Zewail City of Science and Technology
University of Science and Technology
CIE Program
CIE 206

Project Document

<Railway Management System>

<Design Phase – ER Diagram>

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Problem definition:

Rail transport can be considered as one of the most essential transportation methods all over the world as it has many advantages like: being cheap and fast with respect to the other methods. Here in Egypt, we have a railway system which connects between upper and lower Egypt, but we did not have an organized database system specified for this efficient transportation method up till now. Hence, we are aiming to implement a railway database management system to organize tickets reservation processes and get the utmost benefit out of these railway systems. The railway management system provides opportunities to users to make an account to enquire about the available trains for their desired trips, book and cancel tickets for him or for any other passengers, enquire about the status of the booked tickets, etc. The railway management system also maintains information about the trains, stations, tracks, and employees.

System users and privileges:

1) **User:**
    a) **Create an account by inserting his/her personal information.**
    b) **Enquire about available trains and schedules for his/her desired trips.**
    c) **Enquire about the available tickets, its classifications, and prices.**
    d) **Book a ticket for himself/herself or for another person who is not a registered used in the system.**
    e) **cancel a ticket for himself/herself or for another person whose ticket is booked by this user.**

2) **Passenger:**
    a) **Can create an account by inserting his/her personal information and become a user, and hence get all the user's privileges.**
    b) **Enquire about available trains and schedules for his/her desired trips.**
    c) **Enquire about the available tickets, its classifications, and prices.**
    d) **Book a ticket for himself/herself only via the tickets officer.**
    e) **cancel a ticket for himself/herself only via the tickets officer.**

3) **Employee (Ticket officer):**
   a) Access the state of database.
   b) Insert new table or columns (ex. adds train seats column to show to user available seats).
   c) Access the available seats and schedules and hence determine the completed travels.
   d) Edit database (ex. edit trip time).
   e) Book a ticket for a passenger.
   f) Cancel ticket reservation upon the passenger's desire.
   g) Access the statistics and take decisions based on these results.

4) **Train driver:**
   a) Review his schedule if he is a driver.
   b) Make a request for his supervisor to edit trip time.
   c) Access the available seats and schedules and hence determine the completed travels.
   d) Access the state of database.

Entities:

1) Train:

- includes information about all trains like train ID, track, model, and available seats.

  Attributes:

  1) Train_Num: Each train have a number (Key).
  2) Model_year: Represents the Model of this train.
  3) Available seats: Represents the number of the available seats.

2) Stations:

- **Includes all stations (pick up and pick down places) and the track for which they belong.**

  Attributes:

  1. **S_Num: Each station has a unique number (Key).**
  2. **S_Name: Represents the station name.**
  3. **Location: Represents the location of the station.**

3) Track:

- **Includes information about track lines through which each train goes.**

  Attributes:

  1. **TNum: Each track has a unique number (Key).**
  2. **First_Station: The source (first) station for the track**
  3. **Last_Station: The destination (last) station for the track.**
  4. **Time: The estimated taken time to go from first to last station.**
  5. **Pickup_Location: The pickup location for this track.**
  6. **Destination_Location: The destination location for this track.**

4) Ticket:

- **Includes ticket's class, ID, price, and time.**

  Attributes:

  1. **Ticket_Num: Each ticket has a unique number (Key).**
  2. **Price: Represents how much the ticket costs.**
  3. **Type: Represents the type of the ticket (e.g. VIP, Normal, Etc.).**
  4. **Date: Represents the date of reservation.**

5) User:

- **Includes user information containing his (ID- phone number – E-mail – password – gender – Name – Age). Mail and password so he can access his account to book a train. An additional information to contact with him if there is a problem. User acts as passenger if he reserved a train. User can cancel his reservation.**

6) Passenger:

- **This entity represents an information about passenger who can book a train or cancel his booking also has information like his (ID– Gender – Name – Age – reservation status – seat number).**

7) Trip Duration:

- **Includes time required to go from one station to another one. For each train at every station there is a time in or time out time. It indicates that passengers should get in and get out of the train only within that particular duration of time.**

  Attributes:

  1. **Trip_ID: Each trip has a unique ID (Key).**
  2. **Arrival_time: Represents the arrival time for the trip.**
  3. **Dep_Time: Represents the departure time for the trip.**

8) Employee:

- **Includes all information about the all employees and specify their job type whether he is a train driver or ticket officer.**

  Attributes:

  1. **Employee_ID: Each employee has a unique ID (Key).**
  2. **E_Name: Represents the employee name.**
  4. **Role: Represents the Job of the employee.**

9) Statistics:

- **This entity aims to use the previous data to make a predictions and useful statistics to describes to employee many things to help him know if there is anything to do to decrease the pressure on the rest of employees. this entity describes popular time (hour, day, month), popular start station, popular end station, average trip duration to know if there is any problem in the track or there is crowding and avoid it later.**

Relations:

- **Drives:**
    1. Each train should have a driver (full participation), but we **ASSUMED** that each train have one driver (1).
    2. Not every employee driver (partial participation), but we **ASSUMED** that the driver may drives many trains (M).
- **Duration:**
    1. We **ASSUMED** that for each trip duration there is a track (full participation), but many tracks may have the same trip duration (M).
    2. Each track must have a trip duration (full participation) also, each track has only one trip duration (1).
- **Duration_1:**
    1. Each train have trip duration (full participation), also each train have one trip duration (1).
    2. Not every trip duration has a train (partial participation), but we **ASSUMED** that many trains may have the same trip duration (M).
- **Belongs:**
    1. Each track must have stations (full participation) also, each track may have many stations (source, terminator and stop at stations) (M).
    2. Each station must belong to a track (full participation), but we **ASSUMED** that the same station may belong to many tracks (N).
- **Starts:**

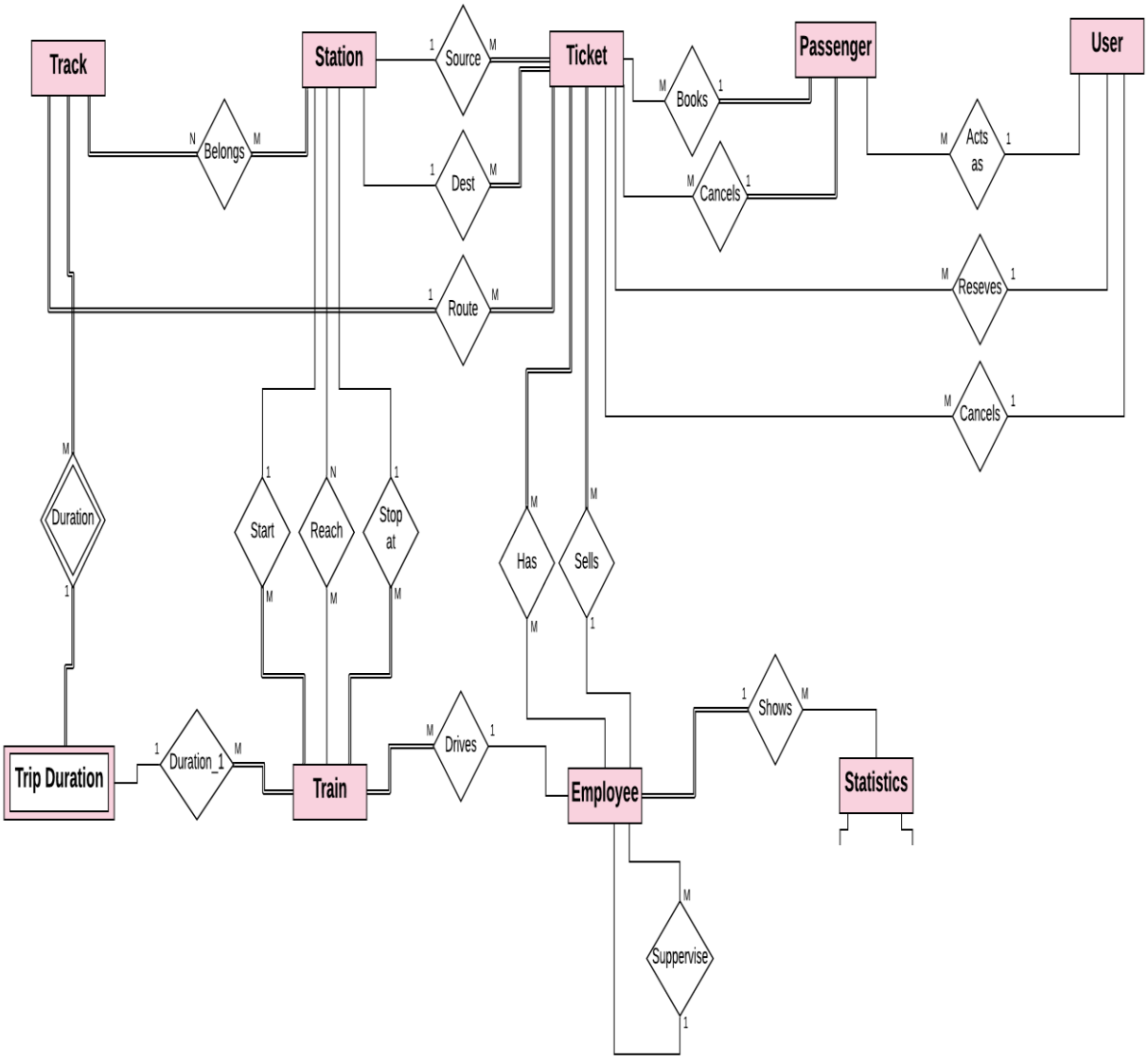
1. Every train must have a station to starts at (full participation) also, each train starts only at one station (1).
2. The station maybe a start station or not (partial participation), but we **ASSUMED** that the same station may have many trains to starts from it (M).

- **Reach:**
    1. Every train may reach this station or not (partial participation) also, each train may reach many stations (N).
    2. The station maybe points for this train or not (partial participation), but the same station has many trains reach it (M).
- **Stops at:**
    1. Every train must have a stop at (destination) station (full participation) also, each train stop at only one station (1).
    2. The station maybe a destination (last) station or not (partial participation), but we **ASSUMED** that the same station may be the destination for many trains (M).
- **Dest:**
    1. Every Ticket must have a destination station (full participation) also, the ticket has only one destination station (1).
    2. Not all the station are destination stations (partial participation), but we **ASSUMED** that the same station may be a destination station to many tickets (M).
- **Books:**
    1. Not every passenger can book a ticket (partial participation), but we ASSUMED that each passenger may books many tickets (M).
    2. Every booked ticket may be booked by a passenger or by a user (partial participation), but every ticket has only one passenger.

- **Cancels:**
    1. Not every passenger cancels the ticket (partial participation), but we ASSUMED that each passenger may cancels many tickets (M).
    2. Every booked ticket may be cancelled by a passenger or by a user (partial participation), but every ticket cancelled only by one passenger (1).

- **Acts as:**
    1. Not all the users act as passenger (partial participation), but we ASSUMED that the user may book to many passengers (M).
    2. We assumed that not all the passengers are users (partial participation), but the passenger acts as only one user (1).
- **Reserves:**
    1. Not all the users reserve a ticket (partial participation), but the user can reserve many tickets (M).
    2. The ticket should be reserved by a user (full participation), but the ticket reserved only by one user (1).
- **Cancels:**
    1. Not all the users cancel the ticket (partial participation), but the user can cancel many tickets (M).
    2. The ticket should be cancelled by a user (full participation), but the ticket cancelled only by one user (1).

Railway Database Management System



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