# Business Administration Platform Management through Budget Editor Tool

*Thesis Report*
*Thesis submitted in partial fulfillment of the requirements for the award of degree of*

**Master of Engineering**
in
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*Submitted By*
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# Certificate

I hereby certify that the work which is being presented in the thesis entitled, **" Business Administration Platform Management through Budget Editor Tool"**, in partial fulfillment of the requirements for the award of degree of Master of Engineering in Computer Science and Engineering submitted in Computer Science and Engineering Department of Thapar Institute of Engineering and Technology, Patiala, is an authentic record of my own work carried out under the supervision of **Dr. Shalini Batra** and refers other researcher's work which are duly listed in the reference section.

The matter presented in the thesis has not been submitted for award of any other degree of this or any other University.

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This is to certify that the above statement made by the candidate is correct and true to the best of my knowledge.

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# Abstract

Every Corporation or institution needs an efficient tool for data organization and data maintenance and when we have to do it manually then it becomes difficult and complex. Budget Editor is basically used for Business Administration Platform Management.

Budget Editor is an efficient Data Governance tool and automated tool used for the organizations. This tool has been used by the supervisors and managers to maintain and organize the important data.

Tool distinguishes about the designing and the certain outcomes. It provides user interface which is made in Microsoft Excel from where user can extract and analyze data in tabular format as well as regular format.

Tool can generate various types of report which contains required data with default conditions and calculations, so that we can easily reach to a conclusion by this kind of specific data. This tool shows the responsibility and role of people under all the organizations.

# Table of Contents

# List of Figures

# List of Tables

# List of Abbreviations

| | |
|---|---|
| BAT | Budget Analysis Tool |
| SOAP | Simple Object Access Protocol |
| REST | REpresentational State Transfer |
| DRC | Data Rule Checks |
| DOM | Document Object Model |
| SAX | Simple API for XML |
| StAX | Streaming API for XML |
| API | Application Programming interface |
| XML | Extensible Markup Language |
| VBA | Visual Basic for Application |
| HTTP | Hyper Text Transfer Protocol |
| CSV | Comma Seperated Values |
| JSON | Java Script Object Notation |
| SQL | Structured Query Language |

# Chapter 01

# Introduction

## 1.1 Introduction to Budget Editor Tool

Budget Editor Tool is macro-enabled Microsoft Excel which contains VBA code in terms of macros and functions. Budget Tool is used for retrieving data from database through Web Service using online server. It is mainly used for generating various types of report and gets a specific conclusion. It makes task easy for users because they get all required information by one tool only and they do not have to do manual work.

There are three important tasks which can be done by the tool:

- **Data Extraction:** We can extract data by selecting some specific organization, quarter and year.

- **Data Updating:** We can update the existing data and edit new data as well, and then we can publish that data to the database tables.

- **Report Generation:** This tool is used for generating report automatically by selecting specific organization and specific data as per your requirement.

## 1.2 Functional Partitioning

Budget Editor Tool can be divided into two parts:

i. Front end: Client side

ii. Back end: Server side

In Client side it works through Excel VBA macro programming.

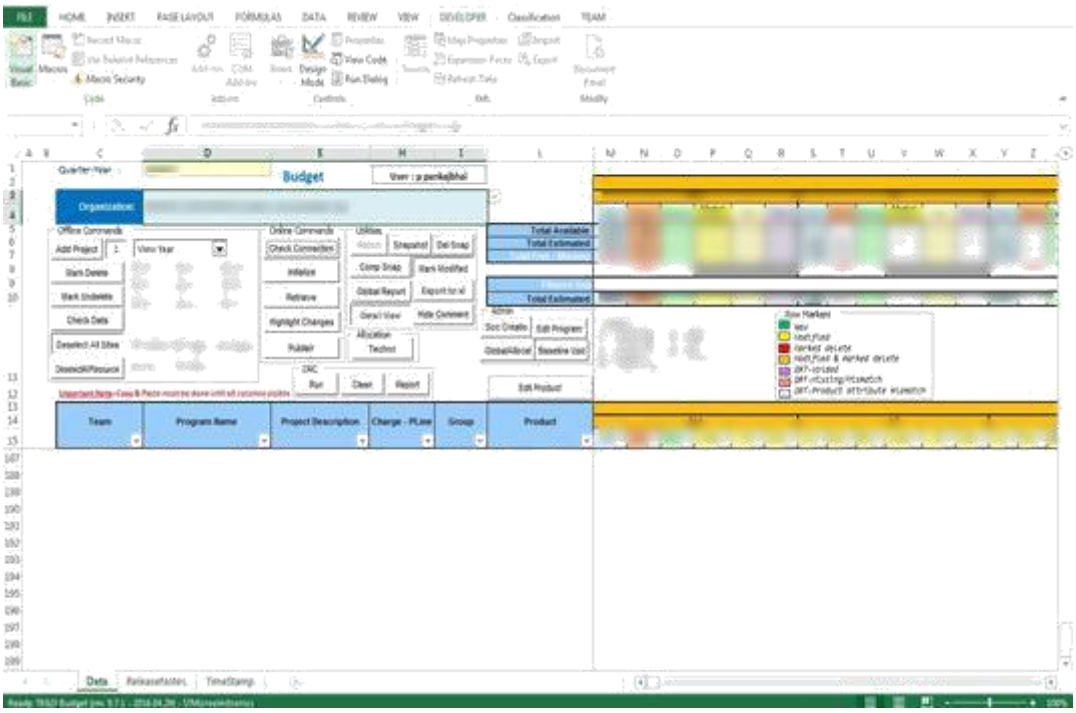

Figure 1.1: Budget Editor Tool

In Server side it works through java programming.

Source code consists of 3 packages:

i. Common: For utilities and common stuff like LDAP functions *etc*.

ii. Resource: For Jax-RS classes called Resources which are something like servlets.

iii. Model: For business java classes that do the real job by querying database *etc*.

Resources do preprocessing like getting parameters, doing LDAP authorization *etc*., invoke suitable business java objects and construct the return value.

Jax-RS is responsible for converting java objects to suitable xml. For this, annotations are used in business java classes which tell Jax-RS which fields to include *etc*.

Eclipse software for java coding and MySQL Workbench is used for database.

## 1.3 Processing Flow

A typical operation consists of:

i. Intercept user action by wiring a VBA macro.

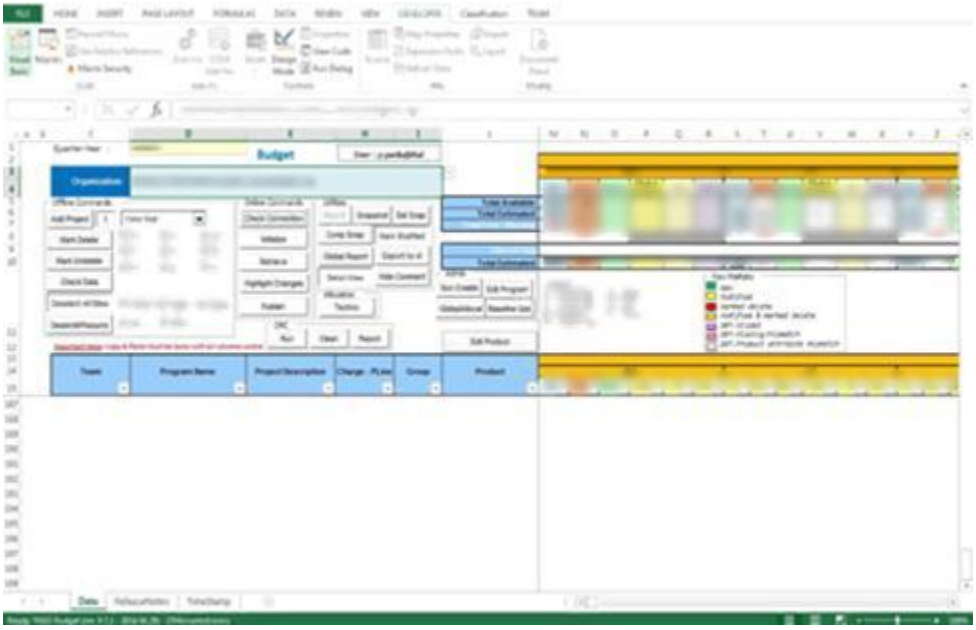

Figure 1.2: Detailed Front End

ii. Macro does some processing and then calls one of the methods in VBA module which initiates a http connection to server side and calls a Jax-RS method by using a defined URL structure e.g. /rootUrl/url1.

iii. Jax-RS instantiates the suitable Resource e.g. rootUrl/Project and invokes the suitable method e.g. getProjectQuery found Facade class of server side code.

iv. The method queries the database and returns desired value.

v. The method converts the data in desired format and constructs a suitable CSV file using buffered Writer, returns response containing zipped CSV files.

vi. Response is returned back to client.

vii. Client VBA method of (2) or (3) processes response and updates UI.

## 1.4 Front End (VBA)

VBA is Visual Basic for Applications; this is a macro programming by Microsoft. This programming language is efficient so user gives priority to this language and it can be used with Microsoft Office.

Visual basic is macro programming that allows an excel user to automate the things as per their requirement.

The developer can utilize the excel formulas and all the features by shifting it to back end. All these feature are present in the Microsoft excels developer tab.

## 1.5 Back End (Web Service)

A Web service is a facility given by an electronic appliance to another electronic appliance. It is communicating via WWW - the World Wide Web, it contain technologies like HTTP. It is used for device to device communication over network. It is widely used for transferring device readable formats like JSON and XML.

Web Service gives an object oriented interface which is based on web and gives an interface to the database server. For example, it is utilized by excel or any other software or any cellphone applications and that gives an interface to the database server from which user wants to fetch data in front end.

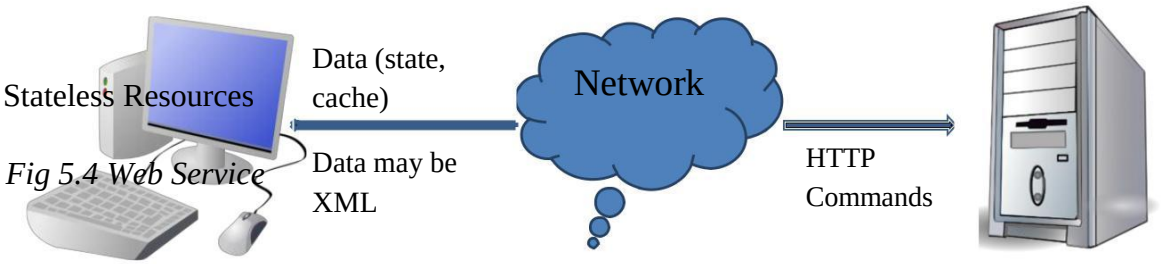


*Fig 5.4 Web Service*

Figure 1.3: Web Service

Web services are used at back end to communicate with VBA and it transfer data in machine readable formats like XML. Web services use SOAP or REST protocol but SOAP is the traditional approach and has many limitations. REST.is an architectural style and uses HTTP protocol to communicate with client and server. Data and functionality are treated as resourced and accessed by Uniform Resource Identifiers (URIs).

Following features of web service are more interactive and light weighted:

- State interactions by hyperlinks
- Self-descriptive messages
- Resource Identifier Restful web service deals with resources
- Uniform interface
- Loosely Coupled
- Coarse-Grained
- Ability to be Synchronous or Asynchronous Supports
- Remote procedure Calls

## 1.6 MySQL Workbench

Data Regulation is required time to time in an organization and it is a tedious job to regulate this data. MySQL Workbench provides DBAs and developers an integrated tools environment for:

- Database Design & Modeling
- SQL Development
- Database Administration
- Database Migration

MySQL workbench ensures that the business achieves the highest levels of reliability, security and uptime.

## 1.7 Thesis Organization

The thesis is organized into following 6 chapters:

**Chapter 1:** This chapter introduces how Budget Administrative Tool is used for retrieving data from database through Web Service using online server and used for generating a various types of report.

**Chapter 2:** This chapter provides a survey of literature in the related area.

**Chapter 3:** In this chapter problem formulation along with research objectives and research methodology is provided.

**Chapter 4:** This chapter describes proposed method along with Restful Web Service and DOM parser used.

**Chapter 5:** Results obtained from proposed method are provided in this chapter. This chapter discusses the performance of the proposed method, containing screenshots of generated various type of Reports and Tools used.

**Chapter 6:** Finally, conclusion and future scope of proposed method are provided in this chapter.

# Chapter 2
# Literature Survey

## 2.1 Excel

**Formatting**: Excel has extensive options for formatting data charts, cells, tables *etc*. Other Sheets has limited formatting capabilities compared to Excel so tool looks more effective and attractive. Excel brings data information together from various file and documents.

**Formulas**: Min-Song Li [3] recommends excel provides important and efficient formulas for financial, logical, text, math or trigonometry fields *etc*.

**Location**: We can use excel at any location, it is supported everywhere.

## 2.2 VBA - Visual Basic for Application

VBA is used in Microsoft Excel to create highly developed tools that can be used in business, engineering and science. Macros are allowed to generate customized reports, charts and perform other data processing functions.

The developer can fully utilize the excel formulas and all the features by shifting it to back end. All these feature are present in the Microsoft excels developer tab that makes one to use the visual basics application. In the developer tab there is an option of visual basics that open an editor where we can write code.

VBA is object-oriented, Structured High-level language and its functions are very efficient and powerful. VBA supports all kind of applications in Window environment for development [4], [5].

A collection of classes available in Excel i.e. workbooks, worksheet, range chart *etc*. Just by controlling different class object, VBA attains the control of excel [3].

VBE - Microsoft Excel has its own editor that is Visual Basic Editor. In this editor we can write macro codes for worksheets. Visual basic Editor is very accurate editor, and it helps to write a code as well. If programmer has done any syntax mistake then it will show it immediately with error message box. It also provides debugging facility, so that one can track flow of your code and find out errors efficiently at particular line only.

Microsoft Excel gives lot of in-built functions to user. Users can write their own functions for performing particular task by using Excel macros. Further, user can add their macros as excel function list, thus user can use it same as like in-built functions. [4]

Recording Macros - Microsoft Excel provides functionality like macros recording. This feature is a replacement option for users, if they don't want to write a code and directly do an action from Excel toolbar and using Excel's basic functionality then they can record entire process and it will convert this process into code in Visual Basic Editor.

## 2.3 Web Services

A Web service is a facility given by an electronic appliance to another electronic appliance. Web Service is communicating via WWW - the World Wide Web and the web technology such as HTTP. It is widely used for transferring device readable formats like JSON and XML [6].

Web Service gives an object oriented interface which is based on web. For example it is utilized by excel or any other software or any cellphone applications.

It provides a mash up to the user where server contains lots of web services on different devices and it compiles program into a single interface.

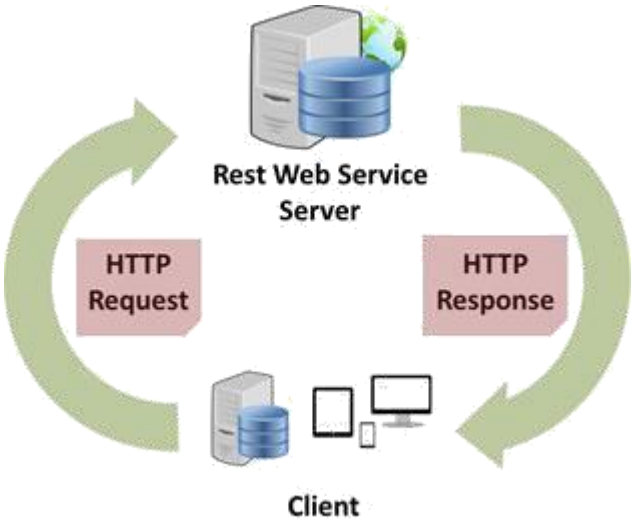


Figure 2.1: Web Service Functionality

Differentiate web services by two levels:

**i. Conceptual level** - This level of Web Service is a programming part given through an endpoint which is accessible by network. In this level, service source and service destination send messages to interchange request and response data in different formats like any of the self-containing files which makes less assumptions for the technical capacities of the receiver.

**ii. Technical level** - This level of service can be executed in many ways. There are two types of Web Services: "Big Web Services" which are also known as SOAP web services and "Restful" web services [8].

## 2.4 Difference between SOAP and REST Web Services

Table 2.1: Difference between SOAP and REST Web Services [7]

| No. | SOAP | REST |
|---|---|---|
| 1. | SOAP is a Protocol | REST is an architectural style |
| 2. | SOAP stands for Simple Object Access Protocol | REST stands for Representational State Transfer |
| 3. | SOAP can't use REST because it is protocol | REST can use SOAP web service because it is concept and can use any protocol like HTTP, SOAP. |
| 4. | SOAP uses service interfaces to expose the business logic. | REST uses URI to expose business logic. |
| 5. | JAX-WS is the java API for SOAP web services. | JAX-RS is the java API for REST web services. |
| 6. | SOAP defines standards to be strictly followed. | REST does not define too much standards like SOAP. |
| 7. | SOAP requires more bandwidth and resource than REST. | REST requires less bandwidth and resource than SOAP. |
| 8. | SOAP defines its own security | REST web service inherits security measures from the underlying transport. |
| 9. | SOAP permits XML data format only. | REST permits different data format such as plain text, HTML, XML, JSON *etc.* |
| 10. | SOAP is less preferred than REST. | REST is more preferred than SOAP. |

## 2.5 Parsers

In XML document, data access or data modification can be done by using XML parsers. Parsers are designed to read data in form of XML and create a method for programs, so that functionality of program can use that data.

In other words XML Parser is a package or library that gives interface for user pro-grams to deal with XML data. It is also used for validating a document and it checks that document is well formatted or not [9].

Almost all browsers have an inherent xml parser to modify xml data and to retrieve same data. There are multiple options for parsing of xml data in Java. But which are frequently used for parsing xml document.

i. DOM Parser
ii. SAX Parser
iii. StAX Parser

### 2.5.1 DOM Parser

DOM parser is 'Document Object Model' Parser. DOM parser parses xml data in different manner and it defines a standard method for manipulating and accessing document which is in XML format.

It loads whole content of xml document and then it generates its hierarchical tree in system memory [10].

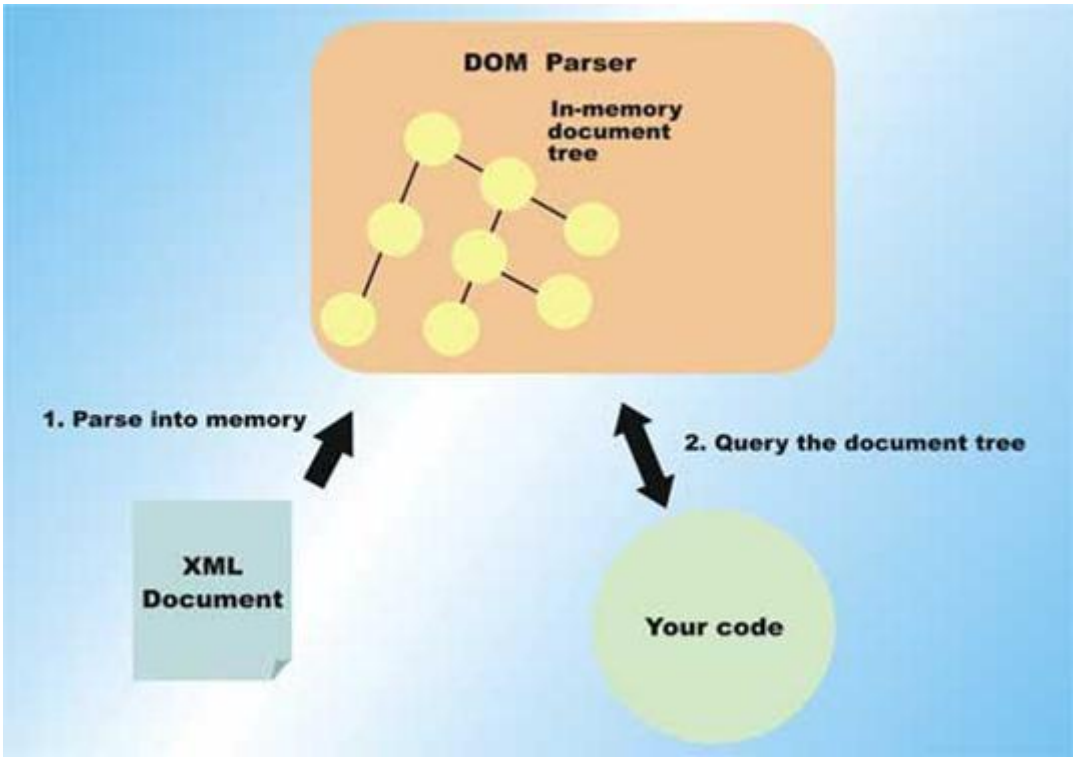


Figure 2.2: DOM Parser [10]

### 2.5.2 SAX Parser

SAX parser is Simple API for xml parser. Its main feature is that it read every unit of document and this parser creates different events so that user can call those events from program.

This parser permits the calling method to avoid the bits, which is not needed for that method, and it will keep only required data. But there is one disadvantage that calling method must maintain track of entire bits that may be needed in future.

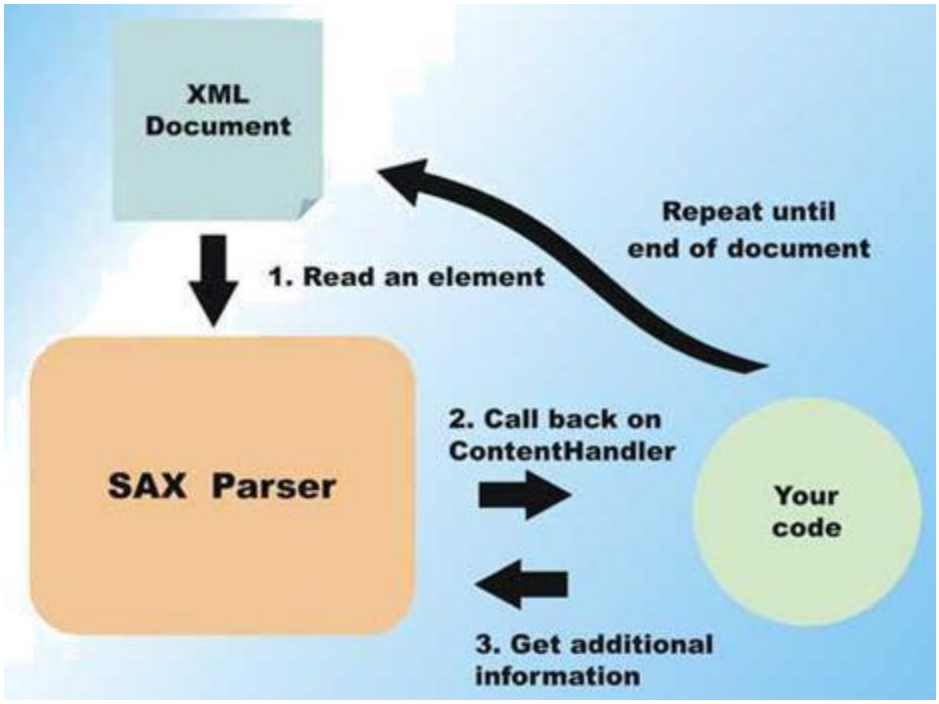


Figure 2.3: SAX Parser [11]

Table 2.2: Advantages and Disadvantages of DOM and SAX Parser

| Parsers | Advantages | Disadvantages |
|---|---|---|
| **DOM** | It supports both read and writes operations and the API is very simple to use. | It is memory inefficient. (consumes more memory because the whole XML document needs to loaded into memory) |
| | It is preferred when random access to widely separated parts of a document is required. | It is comparatively slower than other parsers. |
| **SAX** | It is simple and memory efficient. | It is event based so its API is less intuitive. |
| | It is very fast and works for huge documents. | Clients never know the full information because the data is broken into pieces. |

### 2.5.3 StAX Parser

StAX parser is Streaming API for xml parser. This parser is mainly used in java world and StAX parser is also known as pull parser. Pull parsing is supported by Data Direct XQuery and Saxon both.

This parser is similar to the SAX parser but StAX parser works in more efficient manner.


Figure 2.4: StAX Parser [11]

### 2.5.4 XML Processing Stages

Table 2.3: Parsing

| PARSING | | | |
|---|---|---|---|
| **No.** | **DOM** | **SAX(Push)** | **StAX(Pull)** |
| 1 | Extract token as objects. | Extract token as objects. | Extract token as objects. |
| 2 | Build tree by objects (i.e. Nodes). | Create events by objects (i.e. Strings). | Create events by objects (i.e. Strings). |
| 3 | Not ready for access. | Ready for access- go to step 8(application handles event). | Ready for access- go to step 8(application handles or skips event). |
| 4 | Do not destroy any objects. | Destroy objects after handling the event. | Destroy objects after handling or skipping the event. |
| 5 | Repeat from step 1 until all tokens are processed. | Repeat from step 1 until all tokens are processed. | Repeat from step 1 until all tokens are processed. |
| 6 | (Optional) Destroy the original document after building the entire tree. | (Optional) Destroy the original document after handling the events. | (Optional) Destroy the original document after handling or skipping all events. |
| 7 | Ready for access. | Access is complete – go to step 9. | Access is complete – go to step 9. |

Table 2.4: Access

| ACCESS | | | |
|---|---|---|---|
| **No.** | **DOM** | **SAX(Push)** | **StAX(Pull)** |
| 8 | Back and forth access: Parsing provides sufficient data structures (tree). | Sequential access (no skip): The application creates its own data structure if more advanced access or modification is required. | Sequential access (skip forward): The application creates its own data structure if more advanced access or modification is required. |

Table 2.5: Modification

| MODIFICATION | | | |
|---|---|---|---|
| **No.** | **DOM** | **SAX(Push)** | **StAX(Pull)** |
| 9 | Update the tree. | Update the data structure from step 8. | Update the data structure from step 8. |
| 10 | Write the tree in XML format. | Write the data structure from step 9 in XML format. | Update the data structure from step 9 in XML format. |
| 11 | Destroy the tree. | Destroy the data structure. | Destroy the data structure. |

### 2.5.5 XML Processing Performance

Table 2.6: Performance [11]

| PERFORMANCE | | | |
|---|---|---|---|
| **Category** | **DOM** | **SAX(Push)** | **StAX(Pull)** |
| Output | Tree Object | Events(all tokens) | Events(interested tokens) |
| Parsing(CPU) | High | Medium | Medium |
| Parsing(memory) | Intensive | Low | Low |
| Access(navigation) | Fast(back and forth) | Slow(sequential no skipping) | Medium(sequential: skip forward) |
| Modification (update) | Medium (not incremental) | Depends (template/forward) | Depends (template/forward) |
| Estimated throughput, small file(1KB-15KB) | ~10 MB per second. | ~20 MB per second. | ~20 MB per second. |
| Estimated throughput, small file(1KB-15KB) | ~5 MB per second. | ~20 MB per second. | ~20 MB per second. |
| Estimated throughput, small file(1KB-15KB) | ~7 MB | Does not depend on document size. | Does not depend on document size. |

### 2.5.6 XML Processing Capability

Table 2.7: Capability

| CAPABILITY | | | |
|---|---|---|---|
| **Capability** | **DOM** | **SAX(Push)** | **StAX(Pull)** |
| Parsing output | Tree Object (long-lived) | Events (frequently destroyed). | Events (frequently destroyed). |
| Streaming | No | Yes | Yes |
| Access | Back and forth repeatedly. | One passes sequentially. | One passes sequentially. |
| Modification | Directly modify the tree(frequent and complex is OK) | Get and put into template (only OK if simple and rare). | Get and put into template (only OK if simple and rare). |
| Desirable application | Database | Networking | Networking |

### 2.5.7 Estimated Throughput

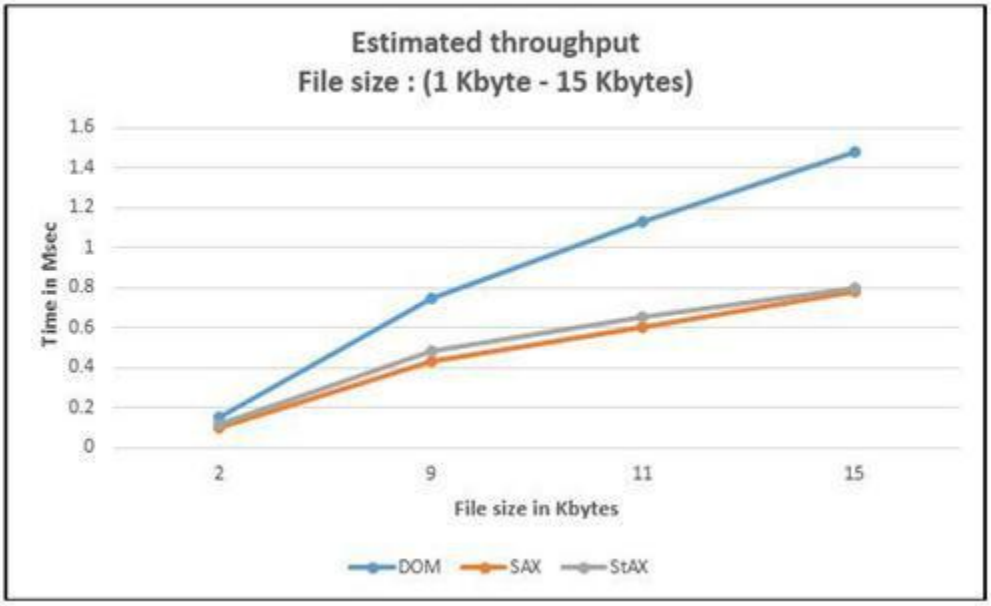


Figure 2.5: Estimated Throughput of Small File [9]

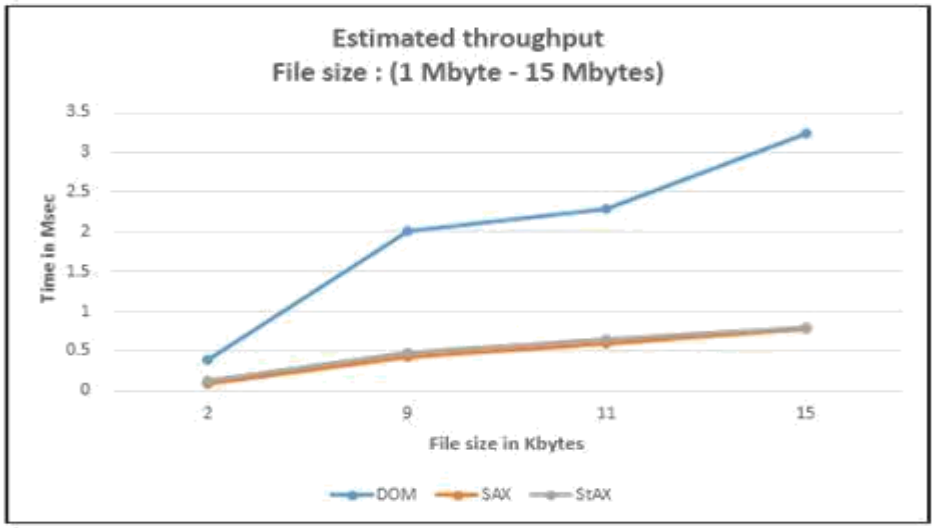


Figure 2.6: Estimated Throughput of Large File [9]

## 2.6 JAXB

JAXB stands for Java Architecture for xml Binding. It is used to convert XML to Java object and Java object to xml. In SAX parser and DOM parser, one has to be aware of xml parsing techniques so that one can use xml data in their program but in JAXB, one does not needs to be aware of xml parsing techniques [17].

It is mostly used in java program for xml web services and can create and map objects easily with xml [16].

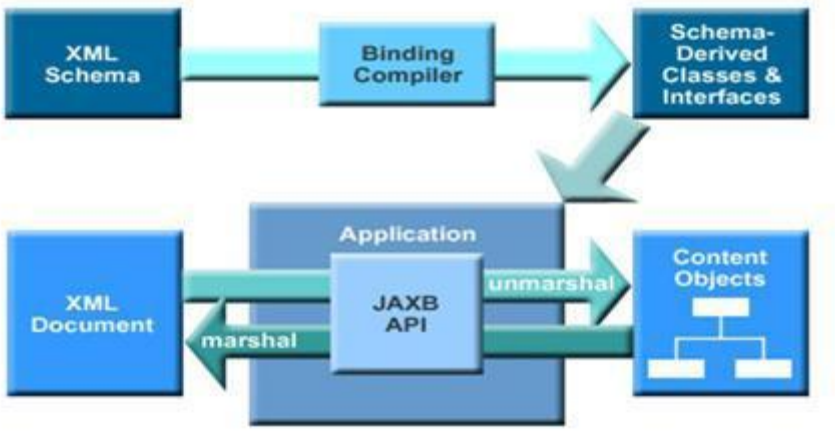


Figure 2.7: JAXB [17]

There are two ways of converting data object in JAXB [18].

i. Marshalling - It converts Java objects to XML.

ii. Unmarshalling - It converts XML to Java objects.

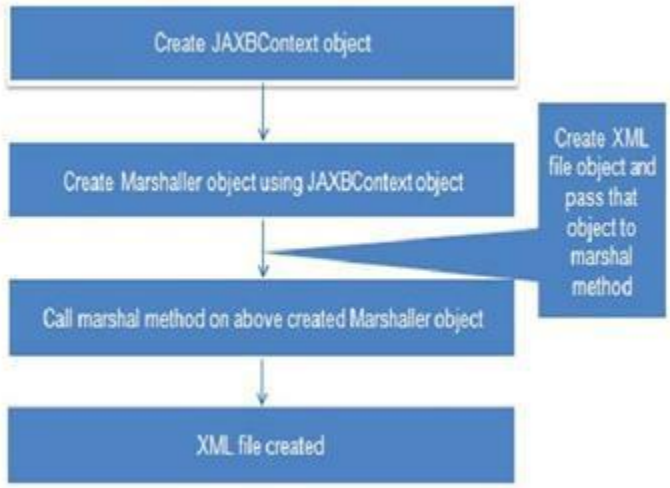


Figure 2.8: Marshalling

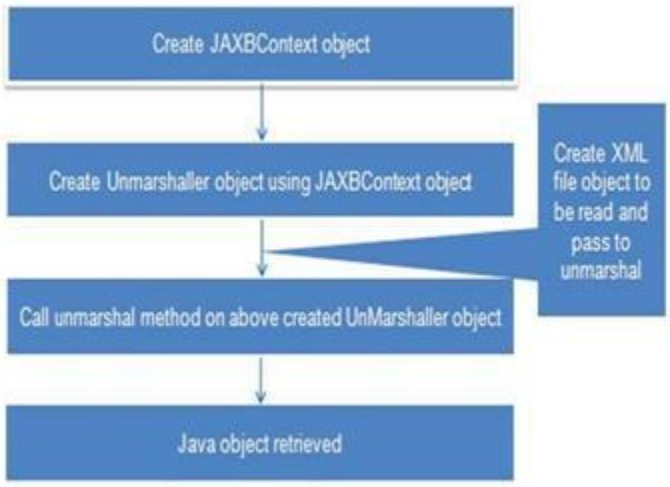


Figure 2.9: Unmarshalling

# Chapter-3

# Problem Statement

## 3.1 Motivation

Business Tools are used to maintain business data, project plans and change management. In business environment, management, scheduling and planning are the terms that are used to describe about company's vision and helps in determining the resources required to achieve it. Effective management and technical support play a key role in accomplishing this task. However, some of managerial tasks like planning project, assigning task to different teams, tracking status of projects and checking resource availability, if performed manually, will be a tedious works and is not feasible at high level organizations.

## 3.2 Problem Description

Project development is a complex, critical and long term process so it is not feasible to maintain all the reports manually. At some interval, an employee may need project performance and analysis reports to check the progress. To support these tasks, an automated system is created which records the scheduling of all projects and project related task and generate the progress reports. A project passes through many stages of planning, development, design, testing, maintaining phases to ensure a high-quality tool that meets or exceeds company's expectations, reaches completion within times and cost estimates, all these data will be maintained in different business management tools.

## 3.3 Objectives

The main focus of our thesis work is to reduce the time complexity for retrieving large data from database through Web Service using online server and that are used for generating a various types of report.

The key objectives of this work are listed below:

- To study existing web service for retrieving large amount of data and parsing techniques for converting object from one form to another form.
- To propose a best technique for report generation using REST web service, DOM Parser and importing CSV file.
- To validate the performance of the proposed technique through various evaluation parameters.

## 3.4 Methodology

Major aim of this work is improving the existing techniques and making them more efficient by reducing storage and computational cost. Below is the methodology that will be followed to achieve the same:

- Comprehensive and thorough study of existing SOAP and REST web service are done.
- Rigorous study of different type of XML parser is done.
- A novel technique is proposed for fastest Report Generation.
- Simulation and theoretical analysis of the proposed method is done.

# Chapter- 4

# Proposed Solution

## 4.1 Restful Web service

While REST seems to be growing in popularity these days, it's a term that seems to mean that different things to different people. REST emphasizes things like separation of concerns and layers, statelessness, and caching, which are common in many distributed architectures because of the benefits they provide. These benefits include interoperability, independent evolution, interception, improved scalability, efficiency, and overall performance [2].

Web services are used at back end to communicate with VBA and they transfer data in machine readable formats like XML. Web services use SOAP or REST protocol but SOAP is the traditional approach and has many limitations. REST.is an architectural style not a protocol likes SOAP and uses HTTP protocol to communicate with client and server. Data and functionality are treated as resourced and accessed by Uniform Resource Identifiers (URIs).

To schedule all organization projects we need a database system to store the details. As a bridge between database and web service, Restful web service are used. Web services generate data in XML forms and this XML is parsed through this web service at the front end. While developing a project it is the best technique to use the most suitable Web service and parsing methods.

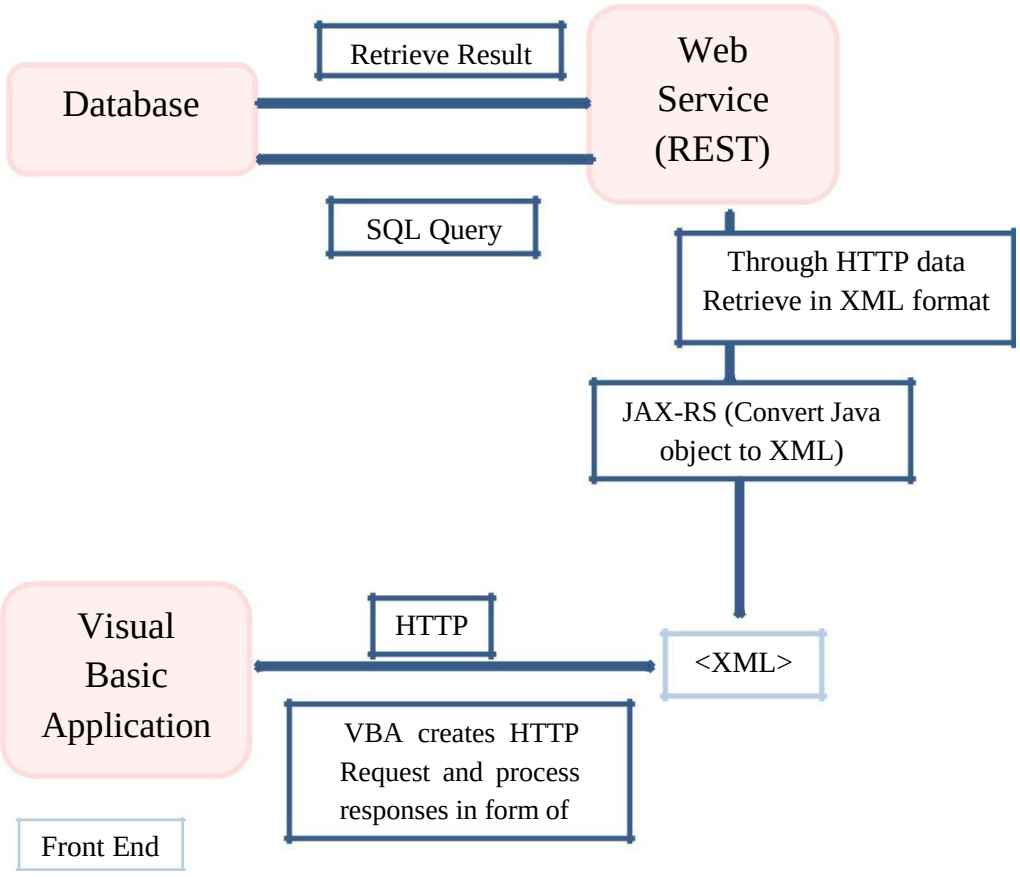


Figure 4.1: System Flow for data retrieval, publish, delete records

## 4.2 JAX-RS Specification

A group of API is defined by JAX-RS *i.e.* Java API for Restful services for developing web services which follow the REST architectural principles. GET, PUT, POST are HTTP methods and many content types can be used to show input (Consumed) and output (Produced) data [1], [14].

```
@PUT
@Path("ForecastCapacityMergeMultiYear")
@Produces({"application/zip", MediaType.APPLICATION_OCTET_STREAM})
@Consumes(MediaType.APPLICATION_FORM_URLENCODED)
public static Response getMergeForecastCapacityMultiyear(@FormParam("name") String teamName,
@FormParam("quarter") String quarter, @FormParam("year") String year, @FormParam("view") String
view, @FormParam("report") String report,@FormParam("userId") String userId) {
                //Do Something
        }
@DELETE
@Path("GlobalAllocation/{id}")
public Response DeleteGARecord(@PathParam("id") String id){
                //Do Something
        }

@GET
@Path("CapacityNReport_ByQuarter")
@Consumes(MediaType.APPLICATION_FORM_URLENCODED)
@Produces(MediaType.APPLICATION_XML)
public List<CapacityN> getCapacityForReportByQuarter(@QueryParam("name") String teamName,
@QueryParam("quarter") String quarter, @QueryParam("year") String year, @QueryParam("view")
String view) {
                //Do Something
        }

@POST
@Path("BatReferentialData")
 @Produces(MediaType.APPLICATION_XML)
 @Consumes(MediaType.APPLICATION_XML)
public ReferenceData getBatReferentialData(JAXBElement<RequestReferenceData> request) {
                //Do Something

        }
```

Figure 4.2: JAX-RS Sample

## 4.3 Parsing

A parser is a compiler or interpreter component that breaks data into smaller elements for easy translation into another language. A parser takes input in the form of a sequence of tokens or program instructions and usually builds a data structure in the form of a parse tree or an abstract syntax tree. It is mostly used for transmitting and fetching large amount of data over web services. It is a piece of program that takes a physical representation of some data and converts it into an in-memory form for the program as a whole to use. Parsers are used everywhere in software environment.

In business administration platform tools for transferring data XML parser is used. The XML Parser defines the properties and methods for accessing and editing XML.

### 4.3.1 XML Parser

In XML document, data access or data modification can be done by using xml parsers. Parsers are designed to read data in form of an xml and create a method for programs, so that functionality of program can use that data.

DOM parser is 'Document Object Model' Parser. DOM parser parses xml data in different manner and it defines a standard method for manipulating and accessing document which is in XML format.

DOM parser loads whole content of xml document and then it will generate its hierarchical tree in system memory. Their API is very simple to use.

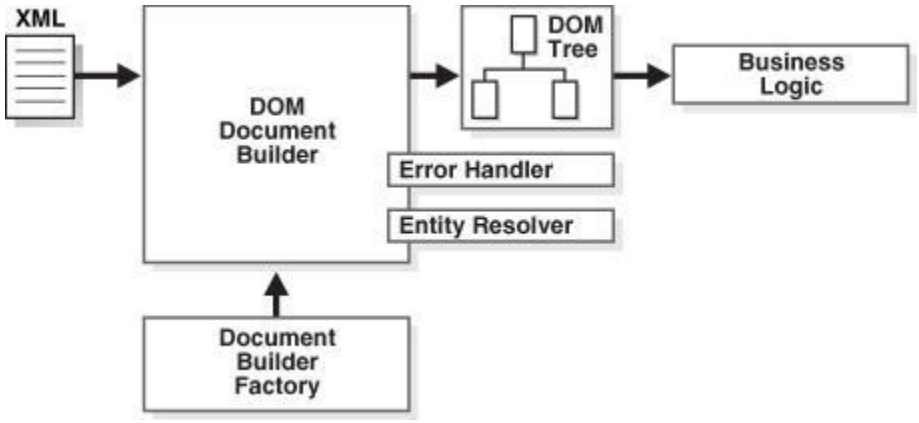


Figure 4.3: Flow of DOM Parser

## 4.4 Budget Editor Tool

The project is related to development of Business Administration Platform Management Tools such as Record Management, Schedule Database, and Budget Editor Etc. Budget

Tool is used for retrieving data from database through Web Service using online server. This tool is mainly use for generating various types of detailed reports and get specific conclusions based on organization and flexible date range. It makes task so easy for users because they get all required information by one tool only and they do not have to do manual work.

## 4.5 Processing Flow

A typical operation consists of:

- Intercept user action by wiring a VBA macro to that specification.
- Macro does some processing then calls one of the methods in VBA module which initiates a http connection to server side and calls a Jax-RS method by using a defined URL structure e.g. /rootUrl/url1.
- Jax-RS [1] instantiates the suitable Resource e.g. rootUrl/Project and invokes the suitable method e.g. getProjectQuery found Facade class of server side code.
- The method queries the database and returns desired value.
- The method converts the data in desired format and constructs a suitable CSV file using buffered Writer, returns response containing zipped CSV files.
- Response is returned back to frontend and direct import CSV file in excel sheet and make report into desired format using Pivot Table and updates User interface.

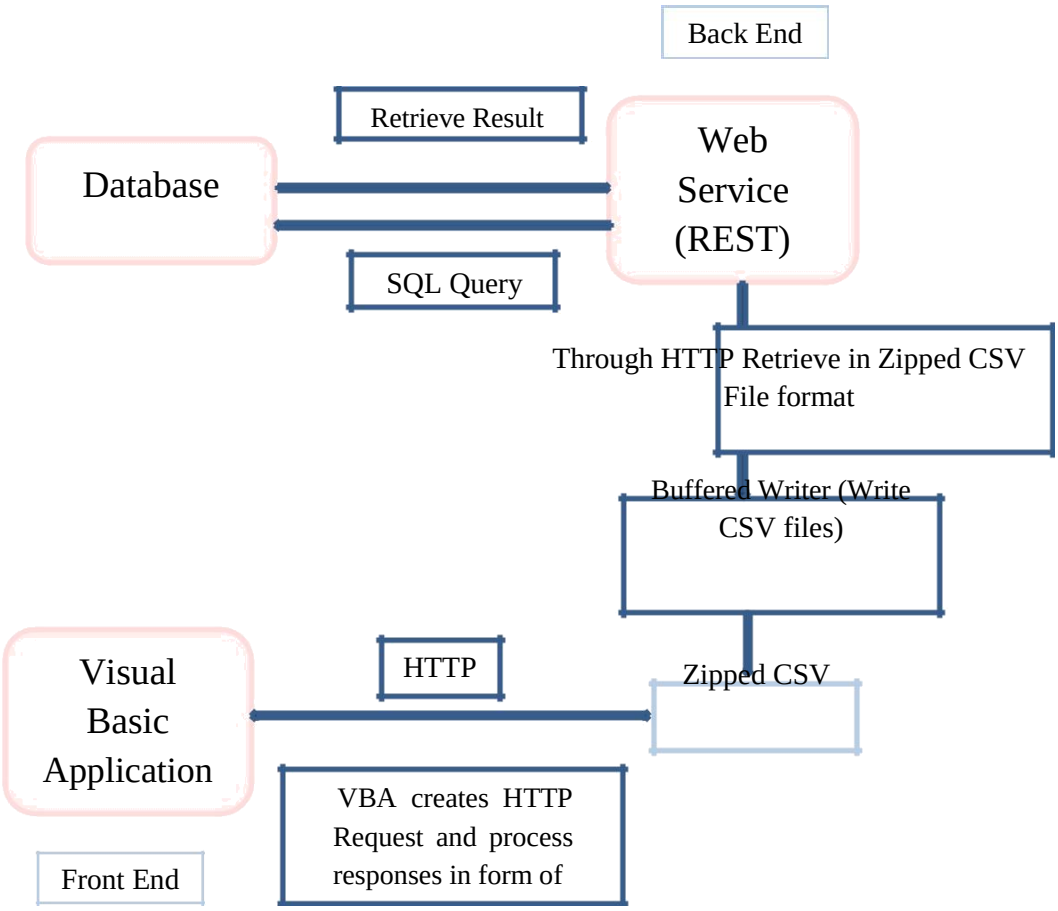


Figure 4.4 System Flow for report generation

# Chapter-5

# Design and Implementation

Budget Editor Tool has different functionalities for different task. Functionalities are represented in form of buttons, so that user can easily access this facility.

## 5.1 User Interface (Online Commands)

### 5.1.1 Check Connection

It checks whether Workbook is able to access database or not. It also checks current version of tool that it is properly maintained with database or not.

### 5.1.2 Initialize

It initializes all permissions and reference data required for the application. This command takes log-in id from the user to check the category of that user in database and it provide limited access according to which organizations are allowed to user and which functionality he/she can use.

### 5.1.3 Retrieve

This command extracts data from database server. Data is extracted on basis of selected organization, quarter and year. This command retrieves two types of data. i. Forecast Data

ii. Capacity Data.

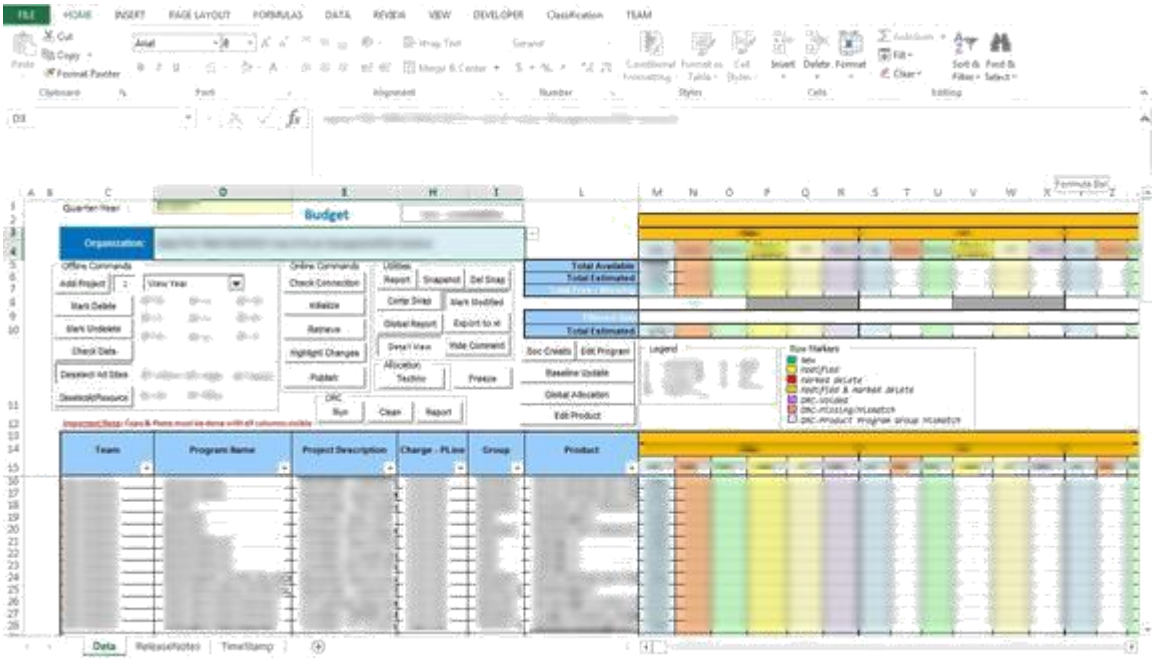


Figure 5.1: Output after data retrieval

### 5.1.4 Highlight changes

Highlight data which is changed and not aligned with database. If user adds new records and does not published it then he/she use this command to show this new records along with the changed records.

### 5.1.5 Publish

This command commits changes in data to the central database. All the changes made by user are reflected in main database tables.

## 5.2 DRC - Data Rule Checks

### 5.2.1 Run

This command runs Data Rule Checks and highlights violated cells. If some specific rules

are defined for tool as per admin requirements then DRC run will check these rules and then highlight according to these rules.

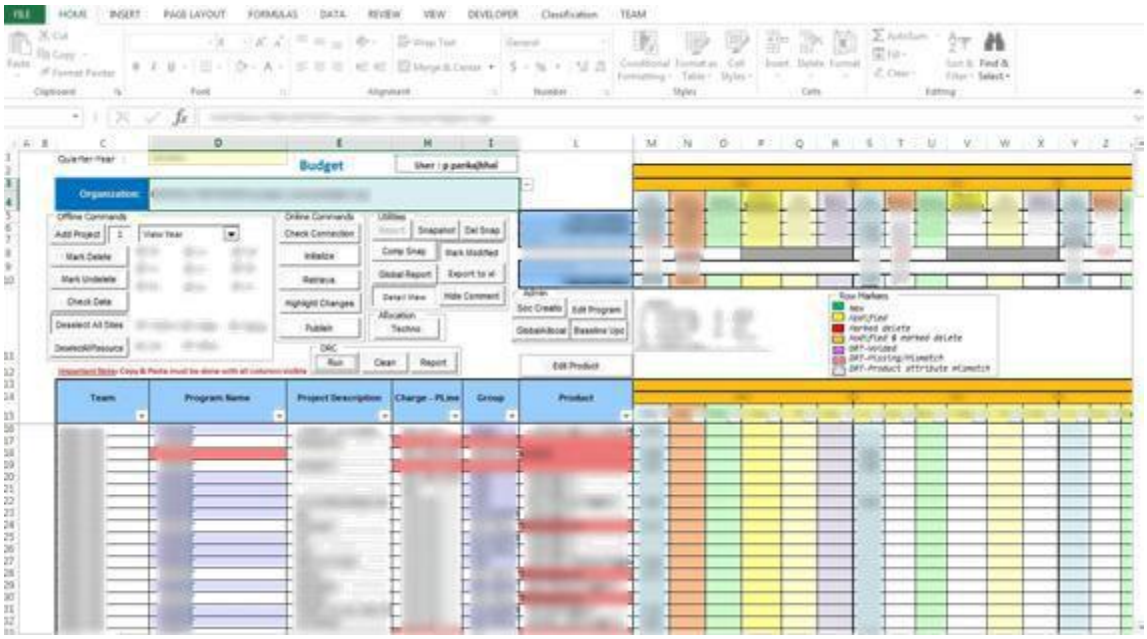


Figure 5.2: DRC Run

### 5.2.2 Clean

This command deletes DRC marked data.

## 5.3 Report

Generate different type of report based on selected organization and date ranges are:

- Normal Report
- Team Shared Report
- Global Shared Report
- Overload Report (Containing Graph)

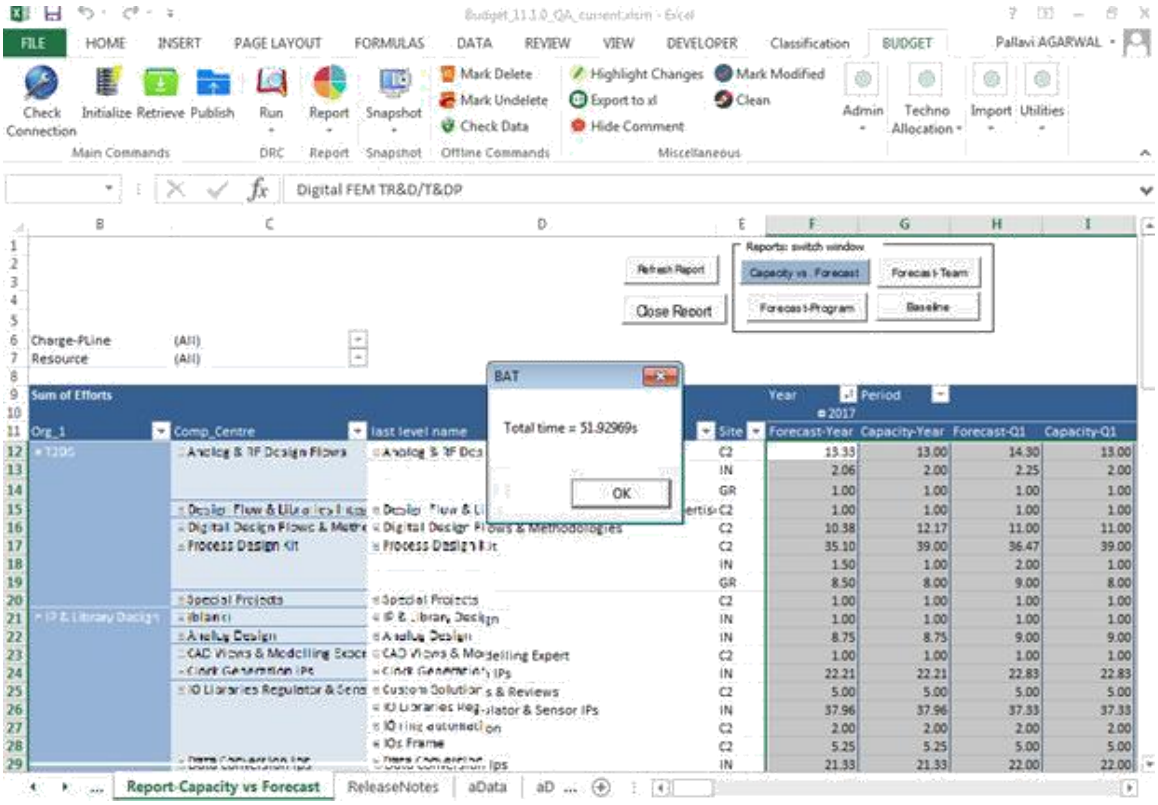


Figure 5.3: Team Shared Report

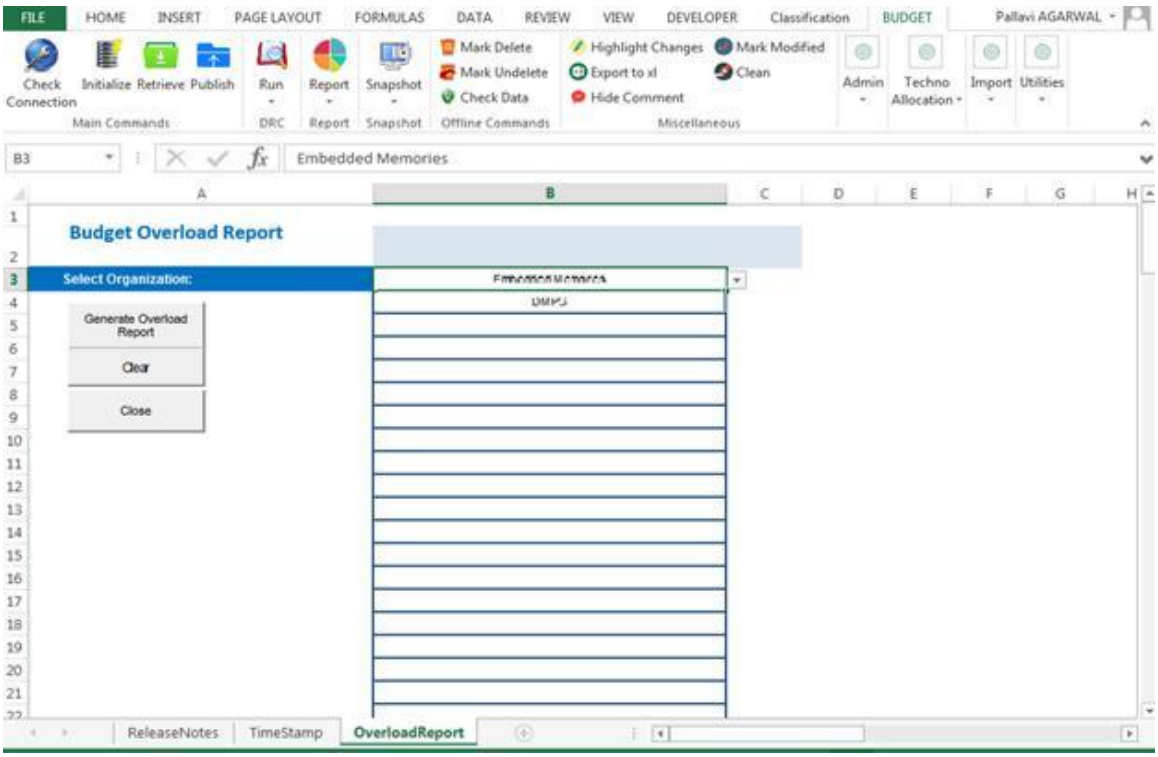


Figure 5.4: Select Team for Overload report

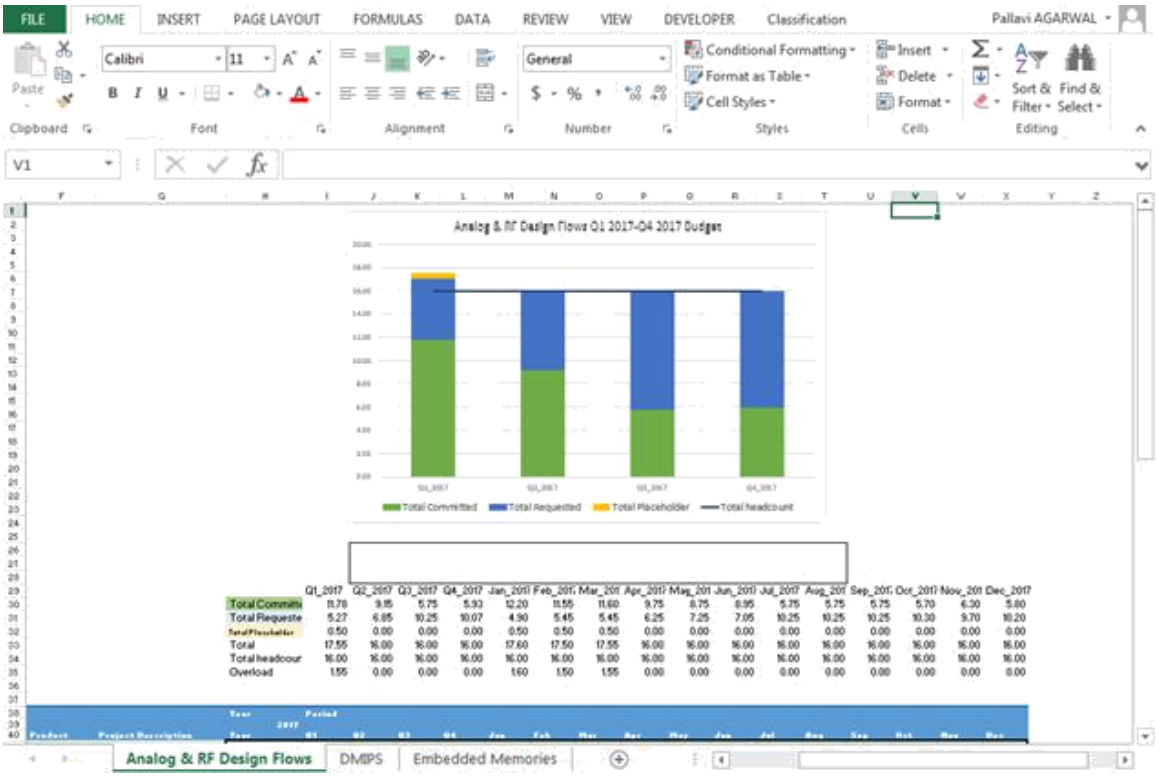


Figure 5.5: Overload Report

### 5.3.1 Report Generation Time

Table 5.1: Report Generation Time

| Report Type | Date Range | Multiyear(In Sec) | Multiyear(No of Rows) |
|---|---|---|---|
| Global Shared Report | Q1-2017 to Q4-2017 | 195 | 266407 |
| Team Shared | Q1-2017 to Q4-2017 | 52 | 51103 |
| Normal Report | Q1-2017 to Q4-2017 | 30 | 23866 |
| Team Shared | Q3-2017 to Q2-2018 | 45 | 30610 |

## 5.4 Online Commands

### 5.4.1 Add Project

By this command user can add a record and this record is known as forecast data. User can also add more than one record by entering number of records he/she wants to add.

### 5.4.2 Mark Delete

This command is used to mark the data which user wants to delete. User can select the cell from a row which row user wants to delete, and this command highlights that row.

### 5.4.3 Mark Undelete

This command unmarks the selected rows which are already marked for deletion and later user does not want to delete that data.

### 5.4.4 Check Data

There are some conditions that some specific fields cannot be empty. If those fields are empty then Check Data command highlights those rows, so that user can easily check this out.

### 5.4.5 Select/Deselect All Sites

This command selects all the sites in one click so that user does not have to bother by selecting all the sites individually and vice versa.

### 5.4.6 Select/Deselect All Resource

This command selects all the resources together so that user does not have to select every resource turn by turn and vice versa.

## 5.5 Flow Process

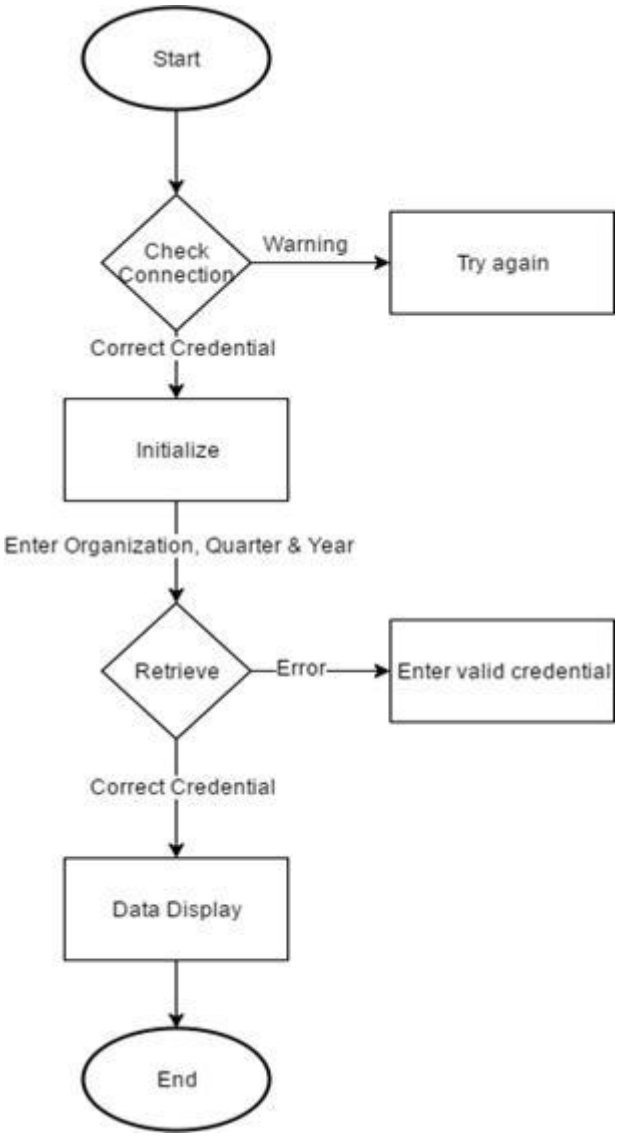


Figure 5.6: Flow chart for Data Retrieval

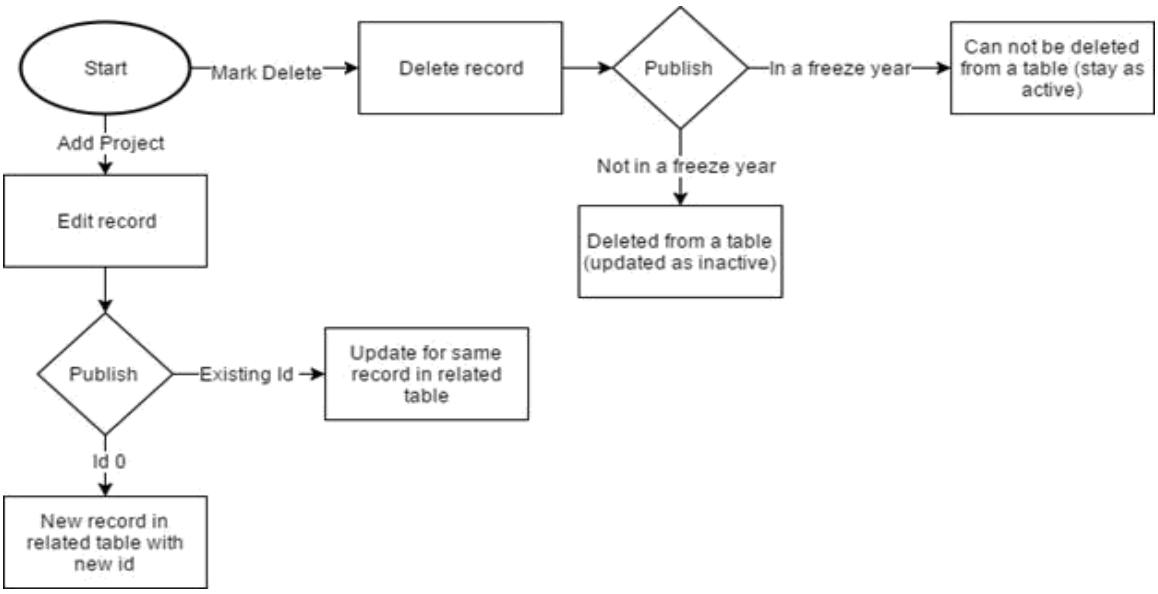


Figure 5.7: Flow chart for Data Publish

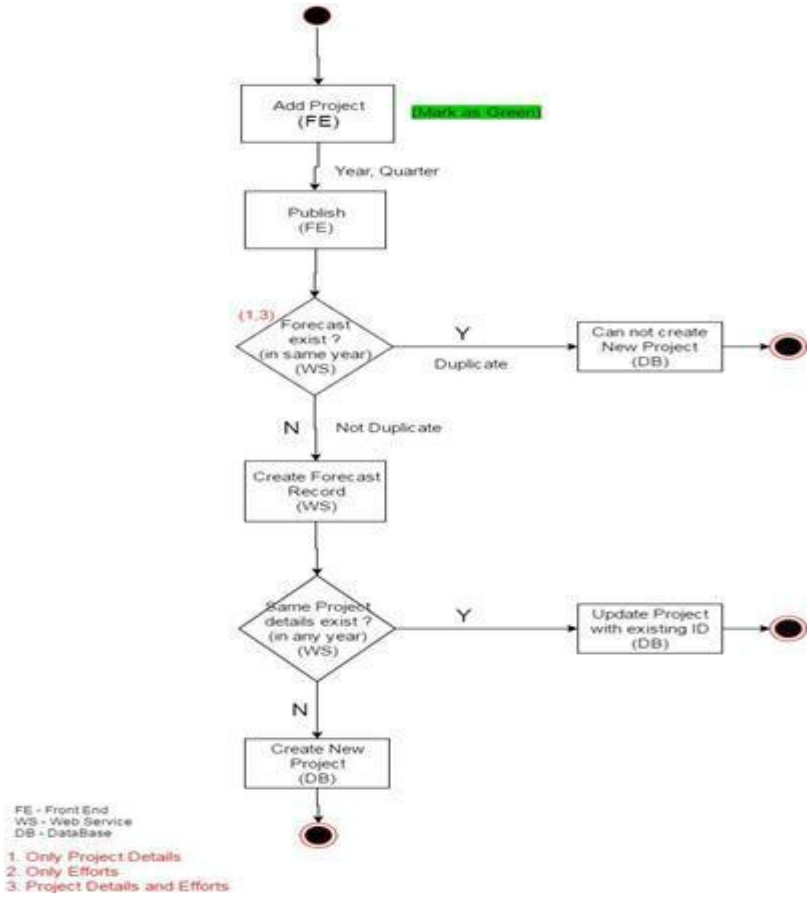


Figure 5.8: Flow chart for Create Project

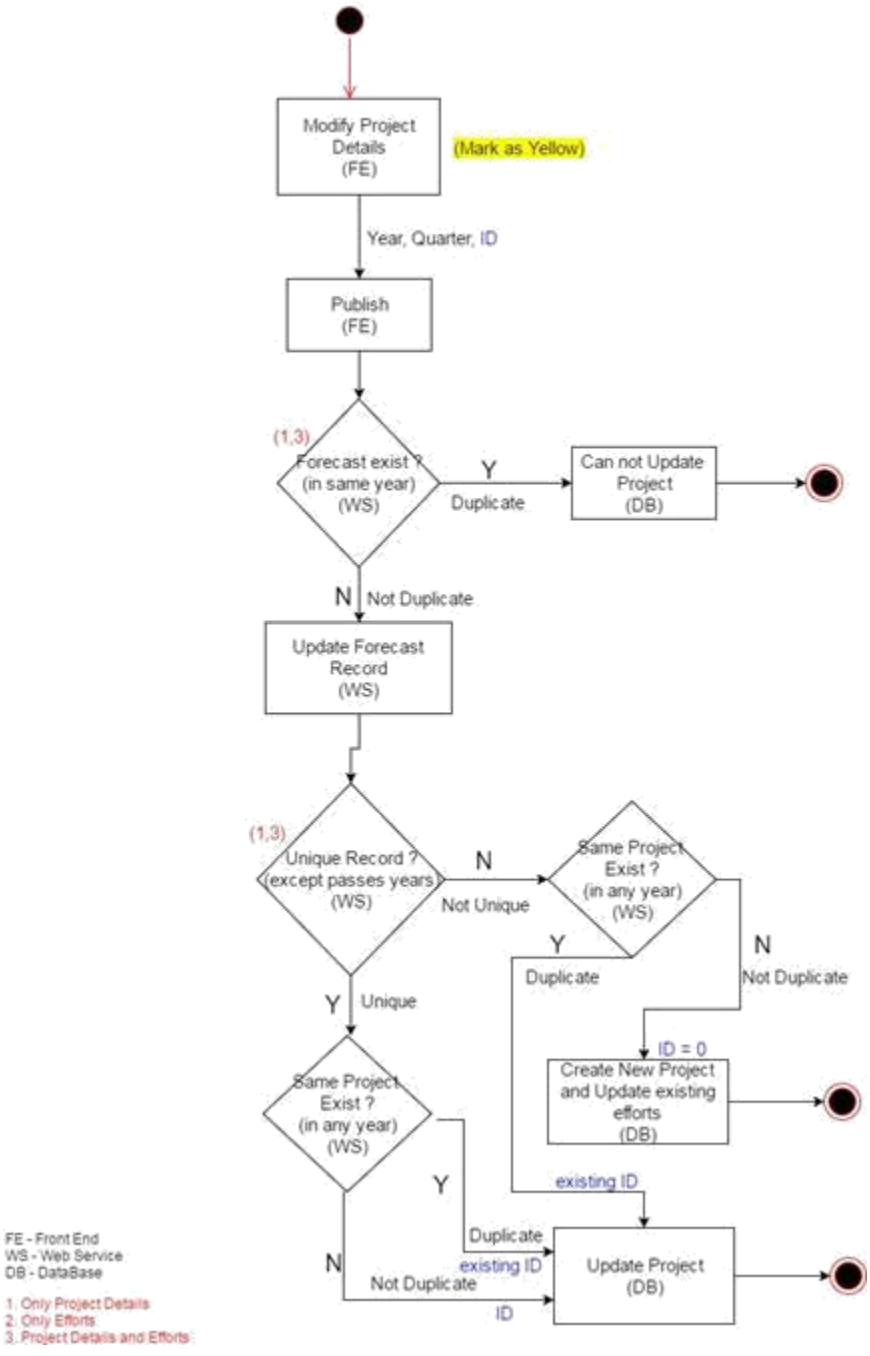


Figure 5.9: Flow chart for Update Project

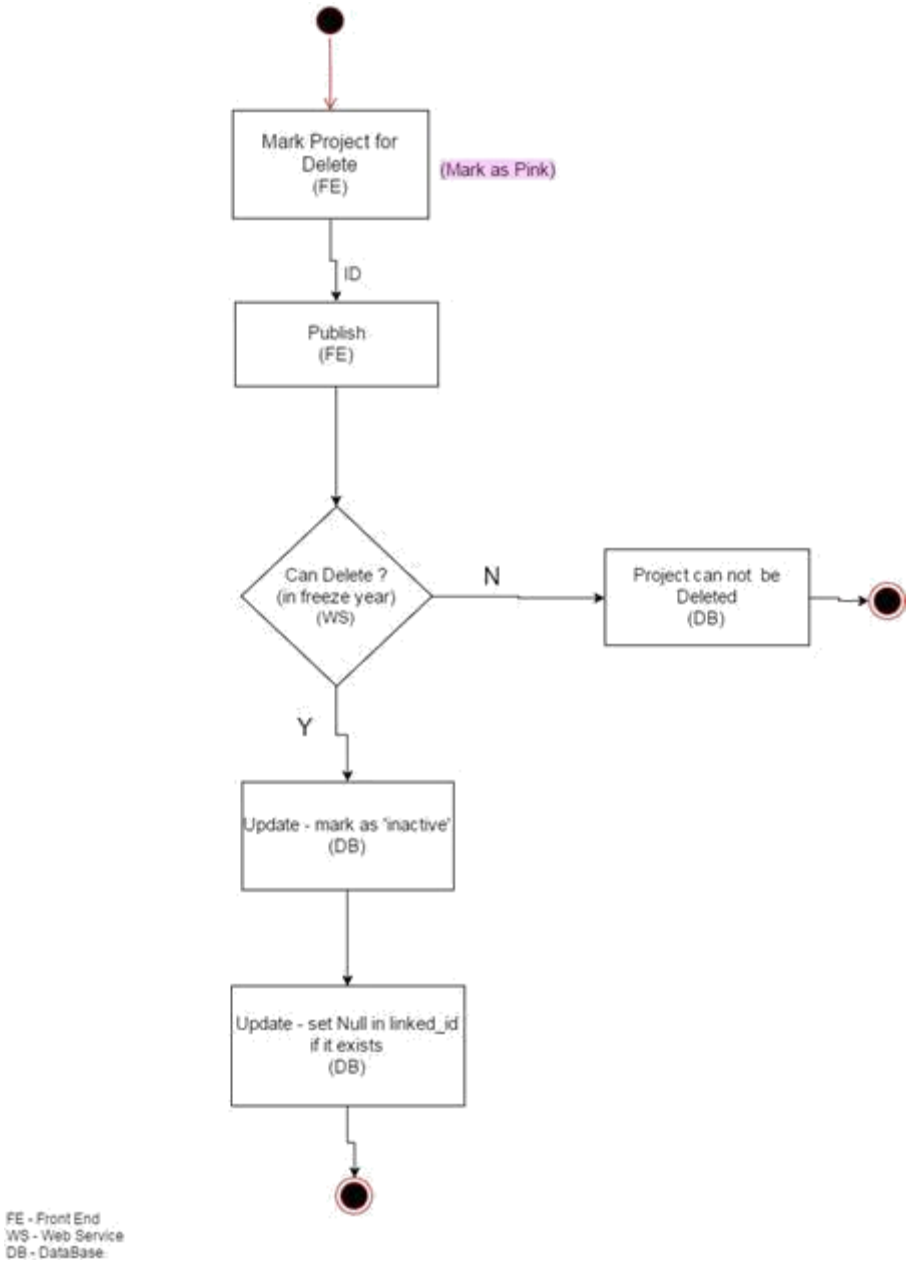


Figure 5.10: Flow chart for Delete Project

## 5.6 Tools

### 5.6.1 MySQL Workbench

Data Regulation is required time to time in an organization and it is a laborious job to regulate this data. So MySQL Workbench provides DBAs and developers an integrated tools environment for:

- Database Design & Modeling
- SQL Development
- Database Administration
- Database Migration

MySQL workbench ensures that the business achieves the highest levels of reliability, security, and uptime.

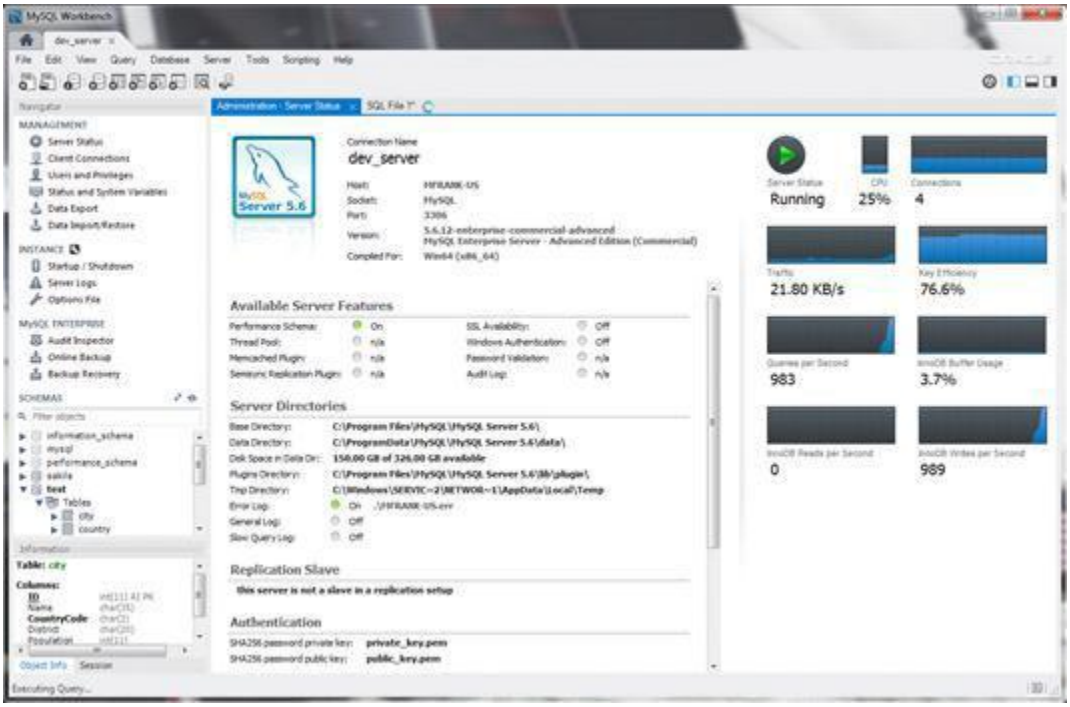


Figure 5.11: MySQL Workbench Home

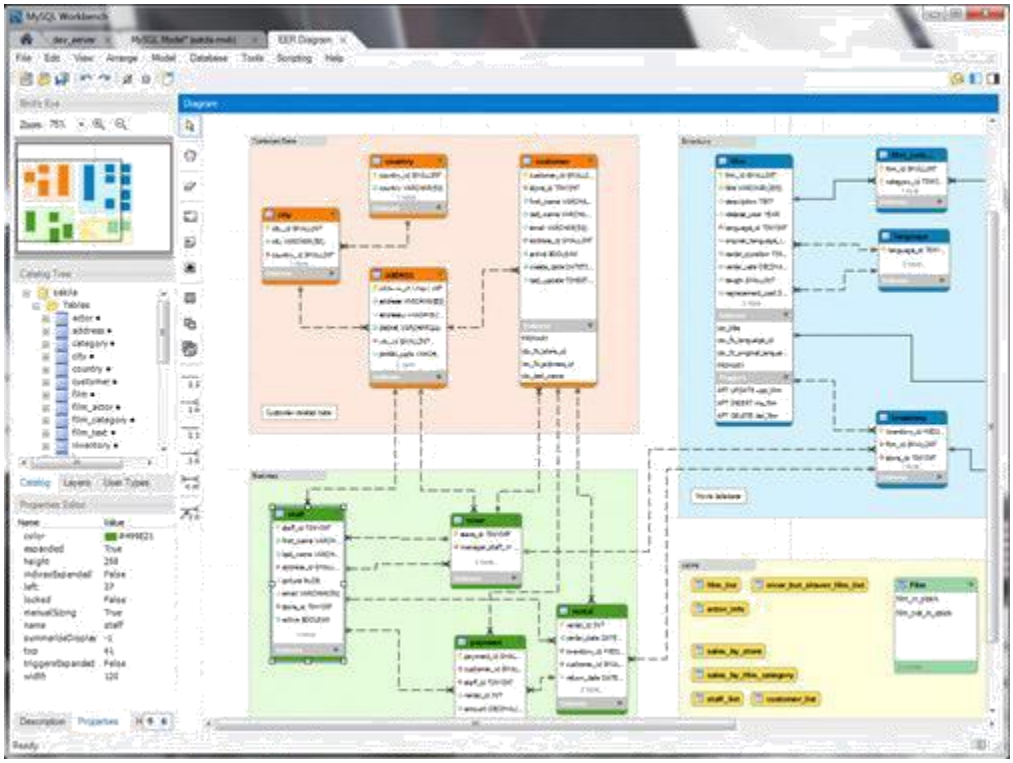

Figure 5.12: Visual Database Design

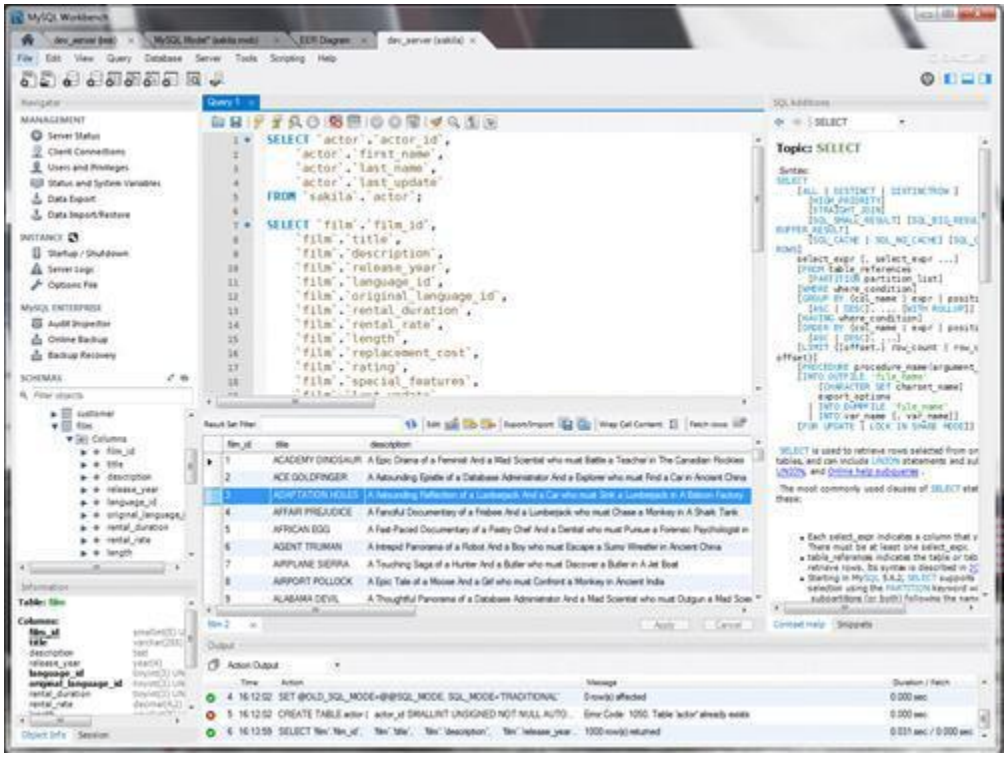

Figure 5.13: SQL Editor

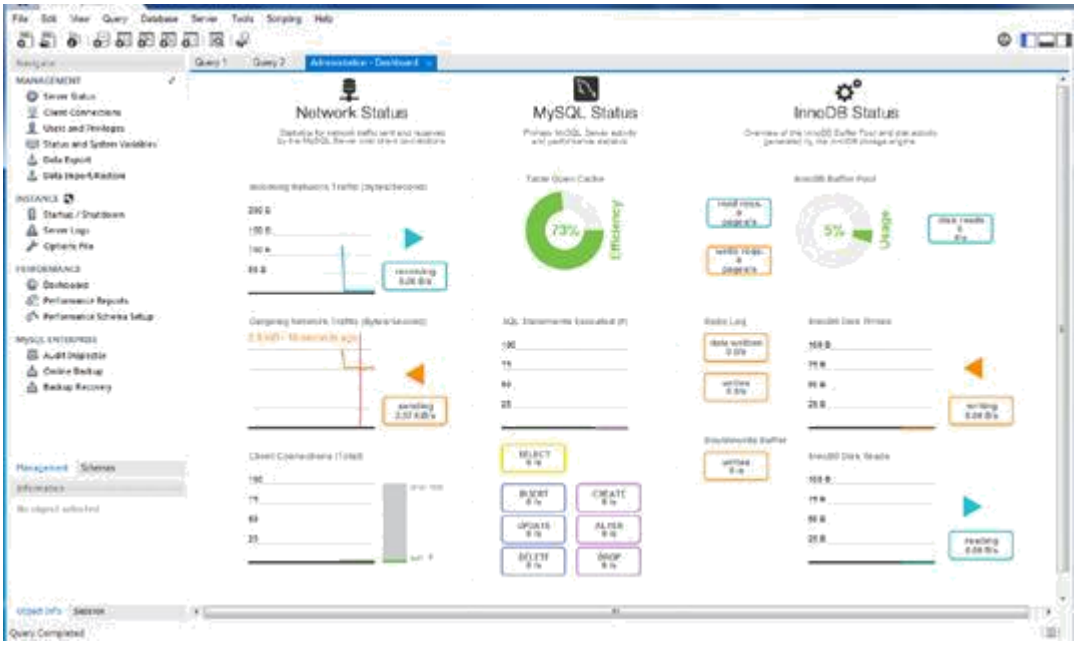


Figure 5.14 Performance Dashboard

### 5.6.2 Eclipse

Eclipse is used for designing java application but it also has additional plug-in that extends the scope of Eclipse. For this project development Eclipse provide web service interface. Through this interface database related query is executed which is accessed by the front end. Result is transferred to the front end.

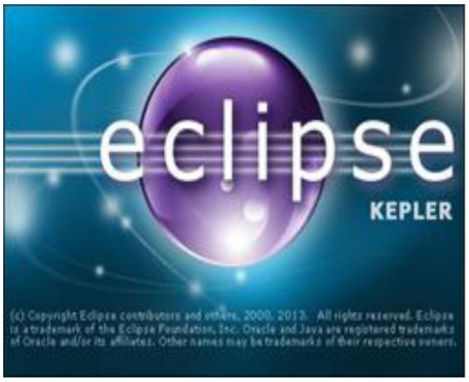


Figure 5.15: Eclipse Kepler

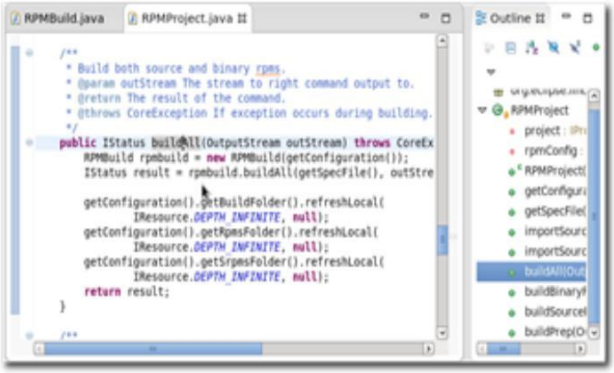


Figure 5.16: Eclipse Overview

The Eclipse Platform is divided into following component areas:

- **Platform UI**: Platform user interface, runtime, text editor, search and help components (also see UI wiki page, Text and Search)
- **SWT**: Standard Widget Toolkit
- **Workspace** (Team, CVS, Compare, Resources): Platform resource management
- **Debug**: Generic execution debug framework
- **Releng**: Release Engineering

### 5.6.3 Visual Basic for Application Interface

A VBA window opens up as shown in the following screenshot.

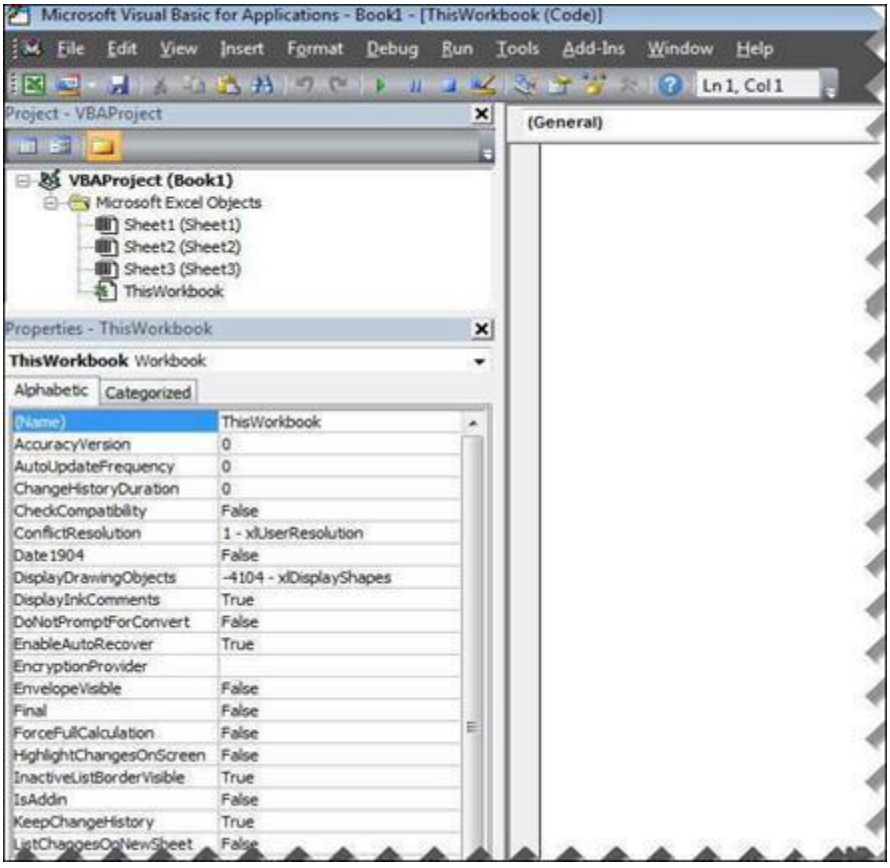


Figure 5.17: Excel VBE Editor

### 5.6.4 Glassfish Server

Glassfish Server enables users to deploy web services and java enterprise edition application.

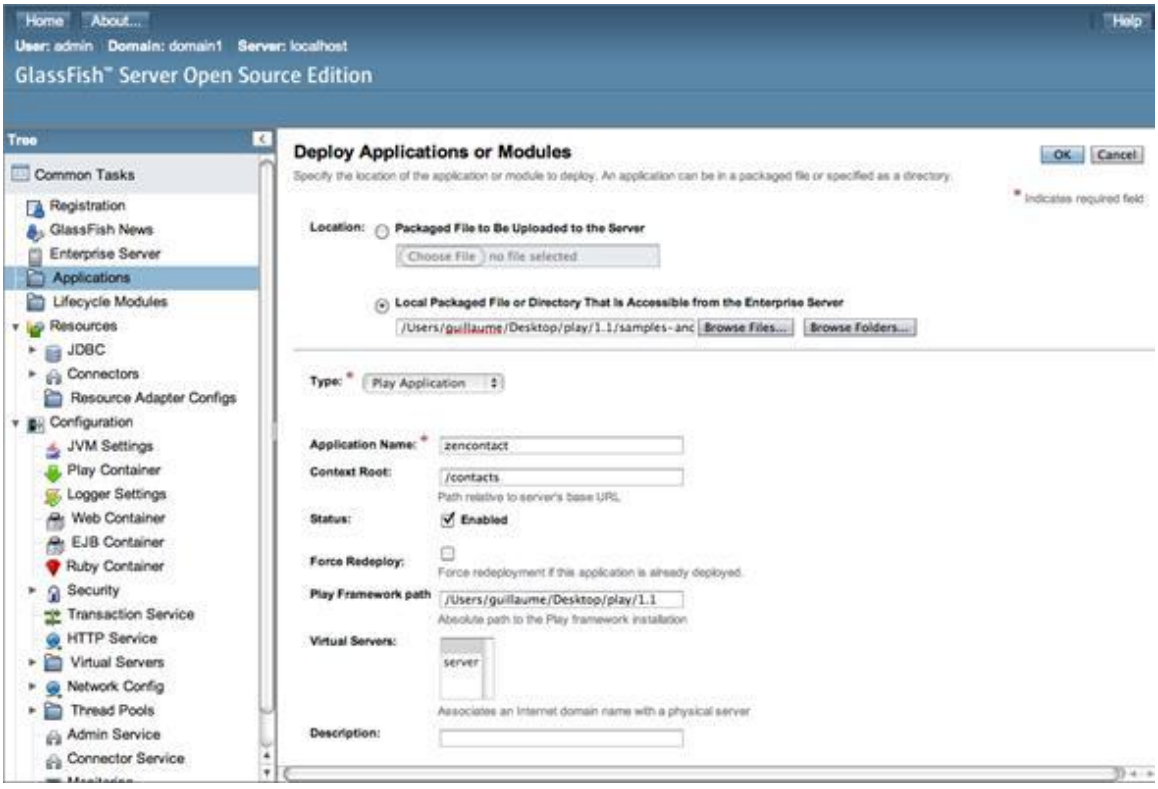


Figure 5.18: Glassfish Server Interface

### 5.6.5 Web Service Database Frameworks

#### 5.6.5.1 Java Database Connectivity

Business Administration Tools manage a large number of projects simultaneously. Further each project has to go through multiple parameters in each phase of project life cycle, thus consisting of a large amount of information of a tool.

When a user requires these details then web service populates it in the front end. Web service acts as middleware which provides interoperability and low cost communication environment. So a web service database framework is needed to directly connect with

database. Presently we are using JDBC database framework to connect with DB [20], [21].


Figure 5.19: Java Database Connectivity

## 5.7 Importance of Business Administration Tool

Business Administration is the cycle of evaluating plans and policies with effective procedures that model business in future. It assures that projects sphere is defined and outlined accurately so as to accomplish the business goals. Therefore, business tools are needed to take care of all business administration and management related task and ensure business administrator that things are running smoothly.

# Chapter-6

# Conclusions

## 6.1 Conclusion

Every organization requires management of information and it is a tedious work but user can do this task more efficiently by Budget Editor Tool. Report is the best feature of this tool because user can get all the required data together with some pre-requisite conditions and pre-defined rules. User can get overall review of the data and can do their task easily. This tool is quite efficient since it maintains huge storage of data, server connections are well maintained and user can see all the data about every organization, every project, and each team in one tool itself.

## 6.2 Summary of Contributions

Business Tools are used to maintain business data, project plans and change management. Effective management and technical support play a key role in accomplishing this task. However, some of managerial tasks like planning project, assigning task to different teams, tracking status of projects and checking resource availability, if performed manually that was not feasible at high level organizations. This research introduce the idea to make tool to maintain huge storage of data, server connection are well maintained. It makes task so easy for users because they get all required information in single tool. Project Management or Top management can analyze the overall information effortlessly.

## 6.3 Future Scope

We can modify the tool as per user requirement; we can do changes as per our requirement and add some more features and functionalities for better performance. We will work on code optimization and reduce time complexity if code can be optimized for

same task and get the same result with optimized form and reducing number of loops, repetitive code processing for reducing time complexity.

Budget Editor Tool is used by ST employees from India and outside of India. So that they have to maintain some standards of tool and we have to try to make it more efficient and better.

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