Fall 2008 Project Final Project Report

1.0 Report Description

The final report is a technical description of the device that you have designed and built for your project. The main purposes of documentation are:

1. Allow users to understand and operate your device.
2. Help your fellow engineers to understand your design so it can be upgraded, improved, and maintained.

Your goal should be to ensure that your design will be useful even if you are no longer around to explain its function. Without adequate documentation, many great designs are sent to the scrap heap.

For this semester, since the SDRAM Controller/Arbiter and Waveform Generator are the heart of the project, we want them to be given the most emphasis. Make sure to leave time for editing, typing, and proof-reading; nothing is more annoying than trying to read documentation that has obviously never been proof-read.

2.0 Report Outline

This is the closest you will get to detailed specification for the contents of your report. It is your job to design, write and edit your report as well as produce diagrams that will adequately document your design. Your report should closely follow the outline specified below.

Your report, excluding the cover page and table of contents may total no more than 10 pages of text and 20 pages (total) with diagrams. You may include diagrams within the text or on separate pages at the end. We suggest using Microsoft Visio for the diagrams; they are available on the lab computers. If you decide to (hand) draw your diagrams, be sure to use a ruler or graph paper. Messy diagrams are useless.

1. Cover Page
2. Table of Contents
3. Abstract
   a. Approximately 1 paragraph
   b. Your abstract should be about your project
   c. Describe your design, not the project requirements
4. Overview (1-2 pages)
a. Design (Block Diagram)
   i. You may NOT use our diagrams
   ii. You may draw this by hand, but use a ruler
   iii. You must show more detail than our diagrams
   iv. You diagram should be easily read and understood

b. Brief Description of Major Sub-Modules
   i. Keep this part short
   ii. Do not repeat the assignment specification
   iii. Add details about how you changed or added to the assignment
        specifications

5. System Description (5-6 pages)
   a. Include detailed figures
      i. You may NOT use our diagrams
      ii. You may draw these by hand, but use a ruler
      iii. You must show more detail than our diagrams
      iv. You diagrams should be easily read and understood
   b. Subsystem 1: Video Encoder
      i. Short Section
      ii. Block and Bubble-and-Arc diagrams
      iii. Module decomposition / Block Diagram (if you have multiple
           modules)
      iv. Ready/Valid handshake between data and addresses
   c. Subsystem 2: SDRAM Control and Arbiter
      i. SDRAM Arbiter
         1. Your design to accommodate multiple clients for
            checkpoint 5 (multiple ports or wrappers)
      ii. Block and Bubble-and-Arc diagrams for a:
         1. Read request
         2. Write request
         3. Refresh (if you implemented it)
   d. Subsystem 3: Waveform Generator
      i. Detailed block diagram and bubble-arc diagram (if you used state
         machines)
      ii. Feel free to use your final checkpoint 4 designs (they have been
          returned to the homework drop area inside of lab).
      iii. Discuss datapath and how your waveform generator works (in
           plain English).
   e. Subsystem 4: AC97 Audio
      i. Short Section
      ii. Block diagrams
      iii. Design challenges
   f. Extra Credit:
      i. Give any applicable description (block diagrams, etc) needed to do
         your extra credit justice.
      ii. You must fully document all of your extra credit for credit.
iii. You can exceed the 20 page limit to talk about extra credit (we will subtract the number of pages spent discussing extra credit from the total page count).
iv. After describing your extra credit technically and functionally, add a README section that details exactly how you use your extra credit (dipswitches, etc).
g. Design Tradeoffs
   i. Did you have to sacrifice any features to make it work?
   ii. What did you change as a result of debugging?
   iii. What would you design differently next time?

6. Design Metrics (1 page absolute max)
a. Number of 4LUTs
b. Design and debugging time estimates
   i. Design Time
   ii. Time for each checkpoint
   iii. Time spent writing Verilog
   iv. Debugging time

7. References
a. Note any and all source files that are not your own
   i. Give a description of its function
   ii. May have to include diagrams if the code is crucial to your project and the code is complicated.
      1. We know that fpga_top.v, Register.v, and Counter.v are ours and we know how they work. We don’t need too much detail on these.
b. Cite where you obtained the code or idea.
   i. WWW, book, etc.
   ii. Ideas that other groups significantly contributed.

8. Conclusion (1 page)
a. Summary of main features
b. Problems Encountered
c. What would you do differently next time

9. Suggestions (1 paragraph)
a. What was too difficult
b. What should we (the staff) do differently

For the overview section, try to give a “breadth before depth” introduction to your project. Your readers need to get a general picture of your system before they can understand the details. Describe the user visible features; save the detailed inner workings for the system description section. You should have a general block diagram in this section. Try not to duplicate our description of the assignment too much; we already know what we assigned you. Also, do NOT use our block diagrams, you will lose many points and besides your project won’t completely match our diagrams.

The detailed system description can start with functional and input/output specifications. Modules can be described in order from input to output, or from most to least important module. Illustrate the descriptions with the block diagrams and timing
diagrams you have prepared; refer to these as figures. Don’t bother going into the details of very simple modules, especially the ones we provide you. However, do give detailed descriptions and figures for your SDRAM Controller, Arbiter and Waveform Generator. For the conclusion, summarize the key design features. What will the reader need to be careful about if they were to attempt to duplicate or modify your design? And, what are possible improvements which could be made to the design?

3.0 Guidelines

1. Type this report. DO NOT hand write it
   a. Diagrams and figures are an exception. Visio is preferred, but if you are going the hand-drawn route, please make them neat by using a ruler and/or graph paper.
      i. If you hand-draw your diagrams, you must scan and integrate them into the rest of your report.
2. Use standard 8.5 by 11 paper throughout the report.
3. Minimum/Maximum 12pt font, single spaced with 1 inch margins.
4. Page Limit
   a. Cover page and Table of Contents are not included in the page limit
   b. Text portion of report should not exceed 10 pages.
   c. Appendices, including timing diagrams and schematics can be up to 20 pages MAXIMUM.
   d. Anything after 20 pages will be torn off and IGNORED.
5. Make a copy of your report for safety.
6. Make sure the copy you hand in is easily readable.
7. Include block diagrams, bubble and arc diagrams, timing diagrams, state diagrams, and tables as appropriate and on or as near as possible to the page in which they are referenced.
   a. Do NOT include any Verilog in your report.
8. Put titles on all figures and diagrams.
9. Put some thought into this
   a. Poor documentation will degrade the perceived quality of your work.
   b. Future employers may want to look at this report.
   c. This report is worth nearly as much as a checkpoint.
### 4.0 Final Project Report Submission

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<tr>
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<td>Friday, December 5(^{th}), 2:10pm sharp</td>
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Please commit a copy of your final report to SVN under “ReportSubmission,” by the due date.

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| RevB – 11/19/08 | Chris Fletcher | Cleanup and move to Fall 2008 template. |
| RevA            | Various Others | Created new document. |