IST – 659 (Fall 2023)

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Project Proposal: DBMS for Music Streaming Service

Description:

The main goal of this project is to create a database that will store and organize information about tracks, artists, streaming history, and payment transactions. It's meant to help users, artists, and sponsors understand which artists and songs are the most popular. This project also ensures that user accounts, and artist's accounts are managed properly, and keeps user information safe. This database is a collection of songs, albums, artists, and music genres. This makes it easy for users to find and enjoy their favorite songs. The project keeps track of what songs users listen to, which helps in the analysis of streaming data. For artists, music companies, and the project itself, the database provides essential information about how users behave. This data can be used to see which songs are popular, spot trends, and make decisions based on data.

Assumptions

- If a user starts a song, we're assuming that the user listens to the entire song
- All the users are based in the US

Problem Statement:

Our goal is to design and implement a comprehensive Database Management System (DBMS) for a music streaming service, addressing the following key challenges:

User Data Management: The service has millions of users, and we need an efficient system to manage user profiles, including personal information, and subscription models. The DBMS should allow for user registration, authentication, and profile management.

Track Data Management: The service has a vast music library with millions of tracks. The DBMS should store track metadata, including title, artist, album, genre, release date, duration, popularity, and streaming statistics. It should efficiently handle track indexing and retrieval.

Streaming History: This service needs to maintain a record of users' streaming history to provide track statistics. The DBMS should record the history of tracks that each user listens to. As the years pass, user behavior is changing constantly and to keep track of the same and let sponsors decide their artists for their promotions, streaming history of the users in their respective states of the US is required.

Payments/Transactions: The service needs to record payment transactions and subscription history for billing purposes to understand and improvise customer services. We need data about the number of subscriptions and users in the streaming service for analyzing the trends about the growth of users and subscriptions over time to analyze the recurring expected revenue

Proposed Solution

To address the problem statements related to user data management, track data management, streaming history, and payments/transactions, we propose the development of a comprehensive database management system (DBMS) for a music streaming service.

User Profile Management

User Profiles: Implement a Users table to store user data, including usernames, email addresses, hashed passwords, and subscription details.

Authentication: Develop a secure authentication system for user login and registration.

Track Data Management:

Track Metadata: Create a Tracks table to store track metadata, including title, artist, album, genre, release date, duration, popularity, and streaming statistics.

Albums and Artists: Develop Albums and Artists tables to store data related to albums and artists, establishing relationships with the Tracks table.

Genres: Implement a Genres table to categorize tracks, artists, and albums by genre.

Streaming History:

User Activity Log: Create a UserActivities table to record user actions like login & exit time , streaming time, active time. Include timestamps for each activity.

Listening History: Maintain a separate ListeningHistory table to store the history of tracks listened to by each user.

Payments/Transactions:

Subscription Details: Store user subscription information, including subscription type, renewal dates, and payment history, in a Subscriptions table.

Transaction Records: Maintain a Transactions table to record payment transactions, including timestamps, amounts, and transaction statuses.

Potential Entities and Attributes

Users Table:

- UserID (Primary Key)
- Full Name
- Username
- Email
- Password (Hashed and Salted)

- Date of Birth (Age can be derived)
- State (Assumption: Everyone is from the US)
- Subscription Type

Track Table:

- ArtistID (Foreign Key)
- TrackID (Primary Key)
- AlbumID (Foreign Key)
- GenreID (Foreign Key)
- Title
- Duration
- Release Date
- Genre
- Language

Albums Table:

- AlbumID (Primary Key)
- Title
- Release Date
- ArtistID (Foreign Key)

Artists Table:

- ArtistID (Primary Key)
- Artist Name
- Full Name
- AlbumID (Foreign Key)
- TrackID (Foreign Key)
- Country

Genre Table:

- GenreID
- Genre Name
- Description

User Activity Table

- ListeningID (Primary Key)
- UserID (Foreign Key)
- TrackID (Foreign Key)
- AlbumID (Foreign Key)
- SessionID
- Session Duration
- Session_Start_Timestamp
- Session_End_Timestamp

Business/Data Analytics: (WIP)

User Perspective:

- Top Tracks, Artists, Albums, Genres, Languages that the user has been listening to over the chosen frequency of day, week, month or year.
- App usage time based on streaming history

Artist Perspective:

- Top Tracks, Albums, Genres, Languages that users have been listening to with a filter on state over the chosen frequency of day, week, month or year.
- User Demographics Summary- Age, Gender, Location
- To understand what specific time and day of the week when the users are highly active in order to understand the optimal time to release a Track/Album

Business Perspective:

- To identify top Artists and their characteristics in a particular state of the US to decide their market value for sponsors to invest
- What is the user conversion rate, and are there specific patterns or behaviors associated with users who cancel or renew their subscriptions?