Case Study: Database Design and Development for E-commerce Platform (SneakerHead)

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Introduction

Sneakerhead is an innovative e-commerce platform specializing in personalized, sustainable sneakers. The platform aims to enhance customer experiences through seamless online shopping while leveraging data-driven insights to optimize operations and product offerings. This report outlines the database design that supports Sneakerhead's business objectives.

Mission

To use data insights to develop sustainable, high-quality footwear, streamline business operations, and enhance customer experiences.

Objectives:

- Analyse customer data to develop products aligned with their preferences.
- Optimize inventory management and supply chain using data insights.
- Utilize customer feedback to enhance product satisfaction and engagement.

Database Structure & Tables

The Sneakerhead database consists of multiple relational tables that efficiently store and manage data related to users, orders, products, suppliers, payments, and shipping.

List of Tables:

1. **User & Order Management Tables:**
   - Users Table
   - Orders Table
   - Feedback Table
2. **Product & Supplier Management Tables:**
   - Products Table
   - Product Categories Table
   - Suppliers Table
3. **Transaction & Shipping Tables:**
   - Payments Method Table
   - Shipping Information Table

Users Table:

- USER_ID: Unique identifier for each user.
- FIRSTNAME & NAME: User's name details.
- EMAIL & PHONE: Contact details.
- ADDRESS: Shipping and residential address.

USERS	
USER_ID	INTEGER(20)
FIRSTNAME	VARCHAR(30)
Name	VARCHAR(100)
Email	VARCHAR(100)
Phone	VARCHAR(15)
Address	VARCHAR(250)

Orders Table:

- ORDER_ID: Unique order identifier.
- USER_ID: Links orders to users.
- ORDER DATE: Date of order placement.
- TOTAL AMOUNT: Total order cost.
- PAYMENT STATUS: Status of the payment.

ORDERS	
Order_ID	INTEGER(20)
User_ID	INT(20)
OrderDate	DATE
TotalAmount	DECIMAL
PaymentStatus	VARCHAR(50)

Products Table:

- PRODUCT_ID: Unique identifier.
- NAME: Product name.
- CATEGORY_ID: Links products to categories.
- ORDER_ID & SUPPLIER_ID: Links products to orders and suppliers.
- PRICE, MATERIAL, SIZE, COLOR, STOCK QUANTITY, LAUNCH DATE: Product details.

Product Categories Table:

- CATEGORY_ID: Unique category identifier.
- NAME & DESCRIPTION: Category details.

Suppliers Table:

- SUPPLIER_ID: Unique supplier identifier.
- NAME, CONTACT PERSON, PHONE, EMAIL, ADDRESS: Supplier details.

Suppliers	
Supplier_ID	INTEGER(20)
Name	VARCHAR(100)
ContactPerson	VARCHAR(100)
Phone	VARCHAR(15)
Email	VARCHAR(100)
Address	VARCHAR(250)

Payments Table:

- PAYMENT_ID: Unique identifier.
- ORDER_ID: Links payments to orders.
- PAYMENT DATE, METHOD, STATUS: Payment details.

Paymentmethod	
Payment_ID	integer(20)
OrderID	INT
PaymentDate	DATE
PaymentMethod	VARCHAR(50)
PaymentStatus	VARCHAR(50)

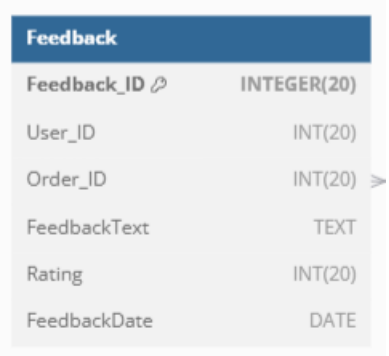
Shipping Information Table:

- SHIPPING_ID: Unique identifier.
- ORDER_ID: Links shipping info to orders.
- SHIPPING ADDRESS, METHOD, DATES: Shipping details.

ShippingInformation	
Shipping_ID	INTEGER(20)
Order_ID	INT(20)
ShippingAddress	VARCHAR(250)
ShippingMethod	VARCHAR(100)
ShippingDate	DATE
DeliveryDate	DATE

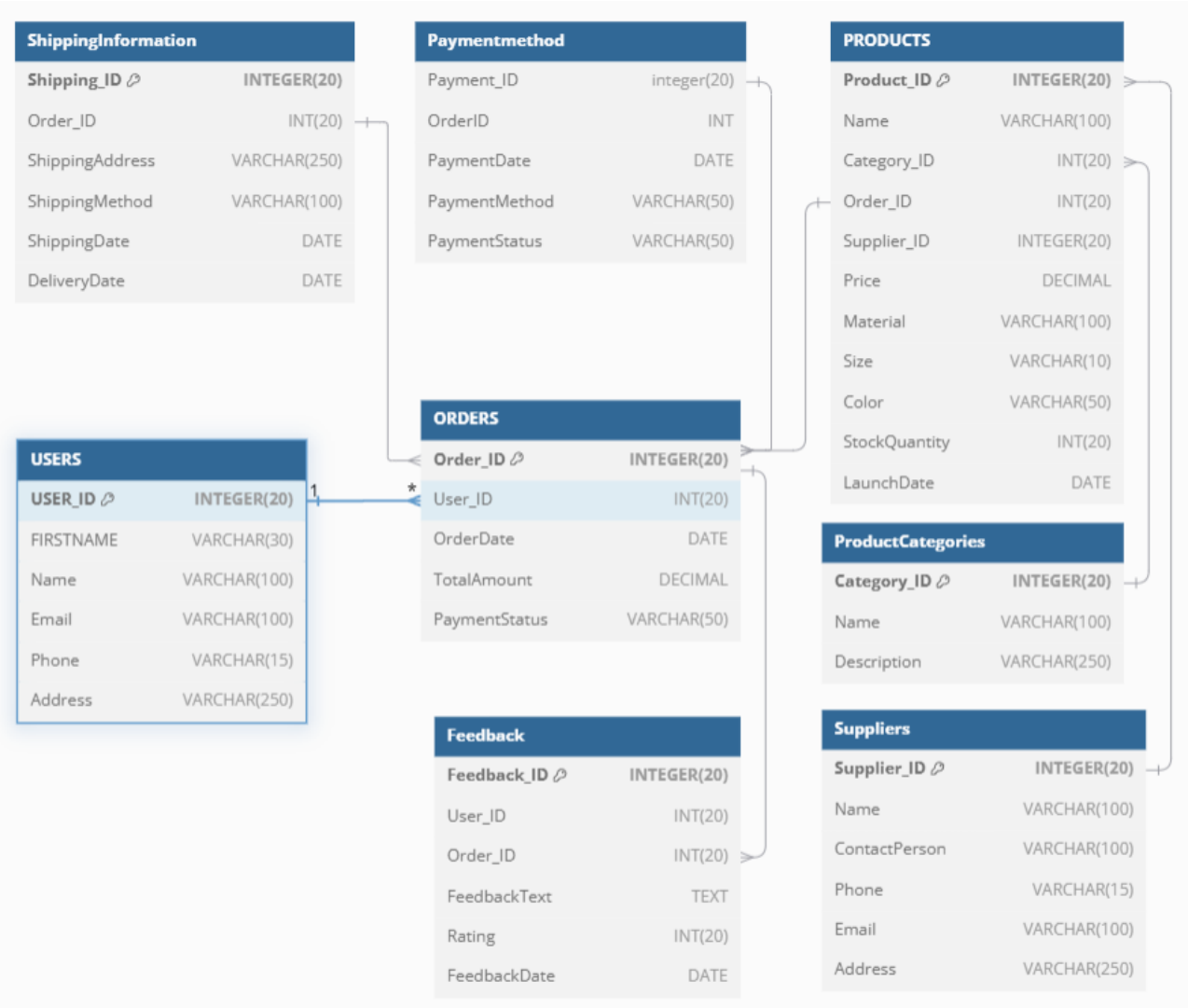
Feedback Table:

- FEEDBACK_ID: Unique identifier.
- USER_ID & ORDER_ID: Links feedback to users and orders.
- FEEDBACK TEXT, RATING, FEEDBACK DATE: Customer reviews.



Entity Relationship Diagram

Entity-Relationship (ER) Diagram the ER diagram illustrates relationships between different database tables, ensuring a structured and efficient database schema for Sneakerhead's operations.



E-R Diagram

Join Types in Database

1. INNER JOIN:

This join returns only the records that have matching values in both tables. For example, if we join the Users and Orders tables using an inner join, we will get a list of users who have placed at least one order. Users who have never placed an order will not be included in the result.

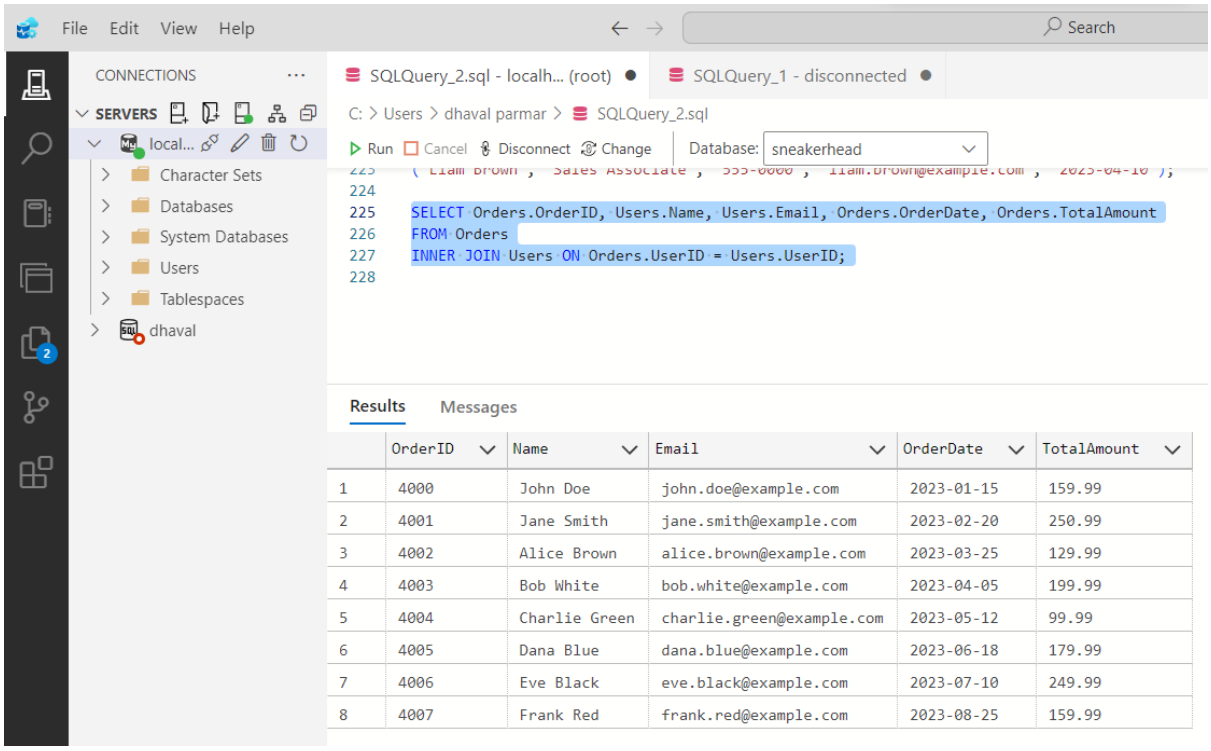
Query:

SELECT Orders.OrderID, Users.Name, Users.Email, Orders.OrderDate, Orders.TotalAmount

FROM Orders

INNER JOIN Users ON Orders.UserID = Users.UserID;

Output:



	OrderID	Name	Email	OrderDate	TotalAmount
1	4000	John Doe	john.doe@example.com	2023-01-15	159.99
2	4001	Jane Smith	jane.smith@example.com	2023-02-20	250.99
3	4002	Alice Brown	alice.brown@example.com	2023-03-25	129.99
4	4003	Bob White	bob.white@example.com	2023-04-05	199.99
5	4004	Charlie Green	charlie.green@example.com	2023-05-12	99.99
6	4005	Dana Blue	dana.blue@example.com	2023-06-18	179.99
7	4006	Eve Black	eve.black@example.com	2023-07-10	249.99
8	4007	Frank Red	frank.red@example.com	2023-08-25	159.99

Purpose:

Retrieves only matching records from both tables. If no match is found, the row is excluded.

Use Cases:

- Getting customers who have placed orders.
- Finding employees who belong to a department.
- Fetching products that have categories assigned.

2. LEFT JOIN (or LEFT OUTER JOIN)

This join returns all records from the left table and only the matching records from the right table. If there are no matches, NULL values are displayed for columns from the right table. For example, if we join Users with Orders using a left outer join, we will get all users, including those who haven't placed an order. Users without orders will have NULL values in the order-related columns.

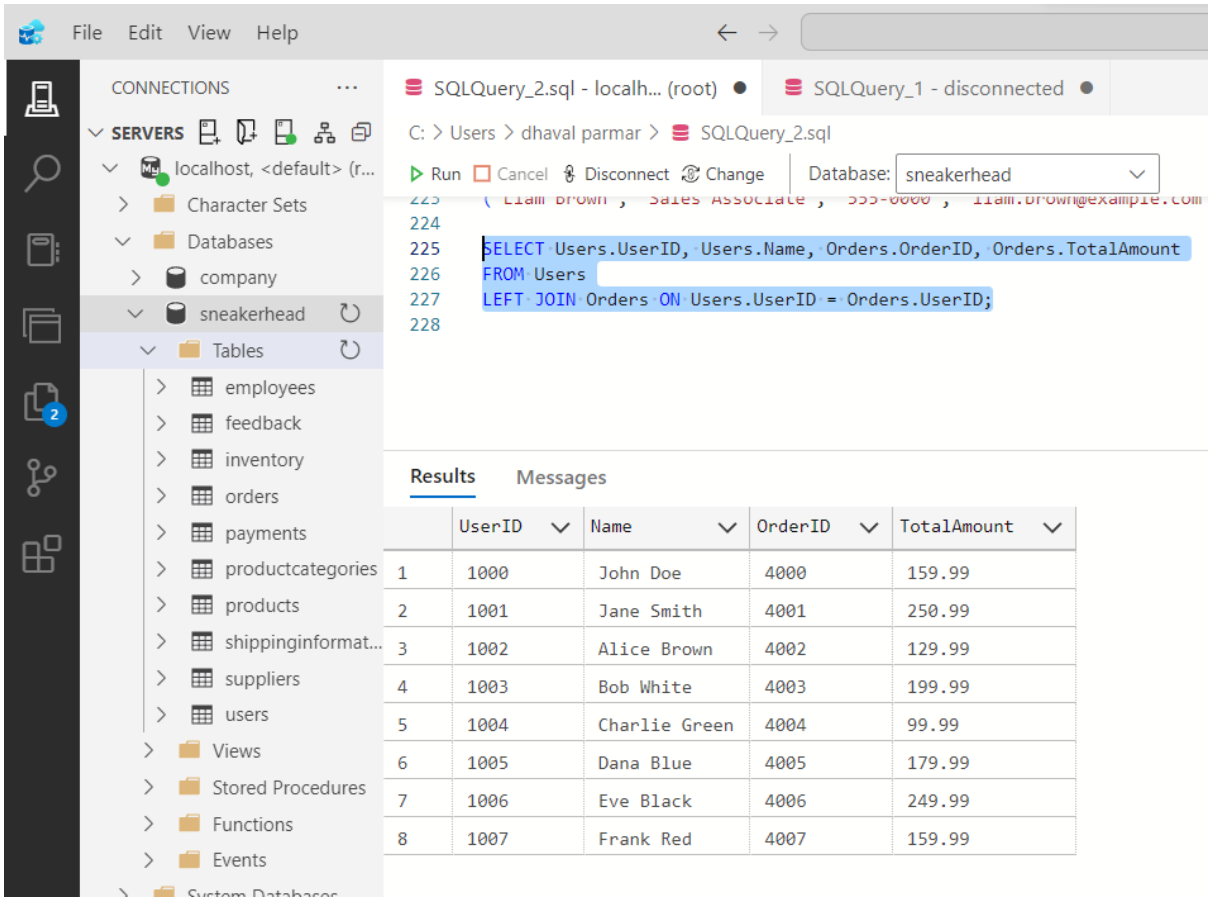
Query:

SELECT Users.UserID, Users.Name, Orders.OrderID, Orders.TotalAmount

FROM Users

LEFT JOIN Orders ON Users.UserID = Orders.UserID;

Output:



Purpose:

Returns all records from the left table and matching records from the right table. If no match is found, NULL is returned.

Use Cases:

- Finding users who haven't placed orders.
- Listing all products, even if they have no supplier.
- Getting employees, even if they are not assigned to a department.

3. RIGHT JOIN (or RIGHT OUTER JOIN)

This join returns all records from the right table and only the matching records from the left table. If there are no matches, NULL values are displayed for columns from the left table. For example, if we join Orders with Users using a right outer join, we will get all orders, including those that do not have associated users (e.g., orders placed by deleted accounts). Orders without users will have NULL values in the user-related columns.

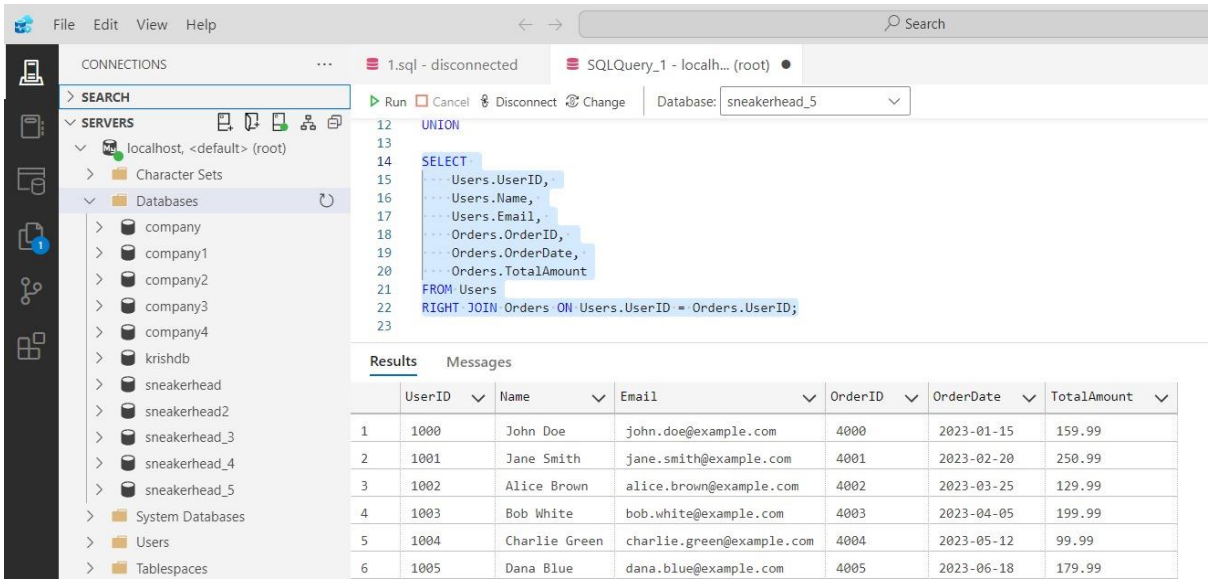
Query:

SELECT Suppliers.SupplierID, Suppliers.Name, Products.Name AS ProductName

FROM Suppliers

RIGHT JOIN Products ON Suppliers.SupplierID = Products.SupplierID;

Output:



Purpose:

Returns all records from the right table and matching records from the left table. If no match is found, NULL is returned.

Use Cases:

- Listing all suppliers, even those who haven't supplied any products.
- Finding departments that don't have any employees assigned.
- Getting all orders, even if they don't have a registered user.

4. CROSS JOIN

This join returns the Cartesian product of both tables, meaning every row from the first table is paired with every row from the second table. For example, if we perform a cross join between Users and Products, the result will show every user associated with every product, even if they have never purchased it. This can be useful for generating all possible combinations for recommendations or promotions.

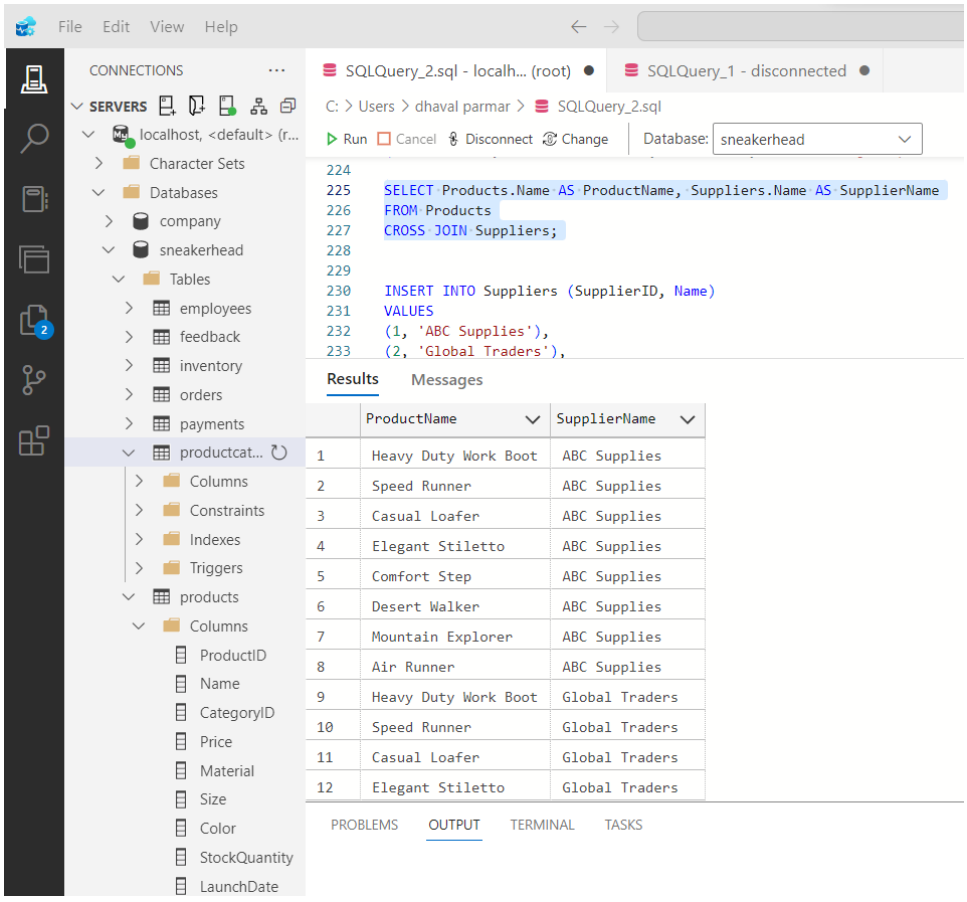
Query:

SELECT Products.Name AS ProductName, Suppliers.Name AS SupplierName

FROM Products

CROSS JOIN Suppliers;

Output:



Purpose:

Creates a Cartesian product (all possible combinations of rows).

Use Case:

- Listing all possible combinations of products and suppliers.
- Generating all possible matchups between players in a tournament.
- Creating pricing models for all combinations of services and discounts.

Conclusion

The database design for SneakerHead has been developed with the goal of providing an efficient and structured approach to manage all aspects of the e-commerce platform. By implementing relational tables for users, orders, products, suppliers, payments, shipping, and feedback, the design ensures seamless data flow and accurate record-keeping, allowing the platform to meet its mission of delivering personalized, sustainable sneakers. The use of various SQL join types enhances data retrieval flexibility, enabling the platform to optimize operations, customer experiences, and decision-making. This database design serves as the backbone for SneakerHead's data-driven strategies, providing insights that support inventory management, customer satisfaction, and overall business growth.