Phase IV - Database Design

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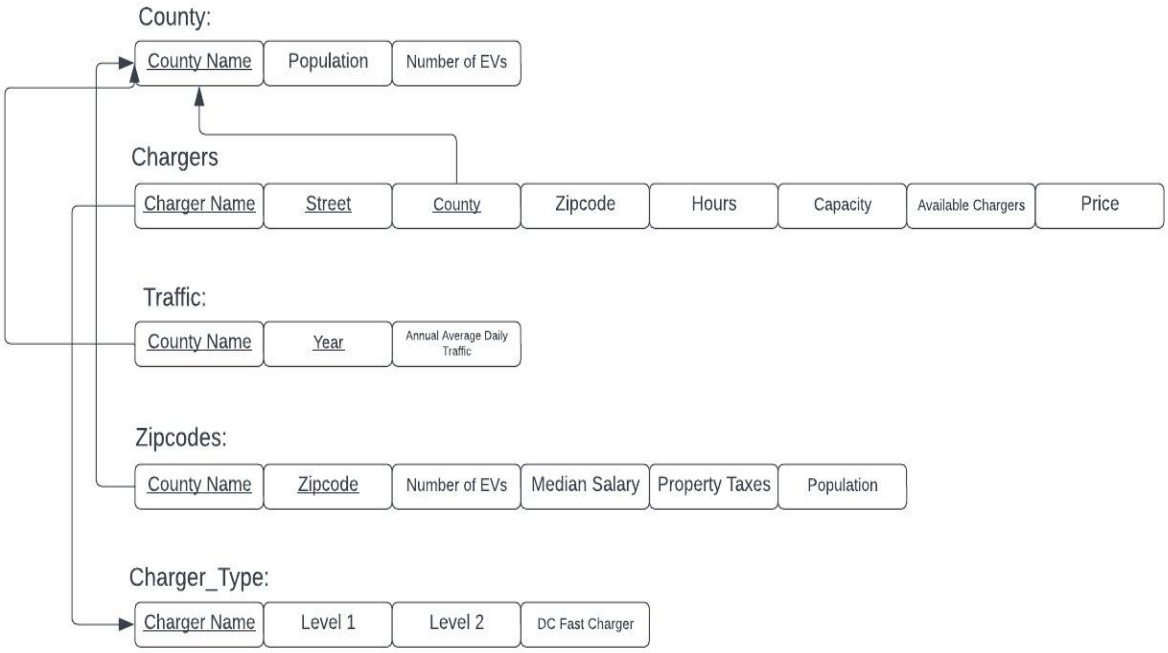
Updated Relational Schema



Normalizing Relations

County(CountyName, Population, Number of EVs)
CountyName → Population, Number of EVs
This relation is in BCNF form. There do not exist any partial dependencies that would violate 2NF, no transitive dependencies to violate 3NF, and no relationships where a dependency relies on a non-prime attribute within a relation to violate BCNF.

Chargers(ChargerName, Street, County, Zipcode, Hours, Capacity, Available Chargers, Price)
{ChargerName, Street} → Hours, Capacity, Price, Available Chargers, County, Zipcode
This relation is in BCNF form. There do not exist any partial dependencies that would violate 2NF, no transitive dependencies to violate 3NF, and no relationships where a dependency relies on a non-prime attribute within a relation to violate BCNF.

Traffic(CountyName, Year, AADT)
{CountyName, Year} → AADT

This relation is in BCNF form. There do not exist any partial dependencies that would violate 2NF, no transitive dependencies to violate 3NF, and no relationships where a dependency relies on a non-prime attribute within a relation to violate BCNF.

Zipcodes(CountyName, Zipcode, Number of EVs, Median Salary, Property Taxes, Population)
{CountyName, Zipcode} → Number of EVs, Median Salary, Property Taxes, Population
This relation is in BCNF form. There do not exist any partial dependencies that would violate 2NF, no transitive dependencies to violate 3NF, and no relationships where a dependency relies on a non-prime attribute within a relation to violate BCNF.

Charger_Type(ChargerName, Level 1, Level 2, DC Fast Charger)
ChargerName → Level 1, Level 2, FastCharger
This relation is in BCNF form. There do not exist any partial dependencies that would violate 2NF, no transitive dependencies to violate 3NF, and no relationships where a dependency relies on a non-prime attribute within a relation to violate BCNF.

Potential Virtual Views

ChargerInCountyView (Join Charger and County):
This view provides all the available chargers within a county. Using this view, a user can determine which counties contain the most amount of EV chargers, select chargers within a county based on price or capacity, and more. This type of view can be used with or without user input, where the input county name.

ZipcodesTrafficView (Join Zipcodes and Traffic):
This view provides the annual average traffic counts of various years for a zipcode within a county. This view will not provide the traffic count for a specific zipcode, but will for the entire county it sits within. Using this view, a user can view how many EVs may exist within a county and compare it with traffic data. In addition, the user could also compare population demographics to overall traffic data. This type of view can be used with or without user input, where the input could be the zipcode or county name.

ChargerTypeView (Join Charger and ChargerType):
This view provides the user the ability to select a specific type of charger (Level 1, etc.). For example, a user may only be looking for Level 2 chargers. This view can be combined with other views to search for specific charger types within a specific county/zipcode. This type of view can be used with or without user input, where the input could be the charger name or type of charger.

Example SQL Commands

ChargerInCountyView (Join Charger and County):

```
SELECT ChargerName, Street, Hours, Price
FROM ChargerInCountyView
WHERE price < $10

SELECT *
FROM ChargerInCountyView
WHERE zipcode = '08550'

SELECT County
FROM ChargerInCountyView
WHERE Number_of_EVs = (
        SELECT MAX(Number_of_EVs)
        FROM County
)
```

ZipcodesTrafficView (Join Zipcodes and Traffic):

```
SELECT annual_average_daily_traffic
FROM ZipcodesTrafficView
WHERE year = '2020' AND county='union'

SELECT number_of_EVs, annual_average_daily_traffic
FROM ZipcodesTrafficView
WHERE zipcode = '08550' AND year='2019'

SELECT Number of EVs, Property Taxes, Population
FROM ZipcodesTrafficView
```

ChargerTypeView: All Charger joined with ChargerType

```
SELECT number_of_EVs, charger_name
FROM County NATURAL JOIN ChargeTypeView;

SELECT *
FROM ChargerTypeView
WHERE county="Union";

SELECT *
FROM ChargerTypeView
WHERE charger_type = "Level 1" AND county="union"
```