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Synchronize Learning Management System(LMS) with Centralized Database(CDB)

Bachelor of Science in Computer Science

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April, 2017

Certificate

We are going to develop " SyncApp" to synchronize Learning Management System (LMS) with Centralized Database (CDB). Focus of our project is to build such application which acts as a bridge between LMS and CDB that can synchronize the select fields of the database. The application is able to synchronize the databases as per desired fields. Therefore, the manual efficiency and time required to synchronize will be reduced.

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Abstract

The main concern of the project is to synchronize Learning Management System (LMS) and Centralized Database (CDB) by developing such an application which perform the synchronization on the selected fields of database. There are applications which are used for this type of synchronization in real world, but they all have drawbacks due to which these applications are not efficient and they are not as exible as our application to perform required field's synchronization. The development of this application will improve efficiency of sync which will enhance the services of LMS and reduce manual effort to perform modications in the databases. The project will also serve another task which is sending emails to the LMS users so that, they will be up-to-date with all activities regarding LMS. The end result of this project will originate synchronized LMS and CDB with the help of our application which will assist the organizations to perform synchronization on specific fields of databases.

Acknowledgements

All praises to Almighty Allah who provided us not only this golden opportunity to enhance our skills, but also gave us power and wisdom to work and plan with full devotion. We pay gratitude and thanks to our supervisor Dr. Muhammad Asfand-e-Yar for guidance, support, patience and understanding throughout the research period. He is an inspiration for us and we are honored to be in his supervision. No words in any dictionary can acknowledge the sacrifices, love and moral support given to us by our beloved families. Their prayers had never left us alone in any circumstances.

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”It always seem impossible until it’s done.” -Nelson Mandela

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Acronyms

CDB	Centralized Database
ETL	Extract, Transformation, Load
LMS	Learning Management System
SyncApp	Synchronized Application
SQL	Structured Query Language

Chapter 1

Introduction

1.1 Overview

The “SyncApp” application is to synchronize Learning Management System (LMS) with a Centralized Database (CDB). The project is to build the application that acts as a bridge between LMS and CDB and synchronizes the select fields of the database. The application is able to synchronize the databases as per desired fields. Therefore, the manual efficiency and time required to synchronize will be reduced. There are existing software’s which perform replication of data among databases such as FlySpeed DB Migrate to SQL Server, HVR - High Volume Replication, SharePlex for SQL Server. These applications are free and open source applications. The applications synchronize complete database rather than individual entities. FlySpeed DB Migrate to SQL Server software generate errors while trying to connect Oracle database [1]. HVR - High Volume Replication and SharePlex for SQL Server software only synchronized whole database rather than synchronizing specific fields of database [2]. Existing software have all features of replicating databases for example they can replicate whole data fields from both ends. Our application will provide a feasibility to user such as he can replicate specific data fields, and perform various query operations on CDB database. As Moodle LMS are in working process in different organization’s now a days but we will developed our own LMS for the same functionality as Moodle have [3] [4].

1.2 Objective

The objective is to Synchronize LMS with CDB. The replication of data will be according to the requirements of the user. We will use ETL utility to synchronize the CDB with any other DB of LMS, even if the database schema is different. As this utility is use to move the data smoothly and accurately within different databases so our application will perform synchronization by using this utility function [5].

1.3 Problem Description

The project facilitates the database administrator in synchronizing the whole database or individual fields of a database. Moreover, it liberates the database user from manual replication of desired fields when database become too large, which is a time-consuming task [6].

1.4 Project Scope

To synchronize the databases manually, according to required entities, is difficult, therefore an application is to be developed which helps in synchronizing the required fields from one database to other. We can achieve our goal by using "Synchronization of Learning Management System and Centralized Database". Therefore, with the help of (SyncApp) application we will be able to modify database from CDB to LMS and that will help LMS users to get necessary information about the management system via emails.

1.5 Tools Used

There are available tools which are used to developed the application, which are defined below:

1.5.1 Microsoft Visual Studio

To developed this application Microsoft Visual Studio will be used. The language used is C sharp, which has been around for a while now and it is continually being enhanced. The new features make it a quite unique language. C sharp is readily used for the implementation of various applications. In C sharp many languages can be linked together and also provides many libraries which support the ETL utility and synchronization process [5].

1.5.2 LMS

LMS which is used to deliver online courses and provide training to learners while managing students and keeping track of their progress and performance [4].

1.5.3 CDB

A centralized database is a database that is located, stored and maintained in a single location. The location is most often a central computer or a database system mostly it is used by organization or institutions.

Chapter 2

Literature Review

2.1 Synchronization

Synchronization is the process of harmonizing two or more processes or parallel execution. The major benefit of this process is that it reduces time consuming and increase the efficiency of whole task. It can be used by almost every process in this advance era of technology. In the Database Management System, synchronization methods are also use to make steady flow of data through different databases that is known as replication of databases. In this project synchronization is performed on Learning Management System by the Central Database including a "SyncApp" which perform this synchronization process. By using "SyncApp" manual effort of performing modifications on the databases become minimal and efficiency also increase because of the flexibility to perform synchronization on required fields [7].

2.2 Existing Systems

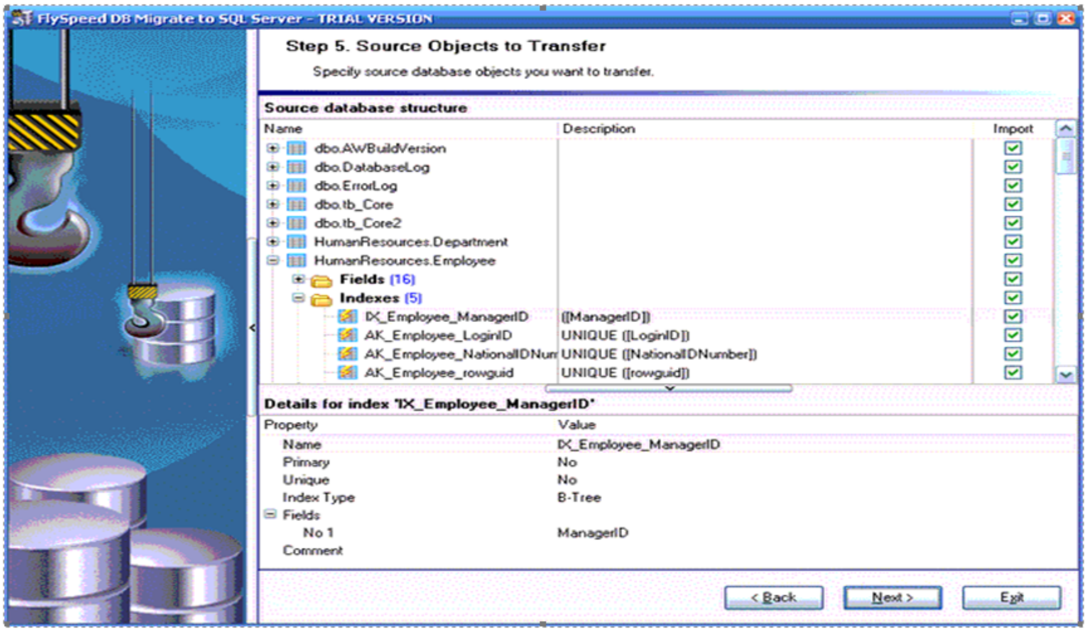
Synchronization between databases can be performed by other tools. There are many softwares which perform this type of replication such as:

- FlySpeed DB Migrate to SQL Server
- HVR - High Volume Replication
- SharePlex for SQL Server

These applications are free and open source applications and synchronize complete database rather than individual entities. FlySpeed DB Migrate to SQL Server software generate errors while trying to connect Oracle database. HVR - High Volume Replication and SharePlex for SQL Server software only synchronized whole database rather than synchronizing specific fields of database. Existing software have all features of replicating databases, for example, they can replicate whole data fields from both ends. The backdrop of these applications are explained as follows:

2.2.1 FlySpeed DB Migrate to SQL Server

The FlySpeed database tool extremely simplifies database management, having all essential functions to deal with routine database tasks. This software is developed by Active Database Software in 2005 which is a privately-owned software development company [4].



Step 5. Source Objects to Transfer

Specify source database objects you want to transfer.

Source database structure

Name	Description	Import
⊞ dbo.AWBuildVersion		☑
⊞ dbo.DatabaseLog		☑
⊞ dbo.ErrorLog		☑
⊞ dbo.tb_Core		☑
⊞ dbo.tb_Core2		☑
⊞ HumanResources.Department		☑
⊟ HumanResources.Employee		☑
⊞ **Fields** (16)		☑
⊟ **Indexes** (5)		☑
IX_Employee_ManagerID	([ManagerID])	☑
AK_Employee_LoginID	UNIQUE ([LoginID])	☑
AK_Employee_NationalIDNum	UNIQUE ([NationalIDNumber])	☑
AK_Employee_rowguid	UNIQUE ([rowguid])	☑

Details for index 'IX_Employee_ManagerID'

Property	Value
Name	IX_Employee_ManagerID
Primary	No
Unique	No
Index Type	B-Tree
⊟ Fields	
No 1	ManagerID
Comment	

Figure 2.1: Graphical User Interface of FlySpeed DB Migrate

Drawbacks

It generates errors while trying to connect Oracle database. Its connectivity is complicated or even impossible with the different versions of Oracle. Its user interface is not much friendly, it does not response when large database is connected as shown in figure 2.1.

2.2.2 HVR - High Volume Replication

HVR is a synchronization software which is used to replicate large databases in real time. It is developed by HVR solutions [5].

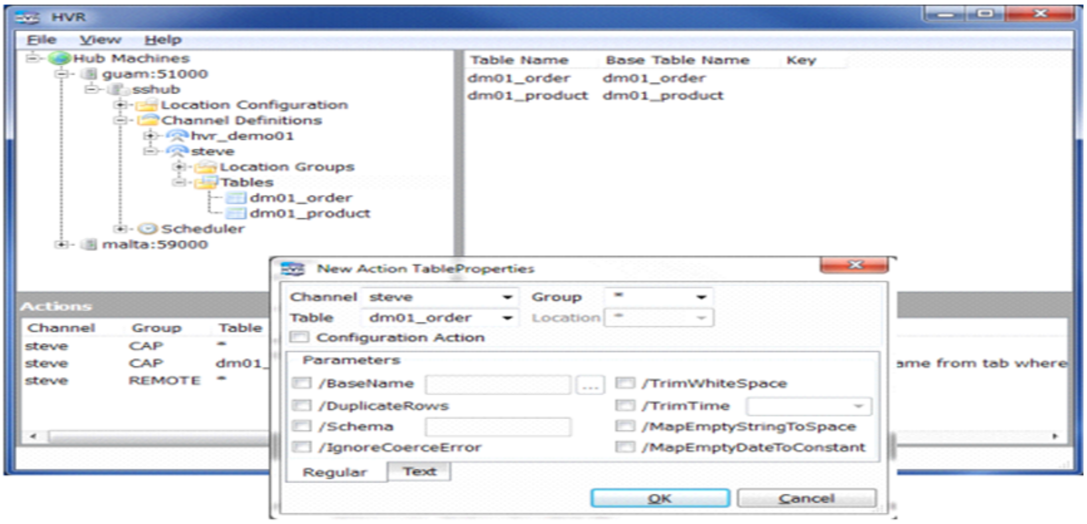


Table Name	Base Table Name	Key
dm01_order	dm01_order	
dm01_product	dm01_product	

Channel	Group	Table
steve	CAP	*
steve	CAP	dm01_
steve	REMOTE	*

ame from tab where

Channel: steve
Group: *
Table: dm01_order
Location: *
□ Configuration Action

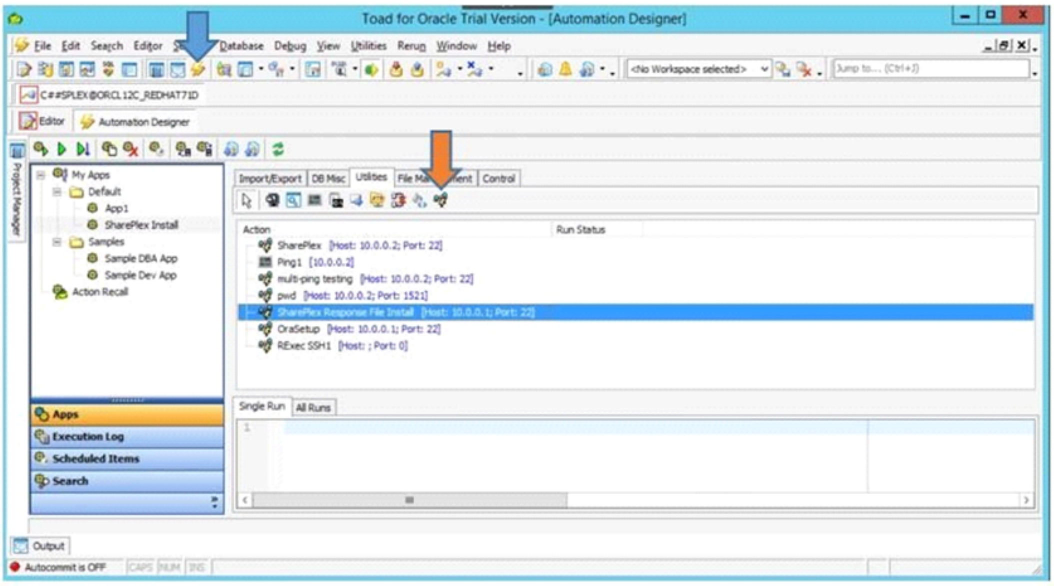
□ /BaseName
□ /DuplicateRows
□ /Schema
□ /IgnoreCoerceError
□ /TrimWhiteSpace
□ /TrimTime
□ /MapEmptyStringToSpace
□ /MapEmptyDateToConstant

Figure 2.2: Graphical User Interface of HVR

Drawbacks
This software only synchronizes whole database rather than synchronizing specific fields of database. Its performance is slow while replicating large database. The software crashes in replication process, this may result in loss of data as shown in figure 2.2.

2.2.3 SharePlex for SQL Server

This is the product of DELL Inc. which is a global company. The SharePlex for SQL Server tool used to simplify database management by performing replication on databases [2].



Action	Run Status
SharePlex [Host: 10.0.0.2; Port: 22]	
Ping1 [10.0.0.2]	
multi-ping testing [Host: 10.0.0.2; Port: 22]	
pwd [Host: 10.0.0.2; Port: 1521]	
SharePlex Response File Install [Host: 10.0.0.1; Port: 22]	
OraSetup [Host: 10.0.0.1; Port: 22]	
RExec SSH1 [Host: ; Port: 0]	

Figure 2.3: Graphical User Interface of SharePlex

Drawbacks
SharePlex is old software which just compatible with the older versions of Oracle or SQL Server. When an update is required this software does not ensure that all replicas are updated and the replication become difficult as shown in figure 2.3.

2.3 Proposed System

The proposed system contains an application which will eliminate all the manual efforts and will increase the speed of the whole process of synchronization and make it reliable for database user to get satisfy about the modifications performed on the database. This application will be completely adaptable as system which will remove all the drawbacks of other existing software. The application is able to synchronize the databases as per desired fields. Therefore, the manual efficiency and time required to synchronize will be reduced. To overcome all the disadvantages of the traditional systems, a new automated dynamic and efficient synchronization system is being proposed [8].

Chapter 3

Requirement Specifications

3.1 Existing System

The existing systems are well enough to perform synchronization from one database to another but have drawbacks, as discussed in section 2.2. This drawback gives the database administrator a manual effort because these systems synchronize whole databases instead of synchronizing the required fields. There are many software's which perform this type of replication such as FlySpeed DB Migrate to SQL Server, HVR - High Volume Replication, SharePlex for SQL Server. Our proposed software has all features of replicating databases like they can replicate whole data fields and also required fields of databases [3], [4], [5].

3.2 Proposed System

The proposed system is basically a “SyncApp” which perform synchronization between Centralized Database (CDB) and Learning Management System (LMS). The main goal of our project is to develop an application having ability to view the unsynchronized data between LMS and CDB. It can also be able to synchronize the unsynchronized data or required fields of the database. As a result, the manual efficiency of the user and time consumption of synchronization will be reduced. The “SyncApp” will work by using a database utility known as ETL which makes the movement of data between databases without loss or changing the format of data [6]. Our system basically gives ease to the database administrator to synchronize the databases as whole or individual fields. Moreover, it removes the effort of database user from manual replication of desired fields when database become too large, which is a time-consuming task. To synchronize the databases according to specific entities is difficult now a day, therefore we will develop an application which will help to synchronize the required fields from one database to other. We can achieve our goal by using “Synchronization of Learning Management System and Centralized Database”. Therefore, with the help of this application we will be able to modify database from CDB to LMS and that will help LMS users to get necessary information about the management system via emails [9].

3.3 Requirement Specifications

3.3.1 Functional Requirements

The functional requirements of the system are given below:
- Check of unsynchronized data

Our system will able to check the unsynchronized data between LMS and CDB and display that data to the database administrator and waits for the administrator command whether that data should be synchronized or not. This requirement gives the system an extra check which improves the performance.

- Perform Synchronization perfectly

Our system will take the command of administrator to move the data from CDB to LMS and performs a smooth, clean and fast synchronization which reduces the time and manual effort of the user.

3.3.2 Non-Functional Requirements

The non-functional requirements of the system are given below:
- Design

Our system has a very user-friendly interface which gives ease to the user to perform his or her task and to use the system properly.
- Security

Our system moves the data from CDB to LMS without any leak or loss which makes the system reliable and secure.
- Speed

Our system has very effective speed of checking the unsynchronized data and perform the synchronization which reduces the time consumed in the old systems.
- Accuracy

Our system also keeps the datatypes and its variables as same as they are in source database which means the synchronization of data with complete accuracy.

3.3.3 Use Case Scenario

The use case scenario of the system are given below;

- **Use case of Administrator**

As the system contain an administrator with having complete access over the whole system including the management of centralized database, LMS Database management and administrator also have complete rights over the synchronization application which synchronizes the database from CDB to LMS. In CDB management, admin can perform all type of modifications in the database like adding data or tables into the database, removing the data or tables. Similarly, he or she can perform all these tasks on LMS database further more administrator can also add or remove LMS users and administrator also have complete access over the "SAC" which perform synchronization between databases. As shown in the given below figure 3.1 and details are given in table 3.1 [8].

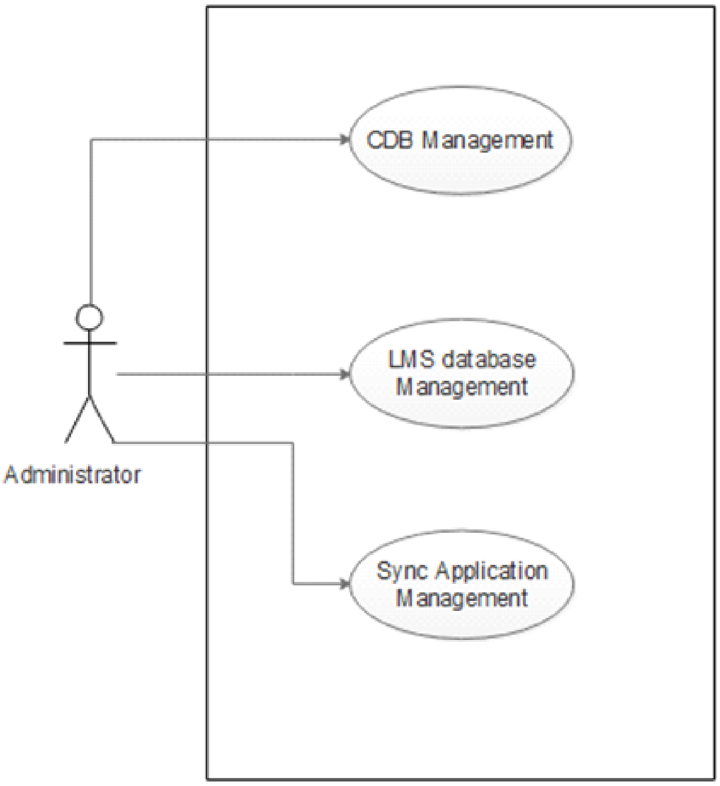


Figure 3.1: Use case Diagram of Administrator

Table 3.1: Interaction of Admin with the system

Use case name	Interaction of Admin with the system
1. Brief Description	1. List of functions which an admin can perform in this system
2. Active User	2. Administrator
3. Pre-conditions	3. Admin should have proper login account in CDB, LMS and SyncApp
4. Post-conditions	4. Admin have complete access over these functions of the system

- **Use Case of Instructor**

Instructor is also an important user in our system. Instructor is only able to work on LMS platform on which he or she can build courses and their contents etc. for the students. Instructor should have a proper account on LMS so that he or she can be able to post assignment and quizzes for students. Instructor can also perform grading management of all these assessments. Instructor can modify his or her personal information in LMS. Instructor has very limited rights as compare to the admin. In the below diagram instructor, can only perform the mention tasks. Instructor cannot able to modify the LMS database because this type of access is only for admin. As shown in the given below figure 3.2 and details are given in table 3.2 .

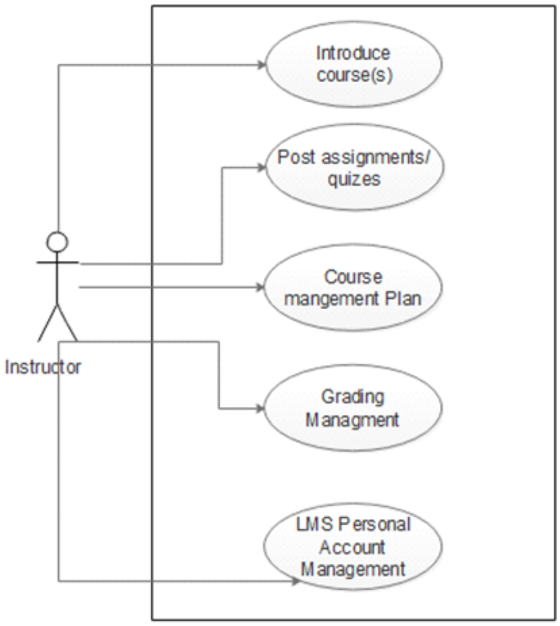


Figure 3.2: Use case Diagram of Instructor

Table 3.2: Interaction of Instructor with the system

Use case name	Interaction of instructor with the system
1. Brief Description	1. List of functions which an instructor can perform in the LMS
2. Active User	2. Instructor
3. Pre-conditions	3. Instructor should have proper login account in LMS
4. Post-conditions	4. Instructor can able to perform tasks on the system

- **Use Case of Student**

Student is an important user of our system. Student is only able to work on LMS platform on which he or she can perform very limited tasks like downloading course material or their contents, viewing quizzes uploaded by their instructors, uploading the assignments and viewing the grades given by the instructors. Student should have a proper account on LMS so that he or she can be able to use the LMS. Student have very limited access over the LMS even less than the instructor. This diagram shows the basic functions or processes that a student can perform on LMS. As shown in the given below figure 3.3 and details are given in table 3.3 [8].

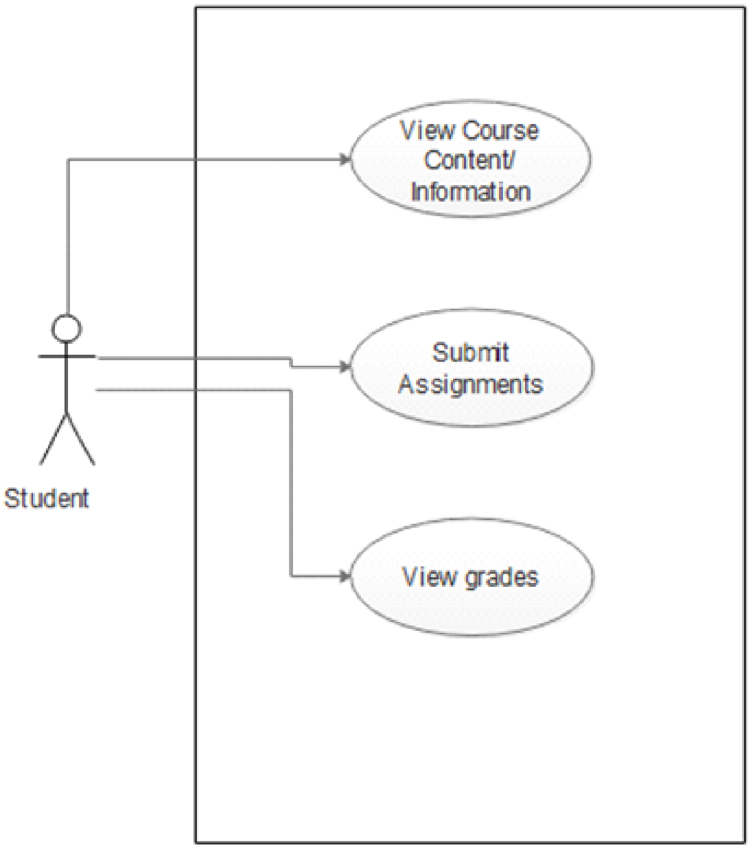


Figure 3.3: Interaction of student with the system

Table 3.3: Interaction of student with the system

Use case name	Interaction of student with the system
1. Brief Description	1. List of functions which a student can perform in the LMS
2. Active User	2. Student
3. Pre-conditions	3. Student should have proper login account in LMS as student
4. Post-conditions	4. Student can able to perform tasks on the LMS

Chapter 4

Design

4.1 System Architecture

This diagram will show the general architecture of the system. It will show us how the system will function.

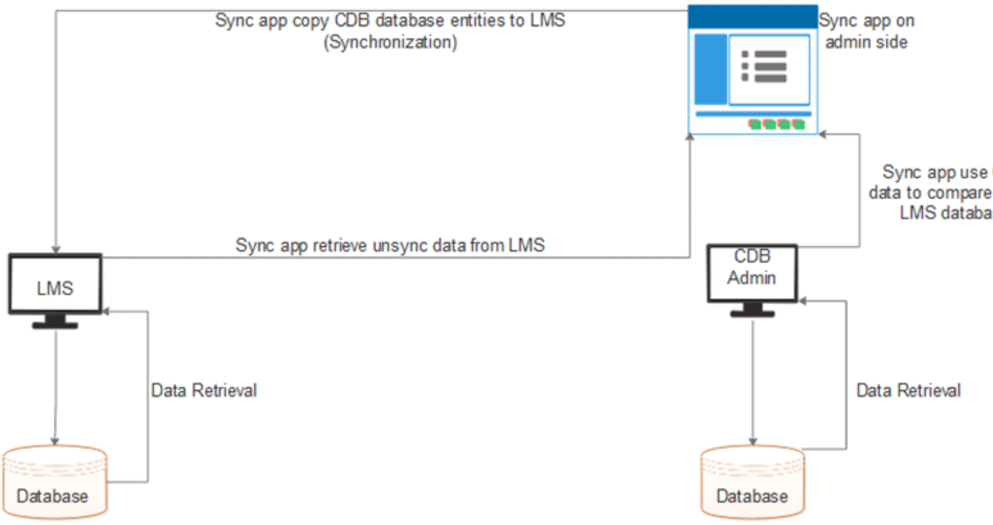

Sync app copy CDB database entities to LMS (Synchronization)
Sync app on admin side
Sync app use CDB data to compare it with LMS database
Sync app retrieve unsync data from LMS
LMS
CDB Admin
Data Retrieval
Data Retrieval
Database
Database

Figure 4.1: System Architecture Diagram

System architecture explains the basic idea of system which contain an application which perform data synchronization from CDB to LMS databases. The diagram shows that "SyncApp" is used by administrator and first of all "SyncApp" will check the unsynchronized data in both databases and display it on the admin screen as shown in figure 4.1. After admin's approval, this application will synchronize that data from CDB to LMS [10].

4.2 Sequence Diagram

4.2.1 Administrator

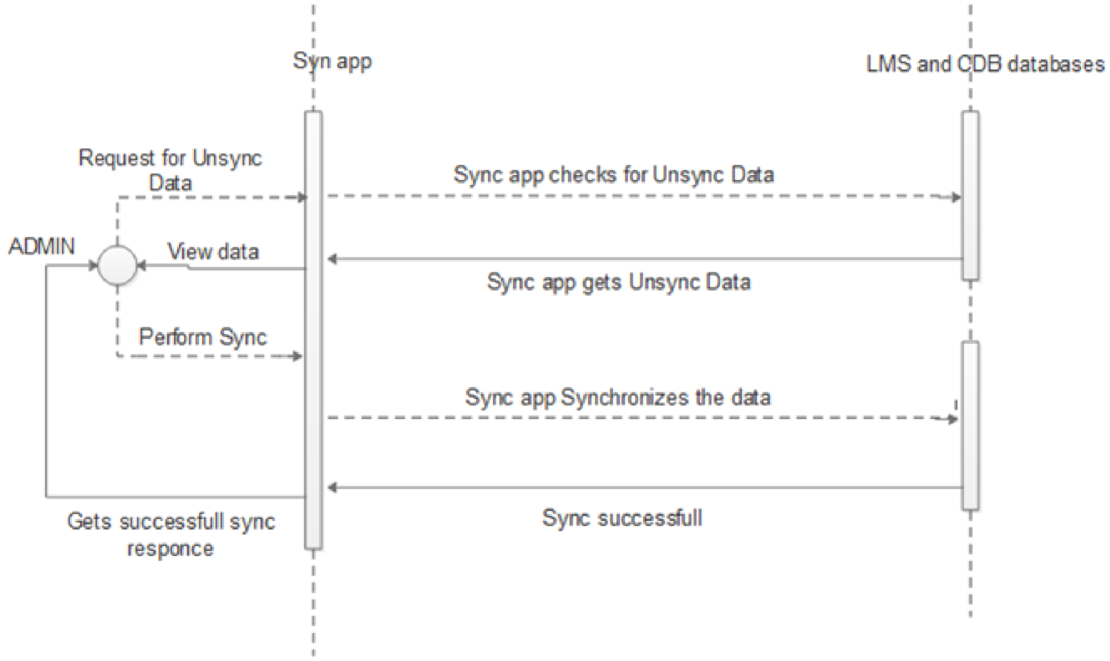

Syn app
LMS and CDB databases
Request for Unsync Data
Sync app checks for Unsync Data
ADMIN
View data
Sync app gets Unsync Data
Perform Sync
Sync app Synchronizes the data
Gets successfull sync responce
Sync successfull

Figure 4.2: Sequence Diagram of Administrator

In that diagram, the administrator side in which admin request the “SyncApp” for displaying unsynchronized data in LMS and CDB as shown in figure 4.2. Then “SyncApp” take the request and retrieve that data, after that admin can view the unsynchronized data and command the application to synchronize the databases if needed. Then synchronize application perform the replication and give a successful response to administrator [11].

4.2.2 Instructor

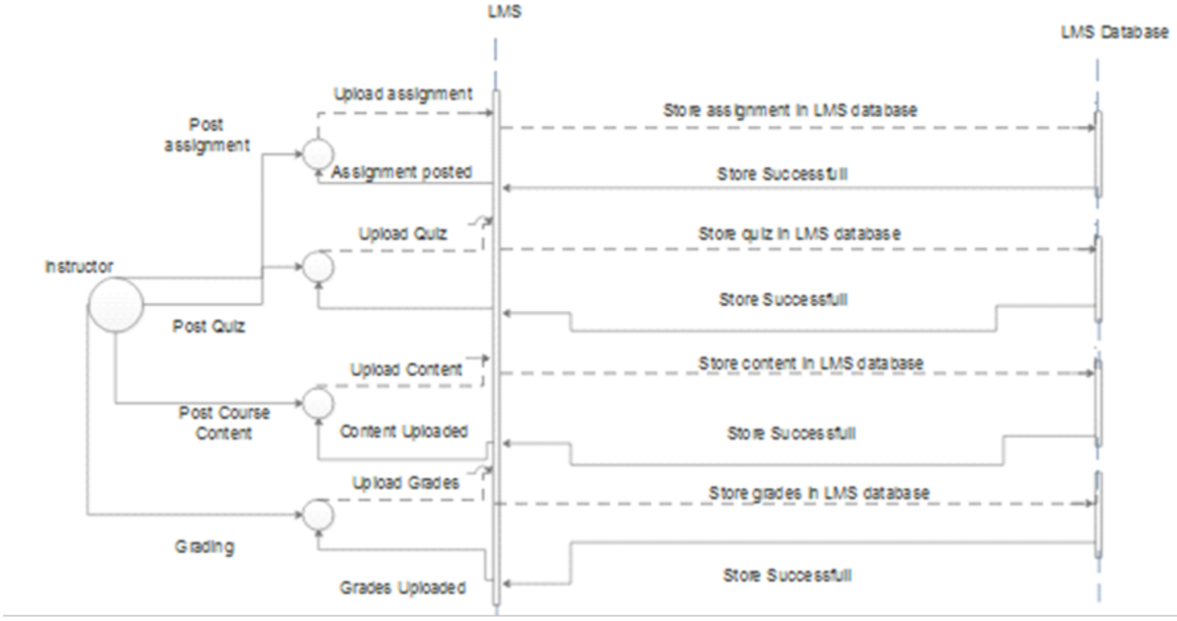


Figure 4.3: Sequence Diagram of Instructor

In that diagram the Instructor interacting with the system in which Instructor can perform several tasks like assignment posting, uploading Quizzes, uploading the course material or content and management of grades of students as shown in figure 4.3. All these tasks can be performing on LMS and LMS will store the information and data in its database [14].

4.2.3 Student

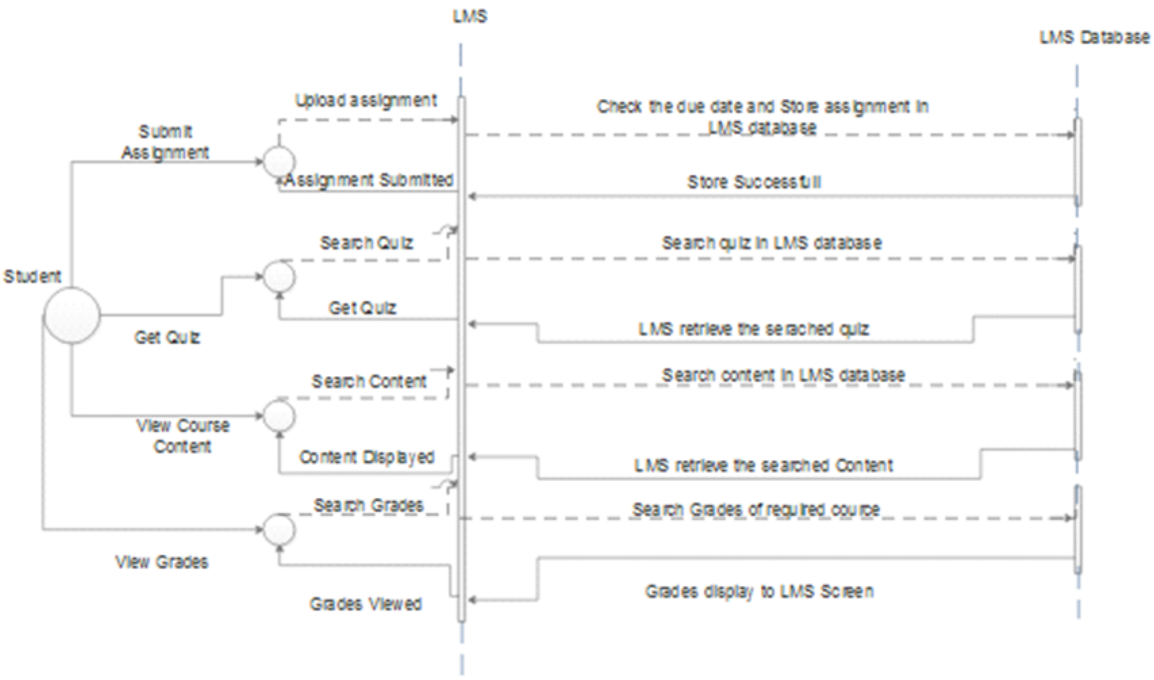

LMS
LMS Database
Upload assignment
Check the due date and Store assignment in LMS database
Submit Assignment
Assignment Submitted
Store Successfull
Search Quiz
Search quiz in LMS database
Student
Get Quiz
Get Quiz
LMS retrieve the serached quiz
Search Content
Search content in LMS database
View Course Content
Content Displayed
LMS retrieve the searched Content
Search Grades
Search Grades of required course
View Grades
Grades display to LMS Screen
Grades Viewed

Figure 4.4: Sequence Diagram of Student

In that diagram the student interacting with the system in which student have very limited access and can only perform few tasks like assignment uploading, searching Quizzes, downloading the course material or content and view grades they get from their instructor as shown in figure 4.4. These tasks can be performing on LMS and LMS will store the information and data in its database [12].

4.3 Activity Diagram

4.3.1 Administrator

In that diagram the activity perform by administrator on the system. Activity starts when administrator give the login details to the system and if the system verifies the login then administrator enters the administrator panel in which he or she can access all the system components like CDB, LMS and “SyncApp” as shown in figure 4.5. In CDB and LMS administrator can view or modify the database while in “SyncApp” he or she can view the unsynchronized data between the CDB and LMS databases and perform synchronization [13].

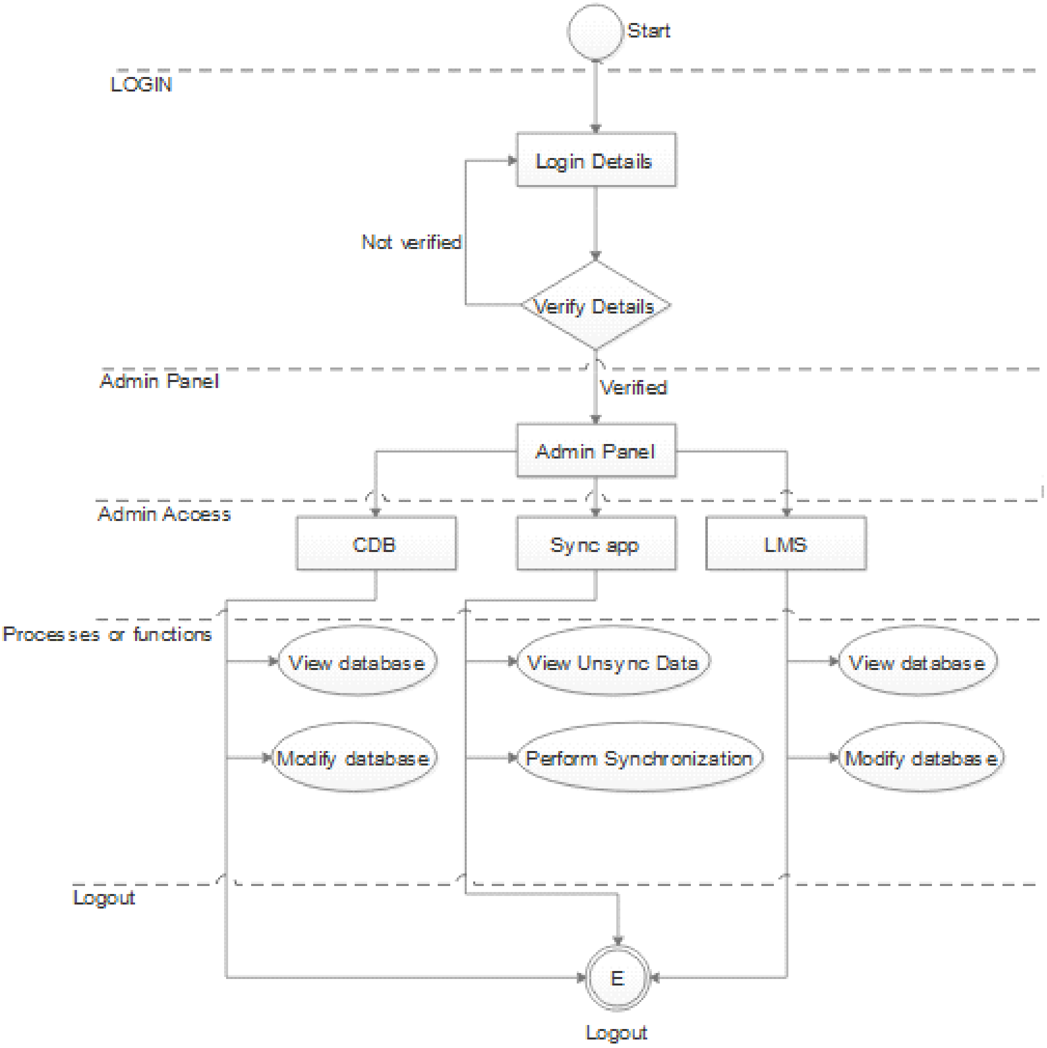


Figure 4.5: Activity Diagram of Administrator

4.3.2 Instructor

In that diagram the activity perform by instructor on the LMS. Activity starts when instructor gives the login details to the system and if the system veries the login then he or she enters the LMS panel in which instructor can perform several tasks like assignment posting, uploading Quizzes, uploading the course material or content and management of grades of students as shown in figure 4.6. After performing the required task, instructor can logout which complete the activity perform by instructor [13].

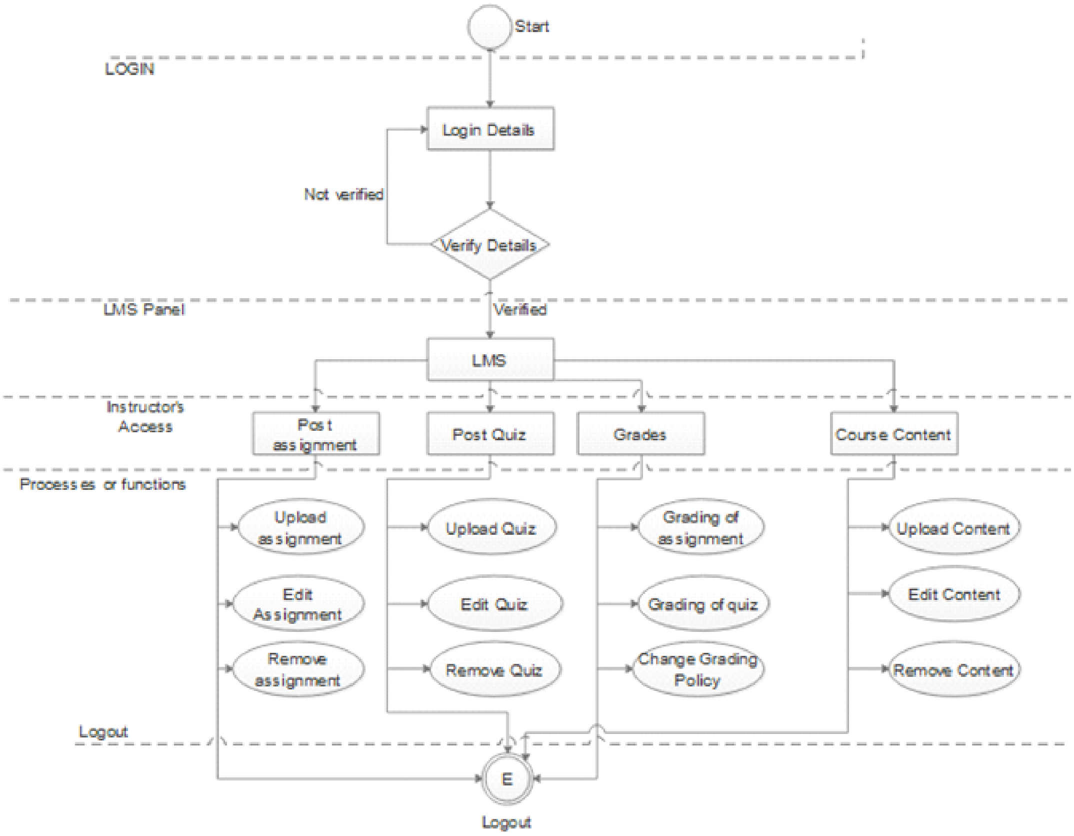


Figure 4.6: Activity Diagram of Instructor

4.3.3 Student

In that diagram the activity perform by student on the LMS. Activity starts when student gives the login details to the system and if the system veries the login then he or she enters into the LMS panel in which student can only perform few tasks like assignment uploading, searching Quizzes, downloading the course material or content and view grades they get from their instructor as shown in figure 4.7. After performing the required task, student can logout which complete the activity.

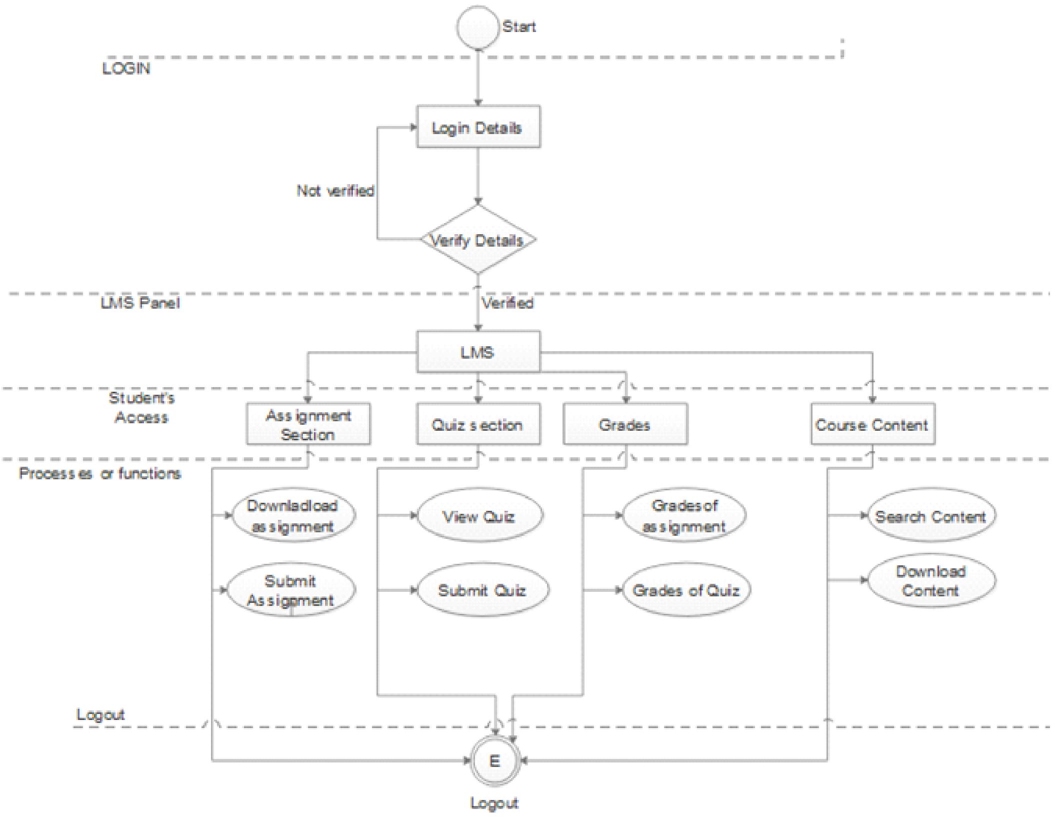


Figure 4.7: Activity Diagram of Student

4.4 Process Model

We are using agile method in our project. First, we analyze the data which will be used in the project. Then we gather requirements and modeling the requirements. After that we will perform following operations:
a) Read database fields
b) Create database fields

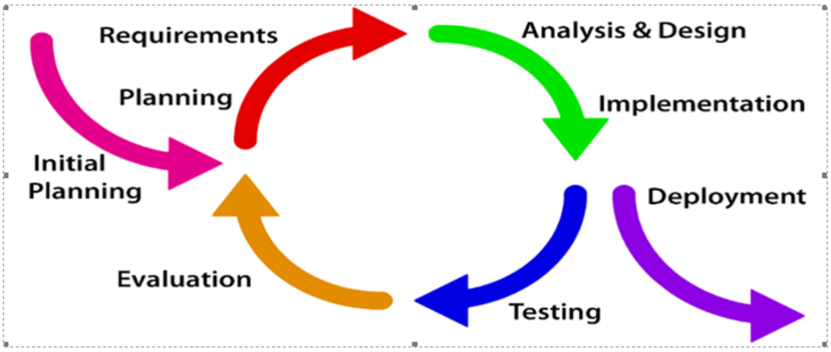


Figure 4.8: Process Model

The next step is to design the interface of application (SyncApp), which is user friendly and perform operations on click buttons. Then we start implementation of project which synchronize the LMS and CDB. When we perform data modification or synchronization from the SQL server in CDB by preforming different operation on application "SyncApp". We also cover the testing part and after checking all the functionalities that they are working perfectly as we want then we launch it as the process model is described in figure 4.8.

4.5 Flow Chart

The flow chart explains the architecture of the whole system with the success scenario in which all the users of the system are shown with their access functions and processes individually as shown in figure 4.9. The figure 4.9 explains all the modules which are used by the users of the system according to their rank, as the admin has complete access over all the system (CDB, LMS, SyncApp) while the other users like instructor and student can use only one part of the system (LMS). After that the lower levels shows the functions that can be used by the specific user like admin can modify databases, check for unsynchronized data or perform synchronization, instructor can upload the assignment, quizzes, course content and mange grades while the student just able to view the grades, download the assignments or quizzes and course material [14].

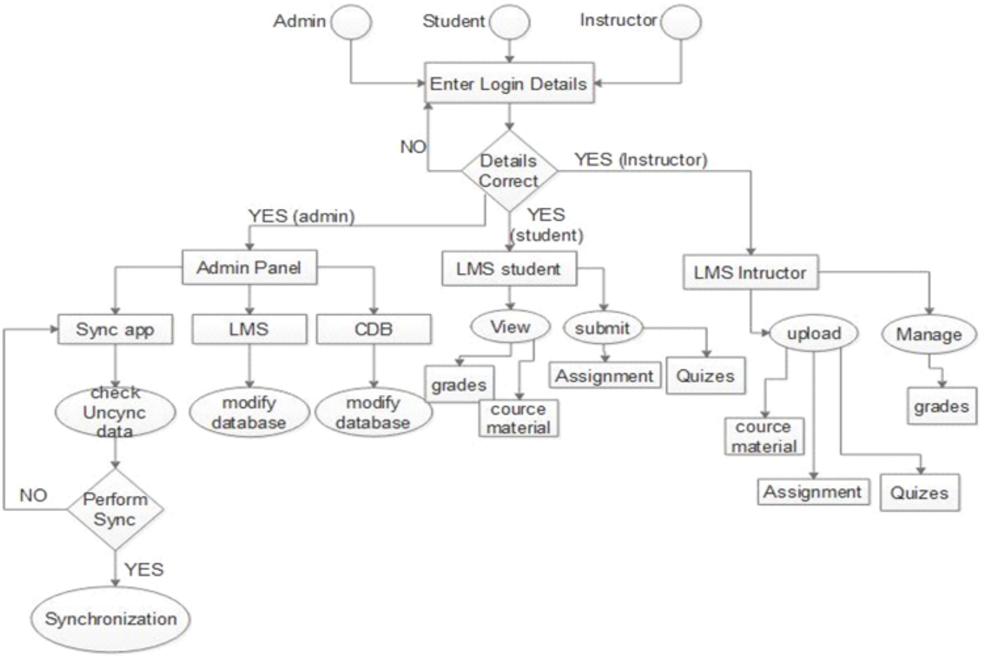


Figure 4.9: Flow Chart

Chapter 5

System Implementation

This chapter contains all the information about the logic's, tools and software and implementation details of the Sync App.

5.1 Strategy

There are various modules that are developed and tested independently. The basic goal of project is achieved by performing system testing after integrating all the developed modules to form whole system.

5.2 Tools and technologies

Following are the several software tools which are used over the complete software development life cycle.

a) Visual Studio 2013
b) SQL Server 2012

5.2.1 Visual studio 2013

A very powerful IDE (Integrated Development Environment) developed by Microsoft. This tool is used to develop windows applications as well as web applications. It provides different development platforms such as Windows Forms and many more. It supports many programming languages but Visual C sharp, ASP.Net (MVC5.0) is used for the development of Sync App and LMS respectively [14].

5.2.2 SQL Server 2012

A very popular server which contain both server and database management developed by Microsoft. The main advantage of SQL server is that it is much compatible with visual C sharp and ASP.Net. It is used to store the administrator data and the data of all the services of Sync App, LMS and CDB. It gives us the liberty to manage the databases and their respective data with complete consistency [15].

5.3 Namespaces, classes and commands

There are basic two development units of the sync app. Their namespaces, classes and functions are described below:
a) LMS
b) SyncApp

5.4 LMS

5.4.1 Namespaces

There is only one namespace which contains all the classes which are used to develop LMS; the namespace is “LMS.Controllers”.

5.4.2 Classes

The “LMS.Controllers” includes the following classes:

- AdminController Class
- HomeController Class
- StudentController Class
- TeacherController Class

5.4.3 AdminController Class

The Class contains all the methods which are used to perform all admin’s tasks. Class contain following methods:

• AdminLogin ()
The method performs admin’s login task at LMS, which gets the username and password. After verifying the given information this method allows or denies the admin login.
• AdminDashboard ()
The method shows the admin’s main dashboard where admin can perform his or her tasks easily.
• TeacherDashboard ()
The method shows the teacher management functions from which admin can perform his or her required easily.
• StudentDashboard ()
The method shows the all the student management functions from which admin can perform his or her required easily.
• CourseDashboard ()
The method shows the all the course management functions from which admin can perform his or her required easily.

- AddTeacher ()

The method is used to add teachers in LMS by admin.

- AddStudent ()

The method is used to add students in LMS by admin.

- AddCourse ()

The method is used to add courses in LMS by admin.

- DeleteTeacher ()

The method is used to delete teachers from LMS by admin.

- DeleteStudent ()

The method is used to delete students from LMS by admin.

- DeleteCourse ()

The method is used to delete courses from LMS by admin.

- UpdateTeacher ()

The method is used to update students from LMS by admin.

- UpdateStudent ()

The method is used to update students from LMS by admin.

- UpdateCourse ()

The method is used to update courses from LMS by admin.

- AddWork ()

The method is used to assign courses to teachers by admin.

- ViewWork ()

The method is used to view courses which are assigned to teachers by admin.

- DeleteWork ()

The method is used to delete assigned courses to teachers by admin.

- ShowStudent ()

The method is used to show all the students in the LMS.

- ShowTeacher ()

The method is used to show all the teachers in the LMS.

- ShowCourse ()

The method is used to show all the courses in the LMS.

- SendEmail ()

The method is used to send an email which contains password to respective student or teacher to perform a successful login or in case of forgetting passwords. This method is using SMTP protocol to send email from this system.

- RandomString ()

The method is used to generate a random string which is then send to LMS users as their passwords.

- Signout ()

The method is used to delete the session of the admin in LMS.

5.4.4 HomeController Class

The class contains all the methods of LMS landing page which are described below:

- Login ()

The method is used to get username and password, after verifying the given information this method allows the user to re-direct to their respective dashboards.

• ForgotPassword ()
The method is used to help the user to get a new password in case if the user forgets his or her password. It sends the new password to the user's email address through email.
• LMSLandingPage ()
The method is used to redirect the user to LMS landing page which contains the basic information of the LMS.

5.4.5 TeacherController Class

The Class contains all the methods which are used to perform all teacher's tasks. Class contain following methods:
• TeacherCourses ()
The method displays all the assigned courses to the teacher.
• AssignmentDashboard ()
The method shows all the assignments posted by the teacher respective to their courses.
• AddAssignment ()
The method is used to add assignment to the assignment portal for the specific course.
• DeleteAssignment ()
The method is used to delete the assignment from the assignment portal from any course.
• ViewStudentAssignments ()
The method displays all the assignments posted by the students.
• QuizDashboard ()
The method shows all the Quizzes announced by the teacher respective to their courses.
• AddQuiz ()
The method allows the teacher to announce a quiz in a specific course in form of a notification.
• DeleteQuiz ()
The method allows the teacher to delete a quiz in any course.
• CourseMatrialDashboard ()
The method shows all the Course material uploaded by the teacher respective to their courses.
• AddCourseMatrial ()
The method allows the teacher to upload the course lectures or other helping materials respective to their courses.
• DeleteCourseMatrial ()
The method allows the teacher to delete uploaded course materials respective to their courses.
• GradeDashboard ()
The method displays Grades Management portal from which teacher can perform all the grade related tasks.
• AddStudentGrade ()
The method allows the teacher to add grades to students.

• DeleteGrade ()
The method is used by the teacher to delete the given grades to students.
• UpdateGrades ()
The method is used by the teacher to modify any student's grades.
• Signout ()
The method is used to delete session of the teacher in LMS.

5.4.6 StudentController class ()

The "LMS.Controllers" includes the following classes;
• AssignedCourse ()
The method displays all the assigned courses to student by admin.
• DownloadCourseMaterial ()
The method allows student to download the course material uploaded by the teacher.
• DownloadAssignment ()
The method allows the student to download assignment uploaded by the teacher.
• ViewQuiz ()
The method allows the student to view the quizzes notifications.
• UploadCourseAssignment ()
The method allows the student to upload the solved assignment to respective course and teacher.
• ViewUploadAssignment ()
The method allows the student to view all his or her uploaded assignments.
• DeleteUploadStudentAssignment ()
The method allows the student to delete any of his or her uploaded assignments.
• View Grades ()
The method allows the student to view all the grades given by the teachers in assignments, mids, finals or in quizzes.
• SignOutStudent ()
The method is used to delete session of the student in LMS.

5.5 SyncApp

5.5.1 Namespace

A namespace that contains all the classes used to develop, the namespace is "SyncApp".

5.5.2 Classes

The namespace is "SyncApp" includes the following classes;

- StartUp class
- LoginControls class
- CDB class

- CDBDatabase Class
- CDBModifyTable class
- LMS class
- LMSDatabase Class
- LMSModifyTable class
- HistoryOfPerformedSyncs class
- PerformSync class
- ShowAllRecords class
- SignUp class
- UnSyncData class

5.5.3 Start Up class

The class contain methods which starts displaying ”SyncApp” logo at the start of the application.
• Timer1Tick ()
The method is a timer in which only logo will visible for 5 sec.
• Timer2Tick ()
The method is also a timer which runs another logo for 10 sec.

5.5.4 Login Controls class

The Login Controls class includes the following methods;
• GetPassword ()
The method compares passwords given by the user and from the database.
• SetLogin ()
After the correct given information, this method allows user to redirect to home page.
• ForgetPassword ()
The method is used to help the user to get a new password in case if the user forgets his or her password. It sends new password to the user’s email address through email.

5.5.5 CDB class

The CDB class includes the following method;
• SelectTable ()
The method allows user to select table from all the given tables in CDB.

5.5.6 CDB Database Class

The CDB Database class includes the following methods;
• GetallrecordsOfCdb ()
The method gets all the record of the selected table of CDB.

• Gettables ()
The method retrieves all the tables from CDB.

5.5.7 CDB Modify Table class

The CDB Modify Table class includes the following method;
• Modify ()
The method allows the user to modify the record in any table of CDB.

5.5.8 History Of Performed Syncs class

The History of Performed Syncs class includes the following method;
• ShowDetail ()
The method displays all the information of performed syncs.

5.5.9 Perform Sync class

The perform sync class includes the following methods:
• CompareTables()
The method picks every table from CDB and LMS and put all the data in the arrays. Then data of arrays is moved to lists.
• CheckbothLists ()
The method compare both lists and brings out the different data.
• DeleteRecordFromTable ()
The method delete records from the LMS which are not present in CDB.
• SelectTable()
The method picks the unsync data from CDB and put that into LMS

5.5.10 Show All Records class

The class show all the tables and their record of CDB and LMS separately.

5.5.11 Sign Up class

The class get information of a new user and register it.
• SendEmail ()
The method sends password to the new user through email.

5.6 Methodology

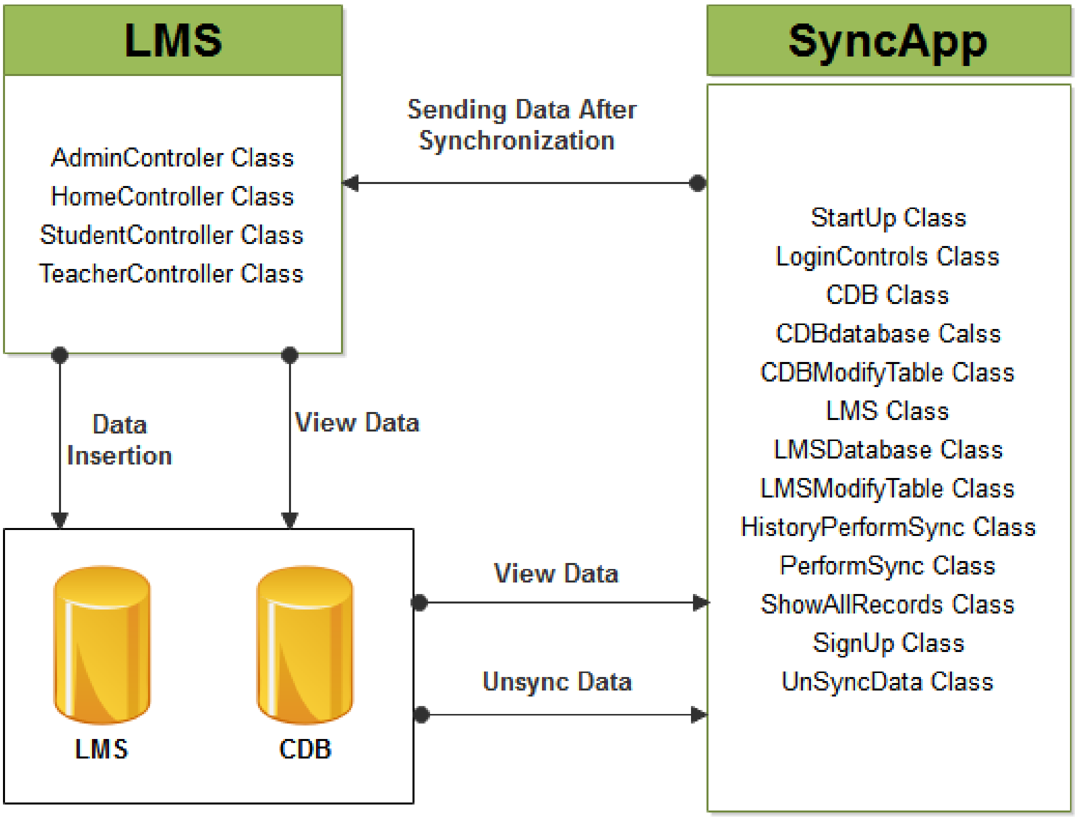


Figure 5.1: Methodology

The figure 5.1 shows that the both databases (LMS and CDB) can view data and check unsync data with the help of SyncApp. The SyncApp plays the middle role for managing data between CDB and LMS. Unsync data is synchronized between both the databases which can be viewed in LMS and can also be modified.

Chapter 6

System Testing and Evaluation

6.1 Objective of Testing

The main objective of “SyncApp” is to evaluate its performance against the existing systems and user’s requirement. If the system give expected output on given input and handling all exceptions, then it is error free. Testing is the way to ensure that the system is working better than the existing ones and per the user’s requirement.

6.2 Test Cases

6.2.1 Test Case 1

The table 6.1 describes the hosting of LMS site on server so that the site becomes online.

Table 6.1: Interaction of Instructor with the system

Test case id	01
1.Description	1. The LMS site is to be hosted on server
2. Initial Requirements	2. Server status should be active
3. Actions	3. The LMS site is hosted on server
4. Expected Result	4. The LMS site should be online
5. Actual Result	5. The LMS site is online
6. Status	6. Success

In test case 1, black box testing is performed by hosting the LMS site on server to know behavior of site whether it goes online or remain offline.

6.2.2 Test Case 2

The table 6.2 describes the successful login of administrator at LMS admin panel. Admin panel can be access by localhost://2101/admin/adminlogin

Table 6.2: Interaction of Instructor with the system

Test case id	02
1.Description	1. Admin login
2. Initial Requirements	2. Admin account should be created in database
3. Actions	3. Username and password is entered and pressed login
4. Expected Result	4. Admin should be login successfully in admin panel
5. Actual Result	5. Admin is login successfully in admin panel and ready to perform his/her tasks
6. Status	6. Success

In test case 2, unit testing is performed by LMS site and it will compare the data with database that the information enter by an admin is correct or not if its is correct then it will take the user successfully on home page of LMS.

6.2.3 Test Case 3

The table 6.3 describes the admin task which is to add a teacher from admin panel by giving his/her information in Manage Teachers tab.

Table 6.3: Admin Modify Teachers Data

Test case id	03
1.Description	1. Admin modify teacher's data
2. Initial Requirements	2. Admin should be successfully login
3. Actions	3. Press the Manage Teachers tab and add teacher information and press submit button
4. Expected Result	4. Teacher should be added successfully
5. Actual Result	5. Teacher added successfully
6. Status	6. Success

In test case 3, unit testing is performed on modify teacher's data and in that case the admin can add, manage the teacher information.

6.2.4 Test Case 4

The table 6.4 describes the admin task which is to add a student from admin panel by giving his/her information in manage students tab.

Table 6.4: Admin modify student data

Test case id	04
1.Description	1. Admin modify student data
2. Initial Requirements	2. Admin should be successfully login
3. Actions	3. Press the Manage Students tab and add student information and press submit button
4. Expected Result	4. Student should be added successfully
5. Actual Result	5. Student added successfully
6. Status	6. Success

In test case 4, unit testing is performed on modify student's data and in that case the admin can create, add, manage the student's information manually.

6.2.5 Test Case 5

The table 6.5 describes the admin task which is to add a Course from admin panel by giving its name and description in Manage Courses tab.

Table 6.5: Admin modify Course data

Test case id	05
1.Description	1. Admin modify Course data
2. Initial Requirements	2. Admin should be successfully login
3. Actions	3. Press the Manage Course tab and add Course information and press submit button
4. Expected Result	4. Course should be added successfully
5. Actual Result	5. Course added successfully
6. Status	6. Success

In test case 5, unit testing is performed on modify course data and in that case the admin can create, add, manage the course information.

6.2.6 Test Case 6

The table 6.6 describes the successful login of Teacher at LMS login panel. Teacher panel can be access by localhost://2101/

Table 6.6: Teacher Login

Test case id	06
1.Description	1. Teacher Login
2. Initial Requirements	2. Teacher account should be created in database
3. Actions	3. Username and password is entered and pressed login
4. Expected Result	4. Teacher should be login successfully in teacher panel
5. Actual Result	5. Teacher is login successfully in admin panel and ready to perform his/her tasks
6. Status	6. Success

In test case 6, unit testing is performed on teacher login data and in that case the teacher will enter his/her name and password at LMS Login page and after entering the correct information he will proceed to his/her dedicated home page.

6.2.7 Test Case 7

The table 6.7 describes the teacher task task which is to upload assignment regarding course at upload assignment page.

Table 6.7: Teacher Upload Assignment

Test case id	07
1.Description	1. Teacher Upload Assignment
2. Initial Requirements	2. Teacher should be successfully login
3. Actions	3. Upload assignment ragarding subject on upload assignment page
4. Expected Result	4. Teacher is login successfully in admin panel and ready to perform his/her tasks
5. Actual Result	5. Assignment uploaded successfully
6. Status	6. Success

In test case 7, unit testing is performed on upload assignment page and the assignment should be uploaded at that page by teacher successfully.

6.2.8 Test Case 8

The table 6.8 describes the teacher task which is to notify a student for a quiz at quizzes page.

Table 6.8: Teacher Notify Quizzes

Test case id	08
1.Description	1. Teacher Notify Quizzes
2. Initial Requirements	2. Teacher should be successfully login
3. Actions	3. Notify quiz update regarding subject on quiz page
4. Expected Result	4. Notification should be successfully generated
5. Actual Result	5. Notification successfully generated
6. Status	6. Success

In test case 8, unit testing is performed on quizzes page and the notification should be generated at that page by teacher successfully.

6.2.9 Test Case 9

The table 6.8 describes the teacher task which is to notify a student for a quiz at quizzes page.

Table 6.9: Teacher Upload Grades

Test case id	09
1.Description	1. Teacher Upload Grades
2. Initial Requirements	2. Teacher should be successfully login
3. Actions	3. Notify regarding subject grades on grades page
4. Expected Result	4. Grades should be successfully uploaded
5. Actual Result	5. Grades successfully uploaded
6. Status	6. Success

In test case 9, unit testing is performed on grades page and the grades should be uploaded at that page by teacher successfully.

6.2.10 Test Case 10

The table 6.10 describes the successful login of Student at LMS login panel. Student panel can be access by localhost://2101/

Table 6.10: Student login

Test case id	10
1.Description	1. Student login
2. Initial Requirements	2. Student account should be created in database
3. Actions	3. Username and password is entered and pressed login
4. Expected Result	4. Student should be login successfully in student panel
5. Actual Result	5. Student is login successfully in admin panel and ready to perform his/her tasks
6. Status	6. Success

In test case 10, unit testing is performed on student login data and in that case the student will enter his/her name and password at LMS Login page and after entering the correct information he will proceed to his/her dedicated home page.

6.2.11 Test Case 11

The table 6.11 describes the teacher task which is to upload assignment regarding course at upload assignment page.

Table 6.11: Student Download Assignment

Test case id	11
1.Description	1. Student Download Assignment
2. Initial Requirements	2. Student should be successfully login
3. Actions	3. Student download assignment regarding subject on assignment page
4. Expected Result	4. Assignment should be successfully downloaded
5. Actual Result	5. Assignment downloaded successfully
6. Status	6. Success

In test case 11, unit testing is performed on download assignment page and the assignment should be downloaded by a student successfully.

6.2.12 Test Case 12

The table 6.12 describes the teacher task which is to upload assignment regarding course at upload assignment page.

Table 6.12: Student get notification of Quizzes

Test case id	12
1.Description	1. Student get notification of Quizzes
2. Initial Requirements	2. Student should be successfully login
3. Actions	3. Student get notification about quizzes regarding subject on quizzes page
4. Expected Result	4. Student should get quizzes notification successfully
5. Actual Result	5. Student get quizzes notification successfully
6. Status	6. Success

In test case 12, unit testing is performed on quiz notification page and the quizzes should be notify to a student successfully.

6.2.13 Test Case 13

The table 6.13 describes the teacher task task which is to upload assignment regarding course at upload assignment page.

Table 6.13: Student view his/her grades

Test case id	13
1.Description	1. Student view his/her grades
2. Initial Requirements	2. Student should be successfully login
3. Actions	3. Student can view his/her grades on grades page
4. Expected Result	4. Student should view his/her grades on grades page successfully
5. Actual Result	5. Student view his/her grades successfully
6. Status	6. Success

In test case 13, unit testing is performed on grades page and the grades should be successfully view by a student.

6.2.14 Test Case 14

The table 6.14 describes the installation process of "SyncApp" on windows operating system.

Table 6.14: The Installation of SyncApp

Test case id	14
1.Description	1. The Installation of SyncApp
2. Initial Requirements	2. Windows Operating System
3. Actions	3. Install SyncApp on windows operating system
4. Expected Result	4. The SyncApp should be installed successfully on operating system
5. Actual Result	5. The SyncApp installed successfully
6. Status	6. Success

In test case 14, black box testing is performed to install the "SyncApp" on windows operating system successfully.

6.2.15 Test Case 15

The table 6.15 describes the successful login of administrator at SyncApp admin panel. Admin panel can be access by entering his information which are saved in database.

Table 6.15: Admin login at SyncApp

Test case id	15
1.Description	1. Admin login at SyncApp
2. Initial Requirements	2. Admin account should be created in database
3. Actions	3. Username and password is entered and pressed login
4. Expected Result	4. Admin should be login successfully in admin panel
5. Actual Result	5. Admin is login successfully in admin panel and ready to perform his/her tasks
6. Status	6. Success

In test case 6.15, unit testing is performed by SyncApp site and it will compare the data with database that the information enter by an admin is correct or not if its is correct then it will take the user successfully on home page of SyncApp home page.

6.2.16 Test Case 16

The table 6.16 describes the admin task in which admin can view database of CDB site where all records of students, teacher are saved.

Table 6.16: Admin View CDB database

Test case id	16
1.Description	1. Admin View CDB database
2. Initial Requirements	2. Admin should be successfully login
3. Actions	3. Press the View Data to see the information in database
4. Expected Result	4. Data should be viewed successfully
5. Actual Result	5. Data viewed successfully
6. Status	6. Success

In test case 6.16, unit testing is performed on SyncApp site and in that testing the admin can view the database of CDB to check the data whether its is inserted correctly.

6.2.17 Test Case 17

The table 6.17 describes the admin task in which admin can modify database of CDB site where all records of students, teacher are saved.

Table 6.17: Admin modify CDB database

Test case id	17
1.Description	1. Admin modify CDB database
2. Initial Requirements	2. Admin should be successfully login
3. Actions	3. Press the modify Data button to see the information in database and modify it
4. Expected Result	4. Data should be modified successfully
5. Actual Result	5. Data modified successfully
6. Status	6. Success

In test case 6.17, unit testing is performed on modify CDB database and in that case the admin can modify the information at CDB site of student, teacher related material.

6.2.18 Test Case 18

The table 6.18 describes the admin task in which admin can check unsync data at CDB site where all records of students, teacher are saved respectively.

Table 6.18: Admin check unsync data

Test case id	18
1.Description	1. Admin check unsync data
2. Initial Requirements	2. Admin should be successfully login
3. Actions	3. Press the check unsync button to see the information that is an CDB site but not at LMS site
4. Expected Result	4. Data should be check unsync successfully
5. Actual Result	5. Data check unsync successfully
6. Status	6. Success

In test case 6.18, unit testing is performed on check unsync data at CDB site and in that case the admin can view all the data which is in CDB site but not at LMS site.

6.2.19 Test Case 19

The table 6.19 describes the admin task in which admin can check unsync data at CDB site where all records of students, teacher are saved respectively.

Table 6.19: Admin perform sync data

Test case id	19
1.Description	1. Admin perform sync data
2. Initial Requirements	2. Admin should be successfully login
3. Actions	3. Press the perform sync button to see the information that will have to be sync from CDB site to LMS site
4. Expected Result	4. Data should be sync successfully at LMS site
5. Actual Result	5. Data sync successfully at LMS site
6. Status	6. Success

In test case 6.19, unit testing is performed on perform sync operation on data that is at CDB site and after performing sync operation the data will be moved LMS site.

6.2.20 Test Case 20

The table 6.20 describes the admin task in which admin can view the history of data to check the sync operation preformed successfully on database field's.

Table 6.20: Admin view history of data

Test case id	20
1.Description	1. Admin view history of data
2. Initial Requirements	2. Admin should be successfully login
3. Actions	3. Press the history button to see the history of perform all sync operation
4. Expected Result	4. History should be viewed successfully
5. Actual Result	5. History viewed successfully
6. Status	6. Success

In test case 6.20, unit testing is performed to see the history of sync data after performing operation on unsycn data.

Chapter 7

Conclusions

7.1 Conclusion

The project aim was to developed such an application which will help to synchronize the desired tables of database of Centralized Database (CDB) with Learning Management System (LMS). There are applications which are used for this type of synchronization in real world, but they all have drawbacks due to which these applications are not efficient and they are not as flexible as our application to perform required field's synchronization. The development of this application will improve efficiency of sync which will enhance the services of LMS and reduce manual effort to perform modifications in the databases. The project will also serve another task which is sending emails to the LMS users so that, they will be up-to-date with all activities regarding LMS. The end result of this project will originate synchronized LMS and CDB with the help of our application which will assist the organizations to perform synchronization on specific fields of databases. Major requirement of the project is to make application much efficient than the existing applications as discussed in section 2.2. SyncApp is much more productive due to the following reasons:

- It can retrieve all the unsync tables from both databases (CDB and LMS).
- It can perform synchronization on user's required tables and it is the main objective of the project.
- It can keep detailed records of all performed synchronizations.
- It is fast, reliable and secure.

7.2 Future Enhancement

In the near future,many enhancements can be made in this project. LMS can be expanded with numerous new features including assignment time tagging,sections and department wise student management and a digital library etc. Sync app can be enhanced by performing synchronization on large databases,retrieving unsync tables from large databases etc.

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