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Initial Proposal:

Part 1 – Processor

We would like to create a processor based on the RISC-V (or a RISC-V subset) ISA to run on the FPGA. We plan to implement the ISA as a multi stage pipelined Von Neumann architecture. We chose the RISC-V because it provides an useful but small set of instructions and provides an interesting challenge in its implementation.

Along with the processor we plan to build "drivers" to interface with the VGA and PS/2 ports on the DE1-SOC.

Part 2 – Assembler

We will also build an external assembler to convert a simple assembly language into machine readable binary. This will be written in C# or Java and will be used to demonstrate the capabilities of the processor.

The following parts may be scrapped if we have run out of time

Part 3 – Compiler

We want to build a compiler to convert a simple C-like language into assembly code allowing us to more easily build higher level programs to run on the FPGA.

Part 4 – Video Games

For the final part of our project, we want to build a few simple games to run on the FPGA. If possible, we would like to build a pseudo 3d game based on the Wolfenstein 3D rendering method.