

Testing Strategy

Error Log

Software Project Group 9

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Overview

This is the test strategy for the HR software program developed by Software Group 9. This document shall illustrate the program testing progression and the overall testing strategy adopted by the software development team. All tests will be developed and run based on the requirements decided upon by the project team members.

This document will remain under continuous development and will be altered and adjusted as the project takes shape. All project members will review, modify offer feedback where and where they deem necessary. The final responsibility for the establishment of this document will be shared by the Project Manager, the Test Manager, the Architect, the Developer, the Database Manager as well as the Designer. The final version of the Test Strategy document will be submitted for review and approval to the clients/professors.

Project Description

The HR module allows the HR manager and HR assistants to track employee training registrations, activities and history.

It allows HR personnel to access the platform from their desktop stations or through mobile app making it possible that they add, modify or archive information from anywhere. Only authorized HR personnel will have access to the information. Access to the system will be protected and controlled by requiring authentication of the user.

Test Strategy

The objective of the tests incorporated into the test strategy will be designed so as to ensure proper operation of the HR module according to the specifications set forth by the client and software team.

The tests will be established so as to provide adequate – and if possible – near-perfect test coverage at the unit level. The strategy also includes system level and user acceptance/GUI testing.

Test Operations:

Manual testing of the Graphic User Interface will be conducted under two different profiles:

Username: TestingHR_password_test Password: test

Username: TestingADMIN_password_test Password: test

Every project team member will be an integral part of the testing operations hereafter called a 'tester' as every project member will also perform tests. When a tester detects a defect, the error needs to be recorded in the **error history log** of the Test Strategy document. The tester will then attempt to remediate the error.

If the error has been corrected, the tester will record the correction in the error history log so as to close the incident.

If the tester is unable to correct the error, the test manager needs to be notified. He will then add the error to the **to-do list** and assign the error to the developer or to another project team member for correction.

Once the error has been corrected, the test has passed successfully and the correction approved by the architect and/or the developer, the error correction will be logged in the history log and removed from the to-do list by the project manager.

If correction of the error is impossible, its severity for the integrity of the HR module will be assessed by the team members. If considered 'critical', the error will remain on the to-do list until a solution has been found. If considered 'minor', the error will be recorded on the **'nice-to-be-fixed' list** to be further considered and hopefully corrected at later date if any time remains before the project deadline.

Unit testing will cover:

- each statement with at least one test
- each conditional statement each way
- all boundary cases

Integration testing will cover:

- the interaction between the database and the application

User Acceptance/GUI testing will cover:

- manually testing the application with regards to user-friendly access
- testing application response following incorrect input by the user
- visual testing of the application

Software

No specific software requirements have been established.

The program should run on any Windows platform with the following minimum specifications:

-

The mobile application has been designed for best performance on:

-

The application has not been limited to any specific browser but due to time and budgetary constraints we decided to limit the testing to the following browsers:

- Google
- Firefox
- Safari
- Opera

The web application was build with Laravel 5,4 which is a PHP framework following the model-view-controller (MVC) architectural pattern. Testing will consist of verifying and testing

- the links to the database
- the login and authentication procedure
- the backup functionality
- the appearance of different views per user role/permissions

Testing the web application will be accomplished with **SeleniumHQ** (<http://www.seleniumhq.org/>) which has been designed for automating web applications for testing purposes. We have selected this portable software-testing framework as it is open-source software, released under the Apache 2,0 license, and can be downloaded and used without charge.

Unit testing of the program itself will be performed with **JUnit** (<http://junit.org/junit5/>) which is a unit testing framework for the Java programming language – our language of choice – and which is available under an Eclipse Public License.

In order to test proper operation of our database connections we will be using **DbUnit** (<http://dbunit.sourceforge.net/>). It is advertised as “ *a Junit extension targeted at database-driven projects that, among other things, puts your database into a known state between test runs. This is an excellent way to avoid the myriad of problems that can occur when one test case corrupts the database and causes subsequent tests to fail or exacerbate the damage.*

DbUnit has the ability to export and import your database data to and from XML datasets. Since version 2.0, DbUnit can also work with very large datasets when used in streaming mode. DbUnit can also help you to verify that your database data match an expected set of values.”
source: <http://dbunit.sourceforge.net/>

Manual Testing

Graphical Interface - Error Log

Usability testing without checking events in database

Date	Location	Description
	Login	
		Username: TestingHR_password_test Password: test Username: TestingADMIN_password_test Password: test
20/12		HR and ADMIN login seem to offer same functionality --> suggestion: remove backup functionality from HR profile?
22/12		Testing user name and password are no longer recognized – no console error Console message: Hibernate: select user0_.username as username1_17_0_, user0_.archive as archive2_17_0_, user0_.password as password3_17_0_, user0_.privilege as privileg4_17_0_, user0_.userID as userID5_17_0_ from Users user0_ where user0_.username=?
22/12		Using username test and password test: Upon clicking 'Login', system shows 'Logging in...' with user name green AND shows the dashboard menu on the left but does not move from that view – Ton of console errors Note: Menu buttons Dashboard , Employees and Trainings yield similar errors and no access to application. The buttons Books , Surveys , Certificates and Settings do have access and yield expected/desired results albeit with inconsistent layout partially off screen, i.e. hidden under left pane Console messages: ERROR StatusLogger No log4j2 configuration file found. Using default configuration: logging only errors to the console. Set system property 'log4j2.debug' to show Log4j2 internal initialization logging. Fri Dec 22 06:59:30 CET 2017 WARN: Establishing SSL connection without server's identity verification is not recommended. According to MySQL 5.5.45+, 5.6.26+ and 5.7.6+ requirements SSL connection must be established by default if explicit option isn't set. For compliance with existing applications not using SSL the verifyServerCertificate property is set to 'false'. You need either to explicitly disable SSL by setting useSSL=false, or set useSSL=true and provide truststore for server certificate verification. Hibernate: select user0_.username as username1_17_0_, user0_.archive as archive2_17_0_, user0_.password as password3_17_0_, user0_.privilege as privileg4_17_0_, user0_.userID as userID5_17_0_ from Users user0_ where user0_.username=?

welcome

Hibernate: select training0_.id as id1_16_, training0_.archive as archive2_16_, training0_.language as language3_16_, training0_.responsible as responsi4_16_, training0_.sessions as sessions5_16_, training0_.subject as subject6_16_, training0_.title as title7_16_ from Trainings training0_ where training0_.archive=0

javafx.fxml.LoadException:

/C:/Users/Charles/git/SoftwareProject2Groep9/bin/view/HomeView.fxml

at javafx.fxml.FXMLLoader.constructLoadException(FXMLLoader.java:2601)
at javafx.fxml.FXMLLoader.loadImpl(FXMLLoader.java:2579)
at javafx.fxml.FXMLLoader.loadImpl(FXMLLoader.java:2441)
at javafx.fxml.FXMLLoader.loadImpl(FXMLLoader.java:3214)
at javafx.fxml.FXMLLoader.loadImpl(FXMLLoader.java:3175)
at javafx.fxml.FXMLLoader.loadImpl(FXMLLoader.java:3148)
at javafx.fxml.FXMLLoader.loadImpl(FXMLLoader.java:3124)
at javafx.fxml.FXMLLoader.loadImpl(FXMLLoader.java:3104)
at javafx.fxml.FXMLLoader.load(FXMLLoader.java:3097)
at application.Navigator.loadVista(Navigator.java:84)
at controller.LoginController.doLogin(LoginController.java:74)
at sun.reflect.NativeMethodAccessorImpl.invoke0(Native Method)
at sun.reflect.NativeMethodAccessorImpl.invoke(Unknown Source)
at sun.reflect.DelegatingMethodAccessorImpl.invoke(Unknown Source)
at java.lang.reflect.Method.invoke(Unknown Source)
at sun.reflect.misc.Trampoline.invoke(Unknown Source)
at sun.reflect.GeneratedMethodAccessor1.invoke(Unknown Source)
at sun.reflect.DelegatingMethodAccessorImpl.invoke(Unknown Source)
at java.lang.reflect.Method.invoke(Unknown Source)
at sun.reflect.misc.MethodUtil.invoke(Unknown Source)
at javafx.fxml.FXMLLoader\$MethodHandler.invoke(FXMLLoader.java:1769)
at javafx.fxml.FXMLLoader\$ControllerMethodEventHandler.handle(FXMLLoader.java:1657)
at com.sun.javafx.event.CompositeEventHandler.dispatchBubblingEvent(CompositeEventHandler.java:86)
at com.sun.javafx.event.EventHandlerManager.dispatchBubblingEvent(EventHandlerManager.java:238)
at com.sun.javafx.event.EventHandlerManager.dispatchBubblingEvent(EventHandlerManager.java:191)
at com.sun.javafx.event.CompositeEventDispatcher.dispatchBubblingEvent(CompositeEventDispatcher.java:59)
at com.sun.javafx.event.BasicEventDispatcher.dispatchEvent(BasicEventDispatcher.java:58)

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at com.sun.javafx.event.EventDispatchChainImpl.dispatchEvent(EventDispatchChainImpl.java:114)
at com.sun.javafx.event.BasicEventDispatcher.dispatchEvent(BasicEventDispatcher.java:56)
at com.sun.javafx.event.EventDispatchChainImpl.dispatchEvent(EventDispatchChainImpl.java:114)
at com.sun.javafx.event.BasicEventDispatcher.dispatchEvent(BasicEventDispatcher.java:56)
at com.sun.javafx.event.EventDispatchChainImpl.dispatchEvent(EventDispatchChainImpl.java:114)
at com.sun.javafx.event.EventUtil.fireEventImpl(EventUtil.java:74)
at com.sun.javafx.event.EventUtil.fireEvent(EventUtil.java:49)
at javafx.event.Event.fireEvent(Event.java:198)
at javafx.scene.Node.fireEvent(Node.java:8413)
at javafx.scene.control.Button.fire(Button.java:185)
at com.sun.javafx.scene.control.behavior.ButtonBehavior.mouseReleased(ButtonBehavior.java:182)
at com.sun.javafx.scene.control.skin.BehaviorSkinBase$1.handle(BehaviorSkinBase.java:96)
at com.sun.javafx.scene.control.skin.BehaviorSkinBase$1.handle(BehaviorSkinBase.java:89)
at
com.sun.javafx.event.CompositeEventHandler$NormalEventHandlerRecord.handleBubblingEvent(CompositeEventHandler.java:218)
at com.sun.javafx.event.CompositeEventHandler.dispatchBubblingEvent(CompositeEventHandler.java:80)
at com.sun.javafx.event.EventHandlerManager.dispatchBubblingEvent(EventHandlerManager.java:238)
at com.sun.javafx.event.EventHandlerManager.dispatchBubblingEvent(EventHandlerManager.java:191)
at com.sun.javafx.event.CompositeEventDispatcher.dispatchBubblingEvent(CompositeEventDispatcher.java:59)
at com.sun.javafx.event.BasicEventDispatcher.dispatchEvent(BasicEventDispatcher.java:58)
at com.sun.javafx.event.EventDispatchChainImpl.dispatchEvent(EventDispatchChainImpl.java:114)
at com.sun.javafx.event.BasicEventDispatcher.dispatchEvent(BasicEventDispatcher.java:56)
at com.sun.javafx.event.EventDispatchChainImpl.dispatchEvent(EventDispatchChainImpl.java:114)
at com.sun.javafx.event.BasicEventDispatcher.dispatchEvent(BasicEventDispatcher.java:56)
at com.sun.javafx.event.EventDispatchChainImpl.dispatchEvent(EventDispatchChainImpl.java:114)
at com.sun.javafx.event.EventUtil.fireEventImpl(EventUtil.java:74)
at com.sun.javafx.event.EventUtil.fireEvent(EventUtil.java:54)
at javafx.event.Event.fireEvent(Event.java:198)
at javafx.scene.Scene$MouseHandler.process(Scene.java:3757)
at javafx.scene.Scene$MouseHandler.access$1500(Scene.java:3485)
at javafx.scene.Scene.impl_processMouseEvent(Scene.java:1762)
at javafx.scene.Scene$ScenePeerListener.mouseEvent(Scene.java:2494)
at com.sun.javafx.tk.quantum.GlassViewEventHandler$MouseEventNotification.run(GlassViewEventHandler.java:381)
at com.sun.javafx.tk.quantum.GlassViewEventHandler$MouseEventNotification.run(GlassViewEventHandler.java:295)
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at java.security.AccessController.doPrivileged(Native Method)
at com.sun.javafx.tk.quantum.GlassViewEventHandler.lambda\$handleMouseEvent\$353(GlassViewEventHandler.java:417)
at com.sun.javafx.tk.quantum.QuantumToolkit.runWithoutRenderLock(QuantumToolkit.java:389)
at com.sun.javafx.tk.quantum.GlassViewEventHandler.handleMouseEvent(GlassViewEventHandler.java:416)
at com.sun.glass.ui.View.handleMouseEvent(View.java:555)
at com.sun.glass.ui.View.notifyMouse(View.java:937)
at com.sun.glass.ui.win.WinApplication._runLoop(Native Method)
at com.sun.glass.ui.win.WinApplication.lambda\$null\$147(WinApplication.java:177)
at java.lang.Thread.run(Unknown Source)

Caused by: java.lang.IllegalArgumentException: Unknown name value [] for enum class [logic.Training\$Language]

at org.hibernate.type.EnumType\$NamedEnumValueMapper.fromName(EnumType.java:433)
at org.hibernate.type.EnumType\$NamedEnumValueMapper.getValue(EnumType.java:417)
at org.hibernate.type.EnumType.nullSafeGet(EnumType.java:231)
at org.hibernate.type.CustomType.nullSafeGet(CustomType.java:119)
at org.hibernate.type.AbstractType.hydrate(AbstractType.java:82)
at org.hibernate.persister.entity.AbstractEntityPersister.hydrate(AbstractEntityPersister.java:2854)
at org.hibernate.loader.Loader.loadFromResultSet(Loader.java:1747)
at org.hibernate.loader.Loader.instanceNotYetLoaded(Loader.java:1673)
at org.hibernate.loader.Loader.getRow(Loader.java:1562)
at org.hibernate.loader.Loader.getRowFromResultSet(Loader.java:732)
at org.hibernate.loader.Loader.processResultSet(Loader.java:991)
at org.hibernate.loader.Loader.doQuery(Loader.java:949)
at org.hibernate.loader.Loader.doQueryAndInitializeNonLazyCollections(Loader.java:341)
at org.hibernate.loader.Loader.doList(Loader.java:2692)
at org.hibernate.loader.Loader.doList(Loader.java:2675)
at org.hibernate.loader.Loader.listIgnoreQueryCache(Loader.java:2507)
at org.hibernate.loader.Loader.list(Loader.java:2502)
at org.hibernate.loader.hql.QueryLoader.list(QueryLoader.java:502)
at org.hibernate.hql.internal.ast.QueryTranslatorImpl.list(QueryTranslatorImpl.java:384)
at org.hibernate.engine.query.spi.HQLQueryPlan.performList(HQLQueryPlan.java:216)
at org.hibernate.internal.SessionImpl.list(SessionImpl.java:1490)
at org.hibernate.query.internal.AbstractProducedQuery.doList(AbstractProducedQuery.java:1445)
at org.hibernate.query.internal.AbstractProducedQuery.list(AbstractProducedQuery.java:1414)
at org.hibernate.query.Query.getResultList(Query.java:146)

		at db.TrainingDB.getActiveTrainings(TrainingDB.java:183) at controller.HomeController.initialize(HomeController.java:133) at javafx.fxml.FXMLLoader.loadImpl(FXMLLoader.java:2548) ... 67 more
	Dashboard	
19/12	Responsive	Name top left does not move while list elements (right pane) squeeze together
19/12		Right pane - moves under left pane
19/12		Top left – frozen image? - does not move
20/12		Upon opening dashboard tables justified 'right' instead of 'centered'
20/12		Window does not scale well to screen – too much empty space
20/12	Create training from Dashboard	Spelling: Daitails Training --> Deails Training
20/12		Add new session: input location not clear to user – needs clarification --> maybe 'name/definition' instead of search string information
20/12		Add new Session: no confirmation message after adding new session/location
20/12		Add new location: no '*' indication of required fields
20/12		Add new location: if 1 st attempt adding location, information is missing (ex.country), 2 nd attempt checking location fails even after completing address
20/12		Add new location: if 1 st attempt adding location information is wrong (ex.postal code <-> city), 2 nd attempt checking location fails even after completing address
20/12		Add new location: wrong postal code (10705) is accepted ('5' is ignored and renders school address when checking location) Note: Address entry with foreign address is Greece renders properly
20/12		Add session – add location --> after adding, system jumps to 'Add training' without warning
20/12		Add session – add location --> postal code field accepts more than 4-digit postal code
20/12		Extra info(optional) field: user can not use TAB to move to next field --> seems endlessly fillable

20/12		Add training – add sessions --> user chooses number of sessions, but not clear to user when user adds matching number of individual sessions --> emphasize 'part'
	Employees	
19/12	Responsive	Right pane – does not collapse – frozen size – slides under left pane
	Trainings	
19/12	Responsive	Right pane – does not collapse – frozen size – slides under left pane
19/12	Buttons	Passed – no reaction
19/12		Future – no reaction
19/12		Now – no reaction
	Search field	
19/12		Zoek – no reaction upon entering data
19/12		Zoek – what must user enter in search field?
19/12		Zoek – erratic sorting function – inconsistent ordering
19/12		Search field does not work with ENTER
	Add Trainings	
19/12		Spelling Languages --> Italien
19/12		Adding existing training --> no error message
	Add Sessions	
19/12		If not all fields completed --> error list does not scroll
19/12		0 sessions is accepted
19/12		If not matching postal code & city are entered, application stalls and does not allow 2 nd corrected entry. Going back does not offer additional option of adding session/location information.
	Books	
19/12	Responsive	Left pane partially hidden under left pane
19/12		Search string 'jeva' --> right pane disappears off screen, information inaccessible, scroll does not go far enough
19/12		Result box too large for screen - instructions and buttons on the left hidden under left pane

	Surveys	
19/12	Responsive	When minimizing/adjusting window, top and left of buttons (in right pane) disappear further under top and left pane
19/12		Right pane information under left pane
	Survey Results	
19/12		All surveys appear double in listing
19/12		SurveyID search field does not work with ENTER
19/12		No return button available -> user has to use Survey menu button to return to Survey selection
	New survey	
19/12		Survey can be saved with the minimum questions/answers and 1 extra answer without question
19/12		Meeting minimum requirements, TrainingID '0' is accepted
19/12		Meeting minimum requirements, Survey can be added with answers without question
19/12		Meeting minimum requirements, Survey is added with TrainingID and title made up of numbers
19/12		Meeting minimum requirements, survey is added with title made up of symbols é&!"é\$à()("!"!ç&è"ç
19/12		Description box: user can not use TAB to move to next field --> seems endlessly fillable
	New Predefined Survey	
20/12	Responsive	Left pane partially hidden under left pane
20/12		Description box: user can not use TAB to move to next field --> seems endlessly fillable
20/12		Survey is saved even when not all questions/answers are not completed consecutively – ie 1&2 en 4&5, leaving 3 unanswered
	Add Predefined Survey	
20/12	Responsive	Left pane partially hidden under left pane
20/12		User cannot select predefined survey or training by double clicking – user needs to enter IDs manually

20/12		Non-existing predefined survey ID(12345) (789456) (0)can be linked to existing survey ID - upon entering non-existing trainingID, system recognizes that non-existing survey ID is entered
	Certificates	
20/12	EmployeeID	Dropdown seems 'crowded' lines – possible to add certificate locating employee using last and/or first name?
		Title field accepts all arithmetic entry as title tor certificate
		Upload functions uploads Pdf document and converts it to .bin file – the saved document consequently does not open
	Settings	
20/12	Settings menu	No back button available unless hidden under left pane
20/12	Settings menu	Change password – description option to be changed – is copy of 'Add New User'
20/12	Add new User	No back button available unless hidden under left pane
		User can be created with name made up of only numbers or symbols
20/12	Change password	No back button available unless hidden under left pane
20/12	Backup database	Give user to select backup path using explorer – or – set default path? Average user might not know how to determine path manually

Testing checking console error messages

Date	Location	Description	Resolved by	Date
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		Username: TestingHR_password_test Password: test Username: TestingADMIN_password_test Password: test		

Console Error Log

Location	Description	Resolved by - Date
Start run	Error thrown at start of program	
null/application.css dec 20, 2017 5:13:35 PM com.sun.javaafx.css.StyleManager loadStylesheetUnPrivileged WARNING: Resource "application.css" not found.		
Login	Error thrown upon login	
ERROR StatusLogger No log4j2 configuration file found. Using default configuration: logging only errors to the console. Set system property 'log4j2.debug' to show Log4j2 internal initialization logging.		
Login	Error thrown upon login	
Wed Dec 20 17:18:02 CET 2017 WARN: Establishing SSL connection without server's identity verification is not recommended. According to MySQL 5.5.45+, 5.6.26+ and 5.7.6+ requirements SSL connection must be established by default if explicit option isn't set. For compliance with existing applications not using SSL the verifyServerCertificate property is set to 'false'. You need either to explicitly disable SSL by setting useSSL=false, or set useSSL=true and provide truststore for server certificate verification.		

SQL Injection – breaking Login

username	password	Error	
'or'1='1	'or'1='1	<p>ERROR StatusLogger No log4j2 configuration file found. Using default configuration: logging only errors to the console. Set system property 'log4j2.debug' to show Log4j2 internal initialization logging.</p> <p>Thu Dec 21 07:06:54 CET 2017 WARN: Establishing SSL connection without server's identity verification is not recommended. According to MySQL 5.5.45+, 5.6.26+ and 5.7.6+ requirements SSL connection must be established by default if explicit option isn't set. For compliance with existing applications not using SSL the verifyServerCertificate property is set to 'false'. You need either to explicitly disable SSL by setting useSSL=false, or set useSSL=true and provide truststore for server certificate verification.</p> <p>Hibernate: select user0_.username as username1_15_0_, user0_.archive as archive2_15_0_, user0_.password as password3_15_0_, user0_.privilege as privileg4_15_0_, user0_.userID as userID5_15_0_ from Users user0_ where user0_.username=?</p>	
' or ' 1 ' = ' 1	' or ' 1 ' = ' 1	<p>Hibernate: select user0_.username as username1_15_0_, user0_.archive as archive2_15_0_, user0_.password as password3_15_0_, user0_.privilege as privileg4_15_0_, user0_.userID as userID5_15_0_ from Users user0_ where user0_.username=?</p>	
' or ' 1 ' = ' 1	' or ' 1 ' = ' 1		
' or ' 1 ' != ' 2	' or ' 1 ' != ' 2		

' or 'a'='a	' or 'a'='a		
	' or 1=1--		
	' or '1'='1' and username <> 'Mickey		
'_	'		
'-0 '	1		
test' or 1=1--	test' or 1=1--		
105 OR 1=1	105 OR 1=1		
" or ""="	" or ""="		
23 OR 1=1	23 OR 1=1		
“or 1=1”	“or 1=1”		
‘test’ + ‘ing’			
‘test’ ‘ing’			
‘test’ ‘ing’			
‘test’ ‘ing’			

Error History Log

Error Location	Error Description	Impact		Status		Solution
			Open	Hold	Closed	

To-Do List

Error Location	Error Description	Impact			Status		Solution
				Open	Hold	Closed	

Nice-to-be-Fixed List

Error Location	Error Description	Impact			Status		Solution
				Open	Hold	Closed	

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<http://dbunit.sourceforge.net/>

Testing for SQL Injection

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Logic – Classes & Methods

1. Book
 - a. getters
 - b. setters
 - c. toString
2. Certificate
 - a. getters
 - b. setters
 - c. toString
3. Employee
 - a. getters
 - b. setters
 - c. toString
4. Enquête
 - a.
5. Location
 - a. getters
 - b. setters
 - c. toString
 - d. addLocation()
 - e. changeCity()
 - f. changeCountry()
 - g. changeInfo()
 - h. changeName()
 - i. changeNumber()
 - j. changePostalCode()
 - k. changeStreetName()
 - l. deleteLocation()
 - m. saveUpdate()

6. MetadataOdata
 - a. getters
 - b. setters
7. Privilege --> Enum
8. Session
 - a. getters
 - b. setters
 - c. toString
9. Source
 - a. dao.getAllBooks()
10. Survey
 - a. getters
 - b. setters
11. User
 - a. getters
 - b. setters
 - c. toString

DB – Classes & Methods

12. BaseDAO

- a. getConnection()
- b. BaseDAO()
- c. setConnection(Connection connection)

13. BookDAO

- a. archiveBook(String isbn)
- b. deleteBook(String isbn)
- c. fill(ResultSet r)
- d. getAllBooks()
- e. getBook(String isbn)
- f. insertBook(Book b)
- g. updateBook(Book b)

14. BookDB

- a. sessionFactory
- b. BookDB()
- c. deleteBook(Book myBook)
- d. getAllBooks()
- e. getBook(String isbn)
- f. insertBook(Book myBook)
- g. updateBook(Book myBook)

15. CertificateDB

- a. sessionFactory
- b. CertificateDB()
- c. deleteCertificate(Certificate myCertificate)
- d. getAllCertificates()
- e. getCertificate(int Id)
- f. insertCertificate(Certificate myCertificate)
- g. updateCertificate(Certificate myCertificate)

16. Credentials

17. LocationDAO

- a. LocationDAO()
- b. deleteLocation(int id)
- c. fill(ResultSet r)
- d. getAllLocations()
- e. getLocationsById(int id)
- f. insertLocation(Location l)
- g. updateLocation(Location l)

18. SessionDAO

- a. SessionDAO()
- b. getAllStudentsEnrolled(int sID)
- c. getAllStudentsPresent(int sID)
- d. getAllTeachers(int sID)
- e. insertSession(Session s)
- f. insertStudentsEnrolled(ArrayList<Integer> se,int sID)
- g. insertStudentsPresent(ArrayList<Integer> sp,int sID)
- h. insertTeachers(ArrayList<String> t,int sID)
- i. updateSession(Session s)

19. Singleton

- a. getSingleton()
- b. Singleton()
- c. clone()
- d. getConnection(boolean autoCommit)

20. SurveyDAO

- a. surveyDAO()
- b. addSurvey(Survey survey)
- c. addSurveyQuestions(Survey survey)
- d. deleteQuestionBySID(int surveyID,String question)
- e. deleteSurvey(int surveyID)
- f. deleteSurveyQuestions(int surveyID)
- g. getAllSurveyByTraining(int trainingsID)

- h. getAllSurveys()
- i. getSurveyByID(int surveyID)
- j. getAllSurveyQuestions(int surveyID)
- k. update(Survey s)

21. TestGson

- a. getEmployees()
- b. readUrl(String urlString)

22. TestJackson

- a. getEmployees()

23. UserDB

- a. insertUser(User myUser)
- b. updateUser(User myUser)
- c. deleteUser(User myUser)
- d. getUser(String userID)
- e. getAllUsers()