

Logistics Optimization for Delivery Routes – UPS

Project Overview:

UPS (United Parcel Service) is one of the world's largest logistics and package delivery companies, operating a global network of sorting hubs, warehouses, transportation routes, and last-mile delivery agents. With millions of parcels shipped daily across regions, ensuring timely delivery and route efficiency is critical to customer satisfaction and cost control.

As shipment volumes grow, UPS faces challenges related to delivery delays, inefficient routing, and operational bottlenecks across warehouses and delivery agents. Data-driven logistics optimization is essential to improve service reliability and operational efficiency.

The logistics data for UPS is stored in structured relational databases and can be analyzed using SQL to uncover insights that help optimize delivery routes, reduce delays, and improve overall shipment performance.

Project Objective:

Build a SQL-driven logistics analytics system for UPS to analyze delivery delays, optimize routes, and enhance shipment efficiency. The project aims to answer key business questions, identify inefficiencies, and recommend actionable improvements using SQL queries, aggregations, and analytical techniques.

(If you're unfamiliar with any concepts or domain-specific terms, feel free to take the help of Google or AI tools like ChatGPT or Gemini to understand them better and apply them effectively in your project.)

Dataset Description

The dataset will include the following key tables:

(Please download the hyperlinked datasets)

1. Orders Table

The Orders dataset contains order-level delivery details including order date, route, warehouse, and payment type.

2. Routes Table

The Routes dataset includes route-level transportation details, covering the source and destination cities, countries, total distance, and average transit time (in hours).

3. Warehouses Table

The Warehouses dataset provides location-level information about FedEx's major hubs and sortation centers.

4. Delivery Agents Table

The Delivery Agents dataset contains agent-level performance data, including agent ID, name, assigned zone and country, experience, and customer rating.

5. Shipment Tracking Table

The Shipments dataset includes shipment-level tracking information with timestamps for pickup and delivery, delay duration, and feedback ratings.

Tasks to be Performed

(Please refrain from using AI to perform the tasks mentioned below, as it will only provide generic solutions.)

Task 1: Data Cleaning & Preparation (10 Marks)

- Identify and delete duplicate Order_ID records.
- Replace null Traffic_Delay_Min with the average delay for that route.
- Convert all date columns into YYYY-MM-DD format using SQL functions.
- Ensure that no Actual_Delivery_Date is before Order_Date (flag such

records). **Task 2: Delivery Delay Analysis (15 Marks)**

- Calculate delivery delay (in days) for each order
- Find Top 10 delayed routes based on average delay days.
- Use window functions to rank all orders by delay within each warehouse.

Task 3: Route Optimization Insights (10 Marks)

- For each route, calculate:
 - Average delivery time (in days).
 - Average traffic delay.
 - Distance-to-time efficiency ratio: $\text{Distance_KM} / \text{Average_Travel_Time_Min}$.
- Identify 3 routes with the worst efficiency ratio.
- Find routes with >20% delayed shipments.
- Recommend potential routes for optimization.

Task 4: Warehouse Performance (10 Marks)

- Find the top 3 warehouses with the highest average processing time.
- Calculate total vs. delayed shipments for each warehouse.
- Use CTEs to find bottleneck warehouses where processing time > global average.
- Rank warehouses based on on-time delivery percentage.

Task 5: Delivery Agent Performance (10 Marks)

- Rank agents (per route) by on-time delivery percentage
- Find agents with on-time % < 80%.
- Compare average speed of top 5 vs bottom 5 agents using subqueries.

Task 6: Shipment Tracking Analytics (15 Marks)

- For each order, list the last checkpoint and time.
- Find the most common delay reasons (excluding None).
- Identify orders with >2 delayed checkpoints

Task 7: Advanced KPI Reporting (10 Marks)

Calculate KPIs using SQL queries:

Average Delivery Delay per Region (Start_Location).
 On-Time Delivery % = (Total On-Time Deliveries / Total Deliveries) * 100.
 Average Traffic Delay per Route.

Task 8: PPT Presentation and Video Submission(20 Marks)

PPT Submission (10 Marks)

- Present your analysis and findings by copying all the queries and result tables from the previous steps into a PowerPoint presentation.
- Copy and Paste SQL queries and its corresponding results for the tasks 1 to 7.
- Ensure that the tables are formatted clearly, and the queries are concise. Use charts, graphs, or tables to make your data more digestible.
- Record a video explaining the project for a maximum of 5 mins. This should include project understanding analysis and explanation of outcomes. Upload in drive and share the drivelink in the ppt.(10 marks)

Note:

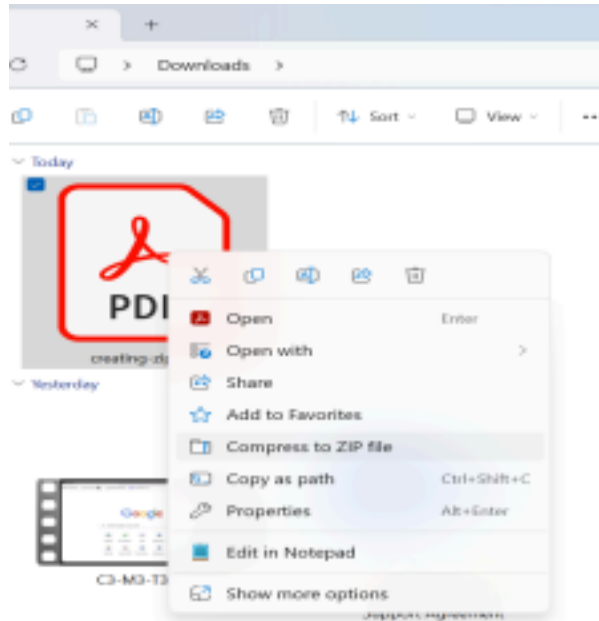
- Submit your PPT and SQL script after zipping those in a folder.
- Plagiarism will result in a penalty, including possible project disqualification. • The project will be evaluated based on the quality of analysis and visualizations, depth of insights, feasibility of recommendations, clarity of explanations, and adherence to instructions and deliverables.
- If the student sets their own criteria, they need to clearly mention and explain it. Marks will be given according to the specified criteria if they are acceptable. • Remember to keep the video length less than 5 minutes with your face clearly visible.

Submission Guidelines:

- Save the PPT, SQL Script in a folder and then convert it into a zipped (.zip) folder. **(Please note, the drivelinek for the video created should also be added in the Ppt itself.)**
- Upload the zipped folder on your respective dashboard.
- Failure to comply with submission guidelines will result in no

grading/0 marks. **How to ZIP a PDF file:**

- Put all of the documents you want to compress (or just one) into a new folder. • Right click on that folder.

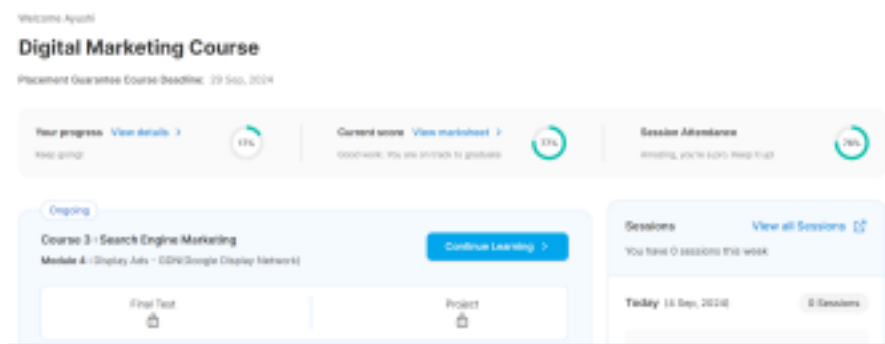


- Select the “Compress to ZIP file” option and then click “Compressed (Zipped) folder.”
- A new .ZIP file will be created that contains your document(s).

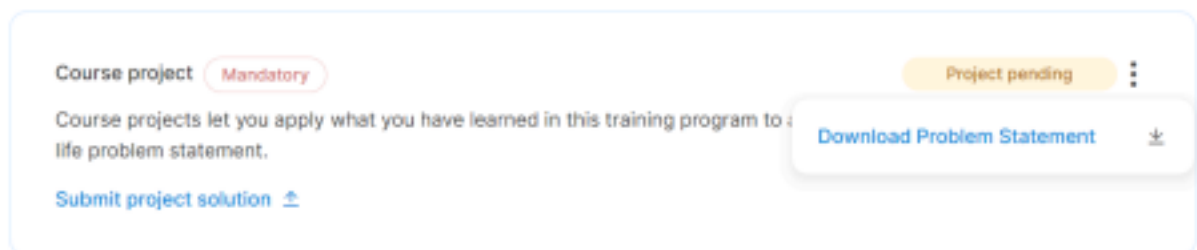
In order to submit the projects please follow the following steps:

1. Click on “ Your progress [View details](#)” after logging into your

dashboard.



2. Next, click on the tab for the specific child course for which you want to download the problem statement. Then, scroll down to find the "**Course Project**" section.
3. Now, click on the three dots on the right-hand side of the "Course Project" tab to select "**Download Problem Statement.**"



4. Please follow the guidelines (screenshot is shared below) provided in the project to ensure correct submissions. Then, click on "**Upload Project Solution**" to submit your work.

