

Capstone Critical Design Review (Presentation) Assignment

Revision 0.1, 25 Oct 2011

Short (15 minute) Critical Design Review (CDR) Presentations are given by project groups covering the project's proposed design. This presentation is followed by 5 minutes or less of questions. The purpose of the presentations is to

1. communicate to your peers, project clients, and the instructional staff the proposed design. Note that this will certainly require a brief introduction to the purpose of your project;
2. communicate the project schedule, including milestones;
3. communicate the project budget;
4. put your presentation skills into practice; and
5. provide an opportunity for your peers, clients, and the instructional staff to provide feedback with respect to feasibility, practicality, etc.

It is from the CDR process that the future of a project is determined; this is a "Go"/"No Go" decision point. As discussed in the syllabus, there are a variety of reasons that a project may not proceed to implementation.

Your peers should walk away with an understanding of what your project does and how it does it, particularly with respect to the hardware design (assuming a project involving hardware, that is). They should also be convinced that the project will be completed on-time and on-budget. Time permitting, you may find it appropriate to discuss why you selected specific design solutions.

Presenting to an audience on a topic like this is akin to teaching. You are, in a way, teaching the audience how your design works, and that you will be able to manage the task ahead of you.

This assignment is quite lengthy as it is necessary to address what constitutes a good design and project planning. This document is slightly slanted toward the discussion of hardware-oriented projects. Analogous discussions can be held in other areas, but that is left to the reader.

The Audience

The target audience of the presentation is your peers. You will, in turn, be part of the audience for the presentations held during your group's lab section. This will likely consist of presentations across several weeks. By taking part in this manner, you will have the opportunity to help other groups improve their designs and planned execution, as you will benefit from their feedback.

Client Involvement at the Presentations

Please invite your clients to your presentation; extension of this invitation is left to your group. Since your client will normally have input regarding whether or not a project proceeds to

implementation, it is important that they remain informed. If, for some reason, they are unable to attend, please be sure to share your design details with them by means other than the presentation.

Please inform your client that the start time of your group's presentation is approximate, but that they are welcome to attend other groups' presentations.

The Venue

All presentation rooms are classroom-style. Various equipment will be provided to assist you in making the presentation: a PC with Adobe Acrobat Reader and a dry-erase (or chalk) board. The (PDF) slides you are asked to submit as part of this assignment will be installed on the PC prior to your presentation.

Please note that the classroom bookings vary: we bounce around from day-to-day.

Presentation Format Suggestion

A suggested format and time distribution for your presentation is as follows:

- Opening: an overview of your project and its goals (~3 minutes)
- Body: the technical portion of your design proposal (~8 minutes)
- Closing: a summary of the main points (~2 minutes)

This follows the typical 'ABC Format' described in other courses. You may choose, as you see fit, to deviate from this format but please remain professional throughout.

The time limit will undoubtedly constrict the amount of detail that you can provide during the presentation. Finding the right balance of detail vs. time is key. Please note, however, that you should have access to all design details, as discussed in the next section.

Presenting the Design

Your theoretical design (one which should, in theory, work) should be complete: all parts known, all values selected, all expenses identified, etc.. Your presentation should be structured such that you have access to all the details of the design. In hardware projects, for instance, you should be able to produce the full schematics.

You may, however, find it necessary to not present the design at the schematic level due to the time limit. A reasonable approach to this is to have the schematics contained in slides at the end of your presentation. Another reasonable approach is to have schematics broken up and inserted at relevant portions. Do what works for you while ensuring the details are at-hand!

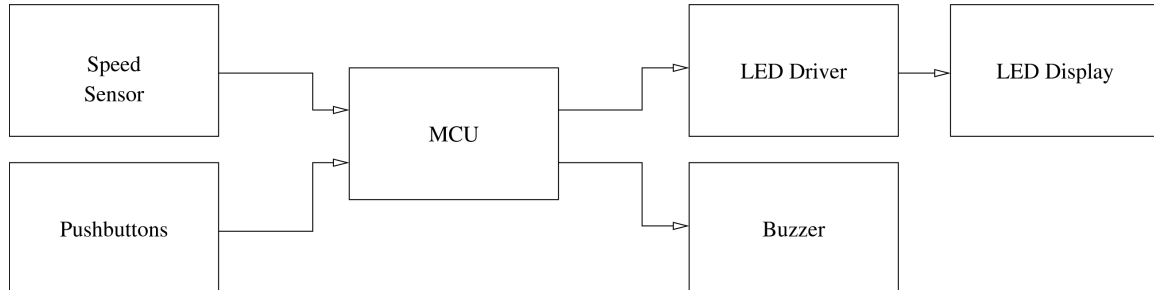
Block Diagram

Presenting a design will likely require the presentation of a system block diagram. This should be relatively detailed, yet an abstraction of schematics. These block diagrams typically

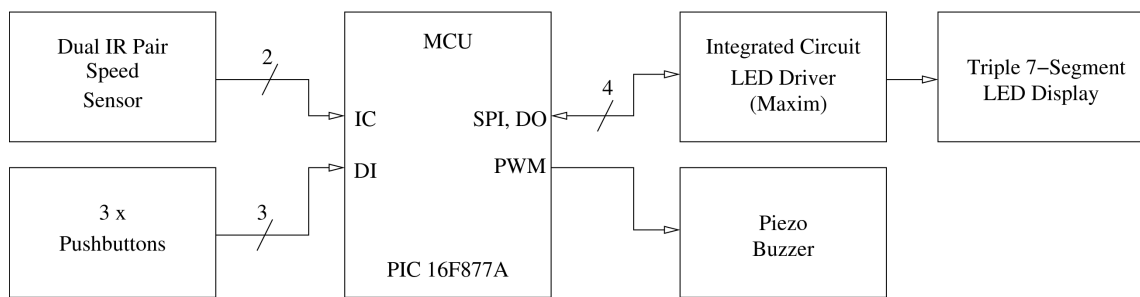
- describe the main part used in the specific blocks;
- are at a level from which creation of a circuit schematic will naturally follow; and
- indicate how the microcontroller resources are allocated (by labeling of connections as SPI, UART, DI, etc.), assuming a microcontroller is used.

This block diagram is at a level of abstraction that makes it possible to understand signaling requirements. Understanding this will help justify your selection of a microcontroller: sufficient I/O, peripherals, memory, and processing capabilities are required.

Please provide sufficient detail in the block diagram to allow scope to become apparent. For instance, the following hardware block diagram, although accurate, does not show enough detail:



However, the following block diagram, describing the same system, is at a level which more accurately reflects the project, and is therefore more appropriate:



IC – Input Capture, DI – Digital Input, DO – Digital Output, SPI – Serial Peripheral Interface , PWM – Pulse Width Modulator

Good block diagrams have the following features:

- they are electronically created;
- signal directions are shown;
- number of signals is shown;
- they have a left-to-right flow;
- appropriate block shapes are used;
- technology of each of the blocks is indicated;
- peripherals and/or signal protocols are identified; and
- they are complete.

Schematics

Schematics are “live documents” and will be modified throughout the life of a project. Because of this continual need to revisit the schematics, it is worth the time to create these electronically. Fortunately, there are many schematic capture programs that help with this, and, additionally

provide further functionality that will be of interest at a later date: printed circuit board layout and simulation.

Capstone design uses Eagle, a cross-platform schematic capture and board layout program that has a (limited capability) free version. This is available from www.cadsoftusa.com. If your project requires a board to be milled using course resources, the use of Eagle will be mandatory. Please see the course web page or other Internet resources for tutorials covering how to use Eagle.

Since schematics are so central to Electrical Engineering, it is important that they are meticulously created and complete. There are many online resources that outline what forms good schematics. The following list describes some of these qualities, and was derived from a rubric formerly used in the course to evaluate submission of schematics:

- **Kernel** - All circuitry required to operate the microcontroller is included: timing element, supply decoupling, reset circuitry, etc.
- **Peripheral Allocation** - Microcontroller peripherals have been allocated with insight. No contention for resources is noted.
- **Interfacing** - All interfacing details are looked after to the point that there is a high likelihood of success. Logic levels, driving capacity, etc. have all been reconciled.
- **Supply Decoupling** - All major components (ICs, modules, etc.) have appropriately-sized decoupling capacitors.
- **Power Circuitry** - A connector for incoming power is included. Voltage regulation and/or supply decoupling is included as part of this power circuitry. Details of power source are included.
- **Correctness** - The overall circuit could be created as-is and be expected to work as desired.
- **Part Values** - All parts have values specified. eg) all resistors have resistance and wattage specified. General notes are encouraged. For example, a note stating "All resistors are 1/4W, 5% tolerance, unless otherwise noted." could be included.
- **Designator Consistency and Numbering** - Designators are consistent throughout the document(s) and selected according to convention. No designators include the \$ symbol (an Eagle default). Numbering is logical and generally follows a top-left to bottom-right sequence.
- **Net Names** - Net names are representative and useful. No default (those that include \$ in Eagle) net names are used.
- **Bus Drop-Offs** - All bus drop-offs are labeled with net names.
- **Bus Labels** - Busses have a displayed name. For example, DATA[0..7].
- **Output Quality** - Vector-based (non-bitmapped) output.
- **Left-to-Right Flow** - Schematic flow is generally left-to-right in nature.
- **Title Block** - A title block exists and includes the project group number, project title, version information, and page numbering (if applicable). This applies to full-page schematics.
- **Notes** - Meaningful schematic notes referring to the entire schematic are kept together in a section, perhaps as part of the title block.
- **Annotations** - Textual annotations are included to aid the reader. These may include things such as labeling the purpose of a connector, the overall purpose of a portion of the schematic, etc.
- **Modularity** - The schematic is appropriately sectioned to increase clarity.

- **Symbols** - Consistent selection of component symbols throughout. For instance, all resistors use the American rather than the European symbol (or vice-versa).
- **Bus Use** - Busses are used where appropriate to improve clarity and reduce clutter.

Presenting a Schedule

There are multiple reasons for creating a schedule, including managing time and resources so that your group can work effectively. Schedules are typically communicated using a Gantt Chart. Like the schematics, the schedule is a dynamic document: it is based upon time estimates that will need to be adjusted as you proceed with the work. There are many tools available to create (and maintain) Gantt charts, including MS Project (Windows), and `planner` (on Linux).

A reviewer of your schedule should be able to identify what each individual working on the project is working on at a given date. They should also understand how development of the project proceeds: the sequence of events is apparent. (These are both addressed by an appropriately created Gantt chart.)

Please include as part of your schedule *milestones* of development. For instance, if your project uses an LCD, please indicate when you plan to have this portion of the system working. Typically, these milestones are subsystem-oriented (i.e. corresponding to blocks in your system block diagram). Further, areas of responsibility are often subsystem-oriented.

One should also know how a milestone is evaluated. For the LCD example, above, for instance, the tests used to verify the operation of the LCD should be known before-hand!

Leave ample time for “integration”: the stage of project development where you take your group's collective individual efforts and pull it together into the final product. Testing, too, of the final product to make sure it meets the requirements specifications is required.

Presenting a Budget

How the design works, and how you are going to develop it such that it is complete on time has been addressed. The purpose of the budget is demonstrate that the work will be completed on-budget. Your budget is to be a list of parts that would need to be purchased in order to replicate the product your design describes. Ideally this will include *every* expense.

It will be from this list of parts that you will, after accommodating changes that may come about through the CDR, create a list of parts that will be ordered through the course.

You may, if you feel it appropriate, to include labour costs as part of your estimate. However, from an institutional perspective, we are mostly concerned about what will need to be spent on parts.

As with the design itself, you may find it necessary to discuss the budget at some level higher than something component-by-component. Presenting with the major (highest cost) items detailed, and smaller expenditures lumped together is a reasonable way to reduce the time that it would take to present this aspect of the project proposal.

Submission and Document Format

Please submit a *single* PDF file by 4PM on the date noted in the syllabus via the course submission facility, located at:

<https://ee401imsvr.ee.ualberta.ca/submission>

The PDF you submit will be provided to you on the day of your presentation, and will be the one projected. Please ensure, therefore, that the pages in the PDF are letter-sized and of landscape orientation. *One slide per page!* Most will create their slides in PowerPoint and export to PDF, checking the results.

This is a group submission, and therefore only one group member needs to submit on behalf of the group. As per usual, later submissions overwrite those made earlier. An email including the file is sent back to the group as an acknowledgement of receipt - be sure to check this file!

Grading

The grading scheme is not rubric-oriented, but rather has the following breakdown.

Category	Sample Questions Evaluators Consider	Weighting
Relevance and Scope of Material	Are the project objectives outlined?	40%
	Is a hardware block diagram provided?	
	Is background information (technical and otherwise) at a level appropriate for the target audience?	
	Are design and technical details concisely presented?	
Understanding/Interpretation	Is the design clearly understandable to the audience?	30%
	Are questions answered knowledgeably?	
Presentation Details	Is presentation time used effectively?	30%
	Are there an appropriate number of visuals?	
	Are the visuals of high quality?	
	Is their good presentation continuity?	
	Is the content logically organized?	
Was poise and professionalism maintained throughout?		

Evaluation is carried out by several individuals and corrected according to the method described in the syllabus. Each evaluator has an equal impact on the resulting mark. Please note that different evaluators have differing opinions and things they look for. To format and deliver your presentation to the liking of a particular person will possibly contradict what another considers an

ideal presentation. In this way, presenting is similar to teaching, and you are best served by a multi-modal instruction approach that aims to reach the most people.

If contribution by individuals is not roughly equal and/or other extenuating circumstances warrant it, evaluators may (individually) decide to evaluate portions of the group separately. It is a standard approach for the group members responsible for a given portion of the project (and its design) to present that part of the design.

Presentation Schedule

Groups are normally expected to present in their scheduled lab time. If, for some reason, a group cannot present at their allocated time, they are asked to swap the presentation time with another group. If all parties (all members of both groups) agree to the swap, the schedule will be modified assuming an appropriately-timed notification to the instructor and the projects' respective advisors.

Please note that in some rare circumstances, advisors may require modifications to the schedule in order to attend. These changes are typically handled prior to creation of the schedule.

Schedule: Fall 2011

The following table outlines the locations and order of the presentations. Each presentation is expected to take approximately 20 minutes. The order of the group listing is relevant, and specified in order of the lab section (not the date!).

Lab Section	Date	Location	Group Designators
Monday (X02)	31 Oct 2011	CCIS 1-160	01, 08, 11, 02, 09, 12, 18
	07 Nov 2011	CCIS 1-160	04, 10, 13, 05, 06, 07, 20, 03
Tuesday (X03)	01 Nov 2011	CCIS L2-190	14, 22, 15, 23, 16, 17, 24
Wednesday (X04)	02 Nov 2011	MEC 2-3	25, 29, 33, 26, 30, 34, 27
	09 Nov 2011	MEC 2-3	28, 31, 35, 32, 36, 19, 21
Thursday (X05)	03 Nov 2011	NRE 1-003	37, 38