

Database design and implementation

Abstract:

A New York based coffee shop chain is looking to expand nationally by opening a number of franchise locations and as a result they want to streamline operations and revamp their data infrastructure. This work is the stages of **RELATIONAL DATABASE DESIGN AND IMPLEMENTATION SYSTEM** for improved operational efficiencies and for executives to make data driven decisions. Their data currently reside in accounting software, suppliers' database, POS systems and spreadsheet. The data in all these systems was reviewed and I designed a central database to house all of the data. Created database objects and data subsets and loaded them into staging databases that uses different RDBMS.

Software used:

- PostgreSQL Database,
- IBM Db2 Database,
- MySQL Database

Project Objectives

- Identify entities.
- Identity attributes.
- Create an entity relationship diagram (ERD) using the pgAdmin ERD Tool.
- Normalize tables.
- Define keys and relationships.
- Create database objects by generating and running the SQL script from the ERD Tool.
- Create a view and export the data.
- Create a materialized view and export the data.
- Import data into a Db2 database.
- Import data into a MySQL database.

Database entities

- Staff entity
- Sales_outlet entity
- Sales_transaction entity
- customer entity
- Product entity

Sales_transaction entity Attributes

- transaction_id
- transaction_date
- transaction_time
- sales_outlet_id
- staff_id
- customer_id
- product_id
- quantity
- price

Sales_transaction entity added to ERD

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Admin File Object Tools Help

Browser Dashboard Properties SQL Statistics Dependencies Dependents Untitled*

Servers (1)
postgres
Databases (2)
COFFEE
Casts
Catalogs
Event Triggers
Extensions
Foreign Data Wrappers
Languages
Publications
Schemas
Subscriptions
postgres
Casts
Catalogs
Event Triggers
Extensions
Foreign Data Wrappers
Languages
Publications
Schemas
Subscriptions
Login/Group Roles
Tablespaces

COFFEE/postgres@postgres

public
sales_transaction
transaction_id integer
transaction_date date
transaction_time time without time zone
sales_outlet_id integer
staff_id integer
customer_id integer
product_id integer
quantity numeric
price numeric

Product entity added to ERD

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pgAdmin

File Object Tools Help

Browser

Servers (1)

- postgres
 - Databases (2)
 - COFFEE

COFFEE/postgres@postgres

public

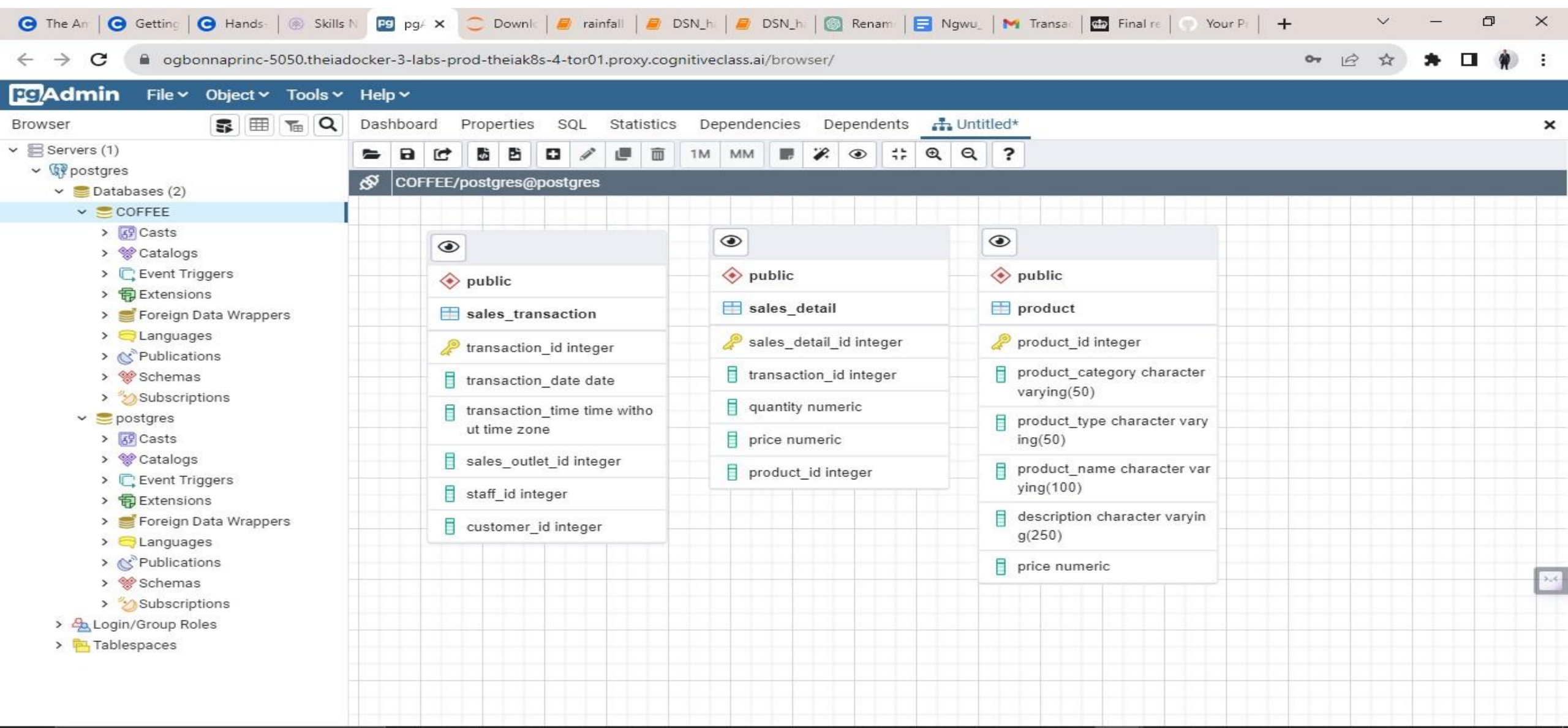
sales_transaction

- transaction_id integer
- transaction_date date
- transaction_time time without time zone
- sales_outlet_id integer
- staff_id integer
- customer_id integer
- product_id integer
- quantity numeric
- price numeric

product

- product_id integer
- product_category character varying(50)
- product_type character varying(50)
- product_name character varying(100)
- description character varying(250)
- price numeric

Database Normalisation :sales_details entity extracted from sales_transaction entity and added to ERD



Database Normalisation: product_type entity extracted from product entity and added to ERD

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Entity Details:

- public**
 - sales_transaction**
 - transaction_id integer (PK)
 - transaction_date date
 - transaction_time time without time zone
 - sales_outlet_id integer
 - staff_id integer
 - customer_id integer
 - sales_detail**
 - sales_detail_id integer (PK)
 - transaction_id integer (FK)
 - quantity numeric
 - price numeric
 - product_id integer (FK)
 - product**
 - product_id integer (PK)
 - product_name character varying(100)
 - description character varying(250)
 - price numeric
 - product_type**
 - product_type_id integer (PK)
 - product_id integer (FK)
 - product_category character varying(50)
 - product_type character varying(50)

Database Normalisation: entity keys identified

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pgAdmin File Object Tools Help

Browser Servers (1) postgres Databases (2) COFFEE

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postgres

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- > Subscriptions

> Login/Group Roles

> Tablespaces

Dashboard Properties SQL Statistics Dependencies Dependents Untitled*

COFFEE/postgres@postgres

1M MM

public

- sales_transaction**
- transaction_id integer
- transaction_date date
- transaction_time time without time zone
- sales_outlet_id integer
- staff_id integer
- customer_id integer

public

- sales_detail**
- sales_detail_id integer
- transaction_id integer
- quantity numeric
- price numeric
- product_id integer

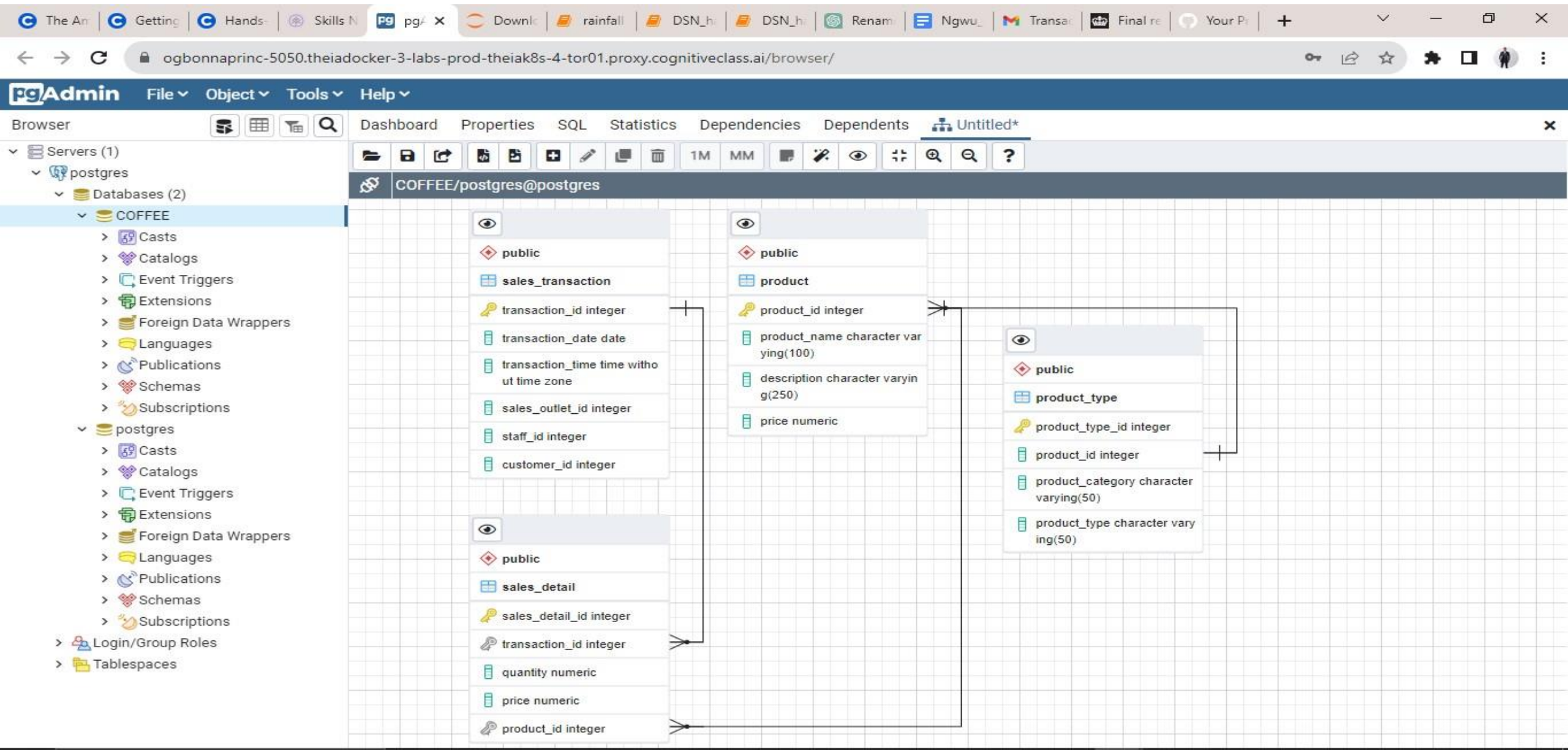
public

- product**
- product_id integer
- product_category character varying(50)
- product_type character varying(50)
- product_name character varying(100)
- description character varying(250)
- price numeric

public

- product_type**
- product_type_id integer
- product_id integer
- product_category character varying(50)
- product_type character varying(50)

Entity Relationships identified in ERD and connections established



SQL script generated from the ERD tool. External SQL script imported and executed to create necessary DB entities and attributes

The screenshot displays the pgAdmin 4 web interface. On the left, the 'Browser' pane shows a tree structure of database objects. The 'Tables (7)' folder is expanded, listing: customer, product, product_type, sales_detail, sales_outlet, sales_transaction, and staff. The main area is divided into three panes. The top pane is the 'Query Editor', showing a SQL script generated by an ERD tool. The script includes comments and DROP statements for tables that may not exist. The bottom pane shows the 'Messages' tab, displaying a series of 'NOTICE' messages indicating that each table listed in the DROP statements does not exist and is being skipped. The script ends with a COMMIT statement.

pgAdmin 4

File Object Tools Help

Browser

- FTS Templates
- Foreign Tables
- Functions
- Materialized Views
- Procedures
- 1.3 Sequences
- Tables (7)
 - customer
 - product
 - product_type
 - sales_detail
 - sales_outlet
 - sales_transaction
 - staff
- Trigger Functions
- Types
- Views
- Subscriptions
- postgres
 - Casts
 - Catalogs
 - Event Triggers

Dashboard Properties SQL Statistics Dependencies Dependents Untitled*

Query Editor Query History

```
1 -- This script was generated by a beta version of the ERD tool
2 -- Please log an issue at https://redmine.postgresql.org/proje
3 BEGIN;
4
5
6 -- The DROP statements have been added to ensure that no error
7 DROP TABLE IF EXISTS public.staff CASCADE;
8 DROP TABLE IF EXISTS public.sales_outlet CASCADE;
9 DROP TABLE IF EXISTS public.customer CASCADE;
```

Data Output Explain Messages Notifications

NOTICE: table "staff" does not exist, skipping
NOTICE: table "sales_outlet" does not exist, skipping
NOTICE: table "customer" does not exist, skipping
NOTICE: table "sales_detail" does not exist, skipping
NOTICE: table "product" does not exist, skipping
NOTICE: table "product_type" does not exist, skipping
NOTICE: table "sales_transaction" does not exist, skipping
COMMIT

Database entities populated with data from imported and executed SQL script with Sales_detail entity first 100 rows displayed

The screenshot shows the pgAdmin 4 web interface. The left sidebar displays the database structure, with the 'postgres' database expanded and the 'sales_detail' table selected. The main panel shows the 'Query Editor' with the following SQL query:

```
1 SELECT * FROM public.sales_detail
2 ORDER BY sales_detail_id ASC LIMIT 100
3
```

Below the query editor, the 'Data Output' tab is active, displaying the first 100 rows of the 'sales_detail' table. The table has the following columns: sales_detail_id [PK] integer, transaction_id integer, product_id integer, quantity integer, and price double precision. The data is sorted by sales_detail_id in ascending order.

	sales_detail_id [PK] integer	transaction_id integer	product_id integer	quantity integer	price double precision
89	89	77	44	1	2.5
90	90	78	50	1	2.5
91	91	79	48	1	2.5
92	92	79	72	1	3.25
93	93	80	27	2	3.5
94	94	81	39	2	4.25
95	95	81	84	1	0.8
96	96	82	26	1	3
97	97	83	41	2	4.25
98	98	83	63	2	0.8
99	99	84	48	1	2.5
100	100	85	40	1	3.75

Created and exported a staff_location view entity from the staff entity to generate a data subset for a specific use case

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pgAdmin File Object Tools Help

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- FTS Dictionaries
- FTS Parsers
- FTS Templates
- Foreign Tables
- Functions
- Materialized Views
- Procedures
- Sequences
- Tables (7)
- Trigger Functions
- Types
- Views (1)**
 - staff_locations_view**
 - Columns (4)
 - staff_id
 - first_name
 - last_name
 - location
 - Rules
 - Triggers
- Subscriptions

postgres

- Casts
- Catalogs

Dashboard Properties SQL Statistics Dependencies Dependents Untitled* COFFEE/postgr... COFFEE/p

Query Editor Query History

```
1 SELECT * FROM public.staff_locations_view
2
```

Scratch Pad

Data Output Explain Messages Notifications

	staff_id integer	first_name character varying (50)	last_name character varying (50)	location character varying (5)
1	3	Marny	Hermione	WH
2	4	Chelsea	Claudia	WH
3	5	Alec	Isadora	WH
4	6	Xena	Rahim	3
5	7	Kelsey	Cameron	3
6	8	Hamilton	Emi	3
7	9	Caldwell	Veda	3
8	10	Ima	Winifred	3
9	11	Ruth	Leslie	4
10	12	Britanni	Jorden	4
11	13	Berk	Derek	4
12	14	Damon	Sasha	4
13	15	Remedios	Mari	4

Created and exported a staff_location materialized view entity from the product entity to generate a data subset for storage and future case.

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pgAdmin

File Object Tools Help

Browser

- FTS Configurations
- FTS Dictionaries
- FTS Parsers
- FTS Templates
- Foreign Tables
- Functions
- Materialized Views (1)
 - product_info_m-view
 - Columns (3)
 - product_name
 - description
 - product_category
 - Indexes
- Procedures
- Sequences
- Tables (7)
- Trigger Functions
- Types
- Views (1)
 - staff_locations_view
 - Columns (4)
 - staff_id
 - first_name
 - last_name
 - location

Dashboard Properties SQL Statistics Dependencies Dependents Untitled* COFFEE/postgr... COFFEE/p...

Query Editor Query History

```
1 SELECT * FROM public."product_info_m-view"
2
```

Data Output Explain Messages Notifications

	product_name character varying (100)	description character varying (250)	product_category character varying (50)
76	Chocolate Chip Biscotti	Crunch!	Bakery
77	Oatmeal Scone	Grannys fav	Bakery
78	Scottish Cream Scone	Old time comfort	Bakery
79	Jumbo Savory Scone	Anytime, anywhere	Bakery
80	I Need My Bean! Toque	keep your head bean warm	Branded
81	I Need My Bean! T-shirt	Stylish chic	Branded
82	I Need My Bean! Diner mug	Classic	Branded
83	I Need My Bean! Latte cup	The cup and saucer set is the ...	Branded
84	Chocolate syrup	Bursting with chocolate flavour	Flavours
85	Rio Nights	2 shots of Ouro Brasileiro and ...	Coffee
86	Ouro Brasileiro shot	From Rio	Coffee
87	Ouro Brasileiro shot promo	Ouro promo	Coffee

Imported staff_location data into IBM Db2 Database for external payroll company's usage

Skills Network Editor | Service Details - IBM Cloud | IBM Db2 on Cloud | YouTube Music

bs2ipcul0apon0jufi80lite.db2.cloud.ibm.com/crn%3Av1%3Abluemix%3Apublic%3Adashdb-for-transactions%3Aeu-gb%3Aa%2F40637218e8f44d7f9a386b817...

IBM Db2 on Cloud

Load Data | Load History | Tables | Views | Indexes | Aliases | MQTs | Sequences | Application objects

LXQ28194.STAFF_LOCATION

Back

Export to CSV

	STAFF_ID SMALLINT	FIRST_NAME VARCHAR(8)	LAST_NAME VARCHAR(8)	LOCATION VARCHAR(2)
1	3	Marny	Hermione	WH
2	4	Chelsea	Claudia	WH
3	5	Alec	Isadora	WH
4	6	Xena	Rahim	3
5	7	Kelsey	Cameron	3
6	8	Hamilton	Emi	3
7	9	Caldwell	Veda	3
8	10	Ima	Winifred	3
9	11	Ruth	Leslie	4
10	12	Britanni	Jorden	4
11	13	Berk	Derek	4
12	14	Damon	Sasha	4
13	15	Remedios	Mari	4
14	16	Reed	Eve	5
15	17	Quail	Octavia	5
16	18	Ezekiel	Rashad	5

Imported the product_info to MySQL database for marketing consultant use

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phpMyAdmin

Recent Favorites

New
coffee_shop_products
New
product_info_m_view
information_schema
mysql
performance_schema
sys

Server: mysql:3306 » Database: coffee_shop_products » Table: product_info_m_view

Browse Structure SQL Search Insert Export Import Privileges Operations Triggers

```
SELECT * FROM `product_info_m_view`
```

☐ Profiling [Edit inline] [Edit] [Explain SQL] [Create PHP code] [Refresh]

1 > >> ☐ Show all Number of rows: 25 Filter rows: Search this table

+ Options

COL 1	COL 2	COL 3
product_name	description	product_category
Brazilian - Organic	It's like Carnival in a cup. Clean and smooth.	Coffee beans
Our Old Time Diner Blend	Our packed blend of beans that is reminiscent of t...	Coffee beans
Espresso Roast	Our house blend for a good espresso shot.	Coffee beans
Primo Espresso Roast	Our premium single source of hand roasted beans.	Coffee beans
Columbian Medium Roast	A smooth cup of coffee any time of day.	Coffee beans
Ethiopia	From the home of coffee.	Coffee beans
Jamacia Coffee River	Ya man, it will start your day off right.	Coffee beans
Civet Cat	The most expensive coffee in the world, the cats d...	Coffee beans
Organic Decaf Blend	Our blend of hand picked organic beans that have b...	Coffee beans
Guatemalan Sustainably Grown	Green beans you can roast yourself.	Coffee beans
Lemon Grass	You will think you are Thailand as you sip your cu...	Loose Tea
Peppermint	Cool and refreshing to help calm your nerves.	Loose Tea
English Breakfast	The traditional cup to start your day.	Loose Tea
Earl Grey	A full leaf of Orange Pekoe blended with organic o...	Loose Tea
Serenity Green Tea	Mountain grown and harvested at the optimal time.	Loose Tea
Traditional Blend Chai	A traditional blend.	Loose Tea
Morning Sunrise Chai	Fair trade and organic and has a warm finish.	Loose Tea
Spicy Eye Opener Chai	A spicier blend to awaken your taste buds.	Loose Tea
ate	This drinking chocolate is smooth and creamy.	Packaged Chocolate

Console

Project Author:

Christian Nzeanorue

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Thank you