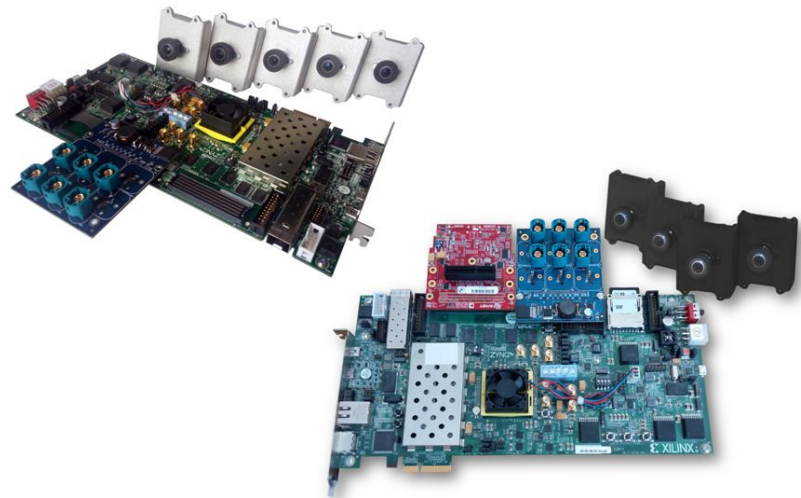# logiADAK-VDF Video Design Framework

Xylon d.o.o.

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Figure 1: Compatible HW Platforms - Xylon logiADAK and logiVID Development Kits

Features

- The complete video design framework for 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
- Prepared for Xylon development kits based on Xilinx® Zynq®-7000 AP SoC:
  - logiADAK Automotive Driver Assistance Kit
  - logiVID Vision Development Kit
- Includes complete reference designs with an integrated video processing block example:
  - HDMI[1] or camera video input to display output
  - Four camera video inputs to display output
- Supports Xylon video cameras included in Xylon development kits

- Designs are prepared for hardware- and software-centric design environments:
  - Xilinx Vivado® Design Suite 2017.1, and
  - SDSoC™ 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[2] Xylon logicBRICKS IP cores
- Resolutions: 1280x800 In and 1280x1024 Out
- Full evaluation version of the design framework is online available
- Suitable for vehicle installations (cars, robots…)
- Documentation and Tech support (e-mail)

Table 1: Reference Designs Implementation Statistics

	Available in XC7Z045	Used Resources	
		CAM-HDMI	FOUR-CAM
Flip Flops (FFs)	437,200	~ 2%	~ 6%
Look-Up Tables (LUTs)	218,600	~ 3%	~ 10%
Block RAM (36 kB BRAM)	545	~ 3%	~ 16%
DSP slices (MULT/DSP)	900	~ 1%	~ 6%

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

[2]   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 Video Design Framework enables Xylon logiADAK and logiVID kits users to quickly utilize the provided hardware platforms for development of the Xilinx Zynq-7000 All Programmable SoC based multi-camera computer vision systems. The framework includes pre-verified logicBRICKS reference designs for video capture from Xylon cameras and the HDMI video input, and the display output under the Linux operating system running on the Xilinx Zynq-7000 AP SoC.

The complete camera-to-display SoC 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, logiADAK-VDF design framework users can immediately focus on specific vision-based parts of their next SoC design. Supported hardware platforms can be installed on test vehicles (cars, robots…) and used in exhaustive tests, i.e. for testing and validation of the new ADAS developments in the test vehicle and under different road conditions.

logiADAK-VDF 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. This example shows kit users 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.
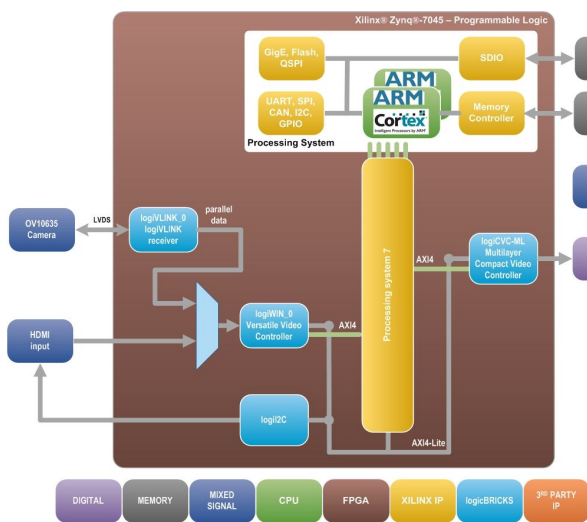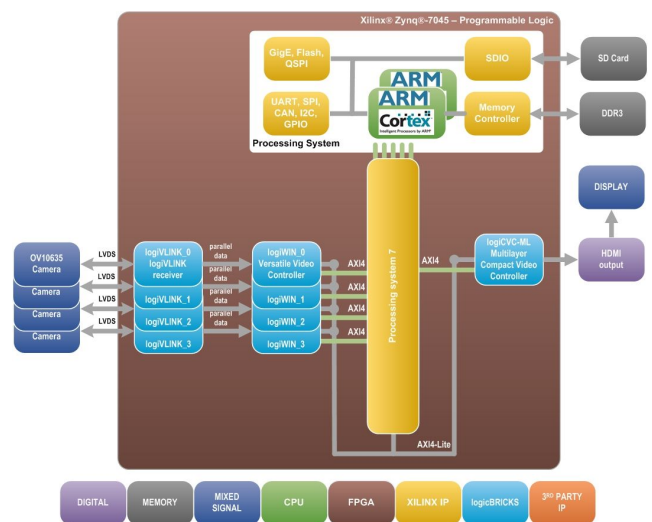

Figure 2: CAM-HDMI SoC Design

Figure 3: 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 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-7000 AP SoC. The design displays a single video source, and automatically switches to the HDMI video input upon detection of the plugged-in HDMI cable.

⚠️ In order to use this reference design with the logiADAK kit, the framework user needs to purchase the HDMI Input/Output FMC module (Figure 4) from Avnet (Part Number: AES-FMC-HDMI-CAM-G). The logiVID kit hardware platform includes this board.

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.
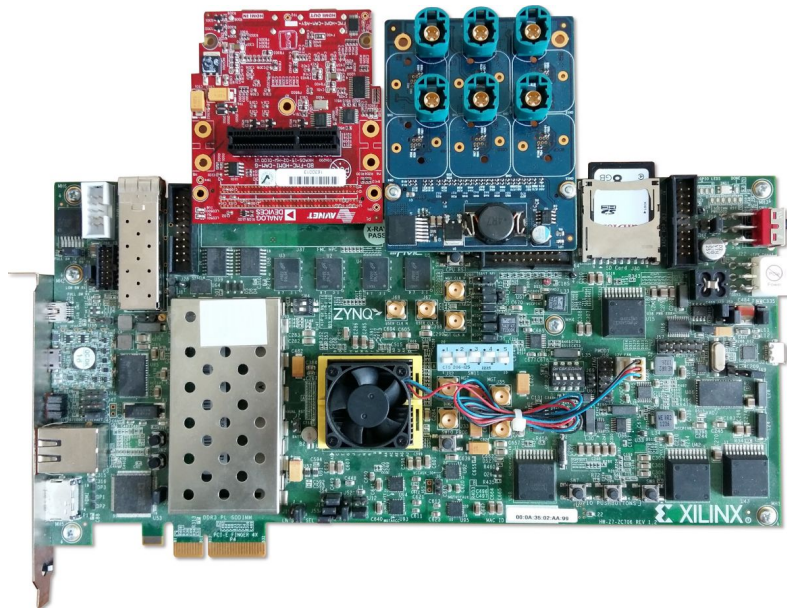

Figure 4: CAM-HDMI Hardware Setup

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

ℹ️ The logiADAK-VDF users who do not have Xylon FMC board and cameras can evaluate the CAM-HDMI design with the Avnet HDMI Input/Output FMC board attached to the ZC706 evaluation kit.

Framework Content

logiADAK-VDF Reference Designs for 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
    - logiVLINK Vanilla LVDS Multimedia Data Link Receiver

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
  - uImage
  - Camera/HDMI demo
  - Four Camera demo

logiADAK-VDF-SDSoC Reference Designs for 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
  - logiVLINK Vanilla LVDS Multimedia Data Link Receiver

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 logiADAK is a great programmable platform for upcoming automotive driver assistance applications that require intensive real-time video processing, parallel execution of multiple advanced algorithms and versatile

interfacing with sensors and vehicle's communication backbones. The abundant performance and reprogrammability of the Zynq-7000 AP SoC device enables ADAS designers to design SoCs that outperform competing solutions and achieve a new level of system differentiation through a combination of hardware-accelerated video inputs from multiple camera inputs and the ability to quickly adapt to ever changing sensor setups and interfacing. To learn more about this product, please contact Xylon or visit our website:

Email:	support@logicbricks.com
URL:	http://www.logicbricks.com/Products/logiADAK.aspx

The logiVID-Z Vision Development Kit provides system designers with everything they need to efficiently develop multi-camera vision applications on the Xilinx Zynq-7000 AP SoC devices. The kit includes the complete hardware platform to support a single HDMI video input and up to four inputs from Xylon video cameras, as well as the fully licensed logiADAK-VDF Video Design Framework. To learn more about this product, please contact Xylon or visit our website:

Email:	support@logicbricks.com
URL:	http://www.logicbricks.com/Products/logiVID-Z.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
URL:	http://www.logicbricks.com/Products/logiADAK-VDF.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
1.00	05.04.2016.	Initial release.
2.00	14.10.2016.	Includes designs prepared for the Xilinx SDSoC Development Environment.
3.00	19.07.2017.	Prepared for the latest Xilinx tools. Added the logiVIOF library and new four camera stitching feature.