



The Product

- Open-source **RISC-V** architecture is gaining momentum, and vector processing is a powerful method for accelerating parallel computation.
- We have implemented a softcore processor that combines an **open-source CPU** with a **custom Vector Processing Unit**.
- To demonstrate real-time capabilities, we have developed an interactive game on the **De1SoC FPGA** that leverages audio, video, and parallel computation.



Testing & Results

Unit testing in simulation and on hardware (**Quartus Prime**, ModelSim, SignalTap, System Console):

CPU: Verified via memory-mapped I/O operations

VPU: Validated vector arithmetic and memory operations.

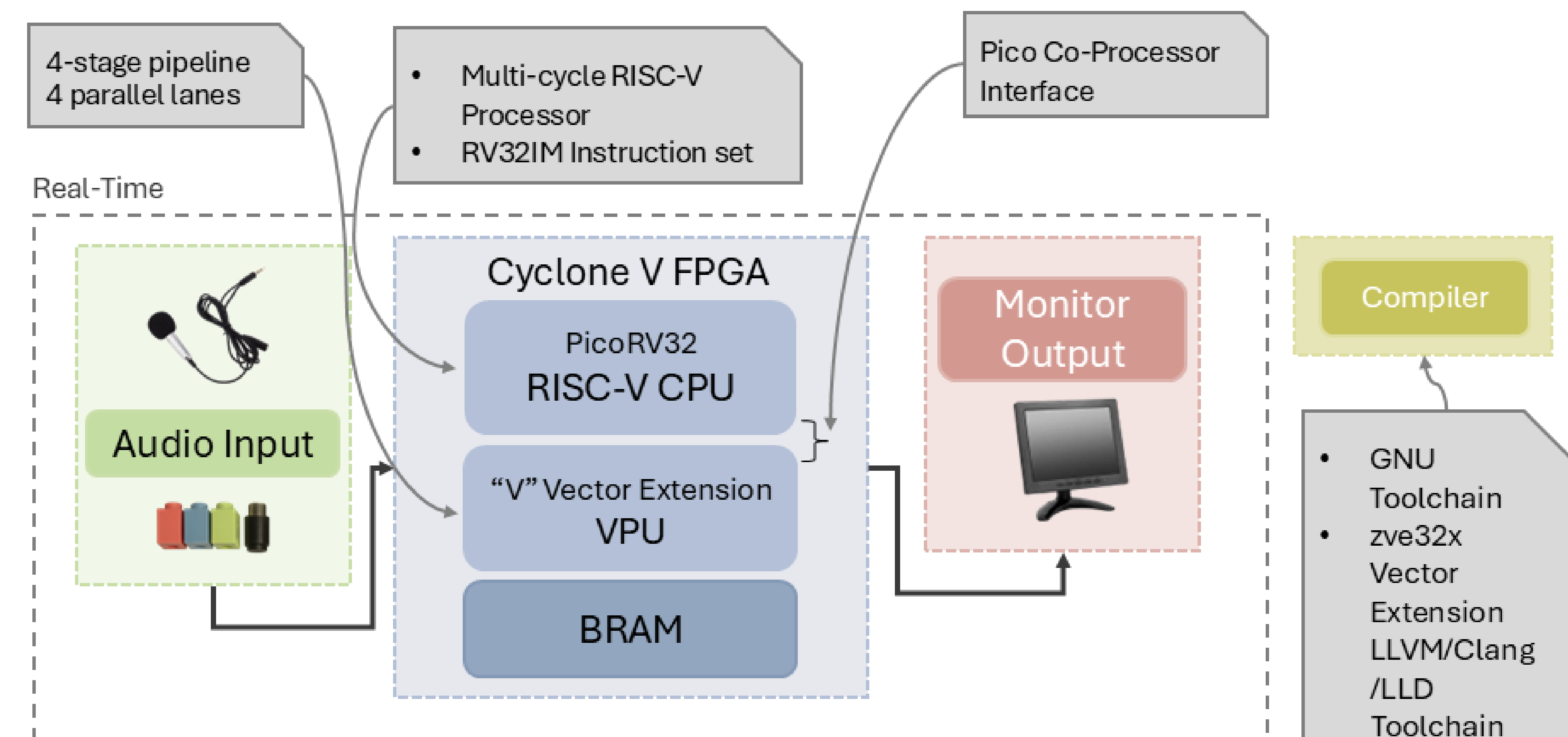
Audio: Performed an ADC-to-DAC loopback.

Video: Developed graphics incrementally and then integrated with game logic.

Flow Status	Successful - Sun Apr 27 21:34:43 2025
Quartus Prime Version	20.1.1 Build 720.11/11/2020 SJ Lite Edition
Revision Name	DE1_SoC
Top-level Entity Name	DE1_SoC
Family	Cyclone V
Device	5C5EMAS031C6
Timing Models	Final
Logic utilization (in ALM)	7,551 / 32,070 (24 %)
Total registers	8108
Total pins	162 / 457 (35 %)
Total virtual pins	0
Total block memory bits	3,098,880 / 4,065,280 (76 %)
Total DSP Blocks	9 / 87 (10 %)
Total HSSI RX PCSs	0
Total HSSI PMA RX Deserializers	0
Total HSSI TX PCSs	0
Total HSSI PMA TX Serializers	0
Total PLLs	3 / 6 (50 %)
Total DLLs	0 / 4 (0 %)

De1SoC Resource Utilization Chart

Project Block Diagram



How to Play

Use your voice to control Bucky! Speak into the microphone to make Bucky jump over obstacles – louder volume means higher jumps. Look out for special elements: cheese hats and extended obstacles.

Micro-Architecture Diagram

