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# TY B.Tech. (CSE) – II [ 2022-23 ]

## 5CS372 : Advanced Database System Lab.

## Assignment No. 6

### Title- To design and implement a data warehouse for a customer order processing system in a company. [ Use any Database]

**Theroy:**

**What is Data Warehouse?**

A Data Warehouse is separate from DBMS, it stores a huge amount of data, which is typically collected from multiple heterogeneous sources like files, DBMS, etc. The goal is to produce statistical results that may help in decision makings. For example, a college might want to see quick different results, like how the placement of CS students has improved over the last 10 years, in terms of salaries, counts, etc.

**Need of Data Warehouse**

An ordinary Database can store MBs to GBs of data and that too for a specific purpose. For storing data of TB size, the storage shifted to Data Warehouse. Besides this, a transactional database doesn't offer itself to analytics. To effectively perform analytics, an organization keeps a central Data Warehouse to closely study its business by organizing, understanding, and using its historic data for taking strategic decisions and analyzing trends.

**Specification :**

The target of data warehouse system is an enterprise that consists of a number of stores located in different cities and states. Each store holds a variety of items in various quantity. In addition, the enterprise keep the information of the customers. There are two kinds of customers: walk-in led by tourism guide and mail-order by post address inclusive. The city location of the customer, together with the data of the customer's first order, is stored by the existing system. Each customer lives in one city only, and the enterprise will try to satisfy the customer's order items by the present stock in the city where the customer lives. Each customer order can be for any quantity of any number of items, and each order is uniquely identified by an order number

The location of the stores is also recorded. Each store is located in one city, and there can be many stores in the city. Each city has one headquarter for coordinating all of its stores. The enterprise's goal is to meet all of the customer's requirements from stores located in the customer's city. If the requirement cannot be met, the company will turn to the other cities where the item can be found if there is any

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Some processing information is important for the enterprise. For example, the total quantity of item stored in each city. After every time an item is taken, the company needs to know the total quantities of the item in all the stores in a city.

**The relational schema of the enterprise's current (operational) databases are:**

**Headquarter Database:**

Relation Customer (Customer_id, Customer_name, City_id, First_order_date)

Relation Walk-in_customers (*Customer_id, tourism_guide, Time)

Relation Mail_order_customers (*Customer_id, post_address, Time)

**Sales Databases:**

Relation Headqarters (City_id, City_name, Headquarter_addr, State, Time)

Relation Stores (Store_id, *City_id, Phone, Time)

Relation Items (Item_id, Description, Size, Weight, Unit_price, Time)

Relation Stored_items (*Store_id, *Item_id, Qantity_held, Time)

Relation Order (Order_no, Order_date, Customer_id)

Relation Ordered_item (*Order_no, *Item_id, Quantity_ordered, Ordered_price, Time)

Where underlined are primary key and "*" prefixed are foreign keys

**Business requirements:**

In order to meet users' demand, the data warehouse system extracts data from the existing two database into a data warehouse, and provides online analytical processing with roll up, drill down, slice and dice features according to users selections based on dimension tables to meet the user requirements.

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**Build data warehouse / OLAP which will answer the following queries :**

**1. Find all the stores along with city, state, phone, description, size, weight and unit price that hold a particular item of stock.**

```
use datawarehouse;
 -- 1
SELECT s.Store_id, c.City_name, c.State, s.Phone, i.Description, i.Size, i.Weight, f.Unit_price
FROM Sales_Fact f
JOIN Store_Dim s ON f.Store_id = s.Store_id
JOIN Item_Dim i ON f.Item_id = i.Item_id
JOIN City_Dim c ON s.City_id = c.City_id
WHERE i.Description='Widget';
```

| Store_id | City_name | State | Phone | Description | Size | Weight | Unit_price |
|---|---|---|---|---|---|---|---|
| 1 | New York City | NY | 555-1234 | Widget | Small | 1.00 | 10.00 |
| 2 | New York City | NY | 555-5678 | Widget | Small | 1.00 | 10.00 |

**2. Find all the orders along with customer name and order date that can be fulfilled by a given store.**

```
use datawarehouse;
-- 2
SELECT o.Order_no, c.Customer_name, o.Order_date
FROM Sales.OrderT o
JOIN Headquarter.Customer c ON o.Customer_id = c.Customer_id
JOIN Sales.Ordered_item oi ON oi.Order_no = o.Order_no
JOIN Sales.Stored_items si ON si.Item_id=oi.Item_id and si.Store_id=3;
```

| Order_no | Customer_name | Order_date |
|---|---|---|
| 1001 | John Smith | 2022-02-15 |

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**3. Find all stores along with city name and phone that hold items ordered by given customer.**

```
use datawarehouse;
-- 3
SELECT DISTINCT Stores.Store_id, Headqarters.City_name, Stores.Phone
FROM Sales.Stores
INNER JOIN Sales.Headqarters ON Stores.City_id = Headqarters.City_id
INNER JOIN Sales.Stored_items ON Stores.Store_id = Stored_items.Store_id
INNER JOIN Sales.Ordered_item ON Stored_items.Item_id = Ordered_item.Item_id
INNER JOIN Sales.OrderT ON Ordered_item.Order_no = OrderT.Order_no
INNER JOIN Headquarter.Customer ON OrderT.Customer_id = Customer.Customer_id
WHERE Customer.Customer_id = 2;
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

| Store_id | City_name | Phone |
|---|---|---|
| 1 | New York City | 555-1234 |
| 2 | New York City | 555-5678 |

**4] Find the headquarter address along with city and state of all stores that hold**

```
use datawarehouse;
-- 4
SELECT DISTINCT h.Headquarter_addr, h.City_name, h.State
FROM Sales.Stored_items si
JOIN Sales.Stores s ON si.Store_id = s.Store_id
JOIN Sales.Headqarters h ON s.City_id = h.City_id
JOIN Sales.Items i ON si.Item_id = i.Item_id
WHERE si.Quantity_held > 75
AND i.Description = 'Widget';
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

| Headquarter_addr | City_name | State |
|---|---|---|
| 123 Broadway, Suite 500 | New York City | NY |

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**5] For each customer order, show the items ordered along with description, store id and city name and the stores that hold the items.**

```
use datawarehouse;
-- 5
SELECT o.Order_no, i.Description, si.Store_id, h.City_name AS Store_City
FROM Sales.OrderT o
JOIN Sales.Ordered_item oi ON o.Order_no = oi.Order_no
JOIN Sales.Items i ON oi.Item_id = i.Item_id
JOIN Sales.Stored_items si ON oi.Item_id = si.Item_id
JOIN Sales.Stores s ON si.Store_id = s.Store_id
JOIN Sales.Headqarters h ON s.City_id = h.City_id
WHERE o.Customer_id = 3;
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

| Order_no | Description | Store_id | Store_City |
|---|---|---|---|
| 1002 | Thingamajig | 4 | Chicago |

**6] Find the city and the state in which a given customer lives.**

```
use datawarehouse;
-- 6
SELECT c.Customer_name, h.City_name, h.State
FROM Headquarter.Customer c
JOIN Sales.Headqarters h
ON c.City_id = h.City_id
WHERE c.Customer_id = 2;
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

| Customer_name | City_name | State |
|---|---|---|
| Mary Johnson | Los Angeles | CA |

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**SQL code-**

```
CREATE DATABASE Headquarter;

USE Headquarter;

CREATE DATABASE Sales;

USE Sales;


CREATE TABLE Headqarters (
   City_id INT PRIMARY KEY,
   City_name VARCHAR(50),
   Headquarter_addr VARCHAR(100),
   State VARCHAR(50),
   Time DATETIME
);


USE Headquarter;
CREATE TABLE Customer (
   Customer_id INT PRIMARY KEY,
   Customer_name VARCHAR(50),
   City_id INT,
   First_order_date DATE,
   FOREIGN KEY (City_id) REFERENCES sales.Headqarters(City_id)
);
```

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```
CREATE TABLE Walk_in_customers (
    Customer_id INT PRIMARY KEY,
    tourism_guide VARCHAR(50),
    Time DATETIME,
    FOREIGN KEY (Customer_id) REFERENCES Customer(Customer_id)
);

CREATE TABLE Mail_order_customers (
    Customer_id INT PRIMARY KEY,
    post_address VARCHAR(100),
    Time DATETIME,
    FOREIGN KEY (Customer_id) REFERENCES Customer(Customer_id)
);

USE Sales;
CREATE TABLE Stores (
    Store_id INT PRIMARY KEY,
    City_id INT,
    Phone VARCHAR(20),
    Time DATETIME,
    FOREIGN KEY (City_id) REFERENCES Headqarters(City_id)
);
CREATE TABLE Items (
    Item_id INT PRIMARY KEY,
    Description VARCHAR(100),
```

```
    Size VARCHAR(20),
    Weight DECIMAL(10,2),
    Unit_price DECIMAL(10,2),
    Time DATETIME
);

CREATE TABLE Stored_items (
    Store_id INT,
    Item_id INT,
    Quantity_held INT,
    Time DATETIME,
    PRIMARY KEY (Store_id, Item_id),
    FOREIGN KEY (Store_id) REFERENCES Stores(Store_id),
    FOREIGN KEY (Item_id) REFERENCES Items(Item_id)
);

CREATE TABLE OrderT (
    Order_no INT PRIMARY KEY,
    Order_date DATE,
    Customer_id INT,
    FOREIGN KEY (Customer_id) REFERENCES headquarter.Customer(Customer_id)
);
```

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```
CREATE TABLE Ordered_item (
    Order_no INT,
    Item_id INT,
    Quantity_ordered INT,
    Ordered_price DECIMAL(10,2),
    Time DATETIME,
    PRIMARY KEY (Order_no, Item_id),
    FOREIGN KEY (Order_no) REFERENCES OrderT(Order_no),
    FOREIGN KEY (Item_id) REFERENCES Items(Item_id)
);


CREATE DATABASE Datawarehouse;
use Datawarehouse;
CREATE TABLE Sales_Fact (
    Store_id INT,
    Item_id INT,
    Quantity_held INT,
    Unit_price DECIMAL(10,2),
    PRIMARY KEY (Store_id, Item_id),
    FOREIGN KEY (Store_id) REFERENCES sales.Stores(Store_id),
    FOREIGN KEY (Item_id) REFERENCES sales.Items(Item_id)
);
```

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```
CREATE TABLE Store_Dim (
    Store_id INT PRIMARY KEY,
    City_id INT,
    Phone VARCHAR(20),
    FOREIGN KEY (City_id) REFERENCES sales.Headqarters(City_id)
);
[2:08 PM, 3/14/2023] Pooja Vhanzende: CREATE TABLE Item_Dim (
    Item_id INT PRIMARY KEY,
    Description VARCHAR(100),
    Size VARCHAR(20),
    Weight DECIMAL(10,2)
);


CREATE TABLE City_Dim (
    City_id INT PRIMARY KEY,
    City_name VARCHAR(50),
    State VARCHAR(50)
);
Use sales;
INSERT INTO Headqarters (City_id, City_name, Headquarter_addr, State, Time) VALUES
(1, 'New York City', '123 Broadway, Suite 500', 'NY', '2022-01-01 00:00:00'),
(2, 'Los Angeles', '456 Main St, 12th Floor', 'CA', '2022-02-01 00:00:00'),
(3, 'Chicago', '789 Elm St, Suite 200', 'IL', '2022-03-01 00:00:00');
```

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```
Use Headquarter;

INSERT INTO Customer (Customer_id, Customer_name, City_id, First_order_date) VALUES

(1, 'John Smith', 1, '2022-01-01'),

(2, 'Mary Johnson', 2, '2022-02-15'),

(3, 'David Lee', 3, '2022-03-20');


INSERT INTO Walk_in_customers (Customer_id, tourism_guide, Time) VALUES

(1, 'Tourist Guide A', '2022-01-01 10:00:00'),

(2, 'Tourist Guide B', '2022-02-15 15:30:00');


INSERT INTO Mail_order_customers (Customer_id, post_address, Time) VALUES

(3, '123 Main St, Anytown USA', '2022-03-20 09:00:00');


Use sales;

INSERT INTO Stores (Store_id, City_id, Phone, Time) VALUES

(1, 1, '555-1234', '2022-01-02 09:00:00'),

(2, 1, '555-5678', '2022-01-02 09:00:00'),

(3, 2, '555-9876', '2022-02-15 10:30:00'),

(4, 3, '555-4321', '2022-03-20 11:45:00');

INSERT INTO Items (Item_id, Description, Size, Weight, Unit_price, Time) VALUES

(1, 'Widget', 'Small', 1.0, 10.00, '2022-01-01 00:00:00'),

(2, 'Gizmo', 'Large', 2.5, 25.00, '2022-02-01 00:00:00'),

(3, 'Thingamajig', 'Medium', 0.5, 5.00, '2022-03-01 00:00:00');
```

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```
INSERT INTO Stored_items (Store_id, Item_id, Quantity_held, Time) VALUES

(1, 1, 100, '2022-01-02 09:00:00'),

(1, 2, 50, '2022-01-02 09:00:00'),

(2, 1, 75, '2022-01-02 09:00:00'),

(3, 2, 100, '2022-02-15 10:30:00'),

(4, 3, 200, '2022-03-20 11:45:00');


INSERT INTO OrderT (Order_no, Order_date, Customer_id) VALUES

(1001, '2022-02-15', 1),

(1000,'2022-01-01',2),

(1002,'2022-03-20',3);

Use sales;

INSERT INTO Ordered_item (Order_no, Item_id, Quantity_ordered, Ordered_price, Time)
VALUES

(1000,1,2,20.00,'2022-01-01 10:00:00');

INSERT INTO Ordered_item (Order_no, Item_id, Quantity_ordered, Ordered_price, Time)
VALUES

(1001,2,3,75.00,'2022-02-15 15:30:00');

INSERT INTO Ordered_item (Order_no, Item_id, Quantity_ordered, Ordered_price,Time)
VALUES

(1002,3,1,5.00,'2022-03-20 09:00:00');
```

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```
use datawarehouse;

 -- Load data into the dimension tables:

 INSERT INTO Store_Dim (Store_id, City_id, Phone)

SELECT DISTINCT Store_id, City_id, Phone

FROM Sales.Stores;


INSERT INTO Item_Dim (Item_id, Description, Size, Weight)

SELECT DISTINCT Item_id, Description, Size, Weight

FROM Sales.Items;


INSERT INTO City_Dim (City_id, City_name, State)

SELECT DISTINCT City_id, City_name, State

FROM Sales.Headqarters;


-- Load data into the fact table:

INSERT INTO Sales_Fact (Store_id, Item_id, Quantity_held, Unit_price)

SELECT si.Store_id, si.Item_id, si.Quantity_held, i.Unit_price

FROM Sales.Stored_items si

JOIN Sales.Items i ON si.Item_id = i.Item_id;


-- 1

SELECT s.Store_id, c.City_name, c.State, s.Phone, i.Description, i.Size, i.Weight, f.Unit_price

FROM Sales_Fact f

JOIN Store_Dim s ON f.Store_id = s.Store_id

JOIN Item_Dim i ON f.Item_id = i.Item_id
```

```
JOIN City_Dim c ON s.City_id = c.City_id

WHERE i.Description='Widget';


-- 2

SELECT o.Order_no, c.Customer_name, o.Order_date

FROM Sales.OrderT o

JOIN Headquarter.Customer c ON o.Customer_id = c.Customer_id

JOIN Sales.Ordered_item oi ON oi.Order_no = o.Order_no

JOIN Sales.Stored_items si ON si.Item_id=oi.Item_id and si.Store_id=3;


-- 6

SELECT c.Customer_name, h.City_name, h.State

FROM Headquarter.Customer c

JOIN Sales.Headqarters h

ON c.City_id = h.City_id

WHERE c.Customer_id = 2;


-- 2.

SELECT OrderT.Order_no, Customer.Customer_name, OrderT.Order_date

FROM Sales_Fact

JOIN Store_Dim ON Sales_Fact.Store_id = Store_Dim.Store_id

JOIN Item_Dim ON Sales_Fact.Item_id = Item_Dim.Item_id

JOIN Sales.Ordered_item ON Sales_Fact.Store_id = Ordered_item.Item_id

JOIN Sales.OrderT ON Ordered_item.Order_no = OrderT.Order_no

JOIN Headquarter.Customer ON OrderT.Customer_id = Customer.Customer_id
```

```
WHERE Store_Dim.Store_id = 3;


-- 3
SELECT DISTINCT Stores.Store_id, Headqarters.City_name, Stores.Phone
FROM Sales.Stores
INNER JOIN Sales.Headqarters ON Stores.City_id = Headqarters.City_id
INNER JOIN Sales.Stored_items ON Stores.Store_id = Stored_items.Store_id
INNER JOIN Sales.Ordered_item ON Stored_items.Item_id = Ordered_item.Item_id
INNER JOIN Sales.OrderT ON Ordered_item.Order_no = OrderT.Order_no
INNER JOIN Headquarter.Customer ON OrderT.Customer_id = Customer.Customer_id
WHERE Customer.Customer_id = 2;


-- 4
SELECT DISTINCT h.Headquarter_addr, h.City_name, h.State
FROM Sales.Stored_items si
JOIN Sales.Stores s ON si.Store_id = s.Store_id
JOIN Sales.Headqarters h ON s.City_id = h.City_id
JOIN Sales.Items i ON si.Item_id = i.Item_id
WHERE si.Quantity_held > 75
AND i.Description = 'Widget';


-- 5
SELECT o.Order_no, i.Description, si.Store_id, h.City_name AS Store_City
FROM Sales.OrderT o
JOIN Sales.Ordered_item oi ON o.Order_no = oi.Order_no
```

```
JOIN Sales.Items i ON oi.Item_id = i.Item_id

JOIN Sales.Stored_items si ON oi.Item_id = si.Item_id

JOIN Sales.Stores s ON si.Store_id = s.Store_id

JOIN Sales.Headqarters h ON s.City_id = h.City_id

WHERE o.Customer_id = 3;
```

**Conclusion- We successfully connect the different database to each other and fetch the information**