Low Level Design

Supply Chain Segmentation Analysis

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DOCUMENT CONTROL

Change Record:

VERSION	DATE	AUTHOR	COMMENTS
0.1	02- May - 2025	Shubham temburne	Introduction and architecture defined
0.2	02 - May - 2025	Shubham tembhurne	Architecture & Architecture description appended and updated.

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 the Us Pollution 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.

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.

1.3 Project Introduction

The goal of this project is to analyze the air pollution is the contamination of air due to the presence of substances in the atmosphere that are harmful to the health of humans and other living beings, or cause damage to the climate or to materials.

2.Problem Statement

AtliQ Mart is a growing FMCG (fast moving consumer Good) manufacturer headquartered in Gujarat, India. It is currently operational in three cities Vadodara, Surat and Ahmedabad. They want to expand to other metro/tier1 cities in the next 2 years.

AtliQ Mart is currently facing a problem where a few key customers did not extend the annual contract due to service issues. It is speculated that some of the essential products were either not delivered on time or not delivered in full over a continued period, which could have resulted in bad customer service. Management wants to fix this issue before expanding to other cities and requested their supply chain analytics team to track the 'On time' and 'In Full' delivery service level for all the customers on a daily basis so that they can respond swiftly to these issues.

The Supply Chain team decided to use a standard approach to measure the service level in which they will measure 'on-time delivery (OT) %', 'In-full delivery (IF) %' and OnTime in full (OTIF) % of the customer orders on a daily basis against the target service level set for each customer**.**

2. Dataset Information

Generally, an order contains information about the order. Who placed the order, what time they placed it, the shipping address associated, the billing address, payment method, when it was fulfilled, etc. It often does not contain any information about what was ordered.

The order line generally contains information about what was ordered, this is done because a single order can have multiple items in it. So, the order line would specify the item ordered, the quantity ordered and the price charged, and there would be one line for each different item ordered.

Example: Let's say you order 2 sweaters and 1 jogger from Ajio. A unique order ID is generated for all these items. Here Sweaters and Jogger is an order line.

Line Fill Rate is an important metric for the supply planning team to understand how many lines they shipped out of the total lines ordered. This metric does not consider the delivery time of the order.

Volume fill rate or case fill rate is a similar metric useful for the supply planning team to understand the total quantity they are able to ship for a customer per order or for a given period of time.

On Time delivery %: OTD is a calculation of the number of shipments delivered on time to the customer in relation to the total number of orders shipped

Full delivery %: This measure is measured at the order level. It determines if an order is delivered in full as per the requested quantity by the customer.

OTIF%: OTIF or On-Time In-Full is a KPI used for measuring how many orders were delivered on time and in full. It helps to assess whether the business was able to deliver every item in the order

on or before the expected date of delivery. This metric is mainly used as a delivery KPI, although it can also be applied throughout the supply chain.
This project contains these datasets:

dim_customers.csv
dim_products.csv
dim_date
dim_targets_orders
fact_order_lines.csv
fact_orders_aggregate.csv

Column Description for fact_order_lines: This table contains all information about orders and each item inside the orders.

1. order_id: Unique ID for each order the customer placed
2. order_placement_date: It is the date when the customer placed the order
3. customer_id: Unique ID that is given to each of the customers
4. product_id: Unique ID that is given to each of the products
5. order_qty: It is the number of products requested by the customer to be delivered
6. agreed_delivery_date: It is the date agreed between the customer and AtliQ Mart to deliver the products
7. actual_delivery_date: It is the actual date AtliQ Mart delivered the product to the customer
8. delivered_qty: It is the number of products that are actually delivered to the customer

Column Description for fact_orders_aggregate: This table contains information about OnTime, InFull and OnTime Infull information aggregated at the order level per customer

1. order_id: Unique ID for each order the customer placed

2. customer_id: Unique ID that is given to each of the customers

3. order_placement_date: It is the date when the customer placed the order

4. on_time: '1' denotes the order is delivered on time. '0' denotes the order is not delivered on time.

5. in_full: '1' denotes the order is delivered in full quantity. '0' denotes the order is not delivered in full quantity.

6: otif: '1' denotes the order is delivered both on time and in full quantity. '0' denotes the order is either not delivered on time or not in full quantity

3. Architecture

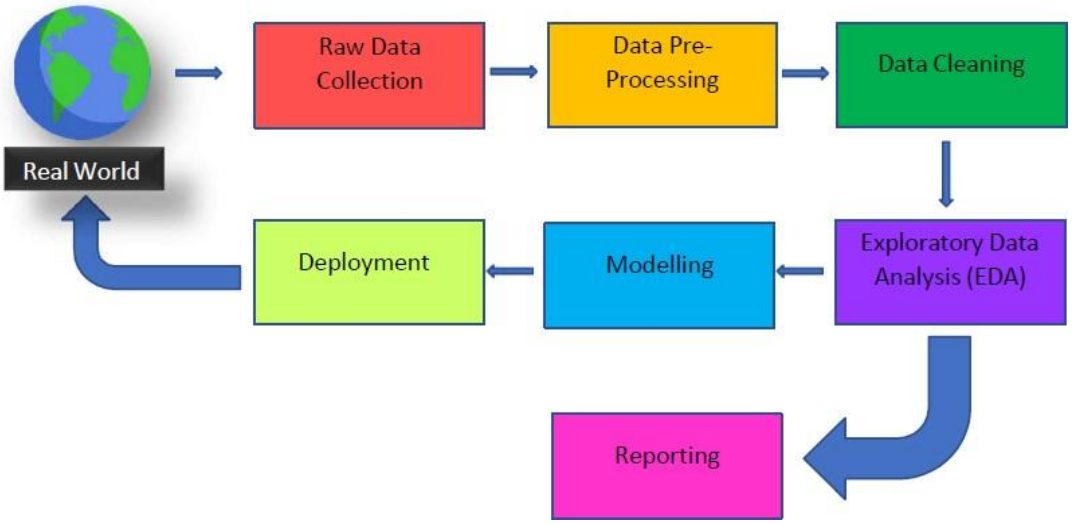


Tableau Server Architecture

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

The following diagram shows Tableau Server's architecture:

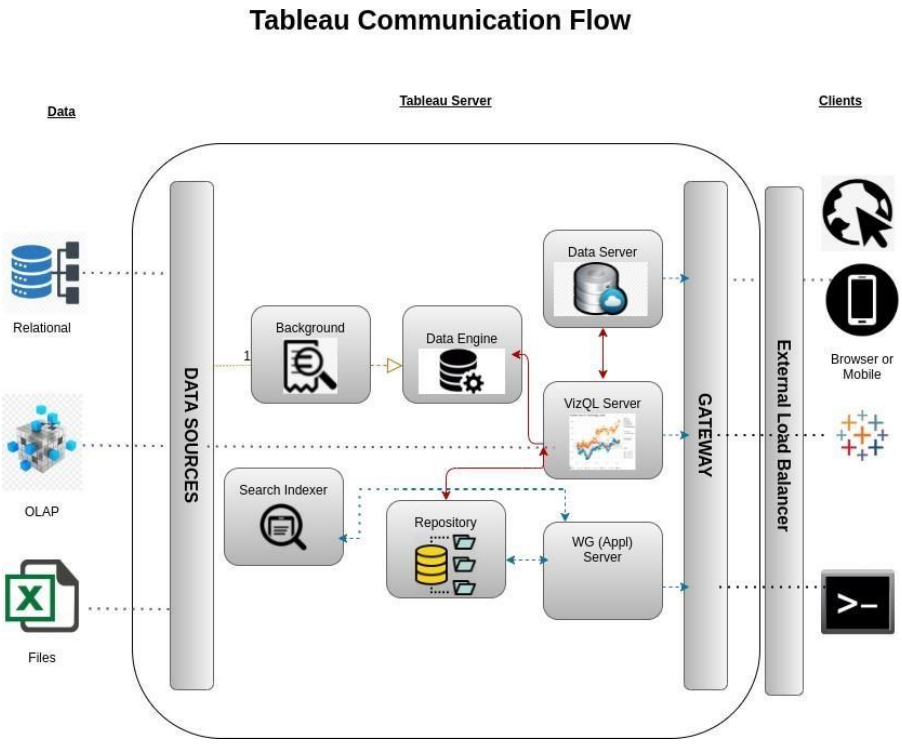


Tableau Server is internally managed by the multiple server processes.

1). Gateway/Load Balancer

It acts as an Entry gate to the Tableau Server and also balances the load to the Server if multiple Processes are configured.

2) Application Server: -

Application Server processes (wgserver.exe) handle browsing and permissions for the Tableau Server web and mobile interfaces. When a user opens a view in a client device, that user starts a session on Tableau Server. This means that an Application Server thread starts and checks the permissions for that user and that view.

3) Repository: -

Tableau Server Repository is a PostgreSQL database that stores server data. This data includes information about Tableau Server users, groups and group assignments, permissions, projects, data sources, and extract metadata and refresh information.

4) VIZQL Server: -

Once a view is opened, the client sends a request to the VizQL process (vizqlserver.exe). The VizQL process then sends queries directly to the data source, returning a result set that is rendered as images and presented to the user. Each VizQL Server has its own cache that can be shared across multiple users

5) Data Engine: -

It Stores data extracts and answers queries.

6) Backgrounder: -

The backgrounder Executes server tasks which includes refreshes scheduled extracts, tasks initiated from tabcmd and manages other background tasks.

7) Data Server: -

Data Server Manages connections to Tableau Server data sources

It also maintains metadata from Tableau Desktop, such as calculations, definitions, and groups.

4.Architecture Description

1. Raw Data Collection

The Dataset was taken from Kaggle Provided.

2. Data Pre-Processing

Before building any model, it is crucial to perform data pre-processing to feed the correct data to the model to learn and predict. Model performance depends on the quality of data fed to the model to train.
This Process includes)
Handling Null/Missing Values
b) Handling Skewed Data
c) Outliers Detection and Removal

3. Data Cleaning

Data cleaning is the process of fixing or removing incorrect, corrupted, incorrectly formatted, duplicate, or incomplete data within a dataset.
a) Remove duplicate or irrelevant observations
b) Filter unwanted outliers
c) Renaming required attributes

4. Reporting

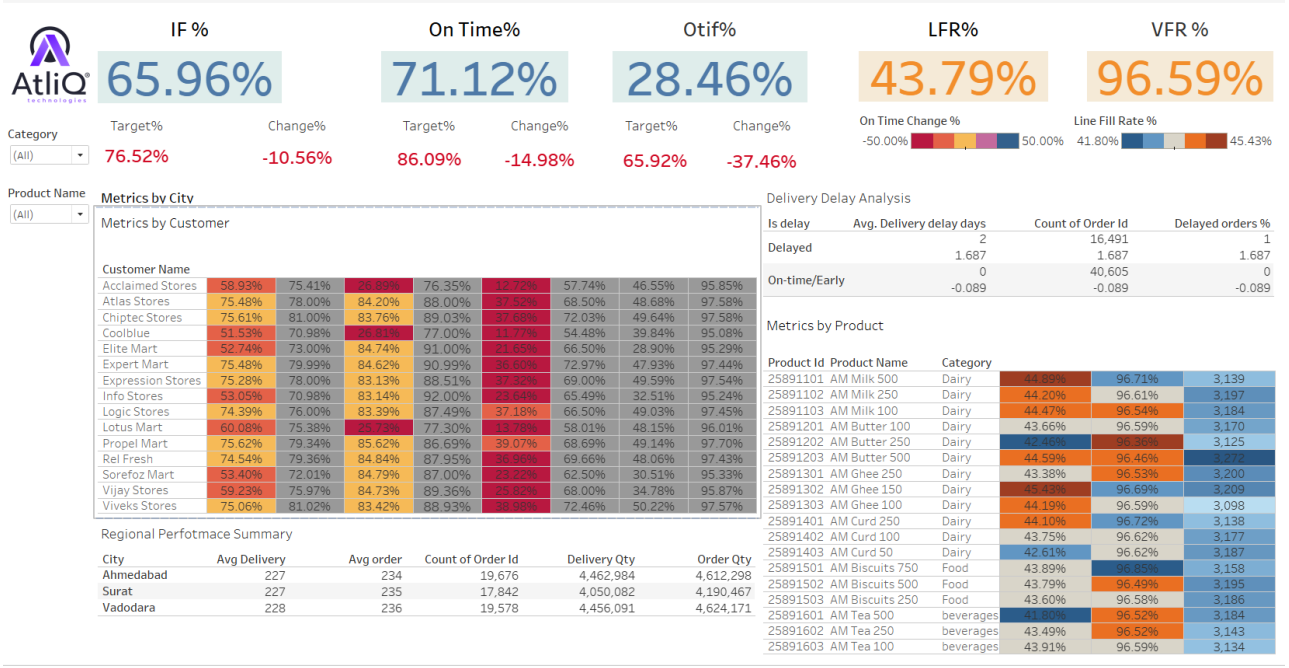
Reporting is a most important and underrated skill of a data analytics field. Because being a Data Analyst you should be good in the easy and self-explanatory report because your model will be used by many stakeholders who are not from a technical background. a) High-Level Design Document (HLD) b) Low-Level Design Document (LLD) c) Architecture d) Wireframe e) Detailed Project Report f) PowerPoint Presentation

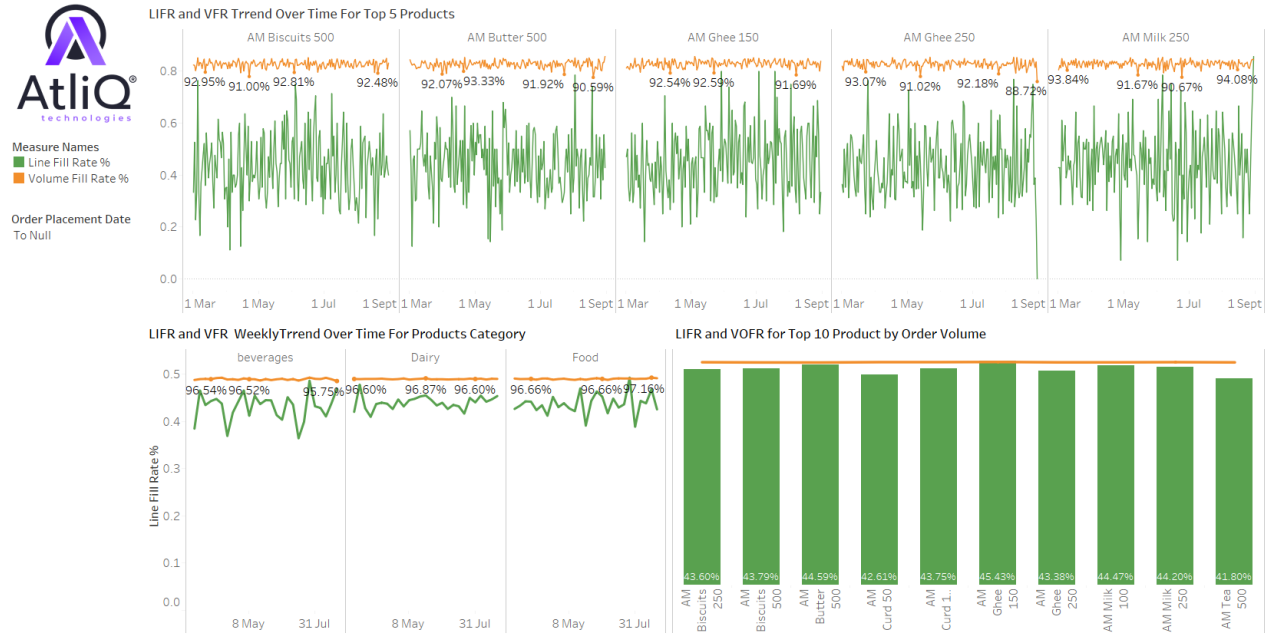
5. Modelling Data

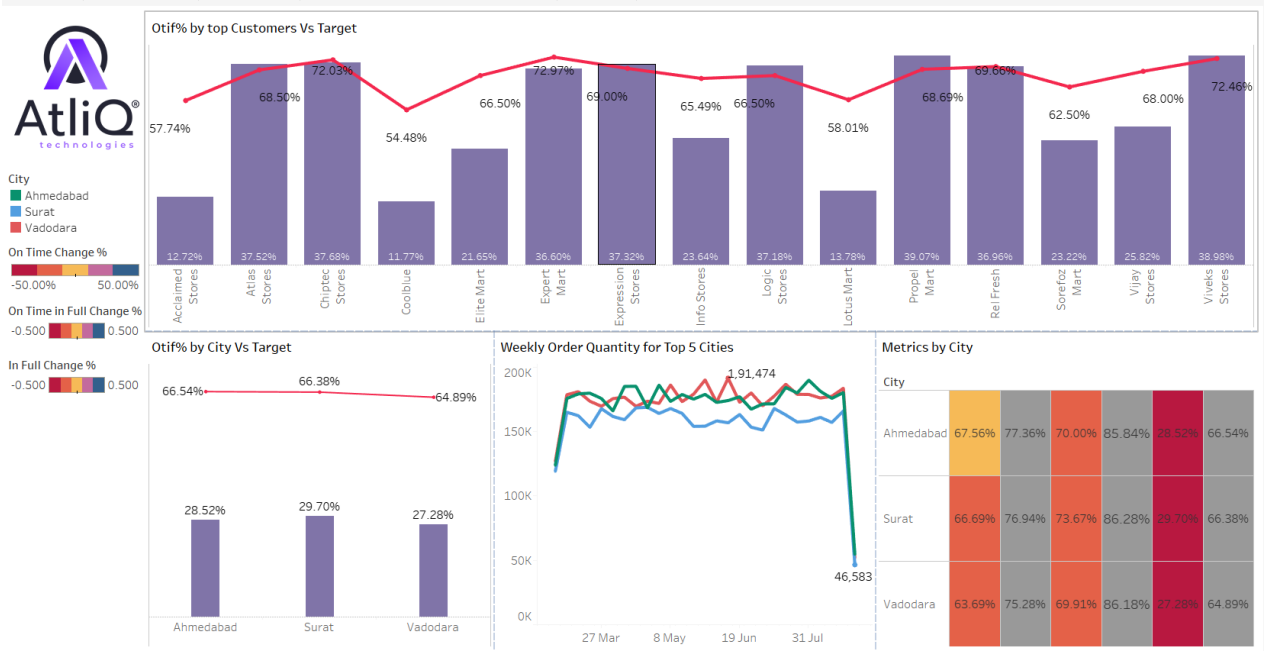
Modelling is the process of analyzing the data objects and their relationship to the other objects. It is used to analyze the data requirements that are required for the business processes. The data models are created for the data to be stored in a database. The Data Model's main focus is on what data is needed and how we have to organize data rather than what operations we have to perform.

6. Deployment

We created a Tableau Dashboard




AtliQ technologies
Measure Names
Line Fill Rate %
Volume Fill Rate %
Order Placement Date
To Null
LIFR and VFR Trrend Over Time For Top 5 Products
AM Biscuits 500
AM Butter 500
AM Ghee 150
AM Ghee 250
AM Milk 250
LIFR and VFR WeeklyTrrend Over Time For Products Category
beverages
Dairy
Food
Line Fill Rate %
LIFR and VOFR for Top 10 Product by Order Volume


AtliQ technologies
City
Ahmedabad
Surat
Vadodara
On Time Change %
On Time in Full Change %
In Full Change %
Otif% by top Customers Vs Target
Otif% by City Vs Target
Weekly Order Quantity for Top 5 Cities
Metrics by City
City
Ahmedabad
Surat
Vadodara