

How Lessons Learned were applied

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1. CRDU interfaces learned from project 1 was applied. At server side, there are CRDU interfaces for both customer user and seller user.
2. Abstract class design conception learned from mini 1 was applied for encapsulation. In adapter package, there are Proxy_customer.java and Proxy_server.java abstract classes which actually implements all the CRDU interfaces.
3. Exception class was installed to react in exception situation caused by requests from client side.
4. Exception handling mainly focuses on how to respond the client app if the request
5. In model package of server project, Customer class and Seller class are the basic classes for storing information about a seller or customer, which contains basic methods like setters and getters.
6. In model package of server project, a Seller class object contains an ArrayList object of product class, and product class contains basic information about a specific product.
7. In model package of server project, Customer_list class has a linkedHashMap object of Customer class, and Sellers_list has a linkedHashMap object of Seller class.
8. There is a servlet package containing servlet classes for interacting with client app.
9. In the servlet package, Add_a_product and Delete_a_product servlets are for operating products barn to add or delete a product.
10. In the servlet package, Edit_a_seller, Edit_a_product, and Edit_a_customer servlets are for account setting and editing a product's info requests from client app.
11. Login, Change_password, Sign_up_customer and Sign_up_seller servlets are for responding login, sign-up and password changing requests from client app.
12. Search_products and Search_sellers servlets are for responding searching requests from client app.
13. Build_customer.java and Build_seller.java class in model package are empty class for encapsulation.
14. Create_delete_customers.java and Create_delete_sellers.java in adapter package are creating and deleting interfaces to add and delete a customer or seller.
15. Update_customers and Update_sellers in adapter package are updating interfaces containing methods to update a seller or customer basic information.
16. Read_customers and Read_sellers in adapter package are reading interfaces containing methods to providing client app information of a specific customer or seller.
17. Network operations in an android application must be implemented in a thread class, and main activity should not be stopped to wait for a thread.

18. To implement the interaction and message transfer between main activity and thread, we can use Handler class in main activity. Handler can react accordingly when it receives message from a thread.
19. CRDU interfaces in adapter package can use methods provided by db package to interact with database.
20. There are several kinds of database, including five main types, such as flat, network, hierarchical, relational and Object-oriented.
21. In this team project, we use relational database. Relational database is an information system that presents information as rows contained in a collection of tables, each table possessing a set of one or more one or more columns.
22. The first step is to collect requirements. The general requirements is to build a B2C plat form as an android application.
23. In this application, we have three kind of actors, seller, customer and guest. The guest does not need an account to be stored in the database, so that the database does not have such a table for guest.
24. Database designing shall obey three normalization rules.
25. First normal form says that each attribute contains only atomic values. That means there is no repeating group.
26. Based on first normal form, we will separate information of product of a seller from the information of the seller, because a seller may have many products, and those are repeating information if they are in one table.
27. Second normal form is on the basis of the first normal form. It requires that all of the data must be dependent only on the primary key.
28. Base on second normal form, we use primary key and foreign key in the table to represent the relationship between all of the entities.
29. Third normal form says that each column in the table, except the primary key, should not be interdependent.
30. Based on the third normal form, we delete a column in the product info table. The discount rate can be calculated from previous price and present price, so it should not be in the table.
31. Database will be manipulated through eclipse JDBC. As a consequence, we must provide methods for CRUD functionality.
32. All the operation of database are accessed by interface. The interface are implemented by an empty abstract class extending a real class that really implement all the interface. This kind of design is called adapter pattern.
33. For the convenience of maintenance, the SQL query are stored in a property file and loaded when needed.
34. Primary key must be unique. It must identify a row of information.

35. Foreign key is the primary key of another table, it should be declared in the child table. As the parent table changes, child table will also change.

36. Database and model are both on the remote server. It is accessed from android mobile through HTTP connection.

37. Every request is handled by servlet on the remote server and servlet call methods to access database.

38. User interface is one of the most important parts of an android application. It's the directly page users can see. Compare to server, business model and database, which run in a remote laptop and support the whole application used for storing data. In order to make our application user friendly and improve user experience, it is a great idea to design page flow first and have a general view of your application, and then begin to design details.

39. It's better to use different layout such as liner layout, table layout , etc. to design your UI, that will help a lot when you have many resolutions, you can simply modify the original interface and adjust it to different resolutions.

40. HttpURLConnection API is a good way to establish connection between server and user, user can easily connect to servlet and communicate with server and its' database through input stream. Our design based on passing string stream between server and client, those information also contains audio and image url which the resource file is stored at amazon server we applied.

41. For the purpose of improving the running speed, in other words, improving user experience, Thread is important to realize concurrency , and there is something special in java, handler is a great tool to manage all the threads we called and design the priority of thread.

42. By using Google map API, one can simply implement navigation and location function in our application. Marker is a convenient tool to use if you want to enable user to find where they want to locate. Our App bases on this function to find nearest shop of users' input marker or their current location.

43. In order to displays all the information we have in database if a user want to know, ListView is a good way in our design to display stores' information, products' information, etc.

44. Another way to implement fragment is to use navigation bar. There are advantages and disadvantages of navigation bar. One can simply jump to another fragment by navigation bar, but if you click back button, you will jump to last activity instead of last fragment.

45. Fragment is used to store some related page in one activity. In our design, a customer user can jump to different fragments such as "about us", "help", "manage account", etc. through navigation bar on the right top side.

46. Recorder and Media player is used to store the vocal introduction of a shop. The url of vocal information is a little bit different of image url, cause we don't need to download vocal information but simply use the url we stored in amazon server and parse it.

47. Camera is used in our design to take photo of shop's logo or products, and those image will be upload and stored at amazon server.

48. Our App also provide the function to explore existing photos or images in the device as your shop's logo or the photo of your products. There are some difficulties we faced when we want to find the absolute path of a selected image, but finally we solve it by using `MediaStore.Images.Media.DATA` , cursor object, and `getContentResolver` method.

49. It's better to implement all the button click listener in one switch function of one fragment or activity, by doing this it can make code more readable and convenient to modify.

50. In order to manage code better, packages are needed. We classify each activities' responding code and put it into its related package. In our design we have activity, model, and `ws/local` package. Furthermore, there are more packages in activity package to classify guest, customer, seller and main activity.

51. It's much better to create model for list view, then we can easily modify our code and change the view and design of display.

52. Another advantage to create model when receiving data from server is that it can protect data. One can only access to those data through getting setting methods defined in model object class.

53. Bundle is quite important if the app has account login system. It's necessary to pass user name and other related information between activities so that we can provide username for further connection with server.

54. But for different fragments which share the same activity, there is only one extra bundle so there is no need to pass the information through bundle if such information has already passed. So that is another advantage using navigation fragments, one can simply pass the username from login page to customer page and there is no need to pass the username anymore.

55. `ws.local` package contains all the class used for connecting with database server and amazon server. There are totally five classes, `HttpDBserver` class is used to connect database server, there are different servlets to communicate and each performs different functions. Other four classes is used to communicate with amazon server.

56. `DownloadImage` class and `DownloadSound` class is used to get image and audio we have stored in amazon. Customer first retrieve those url data in database by visiting servlet and then use those url and function written in classes mentioned above to get image and audio.