18-500 - ECE Design Experience
Team Name: Game Boi
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Updated Risk Management Plan & Gantt Chart

For the project, the biggest risk is lack of official documentation for the Game Boy. Since we are building the emulator from scratch, we had to learn the Game Boy architecture through-and-through, but from the emulator community developed documents since Nintendo has not released an official manual. Therefore, all of the manuals and articles that we have read were written by developers who have created their own emulators in their spare time. Although they have found many of the nuances, they may not have found all and each developer has their own solution for the various parts within the Game Boy. This meant that we had to reverse engineer the layout of each datapath and design handlers to the best of our ability based on what we have learned. To mitigate this risk, we have reviewed numerous GitHub repositories, watch tech-talks of industry leaders breaking down how the Game Boy works, and assuring our logic supports the necessary cycle count for instructions.

The other big risk is the size of the system. The entire Game Boy system can be divided into the CPU, sound, video, memory accessing/assignment, and button input. On top of that, we have added an SoC component that will require memory mapping, memory transfers, and a controller driver to connect input signals from the USB of the controller to signals for the FPGA. We divided the components to play to each team member's strengths, but we each have to learn how it is implemented in the Game Boy.

Our final risk is integration. This was already a significant portion of our debugging process because of all the interactions each unit will have with another and the different clocks throughout the system. Recently, this has become an even larger challenge because the team will not be able work together in person. To mitigate this risk, we plan on spending a significant time together in the beginning of the project to outline interactions to prevent these integration issues in the future. Additionally, we will all work together on the CPU to learn how the Game Boy system works overall, and in parallel we will conduct our individual research and implement our assigned section.

To set ourselves up for the best scenario for integration, we will be using created unit tests and online test suites to test each component before integrating them together. The online test suites are extensive and comprehensive because they were developed and iterated on by the emulator community. They have become the golden standard for vetting all emulators in the community. By using these tests, we will have evidence that we can get each unit to individually work and fulfill its intended functionality. If we run into an issue during integration, we will be able to focus on debugging the interaction between units. Additionally, if we are unable to finish our

project completely, we will be able to pin the issue on integration and the inability to debug in person as a team.