**Table Attributes Descriptions**

***Route***

* ***Route\_ID (PK)****: The unique identifier for each route within the railway network.*
* ***Distance****: Measures the length of the route from the departure station to the destination station, typically in kilometers or miles.*
* ***Duration****: The time it typically takes to travel from the departure station to the destination station, usually given in hours and minutes.*
* ***Notices****: Important information or alerts relevant to the route, which might include scheduled maintenance, delays, or other pertinent announcements.*
* ***DepartureStation (FK)****: The foreign key linking to the Station\_ID where the route originates.*
* ***DestinationStation (FK)****: The foreign key linking to the Station\_ID where the route terminates.*

***Station***

* ***Station\_ID (PK)****: The unique identifier for each train station in the system.*
* ***StationName****: The official name of the train station, as used in timetables and announcements.*
* ***City****: The city in which the station is located, helping passengers to identify the station's location.*
* ***Amenities****: Facilities provided at the station for passengers' convenience, such as restrooms, waiting areas, or food vendors.*
* ***IfBarrierFree****: A boolean indicator (true/false) of whether the station is equipped with facilities for passengers with disabilities, like ramps or elevators.*
* ***OperationHours****: The hours during which the station is operational for passengers to board trains, buy tickets, etc.*
* ***MaxTrainNum****: The maximum number of trains that the station can handle at one time without causing delays or overloading station resources.*

***Employee***

* ***Employee\_ID (PK)****: The unique identifier for each employee working within the railway company.*
* ***Name****: The full legal name of the employee.*
* ***Role****: The job title or position held by the employee within the company.*
* ***Department****: The department or division of the railway company in which the employee works.*
* ***HireDate****: The date on which the employee started working at the company.*
* ***Salary****: The amount of money the employee is paid, typically expressed as an annual figure.*
* ***Birthdate****: The date of birth of the employee.*
* ***Phone****: The contact telephone number for the employee.*
* ***Address\_ID (FK)****: A foreign key that links to the Address entity, representing the employee's residential address.*
* ***Station\_ID (FK)****: If applicable, the foreign key that links to the Station entity where the employee is assigned to work.*

***TrainSpecs***

* ***TrainSpecs\_ID (PK)****: The unique identifier for the detailed specifications of a train model.*
* ***WeightCap****: The maximum weight that the train is certified to carry, including passengers, luggage, and the train itself.*
* ***AxleLoad****: The maximum load that can be supported by a single axle of the train.*
* ***NumberOfCars****: The number of individual passenger cars or carriages that make up the train.*
* ***Length****: The total length of the train from the first to the last car.*
* ***MaxSpeed****: The highest speed the train is designed to safely travel.*
* ***AccelerationRate****: The rate at which the train can increase its speed, usually measured in meters per second squared.*
* ***DecelerationRate****: The rate at which the train can reduce its speed, for safety or comfort during travel.*
* ***PowerType****: The type of propulsion used by the train, such as diesel or electric.*
* ***TrackType****: The specific type of railway track the train is designed to operate on, which could affect compatibility with certain routes.*
* ***EnergySource****: The primary source of energy for the train's propulsion, such as electricity or fuel.*
* ***EnergyConsumption****: The average amount of energy the train uses over a certain distance or time period.*
* ***Train\_ID (FK)****: The foreign key linking these specifications to a specific train entity.*

***Schedule***

* ***Schedule\_ID (PK)****: A unique identifier for each train schedule entry.*
* ***DepartureDate****: The date on which the train is scheduled to leave the departure station.*
* ***DepartureTime****: The specific time at which the train is scheduled to depart.*
* ***ArrivalTime****: The expected time of arrival at the destination station.*
* ***Status****: The current status of the train's schedule, such as 'On Time', 'Delayed', or 'Cancelled'.*
* ***BookingOpenDate****: The date from which passengers can start booking tickets for this schedule.*
* ***BookingClosedDate****: The last date on which passengers can book tickets for this schedule.*
* ***TotalSeatsBooked****: The number of seats that have been booked by passengers.*
* ***MaxTickets****: The maximum number of tickets that can be issued for this particular train schedule.*
* ***WaitingTickets****: The number of tickets that have been placed on a waiting list due to the train being fully booked.*
* ***Train\_ID (FK)****: Links to the specific train that will be used for this schedule.*
* ***Route\_ID (FK)****: Associates the schedule with a particular route.*

***Station\_Train***

* ***StationTrain\_ID (PK)****: A unique identifier for a train's stop at a specific station.*
* ***StopNumber****: The sequence number of the stop for the train on its current route (e.g., 1st stop, 2nd stop).*
* ***StationArrivalTime****: The scheduled time for the train to arrive at the station.*
* ***StationDepartureTime****: The scheduled time for the train to depart from the station.*
* ***Train\_ID (FK)****: Connects to the Train entity, specifying which train is making the stop.*
* ***Station\_ID (FK)****: Connects to the Station entity, specifying which station the train is stopping at.*

***Train***

* ***Train\_ID (PK)****: The unique identifier for each individual train in the fleet.*
* ***TrainName****: The name given to the train, which may be used for identification or marketing purposes.*
* ***MaxPassengers****: The maximum number of passengers the train can carry.*
* ***MaidenVoyage****: The date on which the train was first put into service.*
* ***ServiceTypes****: The types of services provided on the train, such as standard, business, or first-class accommodations.*

***Maintenance***

* ***Maintenance\_ID (PK)****: The unique identifier for a record of maintenance work on a train.*
* ***Details****: A description of the maintenance work that was performed.*
* ***Duration****: The length of time the maintenance work took to complete.*
* ***WorkType****: The category or type of maintenance work performed (e.g., electrical, mechanical).*
* ***PerformedBy****: The individual or company that carried out the maintenance work.*
* ***NextServiceDate****: The scheduled date for the next maintenance service.*
* ***Address\_ID (FK)****: A link to the Address entity, which can indicate where the maintenance work was performed or where the maintenance company is located.*

***Ticket***

* ***Ticket\_ID (PK)****: The unique identifier for each ticket issued.*
* ***TicketNum****: A number that may be used for quick reference or scanning, which is unique to each ticket.*
* ***BookingDate****: The date on which the ticket was purchased or booked.*
* ***SeatNum****: The designated seat number assigned to the ticket holder.*
* ***PlatformNum****: The number of the platform from which the train will depart, which is helpful for passengers to find their departure point.*
* ***Price****: The monetary cost of the ticket.*
* ***BookingStatus****: The current status of the ticket, such as 'Confirmed', 'Cancelled', 'Pending', etc.*
* ***Schedule\_ID (FK)****: Links the ticket to a specific train schedule, indicating which particular trip the ticket is for.*
* ***Passenger\_ID (FK)****: Associates the ticket with the passenger who will be traveling.*

***Passenger***

* ***Passenger\_ID (PK)****: The unique identifier for each passenger who books a ticket.*
* ***Name****: The full legal name of the passenger.*
* ***Birthdate****: The date of birth of the passenger, which may be used for identification or to apply age-related discounts.*
* ***Gender****: The gender of the passenger, which might be relevant for certain statistical or planning purposes.*
* ***Phone****: The passenger's contact phone number.*
* ***Email****: The passenger's email address, which is often used for booking confirmations and updates.*
* ***Address\_ID (FK)****: A foreign key that links to the Address entity, indicating the passenger's home or billing address.*
* ***Address:***
* ***Address\_ID (PK)****: The unique identifier for a physical address entry.*
* ***Street****: The specific street name and number of the address.*
* ***City****: The city in which the address is located.*
* ***PostalCode****: The postal or ZIP code for the address, which is used for mail delivery and other services.*
* ***Province****: The province, state, or regional division where the address is situated.*
* ***Country****: The country where the address is located.*

***Train\_Maintenance:***

* ***TrainMaintenance\_ID (PK)****: The unique identifier for a specific maintenance record associated with a train.*
* ***IssueDetails****: A description of the issues addressed or the maintenance performed.*
* ***DeadlineDate****: The date by which the maintenance tasks were required to be completed.*
* ***ServiceDate****: The actual date when the maintenance was conducted.*
* ***NextServiceDate****: The date when the next round of maintenance is scheduled to occur.*
* ***Train\_ID (FK)****: The identifier linking the maintenance record to the specific train that was serviced.*
* ***Maintenance\_ID (FK)****: The identifier that connects the maintenance record to a broader maintenance entity, which could include details of the service provider or maintenance plan.*

**Entity Relationship Notes:**

**Route to Station (for DepartureStation and DestinationStation)**:

* **Route to DepartureStation**: The one-to-many relationship is indicated because a single route may start from multiple stations, especially in systems with multiple lines or branches.
* **Route to DestinationStation**: Similarly, a one-to-many relationship is indicated because a single route may end at multiple stations, accommodating routes that have multiple endpoints or termini.
* **Station to Employee**: The one-to-many relationship reflects that a station can have multiple employees working in different capacities, such as ticketing, maintenance, security, customer service, etc.
* **Station to Station\_Train**: The one-to-many relationship indicates that each station will have multiple trains stopping there throughout a period, and each of these stops is recorded as a separate Station\_Train record.
* **Train to Station\_Train**: The one-to-many relationship means that a single train will make stops at multiple stations along its route, each stop recorded as a Station\_Train entry.
* **Train to Schedule**: The one-to-many relationship signifies that a train may have different schedules, possibly for different routes or times, and each schedule is unique.
* **Train to TrainSpecs**: The one-to-one relationship is due to each train having a unique set of specifications that define its physical and operational characteristics, and these specs are unique to each train.

**Train to Maintenance (via Train\_Maintenance)**:

* **Train to Train\_Maintenance**: The one-to-many relationship indicates that over time, a train will undergo several maintenance activities, each of which is logged separately in the maintenance records.

**Maintenance to Train (via Train\_Maintenance)**:

* **Maintenance to Train\_Maintenance**: This one-to-many relationship suggests that a particular type of maintenance could be applicable to multiple trains. Such as regular break inspections.
* **Schedule to Ticket**: The one-to-many relationship reflects that for any given schedule, there can be multiple tickets issued to different passengers.
* **Passenger to Ticket**: The one-to-many relationship is based on the fact that a passenger can purchase several tickets over time for different journeys or multiple tickets for a single journey if they are booking for a group.
* **Passenger to Address**: The one-to-one relationship indicates that in the database, each passenger is associated with a single address record, which is their primary contact address.

**Datatype and key info of entities**

**Table: public.address**

**address\_id** (PK) | INTEGER | Not Null

street | VARCHAR(50)

city | VARCHAR(50)

province | VARCHAR(50)

postalcode | VARCHAR(50)

country | VARCHAR(50)

*Indexes:*

"address\_pkey" PRIMARY KEY, btree (address\_id)

*Referenced by:*

TABLE "employee" CONSTRAINT "employee\_address\_id\_fkey" FOREIGN KEY (address\_id) REFERENCES address(address\_id)

TABLE "maintenance" CONSTRAINT "fk\_address" FOREIGN KEY (address\_id) REFERENCES address(address\_id)

TABLE "passenger" CONSTRAINT "passenger\_address\_id\_fkey" FOREIGN KEY (address\_id) REFERENCES address(address\_id)

**Table: public.employee**

**employee\_id** (PK) | INTEGER | Not Null | nextval('employee\_employee\_id\_seq'::regclass)

name | VARCHAR(50)

role | VARCHAR(50)

department | VARCHAR(50)

hiredate | DATE

salary | MONEY

birthdate | DATE

phone | VARCHAR(50)

address\_id | INTEGER

station\_id | VARCHAR(7)

*Indexes:*

"employee\_pkey" PRIMARY KEY, btree (employee\_id)

*Foreign-key constraints:*

"employee\_address\_id\_fkey" FOREIGN KEY (address\_id) REFERENCES address(address\_id)

"employee\_station\_id\_fkey" FOREIGN KEY (station\_id) REFERENCES station(station\_id)

**Table: public.maintenance**

**maintenance\_id** (PK) | INTEGER | Not Null | nextval('maintenance\_id\_seq'::regclass)

details | TEXT

duration | VARCHAR(10)

worktype | VARCHAR(28)

performedby | VARCHAR(50)

companyphone | VARCHAR(50)

companyemail | VARCHAR(50)

address\_id | INTEGER

*Indexes:*

"maintenance\_pkey" PRIMARY KEY, btree (maintenance\_id)

*Foreign-key constraints:*

"fk\_address" FOREIGN KEY (address\_id) REFERENCES address(address\_id)

*Referenced by:*

TABLE "train\_maintenance" CONSTRAINT "train\_maintenance\_maintenance\_id\_fkey" FOREIGN KEY (maintenance\_id) REFERENCES maintenance(maintenance\_id)

**Table: public.passenger**

**passenger\_id** (PK) | INTEGER | Not Null | nextval('passenger\_passenger\_id\_seq'::regclass)

name | VARCHAR(50)

birthdate | DATE

gender | VARCHAR(50)

phone | VARCHAR(50)

email | VARCHAR(50)

address\_id | INTEGER

*Indexes:*

"passenger\_pkey" PRIMARY KEY, btree (passenger\_id)

*Foreign-key constraints:*

"passenger\_address\_id\_fkey" FOREIGN KEY (address\_id) REFERENCES address(address\_id)

*Referenced by:*

TABLE "ticket" CONSTRAINT "ticket\_passenger\_id\_fkey" FOREIGN KEY (passenger\_id) REFERENCES passenger(passenger\_id)

**Table: public.route**

**route\_id (PK) | INTEGER | Not Null**

**distance | VARCHAR(10)**

**duration | VARCHAR(6)**

**notices | TEXT**

**departurestation | VARCHAR(6)**

**destinationstation | VARCHAR(6)**

***Indexes:***

**"route\_pkey" PRIMARY KEY, btree (route\_id)**

***Foreign-key constraints:***

**"route\_departurestation\_fkey" FOREIGN KEY (departurestation) REFERENCES station(station\_id)**

**"route\_destinationstation\_fkey" FOREIGN KEY (destinationstation) REFERENCES station(station\_id)**

***Referenced by:***

**TABLE "schedule" CONSTRAINT "schedule\_route\_id\_fkey" FOREIGN KEY (route\_id) REFERENCES route(route\_id)**

**Table: public.schedule**

**schedule\_id (PK) | INTEGER | Not Null**

**departuredate | DATE**

**departuretime | VARCHAR(50)**

**arrivaltime | VARCHAR(50)**

**status | VARCHAR(10)**

**bookingopendate | DATE**

**bookingcloseddate | DATE**

**maxtickets | INTEGER**

**totalseatsbooked | INTEGER**

**waitingtickets | INTEGER**

**train\_id | VARCHAR(4)**

**route\_id | INTEGER**

***Indexes:***

**"schedule\_pkey" PRIMARY KEY, btree (schedule\_id)**

***Foreign-key constraints:***

**"schedule\_route\_id\_fkey" FOREIGN KEY (route\_id) REFERENCES route(route\_id)**

**"schedule\_train\_id\_fkey" FOREIGN KEY (train\_id) REFERENCES train(train\_id)**

***Referenced by:***

**TABLE "ticket" CONSTRAINT "ticket\_schedule\_id\_fkey" FOREIGN KEY (schedule\_id) REFERENCES schedule(schedule\_id)**

**Table: public.station**

**station\_id (PK) | VARCHAR(6) | Not Null**

**stationname | VARCHAR(60)**

**city | VARCHAR(50)**

**amenities | VARCHAR(50)**

**ifbarrierfree | VARCHAR(50)**

**operationhours | VARCHAR(50)**

**maxtrainnum | INTEGER**

***Indexes:***

**"station\_pkey" PRIMARY KEY, btree (station\_id)**

***Referenced by:***

**TABLE "employee" CONSTRAINT "employee\_station\_id\_fkey" FOREIGN KEY (station\_id) REFERENCES station(station\_id)**

**TABLE "route" CONSTRAINT "route\_departurestation\_fkey" FOREIGN KEY (departurestation) REFERENCES station(station\_id)**

**TABLE "route" CONSTRAINT "route\_destinationstation\_fkey" FOREIGN KEY (destinationstation) REFERENCES station(station\_id)**

**Table: public.station\_train**

**stationtrain\_id (PK) | INTEGER**

**stopnumber | INTEGER**

**stationarrivaltime | TIME WITHOUT TIME ZONE**

**stationdeparturetime | TIME WITHOUT TIME ZONE**

**train\_id | VARCHAR(4)**

**station\_id | VARCHAR(7)**

**Table: public.ticket**

**ticket\_id (PK) | INTEGER | Not Null**

**ticketnum | INTEGER**

**bookingdate | DATE**

**seatnum | INTEGER**

**platformnum | INTEGER**

**price | NUMERIC(7,2)**

**bookingstatus | VARCHAR(20)**

**schedule\_id | INTEGER**

**passenger\_id | INTEGER**

***Indexes:***

**"ticket\_pkey" PRIMARY KEY, btree (ticket\_id)**

***Foreign-key constraints:***

**"ticket\_passenger\_id\_fkey" FOREIGN KEY (passenger\_id) REFERENCES passenger(passenger\_id)**

**"ticket\_schedule\_id\_fkey" FOREIGN KEY (schedule\_id) REFERENCES schedule(schedule\_id)**

**Table: public.train**

**train\_id (PK) | VARCHAR(4) | Not Null**

**trainname | VARCHAR(50)**

**maxpassengers | INTEGER**

**maidenvoyage | DATE**

**servicetype | VARCHAR(20)**

***Indexes:***

**"train\_pkey" PRIMARY KEY, btree (train\_id)**

***Referenced by:***

**TABLE "schedule" CONSTRAINT "schedule\_train\_id\_fkey" FOREIGN KEY (train\_id) REFERENCES train(train\_id)**

**TABLE "train\_maintenance" CONSTRAINT "train\_maintenance\_train\_id\_fkey" FOREIGN KEY (train\_id) REFERENCES train(train\_id)**

**TABLE "trainspecs" CONSTRAINT "trainspecs\_train\_id\_fkey" FOREIGN KEY (train\_id) REFERENCES train(train\_id)**

**Table: public.trainspecs**

**trainspecs\_id | INTEGER**

**weightcap | INTEGER**

**axleload | VARCHAR(10)**

**numberofcars | INTEGER**

**length | VARCHAR(10)**

**maxspeed | VARCHAR(10)**

**accelerationrate | VARCHAR(10)**

**decelerationrate | VARCHAR(10)**

**powertype | VARCHAR(8)**

**tracktype | VARCHAR(25)**

**energysource | VARCHAR(17)**

**energyconsumption | VARCHAR(10)**

**train\_id | VARCHAR(4)**

***Foreign-key constraints:***

**"trainspecs\_train\_id\_fkey" FOREIGN KEY (train\_id) REFERENCES train(train\_id)**