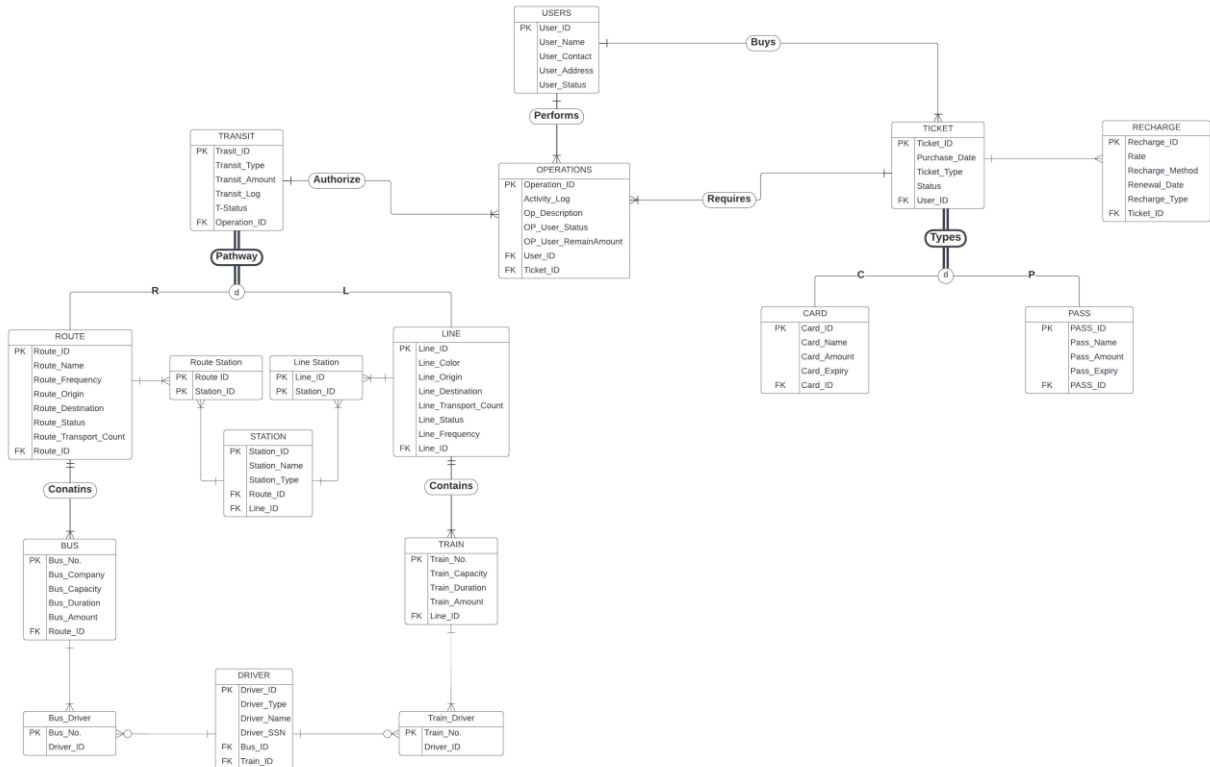


Project 2 Deliverables

ER diagram:



Business Rules:

1. Each user must have a unique user ID.
2. Each ticket must have a unique ticket ID.
3. Each transit must have a unique transit ID.
4. Each operation must be associated with a single user and a single ticket.
5. Each operation must have a status (e.g., pending, in progress, completed).
6. Each card must have a unique card ID.
7. Each pass must have a unique pass ID.
8. Each route must have a unique route ID.
9. Each station must have a unique station ID.
10. Each recharge must be associated with a single ticket.
11. Each transit must be associated with a single bus or train.
12. Each bus must have a unique tram number.
13. Each train must have a unique train number.
14. Each driver must have a unique driver ID.

Additional business rules for the MBTA transportation system:

1. A user can purchase one or more tickets.
2. A ticket can be used for one or more transits.
3. A transit can be associated with one or more operations.
4. A card can be used to purchase tickets or to pay for transits.
5. A pass can be used for unlimited transits over a period of time.
6. A route can have one or more stations.
7. A station can be on one or more routes.
8. A recharge can be used to add money to a card.
9. A transit can only be made if the user has a valid ticket or pass.
10. A user can only use one ticket or pass for a single transit.
11. A transit can only be made if there is a sufficient number of seats available on the bus or train.
12. Each transit can only be made if the user has a valid ticket or pass.
13. A user can only use one ticket or pass for a single transit.
14. A transit can only be made if there is a sufficient number of seats available on the bus or train.

MBTA transportation system will vary depending on your specific requirements.

Cardinality 1:1

1. Each user must have a unique user ID.
2. Each ticket must have a unique ticket ID.
3. Each transit must have a unique transit ID.
4. Each card must have a unique card ID.
5. Each pass must have a unique pass ID.
6. Each route must have a unique route ID.
7. Each station must have a unique station ID.
8. Each bus must have a unique tram number.
9. Each train must have a unique train number.
10. Each driver must have a unique driver ID.

Cardinality 1:M

1. Each user can purchase one or more tickets.
2. Each pass Each ticket can be used for one or more transits.
3. Each transit can be associated with one or more operations.
4. Each card can be used to purchase tickets or to pay for transits.
5. Each recharge can be used to add money to a card.

Cardinality based on Associative entity

1. Each card can be used to purchase tickets or to pay for transits.
2. Each pass can be used for unlimited transits over a period of time.
3. Each route can have one or more stations.
4. Each station can be on one or more routes.
5. Each train can be associated with one or more lines.
6. Each line can be served by one or more trains.
7. Each card can be used to pay for transits on any line.
8. Each transit can be associated with one or more operations.

9. Each transit can be made if the user has a valid ticket or pass.
10. For example, the cardinality 1:1 between the User and Ticket entities means that each user can only have one active ticket at a time. This could be implemented in the system by preventing users from purchasing a new ticket until their current ticket has expired.
11. The cardinality 1:M between the Ticket and Operation entities means that each ticket can be associated with one or more operations. This could be implemented in the system by allowing users to tap their ticket to check in and out of buses and trains. The system would then keep track of all the operations associated with each ticket.
12. The cardinality M:M between the Transit and Operation entities means that each transit can be associated with one or more operations, and each operation can be associated with one or more transits. This could be implemented in the system by storing a list of all the operations associated with each transit.

Entity Description:

1. **User:** A person who uses the transportation system. Each user has a unique user ID, which is used to identify them in the system. The system stores information about each user, such as their name, email address, and payment information.
2. **Ticket:** A document that allows a user to use the transportation system for a certain period of time or for a certain number of trips. Each ticket has a unique ticket ID, which is used to identify it in the system. The system stores information about each ticket, such as its type (single, pass), validity period, and price.
3. **Transit:** A single journey on the transportation system. Each transit has a unique transit ID, which is used to identify it in the system. The system stores information about each transit, such as the ticket ID, route ID, station ID, and time.
4. **Operation:** An action performed on a ticket, such as checking in or checking out. Each operation has a unique operation ID, which is used to identify it in the system. The system stores information about each operation, such as the transit ID, type (check-in, check-out), and time.
5. **Card:** A physical or virtual card that can be used to store money and purchase tickets or pay for transits. Each card has a unique card ID, which is used to identify it in the system. The system stores information about each card, such as the user ID and balance.
6. **Pass:** A ticket that allows a user to use the transportation system unlimited times for a certain period of time. Each pass has a unique pass ID, which is used to identify it in the system. The system stores information about each pass, such as the user ID, type (daily, weekly, monthly), and validity period.
7. **Route:** A path travelled by buses or trains. Each route has a unique route ID, which is used to identify it in the system. The system stores information about each route, such as its name, stops, and schedule.
8. **Station:** A place where buses or trains stop. Each station has a unique station ID, which is used to identify it in the system. The system stores information about each station, such as its name, location, and routes.
9. **Recharge:** A transaction that adds money to a card. Each recharge has a unique recharge ID, which is used to identify it in the system. The system stores information about each recharge, such as the card ID, amount, and time.
10. **Bus:** A vehicle that travels on the road and is used to transport passengers. Each bus has a unique bus ID, which is used to identify it in the system. The system stores information about each bus, such as its tram number, route ID, and capacity.
11. **Train:** A vehicle that travels on rails and is used to transport passengers. Each train has a unique train ID, which is used to identify it in the system. The system stores information about each train, such as its train number, route ID, and capacity.

12. **Driver:** A person who operates a bus or train. Each driver has a unique driver ID, which is used to identify them in the system. The system stores information about each driver, such as their name, license number, and employment status.
13. **Line Station:** A Line Station is a station that is served by one or more lines. It has a unique ID, a name, and a list of line IDs. The line IDs are used to identify the lines that serve the station.
14. **Route Station:** A Route Station is a station that is served by one or more lines. It has a unique ID, a name, and a list of line IDs. The line IDs are used to identify the routes that serve the station.
15. **Bus_Driver:** A Bus_Driver is a person who drives a bus. It has a unique ID, a name, and a bus ID. The bus ID is used to identify the bus that the driver is assigned to.
16. **Train_Driver:** A Train_Driver is a person who drives a train. It has a unique ID, a name, and a train ID. The train ID is used to identify the train that the driver is assigned to.

Database design flow:

