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Requirements Specification

Java Problem Repository & Education Platform

JPREP

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1.1 Product Overview and Summary

DeltaTech's client, Dr. Darren Lim, is in need of a web based system for delivering Java programming problems to the students in the Java programming sequence. The Java Problem Repository and Education Platform (JPREP) will be utilized by Dr. Lim and other faculty members to create problems and assignments or reuse old problems from the question pool. Students will be able to write, compile, and run code within the web browser and then get immediate feedback from test cases.

1.2 Development, Operating, and Maintenance Environments

The development environment listed below is the hardware and the software that *DeltaTech* plans to use during the production phase of JPREP.

Server:

Server Name: oraserv.cs.siena.edu
Operating System: CentOS 5.2, Kernel 2.6.18-92e15
Processor: Intel Xeon
Speed: 2.66 GHz
Memory (RAM): 8.00 GB

Windows Machine:

Dell Optiplex 760
Operating System: Microsoft Windows Vista Enterprise Service Pack 2
Processor: Intel® Core™2 Duo CPU
Model: E7500
Speed: 2.93 GHz
System Type: 32-bit
Memory (RAM): 4.00 GB

Macintosh Machine:

Operating System: Apple Mac OS X Lion Version 10.7.5
Processor: Intel core i5
Model: iMac 21.5 mid 2011
Speed: 2.5 GHz
System Type: 64-bit
Memory (RAM): 4.00 GB

1.3 External Interfaces and Data Flows

1.3.1 User Case Narratives

Student

A student will login with credentials provided by the administrator. The username will be the student's Siena email address, and a password will be created by the administrator. Once logged on to JPREP, the student will have access to all enrolled courses. The student will have access to that course's assignments. Pending and past assignments will be available to view, but only pending assignments can be worked on and submitted. Through the submission process, the student's code will be compiled and validated using predetermined test cases. If the student wishes to work on the problem at a later time, the student will be able to save the code from the most recent question that the student had worked on. The student will be able to see the completion status and grade for each assignment. If the student is enrolled in more than one course, the student will be able to switch between courses as needed. Once the student wishes to end the session on JPREP, the student will be able to log out and return to the login page.

Faculty

A faculty member will login with credentials provided by the administrator. The username will be the faculty member's Siena email address, and a password will be created by the administrator. Once logged on to JPREP, a faculty member will have access to the courses that the administrator has associated with that faculty member. Once a course has been selected, the faculty member will be able to create and edit assignments. When an assignment is selected, the faculty member will be able to create, edit, and delete questions within that assignment. In addition to creating questions, the faculty member will be able to add a question to the faculty member's personal question pool. At any point, the faculty member can reuse a question from either the personal question pool or the course question pool. The faculty member will also be able to set a due date for each assignment. The faculty member will be able to see which students have completed past assignments. The faculty member will also have access to a grade book that displays which questions for each assignment students have completed. Once the faculty member wishes to end the session on JPREP, the faculty member will be able to log out and return to the login page.

Course Coordinator

A course coordinator will login with credentials provided by the administrator. The username will be the course coordinator's Siena email address, and a password created by the administrator. The course coordinator will be able to create questions for the course question pool. The purpose of the course coordinator is to deliver the same questions across all sections of a course, when multiple faculty members are teaching the same course. The course coordinator will also have the same privileges as *Faculty*.

Administrator

An administrator will be able to login with unique credentials. The administrator will be in charge of creating student and faculty accounts. The administrator will provide the unique credentials for all users. The administrator will be able to create and remove courses from JPREP. The administrator will be able to create questions for any particular course question pool. The administrator will assign courses to faculty members. The administrator will be able to enroll students into a course and lock out users who have completed or dropped the course.

1.3.2 UML Use Case Diagram

UML Use Case Diagram Legend

System Boundary: Contains all the Use Cases an Actor is capable of performing within JPREP.

Use Case: Actions done by Actors to interact with JPREP.

Actors: Human or non-human entities that interact with JPREP through various Use Cases.

Extends Relationship: Indicates a relationship from one Use Case to another—Use Case B contains features of Use Case A.

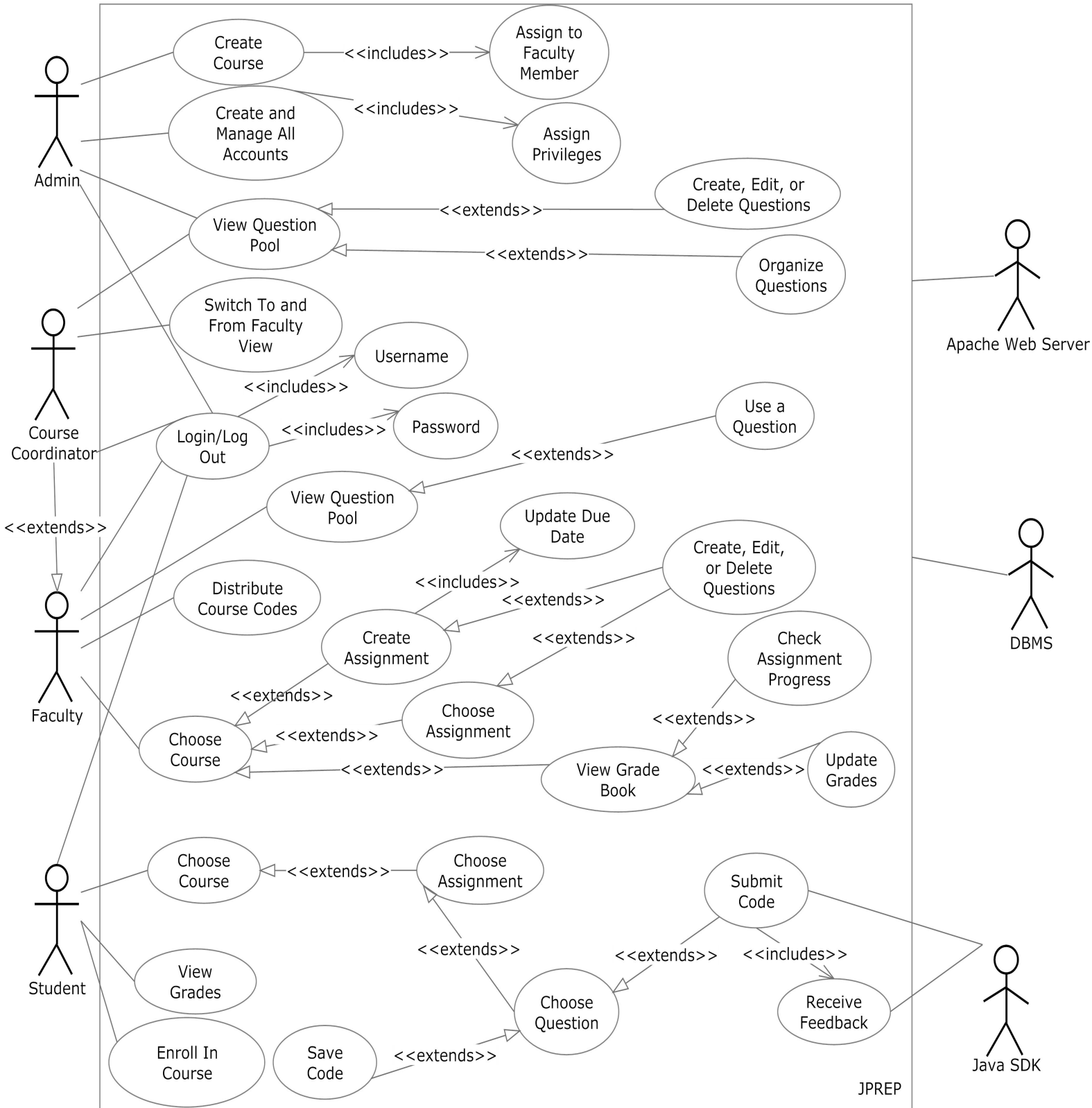
<<extends>>

Includes Relationship: Indicates a dependency of one Use Case on another Use Case—Use Case B requires Use Case A.

<<includes>>

Java Problem Repository and Education Platform

UML Use Case Diagram



1.3.3 Data Flow Diagram

Data Flow Diagram Legend

Process: Action where data is manipulated or transformed

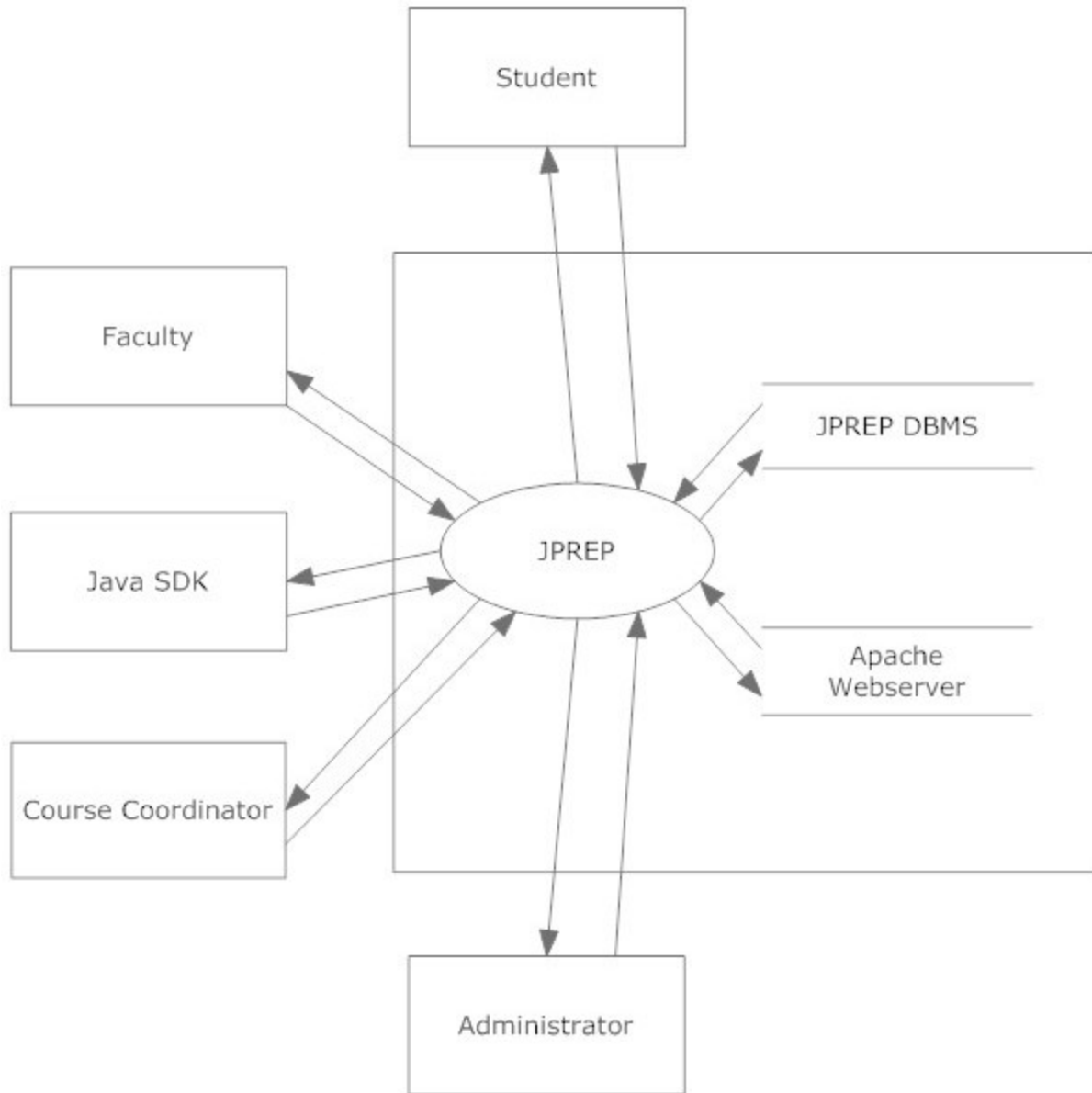
Entity: A human, system, or subsystem where data goes to or originates from

Data Flow: The flow of information

Data Store: Repository of information that is used by JPREP. Can either be contained within JPREP or be an external source of information.

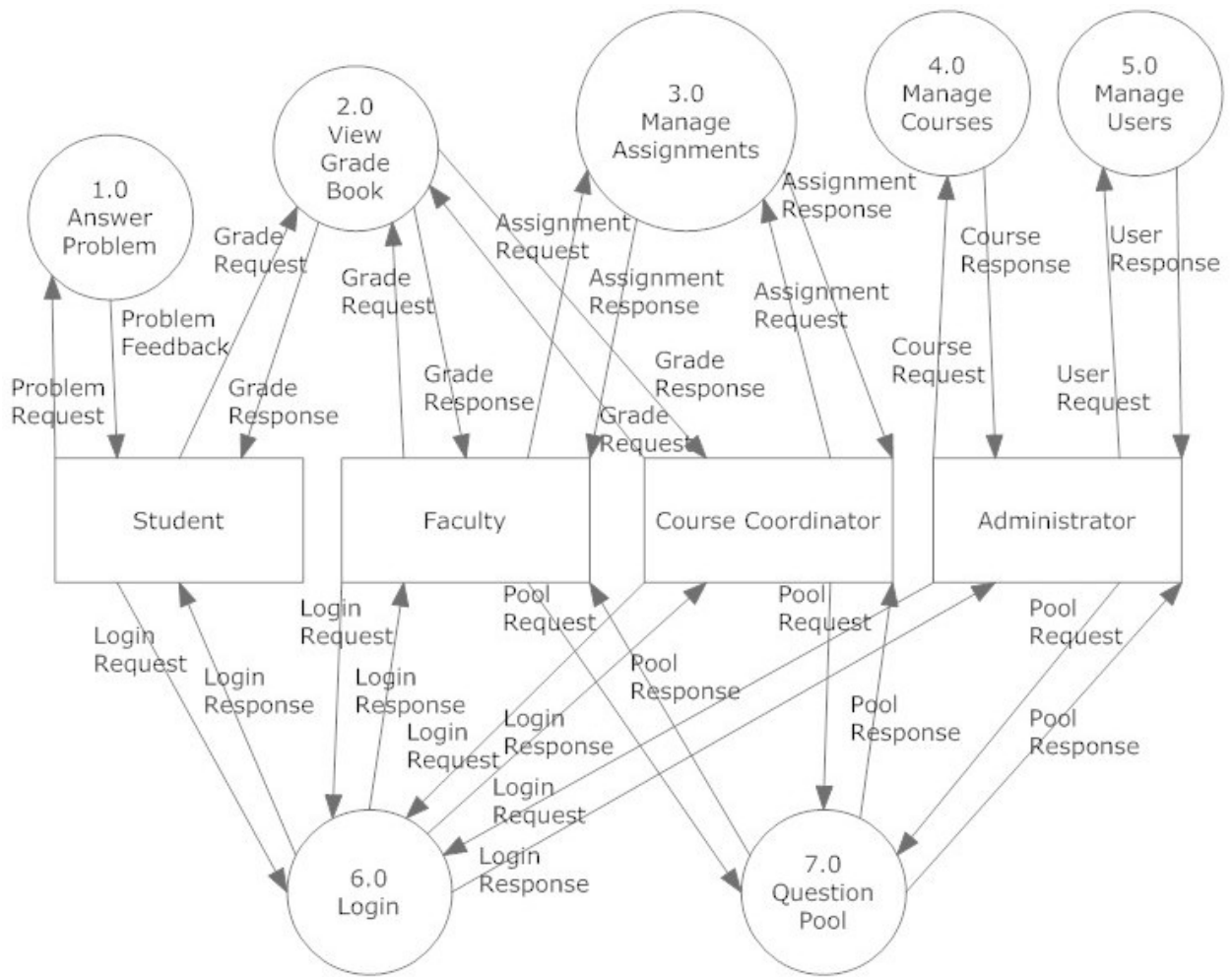
System Boundary: Indicates edge of JPREP. Entities and Data Stores inside the boundary are directly controlled by JPREP and ones outside the boundary are not directly controlled by JPREP. The context diagram is the only data flow diagram that includes a system boundary.

Context Diagram



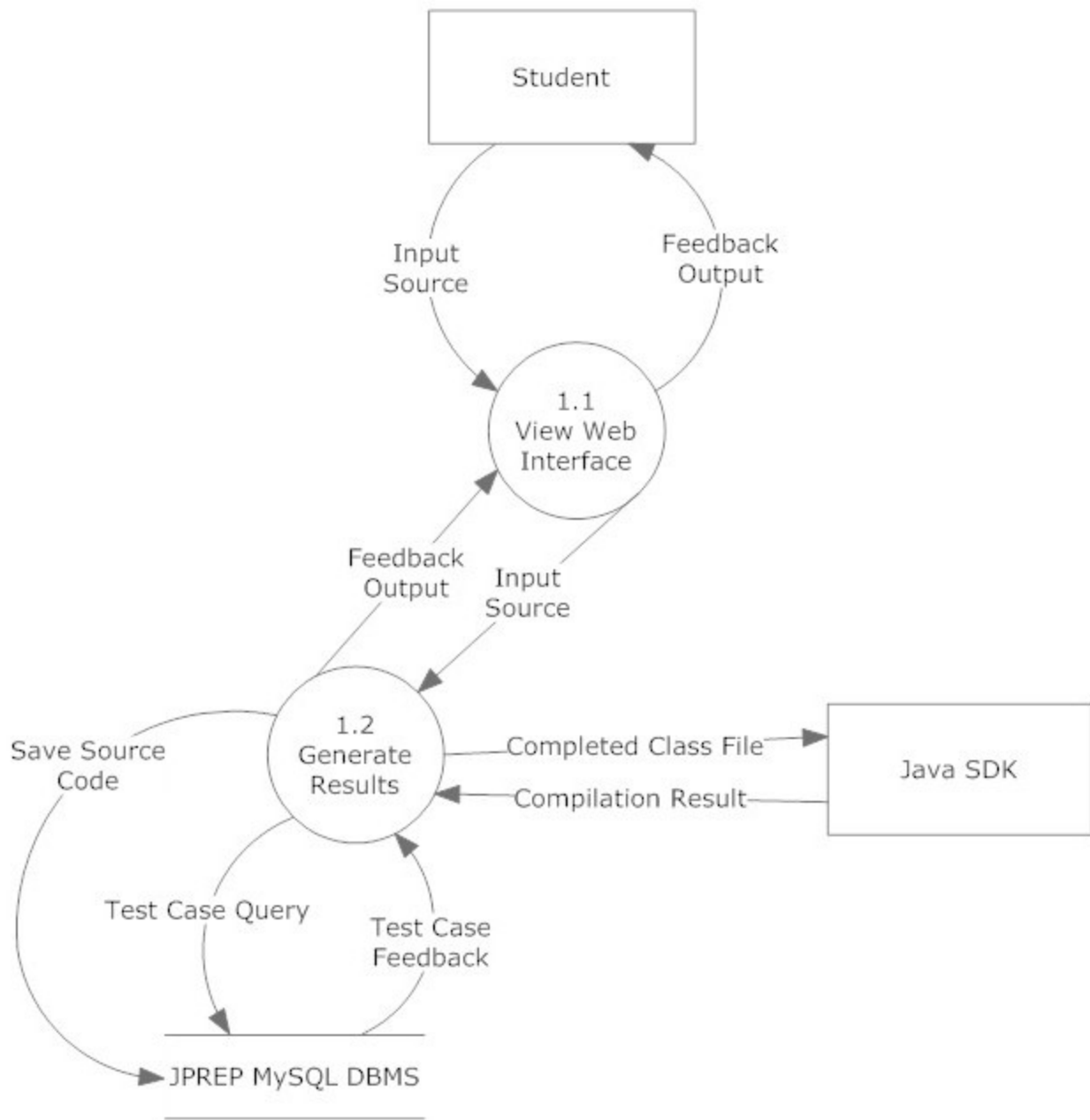
Java Problem Repository and Education Platform

Level 0 Data Flow Diagram



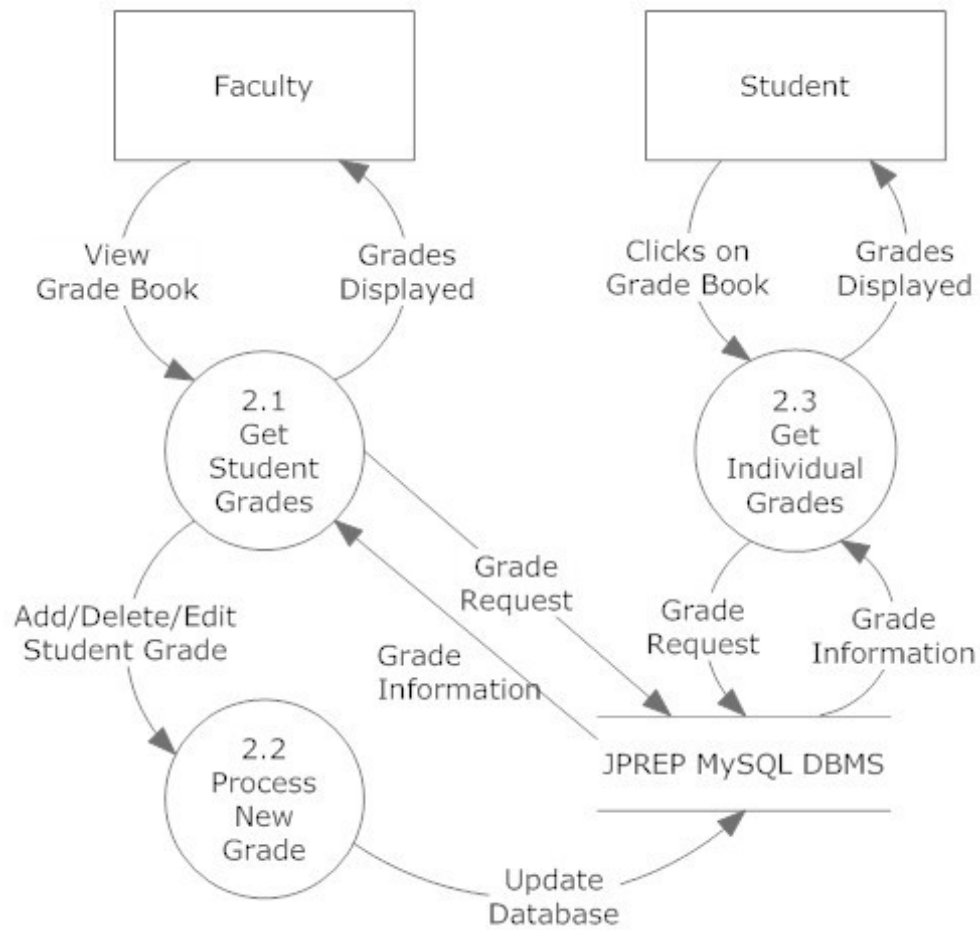
Java Problem Repository and Education Platform

1.0 Answer Problem Level 1 Data Flow Diagram



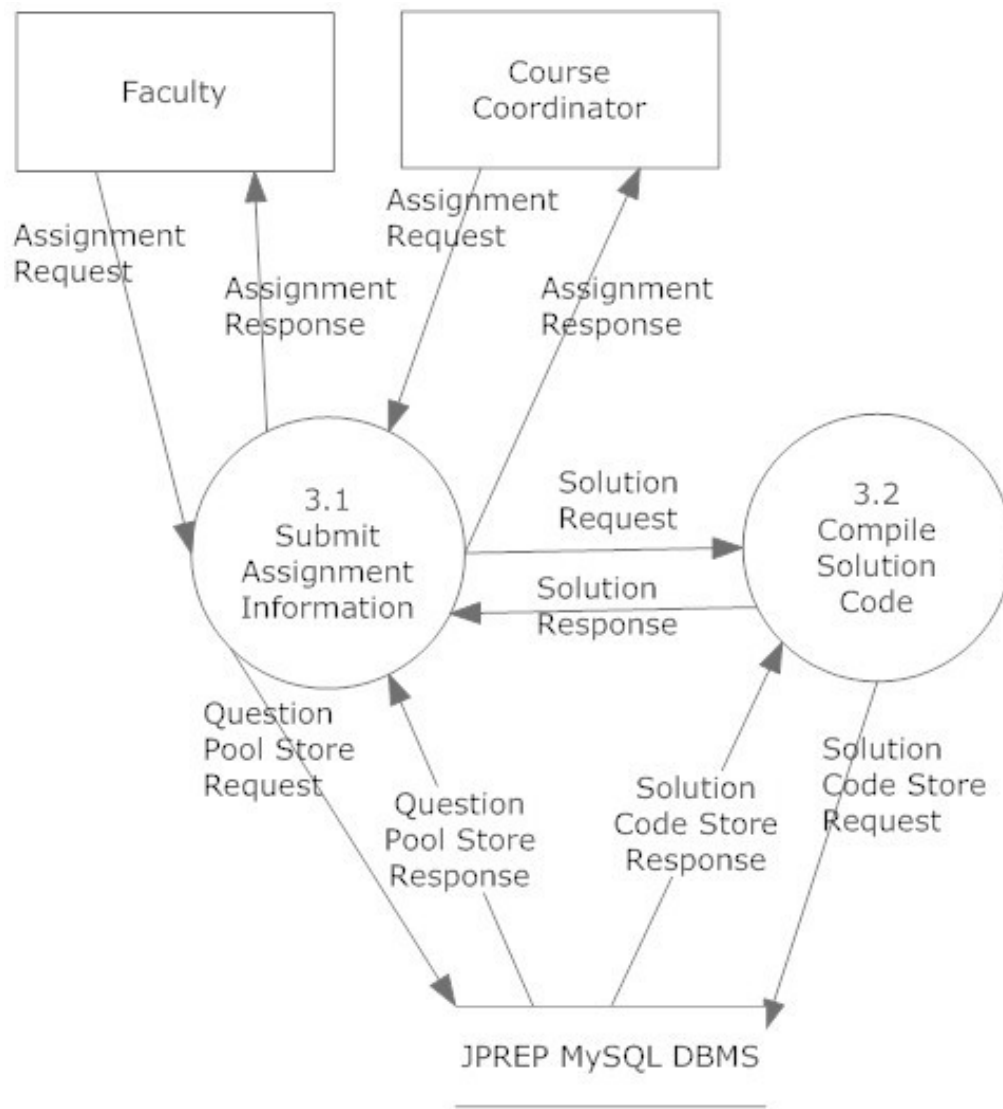
Java Problem Repository and Education Platform

2.0 View Grade Book Level 1 Data Flow Diagram



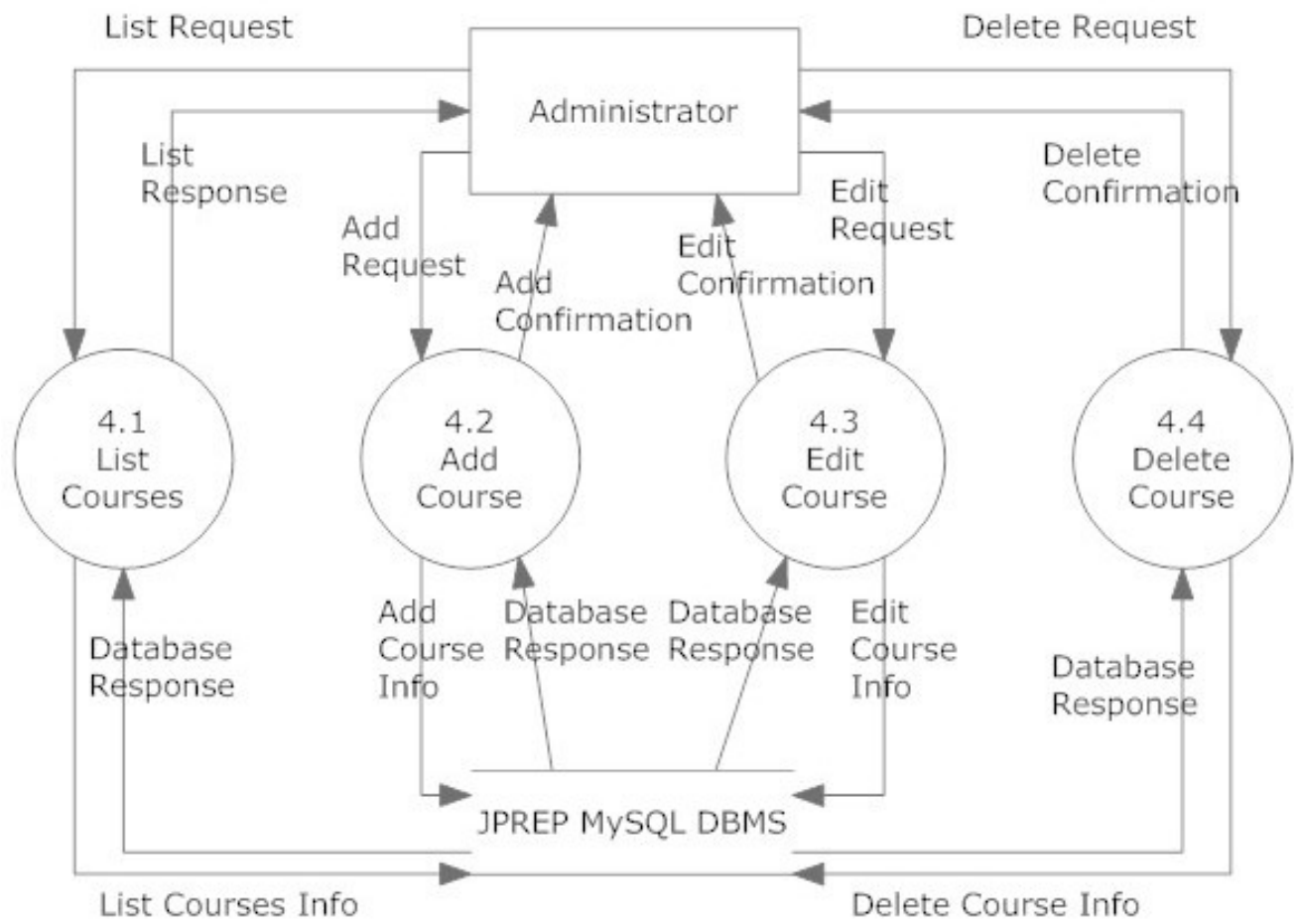
Java Problem Repository and Education Platform

3.0 Manage Assignments Level 1 Data Flow Diagram



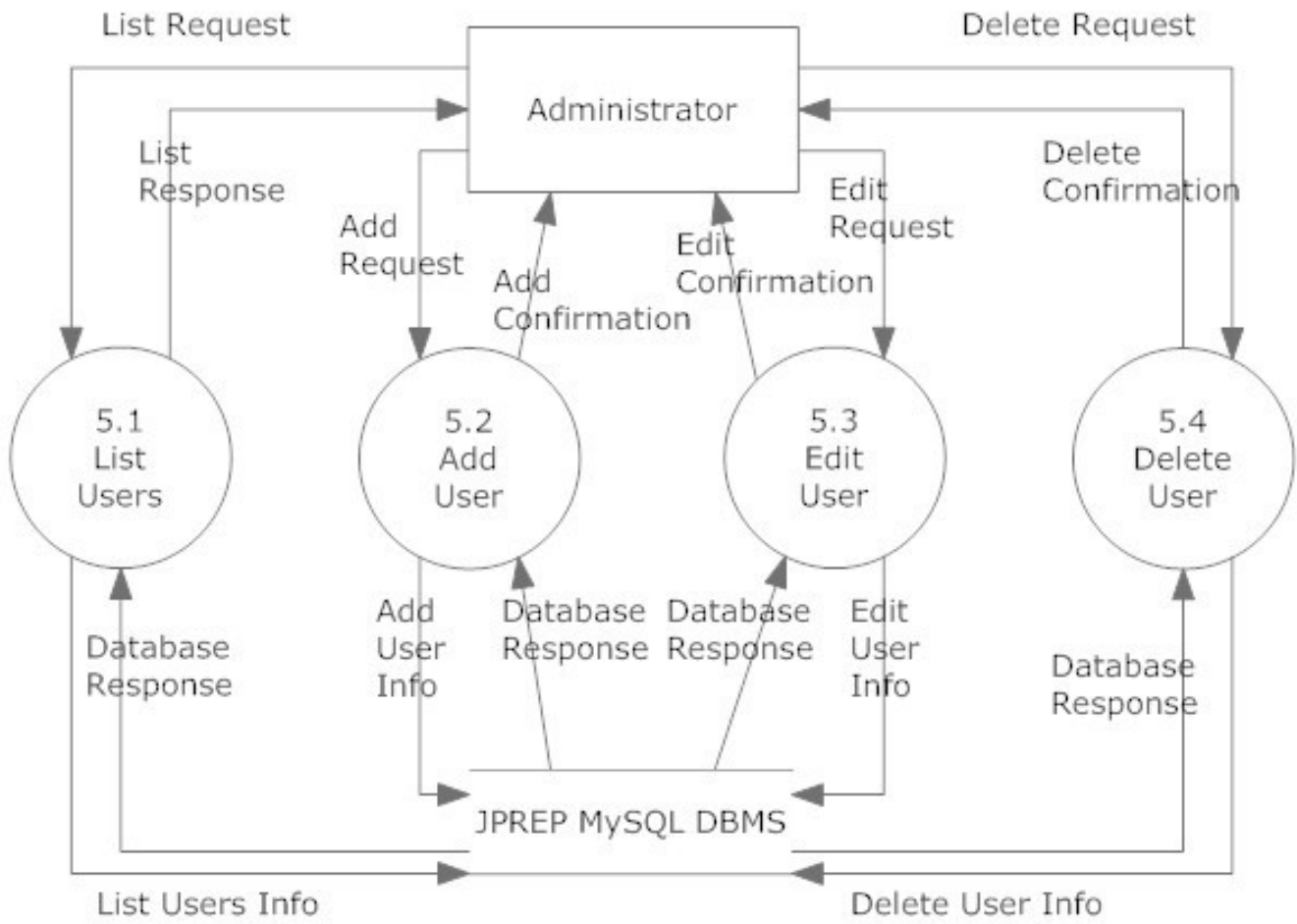
Java Problem Repository and Education Platform

4.0 Manage Users Level 1 Data Flow Diagram



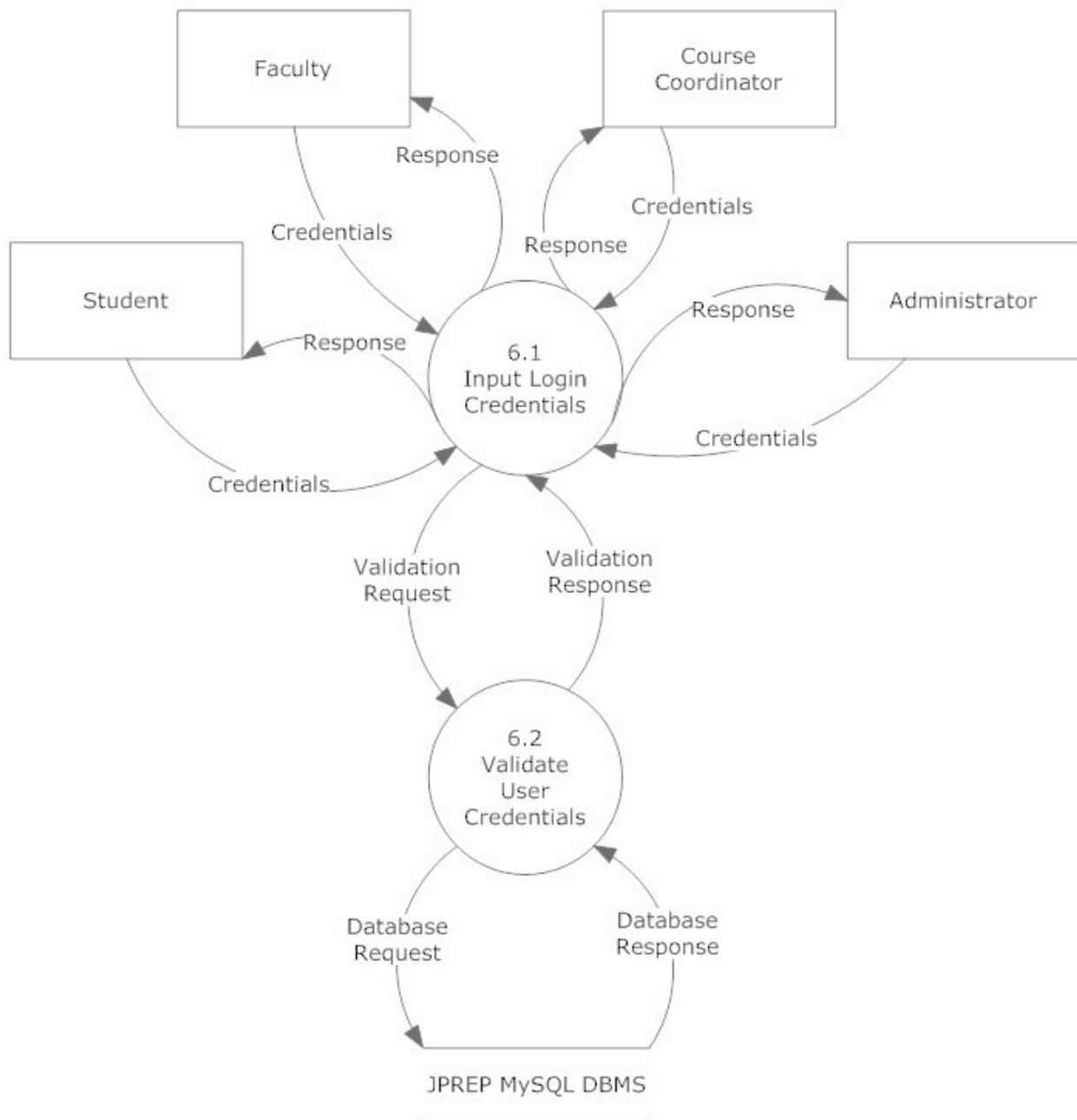
Java Problem Repository and Education Platform

5.0 Manage Users Level 1 Data Flow Diagram



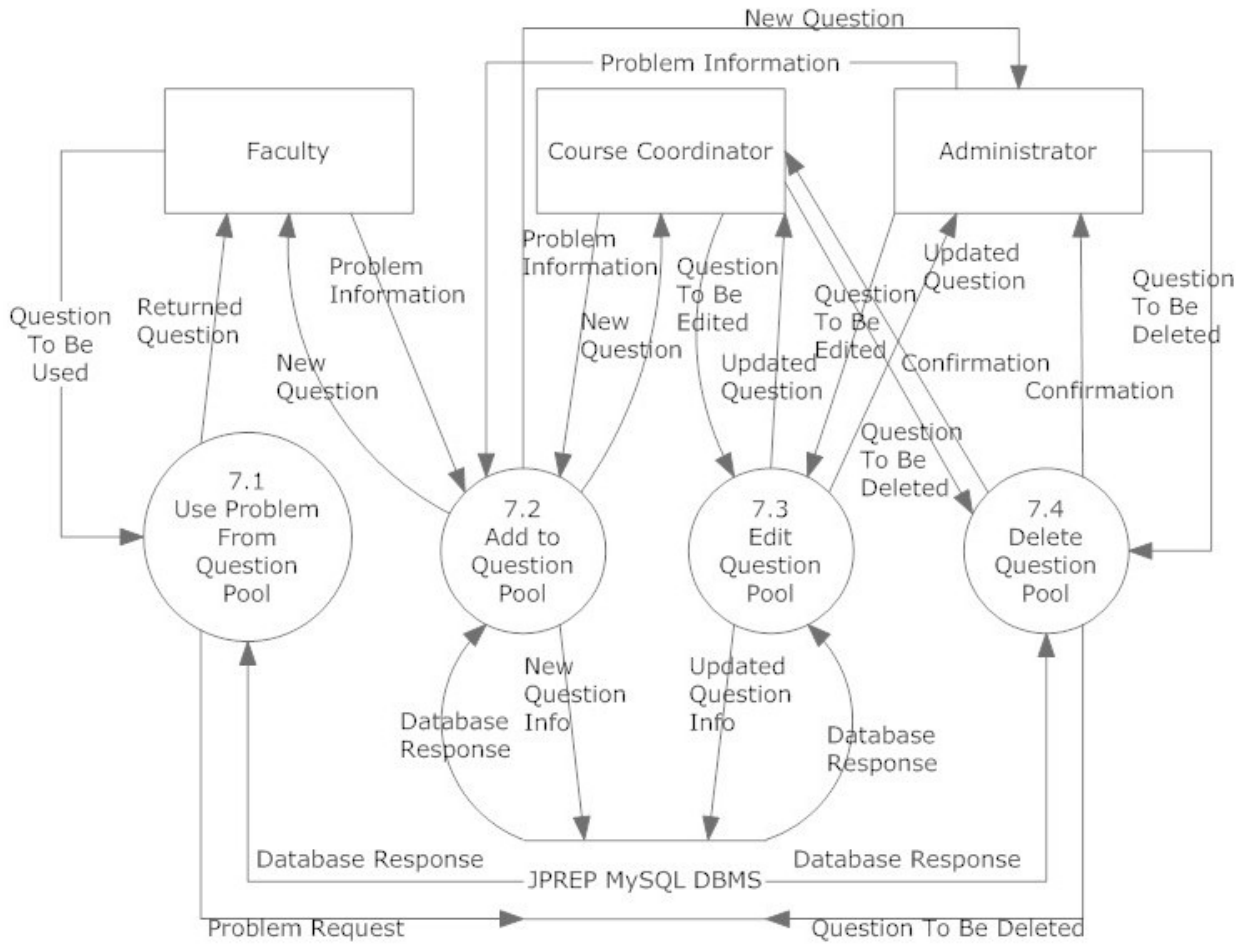
Java Problem Repository and Education Platform

6.0 Login Level 1 Data Flow Diagram



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7.0 Question Pool Level 1 Data Flow Diagram



1.4 Prototypes

The following images represent current prototypes that are being used to develop JPREP further. The prototypes do not represent the final design of JPREP and are subject to change.

1.4.1 Prototype 1: Login Screen

This screen represents the login screen for JPREP. All users will be presented with this screen, in order to provide user credentials.

Delta Tech

About Support

JPREP
Java Problem Repository Education Platform

USERNAME

PASSWORD

[Forgot Password?](#)

Login

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1.4.2 Prototype 2: Course View

This screen represents the view of a student when logged in. A list of courses and the respective course assignments and grade book are presented.



You are currently logged in as STUDENT [Switch Role](#)

Welcome, John [Logout](#)

[Courses](#) [Gradebook](#) [Profile](#)

Current Courses

- ▽ Course 1
 - [View Assignments](#)
 - [View Gradebook](#)
- ▷ Course 2
- ▷ Course 3
- ▷ Course 4

Previous Courses

- ▽ Course 1
 - [View Assignments](#)
 - [View Gradebook](#)
- ▷ Course 2
- ▷ Course 3
- ▷ Course 4

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1.4.3 Prototype 3: Assignment View

This screen represents the view a student would have if an assignment was chosen under a certain course.



You are currently logged in as STUDENT [Switch Role](#)

Welcome, John [Logout](#)

[Courses](#) [Gradebook](#) [Profile](#)

Course 1

Professor: Dr. John Doe

Semester: Fall 2013

Current Assignments

| Assignment | Due Date | Status | |
|---------------|----------|---------------|------------------------------|
| Assignment #1 | 02/02/13 | Not Completed | Complete Now |
| Assignment #2 | 02/03/13 | Completed | View Grade |
| Assignment #3 | 02/04/13 | Not Completed | Complete Now |

Past Assignments

| Assignment | Due Date | Status | |
|---------------|----------|-----------|----------------------------|
| Assignment #4 | 01/02/13 | Completed | View Grade |
| Assignment #5 | 01/03/13 | Completed | View Grade |
| Assignment #6 | 01/04/13 | Completed | View Grade |

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1.4.4 Prototype 4: Submit Code

This screen represents where a student will write, save and/or submit code.



You are currently logged in as STUDENT

Welcome, John [Logout](#)

Assignment #1

Course 1

Due Date: 02/02/2013

Question: This area is where the question and details for each assignment will be displayed.

Student solution code will be written here.

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1.4.5 Prototype 5: View Profile

This screen represents a user viewing the profile.



You are currently logged in as STUDENT [Switch Role](#)

Welcome, John [Logout](#)

[Courses](#) [Gradebook](#) [Profile](#)

[Edit Profile](#) [Change Password](#)

First Name: John

Last Name: Smith

Email Address: jm01smit@siena.edu

Username: jsmith

Password: *****

Security Question: What college do you attend?

Security Answer: Siena College

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1.4.6 Prototype 6: Edit Profile

This screen represents a user editing the profile.



You are currently logged in as STUDENT

Welcome, John [Logout](#)

First Name:

Last Name:

Email Address:

Username:

Password:

Security Question:

Security Answer:

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1.4.7 Prototype 7: Change Password View

This screen represents the students ability to change the password.



You are currently logged in as STUDENT

Welcome, John [Logout](#)

Old Password:

New Password:

Confirm New Password:

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1.4.8 Prototype 8: Course Grade Book Selection

This screen represents what courses the student can view the course grade book for.



You are currently logged in as STUDENT [Switch Role](#)

Welcome, John [Logout](#)

[Courses](#) [Gradebook](#) [Profile](#)

Select a course to view your grade

- Course 1
- Course 2
- Course 3
- Course 4
- Course 5

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1.4.9 Prototype 9: Grade Book View

This screen represents the student's view of a course grade book.



You are currently logged in as STUDENT [Switch Role](#)

Welcome, John [Logout](#)

[Courses](#) [Gradebook](#) [Profile](#)

Course 1 Professor: Dr. John Doe Semester: Fall 2013

| Assignment | Due Date | Grade | Percentage | Comments |
|--------------|------------------|---------|------------|-------------------------|
| Assignment 1 | 01/01/2013 12:00 | 90/100 | 90% | Great job! |
| Assignment 2 | 01/01/2013 12:00 | 100/100 | 100% | |
| Assignment 3 | 01/01/2013 12:00 | 75/100 | 75% | |
| Assignment 4 | 01/01/2013 12:00 | 84/100 | 84% | |
| Assignment 5 | 01/01/2013 12:00 | 80/100 | 80% | |
| Total | | 429/500 | 85% | Good work this semester |

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1.5 Functional Requirements Inventory

Student:

- Will be able to log into JPREP.
 - o An incorrect login will display an error message
- Will be able to enroll in classes they are registered for
 - o Will receive email with unique course code from professor
- Will be able to switch between classes that the student is currently enrolled in at any time
- Will be able to view assignments for each course they are in enrolled in
 - o Will be able to view past and pending assignments
- Will be able to view problems in each assignment
- Will be able to submit solutions to individual problems using the Java™ programming language
 - o Code will be compiled by JPREP
 - o If they exist, the student will instantly receive feedback on compile errors
 - o The student will instantly receive feedback on how their solution performed when run against the test cases
- Will be able to complete assignments
 - o Will be able to work on any problem in the assignment; order does not matter
 - o Will be able to save code for most recent problem
- Will be able to view grades for each class in a grade book
 - o Will be able to view progress for each assignment
- Will be able to view all solutions that have been previously submitted
- Will be able to log out of JPREP

Faculty:

- Will be able to log into JPREP.
 - o An incorrect login will display an error message
- Will be able to create and edit assignments
 - o Will be able to import problems from the question pool to any assignment
 - o Will be able to create a problem for an assignment
 - o Will be able to delete a problem from an assignment
 - o Will be able to edit a problem in an assignment
- Will be able to assign a grading rule for assignments

- o Will be able to assign different point values for problems in the assignments
- Will be able to administer assignments to any courses that the faculty instructs
 - o Will be able to set due dates for each assignment
- Will be able to search the question pool for potential problems
- Will be able to view a grade book for each of the courses
 - o Will be able to view student's progress for each assignment
- Will be able to modify grades for all students in each of the courses they are currently instructing
- Will be able to log out of JPREP

Course Coordinator:

The functionality of a course coordinator will include all of the functionality that a Faculty Member has.

- Will be able to manage question pool
 - o Will create questions for the question pool
 - o Will delete questions from the question pool
 - o Will edit questions that exist in the question pool
- Will be able to switch to Faculty view without logging out

Administrator:

- Will be able to log into JPREP.
 - o An incorrect login will display an error message
- Will be able to add and delete courses
- Will be able to manage all user accounts on JPREP
 - o Will be able to modify all account information for any user
 - o Will be able to delete accounts
 - o Will be able to lock out expired students
- Will be able to manage question pool
 - o Will create questions for the question pool
 - o Will delete questions from the question pool
 - o Will edit questions that exist in the question pool
- Will be able to create course coordinator and faculty accounts
 - o Will be able to assign courses to faculty
- Will be able to log out

1.6 Non-Functional Requirements Inventory

The following list contains non-functional requirements that identify whether properties are not specific features in the software and have no definitive way of measuring:

- The system will have an intuitive user interface.
- The system will run efficiently
- The system will be stable

1.7 Exception Handling

DeltaTech will handle exceptions in an appropriate manner once *DeltaTech* knows the system next semester.

1.8 Implementation Priorities

The bullet points below are a more selective version of the functional requirements that *DeltaTech* has decided are essential for the implementation of JPREP

- Faculty user's ability to create and manage assignment sets
- Student user's ability to compile question answers
- JPREP's ability to provide test case feedback from compiled answers
- Faculty and Student user's ability to view their respective grade books
- Course Coordinator user's ability manage all sections of a particular course
- Administrator user's ability to manage the system and accounts of all users
- Ability for all users to login and out of JPREP securely

1.9

Foreseeable Modifications and Enhancements

At the time, Dr. Lim does not foresee any modifications or enhancements that will need to be added to JPREP. Once all of the items on the functional and non-functional requirements have been met, additional functionality may be added. If any modifications or enhancements appear vital while working on JPREP, then *DeltaTech* will make the necessary changes.

1.10 Acceptance Criteria

The acceptance criteria for JPREP will be the previously stated functional requirements and non-functional requirements of the system defined throughout the Requirements specification document. JPREP's ability to satisfy the functional requirements will be verified through testing and data analysis. The non-functional requirements describe how JPREP should behave under a given condition and cannot be tested. If a functional or non-functional requirement is not met upon final testing and delivery, there must be an acceptable justification for the decision to leave the requirement out of the final version of JPREP.

1.11 Testing Requirements

The protocol and requirements needed to test JPREP will be created by *DeltaTech* using the Functional Requirements. Computers running Windows Vista and Mac OS X will be used to test JPREP along with the web browsers: Mozilla Firefox, Apple Safari, Internet Explorer, and Google Chrome.

Appendices

Appendix A – Cross Reference Index

Appendix B – Sources of Information

Appendix C – Glossary of Terms

Appendix D – Project Timeline

Appendix A – Cross Reference Index

Java Problem Repository & Education Platform Context Diagram

Java Problem Repository & Education Platform Level 0 Diagram

Java Problem Repository & Education Platform 1.0 Answer Problem Level 1 Diagram

Java Problem Repository & Education Platform 2.0 View Grade Book Level 1 Diagram

Java Problem Repository & Education Platform 3.0 Manage Assignments Level 1 Diagram

Java Problem Repository & Education Platform 4.0 Manage Courses Level 1 Diagram

Java Problem Repository & Education Platform 5.0 Manage Users Level 1 Diagram

Java Problem Repository & Education Platform 6.0 Login Level 1 Diagram

Java Problem Repository & Education Platform 7.0 Question Pool Level 1 Diagram

Appendix B – Sources of Information

DeltaTech's main source of information for the Requirements Specification document is meetings with *DeltaTech's* client Dr. Lim. Additionally *DeltaTech* has used the Requirements Specification documents from previous years as examples. Class lectures from Dr. Timothy Lederman have also provided information for *DeltaTech*.

Appendix C – Glossary of Terms

Java – the programming language in which students will be asked to respond to questions in, designed by Sun Microsystems

JPREP – **J**ava **P**roblem **R**epository & **E**ducation **P**latform, the application being developed for the client, Dr. Darren Lim

Mac – a type of computer made by Apple that runs on the operating system Mac OS

MySQL – language that will be used to easily access data from a database

Oracle SQL Server – a database management system used to store and retrieve information from databases

UML – **U**nified **M**odeling **L**anguage is a standardized, general-purpose modeling language in the field of software engineering

Appendix D - Project Timeline

