

# Fall 2014: Database Systems, Project

## 1 Overview

In this project, you will design, implement, and document a database system for an online bookstore. You will carry out this project in a group of two.

## 2 Application Specification

A description of the major functions and data items follows. Some functions will be provided to the customers and others to the manager of the bookstore.

### 2.1 Basic Data

The system should manage information about books in the bookstore, inventory, (registered) users and books they have ordered. It should also store information about user opinions and book ratings. While you are working, keep in mind that these items are a minimal set of requirements.

**Book Data:** An ISBN for each book, title, author(s), publisher, year of publication, number of copies in inventory, price, format (hardcover, softcover), keywords, subject (Sci-Fi, western, history, etc.). You should add additional information if necessary.

**Customer Data:** For each registered customer, you need to maintain: his/her full name, login name, password, address, phone number, books he/she has ordered and information regarding the order.

**Opinions:** Users can provide ‘feedback’ for a book, as a score (1-10) along with optional short text. Users can also rate other users’ feedback as ‘useless’, ‘useful’, ‘very useful’; finally, they are allowed to declare other users as ‘trusted’ or ‘not-trusted’.

### 2.2 Functionality of the system

The following set of events and queries should be handled by the your system:

- 1) [5pts] **Registration:** Registration: a new user has to provide the appropriate information; he/she can pick a login-name and a password. The login name should be checked for uniqueness.
- 2) [5pts] **Ordering:** After registration, a user can order one or more books. The total amount of its order is reported to him/her. A user may order multiple copies of a book, one or more times. (The charging of the credit card and the shipping of the books are outside the scope of this project).
- 3) [5pts] **New book:** The store manager records the details of a new book, along with the number of books that have arrived in the warehouse.
- 4) [5pts] **Arrival of more copies:** The store manager increases the appropriate counts.
- 5) [5pts] **Feedback recordings:** Users can record their feedback for a book. We should record the date, the numerical score (0= terrible, 10= masterpiece), and an optional short text. No changes are allowed; only one feedback per user per book is allowed.
- 6) [5pts] **Usefulness ratings:** Users can assess a feedback record, giving it a numerical score 0, 1, or 2 (‘useless’, ‘useful’, ‘very useful’ respectively). A user should not be allowed to provide a usefulness-rating for his/her own feedbacks.
- 7) [5pts] **Trust recordings:** A user may declare zero or more other users as ‘trusted’ or ‘not-trusted’.
- 8) [20pts] **Book Browsing:** Users may search for books, by asking conjunctive queries on the authors, and/or publisher, and/or title-words, and/or subject. Your system should allow the user to specify that the results

are to be sorted (a) by year, or (b) by the average numerical score of the feedbacks, or (c) by the average numerical score of the trusted user feedbacks.

9) [5pts] **Useful feedbacks:** For a given book, a user could ask for the top  $n$  most ‘useful’ feedbacks. The value of  $n$  is user-specified (say, 5, or 10). The ‘usefulness’ of a feedback is its average ‘usefulness’ score.

10) [10pts] **Buying suggestions:** Like most e-commerce websites, when a user orders a copy of book ‘A’, your system should give a list of other suggested books. Book ‘B’ is suggested, if there exist a user ‘X’ that bought both ‘A’ and ‘B’. The suggested books should be sorted on decreasing sales count (i.e., most popular first); count only sales to users like ‘X’.

11) [15pts] **‘Two degrees of separation’:** Given two author names, determine their ‘degree of separation’, defined as follows: Two authors ‘A’ and ‘B’ are 1-degree away if they have co-authored at least one book together; they are 2-degrees away if there exists an author ‘C’ who is 1-degree away from each of ‘A’ and ‘B’, AND ‘A’ and ‘B’ are not 1-degree away at the same time.

12) [10pts] **Statistics:** Every semester, the store manager wants

- the list of the  $m$  (say  $m = 10$ ) most popular books (in terms of copies sold in this semester),
- the list of  $m$  most popular authors and
- the list of  $m$  most popular publishers

13) [5pts] **User awards:** At random points of time, the store manager also wants to give awards to the ‘best’ users; thus, the manager needs to know:

- the top  $m$  most ‘trusted’ users (the trust score of a user is the count of users ‘trusting’ him/her, minus the count of users ‘not-trusting’ him/her)
- the top  $m$  most ‘useful’ users (the usefulness score of a user is the average ‘usefulness’ of all of his/her feedbacks combined)

### 3 Data Modeling with ER and the Conversion to the Relational Model

Initially, you must design and create a database that organizes and stores data about the bookstore system. This includes designing the ER diagram, and then converting your designs to relational tables/schemas to store this data, and designing rules (when necessary) for how these tables relate to each other so that the data they store can be combined in meaningful ways. We DO NOT require you to enforce constraints via either trigger or assertions. Rather, you can enforce any business rules (if any) in your application-level code (e.g., Java or JSP).

When phase 1 of the project is due, you need to submit your ER diagram and your relational schemas (there is no need to show the CREATE TABLE statements).

### 4 Phase 1: A Workstation/Desktop System with Java

In this phase, you should write the SQL queries and stand-alone Java code that implements a (simple) user interface to your database and executes the queries. Your system should provide all the functionality as specified in Section 2.2. Sample codes will be provided to you at the beginning of this phase.

A command-line based interface will be accepted. A GUI is not necessary, but you are welcome to do so (no bonus points for a GUI though if implemented).

**Due Data: around Dec 9.** You will submit your zipped project folder as a single zip file through email. Please send your submission ONLY ONCE. More details will be provided when the due date is approaching.

Your implementation in this phase will be used as APIs to facilitate your implementation in the next phase for the web interface.

## 5 Phase 2: Web-based System with JSP

Finally, you will create a web portal to your database system. Users will connect to the web site and will be able to execute various functionality from the web interface. This will be achieved via JSP+Tomcat. Note that you are not allowed to use servlet, or any other programming frameworks. Only JSP is allowed (since it allows you to call your Java classes in Phase 1 in an extremely simple fashion). You will be provided sample JSP codes to start with, as well as sample initial set up to your web folder under the Tomcat server. Details will be provided on the class website when this phase begins.

**Due Data: Around January 9th 10pm.** You will simply stop editing any files on your account on our webserver when this phase is due.

## 6 Grading of the Project

Your design (ER+Relational Schemas) carries 20 points. Each subsequent phase carries 40 points. Phase 1 and Phase 2 will be strictly graded based on the points assigned to each functionality as shown above in Section 2.2.