CM0570
Program Design and Development
Assignment 1 of 2
Academic year 2016-17

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Issued Teaching week 2 in classes and on eLP.

Due end of teaching week 6, 23:59; work to be submitted electronically via eLP.

Marks and feedback available week 8 or 9 in lab classes.

Learning Outcomes This part of the assignment assesses, wholly or partly, the following learning outcomes (taken from the Module Descriptor):

1. Perform System Design and Architecture by applying appropriate modelling techniques and tools.
2. Evaluate System Design and Architecture documentation by the application of concepts and principles.

This assignment is weighted at 50% of the marks for this module and has a group work component. To ensure a fair split of marks, an element of peer assessment will be included. This must be supported by evidence in terms of completed meeting minutes. To support this, the group must complete a set of peer assessment forms one for each group member. Failure to submit either the peer assessment form or supporting evidence will result in the marks for the group part of this assignment being capped at 40%. Please see below for further details.

1 Scenario

Bigg City Bank provide banking services in Bigg City. The main things they are concerned with are *Clients* and *Accounts*. There are *Current Accounts* and *Savings Accounts*. A client may have at most one of each type of account. There are no other types of account. The following information is stored about a **client**:

- ClientID: an integer; must be unique;
- FamilyName: a string; must not be null or empty;
- FirstName: a string; must not be null or empty;
- HouseNumber: an integer ≥ 1;
- Postcode: a string consisting of two capital letters, one or two digits, a space, one or two digits and two capital letters. Lowercase letters (if entered) should be converted to the corresponding capital letters.

Accounts. Certain information which is stored is common to both types of account:

- AccountID: a string; wholly numeric, 8 digits long. 00000000 (all 0s) is the only invalid combination. A leading zero is significant. Must be unique.
- Owner: the client ID of the client to whom this account belongs. The client ID must actually exist.
- SortCode: a string; two digits, a hyphen, two digits, a hyphen, two digits. None of the pairs of digits can be 00 (although either one of the digits can be a 0, it is not possible for both to be 0).
- Balance: an integer: an amount in pence; may be negative in case of a current account.

For *current accounts*, information is stored on the *overdraft limit*. This is an integer, representing a whole number of pounds. It is set to a value which is specified when the account is created, but may subsequently be changed. The value must be ≥ 0.

No additional information is stored for *savings accounts*, but such accounts pay interest on the balance at the end of each month.

Both types of accounts are associated with a list of *transactions*. A given transaction may only be associated with one account.

Transactions. There are two types of transactions: credits (which add money to an account) and debits (which remove money from an account). The information stored about either type of transaction is as follows:

- AccountID: a string; the account associated with the transaction.
- Amount: an integer: stored in pence but entered in pounds and pence: eg 12.45 is stored as 1245.
- DateAndTime: a Date; the date-and-time when the transaction occurred.

2 Functionality

Bigg City Bank require a system that is capable of performing the following tasks:

1. adding records for clients, validating the information according to the descriptions given;
2. creating a current account or savings account for an existing client;
3. entering transactions; all of the transactions associated with an account are stored.

3 Your Tasks

You are required to perform the following tasks, in groups of 3 to 5:

1. Develop a domain class diagram for the above scenario, including all of the necessary *entity* classes and the relationships between them, including multiplicity. Do not show boundary, control classes. You should also include all the attributes and operations which can be inferred from the description given.
2. Develop a storyboards and sequence diagrams (taking account of all the possibilities described in the scenario above) for the following situations:
   (a) the creation of an account for a client;
   (b) the entering of a transaction against a current account, including its effect on the account concerned (e.g. change in balance). If a transaction would violate the overdraft limit for the account, an appropriate warning should be issued.

Individually, you are also required to:

3. Evaluate the storyboards produced, using Nielsens Heuristics. You should consider each of the heuristics in turn.
4. Evaluate the quality of the overall design, paying particular attention to the concepts of *coupling* and *cohesion*.

You may use Star UML to produce the UML models. This is available on the PCs in labs in Pandon Building with the Computing image. It is an open-source program and you can download your own copy from:
`http://sourceforge.net/projects/staruml/files/staruml/5.0/`. Alternatively, you may design the UML models (class and sequence diagrams) by hand. A scanned image of a neatly drawn diagram is acceptable.

Academic Misconduct During the group phase of the work, you should not collaborate with, or use the work of, other groups. The individual phase must be solely your own work, although you may of course refer to the jointly-produced material in the course of your evaluation. Any sources you make use of must be referenced correctly using the guidelines in *Cite Them Right*, available on the University website. Any plagiarism or collusion will be dealt with according to University regulations.

4 Handing in your work

Each *group* should submit a report containing

- A list of the names of the group members;
- Completed Peer Assessment forms (see below).
- PDFs of the UML class and sequence diagrams.
- Copies of the storyboards for the two scenarios.

This report should be submitted electronically as a PDF file, via *Turnitin*. A link will be provided on the eLP page for the module.

Each *individual* student should submit a report containing

- Your individual evaluations of the storyboards;
- Your individual evaluation of the overall design quality.

This should be submitted electronically as a single PDF document via Turnitin, using the link available on the eLP (Blackboard).

5 Marking Scheme

Category	Marks	
Class Diagram	20	group
Sequence Diagram of creation a new account	10	group
Sequence Diagram entry of a transaction	10	group
Storyboards	20	group
Storyboard Evaluation	20	individual
Design Evaluation	20	individual

5.1 Detailed marking of Class Diagram

16-20 The correct scope is modelled covering all the requirements. Classes are sensibly named. Appropriate attributes and operations are allocated to classes. An appropriate and complete set of attributes has been identified. An appropriate and complete set of operations has been identified. Plausible visibility is applied to both attributes and operations. Plausible relationships including types, names and multiplicity. Correct following of UML standards The diagram is consistent with the other provided diagrams. Any errors, omissions or additions are very minor. Overall an outstanding class diagram.

14-15 Excellent in the areas of the scope, classes, attributes, operations, visibility relationships, consistency and syntax. All areas are at least good. May be outstanding is some areas and good in others and hence is on balance excellent. Good or above in all areas. Likely to contain minor errors, omissions or additions which prevent the diagram from being outstanding. Overall an excellent class diagram.

12-13 Good in the areas of the scope, classes, attributes, operations, visibility relationships, consistency and syntax. It is possible that the diagram is outstanding or excellent in some areas and satisfactory in others but on balance is good. Satisfactory or above in all areas. Likely to contain a small number of errors, omissions or additions which prevent the diagram from being excellent. Overall a good class diagram.

10-11 Satisfactory in the areas of the scope, classes, attributes, operations, visibility relationships, consistency and syntax. It is possible that the diagram is good or above in some areas and satisfactory in others. Weak in no more than two areas. Likely to contain a number of errors, omissions or additions which prevent the diagram from being good. Overall satisfactory.

8-9 Weak in the areas of the scope, classes, attributes, operations, visibility relationships, consistency and syntax. It is possible that the diagram is satisfactory or above in some areas and unsatisfactory in others. Likely to be weak in more than three areas. It might be unsatisfactory in one area but no more. Likely to contain errors, omissions, additions, or misun-

derstandings which prevent the diagram from being satisfactory. Overall poor.

0-7 Unsatisfactory diagram in the areas of the scope, classes, attributes, operations, visibility relationships, stereotypes, consistency and syntax. It is possible that the diagram is weak or above in some areas and unsatisfactory in others. Unsatisfactory in two or more areas. Likely to contain errors, omissions, additions, or misunderstandings which prevent the diagram from being weak. May not be recognisable as a class diagram, might have majors errors in content or a combination of the two.

5.2 Detailed marking of Sequence Diagrams

For each sequence diagram (hence maximum of 10 marks)

8-10 Full appropriate flow of events is shown. Appropriate use of messages. Messages are named sensibly. Methods have appropriate signature. Iteration dealt with appropriately if required. Correct following of UML standards. Objects performing plausible responsibilities. Objects behave in a sensible manner and provide services as could be plausibly anticipated of them. Sensible behaviour in terms of operations and attributes assigned to appropriate classes. The diagram is consistent with the other provided diagrams. Any errors, omissions or additions are very minor. Overall an outstanding sequence diagram.

7 Excellent in the areas of the scope, messages, iteration, responsibilities, consistency and syntax. All areas are at least good. May be outstanding is some areas and good in others and hence is on balance excellent. Good or above in all areas. Likely to contain minor errors, omissions or additions which prevent the diagram from being outstanding. Overall an excellent sequence diagram.

6 Good in the areas of the scope, messages, iteration, responsibilities, consistency and syntax. It is possible that the diagram is outstanding or excellent in some areas and satisfactory in others but on balance is good. Satisfactory or above in all areas. Likely to contain a small number of errors, omissions or additions which prevent the diagram from being excellent. Overall a good sequence diagram.

5 Satisfactory in the areas of the scope, messages, iteration, responsibilities, consistency and syntax. It is possible that the diagram is good or above in some areas and satisfactory in others. Likely to be weak in no more than two areas. Likely to contain a number of errors, omissions or additions which prevent the diagram from being good. Overall a satisfactory diagram.

4 Weak in the areas of the scope, messages, iteration, responsibilities, consistency and syntax. It is possible that the diagram is satisfactory or above

in some areas and unsatisfactory in others. Likely to be weak in more than three areas. It might be unsatisfactory in one area but no more. Likely to contain errors, omissions, additions, or misunderstandings which prevent the diagram from being satisfactory. Still recognisable as a sequence diagram of the problem in focus. Overall poor but satisfactory.

0-3 Unsatisfactory in the areas of the scope, messages, iteration, responsibilities, consistency and syntax. It is possible that the diagram is weak or above in some areas and unsatisfactory in others. Unsatisfactory in two or more areas. Likely to contain errors, omissions, additions, or misunderstandings which prevent the diagram from being weak. May not be recognisable as a sequence diagram, might have majors errors in content or a combination of the two.

5.3 Detailed marking of Storyboards

For each storyboard (total 20 marks)

8-10 Outstanding storyboard. Is of professional quality. Covers the complete flow of the primary and alternative scenarios. Of a standard that could be discussed with users to provide feedback. Adequate and sensible test data has been identified to illustrate the prototype in the context it was intended.

7 Excellent storyboard. Covers the complete flow of the primary, alternative and exceptional scenarios. Of a standard that could be discussed with users to provide feedback, although some user questions / comments could be anticipated either in layout or test data illustrated.

6 Good storyboard. Covers most of complete flow of the primary, alternative and exceptional scenarios. Of a standard that could be discussed with users to provide feedback, although some obvious user questions / comments could be anticipated either in layout or test data illustrated. May have minor presentation issues.

5 Adequate storyboard. Covers most of the flow of the primary, alternative and exceptional scenarios. Would need amendment / review before showing to a client.

4 Poor storyboard. Covers at least the primary scenario. Probably feels incomplete. Would need significant amendment / review before showing to a client.

0-3 Inadequate storyboard. Covers some of the flow of the primary, alternative and exceptional scenarios but is incomplete. Would probably be embarrassing to show to a client.

5.4 Detailed marking of Storyboard Evaluation

16-20 Outstanding evaluation of storyboard using Nielsens Heuristics. All of the aspects are considered and examples are identified and discussed. The examples provided and the explanations used demonstrate insight into the interaction design. Thought provoking.

14-15 Excellent evaluation of storyboard using Nielsens Heuristics. All of the aspects are considered and examples are identified and discussed. The examples provided and the explanations used demonstrate understanding into the interaction design. There may be minor oversights or minor flaws or the clarity of aspects of the discussion prevent the evaluation from being outstanding.

12-13 Good evaluation of storyboard using Nielsens Heuristics. Most of the aspects are considered and examples are identified and discussed. The examples provided and the explanations used mostly demonstrate understanding into the interaction design. There may be oversights, omissions or flaws or the clarity of aspects of the discussion prevent the evaluation from being excellent.

10-11 Satisfactory evaluation of storyboard using Nielsens Heuristics. The majority of the aspects are considered and examples are identified and discussed. The examples provided and the explanations used in the majority of cases demonstrate understanding into the interaction design. There may be oversights or flaws or the clarity of aspects of the discussion prevent the evaluation from being good. May feel slightly incomplete.

8-9 Weak but satisfactory evaluation of storyboard using Nielsens Heuristics. Some of the aspects are considered and examples are identified and discussed. The examples provided and the explanations used in some of cases demonstrate understanding into the interaction design. There may be oversights or flaws or the clarity of aspects of the discussion prevent the evaluation from being good. May feel incomplete.

0-7 An unsatisfactory answer. The extent of the errors, omissions or oversights is such that the answer is unsatisfactory. Examples or explanation could contain major errors, omissions or oversights. May be incomplete, discussion could be very unclear, could be incorrect in the majority of cases.

5.5 Detailed marking of Design Evaluation

16-20 Outstanding and comprehensive definition and evaluation of *coupling* and *cohesion* within the models. An appropriate set of definitions are provided. These definitions are supported by appropriate quality references. The referencing is completed correctly. The examples provided and the explanations used demonstrate insight into how the design supports *coupling* and *cohesion*. Thought provoking.

14-15 Excellent definition and evaluation of *coupling* and *cohesion* within the models. Definition of *coupling* and *cohesion* is appropriate but not comprehensive. The examples provided and the explanations used may demonstrate *coupling* and *cohesion* but fall short of insightful. There may be minor issues with the grammar related to the referencing or may have minor errors or minor oversights. Or some combination of these issues.

12-13 Good definition and evaluation of *coupling* and *cohesion* within the models. *coupling* and *cohesion* are defined but possibly by only one reliable source. The examples provided and the explanations used are mostly correct. There may be issues with the grammar related to the referencing or may have errors or oversights which prevent it from being excellent. Or some combination of these issues.

10-11 Satisfactory definition and evaluation of *coupling* and *cohesion* within the models. *coupling* and *cohesion* are defined but possibly by only one reliable source. The examples provided and the explanations used are usually correct. There may be issues with the grammar related to the referencing or may have errors or oversights which prevent it from being good. Sources referenced may not be very reliable. Or some combination of these issues.

8-9 A weak but satisfactory answer. An attempt is made to define *coupling* and *cohesion* and evaluate them by providing and explaining examples. However the extent of the errors, omissions or oversights is such that the answer is poor. The sources of information might have been not reliable. The examples provided could have been limited or with major errors. Or a combination of these. A reference list is included in a semblance of the correct format.

0-7 An unsatisfactory answer. The extent of the errors, omissions or oversights is such that the answer is unsatisfactory. A reference list in a semblance of the correct format might have not been provided. The definition of *coupling* and *cohesion* could have been incorrect. Examples or explanation could contain major errors, omissions or oversights.

6 Peer assessment Form

The group must submit

1. One peer-assessment form for each group member. This will need to be agreed and signed by each group member. The peer assessment template is available on the module web page.
2. Evidence for the peer assessment in the form of meeting minutes. A template is available on the web page to help with this.

The peer assessment forms and evidence should be submitted in paper form to the School Office. Make sure the pages are securely bound together, and

labelled with the names of the group members.

If these are not supplied the mark for all group members, for the group part of this assignment, will be capped at 40%.

Based on the peer assessment form you will be able to calculate a score of between 3 and 8 which measures your peers views of the quality of your team work in this task.

We reserve the right to consult with you and potentially change the weightings (and in extreme cases marks) when this is felt necessary. We will not do this before the assignment is handed in.

On the form each students performance in the team is graded by a number of criteria. Each criterion will be given a score of between 3 and 8. Once all the criteria have been graded the average score across the criteria for the student will be determined. This is called Team Work Score, which will be between 3 and 8. Calculate this by adding up the score for each of the nine criteria and then dividing by nine.

Once the peer assessment forms have been completed for all members of the group it is possible to determine the group average. This is calculated by adding up the Team Work Scores for all the group members and dividing the total by the number of group members. A weighting can then be calculated by dividing the students Team Work Score by the group average.

The weighting applies to only the group component of the assessment. A students mark will be determined by multiplying the group mark by the weighting. This will be calculated to the nearest whole number.

A worked example is included in the *peer assessment guidance* document, based on a group of 3 students Rob, Jane and Fred who obtain a group mark of 30/60.