Carnegie Mellon

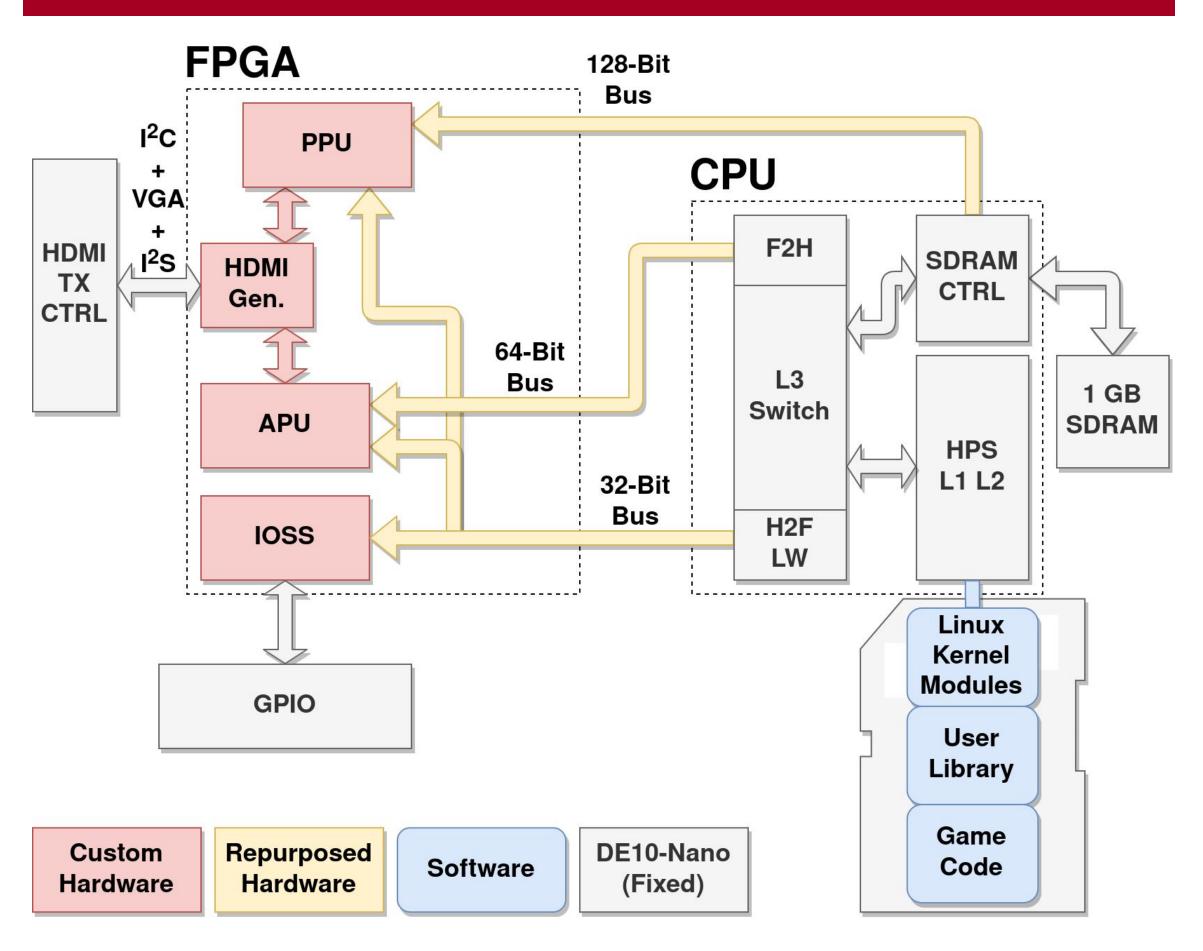
Team C1: Andrew Spaulding, Joseph Yankel

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



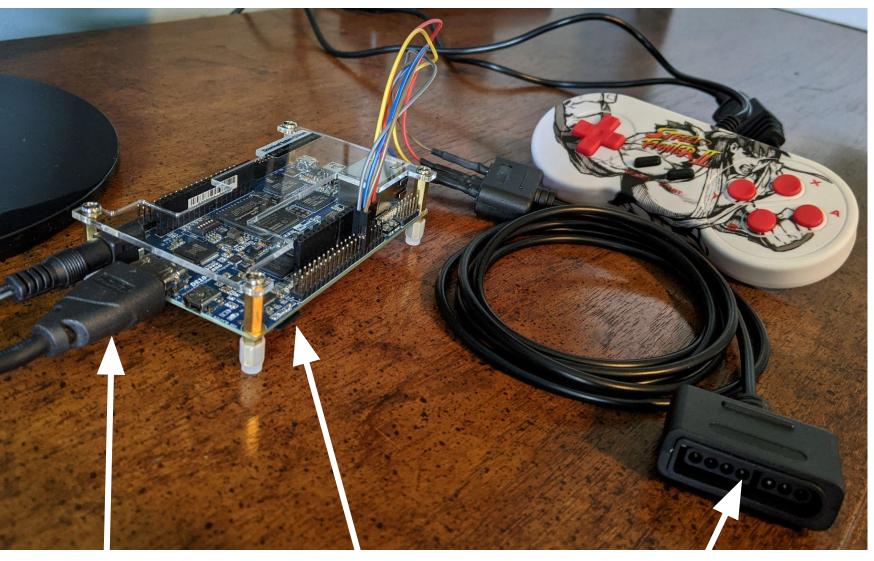
FP-GAme

System Description

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

Cyclone V SoC:

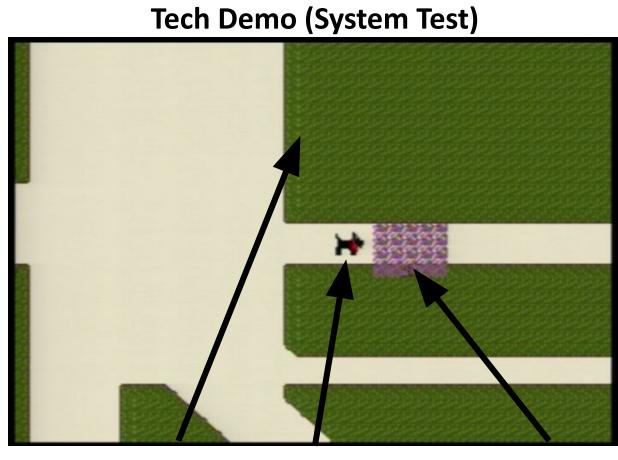
- FPGA contains our Pixel Processing Unit (PPU), Audio Processing Unit (APU), I/O Subsystem (IOSS).
- APU supports 8-bit signed PCM at 32 KHz.
- PPU contains 2 tile layers with independent scrolling and a sprite layer.
- Game code calls user library, which communicates with kernel mode drivers for our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



HDMI

DE10-Nano

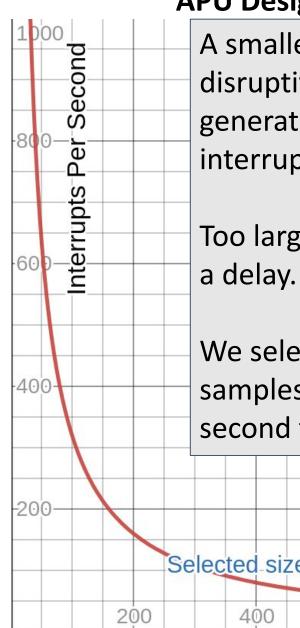
System Evaluation



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	