

CPTR380 Project Definition

There is a range of interests and background among students in this class. The plan for a project is to provide options so the class project will be meaningful for everyone.

These options include:

Solo option (individual).

Team option(2 or 3 individuals, not more):

Hardware design and implementation.

Software design and implementation.

Mixed hardware/software design and implementation.

Objective

Solo option- Be able to apply what you have been studying this quarter to an in-depth topic or project in the computer architecture area.

Team options– Be able to utilize the strengths of your team to implement a processor architecture that includes a customized instruction set.

Specifics

Solo option

Your task is to take your chosen topic and do some research. You can track down information on the web, from manufacturers, from books and journals, and perhaps technical papers from conferences. I'd like to leave what you present and write about quite open-ended, ensuring that an overview of your topic is important, as well as an in-depth analysis sufficient to take up 6minutes of oral presentation time and 8-10pages of writing.

Potential Topics

Processors

Intel's Atom, Core I3/I5/I7, Willamette, Xeon, etc

Snap Dragon, Cell, Apple's A12, latest AMD offerings, RISC-V

Architectures

Intel's Sandy Bridge, IBM Watson GPU Architectures, NVIDIA APU or Tesla GPU

RAID Arrays, Solid State Drives

Compiler architecture and design, SIRI

Internet of Things (IoT)

Other

Floating Point division or multiplication algorithms

Multi-and Hyper-threading

Branch prediction algorithms

Future computing technologies

Asynchronous processors

Team options

Hardware:

Create a custom-designed instruction set (typically focused on supporting a particular type of computing), design a CPU to execute this instruction set, and implement this hardware by describing it with VHDL targeting and FPGA such as the FPGA boards used in Digital Design class (Xilinx Spartan-6 chip suggested for efficient synthesis time)

Possible application topics to spark design of the instruction set:

Booth's Radix-4 multiplication algorithm.

Histogram equalization routine applied to image processing.

Or something else (describe to professor by the proposal date)

Software:

Your task is to choose one or more of the following and implement using an appropriate language or tool:

A graphical data path simulator

A CPU simulator for a particular instruction set.

A full-featured assembler for the customized instruction set (above)

Another software application (that you explain to the instructor by the proposal date)

Mixed:

The task of a mixed team would be to combine the talents of several individuals to implement the combined hardware and assembler described above.

Deliverables

Presentation;

Paper;

Test questions;

Attendance & Presentations

All options require an in-class presentation:

Solo option

–Expect your presentation to be about 6minutes in length followed by a three-minute question and answer session.

Team option

–Expect your presentation to be about 8 minutes in length followed by a five-minute question and answer session.

Paper

A high-quality 8-10 page per person paper on your chosen topic.

Questions

One page of questions relating to your topic, with answers, in that includes:

- 1 multiple choice problem;

- 2 true / false problems;

- 1 short answer question.

Attendance

Attendance is required for all students for all presentations.

Grading

This project will constitute 30%of your final class grade. Note that each person must submit all required materials.

First due dates:

Friday Feb. 18 tentative topic - hand in a short statement describing choice

Tuesday Feb. 22 confirm topic choice - hand in conformation statement.