CROP PRODUCTION ANALYSIS

Low Level Design

Domain: Business Intelligence

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Contents

Introduction

What is Low-Level Design Document?

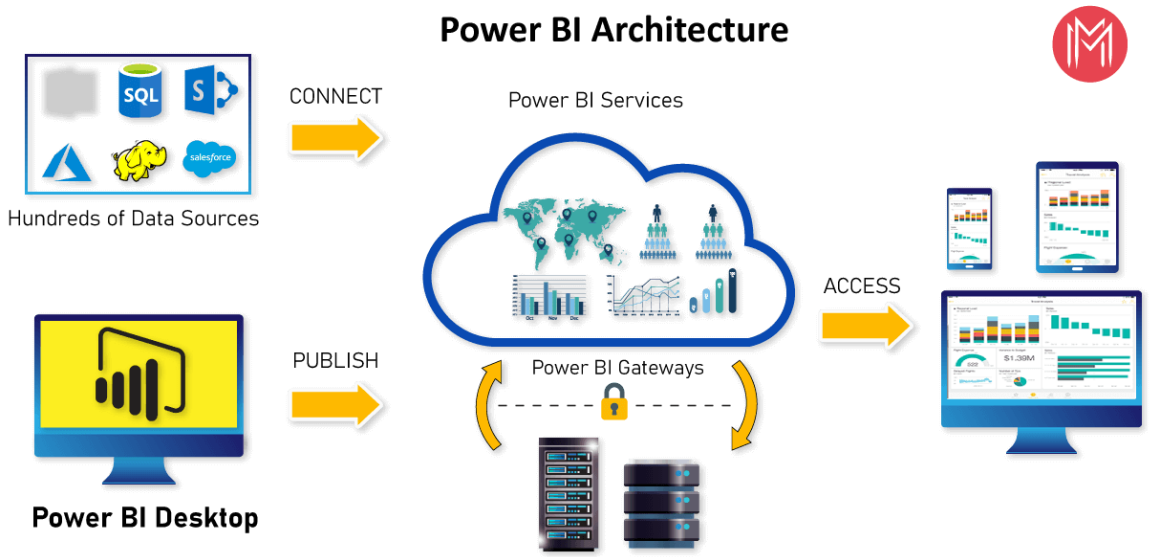
The goal of the LDD or Low-level design document (LLDD) is to give the internal logic design of the actual program code for the Crop Production Analysis dashboard. LDD describes the class diagrams with the methods and relations between classes and programs specs. It describes the modules so that the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

Scope

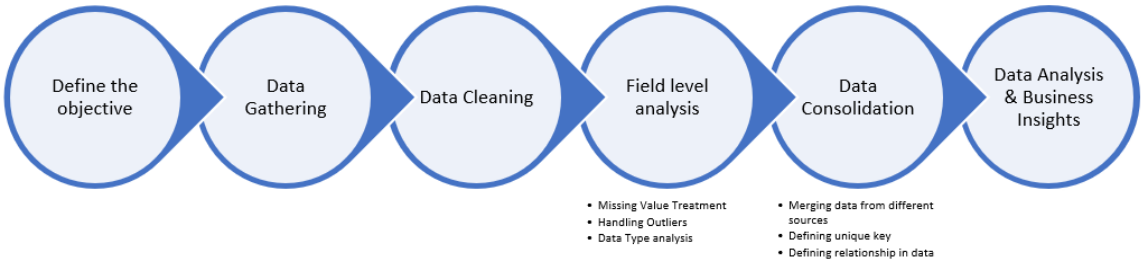
Low-level design (LLD) is a component-level design process that follows a step-by-step refinement process. The process can be used for designing data structures, required software architecture, source code and ultimately, performance algorithms. Overall, the data organization may be defined during requirement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

Architecture

Power BI



Process Flow



Microsoft Power BI Architecture:

Power BI is a business platform that includes several technologies to work together. It delivers outstanding business intelligence solutions. Power BI Architecture contains four steps.

Let us discuss these four steps giving insightful information about each one of them.

1. Data Integration
2. Data Transforming
3. Report & Publish
4. Creating and Dashboard

1. Data Integration:

Data is extracted from different sources which can be different servers or databases. The data from various sources can be in different types and formats. If you import the file into the Power BI, it compresses the data sets up to 1GB, and it uses a direct query if the compressed data sets exceed more than 1GB. Then the data is integrated into a standard format and stored at a place called a staging area. There are two choices for big data sets. They are as follows.

- Azure Analytics Services
- Power BI premium

2. Data Transforming:

Integrated data is not ready to visualize data because the data should be transformed. To transform the data, it should be cleaned or pre-processed. For example, redundant or missing values are removed from the data sets. After data is pre-processed or cleaned, business rules are applied to transform the data. After processing the data, it is loaded into the data warehouse.

3. Report & Publish:

After sourcing and cleaning the data, you can create the reports. Reports are the visualization of the data in the form of slicers, graphs, and charts. Power BI offers a lot of custom visualization to create the reports. After creating reports, you can publish them to power bi services and also publish them to an on-premise power bi server.

4. Creating Dashboards:

You can create dashboards after publishing reports to Power BI services, by holding the individual elements. The visual retains the filter when the report is holding the individual elements to save the report. Pinning the live report page allows the dashboard users to interact with the visual by selecting slicers and filters.

Steps to Create Views, Dashboards, and a Story

Data Preprocessing:

- Handle missing values.
- Convert data types if necessary.
- Feature engineering, if needed (e.g., calculate year-on-year growth).

Exploratory Data Analysis (EDA):

- Summary statistics.
- Visualizations for insights.
  - Trend of crop production over years.
  - Production comparison across states and districts.
  - Seasonal production trends.
  - Crop-wise production analysis.

Dashboards:

- Interactive dashboards using tools like Tableau, Power BI, or Python libraries (Plotly Dash, Streamlit).
  - Overview dashboard showing total production, top crops, top states.
  - Detailed dashboards for each state and crop category.
  - Trend analysis dashboard showing yearly and seasonal trends.

Predictive Analysis:

- Build a machine learning model to predict crop production.
- Identify key indicators influencing crop production using feature importance.

Story:

- A narrative that explains the key insights derived from the data.
- Highlight trends, patterns, and anomalies.
- Present predictions and their implications.
- Discuss potential actions for stakeholders based on insights.

Deployment Strategy

1. Infrastructure Setup

- **Hardware and Software Requirements**: Ensure that the system running Power BI meets the necessary hardware and software requirements.
- **Data Storage**: Use cloud storage solutions like Azure, AWS, or Google Cloud for storing the large dataset. Ensure data security and regular backups.

2. Data Integration

- **Data Sources**: Connect Power BI to various data sources, including databases, CSV files, and live data feeds.
- **Data Refresh**: Schedule regular data refreshes to ensure the dashboard displays up-to-date information.

3. Dashboard Development

- **User Interface Design**: Create a user-friendly interface with intuitive navigation. Use filters and slicers to allow users to customize their views.
- **Visualization Types**: Utilize various visualizations (charts, graphs, maps) to present data effectively.
- **Interactivity**: Ensure that the dashboard is interactive, allowing users to drill down into data for detailed insights.

4. Testing and Validation

- **User Testing**: Conduct user testing sessions to gather feedback and make necessary adjustments.
- **Performance Testing**: Ensure the dashboard performs well under different load conditions.

5. Deployment

- **Publish Dashboard**: Publish the Power BI dashboard to the Power BI Service.
- **Access Management**: Set up user roles and permissions to control who can view or edit the dashboard.
- **Mobile Access**: Ensure the dashboard is accessible on mobile devices for on-the-go insights.

6. Monitoring and Maintenance

- **Performance Monitoring**: Regularly monitor the performance and usage of the dashboard.

- **Updates and Enhancements**: Continuously update the dashboard with new data and enhance features based on user feedback.

Conclusion

The deployment of this dashboard ensures that stakeholders have access to real-time, actionable insights, driving efficiency and innovation in the agriculture business domain. With regular updates and continuous improvements, the dashboard will remain a valuable tool for decision-making and collaboration in the agri-food sector.