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**Individual Assignment**

**Designing and Developing Applications on the Cloud**

**CT071-3-3-DDAC**

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# **Acknowledgement**

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Apart from this, I would also like to show my appreciation to my classmates as we have helped each other when any of us facing problems while doing this assignment, without them the completion of this task would have been a hard challenge.

Lastly, I would also like to say thank you to Asia Pacific University College which is readily available and has abundant recourses that have also been shown to be a great assistance throughout my assignment from start to finish.

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# **Introduction**

Ukraine International Airlines (UIA) is the flagship carrier which placed in Ukraine. The airline is the largest airline in the country with operations in domestic and international passenger flights. UIA also offers cargo services and all the services are towards Europe, Middle East, United States and also Asia. In order to prevent the denial-of-service (DOS) attacks as occurred to the site while the airline wanted to expand their business, Dmitriy Prudnikov, Chief Information Officer at Ukraine International Airlines, realized that migrating the website out of UIA datacenters into a public cloud could solve all these problems.

UIA are looking forward in designing and developing an Online Flight Booking System and chose Azure while comparing both Amazon Web Services and Microsoft Azure as Azure is higher compatible with open source software. The single tenant web solution with the function of creating customer profile, and entire booking process management.

The system proposed by developer is a system that allows user registration, login and also enables the user to make booking of flight ticket in the system. Besides, the system admin also able to login to the system and schedule or reschedule the flight details. Both type of users are able to manage their own profile in the system.

# **Project Plan**

## Gantt Chart

# **Design**

1. Architecture Diagram



1. Class Diagram



1. Use Case



1. Description

|  |  |
| --- | --- |
| Use Case Name: | Registration |
| Participating Actor: | Unregistered User |
| Flow of Events: | 1. Unregistered user enters details for registration. 2. If data in all fields are valid and match field format, registration proceeds and user is directed to the system login page. |
| Entry Condition: | - |
| Exit Condition: | * All fields contain valid data and all matches field types. |
| Quality Requirement: | All compulsory fields must be filled in. |

|  |  |
| --- | --- |
| Use Case Name: | Login |
| Participating Actor: | Registered User, Administrator |
| Flow of Events: | 1. Registered User and Administrator enters username and password. 2. If the username and password are valid, Registered User and Administrator will be granted access to the application 3. Otherwise, Registered User and Administrator is required to fill in their username and password again. |
| Entry Condition: | * Registered User and Administrator has accessed the website for the web application. |
| Exit Condition: | * Username and password are valid. |
| Quality Requirement: | - |

|  |  |
| --- | --- |
| Use Case Name: | Manage Profile |
| Participating Actor: | Registered User, Administrator |
| Flow of Events: | 1. Registered User and Administrator Click on My Profile Page. 2. Edit the necessary field. All field must be filled in. 3. Click Update button. 4. The updated data will be stored at database and session is updated. |
| Entry Condition: | * Registered User and Administrator has accessed the website for the web application. |
| Exit Condition: | * Edited fields are valid. |
| Quality Requirement: | - |

|  |  |
| --- | --- |
| Use Case Name: | Book Ticket |
| Participating Actor: | Registered User |
| Flow of Events: | 1. Registered User click on Book Ticket Page. 2. Search for the origin and destination using the drop-down list provided. 3. Click Search button. 4. Select the desired flight to be booked and enter the booking seat. 5. Click “Calculate” to get the total price. 6. Click “Proceed to Payment” to proceed to payment page. 7. The updated data will be stored at database. |
| Entry Condition: | * Registered User has accessed the website for the web application. |
| Exit Condition: | * Entered field are valid. |
| Quality Requirement: | All data entry must match the field type in booking and payment sections. |

|  |  |
| --- | --- |
| Use Case Name: | View Booking History |
| Participating Actor: | Registered User |
| Flow of Events: | 1. Registered User click on Booking History Page. 2. The updated booking history are showed in the table. |
| Entry Condition: | * Registered User has accessed the website for the web application. |
| Exit Condition: | - |
| Quality Requirement: | - |

|  |  |
| --- | --- |
| Use Case Name: | Schedule Flight |
| Participating Actor: | Administrator |
| Flow of Events: | 1. Administrator click on Schedule Page. 2. Click “New” button. 3. Select and fill in the details in the form pop up. 4. Click “Save” to get updated data to be stored at database. |
| Entry Condition: | * Administrator has accessed the website for the web application. |
| Exit Condition: | * Entered field are valid. |
| Quality Requirement: | - |

|  |  |
| --- | --- |
| Use Case Name: | Update Flight |
| Participating Actor: | Administrator |
| Flow of Events: | 1. Administrator click on Schedule Page. 2. Search for the Flight Number or origin / destination using the textbox and drop-down list provided. 3. Click Search button. 4. Select the desired flight to be edited and edit the desired fields. 5. Click “Save” to get updated data to be stored at database. |
| Entry Condition: | * Administrator has accessed the website for the web application. |
| Exit Condition: | * Entered field are valid. |
| Quality Requirement: | - |

1. Sequence

Unregistered User



Registered User



Admin



# **Implementation**

Firstly, the implementation of the system is started with the application UML diagram such as use case diagram and class diagram. This is to determine the field and functions that the system will be included. Then, the implementation process continued by designing the webpages layout.

Next, deciding the programming language that need to be used in the coding of the system. I have decided to use C# as the programming language in deploying the system. After deciding the programming language, the webpage implementation on the web page interface starts.

After the interface of the webpage have been created the coding of the C# behind the interface starts. The integration of the project and the Microsoft Azure database are implement after the SQL database and its resources are deployed. In this process, the testing also occurs to make sure the integrity of the data stored as well as the data retrieved.

After all the process above are completed, the deployment on the Azure is carried out. In this point, the Web App and its resources are created as the system will be published to 2 different regions. Traffic Manager is also implement to control the traffic of the system and enables the user to get their services from the nearest location.

Then, the test plan is implemented to test on each unit in the system and minimize the bugs and errors occurs. After the bugs are fixed, the performance test is taken place in the Microsoft Azure. Lastly, all the process and the results shown are documented.

# **Test Plan & Testing Discussion**

Unit Testing

1. *Login*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Test Case** | **Username** | **Password** | **Expected Output** | **Actual Output** | **Status** |
| T1.1 | peiching101@gmail.com (System Admin) | Ching101# | Access to the application will be granted and *Schedule* page with granted functionalities will be shown at the top menu. | Access to the application is granted and *Schedule* page with functionalities is shown. | Pass |
| T1.2 | peiching101@gmail.com | 123456789 | Access to the application will not be granted as password is wrong. | Access to the application is not granted. | Pass |
| T1.3 | Peiching\_101@hotmail.com  (System User) | Ching101# | Access to the application will be granted and *Booking* page with granted functionalities will be shown. | Access to the application is granted and *Booking* page with Booking History and Profile Management functionalities, is shown. | Pass |
| T1.4 | peiching\_101@hotmail.com | - | Authentication cannot be performed as necessary field is empty. | Authentication cannot be performed and an error indication shows “The password field is required.” | Pass |
| T1.5 | yeye | 123456789 | Access to the application will not be granted as username does not exist. | Access to the application is not granted. | Pass |

1. *Registration*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Test Case** | **Fill up details** | **Expected Output** | **Actual Output** | **Status** |
| T2.1 | Fill up all fields and click “Submit” button. | Registration will be successful and registration data will be stored into the database. | Registration is successful, registration data is stored into the database. User are directed to Login Page | Pass |
| T2.2 | Fill up all fields except some necessary fields like *Email* and click “Submit” button. | Registration will fail and necessary field will need to be filled for registration to be successful. | Registration fails and an error indication showing “Please complete in all necessary field!” | Pass |
| T2.3 | Fill up all fields with “peiching\_101@hotmail.com” as the *Email* and click “Submit” button. | Registration will fail as email already exists. | Registration fails and an error indication showing “peiching\_101@hotmail.com has been registered.” | Pass |
| T2.4 | Fill up all fields with “12345678” as the Password and “123456789” as the Confirm Password, and then click “Submit” button. | Registration will fail as Password and Confirm Password fields do not match. | Registration fails and an error indication showing “The password and confirmation password do not match.” | Pass |

1. *System Administrator*
   1. *Page Navigation*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Test Case** | **Select Page** | **Source** | **Expected Output** | **Actual Output** | **Status** |
| T3.1.1 | Click *My Profile* | Profile Page | Page will be navigated to *My Profile* page. | Page is navigated to *My Profile* page. | Pass |
| T3.1.2 | Click *Schedule Flight* | Schedule Page | Page will be navigated to *Schedule Flight* page. | Page is navigated to *Schedule Flight* page. | Pass |
| T3.1.3 | Click *Logout* | Logout Page | Page will be navigated to *Logout* page. | Page is navigated to *Logout* page. | Pass |

* 1. *Flight Schedule*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Test Case** | **Action** | **Expected Output** | **Actual Output** | **Status** |
| T3.2.1 | Click “New” button | The new form for create new Flight Details will be show up. | The new form for create new Flight Details shown. | Pass |
| T3.2.2  (a) | Fill up all necessary fields in Flight Details form and then click “Save” button | New Flight Details will be successfully added and the details of the new Flight Details will be stored into the database. | New Flight Details is successfully added and the details of the new Flight Details are stored into the database. | Pass |
| T3.2.2  (b) | Click on “Cancel” button in Flight Details form | No changes will be made and Flight Details form will be closed. | No changes are made and Flight Details form is closed. | Pass |
| T3.2.3 | Click on “Edit” button in the Grid View | The details of the Flight are shown in pop up box and user can “Save” to update the details. | The details of the Flight are shown in pop up box and user can “Save” to update the details. | Pass |
| T3.2.4 | Type in Flight Number or Select Origin / Destination in the drop-down list and click “Search” | The details fulfill the search details will be shown in the grid view below. | The details fulfill the search details is shown in the grid view below. | Pass |

* 1. *Manage Profile*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Test Case** | **Action** | **Expected Output** | **Actual Output** | **Status** |
| T4.6.1 (a) | Click “My Profile” button, change necessary fields, and then click “Update” button. | Profile’s information will be changed and stored into the database. | Profile’s information is changed and a message box pops up showing “Record saved successfully” The changes are stored into the database as well. | Pass |
| T4.2.1 (b) | Click “Edit” button, change necessary fields and leave Password field blank and Click on “Update” button. | Edition of profile’s information will fail because of missing necessary fields. | Edition of profile’s information fails and an error indication showing “Please enter password with at least: 1 lowercase letter, 1 uppercase letter, 1 number, 1 special character and minimum length of 8!” | Pass |

1. *System User*
2. *Page Navigation*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Test Case** | **Select Page** | **Source** | **Expected Output** | **Actual Output** | | **Status** |
| T4.1.1 | Click *My Profile* | Profile Page | Page will be navigated to *My Profile* page. | Page is navigated to *My Profile* page. | Pass | |
| T4.1.1 | Click *Book Ticket* | Book Ticket Page | Page will be navigated to *Book Ticket* page. | Page is navigated to *Book Ticket* page. | | Pass |
| T4.1.2 | Click *Booking History* | Booking History Page | Page will be navigated to *Booking History* page. | Page is navigated to *Booking History* page. | | Pass |
| T3.1.3 | Click *Logout* | Logout Page | Page will be navigated to *Login* page. | Page is navigated to *Login* page. | Pass | |

1. *Booking*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Test Case** | **Action** | **Expected Output** | **Actual Output** | **Status** |
| T4.2.1 | Select Origin and Destination from drop down list and Click “Search”. | The results fulfil requirement are shown on today’s date and onwards shown. | The results fulfil requirement are shown on today’s date and onwards shown. | Pass |
| T4.2.2 | Select the flight details desired to book ticket. | The pop up form will be shown to ask how many ticket want to buy. | The pop up form is shown to ask how many ticket want to buy. | Pass |
| T4.2.3 (a) | Type in the number of flight ticket and click “Calculate”. | The pop up box will be shown with the total price of ticket. | The pop up box is shown with the total price of ticket. | Pass |
| T4.2.3 (b) | Click “Proceed to Payment” button. | New booking is created and the booking will be sent to customer’s email. The database of flight details and make Order is updated. | New booking is created and the booking will be sent to customer’s email. The database of flight details and make Order is updated. | Pass |

1. *Booking History*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Test Case** | **Action** | **Expected Output** | **Actual Output** | **Status** |
| T4.3.1 | Load Booking History page. | All booking History of the customer will be shown. | All booking History of the customer are shown. | Pass |

1. *Manage Profile*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Test Case** | **Action** | **Expected Output** | **Actual Output** | **Status** |
| T4.6.1 (a) | Click “My Profile” button, change necessary fields, and then click “Update” button. | Profile’s information will be changed and stored into the database. | Profile’s information is changed and a message box pops up showing “Record saved successfully” The changes are stored into the database as well. | Pass |
| T4.2.1 (b) | Click “Edit” button, change necessary fields and leave Password field blank and Click on “Update” button. | Edition of profile’s information will fail because of missing necessary fields. | Edition of profile’s information fails and an error indication showing “Please enter password with at least: 1 lowercase letter, 1 uppercase letter, 1 number, 1 special character and minimum length of 8!” | Pass |

Performance Testing

For performance testing, I have loaded the test by having 250, 500 and 750 User Load in duration of 5 minutes for each of the Region (Web App). The results are shown in below.

1. *Region: Southeast Asia*

|  |  |  |  |
| --- | --- | --- | --- |
| User Load | Duration (minutes) | Virtual User | Results |
| 250 | **5** | **1250** | **Request:**   * Successful: 46819 (100%) * Failed: 0 (0%)   **Performance under Load**    **Web App Usage** |
| 500 | **5** | **2500** | **Request:**   * Successful: 36546 (100%) * Failed: 0 (0%)   **Performance under Load**    **Web App Usage** |
| 750 | **5** | **3750** | **Request:**   * Successful: 61087 (100%) * Failed: 0 (0%)   **Performance under Load**    **Web App Usage** |

1. *Region: West Europe*

|  |  |  |  |
| --- | --- | --- | --- |
| User Load | Duration (minutes) | Virtual User | Results |
| 250 | **5** | **1250** | **Request:**   * Successful: 17919 (100%) * Failed: 0 (0%)   **Performance under Load**    **Web App Usage** |
| 500 | **5** | **2500** | **Request:**   * Successful: 28451 (100%) * Failed: 0 (0%)   **Performance under Load**    **Web App Usage** |
| 750 | **5** | **3750** | **Request:**   * Successful: 43009 (100%) * Failed: 0 (0%)   **Performance under Load**    **Web App Usage** |

As seen in the results shown, the system are able to be support the users up to 3750 users without having any errors which brings a good results to the system.

# **Conclusion**

In conclusion, I have research and learnt on the knowledge related to the Microsoft Azure and Microsoft Visual Studio. Throughout the process of research, the process of deploying the web and publish it to the Azure cloud, the theory on the flows is reviewed and understand in terms of theory. This provides me an overview on the real world how web app is done.

In this assignment, I would like to thank my lecturer, Dr. Kalai Anand A/L Ratnam, classmates and friends in helping me to understand and complete the assignment. Next, I would like to thank APU for providing me the opportunity to understand on the whole project management flows and giving me a chance to gained knowledge in Designing and Developing Applications on the Cloud. All the knowledge and experience gained will helps me in my future career.

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# **Appendices**

## **ASSESSMENT CRITERIA**

|  |  |  |  |
| --- | --- | --- | --- |
| **No** | **Criteria** | **Mark Allocated** | **Score** |
|  | **Documentation** |  |  |
| 1. | Introduction | 15 |  |
| 2. | Project Plan | 15 |  |
| 3. | Design & Solution Architecture | 60 |  |
| 4. | Conclusion | 10 |  |
|  | **Total (Documentation)** | **100** |  |
|  | | | |
|  | **Implementation** |  |  |
| 5. | Publishing an Application to Azure | 10 |  |
| 6. | Application Scaling with Justification | 20 |  |
| 7. | Testing Cloud Applications (Unit Testing & Performance Testing) | 25 |  |
| 8. | Investigate & Analyze Application (Plan, collect, and interpret diagnostics and instrumentation data) | 20 |  |
| 9. | Implementation & Discussion of Managed Databases (PaaS) | 25 |  |
|  | **Total (Implementation)** | **100** |  |

## **URL**

1. GitHub URL

https://github.com/PeiChing101/DDAC2#ddac2