

# ECS519U Eurostar 2030 - CW3

## GROUP 5

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### 1. Route – Station (Start and End)

There is a 1:M relationship between Station and Route because each station can serve multiple routes. Participation is mandatory for Route and optional for Station. The relationship is migrated into Route using foreign keys start\_station\_id and end\_station\_id referencing Station(station\_id).

### 2. Route – Station (Stops)

This is a M:N relationship because a route can include many stations and a station can appear in multiple routes. Participation is optional for Route and Station. The relationship is implemented through a link table RouteStation(route\_id, station\_id, stop\_order).

### 3. Route – Train Eligibility

There is a M:N relationship between Route and Train showing which trains can operate on certain routes. Participation is optional for both Route and Train. The relationship is implemented using RouteTrainEligibility(route\_id, train\_id) with route\_id and train\_id as foreign keys and a composite primary key.

### 4. Role – Employee

This is a 1:M relationship where one role can apply to many employees. The participation is mandatory for Role and optional for Employee. The relationship is migrated into Employee using the foreign key role\_id referencing Role(role\_id) because each employee has only one role this makes it more efficient and normalized to store the reference in the Employee table.

### 5. Trip – Route

This is a M:1 relationship between Trip and Route because each trip follows one route. The Participation is mandatory for Trip and is optional for Route. The relationship is migrated into Trip using the foreign key route\_id referencing Route(route\_id) because it is logical to store the reference in the Trip table where each trip record points to its route.

### 6. Trip – Employee (Crew Assignment)

This is a M:N relationship where trips have multiple crew members and employees can work on multiple trips. Participation is optional for both Trip and Employee. The relationship is implemented using the table TripCrew(trip\_id, employee\_id, crew\_role\_description) with a composite key.

7. Trip – PassengerCategory

There is a M:N relationship between Trip and Passenger Category showing passenger counts. Participation is optional for Trips and PassengerCategory. The relationship is implemented using TripPassenger(trip\_id, category\_id, passenger\_count) with a composite primary key.

8. Passenger Counts Per Trip

There is a M:N relationship between Trip and PassengerCategory this shows how many passengers of each category are on each trip. The participation is optional for both Trip and PassengerCategory. The relationship is implemented using the link table TripPassenger(trip\_id, category\_id, passenger\_count) with a composite primary key (trip\_id, category\_id) and foreign keys to Trip(trip\_id) and PassengerCategory(category\_id). This means each trip category pair and its count is stored once.

9. Person – Employee (Generalisation)

There is a 1:1 relationship as each employee is a person. Participation is mandatory for Employee and optional for Person since not every Person is an Employee. The implementation of this has Employee migrating via the foreign key person\_id referencing Person(person\_id)

10. Person – Passenger (Generalisation)

There is a 1:1 relationship as each passenger is a person. The participation is mandatory for Passenger and optional for Person. The implementation of this has Passenger migrating via train\_id referencing Train(train\_id)