

Hardware Accelerated Super Resolution & Framerate Upscaling

ECE532 Design Project
Group 2

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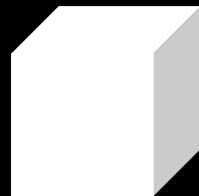
Motivation

1. Real-time rendering 3D content (e.g. gaming) is compute intensive and hardware (GPUs) is expensive.
2. Video sources may be low quality (low resolution, low frame rate)

Solution



→
HD@30FPS

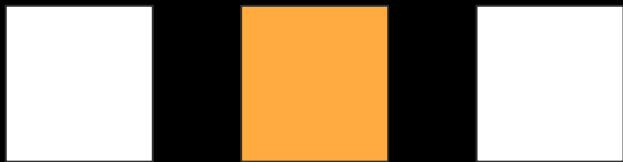


up-scaler

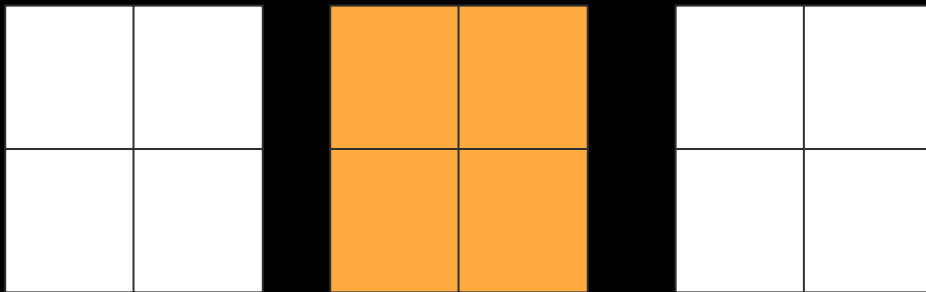
→
FHD@60FPS



Solution

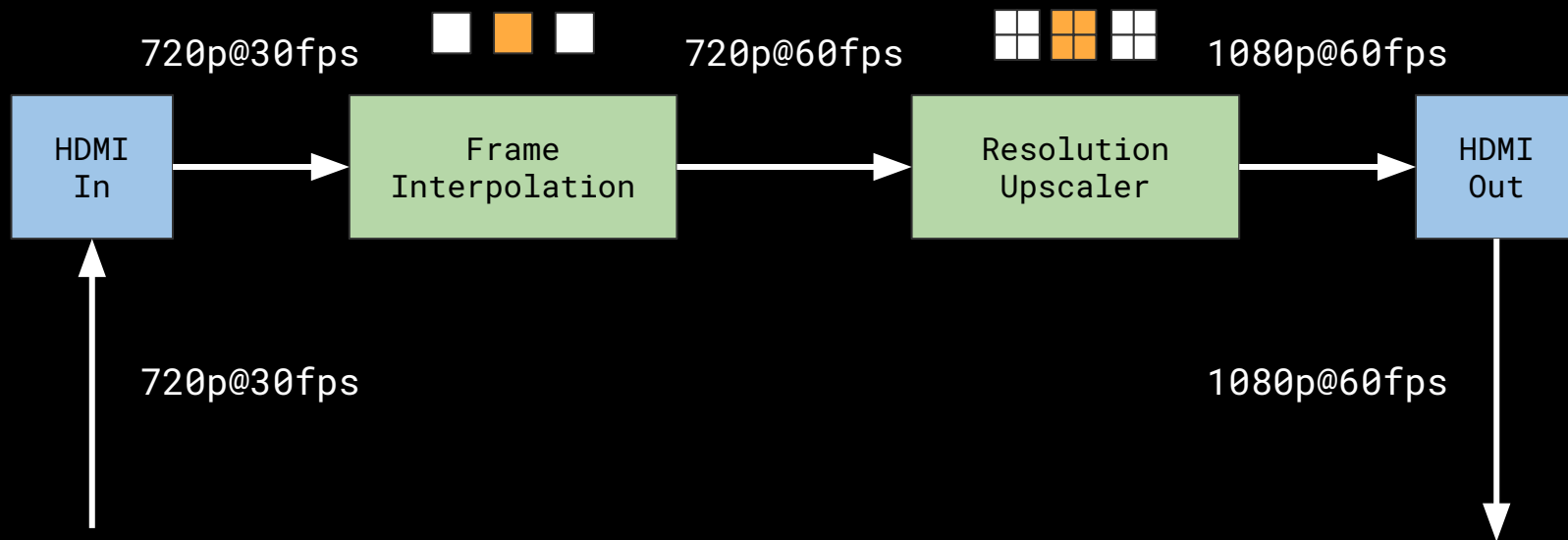


Interpolate



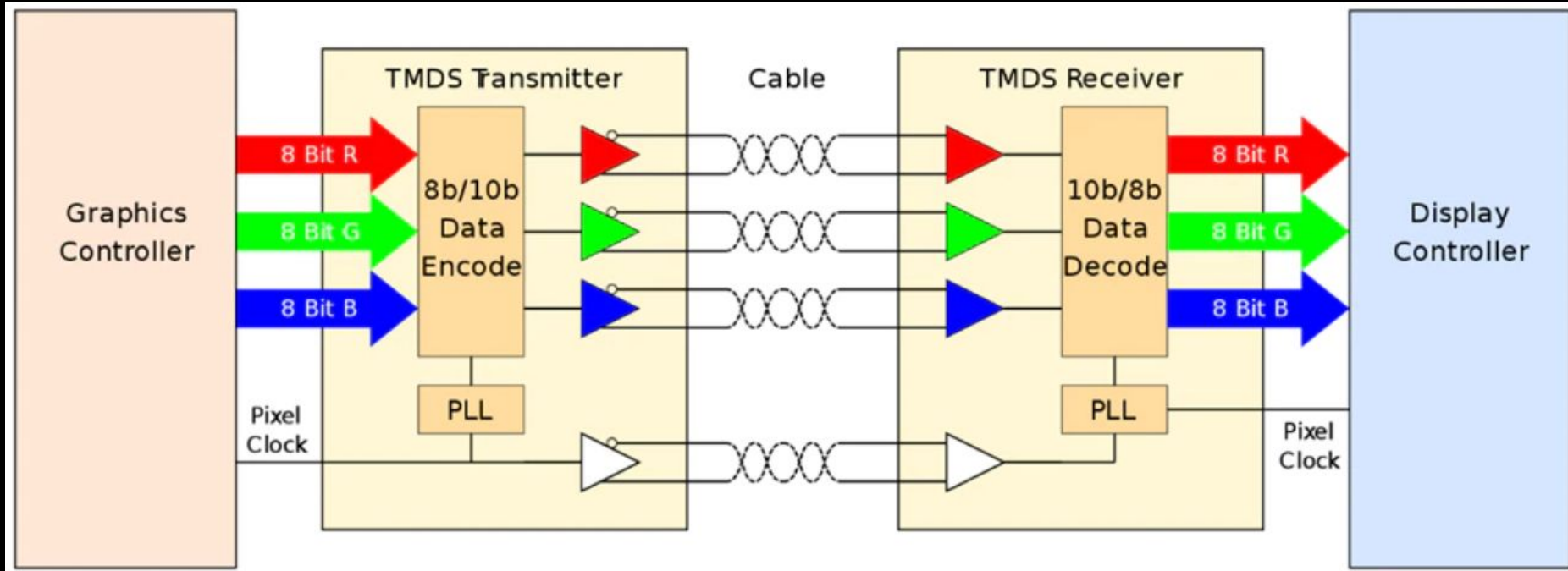
Upscale

High Level Design



Component Architectures

HDMI Video Processing



HDMI Video Processing

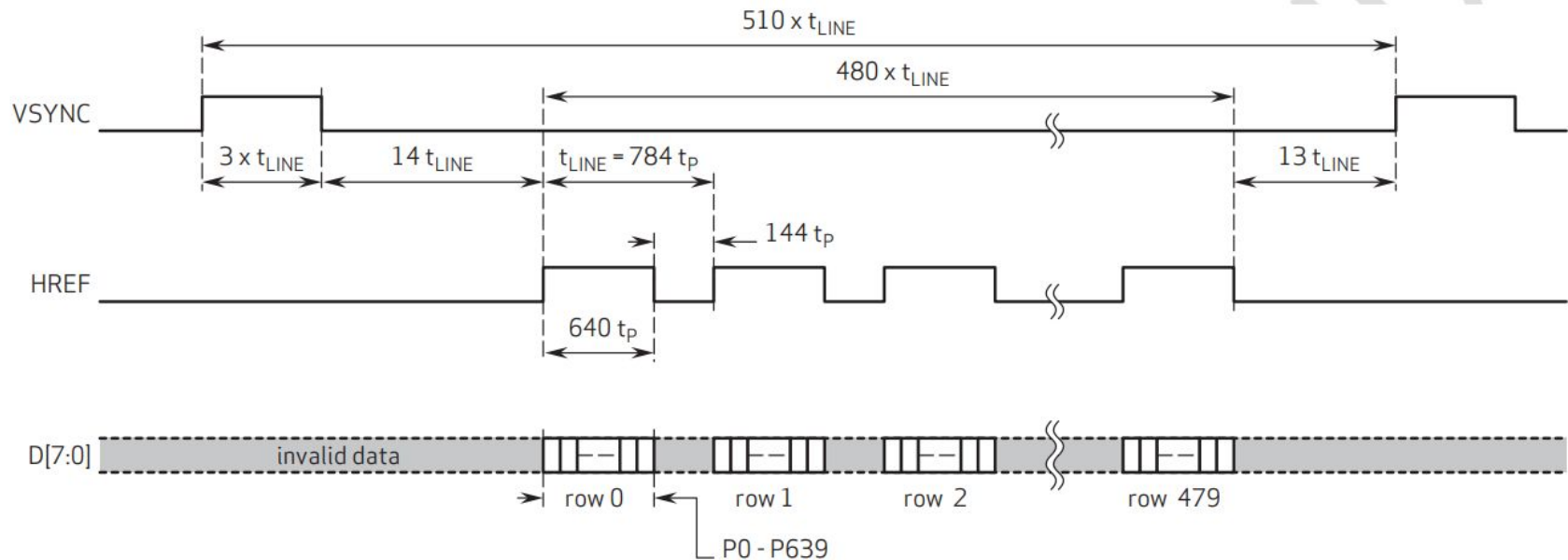
The screenshot shows the GitHub interface for the repository **Digilent/vivado-library**, which is a public fork of **DigilentInc/vivado-library**. The repository has 57 watches and 304 forks. The **Code** tab is selected, showing a file explorer on the left with the following structure:

- dvi2rgb
 - docs
 - Advantiv_DGL_1080P_CEA.dat
 - Advantiv_DGL_1280_1024_CEA....
 - Advantiv_DGL_720P_CEA.dat
 - dvi2rgb.docx
 - dvi2rgb.pdf** (selected)
 - gui
 - src
 - xgui
 - .gitignore

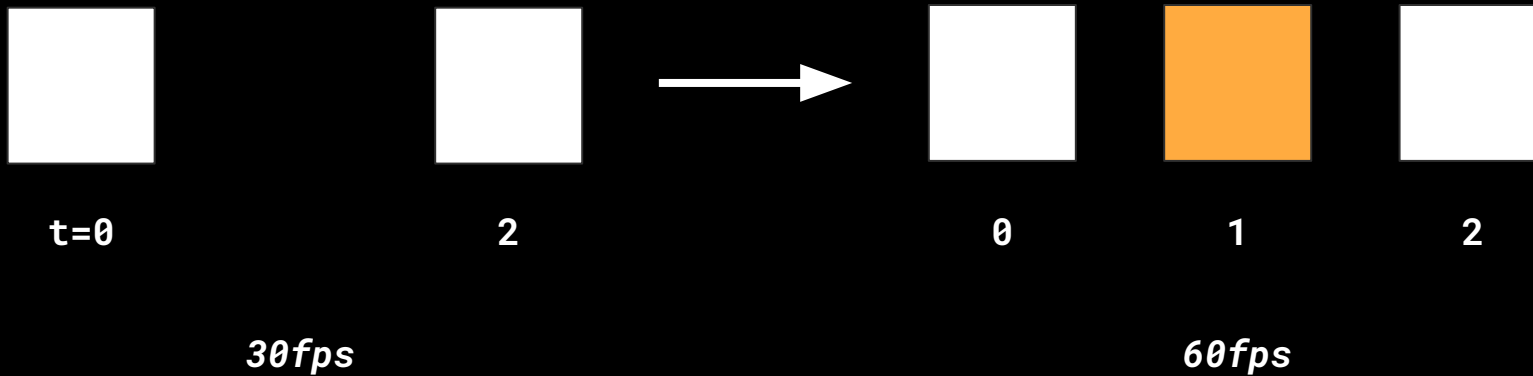
The main content area displays the selected file **dvi2rgb.pdf**. A commit by **elodg** is shown, titled "dvi2rgb sub-IPs updated to 2018.2, introduced pLocked, deprecating aP...". Below the commit, there are tabs for **Preview**, **Raw**, and **Blame**. The **Preview** tab is active, showing the PDF content. The PDF is the **DVI-to-RGB (Sink) 2.0 IP Core User Guide**, revised on October 9, 2019, by author Elod Gyorgy. The Digilent logo and contact information (1300 Henle Pullman, WA 99161, 509.333.1111, www.digilent.com) are visible in the top right corner of the PDF preview.

HDMI Video Processing

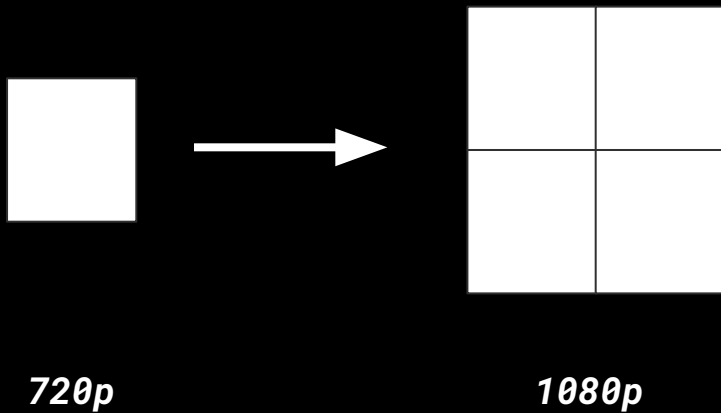
figure 6-1 VGA timing diagram



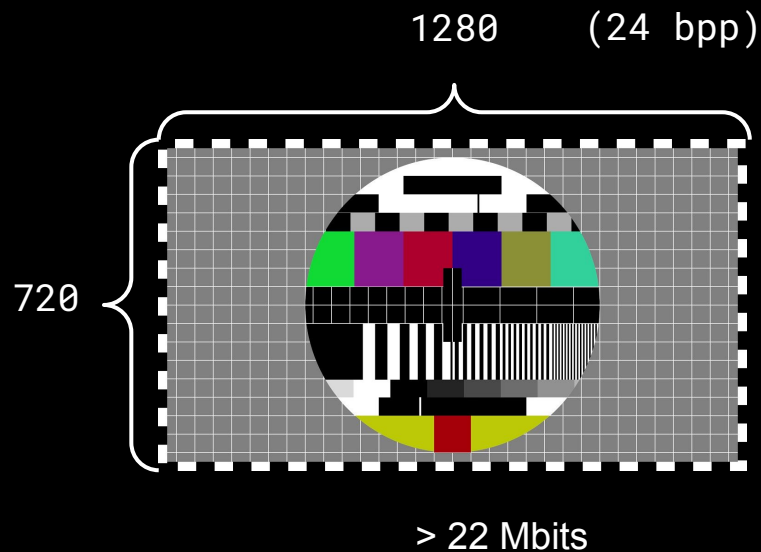
Framerate Upscaling



Resolution Upscaling

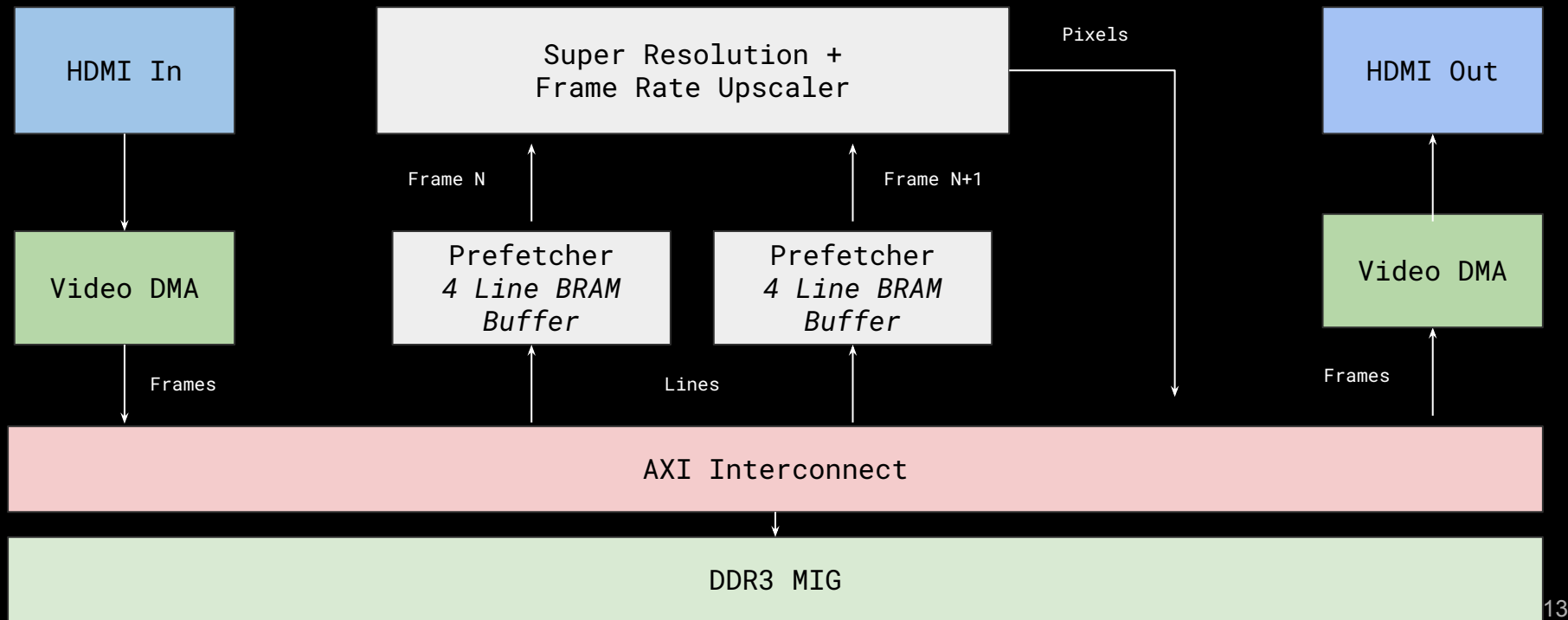


Key Challenges

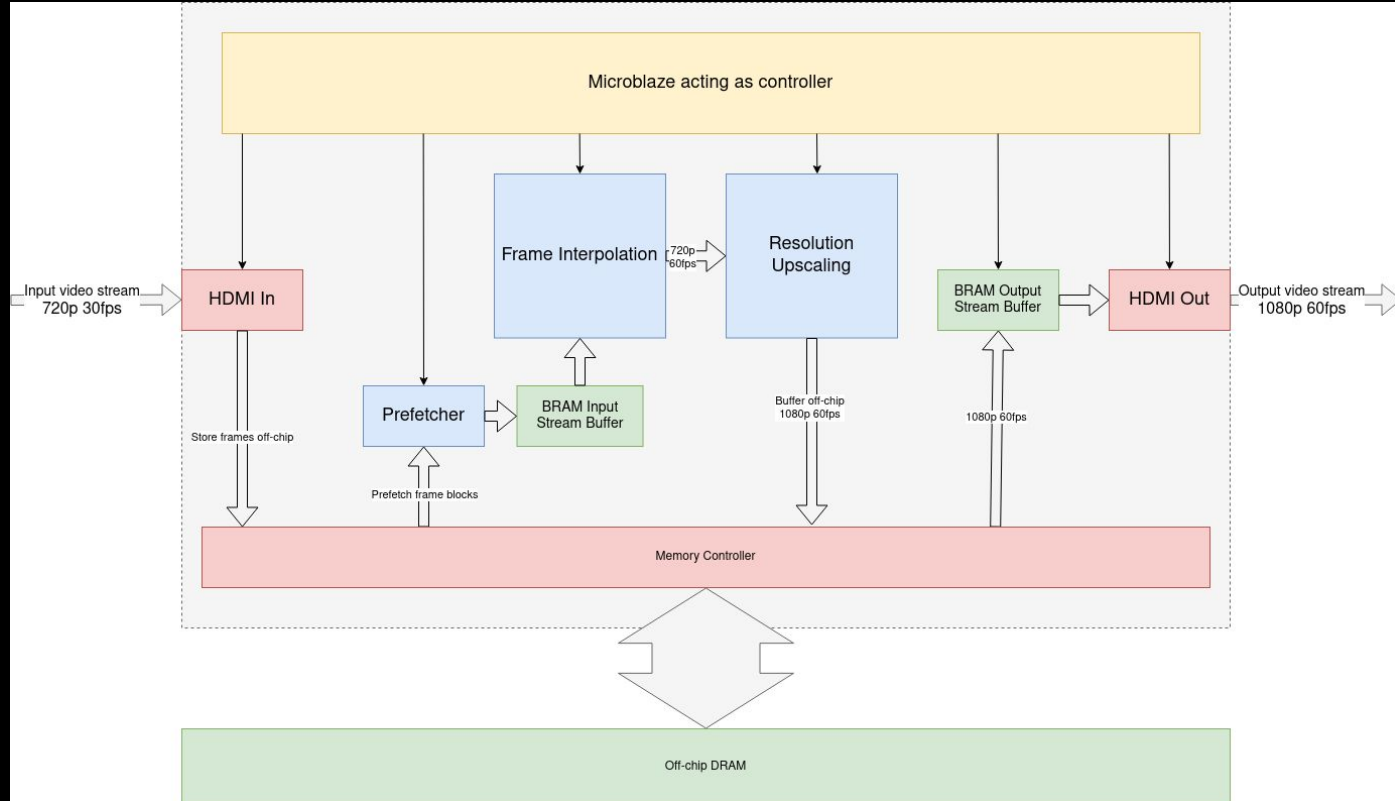


13,140 kbits
BRAM

Key Challenges



System Architecture



Milestones

Video

Upscaling

Interpolation

Control

Milestone 1

Design + Environment

Video

Upscaling

Interpolation

Control

Milestone 2

HDMI

Video

Upscaling

Interpolation

Control

Milestone 3

Passthrough

Video

Upscaling

Interpolation

Control

Milestone 4-5

Algorithms

Video

Upscaling

Interpolation

Control

Milestone 6

Control

Video

Upscaling

Interpolation

Control

Q&A