## **Carnegie Mellon**

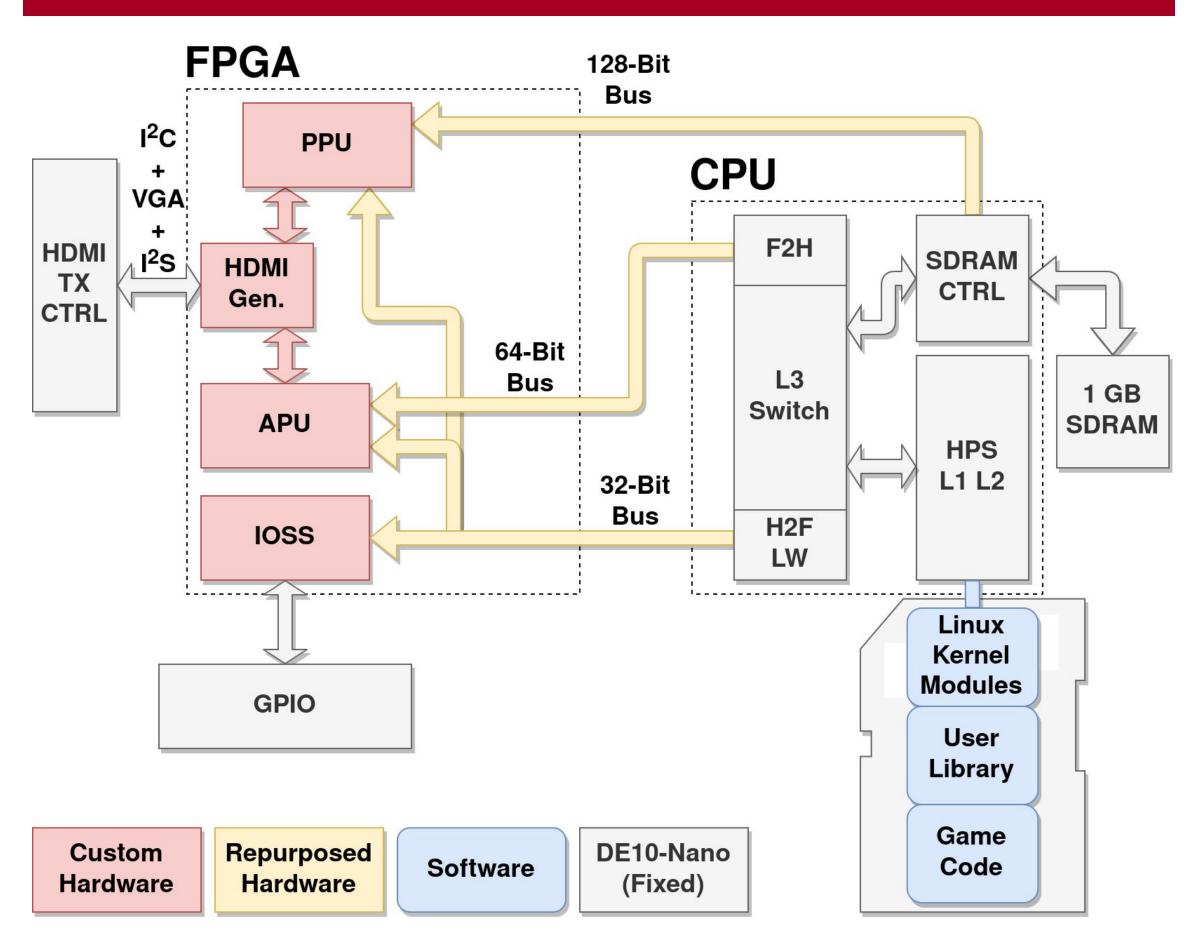
### Team C1: Andrew Spaulding, Joseph Yankel

#### **Product Pitch**

FP-GAme is a retro video game console and development kit for hobbyists and learners.

- Low cost (< \$200) compared to traditional development kits (~ \$2000).
- Offers features similar to the NES and GBA.
- More accessible development experience compared to traditional retro consoles.
  - Open source: <u>https://github.com/FP-GAme</u>
  - Includes detailed instructions for the entire development process.
  - Convenient user libraries allow hobbyists to focus on developing their games, rather than on obscure hardware details or Assembly programming.

#### System Architecture



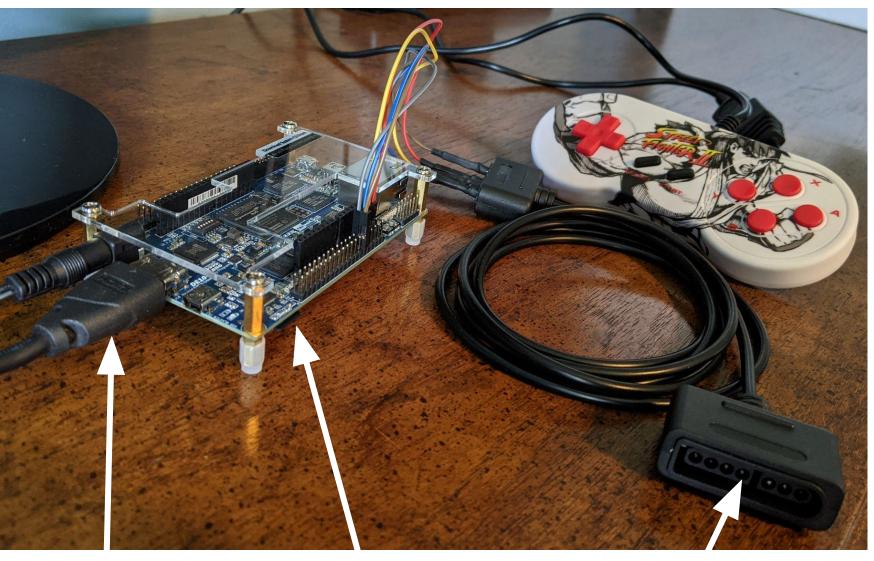
### **FP-GAme**

#### **System Description**

FP-GAme utilizes the DE10-Nano board, equipped with an Cyclone V SoC, HDMI output, and GPIO.

Cyclone V SoC:

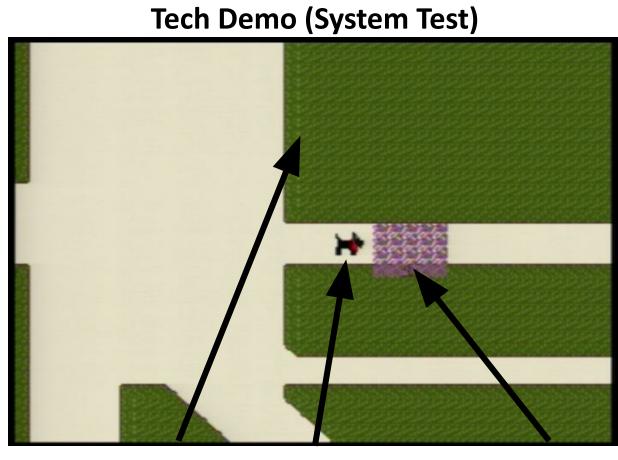
- FPGA contains our Pixel Processing Unit (PPU), Audio Processing Unit (APU), I/O Subsystem (IOSS).
- APU supports 8-bit signed PCM at 32 KHz.
- PPU contains 2 tile layers with independent scrolling and a sprite layer.
- Game code calls user library, which communicates with kernel mode drivers for our custom hardware.



HDMI

DE10-Nano

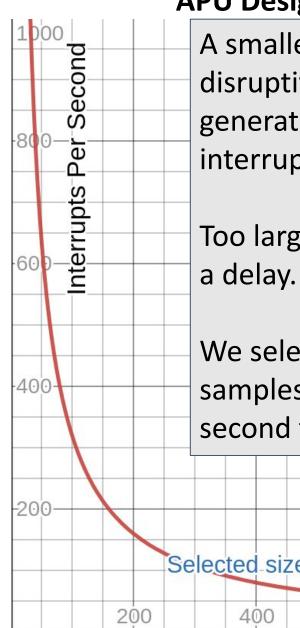
#### **System Evaluation**



Background Tile Sprite

Foreground Tile

Foreground, background, and sprite layers functionally correct, outputs at 60Hz 640x480





# Electrical & Computer ENGINEERING

#### **FP-GAme Hardware**

**SNES Controller Port** 

#### **APU Design Tradeoffs**

A smaller buffer size is disruptive for the CPU, as it generates a large amount of interrupts.

Too large of a buffer introduces

We selected a size of 512 samples with 60 interrupts per second to balance these factors.

d_size_of_samp	le huffer	