Module 5 – Lab 5: Enforcing Data Access Policies

Primary Course SLO: SLO 5 – Implement data access security and monitoring
Environment: PostgreSQL + Terminal
Time: 40–60 Minutes

Purpose (Read First)

You are now the *Security Administrator*. In previous labs, you built the data structures; now, you will lock them down. You will implement:

- **Role-Based Access Control (RBAC):** Creating distinct roles for Analysts, Stewards, and Admins.
- **Data Masking:** Hiding Personally Identifiable Information (PII) while keeping data queryable.

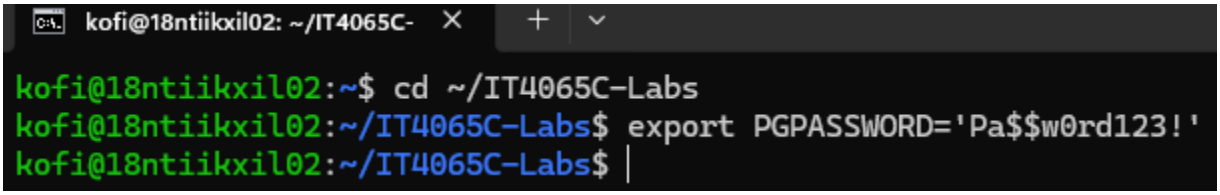
Step 1: Replace Placeholder Files (Required)

Your repo currently contains placeholder files for Lab 5.

1. **Download:** Lab5_Source.zip from Canvas.
2. **Navigate:** *~/IT4065C-Labs/labs/module_5/lab5* in your lab environment.
3. **Replace:** Delete the old 7 files and paste the new (7) ones (_run_all.sh, 00_precheck.sql, 01_see_if_missing.sh, etc.).
   Do not rename files. Do not merge content. Replace them entirely.
4. **Verify:** Run ls. You must see the _run_all.sh script before proceeding.

Step 2: Establish your Session

1. Navigate to the root course directory
   cd ~/IT4065C-Labs
2. Run this in your terminal to avoid repeated password prompts:
   export PGPASSWORD='Pa$$w0rd123!'



Step 3: Run Policy Enforcement

1. Execute the master script. This will build the views and apply GRANT and REVOKE commands.
   bash labs/module_5/lab5/_run_all.sh

This script will automatically:

1. Verify required schemas exist
2. Confirm raw data is present
3. Create analytics and masked views
4. Create roles and apply least-privilege access

5. Test access using PASS / FAIL verification

You should see output indicating:

- Views created
- Roles created
- Some queries succeed
- Some queries fail on purpose

📸 **Screenshot 1: PASS/FAIL Results**

Scroll up to Step **4: Verify access behavior** section.

- **Notice:** role_analyst gets an ERROR: permission denied when trying to touch raw data. This is **good**; it means your security is working.
- **Capture a screenshot** of this PASS/FAIL section.

Step 4: Audit the "Privilege Matrix"

Now, look under the hood to see how Postgres stores these permissions.

1. **Enter Postgres:** psql -h localhost -U postgres -d it4065c
2. **Audit the Schema:** \dp student_kofi.*

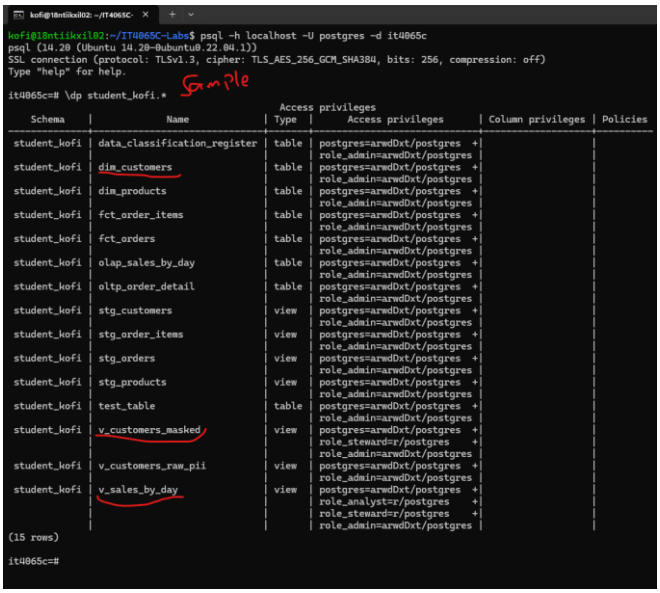
Decoder Ring for Screenshot 2

Look closely at the **Access privileges** column for these three rows:

- **v_sales_by_day:** You should see role_analyst=r. (**r** = read/select).
- **v_customers_masked:** You should see role_steward=r.
- **dim_customers:** You should only see role_admin.

Screenshot 2: The Audit Trail

- **Capture a screenshot** of the \dp output.



Step 5: Critical Thinking

Answer in 4–7 sentences each.

1. **RBAC vs. Masking:** In your script output, role_steward was allowed to see v_customers_masked but denied access to raw.customers. Explain why we give the Steward a masked view instead of just giving them restricted access to the raw table.
2. **Interpreting Errors:** Look at the error ERROR: permission denied for schema raw. Even though the analyst has a role, they can't even "see" into the raw schema. How does this **Schema-level** security provide a better "defense in depth" than just table-level security?
3. **The Role of role_admin:** Your \dp output shows role_admin=arwdDxt. Using the decoder ring, explain what happens to the security of the system if a student accidentally uses the role_admin credentials for a basic dashboard.
4. **Monitoring:** We successfully enforced access. If an analyst tried to run SELECT * FROM raw.customers 100 times in a row, the database would stop them every time. Why is it still important to log those 100 **failed** attempts?

Deliverables

Submit a PDF containing:

1. **Screenshot 1:** Verification section showing SET ROLE and PASS/FAIL.
2. **Screenshot 2:** The \dp student_kofi.* table.
3. **Written Responses:** Q1–Q4.