CMPE 450

SOFTWARE ENGINEERING

OBJECT DESIGN DOCUMENT

Version 1.0

Project Name:	WFCAM Science Archive System Project
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Introduction

The purpose of this document is to summarize the design principle of WFCAM Science archive system in detail. The design document includes information about catalogue and table designs of databases, description of classes and their methods. The document also provides information for the database system, the environment and the properties. It is important to note that WFCAM Science archive system is still being developed, therefore this document is not the final object design document; it may vary during the development process.

1.1 OBJECT DESIGN TRADE-OFFS

The WFCAM science archive is designed to provide rapid and straightforward access to WFCAM data from UKIDSS and generalized open-time usage. During the WFCAM Science Archive object design process, to gain speed, a trade-off is made on the quality of recorded frames. On compression process, the resolutions of frames are reduced since the frame sizes, recorded by WFCAM, are big and hard to handle. With this trade-off, rapid access to data is obtained. Until WFCAM provides new frames, user would have data to work on it. We saved time and space while losing quality.

Secondly , another trade-off is made on interdependency classes to save time and minimize complexity. The number of methods is minimized in order to obtain a simple code. The WFCAM Science archive is a long term project, therefore the code must be clear to everyone. Our purpose is also to save time. No one would need to deal with a complex code to modify it. The code would be more understandable in this way.

Another trade-off is made on cost and system security. It is hard to have a science archive system working fast and properly without any cost. We used two different databases and made a support system not to loose any data. The security of the data, coming from Surveys and UKIDSS is an important issue. To prevent crash of our system, we need to be sure that we have enough space to work on.

1.2 INTERFACE DOCUMENTATION GUIDELINES

In WFCAM Science archive design three packages are used, which are UserInterface, WFCAMInterface and WFCAMClasses. UserInterface and WFCAMInterface work independent of each other but methods of WFCAMClasses are accessed and used by interfaces.

WFCAM science project's code is to be written clearly in a certain order to make it understandable to every programmer. The names of classes in packages start with capital letter. In case the name of the class includes more than a word, the first letter of each word is capitalized. For instance, UserInterface consist of two different words "User" and "Interface" and their first letters are capitalized.

The names of the class methods are given in same manner. Their first letters have to capital. The names of the parameter used in program are given according to the type of the parameter. An acronym is used preceding the name of the parameter. e.g. txtUserName.

1.3 DEFINITIONS, ACRONYMS, AND ABBREVIATIONS

In this object design document, there are several terms that are commonly used as followings :

WFCAM : a new camera for United Kingdom Telescope.

WSA : WFCAM Science Archive

UKIDSS: UKIRT Infrared Deep Sky Survey

UKIRT : The United Kingdom Infrared Telescope

WFAU : Wide Field Astronomy Unit

VISTA : Visible and Infrared Survey Telescope for Astronomy

SRD : Science Requirements document

ODD : object design document

UML : Unified Modeling Language

PR user: Product User

1.4 REFERENCES

The WFAU WSA development department

http://www.roe.ac.uk/ nch/wfcam

WFCAM- need for science archive

http://www.roe.ac.uk/atc/projects/wfcam/index.html

The VISTA science case

http://www.vista.ac.uk

2

PACKAGES

2.1 PACKAGE DIAGRAM

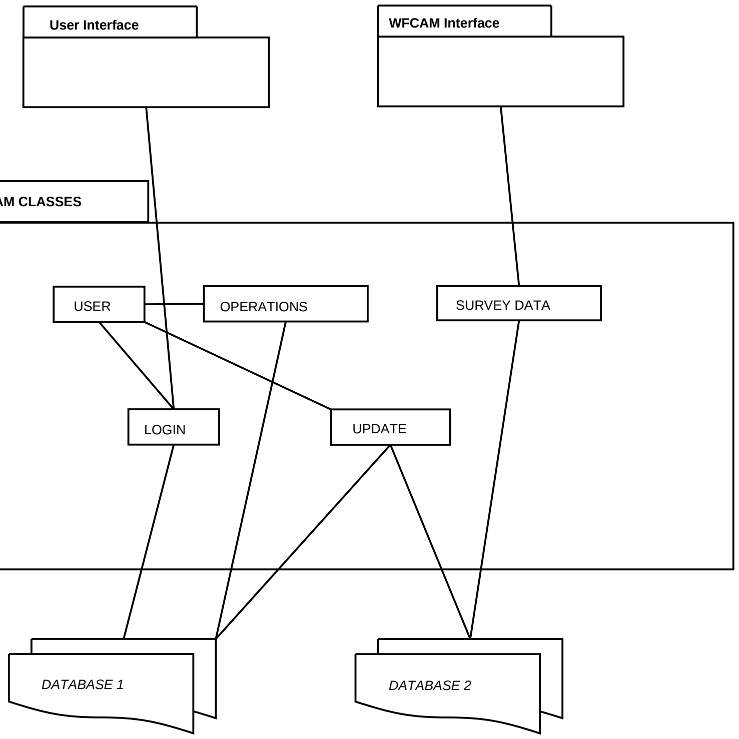

Figure 2.1: PACKAGE DIAGRAM of WFCAM SCIENCE ARCHIVE

2.2 PACKAGE DEFINITIONS

There are three different package designed for this Project. One package is especially designed for the interface of WFCAM Science Archieve named WFCAMInterface , another package is designed for the interface of the users named UserInterface and lastly there is a package called WFCAMClasses which is used for the internal structure.

2.2.1 USER Interface Package

The package named UserInterface is responsible for the handling the operations that are related with the users of WFCAM Science Archieve. The methods provided by this package are explained in the section 3.

2.2.2 WFCAM Interface Package

This package is responsible for the handling of the operations that are related with the WFCAM Science Archieve itself, not the users of the archieve.

2.2.3 WFCAM Classes Package

This package encapsulated the classes and the methods which are related with the execution of the system rather than the interface interactions. The name of these classes are as follows: User, Operations , Login, SurveyData and Update.

An object of the class Login is used when a user wants to login, then if the authentication is provided there is created an object of the class User. During his/her session while using the WFCAM Science Archieve, whenever the user wants to do operations on the data in the system, an instance of the class Operations is created. This class includes the following operations: Cross_Calibration, ArithmeticOperations, GetQuery and Insert. These operations are done on Database1. The class SurveyData is instantiated when the system itself will do an operation on the database, such as GetSurveyData, Insert and Merge. There is no user intervention upon these operations. An object of the class Update is used when the user wants to do an updating operation on the data in the system. This class has access to both of the databases according to the type of the action it will take. The method called

BackUp in this class is responsible for the periodical backup process of the databases.

2.3 CLASS DIAGRAM

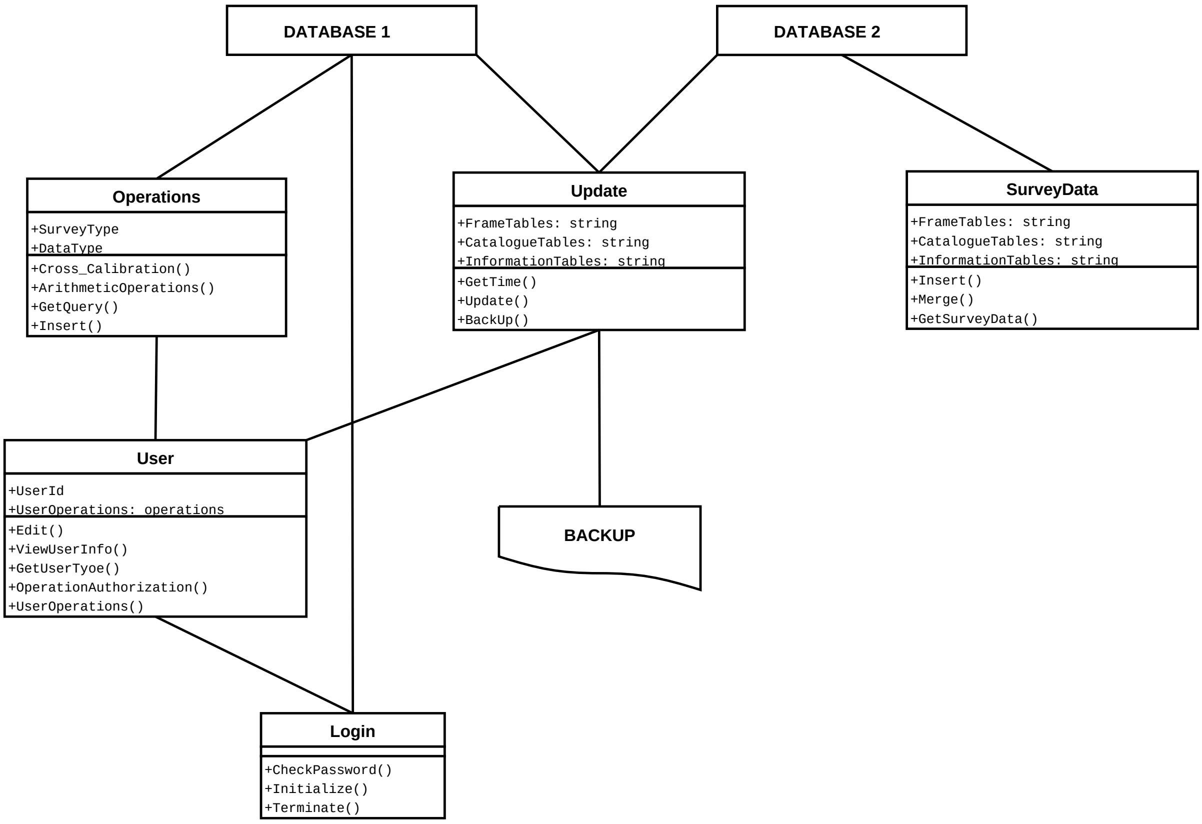

Figure 2.2: CLASS DIAGRAM

2.4 CLASS DEFINITIONS

2.4.1 SURVEYDATA Class

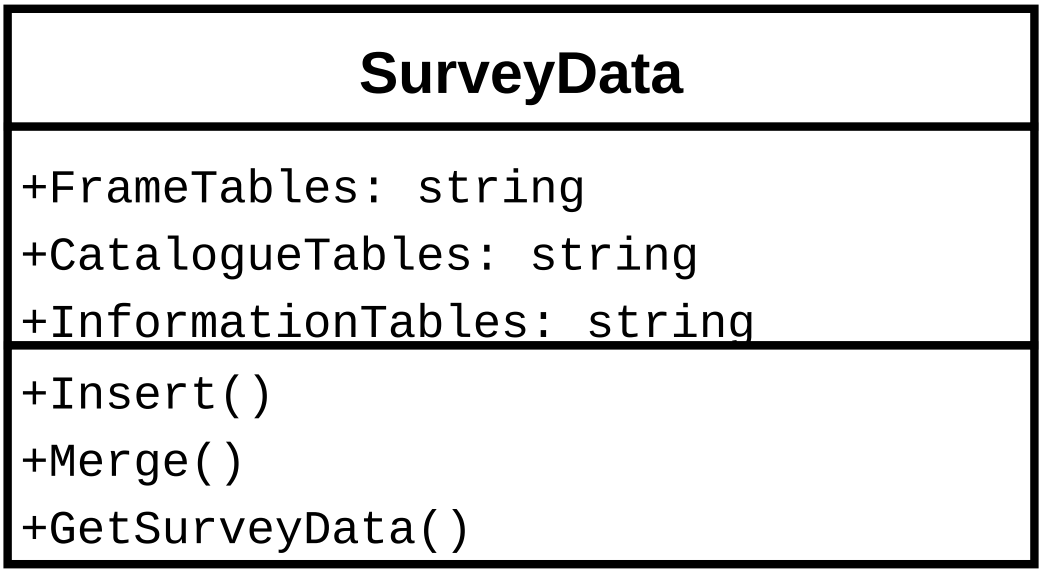

Figure 2.3: SURVEYDATA Class

SURVEYDATA Class contains methods for capitalizing on the UKIDSS Surveys. The information coming from UKIDSS surveys are processed in the methods of this class and then these information are inserted into the relative tables in database. Therefore the names of tables are held as class attributes; Frames Tables, Catalogue Tables and Information Tables.

The method ”Insert” gets the information type such as Frame,Catalogue or Ordinary Information and then inserts these information to the relevant tables. Any information that is sent to this method is preprocessed by other methods of this class.

The method ”Merge” uses the frames of the Survey and recalibrates them with the better quality frames taken throughout the same survey. This method provides us the improvement of the frames taken in nonphotometric conditions from the earlier stages of the survey.

The method ”getSurveyData” gets the UKIDSS Survey Results from the pipeline and enters these results into the tables specified. For this purpose it uses the method ”Insert”. This method does the calibration on the information using ”Merge” method and it does the compression operations on the information for later usage.

2.4.2 UPDATEandBACKUP Class

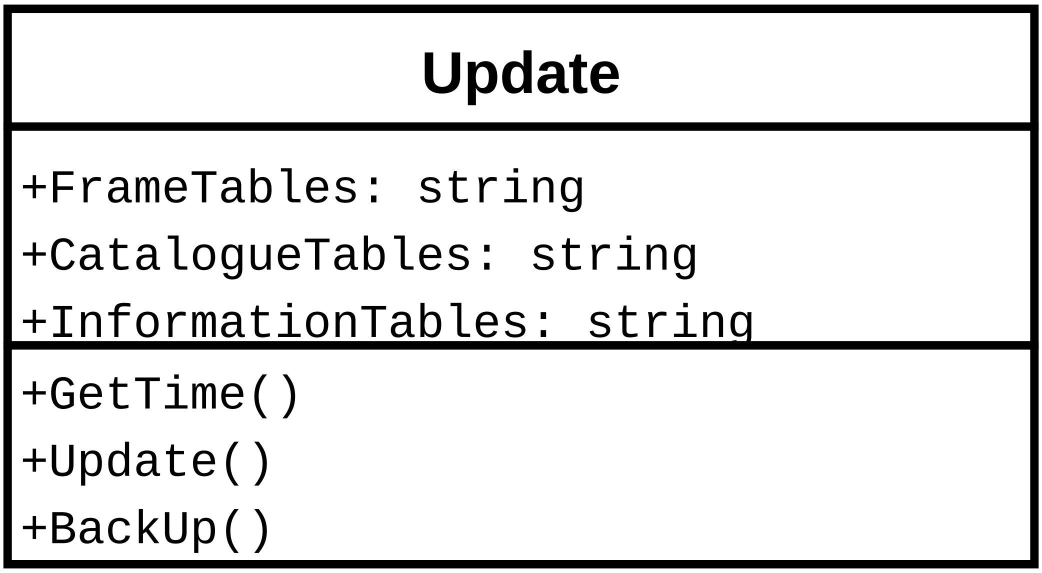

Figure 2.4: UPDATEandBACKUP Class

This class contains methods for getting a backup for the database and updating the database used by users for querying etcetera by another online database. This class therefore holds all the relevant table names of both databases as class attributes for ease. These tables consist of Frame,Catalogue and Information tables.

The method ”getTime” is used for getting the current time and it is used by another method.

The method ”Update” is called by an administrator and it is for taking the contents of the online database to the user database. Therefore the user database is not disrupted by regular ingest of new survey data. The method must be called on release dates.

The method ”BackUp” uses ”getTime” method and backups the user database on a periodical basis. This method ensures the safety of the information stored by providing redundancy of data.

2.4.3 OPERATIONS Class

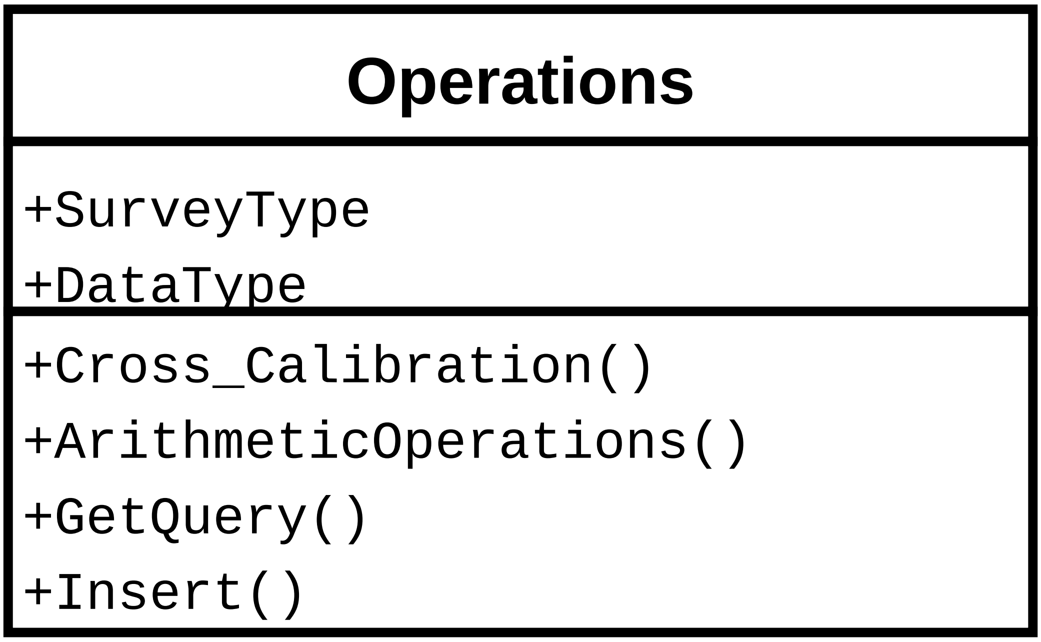

Figure 2.5: OPERATIONS Class

The Operations class is a part of the WFCAM classes package and handles the operations performed by the user of WFCAM.

The first method is Cross_Calibration, which takes a survey as input and cross-calibrate the photometric information using areas of overlap between processed frames, here available. This method acceses the database1 where the surveys are stored.

The second method is ArithmeticOperations, which does the appropriate operation according to the operationType which is taken as input. The operation is done on the operand1 and operand2, which are also taken as input parameters. The operands are taken as parameters of type string for the ease of reading from the graphical user interface but these operands are type-casted into long doubles for the scientific computation.

The third method is GetQuery, which takes a query of type string as input parameter and takes the appropriate action according to the query. After the query is executed on the database1, the result which can be a frame,simple information or a survey catalogue is returned to the user.

The fourth method is Insert, which takes the name of the data as string and the data itself of type Datatype. The data is simply inserted into the database.

2.4.4 USER Class

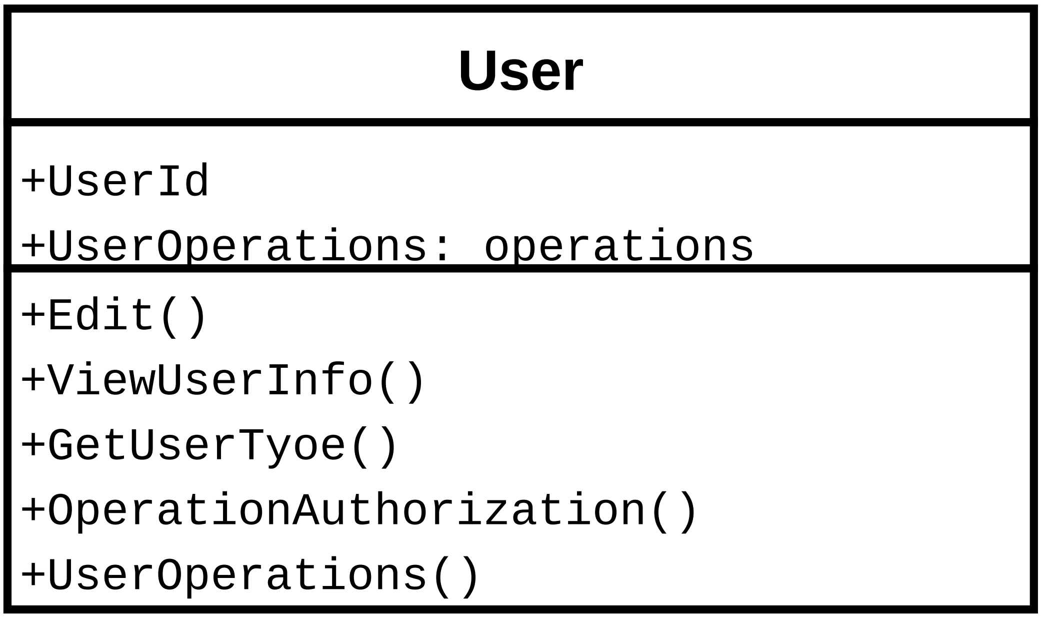

Figure 2.6: USER Class

The User Class is used to edit or view user information, to make operation queries and check user's authorization for required operations. The User Class has access to the Operations, Login and Update Classes, Database1 and Database 2.

The method Edit() is necessary to modify user's account information, recorded on the "UserInfo" table in database1.

The method ViewUserInfo() views the current user's information, recorded on "UserInfo" table in database1.

The method GetUserType() returns the matching value with UserId parameter on UserType column of UserInfo table. User type is important to determine user's boundaries. There are 3 types of user which are Admin, PR users, GRID users. User types are represented as 0, 1, and 2 on table

UserInfo. Hence, GetUserType() method returns an integer.

The method OperationAuthorization() gets UserType and UserOperations, then determines whether the user has right to do the requested operation, or not. If user has authorize to do the operation, the system performs the operation; else the OperationAuthorize() method makes system to give an error message to user indicating that user is not allowed to perform that operation.

The method UserOperations makes user enable to make new operation queries. When user wants to perform an action, Operations class will be accessed through UserOperations method. This method calls OperationAuthorize method to check whether user is authorized to use that operation.

2.4.5 LOGIN Class

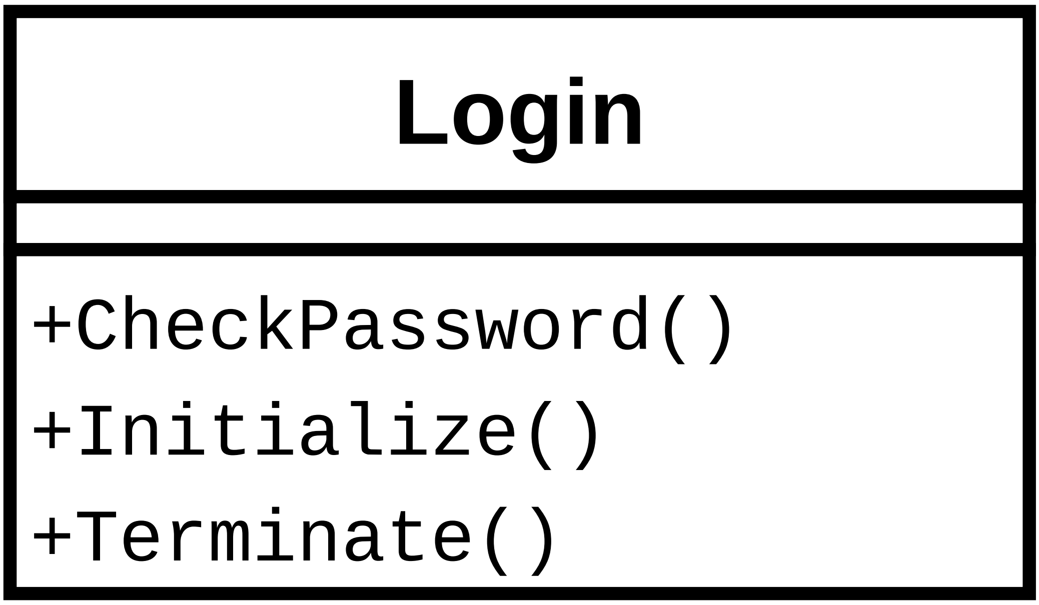

Figure 2.7: LOGIN Class

Login class is responsible for checking username and password data, entered by user, relying on the data, kept in database1 and authenticate the user in login process.

CheckPassword() method accesses Password table through the dbconn in database1 and checks if the entered password and user name are valid. In case the entered password and username do not match with the data on Password table in database1, the method gives an error message to user in order to tempt user to re-enter his password and username.

Initialize() method creates a database connection and a session object for the current user will be created during initializing process.

Terminate() method terminates the session and ends the connection with database1.

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Class Interfaces

As WFCAM Science Archive is not a module for a bigger system but it is a system of its own, then there is no need for an interface for communicating with other systems.

However, a communication interface for a user is needed. Therefore we have defined some methods which are elements of ”User class” and ”Operations” class. The definitions and detailed methods of these classes for user interface is on class definitions section.

Also as an interface to WFCAM telescope, the methods of the class ”Survey” are used. The method survey data has the duty of getting the data from the WFCAM telescope and it thoroughly explained in Class Definitions section.

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