Engineering Class Project

How to Present Your Work in an Effective Way

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# Report Information

|  |  |  |  |
| --- | --- | --- | --- |
| **Date** | **Version Number** | **Author** | **Comment** |
| 10/31/2019 | 0.0 | Amr Zaky | Initial |
| 11/1/2019 | 1.0 | Amr Zaky | Added details about charts. |

**Table 1: Report version information.**

# Introduction

This document demonstrates a short organized engineering class report. It is specifically addressing reports for projects assigned in SCU Computer Architecture classes (COEN210 and COEN 313). The benefit could extend to other engineering reports. It is not comprehensive by any means, but it list some good practices to follow and some mistakes to avoid. The goal at the end is to produce a report that summarizes some findings.

The document advises by example. Therefore, in this introduction section it covers what introductions are for: a summary of the document purpose, and a summary of the document organization.

# Sections

This section proposes a simple organization for the report.

## Logical Organization

Typically a report will have the following sections

1. An introduction that explains what the report is about and describes its organization.
2. A background section which discusses the problem that the report addresses in some detail and relates the problem to existing body of knowledge (e.g. published papers, textbooks, algorithms, etc.).
3. One or more section (there is a leeway for the author(s) to choose the number of sections and their organizations). If the report is about an experiment (physical or simulated), then the following sections would be nice to have
   1. One section describing the setup (e.g. the simulation code name, the assumptions made, the source of the data etc.).
   2. One section (can be combined with ‎a) to describe the experiments (for example designs and/or configurations tested). What will be measured might as well be described in this section.
   3. One section to summarize the results in enough useful details. Example of useless details is how long a program ran. That would be only useful, if measuring the complexity was one of the goals.
   4. Other sections describing an algorithm, design, etc., the rationale for choosing it.
4. A section that analyses the results. It compares the results for different designs and attempts to establish explanations for the different results whether they were expected or not. Depending on the availability of time, effort should be made to explain the result based on actual insights rather than just providing “guesses”. In fact, if time allows, further experiments might be performed at this stage to confirm or deny some explanation.
5. A conclusion section that sums up the report and provides a summary of its contribution. Class reports usually have no follow-up work. But in other technical documents, like academic papers or theses, detailed future work to address or extend the problem are proposed.

## Physical Organization

The report should be divided into numbered section, subsections, sub-subsections, etc. This document used an MS Word design template that facilitates this task. You can use this document (after you clear it of the current content) as the basis of your report document.

Using connecting sentences between sections helps the reader stay in focus.

# Language

Using slang should be avoided in reports.

Contractions (don’t, won’t, etc.) are not suitable for a report.

Acronyms unless very familiar to the readers should be defined first.

“Will” is a better choice than “going to”.

Words like “rare”, “often”, “very” and other similar words would be better replaced by more precise words or phrases. “The miss rate was 3%” is more precise than “The miss rate was very low.”

It is recommended to avoid using the first person (singular or plural): it is considered arrogant. Avoiding irrelevant personal anecdotes is a must.

“I was tired and had a final so I did not run another set of experiments” can be better expressed as “Due to time limitations, no other set of experiments was run.” It should be noted that MS Word spelling checker is often not pleased by the use of passive voice; however, it is often more appropriate to use passive voice to avoid starting sentences with “I” or “we”.

# DESCRIBING ALGORITHMS

It is not a good idea to present code in lieu of an algorithm, especially in a report. If snippets of code are needed to illustrate a point (for example about a coding style), then only the smallest snippet needed to convey the idea is needed. When the code is part of the project report deliverables, then it is better to turn a soft version of the code as a pointer to a common directory, URL link, some public repository, or on a removable storage medium (e.g. a USB flash drive).

The best way to describe an algorithm is through pseudocode, flowchart, precise steps, or all of the above. If the algorithm is a modification of an existing commonly known algorithm, it is a good practice to either present the earlier algorithm in some detail, then point the changes. Alternatively, a reference (paper, textbook, or web article) to the earlier algorithm should be provided.

# Presenting Quantitative Results

## Format of Results

Screen shots (especially dark screen shots) are not readable. The results should be presented in tables and/or charts. Some redundancy (i.e. some result data is presented in more than one table or chart) is inevitable. There should be precise description of what the tables or charts are supposed to prove.

## Amount Of Data Presented

In an experimental architectural study there are three data handling steps

1. Producing the data through measurements, modeling or simulation,
2. Analyzing the data and drawing conclusions, and
3. Presenting the data.

There is a reasonable understanding that presenting very little data is not helpful. This is even more so for class reports since presenting little result data casts a shadow of lack of effort on the part of the students.

However, a serious shortcoming, that is often missed, is that presenting too much data is not a good idea either. Useful information based on quantitative results is the expected value of the report.

Too much data provided in class reports is not a sign of “tireless” effort. First, it is well known that the mountains of data presented are often produced by an automated setup (maybe the output of a program), so the hard work is put in by a machine! Second, too much data presented suggests that the data collector (students in the case of a class report) is assuming the role of a hands-off data “communicator”. Data should be analyzed, distilled, and interpreted in a manner that whole is more informative than the sum of the parts. **Thorough analysis of the data, and the identification of the outcome it conveys is an invaluable part of the project. It also demonstrates the technical maturity of the analysts (students in case of a class report).** Hence, a few tables or charts with a thorough explanation of what they convey, is several orders of magnitudes more useful than a telephone directory worth of unanalyzed data.

## Using Charts

Numerical charts (like those produced my MS Excel) are great in helping present the data. There are complete books about how to present data in the most informative way. There is no attempt to compete with those in this short paragraph. Instead, we will present a few examples of charts and demonstrate how they can be successively improved.

### Bad Chart 1

The chart above is supposed to show the increase of the hit time versus the cache size for 2-way associative caches. Without analyzing the chart, it should be noted that a “Figure” caption should be under the chart. So this is added next.

### Bad Chart 2

**Figure 1: Growth of cache hit time versus cache size for a 2-way set associative cache.**

The second attempt is better, however the chart itself lacks a lot of details. If it is cut and pasted in some presentation slide it will be almost useless. That calls for an improvement.

### Better Chart 3

**Figure 2: Growth of cache hit time versus cache size for a 2-way set associative cache**

The chart in Figure 2 is much more informative than the previous chart. However, the y-axis values are close to each other. It is better to display the percentage increase in hit time compared to the 16-Kbyte cache.

### Good Chart 3

**Figure 3: Percent increase in hit time vs. cache size (compared to 16 Kbyte cache)**

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# Summing UP

The summary of what was done and the results is provided in the last (conclusion) section. It is important in a report to underline what was achieved. A class report summarizing work performed in 4 weeks is not expected to report any breakthrough. The reader (instructor in case of a class report) is judging the contribution from the perspective of the report authors. The instructor might value or not value the contribution, can confirm that the contribution took place or can deny that the report really detailed such contribution.