Operating system -1 - Final Project

Project Intro:

The project aims to simulate how a Database works by simply implementing some of the basic Database operations using Bash Scripts with Docker platform.

The operations that we are focusing on in this project are:

> ➢ Create a Database.
> ➢ Delete a Database.
> ➢ Empty a Database.
> ➢ Create tables.
> ➢ Delete tables.
> ➢ Update tables.
> ➢ Insert data.
> ➢ Delete data.
> ➢ Retrieve data.
> ➢ Backup Database.
> ➢ Restore Databases.
> ➢ Logs of Databases.

1. When **Creating** a Database, achieve the following:
   - All Databases will be created under a directory called **Databases**.
   - Every Database will be represented as a **Directory**.
   - When creating a Database, the database could be **Public** or **Private**:
     - **Public**: all users have access and can perform (retrieve, insert, update) on the database.
     - **Private**: only the owner and admin have full access to the database.
   - The owner of the Database is the user who created it.
   - The group owner of the Database is a new group created with the same name as the database and has the owner and admins as a member.
   - All Admins (who are in the admins file) have full access to all databases.
   - The script should take the name of the Database.

2. When **<u>Deleting</u>** a Database, achieve the following:
   - Only owners or admins can delete any database (private or public).
   - Only empty databases can be deleted.
   - Deleting a Database requires deleting the metadata of the Database.
   - The script should show all the databases inside the **Database** directory to choose one to delete.

3. When **<u>Emptying</u>** a Database, achieve the following:
   - Only owners and admins can empty any database (private and public).
   - The script should show all the databases inside the **Database** directory to choose one to empty.

4. When **<u>Creating tables</u>** in a database, achieve the following:
   - Only owners and admins can create tables inside the database.
   - The script should show all the databases inside the **Database** directory to choose one to create tables in.
   - The script should prompt the user to enter the name of the table, the number of columns and the name of columns.
   - A default column should be created by the script representing the ID.

5. When **<u>Deleting tables</u>**, achieve the following:
   - Only owners and admins can delete tables from a database.
   - The script should show all the databases inside the **Database** directory (check the 2nd note) to choose one to delete tables from.
   - The script should show all the tables inside the selected database to choose one to delete.

6. When **<u>Inserting data</u>**, achieve the following:
   - Only owners and admins can Insert data into tables.
   - The script should show all the databases inside the **Database** directory (check the 2nd note) to choose one.
   - The script should show all the tables inside the selected database to choose one to insert data into.
   - The script should start showing column names and ask you to enter the data corresponding to the column name. (Don't forget that the first value should be unique since it will be the id).

7. When **Retrieving data**, achieve the following:
    - All users that are members of the private database group can retrieve data and all users can access public databases.
    - The script should show all the databases inside the **Database** directory (check the 2nd note) to choose one.
    - The script should show all the tables inside the selected database to choose one to retrieve data from.
    - There are two options for retrieving data:
        - Retrieving all table data: this will print all table data.
        - Retrieving data based on specific criteria: the user should enter the value he/she wants to search for, and the database should return every row that has this value in.

8. When **Updating data**, achieve the following:
    - All users that are members of the private database group can update data and all users can access public databases.
    - The script should show all the databases inside the **Database** directory (check the 2nd note) to choose one.
    - The script should show all the tables inside the selected database to choose one to update data.
    - The script should show all columns inside the table to choose one to update.
    - Then the ID of the row to be updated should be specified.

9. When **Deleting data**, achieve the following:
    - Only owners and admins can delete tables from a database.
    - The script should show all the databases inside the **Database** directory (check the 2nd note) to choose one.
    - The script should show all the tables inside the selected database to choose one to delete data from.
    - There are two options for deleting data:
        - Delete all table data: this will delete all table data.
        - Delete data based on specific criteria: the user should enter the value he/she wants to delete data based on, and the database should delete every row that has this value in.

10. when **Backup and Restore** databases achieve the following:
   - All backups will be stored in a directory called **backups** in the path **/opt.**
   - Only owners and the admins can backup and restore the database.
   - A backup should support multiple compression modes (zip, tar and gzip).
   - Schedule backups (daily, weekly, or monthly) you have two options to backup:
     - Backing up all databases, the admin chooses the option of scheduling (daily, weekly, or monthly)
     - Backing up all databases that were updated on a certain date (year, month, day).
   - Achieve the database rotation based on backup date (keep the five most recent copies) or database size (when the backup size of a database reaches a certain threshold, delete old backups so that the size of backups does not exceed this threshold) (two options are required).

11. When **Storing logs** of a database, achieve the following:
   - All logs should be stored in a directory called **logs** in the path **/opt.**
   - Only owners and admins can access the logs directory.
   - The log includes: the **event** (create, insert, update, delete or retrieve), the **name** of the database, the **user** who carried out the event (the username and type of use (admin, owner, other), and the **date** of the event.
     Ex: insert:test mhd:admin Wed Oct 29 06:11:31 UTC 2023
   - Achieve logs rotation based on logs date (keep the latest ten days).
   - Only owners and admins can Export logs file to excel file.

Notes:
   1. Admins are users in the system and should exist in a file called **Admins.**
   2. When listing existing databases only databases you have access to should appear.
   3. The project should be implemented using Docker (use Ubuntu image).

نواحي تنظيمية:

1. عدد الطلاب في المجموعة الواحدة يجب ألا يتجاوز الخمسة طلاب.

2. يجب إعداد تقرير مطبوع يوضح جميع خطوات الحل إضافة لخطوات التحقق من نجاح الأوامر المطبقة.

3. تجرى مقابلات في المشروع في تاريخ **18/12/2023**.

4. تمنح علامة الصفر في حال أي تشابه بأي طلب من الطلبات بين المجموعات فضلاً عن تطبيق العقوبات الإدارية بحق الطلاب.

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