



NYU

ADVANCED PROJECT I

ECE-GY 9953

BK33

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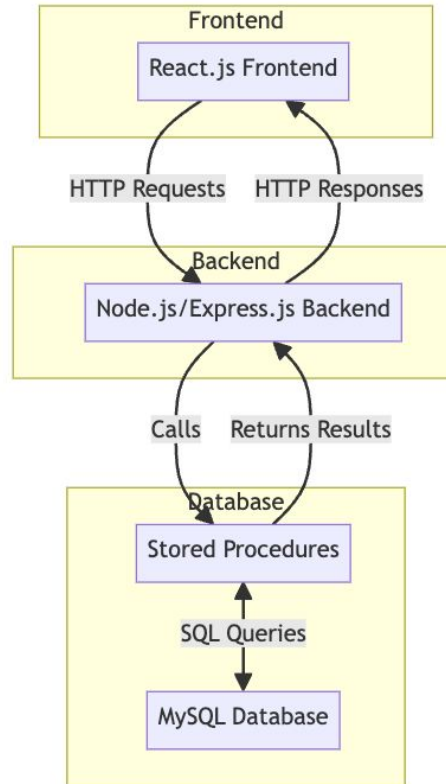
Submission Date: 20 December 2023

Business Case

- Awesome Superstore Inc. is a global e-commerce platform that connects sellers from around the world to customers in different markets, specializing in the categories of technology, furniture, and office supplies. The company aims to leverage technology to create a seamless online shopping experience, tapping into markets in Africa, Asia Pacific, Europe, Latin America, and the US & Canada. To achieve this, Awesome Superstore Inc. plans to develop an Online Transaction Processing (OLTP) database and a web application for day-to-day operations, along with a data warehousing system and dashboard for in-depth data analysis and business monitoring.

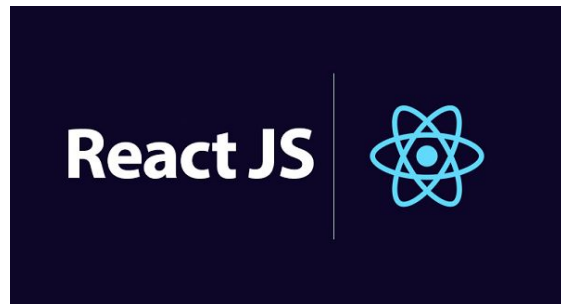


Web Application Architecture



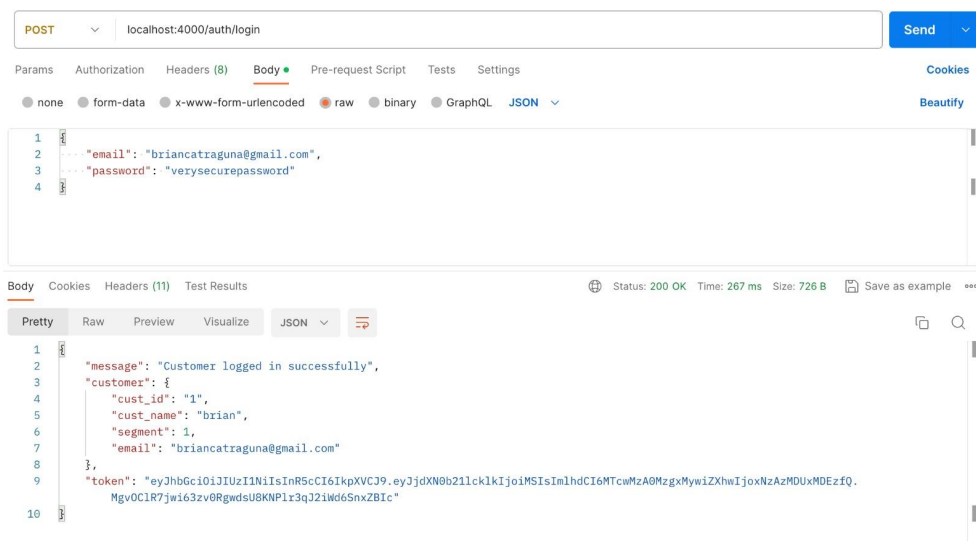
Frontend Tech Overview

- Javascript as the primary programming language
- ReactJS as the framework used
- Material UI as the UI component library
- Axios as the networking tool to hit backend endpoints
- React router as the routing tool
- Redux and local storage for state management
- Toast Notifications for success and failure messages.
- We created a total of 12 different pages for the web application



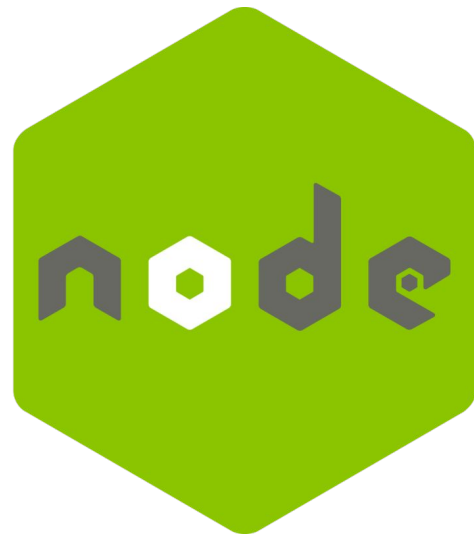
REST API

- REST (Representational State Transfer) API is used for communication between the client (our frontend) and our backend server, allowing them to exchange data and perform actions over the internet using HTTP methods such as PUT, POST, GET, DELETE



Backend Tech Overview

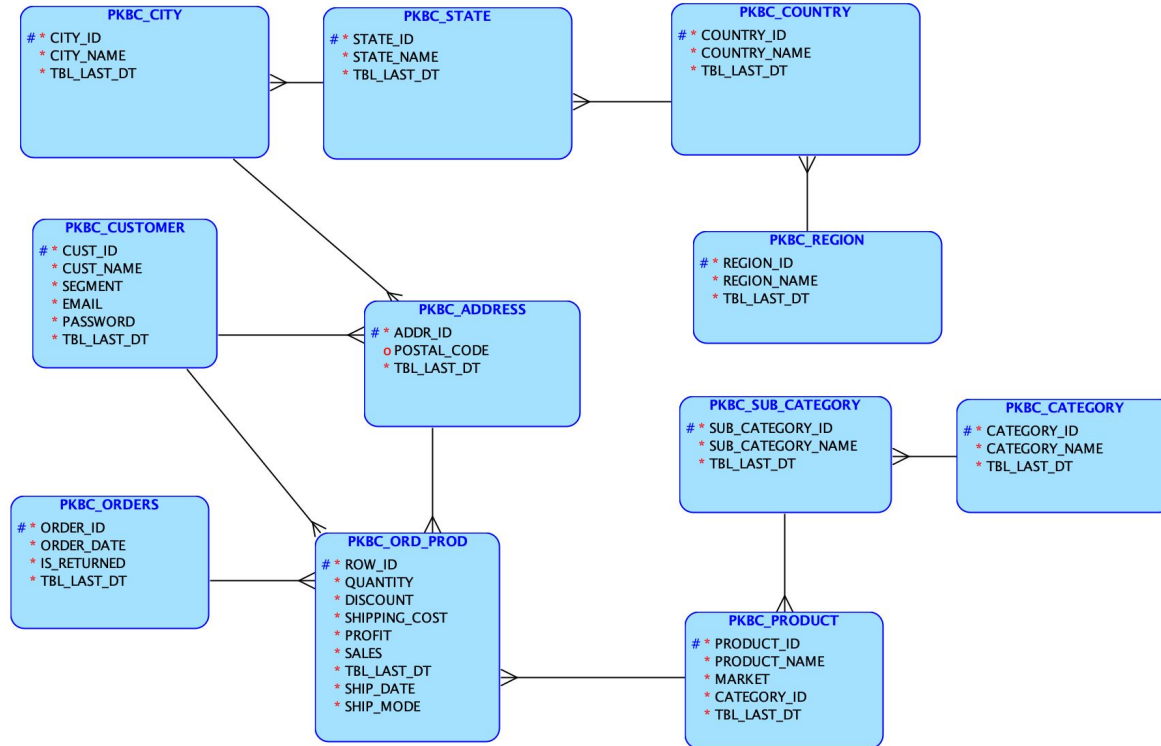
- NodeJS for server side runtime environment
- ExpressJS for the framework for routing API endpoints
- BcryptJS for password encryption tool
- Express validator for HTTP requests validation
- Nodemailer and Google's SMTP server for generating and sending emails
- JSONwebtoken for user authentication
- We created a total of 24 API endpoints for the frontend to interact with our backend. In which 6 are public endpoints and the rest required authentication and a signed JSONwebtoken to access resources



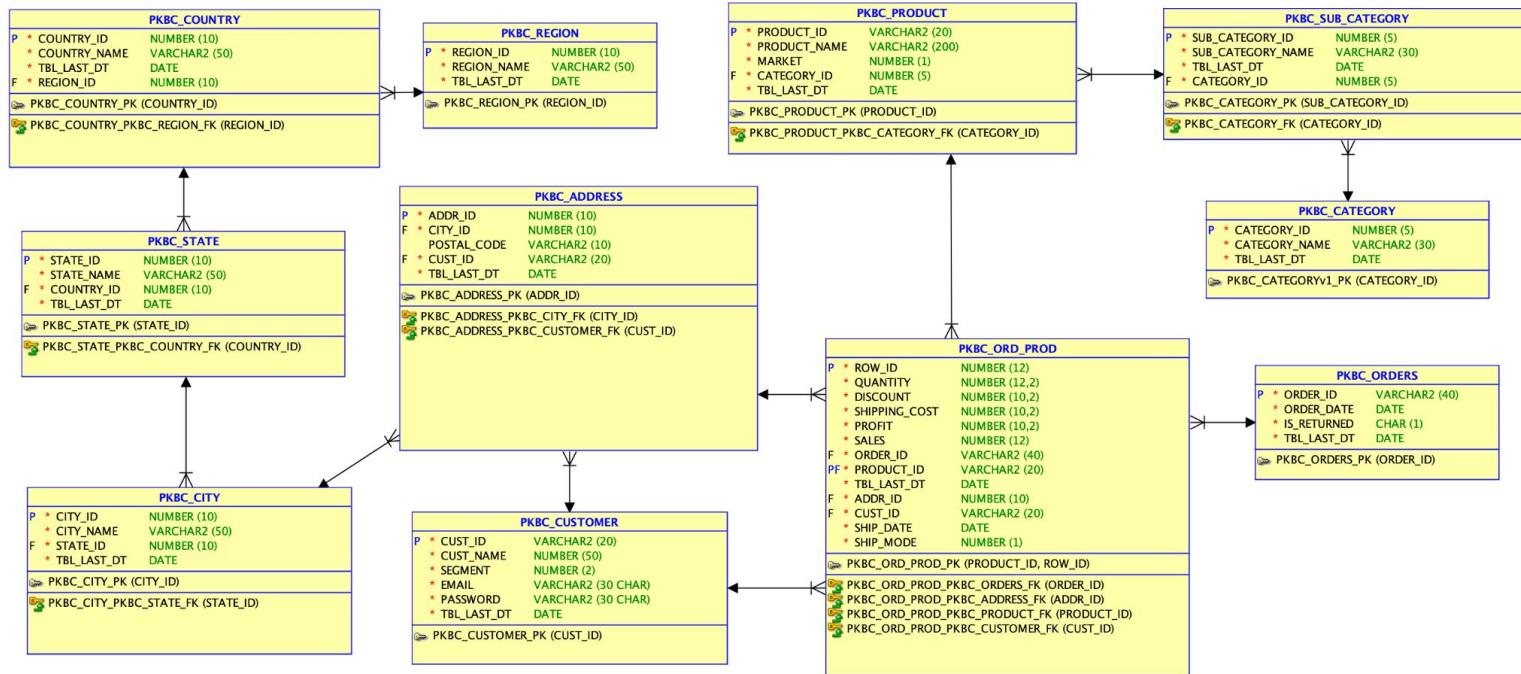
OLTP Database Tech Overview

- MySQL database as the database used.
- Use of stored procedures and parametrized queries to prevent SQL injection. We have created a total of 22 stored procedures for the backend server to interact with DB
- Database indexing on frequently used columns to increase performance in lookups. We added 5 indexes on the database for columns that we frequently query on
- Triggers to insert and update 'tbl_last_dt' on every table to record the last time we updated the row for ETL purposes
- Using transaction (commit & rollback) in Stored Procedures to maintain data integrity

Logical Model (OLTP)



Relational Model (OLTP)





Application Functionality

Customers users are able to :

- Create and log into their accounts.
- Forgot and reset password through OTP email
- View and search for products that are available in the market
- Edit their profile such as changing their full name, email, or customer segment
- Changing password once logged in
- Adding address related to the customer
- Editing existing address
- Adding products to cart, adjust the quantity
- Checkout the cart by selecting address, selecting ship mode and placing orders
- Viewing past orders and filter by non-returned and returned orders
- Requesting for return orders
- Viewing details of orders by viewing products that are related to the order

Screenshots


 **AWESOME INC.** DASHBOARD ORDERS CART





Welcome to Awesome Inc. Superstore

Search Products


Product ID	Product Name	Market	Category Name	Sub Category Name	Action
TEC-PH-2878	Aastra 57i VoIP phone	USCA	Technology	Phones	ADD TO CART
TEC-PH-2879	Aastra 6757i CT Wireless VoIP phone	USCA	Technology	Phones	ADD TO CART
TEC-PH-3017	Adtran 1202752G1	USCA	Technology	Phones	ADD TO CART
TEC-PH-3120	Anker 24W Portable Micro USB Car Charger	USCA	Technology	Phones	ADD TO CART
TEC-PH-3121	Anker 36W 4-Port USB Wall Charger Travel Power Adapt...	USCA	Technology	Phones	ADD TO CART
TEC-PH-3122	Anker Astro 15000mAh USB Portable Charger	USCA	Technology	Phones	ADD TO CART
TEC-PH-3123	Anker Astro Mini 3000mAh Ultra-Compact Portable Charger	USCA	Technology	Phones	ADD TO CART
TEC-PH-3127	Apple Audio Dock - Cordless	Asia Pacific	Technology	Phones	ADD TO CART


 **AWESOME INC.** DASHBOARD ORDERS CART






User Details


Full Name 
Brian

Email Address 
palakkeni@gmail.com

Customer Segment 
Consumer

Please select Customer Segment

[SAVE DETAILS](#) [CHANGE PASSWORD](#)



Address Details


[ADD NEW ADDRESS](#)


Your existing addresses

City : Beijing
Country : China
Zip Code : 12345

State : Beijing
Region : Eastern Asia

[EDIT ADDRESS](#)

 **AWESOME INC.** DASHBOARD CART ORDERS




Orders


[PAST ORDERS](#) [RETURNED ORDERS](#)


Order Id : 1201c7c6-8fe8-11ee-a079-023a1ee52506

Order Date : 2023-12-01T01:22:19.000Z


Total Items : 3


[MORE DETAILS](#) [RETURN ORDER](#) 

 **AWESOME INC.** DASHBOARD CART ORDERS



Your Cart

 Edit Order

 Select Address

Items in your cart are below

ID : OFF-EN-2851
Product Name : #10 Self-Seal White Envelopes
Category : Office Supplies
Sub-Category : Envelopes
Product Market : USCA
UNIT PRICE : \$10.90

Quantity
1
Total : \$10.90

ID : OFF-EN-2852
Product Name : #10 White Business Envelopes,4 1/8 x 9 1/2
Category : Office Supplies

Quantity
1

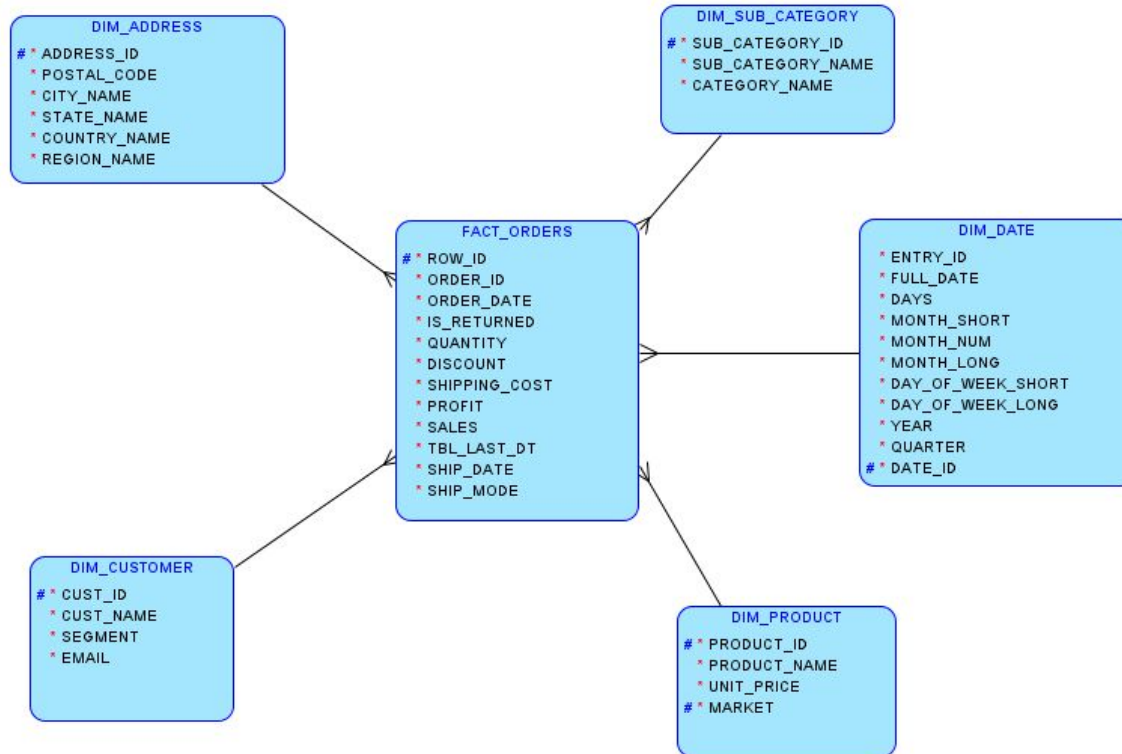
History Table (OLTP)

- Added history table to preserve deleted data and track history
- We added history tables for table
 - Pkbc_address
 - Pkbc_customer
 - Pkbc_ord_prod
 - Pkbc_order
 - pkbc_product

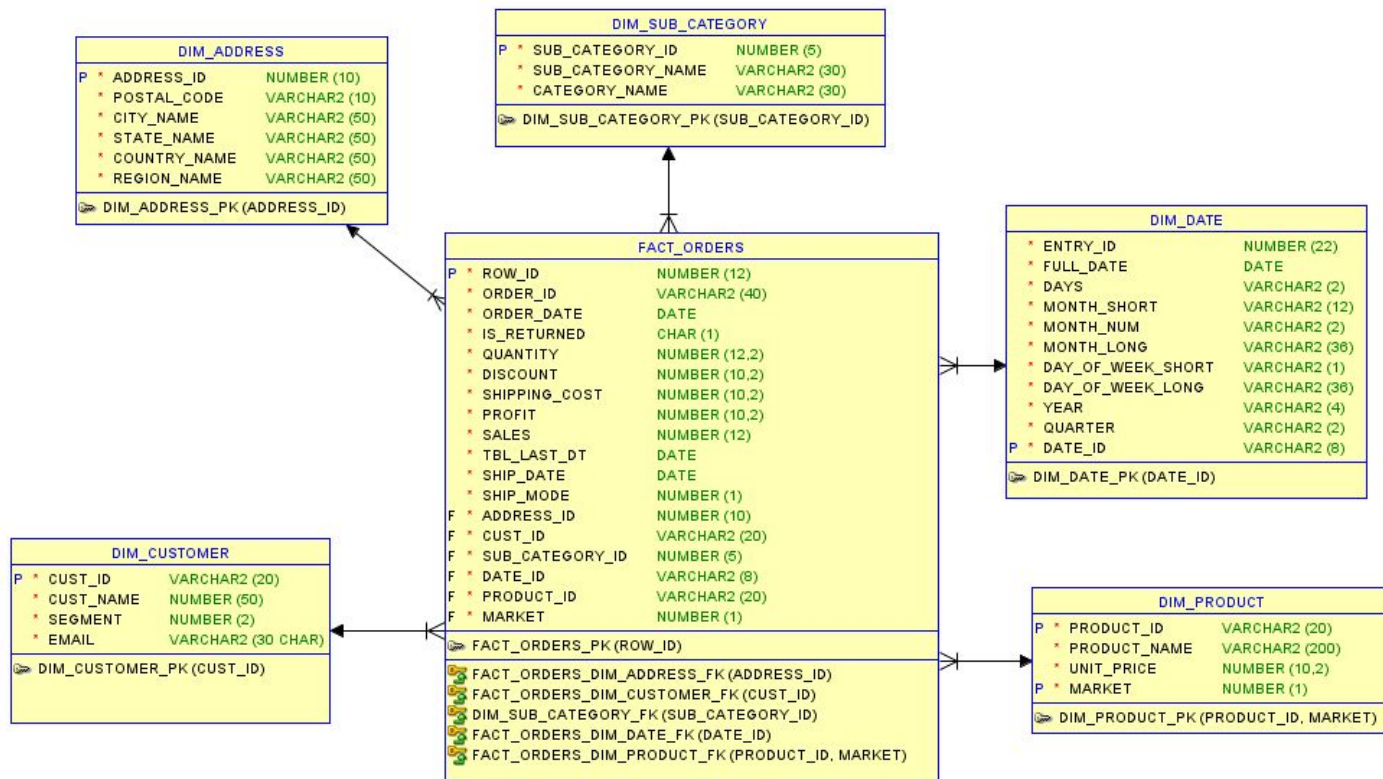
```
drop table if exists pkbc_address_history;  
create table pkbc_address_history as select * from  
pkbc_address where 1 = 2;  
alter table pkbc_address_history add constraint  
pk_address_history primary key (addr_id);
```

```
delimiter $$  
drop trigger if exists td_pkbc_address;  
create trigger td_pkbc_address  
before delete on pkbc_address for each row  
begin  
insert into pkbc_address_history  
select * from pkbc_address  
where addr_id = old.addr_id;  
update pkbc_address_history  
set tbl_last_dt=current_timestamp()  
where addr_id=old.addr_id;  
end$$  
delimiter ;
```

Logical Model (DW)



Relational Model (DW)



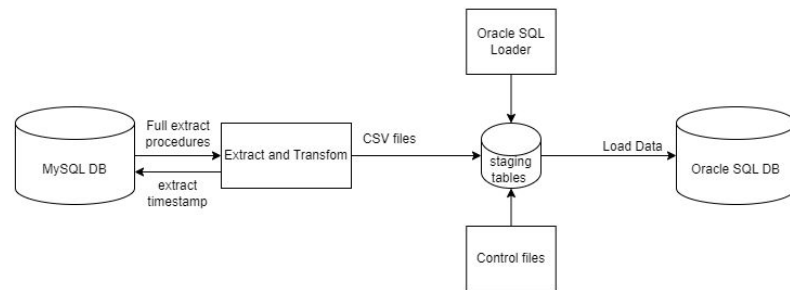
ETL Approach

- Used ETL approach to integrate MySQL OLTP data into Oracle Data Warehouse
- Leveraged Change Data Capture (CDC) for incremental updates on scheduled basis
- Minimizes data transfers by extracting only changes after initial load
- Extracts taken to CSV files, loaded into Oracle staging tables via SQL*Loader
- Implemented star schema data model for simplicity and fast query performance
- Staging tables used to land, transform, and stage data before data warehouse tables

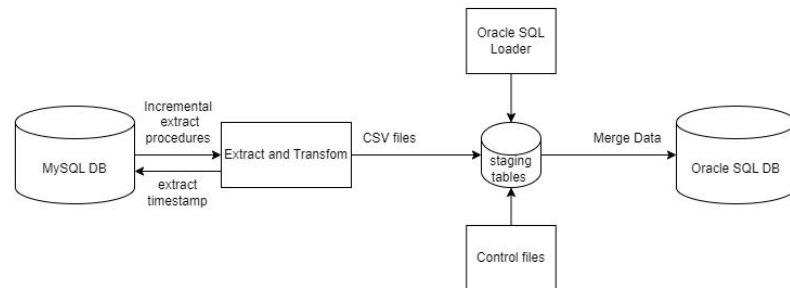
ETL Approach(.. contd)

- Initial full extract export from MySQL, apply transformations, load into warehouse (baseline)
- etl_extract_date table tracks full extract timestamps
- Then periodic incremental extracts from MySQL - only changed data since last extract
- Apply similar ETL process on extracts and merge into data warehouse tables
- Achieves ongoing synchronization of data warehouse with only incremental deltas

FULL ETL PROCESS



INCREMENTAL ETL PROCESS



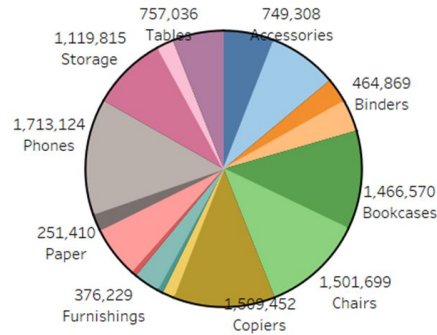
Partition Table

- Partition on orders table in data warehouse based on order date

```
CREATE TABLE fact_pkbc_orders (  
  row_id      NUMBER(12) NOT NULL,  
  order_id    VARCHAR2(40) NOT NULL,  
  order_date  DATE NOT NULL,  
  is_returned CHAR(1) NOT NULL,  
  quantity   NUMBER(12, 2) NOT NULL,  
  discount   NUMBER(10, 2) NOT NULL,  
  shipping_cost NUMBER(10, 2) NOT NULL,  
  profit     NUMBER(10, 2) NOT NULL,  
  sales      NUMBER(12) NOT NULL,  
  ship_date  DATE NOT NULL,  
  ship_mode  NUMBER(1) NOT NULL,  
  address_id NUMBER(10) NOT NULL,  
  cust_id    VARCHAR2(20) NOT NULL,  
  sub_category_id NUMBER(5) NOT NULL,  
  product_id VARCHAR2(20) NOT NULL,  
            market    NUMBER(1) NOT NULL,  
  date_id    VARCHAR2(8) NOT NULL  
)PARTITION BY RANGE (order_date)  
  (  
    PARTITION P1 VALUES less than(to_date('01-JAN-2012', 'DD-MON-YYYY')),  
    PARTITION P2 VALUES less than(to_date('01-JAN-2013', 'DD-MON-YYYY')),  
    PARTITION P3 VALUES less than(to_date('01-JAN-2014', 'DD-MON-YYYY')),  
    PARTITION P4 VALUES less than(to_date('01-JAN-2015', 'DD-MON-YYYY')),  
    PARTITION P5 VALUES less than(to_date('01-JAN-2016', 'DD-MON-YYYY')),  
    PARTITION P6 VALUES less than(to_date('01-JAN-2017', 'DD-MON-YYYY')),  
    PARTITION P7 VALUES less than(to_date('01-JAN-2018', 'DD-MON-YYYY')),  
    PARTITION P8 VALUES less than(to_date('01-JAN-2019', 'DD-MON-YYYY')),  
    PARTITION P9 VALUES less than(to_date('01-JAN-2020', 'DD-MON-YYYY')),  
    PARTITION P10 VALUES less than(to_date('01-JAN-2021', 'DD-MON-YYYY')),  
    PARTITION P11 VALUES less than(to_date('01-JAN-2022', 'DD-MON-YYYY')),  
    PARTITION P12 VALUES less than(to_date('01-JAN-2023', 'DD-MON-YYYY')),  
    PARTITION P13 VALUES less than(to_date('01-JAN-2024', 'DD-MON-YYYY'))  
  );
```

Data Analytics

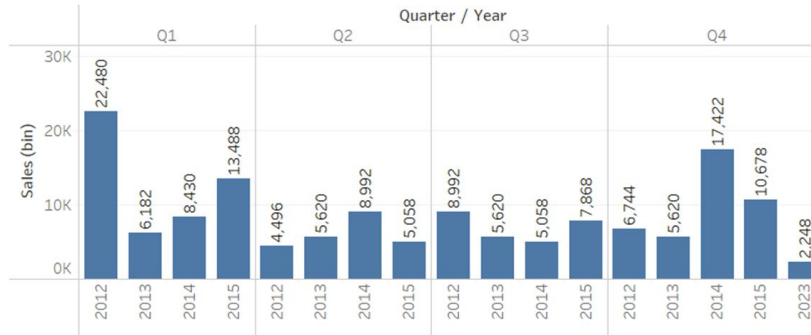
Sales vs Sub-Category



Sub Category Name

- Accessories
- Appliances
- Art
- Binders
- Bookcases
- Chairs
- Copiers
- Envelopes
- Fasteners
- Furnishings
- Labels
- Machines
- Paper
- Phones
- Storage
- Supplies
- Tables

Sales vs Year Quarter



Sales

12,644,800

Lessons Learnt

- Combined complementary skills for well-rounded project
- UI/frontend and backend development
- Covered each other's weaknesses
- Communication was key for collaboration
- Alignment on designs and decisions
- Resolve challenges together
- Enable productive teamwork
- Tools like Git improved code management
- Track changes, fixes, features
- Support concurrent working
- Streamline productivity
- Clean, simple code was crucial
- Simplify troubleshooting
- Avoid new issues
- Facilitate contributions