

University of Toronto
Department of Computer Science
CSC302S – Engineering Large Software Systems

January 17, 2008
Prof. Steve Easterbrook

Assignment 1: Reverse Engineering

Due Date: 11:20am, Thursday, January 31, 2008
(i.e. within 10 minutes of the start of the tutorial)

This assignment counts for 5% of the final grade

Reverse engineer a set of models from the source code you have been given, to explain its design. The goal is to use UML to highlight the structure and behaviour of the code. The assignment requires you to use your judgment about which aspects of the design to model, how much to abstract away from the code base, and which parts of UML to use. There is no “correct” answer – your models will be judged for how well they explain the most interesting and important aspects of the design.

The project is to be carried out in your assigned teams. Each team will submit one report.

I. Doing the Assignment

This assignment has 7 steps. They are:

1. *Familiarize yourself with the existing codebase.* Check it out of the repository, attempt to build it, and browse the directory structure.
2. *Familiarize yourself with the tools available to help you with this assignment.* You will need a UML drawing tool of some kind (simple lightweight tools will work fine for this), and, optionally, a reverse engineering tool. Identifying and evaluating suitable tools is part of the exercise.
3. *Generate a UML class diagram representing all the classes, subclass relationships, and associations in the source code.* You can either do this by hand, or find a suitable reverse engineering tool to do it for you. If you use a reverse engineering tool, note that you will probably still need to edit the generated model to capture information missed by the tool, or to remove unnecessary detail.
4. *Draw a higher-level diagram to show the overall architecture of the system.* Use any appropriate UML notation (e.g. packages, components, interfaces, etc). Be sure to show clearly where each class belongs in this architecture, and what external packages the system interacts with.
5. *Identify three different design patterns used in the system, and show how each is implemented using UML diagrams.* Suggested patterns to look for include any of those covered in CSC301, for example: Command, Adapter, Iterator, Composite, etc. Be sure to illustrate the pattern with both structural views (e.g. class or object diagrams) and behavioural views (e.g. sequence diagrams).
6. *Write a report* that describes the steps you went through to reverse engineer the design and to produce the required models.
7. *Document your teamwork* and complete team member evaluations and team member evaluation summary forms (see attached forms). Submit signed hardcopies as well as the online forms.

II. What to Hand In

Hand in your report at the start of your tutorial on the due date. *Reports not handed in within the first ten minutes of the tutorial will be treated as late.*

The report should not exceed twenty (20) pages (not counting cover pages, appendices, and teamwork forms). It should include the following items:

1. A brief description of the reverse engineering **process** you used, including the tools you used and the abstraction steps you took.
2. A commentary on the **architecture** of the system, highlighting any interesting aspects of the design (e.g. architectural style, degree of coupling, etc), and discussing the quality of the architecture used in the system, and suggesting possible improvements where appropriate. Use UML diagrams to illustrate the points you wish to make.
3. A description of each of the **design patterns** you identified, along with both structural and behavioural UML models (suggestion: limit yourself to no more than 2 pages per pattern).
4. Other UML models you generated, as appropriate. Be sure to include at least enough views so that you show where each and every class fits into the overall system structure.

Written Presentation Requirements

Be sure to include a cover page indicating the name of your team, the names of all team members, title of work, course, date and tutor's name. Assignments will be judged on the basis of visual appearance, the grammatical correctness and quality of writing, and the visual appearance and readability of the models, as well as their contents. Please make sure that the text of your report is well-structured, using paragraphs, full sentences, and other features of a well-written presentation. Use itemized lists of points where appropriate. Text font size should be either 10 or 12 point.

IV. Marking Scheme

Your assignment will be marked by your tutor. If you have questions about a marked assignment, you should first ask your tutor before/after a tutorial. If you don't get satisfactory answers, you should talk to your instructor.

Marks for this assignment will depend on the following factors:

Description of your process (20%): Did you identify and evaluate suitable tools? Did you make good (sensible) choices? Did you describe the decisions you took in abstracting higher-level models from the code? Did you critique your process, and reflect on what you learned?

Description of system architecture (20%): Did you clearly show the overall architecture? Is your architecture an accurate representation of the design of the system? Did you critique the architecture, identifying both strengths and weaknesses? Did you make good use of UML sketches to make your points?

Description of Design Patterns (20%): Did you identify at least three design patterns? Are these patterns genuine? Did you clearly show how the pattern is implemented in the code? Do your UML diagrams correspond accurately to the code? Did you show both structure and behaviour for these patterns?

Remaining UML models (20%): Did you provide UML diagrams with enough detail to see the design of the entire system at least down to class names? Have you eliminated other detail to ensure these diagrams are still readable? Did you make good use of different UML modeling constructs to describe the system?

Presentation (20%): The style of your presentation, including language, grammar, clarity of the presentation, layout and legibility of the models, etc. (10% - Language; 10% - Style and clarity)

CSC302 Team Member Evaluation Form

The following evaluation of your team member is a tool to help improve your experiences with group work. Its purpose is to determine those who have been active and cooperative members of the team, as well as to identify those who did not participate. Use the guidelines below to evaluate each teammate

Teammate's Name _____ Team: _____

Assignment: _____ Date: _____

1- never; 2 – rarely 3 – sometimes 4 usually 5 - always

Circle your responses:

- | | | | | | |
|-----------------------------------------------------------------------------------------------------------------|---|---|---|---|---|
| • My teammate attends team meetings | 1 | 2 | 3 | 4 | 5 |
| • My teammate makes a serious effort to prepare for team meetings | 1 | 2 | 3 | 4 | 5 |
| • My teammate makes a serious effort to fulfill his/her responsibilities on assignments | 1 | 2 | 3 | 4 | 5 |
| • My teammate makes contributions in team meetings | 1 | 2 | 3 | 4 | 5 |
| • My teammate listens to his/her teammates' ideas and options respectfully and gives them careful consideration | 1 | 2 | 3 | 4 | 5 |
| • My teammate cooperates with the group effort | 1 | 2 | 3 | 4 | 5 |
| • My teammate attends tutorials | 1 | 2 | 3 | 4 | 5 |
| • My teammate attends lectures | 1 | 2 | 3 | 4 | 5 |

Based on your responses to the questions above, assign an overall rating of your teammate based on the following scale:

- | | |
|----------------|-------------------------------------------------------------------------------------|
| Excellent | Consistently carried more than his/her fair share of the workload |
| Very Good | Consistently did what he/she was supposed to do, very well prepared and cooperative |
| Satisfactory | Usually did what he/she was supposed to do, acceptably prepared and cooperative |
| Ordinary | Often did what he/she was supposed to do, minimally prepared and cooperative |
| Marginal | Sometimes failed to show up or complete assignments, rarely prepared |
| Deficient | Often failed to show up or complete assignments, rarely prepared |
| Unsatisfactory | Consistently failed to show up or complete assignments, rarely prepared |
| Superficial | Practically no participation |
| No Show | No participation at all |

Overall Rating: _____

Signature: _____

CSC302 Team Member Evaluation Summary

Your Name _____ Team: _____

Assignment: _____ Date: _____

Please write the names of all of your team members, INCLUDING YOURSELF, and rate the degree to which each member fulfilled his/her responsibilities in completing the team assignments. *DO NOT LEAVE ANY COMMENTARY BLANK!* Staple this summary to your Team Member Evaluations Forms, place them in a sealed envelope with your name and team name on the outside, and submit the envelope with your assignment to your instructor. The possible ratings are as follows:

Excellent	Consistently carried more than his/her fair share of the workload
Very Good	Consistently did what he/she was supposed to do, very well prepared and cooperative
Satisfactory	Usually did what he/she was supposed to do, acceptably prepared and cooperative
Ordinary	Often did what he/she was supposed to do, minimally prepared and cooperative
Marginal	Sometimes failed to show up or complete assignments, rarely prepared
Deficient	Often failed to show up or complete assignments, rarely prepared
Unsatisfactory	Consistently failed to show up or complete assignments, rarely prepared
Superficial	Practically no participation
No Show	No participation at all

These ratings should reflect each individual's level of participation, effort and sense of responsibility, not his/her academic ability.

Name of Team Member	Rating	Commentary (DO NOT LEAVE BLANK)
_____	_____	_____ _____

Signature: _____