OLTP and OLAP Database Implementation Documentation

# 1. OLTP Database Context

The OLTP (Online Transaction Processing) database is designed to store and manage day-to-day operational data of an e-commerce platform. It is highly normalized and supports concurrent transactions. The key entities and their purpose include:

- Users: Stores user account details (e.g., name, contact, country, gender).

- Product: Holds product data, including name, weight, price, brand, etc.

- Brand and Category: Maintain classification of products.

- Product\_Category: Many-to-one relationship between products and categories.

- Cart: Temporarily holds selected products per user session.

- Orders and Order\_Item: Track user purchases and their associated products.

- Payment: Defines payment methods.

- Review: Captures user feedback on products.

- Products\_Inventory: Monitors inventory changes over time.

# 2. OLAP Database Context

The OLAP (Online Analytical Processing) database is optimized for complex analytical queries and decision support.

Key analytical questions answered:

- What revenue did the company receive from sales for the selected period?

- What products are available in what quantities now?

- Which product sells the most?

Key OLAP structures:

- Fact Tables: Fact\_Sales, Fact\_Inventory store measurable, quantitative data.

- Dimension Tables: Provide context (e.g., Dim\_Product, Dim\_Date, Dim\_Customer, etc.).

- Bridge Table: Product\_Category\_Bridge handles many-to-many relationships between products and categories.

# 3. Description of Schemas, Tables, Keys, Constraints, Relationships

OLTP Schema Overview

- Primary Keys: All major entities use SERIAL PKs.

- Foreign Keys: FK constraints establish entity relationships.

- Constraints: NOT NULL, UNIQUE, and enum constraints for data integrity.

- Relations:

\* One-to-Many: Users to Orders.

\* Many-to-Many: Products to Categories via Product\_Category.

\* One-to-One: Order\_Item per Product in an Order.

OLAP Schema Overview

- Primary Keys: Mostly SERIAL keys (e.g., brand\_key, category\_key).

- Foreign Keys: Dimensional FKs in fact tables (e.g., Fact\_Sales.product\_key → Dim\_Product.product\_key).

- Bridge Table: Product\_Category\_Bridge with composite PK for multi-category products.

- Unique Constraints: Enforce data deduplication in fact tables.

- Time Dimension: Dim\_Date enables temporal analysis.

# 4. Power BI Report Summary

The Power BI report connects to the OLAP database and includes:

Visuals and Their Insights

1. Sales by location and revenue (Line Chart)

2. Sales of individual products (Pie Chart)