6.033 Spring 2017
DP Final Report Assignment
Due 5/8 at 11:59pm

Having now had two rounds of feedback on your design, it's time to write your final report. Unlike the proposal document, the report should contain enough detail that it could feasibly be turned over to the MBTA for implementation. It should also contain an evaluation of your design.

Outline of the Report

Your team's report should be approximately 5000 words[1] and follow the basic outline below:

- **Title page:** Give your report a title that reflects the subject and scope of your project. Include your names, email address, recitation instructor, section time(s), and the date on the title page.

- **Introduction:** Summarize the problem to be solved and what your design is intended to achieve. Outline your design and briefly outline why your design meets the requirements.

- **System Overview:** Provide a high-level description of your system that includes modules, interactions, and messages. This should include a system diagram and serve to introduce definitions for key terms used in the Design section. The system overview also provides an opportunity to prioritize the main system objective(s).

- **Design:** Explain your design. Identify your design's main components and protocols. You should sub-divide the design, with corresponding subsections in the text, so that the reader can focus on and understand one piece at a time. Explain why your design makes sense as well as explaining how it works. Use diagrams, pseudo-code, and worked examples as appropriate.

  It should be clear from this section that your design meets the specifications of the assignment (e.g., that it does not exceed the storage available on the servers nor the capacity of the network, etc.). Leave any major calculations to the evaluation section, though it's fine to reference those calculations beforehand (e.g., "Our design results in a communication overhead of fewer than 1Kbit/sec; see Section 3.1 for an analysis.").

- **Evaluation:** Evaluate your design. There are more details about this section below.

- **Conclusion:** Briefly summarize your design and provide recommendations for further actions and a list of any problems that must be resolved before the design can be implemented.

- **Acknowledgments and references:** Give credit to individuals whom you consulted in developing your design. Provide a list of references if appropriate.

---

[1] As always, use this word count as a guideline. If you are writing significantly more than 5000 words, you're giving us too much detail. If you are writing significantly fewer than 5000 words, you are giving us too little. We care much more about the content of your paper than the exact word count.

Evaluation

A good evaluation will do more than just calculate metrics relevant to your system; it will also use calculations to justify design decisions. For example, "Our method for transmitting data from the buses results in an overhead of only 1Kbit/sec, compared to a design without this method, which results in an overhead of 1Mbit/sec."

At a minimum, your evaluation section should address the following questions:

- **What is the communication overhead of your system?**

  Typically this will be a measure of the amount of traffic sent between buses and the MBTA servers.

- **On average, how long will it take a bus that wants to use the radio network to be assigned a frequency?**

  For some designs, it may be instantaneous. But consider whether there is any scenario where more than ten buses might need to use the radio at once (in particular, if your system every uses the radio to transmit voice data to the warehouse; consider how long such conversations might take).

- **On average, how long does it take data collected on a bus to be transmitted to the MBTA warehouse?**

- **How much data are you storing on the MBTA's servers? How long will it take before those servers can't store any additional data?**

- **What parts of your system limit scale, and what are those limits?**

  Could your system handle the MBTA adding 100 new routes and 500 new buses? Could it handle an influx of new passengers? What about if the MBTA added new buses to your pool, but required that stops be served every fifteen minutes instead of every twenty? What if the MBTA wanted to use your system to collect data more frequently (e.g., every 20 seconds from every bus)?

- **How accurate is the data you collect?**

  Is your passenger-count data always 100% accurate? What about your system's estimates for reliability data (whether the bus arrives at its origin, midpoint, or destination timepoint within three minutes of schedule)?

- **How long does it take your system to respond to a failure?**

  Among other things, this might include the time it takes for a new bus to get to the failed route.

- **Under what scenarios do you expect your system to *not* meet the MBTA's target requirements?**

In answering those questions, you should provide the appropriate numbers as well as some context for them. How do the values that you calculated affect users or other entities in the system? If your data is X% accurate, is that good or bad? Did you make any trade-offs that involve these metrics? Etc.

Because every system design is different, you may need to discuss additional metrics specific to your system in the evaluation. You may also discuss how your system will evolve as MBTA upgrades their infrastructure (e.g., bus hardware, etc.). What would and increase in bus control specs (storage/CPU/memory) mean for your system? Or an upgrade to a new network between the buses and the warehouse?

Your evaluation should also address the use-cases presented in the design project write-up. You may pull those out into their own subsection, or mention them at different points within your evaluation. Whatever structure works best for your report is fine.

Finally, some design decisions may not correspond to calculable metrics; the most common case is preferring a simple, modular design over a complex one. Your design report should note when you made choices in the name of simplicity or other design principles. Depending on your report organization, it may be more appropriate to include this information in the design section than in the evaluation.

Final Reflection

In addition to the report, **each student** should provide a final reflection of approximately 250 words.

Purpose: To provide a thoughtful and honest reflection of your design team's communication approach. Although you must submit a Final Reflection to receive credit, the content of this Reflection will not impact your course grade, so please be 100% honest.

Audience: Primarily your communication instructor. Your Reflection can help guide communication content for the future. Your technical instructor/TA may also read your Reflection.

Content: The Reflection should briefly summarize the contribution of each team member based on your individual observations. In addition, please answer the following questions:

- What is the biggest change your team has made to your design since the proposal?

- Which model(s) of collaboration did your team use to develop your design and write this report?

- Was your model of collaboration effective for your team? Describe any changes you made to your collaboration process between the proposal and the report.

To help us understand how stasis theory and our teaching can support your work, please reflect on your experience:

- Did you use any aspects of stasis theory in your thinking/writing about the design project presentation or final report? If not, why not? If yes, how did you use stasis theory? As a reading tool? A creation strategy for writing the DPR or planning the presentation? To think through your design? To support collaboration or teamwork?

- What would have helped you better apply stasis theory over the course of the semester?