# PROJECT 1: PANDORA DATABASE DESIGN USING RELATIONAL ALGEBRA

CSCI 331 - Databases

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Songs(SongID, SongName, GenreID, BandID, Rating, Price)
Albums(AlbumID, SongID, BandID, AlbumName)
Artists(ArtistID, ArtistFirst, ArtistLast)
Bands(BandID, BandName, ArtistID)
Customers(CustomerID, CustomerName, Email, DateOfBirth, Age, LastPWChange, Password)
Stations(StationID, CustomerID, SongID, StationName, DatePlayed)
Genres(GenreID, GenreName)
Transactions(TransactionID, DateOfPurchase, CustomerID, SongID)

Few Notations:

- Join operation assumes joining by common attribute
- Date signifies a date as well as a time. When referring to only days, it is assumed that the time will be 12:00 AM (00:00). When time is needed, it will be added. This is for simplicities sake in terms of writing out the project.
- Band is a collection of artists, or a single artist. Because of this, it is considered the artist. When you have a band of multiple people they are a part of the Band, but they are referenced using the ArtistID. When it's a single person Band, it is assumed that the Band Name is equivalent to the name of the single artist unless otherwise specified by the artist.
- $\tau$ refers to the Aggregate symbol. This symbol was not in the document provided by you. I assumed it was allowed since it is required for the final question
- Stations are assigned names like Pandora
- Age is derived using a formula (Current Date – Date of Birth)

1. Identify stations assigned to John Paige. Display the station name.

$A \leftarrow \sigma_{CustomerFirst = 'John' \wedge CustomerLast = 'Paige'} (Customers)$
$B \leftarrow A \bowtie Stations$
$Answer \leftarrow \pi_{StationName} (B)$
$\rho_{Stations\ assigned\ to\ John\ Paige(Station\ Name)} (Answer)$

2. Identify songs John Paige played today. Display the station name, song, artist and genre.

$A \leftarrow \sigma_{CustomerFirst = 'John' \wedge CustomerLast = 'Paige'} (Customers)$
$B \leftarrow A \bowtie Stations$
$C \leftarrow \sigma_{DatePlayed = '10/2/2015'} (B)$
$D \leftarrow C \bowtie Songs$
$E \leftarrow D \bowtie Bands$
$F \leftarrow E \bowtie Genres$
$Answer \leftarrow \pi_{StationName, SongName, BandName, GenreName} (B)$
$\rho_{Songs\ played\ by\ John\ Paige\ today(Station\ Name, Song\ Name, Artist, Genre)} (Answer)$

3. Identify songs assigned a thumbs down (low ratings) by John Paige this month. Display the song name, artist and genre.

$A \leftarrow \sigma_{CustomerFirst = 'John' \wedge CustomerLast = 'Paige'} (Customers)$
$B \leftarrow A \bowtie Stations$
$C \leftarrow \sigma_{DatePlayed >= '9/2/2015'} (B)$
$D \leftarrow C \bowtie Songs$
$E \leftarrow \sigma_{Rating = 'Thumbs\ Down'} (D)$
$F \leftarrow E \bowtie Bands$
$G \leftarrow F \bowtie Genres$
$Answer \leftarrow \pi_{SongName, BandName, GenreName} (B)$
$\rho_{Songs\ rated\ thumbs\ down\ by\ John\ Paige\ this\ month(Song\ Name, Artist\ Name, Genre)} (Answer)$

4. John Paige wants to purchase the Linkin Park song recently played. Display the song name, price and artist.

$A \leftarrow \sigma_{\text{CustomerFirst = 'John'} \wedge \text{CustomerLast = 'Paige'}}$ (Customers)
$B \leftarrow A \bowtie$ Stations
$C \leftarrow \sigma_{\text{DatePlayed >= '10/2/2015 17:00'}}$ (B)
$D \leftarrow \sigma_{\text{BandName = 'Linkin Park'}}$ (Bands) $\bowtie$ Songs
$\text{Answer} \leftarrow \pi_{\text{SongName, BandName, Price}}$ (C $\bowtie$ D)
$\rho_{\text{Recently played song by Linkin Park(Song Name, Artist Name, Price)}}$ (Answer)

5. Identify customers who haven't changed their password in the last 90 days. Display the email and customer name.

$A \leftarrow \sigma_{\text{LastPWChange >= '7/2/2015'}}$ (Customers)
$\text{Answer} \leftarrow \pi_{\text{CustomerFirst, CustomerLast, Email}}$ (A)
$\rho_{\text{Customers who haven't changed their password in the last 90 days(First Name, Last Name, Email)}}$ (Answer)

6. Identify Pop artists not played by John Paige. Display the artist name.

$A \leftarrow \sigma_{\text{CustomerFirst = 'John'} \wedge \text{CustomerLast = 'Paige'}}$ (Customers)
$B \leftarrow A \bowtie$ Stations
$C \leftarrow B \bowtie$ Songs
$D \leftarrow C \bowtie$ Genres
$E \leftarrow \sigma_{\text{GenreName = "Pop"}}$ (D)
$F \leftarrow \sigma_{\text{GenreName = "Pop"}}$ (Genres)
$G \leftarrow F \bowtie$ Songs
$H \leftarrow \sigma_{\text{SongID}}$ (G) - $\sigma_{\text{SongID}}$ (E)
$I \leftarrow H \bowtie$ Bands
$\text{Answer} \leftarrow \pi_{\text{BandName}}$ (I)
$\rho_{\text{Genre Artists not played by John Paige(Artist Name)}}$ (Answer)

7. Identify customers without a music purchase in the last year. Display the customer name and email.

$A \leftarrow \sigma_{DateOfPurchase >= 10/2/2014}$ (Transactions)
$B \leftarrow A \bowtie$ Customers
$C \leftarrow \sigma_{CustomerID}$ (Customers) - $\sigma_{CustomerID}$ (B)
Answer $\leftarrow \pi_{CustomerFirst, CustomerLast, Email}$ (C)
$\rho_{Customers\ without\ a\ music\ purchase\ in\ the\ past\ year(First\ Name,\ Last\ Name,\ Email)}$ (Answer)

8. Identify when the most recent song was purchased by John Paige. Display the song name and price.

$A \leftarrow \sigma_{CustomerFirst = 'John' \wedge CustomerLast = 'Paige'}$ (Customers)
$B \leftarrow A \bowtie$ Transactions
$C \leftarrow \tau_{MAX(DateOfPurchase)}$ (B)
$D \leftarrow B \bowtie C$
$E \leftarrow D \bowtie$ Songs
Answer $\leftarrow \pi_{SongName, Price}$ (E)
$\rho_{Most\ Recent\ song\ purchase\ by\ John\ Paige(Song\ Name,\ Price)}$ (Answer)

9. Identify the number of songs purchased by John Paige. Display the number of songs purchased.

$A \leftarrow \sigma_{CustomerFirst = 'John' \wedge CustomerLast = 'Paige'}$ (Customers)
$B \leftarrow A \bowtie$ Transactions
Answer $\leftarrow \tau_{Count(TransactionID)}$ (B)
$\rho_{Number\ of\ Songs\ Purchased\ by\ John\ Paige(Songs\ Purchased)}$ (Answer)

10. Identify the count of songs played for all customers today. Display two columns: the song name and number of times this song was played.

$A \leftarrow$ Customers $\bowtie$ Stations
$B \leftarrow \sigma_{DatePlayed = '10/2/2015'}$ (A)
$C \leftarrow B \bowtie$ Songs
Answer $\leftarrow {}_{SongName}\tau_{Count(SongID)}$ (C)
$\rho_{Songs\ Played\ Today(Song\ Name,\ Number\ of\ Plays)}$ (Answer)

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