Project Group 9 • Uddhav Zambare • Yugal Lakhyani
• Suhasini Polampelly • Aditya Kotla

Boston Transit Database Management System

Business Problem:

The Boston Transit (BT) is responsible for public transportation in the Greater Boston area. With millions of commuters relying on the BT's services daily, the organization generates a vast amount of data and records. These records encompass everything from operational data, maintenance logs, financial records, customer information, and more. Managing these records efficiently is vital for ensuring the smooth functioning of the BT and maintaining transparency and accountability. Creating centralized database enhances the data accessibility, security, accuracy, and reliability. It also enables advanced analytics and reporting, supporting BT's mission of efficient public transportation.

Entities:

- **Employee**: Represents individuals employed by the Boston Transit organization, including various roles within the organization.
- **Incidents**: Records incidents, service disruptions, or issues related to the public transportation system that require attention and resolution.
- **Rider**: Represents individuals who use the Boston Transit system as passengers.
- **Train**: Represents the mode of transport which the rider will be using for his journey.
- **Stations**: Represents transit stations or stops within the Greater Boston area where passengers board and disembark from Trains.
- **Routes**: Defines the transit routes within the Boston Transit system, specifying the sequence of stations or stops.
- **Maintenance**: Tracks maintenance schedules and repairs for Trains within the transit system to ensure their proper functioning and safety.
- **Schedule**: Represents schedules for transit routes, including departure and arrival times, to provide reliable transportation services to passengers.
- **Complaints**: Records customer complaints or feedback related to the public transportation system. This entity helps in tracking and addressing passenger concerns.
- **Transit Card**: Represents transit cards issued to riders for fare payment and access to transit services, allowing for convenient and cashless travel.

Associative Entity:

- **Payment**: Records payment transactions made by riders for services, such as ticket purchases or fare payments.

Relationships between entities:

- **Employee - Train:**
  An employee can be assigned to operate a specific Train as a driver. Employees are responsible for the maintenance and inspection of Trains.
- **Employee - Stations:**
  Employees may work at transit stations, serving as station attendants or security personnel. Station employees ensure the safety and functionality of station facilities.
- **Incidents - Employee:**
  Employees may be involved in incidents, such as accidents or safety violations. Employees are responsible for reporting incidents and following incident response procedures.
- **Incidents - Train:**
  Incidents can involve Trains, such as accidents or breakdowns.
  Trains may be temporarily taken out of service due to incidents.
- **Rider - Transit Card:**
  Each rider has one transit card, and each transit card is associated with one rider.
- **Payments - Transit Card:**
  Each transit card can have multiple payment transactions recorded on it.
- **Stations - Payments:**
  Each station can have multiple payment transactions recorded, indicating payments made at the station.
- **Stations - Routes:**
  Stations are typically located along specific transit routes.
  Trains - Routes:
  Each train is associated with a specific route. This relationship ensures that a train follows a particular path defined by its assigned route.
- **Routes - Schedule:**
  Routes have associated schedules that dictate when Trains operate on them. Schedule adherence is crucial for maintaining route efficiency.
- **Schedule - Trains:**
  Each schedule is linked to a specific train, indicating which train operates according to that schedule.
- **Schedule - Stations:**
  The "Departure Station" and "Arrival Station" attributes in the "Schedule" entity are foreign keys that link to the "Stations" entity. This establishes the relationship between a schedule and the stations involved in a particular journey.
- **Complaints - Rider:**
  Riders may file complaints related to their experiences while using transit services. Complaints may include issues with employee behavior, Train conditions, or payment disputes.
- **Maintenance - Train:**
  Trains require regular maintenance and inspections to ensure their proper operation. Maintenance schedules are based on Train usage and mileage.

Business Need:

- **Employee:**
  Employee work hours and shifts must adhere to predefined schedules.
  Employee salaries and benefits should be determined according to their roles and experience.
  Rules for employee training and certification should be followed to ensure competency.
- **Incidents:**
  All incidents, such as accidents or safety violations, must be promptly documented.
  Incident response procedures and reporting standards must be followed.
  Incidents should be classified based on severity and addressed accordingly.
- **Train:**
  Train maintenance schedules and inspections must be strictly adhered to.
  Train assignments to routes and drivers should be based on availability and suitability. Rules for Train retirement or replacement should consider factors like age and condition.
- **Stations:**
  Rules for station accessibility and safety must comply with regulatory requirements. Station layouts and facilities should be designed to optimize passenger flow and comfort. Cleaning and maintenance schedules for stations should be defined.
- **Routes:**
  Routes should be planned based on passenger demand and operational constraints. Rules for adjusting routes in response to changing conditions should be defined. Route schedules should be published and adhered to consistently.
- **Complaints:**
  Procedures for receiving and addressing passenger complaints must be established. Rules for tracking and resolving complaints within predefined timeframes should be in place.
  Complaint data should be analyzed for continuous improvement.
- **Maintenance:**
  Preventive maintenance schedules for Trains and infrastructure must be followed. Rules for repair prioritization should be defined. Maintenance records and logs should be maintained.
- **Schedule:**
  Rules for creating and managing schedules for Trains and employees should be established.
  Schedule adherence and punctuality should be monitored and enforced.
  Rules for handling schedule changes due to disruptions should be in place.
- **Transit Card:**
  Rules for issuing, activating, and deactivating transit cards must be defined.
  Card security measures and data protection rules should be in place.
  Procedures for lost or stolen cards, including replacements and refunds, should be established.
- **Rider:**
  Rules for passenger conduct and behavior should be clearly communicated and enforced.
  Rules for rider identification and eligibility for discounts or concessions should be established.
- **Payments:**
  Fare collection and payment methods must adhere to established pricing rules. Rules for handling payment disputes and refunds should be established. Payment data and transactions should be securely managed and audited.

Project Group 9 • Uddhav Zambare • Yugal Lakhyani
• Suhasini Polampelly • Aditya Kotla

Initial ER diagram: