Low Level Design

Analyze International Debt Statistics

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DOCUMENT CONTROL

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VERSION	DATE	AUTHOR	COMMENTS
0.1	18-May - 2024	Author 1	Introduction and architecture defined
0.2	20 - May - 2024	Author 2	Architecture & Architecture description appended and updated.
0.3	23-May- 2024	Author 1	Updated Dashboard Visual.

Approval Status:

VERSION	REVIEW DATE	REVIEWED BY		APPROVED BY	COMMENTS

Contents

1. Introduction

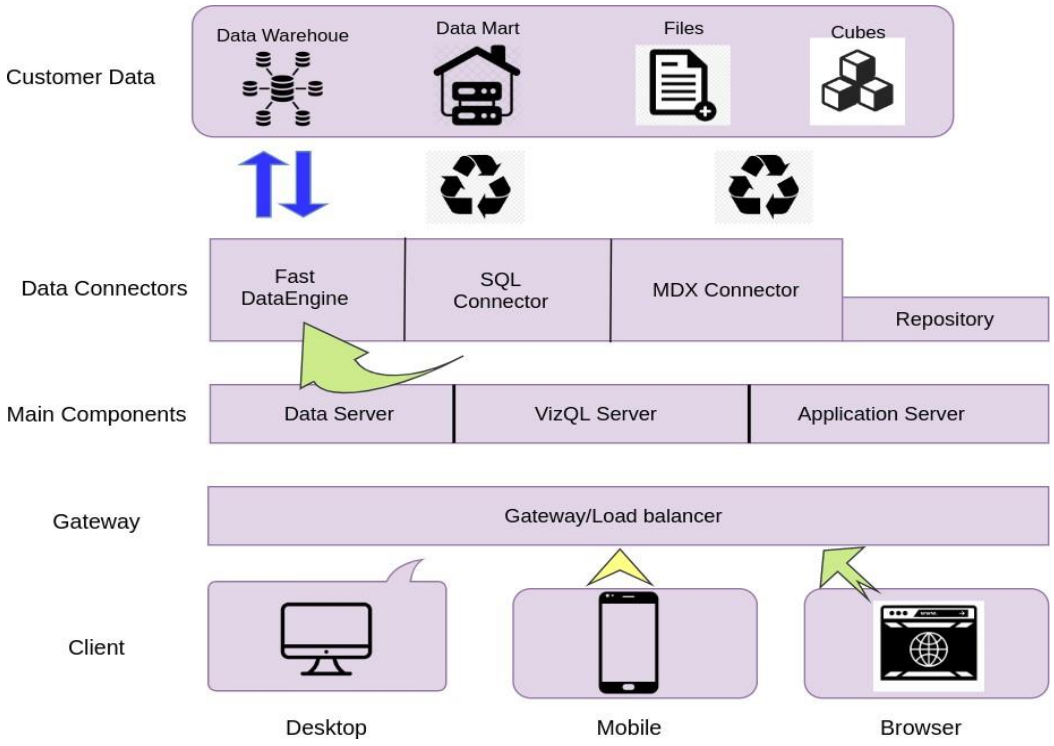
1.1 What is Low-Level design document?

The Low-Level Design (LLD) document provides a detailed description of the internal logic of the actual program code for the Analyze International Debt Statistics project. It includes class diagrams with methods and relations between classes, as well as program specifications. This document is meant to guide programmers to code the application directly from the details provided.

1.2 Scope

Low-Level Design (LLD) focuses on component-level design, refining data structures, software architecture, source code, and performance algorithms. The design process begins with requirement analysis and continues through data design work, ultimately defining the internal logic and structure necessary for implementation.

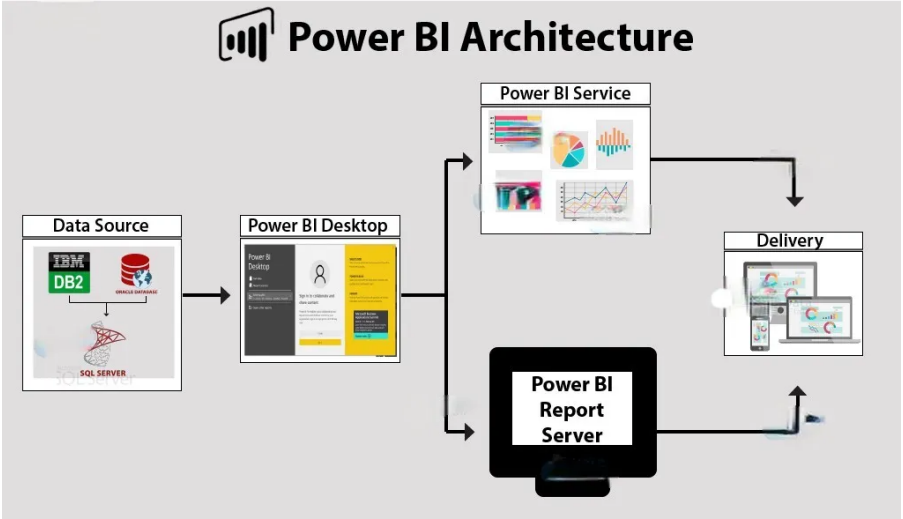
2. Architecture



Power Bi Server Architecture

Power Bi has a highly scalable, n-tier client-server architecture that serves mobile clients, web clients and desktop-installed software. Power Bi Server architecture supports fast and flexible deployments.

The following diagram shows PowerBI Server's architecture:



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

1.Data Sources : An essential 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.

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, model, and create 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 where you can share reports made on Power BI Desktop, collaborate with other users, and create dashboards.

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. Therefore, it is used by organizations who do not want to publish their reports on the cloud and are concerned about their data security. 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.

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.

6. **Power BI Mobile:** Power BI Mobile is a native Power BI application 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 dataset includes World Bank Debt Statistics for countries receiving debt, detailing the year of debt, indicator code, and name. Key fields are:

- Country Name: List of countries worldwide.
- Country Code: Short form or code for each country.
- Indicator Name: Types of indicators related to debt.
- Indicator Code: Short form or code for each indicator.
- Year: Year of debt issuance.
- Debt ($): Amount of debt in USD.

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.

The transformation process involves:

- Cleaning and normalizing the dataset.
- Merging additional attributes and datasets as required.
- Creating calculated columns and measures using DAX in Power BI.

3.4. Data Insertion into Database

Steps for data insertion:

a. **Database Creation and Connection:** Create or connect to an existing database.
b. **Table Creation:** Define tables in the database to store data.
c. **Data Insertion:** Insert cleaned and transformed data into the database tables.

3.5 Make the SQL connection and set up the data source

Step 1: Configuring Power Bi

Launch Power Bi on your workstation and select SQL Server from the connect column on the left. This will open a dialogue box where you need to provide the connection details for SQL Server.

To connect with Power Bi, you will need to provide information about the server which hosts your database. If you want to connect to a contained database, you can also specify the name of the database.

Steps to configure Power BI with SQL Server:

- Launch Power BI and select SQL Server from the connect options.
- Provide Connection Details such as server name and database name to establish a connection.

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.

- Data Export: Extract data from the database and save it as CSV files.

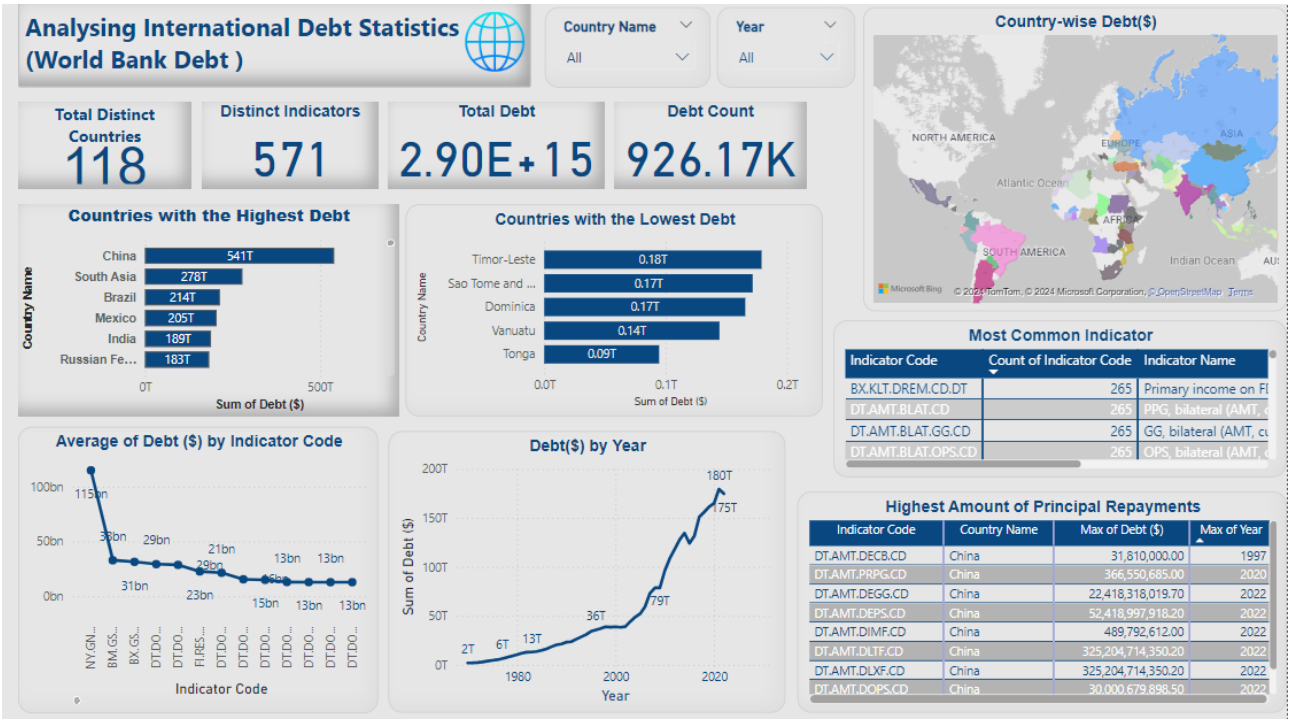
3.6 Deployment.

Deployment involves setting up Power BI pipelines and deploying content from one stage to another.

Steps include:

- Prepare Power BI Deployment Pipeline to manage content stages.
- Deploy Dashboards and Reports to Power BI Service.
- Set Up Permissions and share reports securely with stakeholders.

3.7 Dashboard Visual:



4. Unit Test Cases

TEST CASE DESCRIPTION	EXPECTED RESULTS
Country name slicer	Dropdown displays a list of all countries when clicked.
Year Slicer	Dropdown displays a list of years from 1970 to 2022.
Total Debt	Displays total calculated debt amount in USD.
Total Countries	Displays the count of countries with debt.
Countries with Highest and Lowest debt	Displays top 5 countries with highest and lowest debt in USD.
Relation between Debt amount and Year	Displays a time series graph of debt amount vs. year.
Highest Principal Debt Repayment	Displays countries with the highest principal repayment.

Additional Details

- **Data Sources:** Data is sourced from the World Bank International Debt Statistics.
- **Transformation Tools:** Data transformation is conducted using Power BI Desktop.
- **Database:** SQL Server is used for data storage and retrieval.
- **Reporting and Visualization:** Power BI Service and Desktop are utilized for creating and sharing reports.

This Low-Level Design document aims to ensure that all components and steps of the project are well-defined, providing a clear path for implementation and ensuring a comprehensive understanding of the data flow and system architecture.