## **Topic: Implementation of ETL Process for a Washing Machine Store**

### **Completed by: Kurapatau Tsimafei**

### **Group: C#**

## **Introduction**

The purpose of this course work was to implement an ETL (Extract, Transform, Load) system for an online washing machine store. The main goal was to create an architecture for transferring data from an OLTP (Online Transaction Processing) database to an OLAP (Online Analytical Processing) database, enabling analytics and business reporting.

## **General Architecture and Database Schemas**

### **OLTP Schema**

The OLTP database is designed for handling transactional data and includes the following tables:

1. **users** - information about users.
2. **washing\_machines** - information about washing machines.
3. **orders** - user orders.
4. **order\_items** - order items.
5. **reviews** - user reviews.
6. **addresses** - user addresses.
7. **payment\_methods** - payment methods.
8. **categories** - categories of washing machines.
9. **washing\_machine\_categories** - relationships between washing machines and categories.

**OLAP Schema**

The OLAP database is designed for analytics and includes the following tables:

1. **dim\_users** - information about users.
2. **dim\_washing\_machines** - information about washing machines.
3. **dim\_categories** - categories of washing machines.
4. **dim\_washing\_machine\_categories** - relationships between washing machines and categories.
5. **dim\_addresses** - user addresses.
6. **fact\_reviews** - user reviews.
7. **fact\_orders** - order information.

## **Main Functions and Procedures**

To handle data, the following main functions and procedures were created:

#### **1. add\_user**

This function allows the addition of a new user to the users table. It takes four parameters: p\_username, p\_email, p\_password, and p\_role. The function inserts a new record into the users table with these values.

#### **2. place\_order**

This function handles the creation of a new order. It takes four parameters: p\_user\_id, p\_total\_amount, p\_order\_status, and p\_items (a JSON array of order items). The function inserts a new order into the orders table and corresponding order items into the order\_items table.

#### **3. add\_category**

This function allows the addition of a new category to the categories table. It takes two parameters: p\_name and p\_description. The function inserts a new record into the categories table with these values.

#### **4. add\_washing\_machine**

This function allows the addition of a new washing machine to the washing\_machines table. It takes five parameters: p\_brand, p\_model, p\_price, p\_energy\_rating, and p\_capacity. The function inserts a new record into the washing\_machines table with these values.

#### **5. update\_order\_status**

This function updates the status of an existing order in the orders table. It takes two parameters: p\_order\_id and p\_order\_status. The function updates the order\_status field of the specified order.

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## **Roles and Privileges**

To manage access control and ensure the security of the database, roles and privileges were defined as follows:

### **1. user\_role**

This role is intended for regular users who need basic access to the database for common operations.

**Privileges**:

* Connect to the WashingMachine database.
* Use the public schema.
* Select, insert, and update data in the users, washing\_machines, orders, order\_items, reviews, addresses, and payment\_methods tables.
* Select data from the categories and washing\_machine\_categories tables.

### **2. admin\_role**

This role is intended for administrators who need full access to all tables in the database.

**Privileges**:

* Connect to the WashingMachine database.
* Use the public schema.
* Full privileges (select, insert, update, delete) on all tables in the public schema.

### **User Assignments**

To assign roles to specific users, the following SQL commands were used:

CREATE USER normal\_user WITH PASSWORD 'userpassword';

GRANT user\_role TO normal\_user;

CREATE USER admin\_user WITH PASSWORD 'adminpassword';

GRANT admin\_role TO admin\_user;

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## **Instructions**

### **1. Run OLTP.sql (OLTP database)**

This script will create the Online Transaction Processing (OLTP) database schema. It includes all the necessary tables, indexes, functions, and user roles for managing the washing machine store's transactional data.

### **2. Run insert\_data\_script.sql (OLTP database)**

This script will populate the OLTP database with initial data. It includes sample data for all the tables to simulate a working washing machine store.

**Sample Data Inserted**:

* Users (with different roles)
* Washing machines (with various brands, models, and specifications)
* Orders (with associated order items)
* Reviews (for washing machines)
* Addresses (for users)
* Payment methods (for users)
* Categories (of washing machines)
* Relationships between washing machines and categories

Before executing this script, ensure to update the file path to point to your data location.

### **3. Run DWH.sql (DWH database)**

This script will create the Data Warehouse (OLAP) schema. It defines the structure for the analytical database, which will be used for reporting and data analysis.

**Dimensional Model**: The script sets up a star schema, organizing data into facts and dimensions to facilitate efficient querying and reporting.

### **4. Run ETL**

This process will transfer data from the OLTP database to the OLAP database. The ETL script, typically written in C# using Dapper and Npgsql, performs the following tasks:

* **Extract Data**: Pull data from the OLTP database.
* **Transform Data**: Clean and transform the data as needed to fit the OLAP schema.
* **Load Data**: Insert the transformed data into the OLAP database.

### **5. Open WashingMachine.pbix**

This file is a Power BI report that visualizes the data from the OLAP database. Running this file in Power BI will allow you to see and interact with the analytical reports and dashboards.

* **Reports and Dashboards**: Display various metrics and insights about the washing machine store, such as sales trends, popular products, customer reviews, and more.
* **Interactive Visuals**: Use filters, slicers, and interactive charts to drill down into the data for more detailed analysis.

### **Run function\_queries.sql (OLTP database)**

To see OLTP functions in action.