Low Level Design

Analyze International Debt Statistics

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Contents

1. Introduction

1.1 What is Low-Level design document?

The goal of the LDD or Low-level design document (LLDD) is to give the internal logic design of the actual program code for Analyze International Debt Statistics dashboard. LDD describes the class diagrams with the methods and relations between classes and programs specs. It describes the modules so that the programmer can directly code the program from the document.

1.2 Scope

Low-level design (LLD) is a component-level design process that follows a step-by-step refinement process. The process can be used for designing data structures, required software architecture, source code and ultimately, performance algorithms. Overall, the data organization may be defined during requirement analysis and then refined during data design work.

2. Architecture
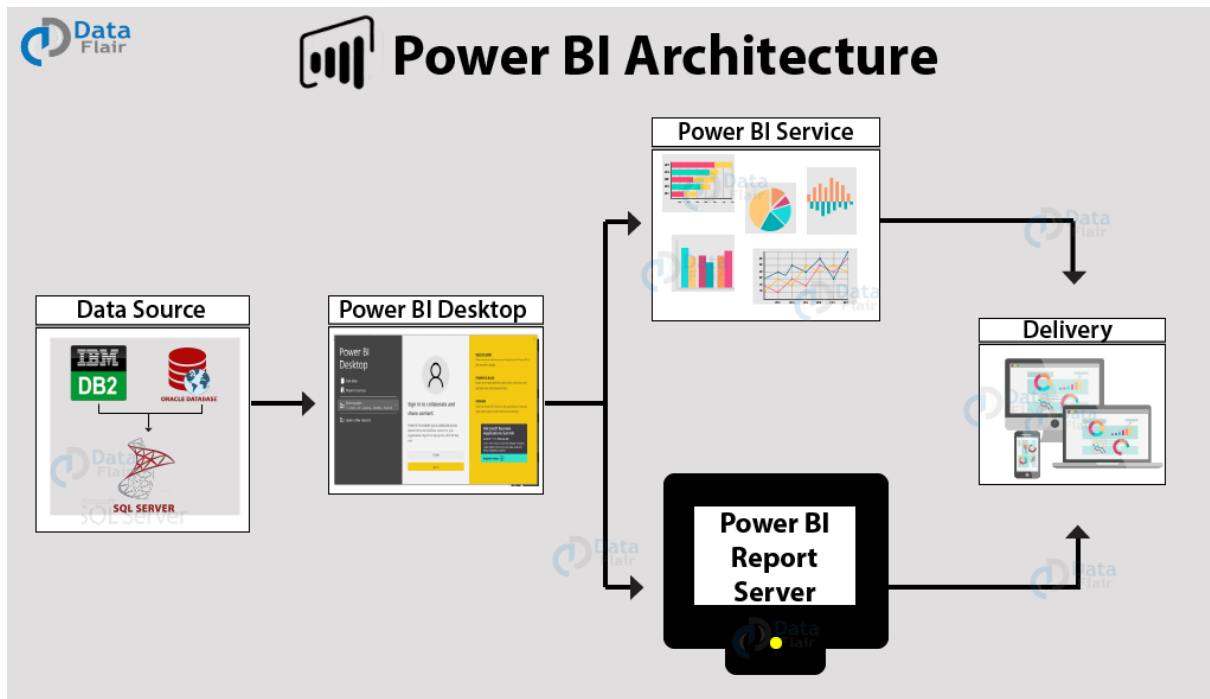
Power BI is a business suite that includes several technologies that work together. To deliver outstanding business intelligence solutions, Microsoft Power BI technology consists of a group of components such as:

- Power Query (for data mash-up and transformation)
- Power BI Desktop (a companion development tool)
- Power BI Mobile (for Android, iOS, Windows phones)
- Power Pivot (for in-memory tabular data modeling)
- Power View (for viewing data visualizations)
- Power Map (for visualizing 3D geo-spatial data)
- Power Q&A (for natural language Q&A)

In simple terms, a Power BI user takes data from various data sources such as files, Azure source, online services, DirectQuery or gateway sources. Then, they work with that data on a client development tool such as Power BI Desktop. Here, the imported data is cleaned and transformed according to the user's needs.

Once the data is transformed and formatted, it is ready to use in making visualizations in a report. A report is a collection of visualizations like graphs, charts, tables, filters, and slicers.

Moving on to the chain of processes, you can publish the reports created in Power BI desktop on two kinds of platforms; Power BI Service and Power BI Report Server.

Power BI Service is a cloud-based public platform whereas Power BI Report Server is an on-premise platform protected by firewall security.

You can create dashboards on these platforms by pinning visualizations from your published reports. Lastly, share your dashboards and reports and collaborate with other users from your organization or outside, using delivery options like a web-browser, Power BI on iPad, tablets, laptops, phones, etc.

Components of Power BI Architecture

Let us learn about the components of Power BI architecture in detail.

1. DATA SOURCES

An important component of Power BI is its vast range of data sources. You can import data from files in your system, cloud-based online data sources or connect directly to live connections. If you import from data on-premise or online services there is a limit of 1 GB. Some commonly used data sources in Power BI are:

Excel
Text/CSV
XML
JSON
Oracle Database
IBM DB2 Database
MySQL Database
PostgreSQL Database
Sybase Database
Teradata Database
SAP HANA Database
SAP Business Warehouse server
Amazon Redshift
Impala
Google BigQuery (Beta)
Azure SQL Database
Salesforce Reports
Google Analytics
Facebook
GitHub
You must learn about Power BI Data Sources thoroughly

2. POWER BI DESKTOP

Power BI Desktop is a client-side tool known as a companion development and authoring tool.
This desktop-based software is loaded with tools and functionalities to connect to data sources, transform data, data modeling and creating reports.
You can download and install Power BI Desktop in your system for free. Using Power BI Desktop features, one can do data cleansing, create business metrics and data models, define the relationship between data, define hierarchies, create visuals and publish reports.

3. POWER BI SERVICE

Power BI Service is a web-based platform from where you can share reports made on Power BI Desktop, collaborate with other users, and create dashboards.
It is available in three versions:
Free version
Pro version
Premium version

Power BI Service is also known as, "Power BI.com", "Power BI Workspace", "Power BI Site" and "Power BI Web Portal". This component also offers advanced features like natural language Q&A and alerts.

4. POWER BI REPORT SERVER

The Power BI Report Server is similar to the Power BI Service. The only difference between these two is that Power BI Report Server is an on-premise platform. It is used by organizations who do not want to publish their reports on the cloud and are concerned about the security of their data. Power BI Report Server enables you to create dashboards and share your reports with other users following proper security protocols. To use this service, you need to have a Power BI Premium license.

Want to learn more about it? Check out the Power BI Report Server Tutorial

5. POWER BI GATEWAY

This component is used to connect and access on-premise data in secured networks. Power BI Gateways are generally used in organizations where data is kept in security and watch. Gateways help to extract out such data through secure channels to Power BI platforms for analysis and reporting.

Wait! Have you checked our Tutorial on Power BI Gateway

6. POWER BI MOBILE

Power BI Mobile is a native Power BI application that runs on iOS, Android, and Windows mobile devices. For viewing reports and dashboards, these applications are used.

7. POWER BI EMBEDDED

Power BI Embedded offers APIs which are used to embed visuals into custom applications.

3. Architecture Description

3.1. Data Description

The World Bank's International Debt Statistics (IDS) is a comprehensive database of information on the debt of developing countries. The data includes information on both external debt and domestic debt, as well as debt service indicators, such as interest payments and principal repayments.

The IDS covers over 190 economies, including both low- and middle-income countries, and provides data for a range of indicators The IDS covers over 190 economies, including both low- and middle-income countries, and provides data for a range of indicators.

3.2. Web Scrapping

Web scraping is a technique to automatically extract content and data from websites using bots. It is also known as web data extraction or web harvesting. Web scrapping is made simple now days, many tools are used for web scrapping. Some of python libraries used for web scrapping are Beautiful Soup, Scrapy, Selenium, etc.

3.3. Data Transformation

In the Transformation Process, we will convert our original datasets with other necessary attributes format. And will merge it with the Scrapped dataset.

3.4. Data Insertion into Database

a. Database Creation and connection - Create a database with name passed. If the database is already created, open the connection to the database.

b. Table creation in the database.

c. Insertion of files in the table

3.5 Make the SQL connection with Python

To connect to a MySQL database from Python, you need to install a MySQL database connector, such as PyMySQL or MySQL Connector/Python. Once you have the connector installed, you can connect to the database using the following steps:

Import the connector: Import the MySQL database connector in your Python script. For example, if you are using PyMySQL, you can import it like this:

python

```
import pymysql
```

Establish a connection: Establish a connection to the database by creating a connection object. You need to pass the following parameters to the connect function:

host: the hostname or IP address of the database server

user: the username for the database

password: the password for the user

db: the name of the database you want to connect to

Here's an example of how to connect to a database using PyMySQL:

sql

```
connection = pymysql.connect(
    host='hostname',
    user='username',
    password='password',
    db='database_name'
)
```

Create a cursor: To execute SQL statements, you need to create a cursor object. The cursor is used to traverse the records in a result set. Here's an example of how to create a cursor:

scss

```
cursor = connection.cursor()
```

Execute SQL statements: You can execute SQL statements using the cursor object. For example, to execute a SELECT statement:

scss

```
sql = 'SELECT * FROM table_name'
cursor.execute(sql)
result = cursor.fetchall()
```

Commit changes: If you make any changes to the database, you need to commit the changes to save them.

scss

```
connection.commit()
```

Close the connection: Finally, when you're done working with the database, it's a good practice to close the connection.

go

```
connection.close()
```

These are the basic steps to connect to a MySQL database from Python and execute SQL statements. You can refer to the official documentation of the MySQL database connector you are using for more advanced usage and features.

3.5. Export Data from Database

Data Export from Database - The data in a stored database is exported as a CSV file to be used for

Data Pre-processing.

3.6 Deployment.

1. Publish to the Power BI service: This option allows users to access the report or dashboard from any device with an internet connection, either by logging into the Power BI service or by embedding the report or dashboard into another application or website.

2. Share with colleagues: This option allows users to share a report or dashboard with specific individuals within their organization. The report or dashboard can be shared through email or a link, and can be accessed by the recipients through the Power BI service or by downloading the Power BI Desktop application.

3. Embed in an application or website: This option allows users to embed a report or dashboard into another application or website using the Power BI API or embedding code. This allows the report or dashboard to be accessed within the context of the application or website, and can be used to create custom BI solutions for specific business needs.

4. Publish to a report server: This option allows users to publish a Power BI report to an on-premises report server, such as SQL Server Reporting Services (SSRS). This allows the report to be accessed within the organization's network, and can be used to create custom BI solutions or to integrate with existing reporting systems.