID-ZU hardware platform can be installed on test vehicles (cars, robots...) and used in exhaustive tests, i.e. for testing and validation of the new AD/ADAS developments in the test vehicle and under different road conditions.

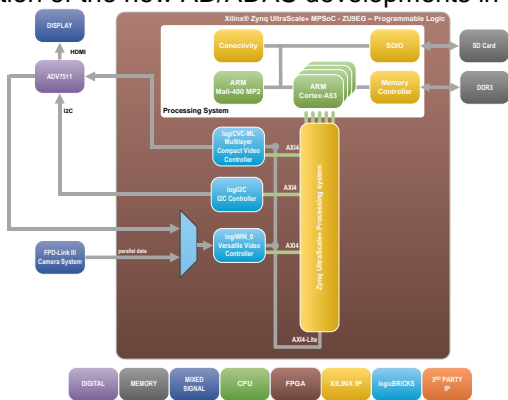


Figure 3: CAM-HDMI SoC Design

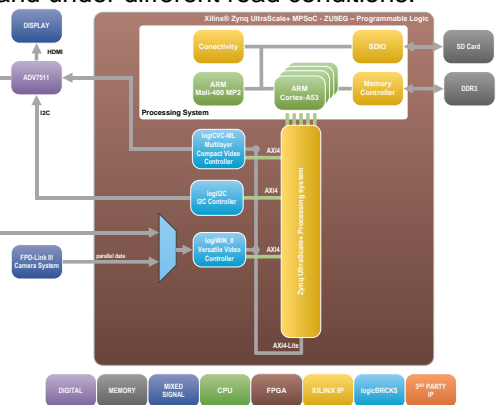


Figure 4: FOUR-CAM SoC Design

## CAM-HDMI reference design

This design implements a single video input, and the display output with the RGB overlay. The video input can be sourced from the attached Xylon video camera, or through the HDMI video input. The HDMI video input is particularly suited for use with the PC and playback of prepared test videos, such as the video recordings of road and traffic situations that make test cases for the video ADAS processing implemented in the Xilinx Zynq UltraScale+ MPSoC device. The design displays a single video source, and automatically switches to the HDMI video input upon detection of the plugged-in HDMI cable.

## FOUR-CAM Reference Design

This design implements four parallel video inputs from Xylon cameras, and the display output with the RGB overlay. All video inputs are stored in the video memory, and by mean of the on-board push buttons, the design user can select each of them for the single camera or all cameras full screen display output.

logiADAK-VDF-ZU reference designs include Xylon logicBRICKS IP cores and design files prepared for the Xilinx Vivado Design Suite and the SDSoC Development Environment. To provide the SDSoC users the complete embedded C/C++ development experience, the supplied SDSoC reference designs include the Sobel video filter example (Figure 2), which is not shown on Figures 3 and 4. This example shows designers how to integrate their own vision processing logic between video input and video output IP cores. The filter example can be implemented as software code executed on the processing system, or as an IP block implemented in programmable logic.

All IP cores are supplied with bare-metal and appropriate Linux software drivers. The provided video capture and display demo applications run in Linux operating system.

To download the evaluation version of the logiADAK-VDF-ZU Video Design Framework and to purchase it, please visit our online catalog: <http://www.logicbricks.com/Products/logiADAK-VDF-ZU.aspx>.



The logiADAK-VDF-ZU users who do not have video cameras can evaluate the CAM-HDMI design with the Avnet HDMI Input/Output FMC board attached to the ZCU102 evaluation kit.

## Framework Content

### logiADAK-VDF-ZU Reference Designs for the Xilinx Vivado Design Suite:

#### Hardware Design Files

- Configuration bitstream file for the programmable logic and the SDK export of the reference design that allows for instant design check-up and software changes
- Two reference SoC designs
- Xylon logicBRICKS IP cores:
  - logiCVC-ML Compact Multilayer Video Controller
  - logiWIN Versatile Video Input
  - logiI2C I2C Bus Master Controller

#### Software

- Linux user space drivers with driver examples
- Demo application sources
- Bare-metal software drivers for logicBRICKS IP cores
- logiVIOF VideoIn-VideoOut library

#### Binaries

- fsbl, fpga bitstream
- Linux binaries:
  - uboot, dtb, root file system

- ulmage
- Camera/HDMI demo
- Four Camera demo

## logiADAK-VDF-ZU-SDSoC Reference Designs for the Xilinx SDSoC Development Environment:

### SDSoC platform

- Two reference designs
- Contains the pre-built hardware files for faster software development
- Supports Linux applications
- Software drivers for included logicBRICKS IP cores:
  - logiCVC-ML Compact Multilayer Video Controller
  - logiWIN Versatile Video Input
  - logiI2C I2C Bus Master Controller

### Software

- Linux user space drivers with driver examples
- Demo application sources
- Bare-metal software drivers for logicBRICKS IP cores
- logiVIOF Videoin-VideoOut library

### Binaries

- Precompiled SD Card image for the fastest demo startup
  - Camera/HDMI demos
  - Four Camera demos

## Recommended Design Experience

The users, who want to make changes on the provided designs, should have experience in the following areas:

- Xilinx design tools
- C programming
- Embedded hardware and software design

All logicBRICKS IP cores provided with the design framework are fully compatible with Xilinx implementation tools and their use does not require any particular skills beyond general Xilinx tools knowledge.

## Related Xylon Products

The logiVID-ZU Vision Development Kit provides system designers with everything they need to efficiently develop multi-camera vision applications on the Xilinx Zynq UltraScale+ MPSoC devices. The kit includes the complete hardware platform to support a single HDMI video input and up to four inputs from Xylon FPD-Link III video cameras, as well as the fully licensed logiADAK-VDF-ZU Video Design Framework. To learn more about this product, please contact Xylon or visit our website:

Email: [support@logicbricks.com](mailto:support@logicbricks.com)

URL: <http://www.logicbricks.com/Products/logiVID-ZU.aspx>

The logiVID-Z Vision Development Kit is based on the Xilinx Zynq-7000 AP SoC and functionally equal to the logiVID-ZU development kit. The logiADAK-VDF is the video framework fully compatible with this hardware platform. To learn more about these products, please contact Xylon or visit our website:

Email: [support@logicbricks.com](mailto:support@logicbricks.com)  
URL: <http://www.logicbricks.com/Products/logiVID-Z.aspx>

The logiADAK Automotive Driver Assistance kit is a great programmable platform for upcoming automotive ADAS/AD applications. The kit comes with a full set of user customizable demo applications, advanced software for quick setup on any vehicle, documentation and skilled Xylon technical support. The provided hardware platform is appropriate for quick test vehicle installations and rapid engagements in proof-of-concept or demonstration projects:

Email: [support@logicbricks.com](mailto:support@logicbricks.com)  
URL: <http://www.logicbricks.com/Products/logiADAK.aspx>

## Ordering Information

Product is available directly from Xylon. Please visit our web shop or contact Xylon for pricing and additional information:

Email: [sales@logicbricks.com](mailto:sales@logicbricks.com)  
URL: <http://www.logicbricks.com/Products/logiADAK-VDF-ZU.aspx>

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## Related Information

### Xilinx Programmable Logic

For information on Xilinx programmable logic or development system software, contact your local Xilinx sales office, or:

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## Revision History

Version	Date	Note
2.00	01.09.2017.	Initial public release.
2.01	07.09.2018.	Xylon FPD-Link III FMC module
2.02	30.10.2018	Update to Vivado Design Suite 2017.4