Electronics Vendor Project for Database Management Systems

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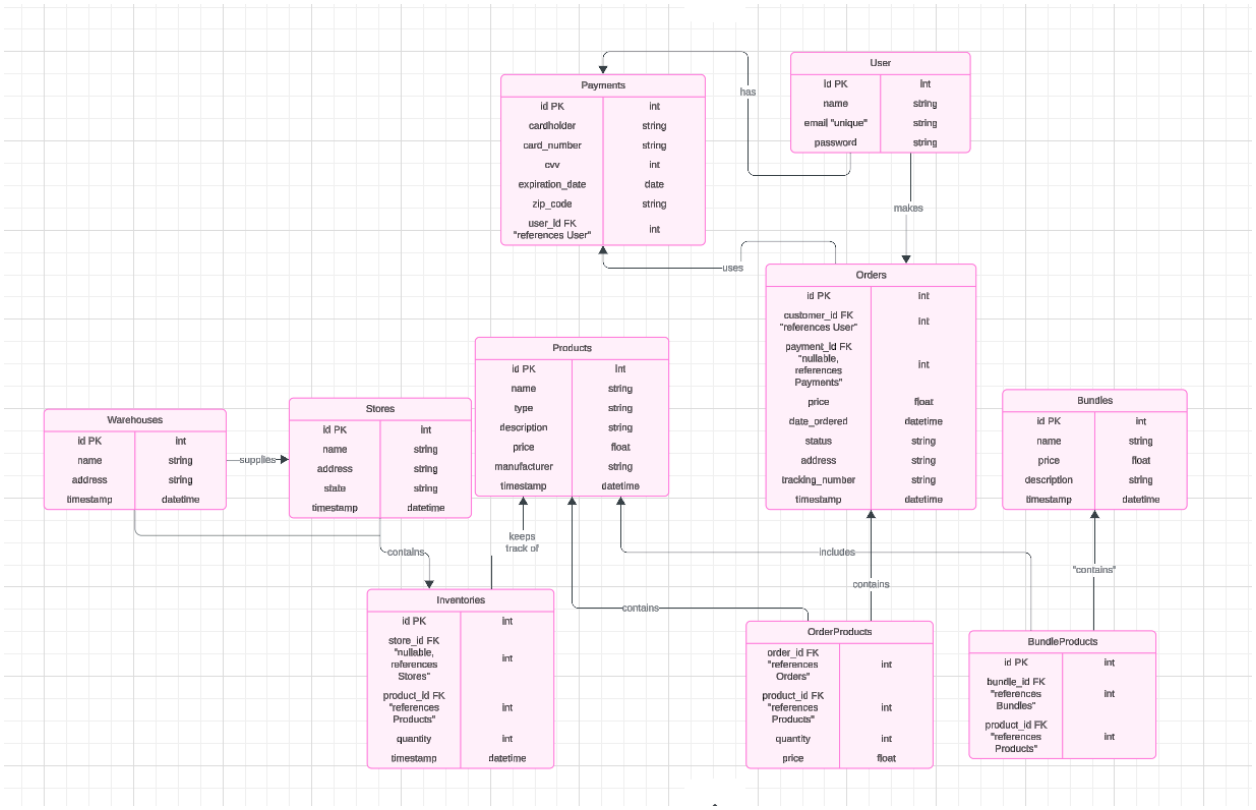
Abstract

This project describes my research and implementation of a database management system run in conjunction with a fullstack web application designed after an electronics vendor like Best Buy, Circuit City, or if Newegg ran physical locations. As a semester project, I created it to (ideally) show my proficiency in what I have learned in this semester, applied to an actual project. It is easy to assume you are knowledgeable about something until that knowledge is tested.

Project Description

The goal of the project was to create a somewhat realistic web application with functions for users, employees, and database administrators alike. With so many moving parts, I had to map out what schemas my database needed, how these schemas needed to interact with each other, as well as how these schemas needed to operate on a low-level, and then I actually had to implement it.

Design

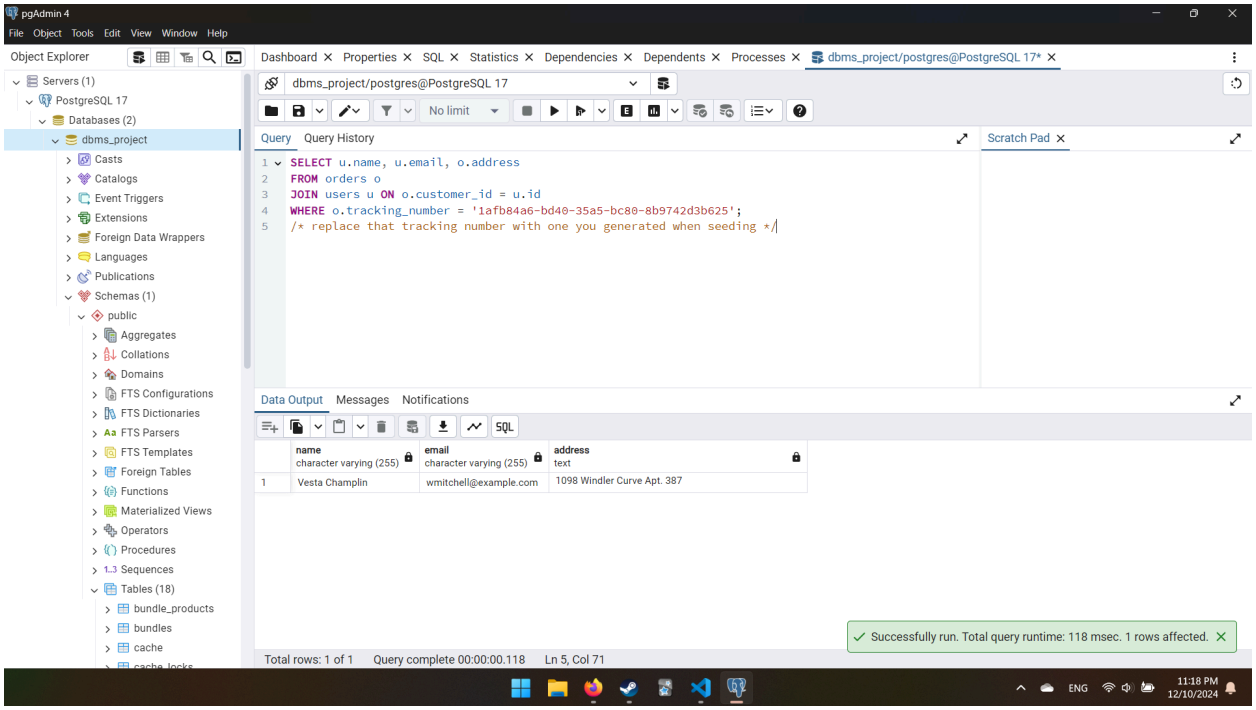


Implementation

The database is run on PostgreSQL and the web application is run on Laravel, a fullstack PHP framework. This setup allowed Laravel to do a lot of the heavy lifting (user authentication, seeding the database, migrations to database, MVC, etc.) so I could focus more on the implementation of the database and the application's features. PHP Composer, Node Package Manager, and GitHub were used as dependency and version control tools to help keep me organized and work on this as I balanced other classes and my full-time job as a software developer.

Running Results and Analysis

The following are screenshots of the given example queries working as intended:


pgAdmin 4
File Object Tools Edit View Window Help
Object Explorer
Dashboard Properties SQL Statistics Dependencies Dependents Processes dbms_project/postgres@PostgreSQL 17*
dbms_project/postgres@PostgreSQL 17
No limit
Query Query History
Scratch Pad
SELECT u.name, u.email, o.address
FROM orders o
JOIN users u ON o.customer_id = u.id
WHERE o.tracking_number = '1afb84a6-bd40-35a5-bc80-8b9742d3b625';
/* replace that tracking number with one you generated when seeding */
Data Output Messages Notifications
name character varying (255)
email character varying (255)
address text
1 Vesta Champlin wmitchell@example.com 1098 Windler Curve Apt. 387
Successfully run. Total query runtime: 118 msec. 1 rows affected.
Total rows: 1 of 1 Query complete 00:00:00.118 Ln 5, Col 71
Servers (1)
PostgreSQL 17
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FTS Templates
Foreign Tables
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Materialized Views
Operators
Procedures
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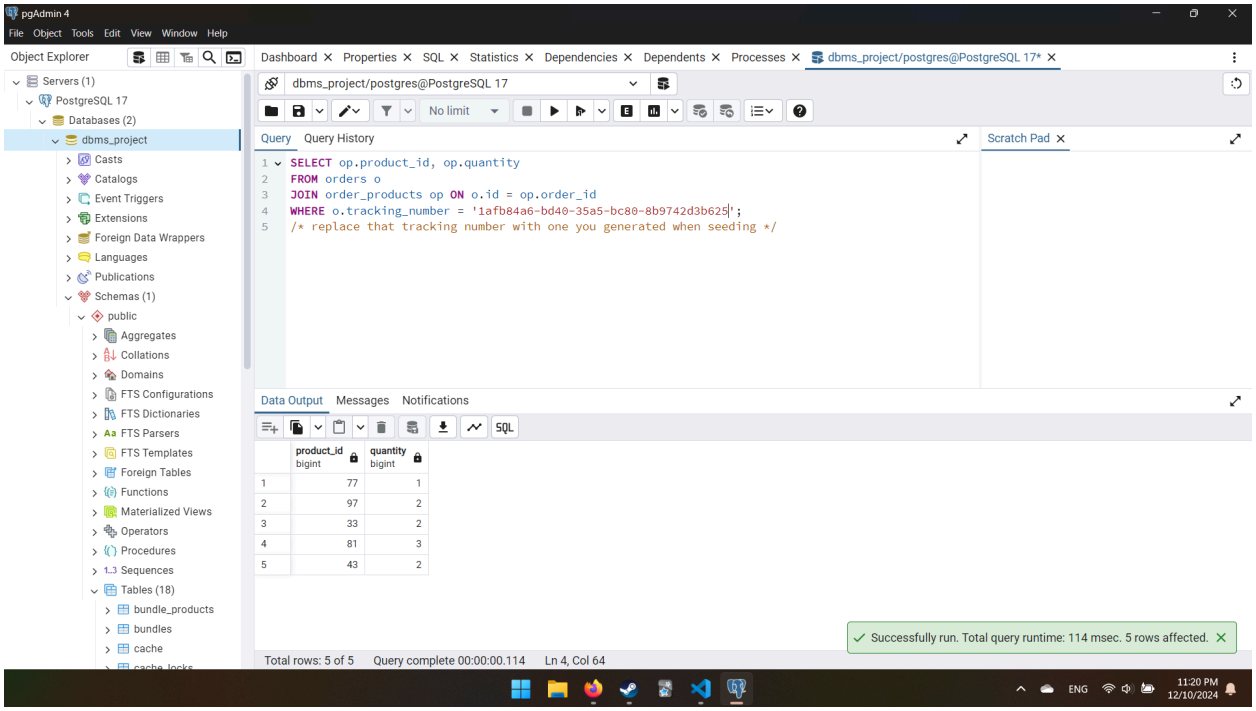
Tables (18)
bundle_products
bundles
cache
ENG
11:18 PM
12/10/2024


pgAdmin 4
File Object Tools Edit View Window Help
Object Explorer
Dashboard Properties SQL Statistics Dependencies Dependents Processes dbms_project/postgres@PostgreSQL 17*
dbms_project/postgres@PostgreSQL 17
No limit
Query Query History
Scratch Pad
SELECT op.product_id, op.quantity
FROM orders o
JOIN order_products op ON o.id = op.order_id
WHERE o.tracking_number = '1afb84a6-bd40-35a5-bc80-8b9742d3b625';
/* replace that tracking number with one you generated when seeding */
Data Output Messages Notifications
product_id bigint
quantity bigint
1 77 1
2 97 2
3 33 2
4 81 3
5 43 2
Successfully run. Total query runtime: 114 msec. 5 rows affected.
Total rows: 5 of 5 Query complete 00:00:00.114 Ln 4, Col 64
Servers (1)
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bundle_products
bundles
cache
ENG
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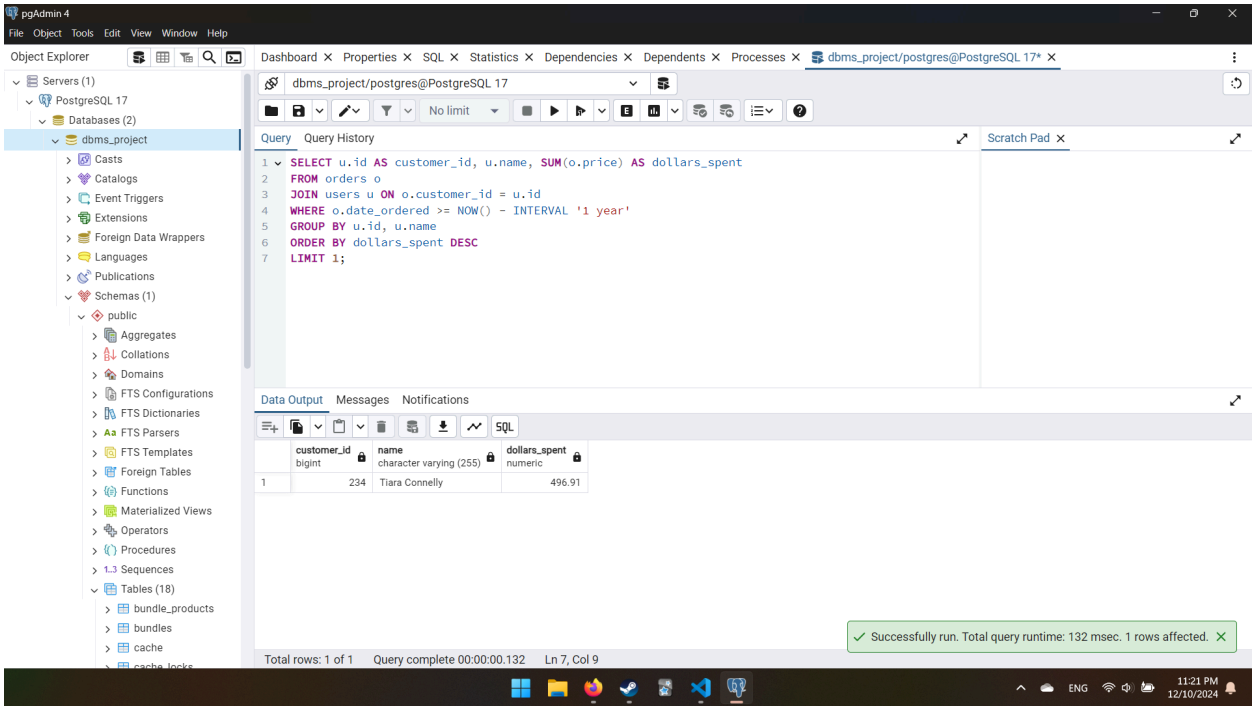
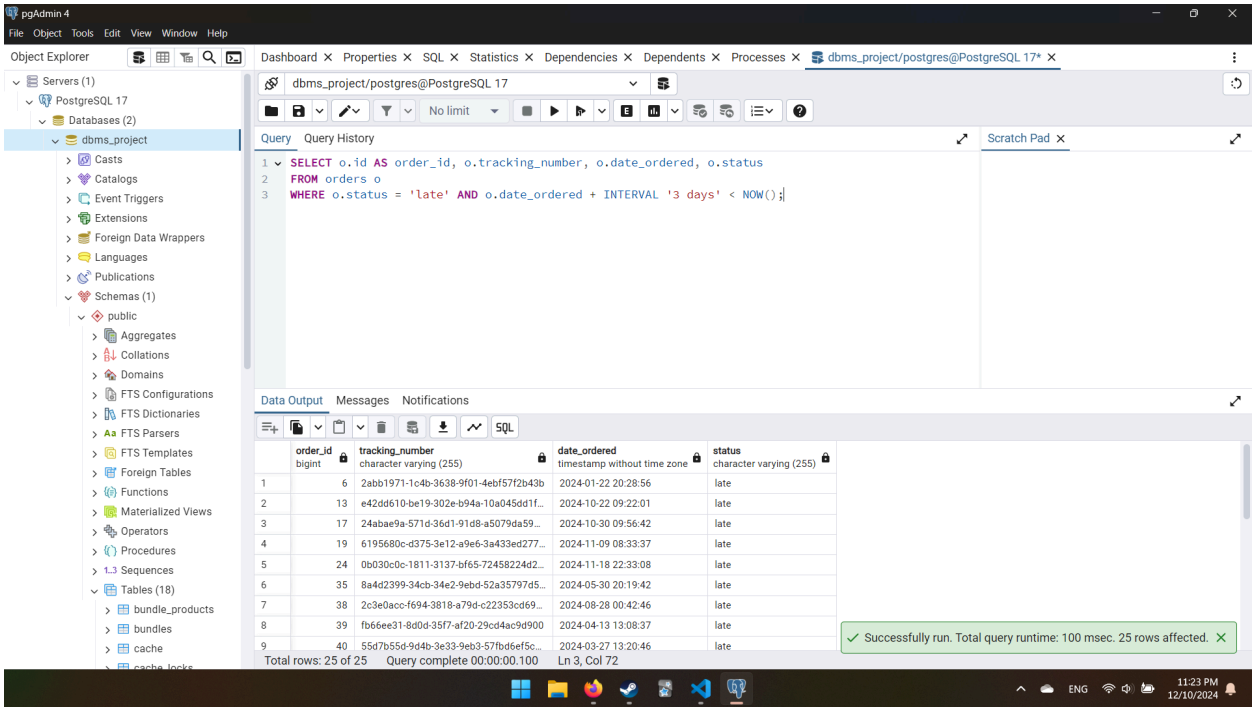
12/10/2024


pgAdmin 4
File Object Tools Edit View Window Help
Object Explorer
Dashboard Properties SQL Statistics Dependencies Dependents Processes dbms_project/postgres@PostgreSQL 17*
dbms_project/postgres@PostgreSQL 17
No limit
Query Query History
Scratch Pad
SELECT u.id AS customer_id, u.name, SUM(o.price) AS dollars_spent
FROM orders o
JOIN users u ON o.customer_id = u.id
WHERE o.date_ordered >= NOW() - INTERVAL '1 year'
GROUP BY u.id, u.name
ORDER BY dollars_spent DESC
LIMIT 1;
Data Output Messages Notifications
customer_id bigint
name character varying (255)
dollars_spent numeric
1 234 Tiara Connelly 496.91
Successfully run. Total query runtime: 132 msec. 1 rows affected.
Total rows: 1 of 1 Query complete 00:00:00.132 Ln 7, Col 9
11:21 PM 12/10/2024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Object Explorer
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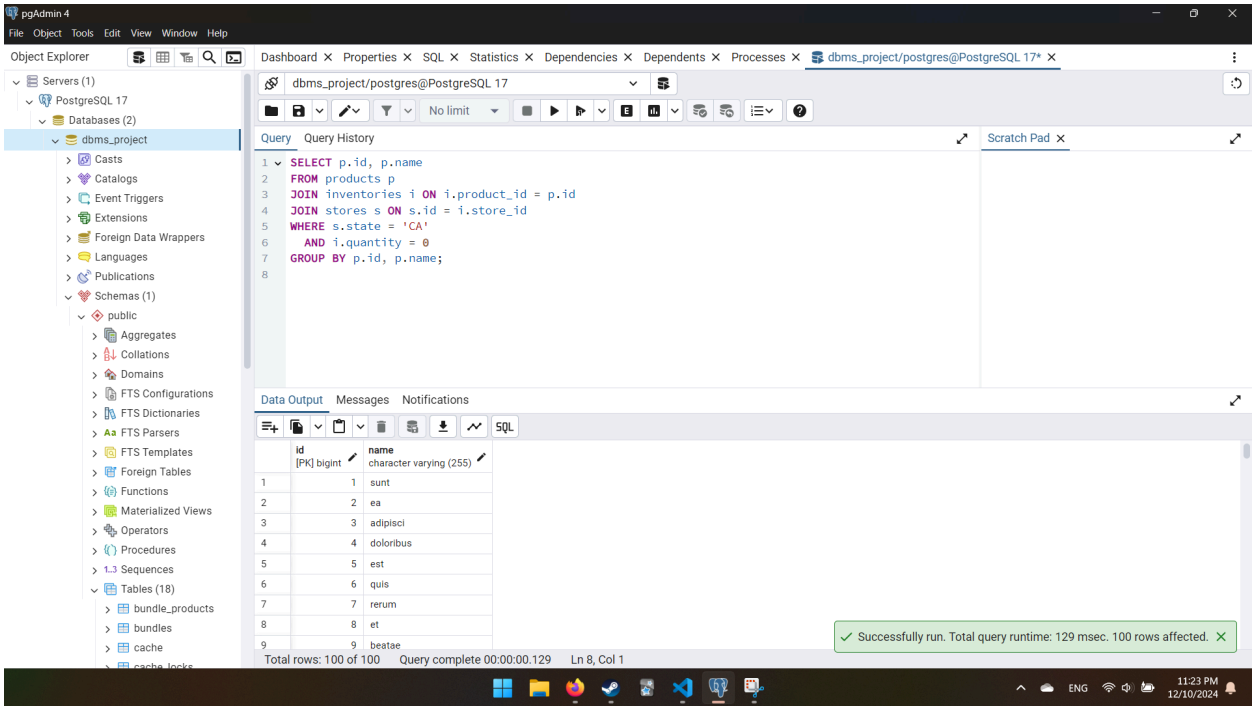
dbms_project/postgres@PostgreSQL 17
No limit
Query Query History
Scratch Pad
SELECT o.id AS order_id, o.tracking_number, o.date_ordered, o.status
FROM orders o
WHERE o.status = 'late' AND o.date_ordered + INTERVAL '3 days' < NOW();
Data Output Messages Notifications
order_id bigint
tracking_number character varying (255)
date_ordered timestamp without time zone
status character varying (255)
1 6 2abb1971-1c4b-3638-9f01-4ebf57f2b43b 2024-01-22 20:28:56 late
2 13 e42dd610-be19-302e-b94a-10a045dd1f... 2024-10-22 09:22:01 late
3 17 24abae9a-571d-36d1-91d8-a5079da59... 2024-10-30 09:56:42 late
4 19 6195680c-d375-3e12-a9e6-3a433ed277... 2024-11-09 08:33:37 late
5 24 0b030c0c-1811-3137-bf65-72458224d2... 2024-11-18 22:33:08 late
6 35 8a4d2399-34cb-34e2-9ebd-52a35797d5... 2024-05-30 20:19:42 late
7 38 2c3e0acc-f694-3818-a79d-c22353cd69... 2024-08-28 00:42:46 late
8 39 fb66ee31-8d0d-35f7-af20-29cd4ac9d900 2024-04-13 13:08:37 late
9 40 55d7b55d-9d4b-3e33-9eb3-57fbd6ef5c... 2024-03-27 13:20:46 late
Successfully run. Total query runtime: 100 msec. 25 rows affected.
Total rows: 25 of 25 Query complete 00:00:00.100 Ln 3, Col 72
11:23 PM 12/10/2024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dbms_project/postgres@PostgreSQL 17
No limit
Query Query History
Scratch Pad
SELECT p.id, p.name
FROM products p
JOIN inventories i ON i.product_id = p.id
JOIN stores s ON s.id = i.store_id
WHERE s.state = 'CA'
AND i.quantity = 0
GROUP BY p.id, p.name;
Data Output Messages Notifications
id [PK] bigint
name character varying (255)
1 1 sunt
2 2 ea
3 3 adipisci
4 4 doloribus
5 5 est
6 6 quis
7 7 rerum
8 8 et
9 9 beatae
Successfully run. Total query runtime: 129 msec. 100 rows affected.
Total rows: 100 of 100
Query complete 00:00:00.129
Ln 8, Col 1
11:23 PM
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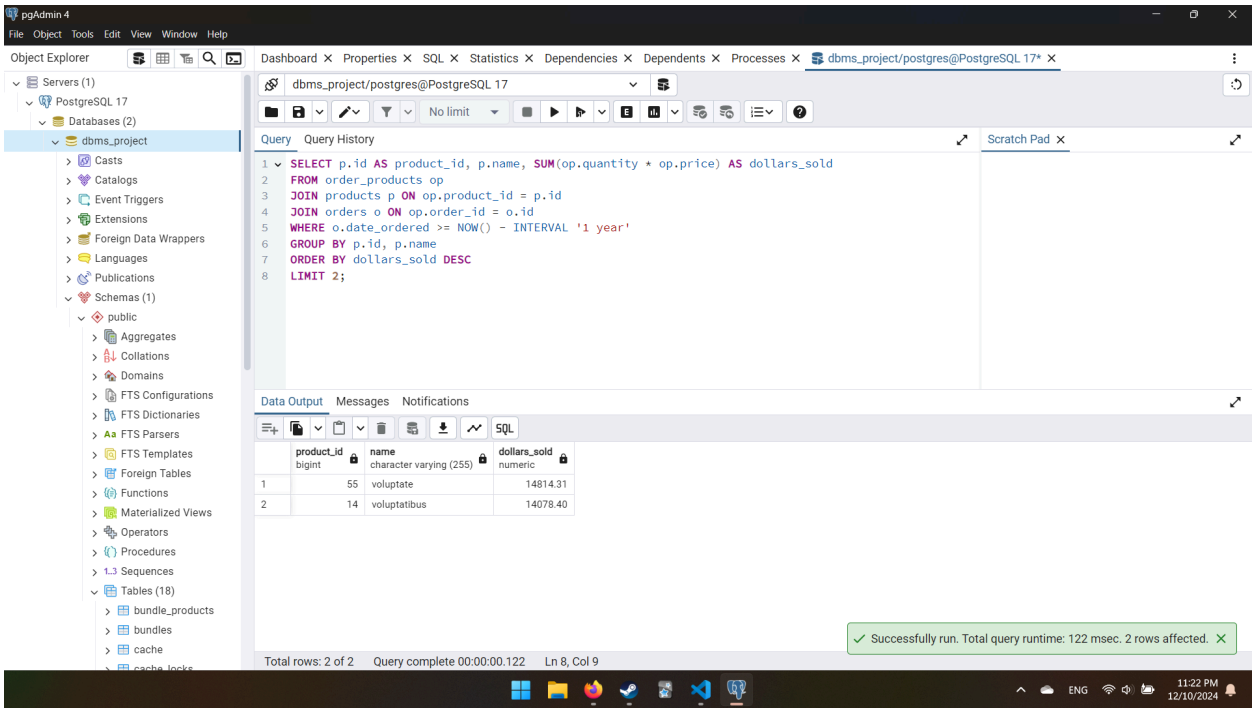
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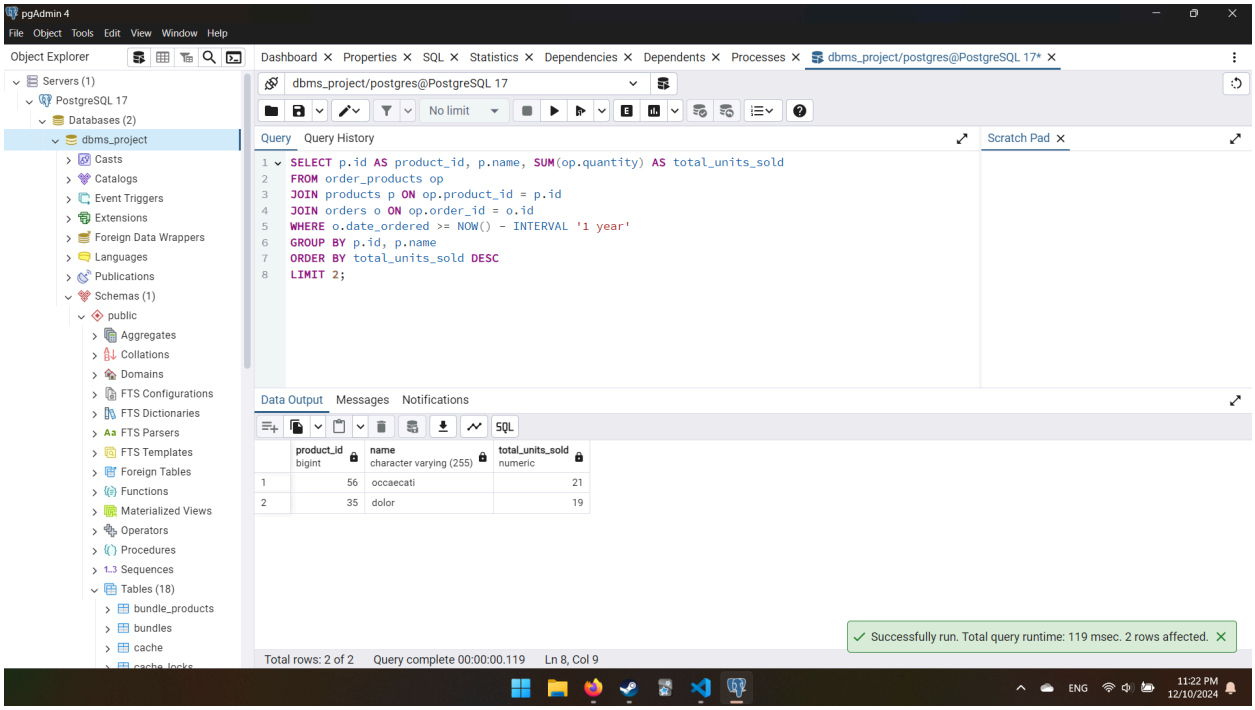
No limit
Query Query History
Scratch Pad
SELECT p.id AS product_id, p.name, SUM(op.quantity * op.price) AS dollars_sold
FROM order_products op
JOIN products p ON op.product_id = p.id
JOIN orders o ON op.order_id = o.id
WHERE o.date_ordered >= NOW() - INTERVAL '1 year'
GROUP BY p.id, p.name
ORDER BY dollars_sold DESC
LIMIT 2;
Data Output Messages Notifications
product_id bigint
name character varying (255)
dollars_sold numeric
1 55 voluptate 14814.31
2 14 voluptatibus 14078.40
Successfully run. Total query runtime: 122 msec. 2 rows affected.
Total rows: 2 of 2
Query complete 00:00:00.122
Ln 8, Col 9
11:22 PM
12/10/2024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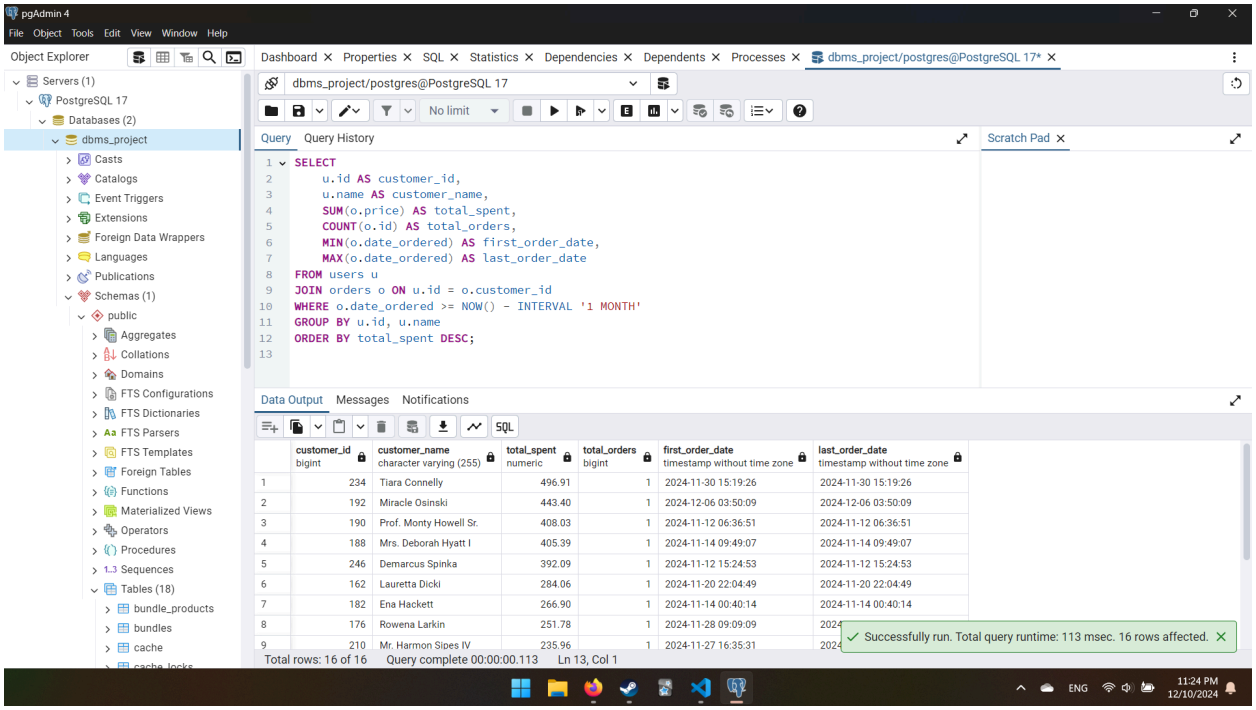
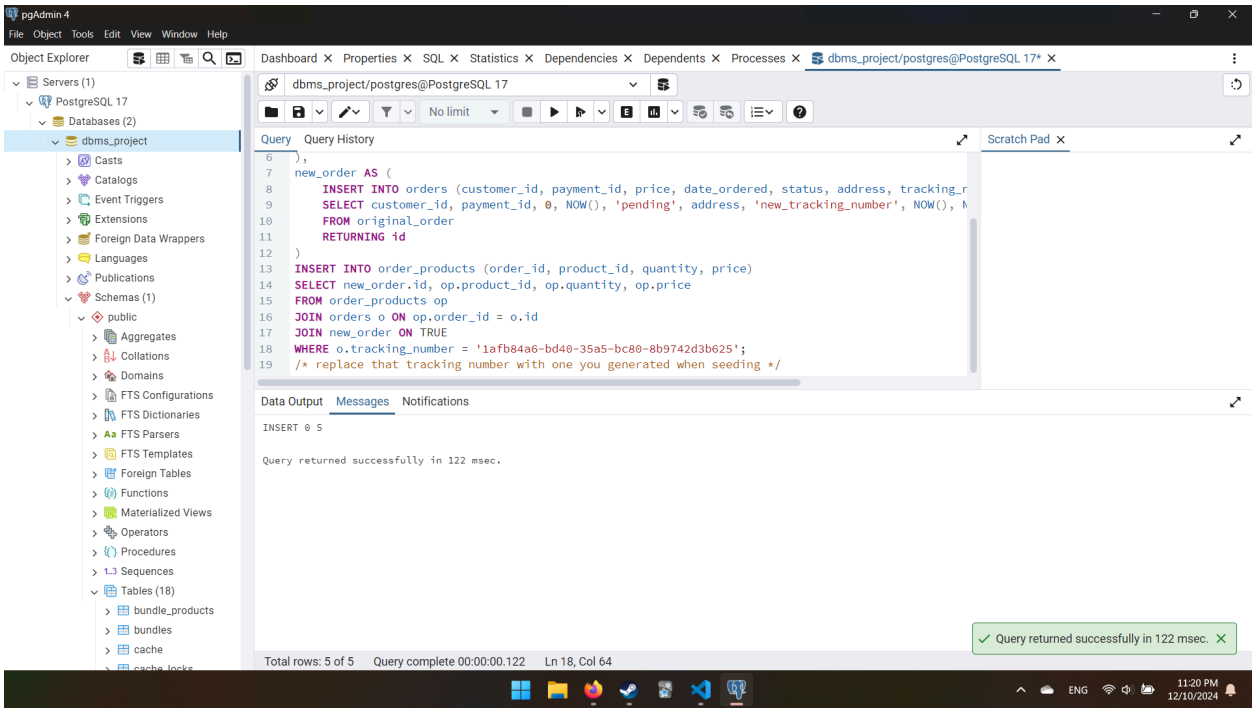
dbms_project/postgres@PostgreSQL 17*
dbms_project/postgres@PostgreSQL 17
No limit
Query
Query History
Scratch Pad
1 SELECT p.id AS product_id, p.name, SUM(op.quantity) AS total_units_sold
2 FROM order_products op
3 JOIN products p ON op.product_id = p.id
4 JOIN orders o ON op.order_id = o.id
5 WHERE o.date_ordered >= NOW() - INTERVAL '1 year'
6 GROUP BY p.id, p.name
7 ORDER BY total_units_sold DESC
8 LIMIT 2;
Data Output
Messages
Notifications
product_id bigint
name character varying (255)
total_units_sold numeric
1 56 occaecati 21
2 35 dolor 19
Successfully run. Total query runtime: 119 msec. 2 rows affected.
Total rows: 2 of 2
Query complete 00:00:00.119
Ln 8, Col 9
ENG
11:22 PM
12/10/2024





Conclusion:

My main takeaway is that it is very difficult to implement something like this, let alone something like this that works. I spent a bit too much time on designing the database, and not enough time implementing features into the web application.