Data Integration and Cloud Services

Course Project on

Mail Delivery Service

Bachelor of Engineering

IN

COMPUTER SCIENCE AND ENGINEERING

Submitted By

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1. Introduction

1.1 Preamble

The mail service database is a central hub for storing critical information related to mail delivery. It includes data on senders, recipients, tracking numbers, and delivery timestamps. This database enables functionalities like real-time tracking of mail items. It facilitates transparency and accountability throughout the delivery process. Additionally, it automates the generation of invoices and receipts for customers. This streamlines billing processes and reduces administrative burden. Moreover, it provides robust data analysis tools. These tools empower organizations to analyze delivery data and identify trends. By centralizing information, the database streamlines workflows and minimizes errors.Ultimately, it enhances customer satisfaction and fosters loyalty. It's a foundational tool for any organization involved in mail delivery.

1.2 Problem Definition and Description

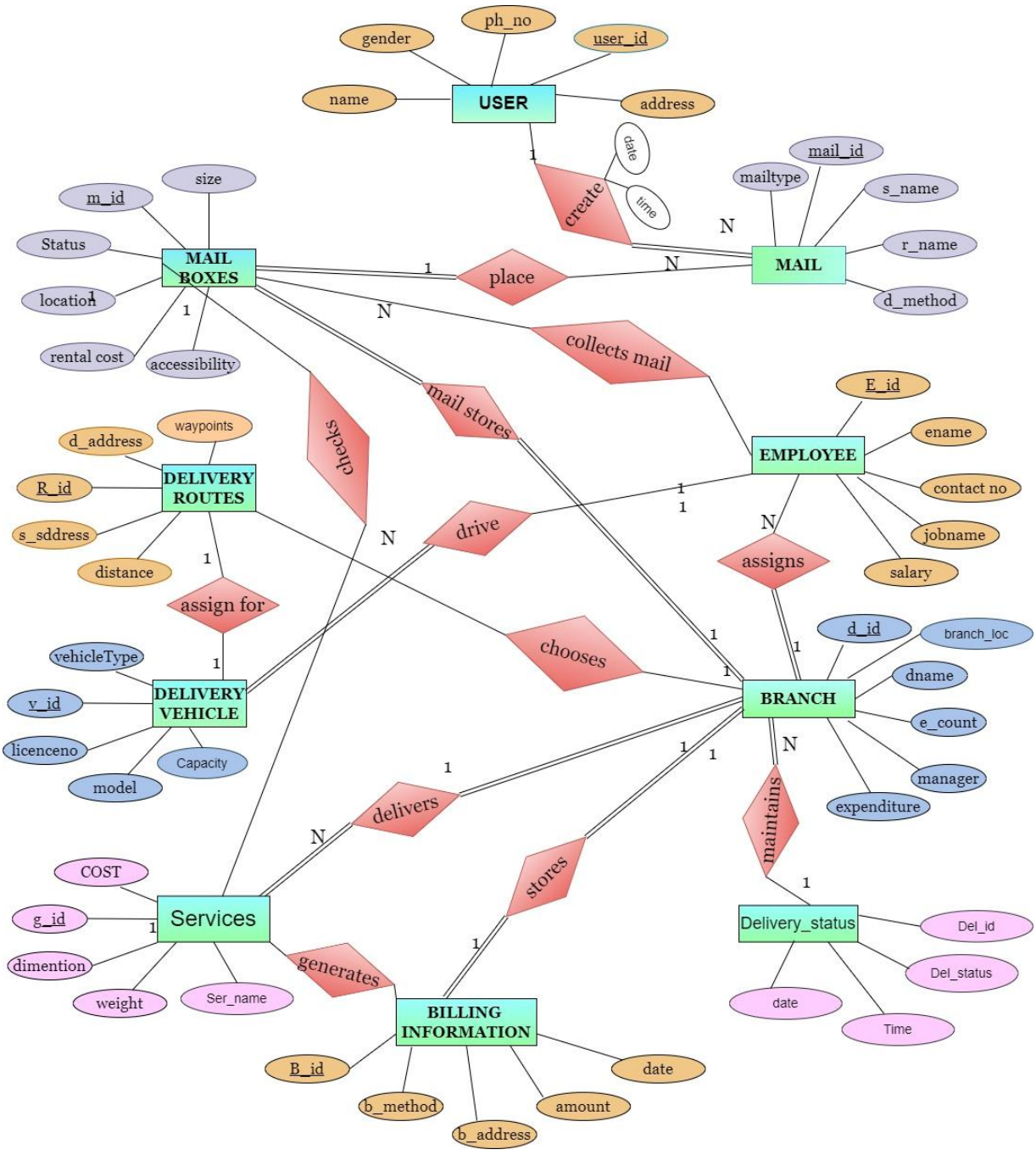
In a typical small town, the local mail delivery system efficiently handles various types of mail, including letters, couriers, and parcels. Customers drop off their mail at designated mailboxes around town, where each item is later collected by postal employees. These items are automatically scanned at the central branch to identify their type, and the system prompts for additional service options like delivery speed and insurance for couriers and parcels, while letters are usually mailed free of charge.

Charges are applied accordingly, and receipts, including tracking numbers for paid items, are issued based on the selected services. The sorted mail is then organized at the branch according to type and delivery specifications, and stored in designated bins. To ensure efficient delivery, the branch manager plans the delivery routes based on the

volume of mail and its destinations and assigns vehicles and drivers for the routes.

As deliveries are made, drivers use handheld devices to update the delivery status in real-time, providing customers with the ability to track their mailed items. This streamlined process not only simplifies initial mail drop-off but also optimizes the sequence from collection and sorting to final delivery, enhancing both operational efficiency and customer service.

2. ER diagram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delivers
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g_id
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weight
Ser_name
Services
generates
Delivery_status
Del_id
Del_status
date
Time
BILLING INFORMATION
B_id
b_method
b_address
amount
date

3. Data set description

Source Tables:

User

User_id	User_name	gender	phoneno	address

Mail

Mail_id	Mail_type	Sender_name	Receiver_name	Deli_method	time	date	User_id	Mailbox_id	destination	weight

MailBox

Mailbox_id	Mailbox_size	Mb_status	location	Rental_cost	accessebility	Emp_id	Branch_id	Service_id

Delivary_routes

DRoute_id	Dest_add	Source_add	waypoints	distance	Branch_id	Amount_km

employe

Emp_id	Emp_name	Contact_no	Job_name	salary	Branch_id	Emp_age	Jo_year

Delivery_vehicle

Vehicle_id	Vehicle_type	Licence_no	Vehicle_model	Vehicle_capacity	Emp_id	DRoute_id

Branch

Branh_id	Brach_loc	Branch_name	Manager_name	Expenditure_month

Services

Service_id	Service_charge	Weight_charge_gm	Branch_id

Billing_information

Billing_id	Billing_method	Billing_address	amount	Billing_date	Billing_time	Service_id	Branch_id

Delivery_status

Delivery_id	Delivery_date	Delivery_status	Delivery_time	Branch_id

Target tables:

Number of mail boxes assigned for each employee and generating sequence number for employee..

ENO	EMP_ID	EMP_NAME	COUNT_MB

Service charge for each service based on mail type.

SERVICE_ID	SERVICE_NAME	SERVICE_CHARGE	WEIGHT_CHARGE_GM

Segregating mails based on mail types.

MAIL_ID	MAIL_TYPE	SENDER_NAME	RECEIVER_NAME	DESTINATION	SERVICE_ID

Generating bill for each mail.

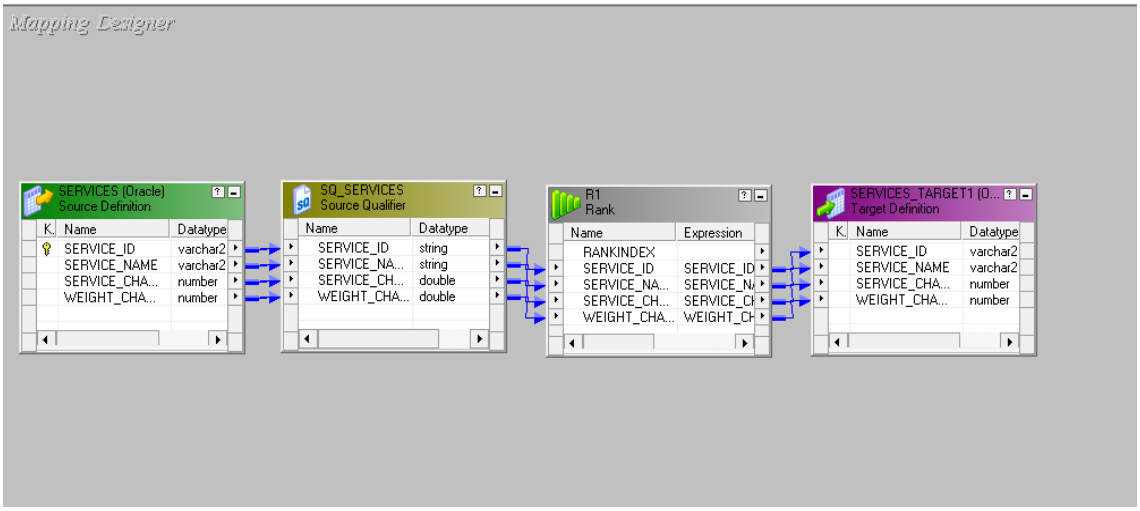
BILLING_ID	MAIL_ID	SERVICE_ID	TOTAL_BILL	SERVICE_NAME

Mail tracking for particular user.

USER_NAME	SERVICE_NAME	MAIL_ID	BILLING_ID	SERVICE_ID	TOTAL_BILL	MAILBOX_NAME	BRANCH_NAME	EMPLOYE_NAMEE

4. Transformations (screen shots) with explanation

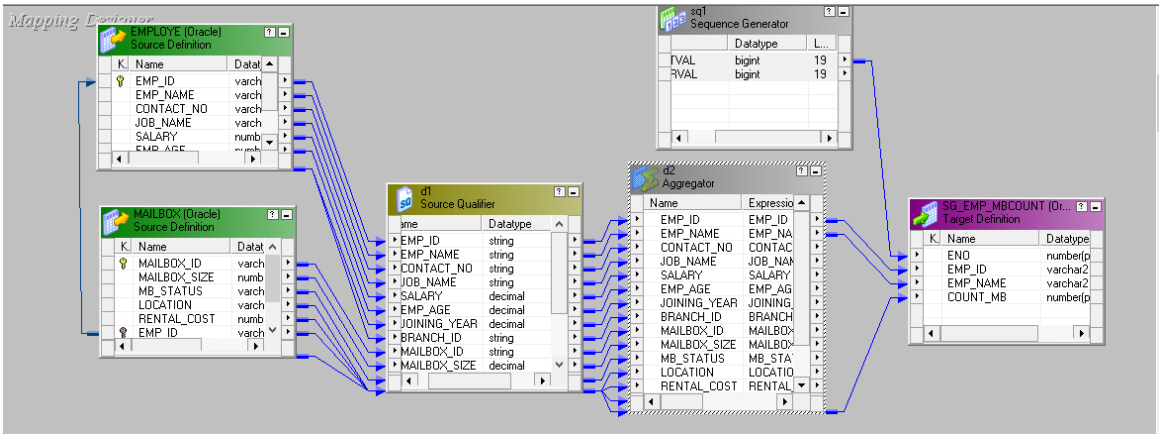
4.1 Arrange the services according to their service charges.



Transformation: Rank transformation

Each service is assigned a rank according to its service charge, with the highest charge receiving the top rank (Rank 1). This step ensures that services with the highest charges are prioritized when sorted.

4.2 Obtain Number of employees working in each mailbox with generating unique id for each mailbox.



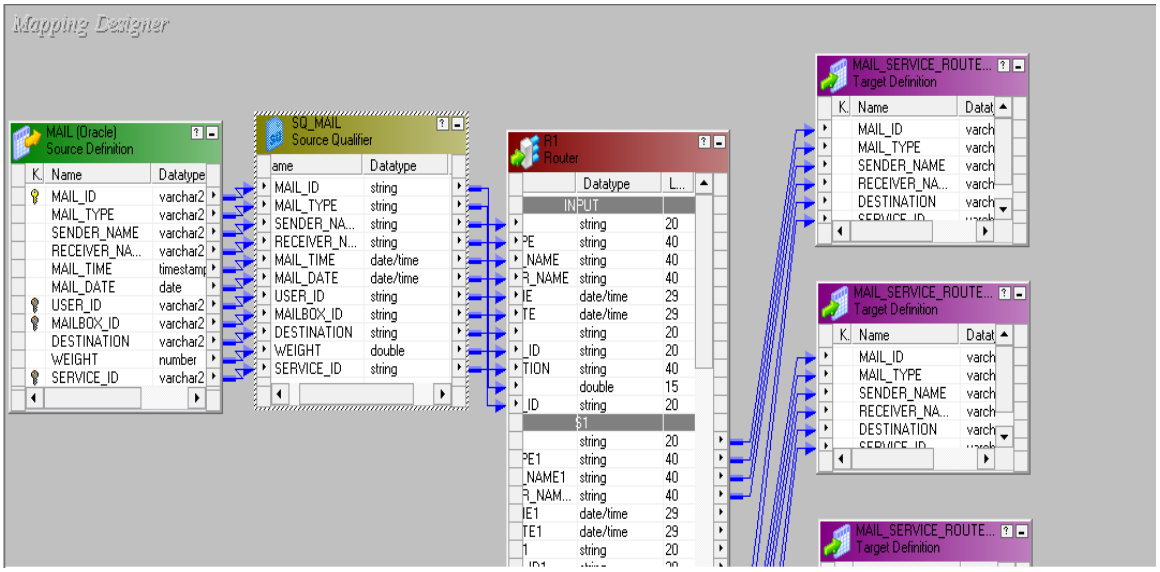
Transformations: Source Qualifier, aggregator, Sequence Generator

Employees and mailboxes are connected through a source qualifier, which is used to join the employee data with the mailbox data based on a foreign key relationship.

The combined data from the source qualifier is then passed through an aggregator transformation. The purpose of the aggregator is to group the employee records by their associated mailboxes and calculate the total number of employees for each mailbox. This is done using an aggregation function like COUNT

After aggregation, the data is passed to a sequence generator. The sequence generator is used to create a unique identifier (ID) for each entry in the target table. This ensures that each record in the target table has a unique primary key.

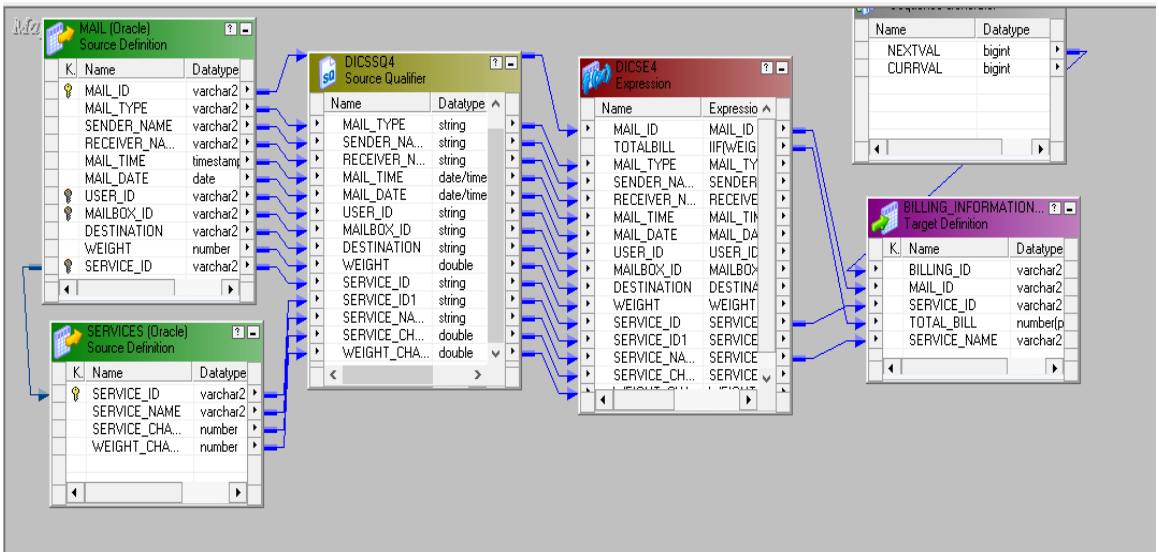
4.3 Sort the Services based on the service type.



Transformations: Router

The router transformation evaluates each service record and routes it to different target tables based on predefined service type conditions (e.g., "Speed Post," "Registered Mail," "Express Mail"). Each condition directs the records to a specific output group connected to the corresponding target table, ensuring that services are categorized and stored in their appropriate tables according to their type.

4.4 Calculate the Total bill generated for the particular mail.



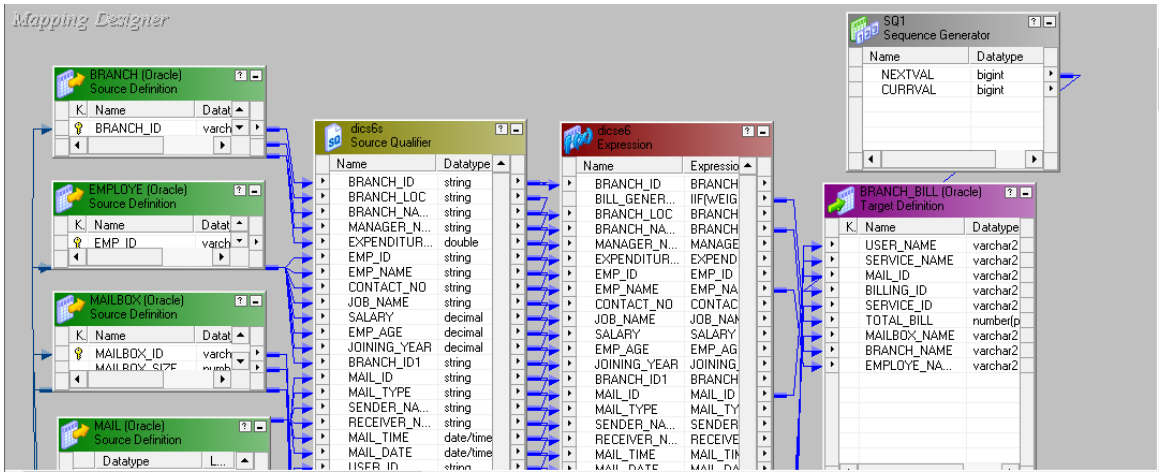
Transformations: Source qualifier, Expression, Sequence generator

The mail records and service records are joined using a source qualifier based on a foreign key relationship. This means each mail record contains a foreign key that references the corresponding service record.

After combining the mail and service records, the data is passed through an expression transformation. In this transformation, a new attribute called "Total Bill" is created. The logic for calculating the total bill is defined within the expression transformation, utilizing other attributes from the combined mail and service records. This calculated "Total Bill" attribute represents the total cost for each particular mail item.

To ensure each entry in the target table is uniquely identifiable, a sequence generator is used. This component generates a unique identifier for each record.

4.5 Generate the receipt like structure for mail includes overall details.



Transformations: Source qualifier, Expression, Sequence Generator

The mail records, services, branch, employee, mailbox records are joined using a source qualifier based on a foreign key relationship.

After combining the data it is passed through an expression transformation. In this transformation, a new attribute called "Total Bill" is created. This calculated "Total Bill" attribute represents the total cost for each particular mail item.

For each entry in the target table is uniquely identifiable, a sequence generator is used. This component generates a unique identifier for each record.

5. Conclusion

The local mail delivery system in a typical small town operates with a high level of efficiency and customer service, leveraging technology and strategic planning to enhance overall performance. Automatic scanning at the central branch reduces manual errors and speeds up the identification of different mail types. Automated prompts for additional service options ensure appropriate service levels, simplifying the process for postal employees. While letters are mailed free of charge, adding value to everyday communication, charges for couriers and parcels, along with tracking numbers, enhance security and customer loyalty. Real-time delivery status updates through handheld devices provide transparency and peace of mind for customers. The branch manager's planning of delivery routes based on mail volume and destinations optimizes resources and ensures timely deliveries. The integration of handheld devices for drivers to update delivery statuses in real-time demonstrates strategic use of technology, further streamlining operations. This well-coordinated system balances operational efficiency with high quality customer service, ensuring the postal service can handle varying mail volumes without compromising on delivery times or service quality. To build on this efficient system, recommendations include utilizing advanced data analytics for predictive planning, integrating customer feedback, expanding service options, and incorporating sustainability initiatives. By refining these processes and leveraging data-driven insights, the local mail delivery system can maintain high standards of efficiency and customer satisfaction while adapting to future challenges and opportunities.