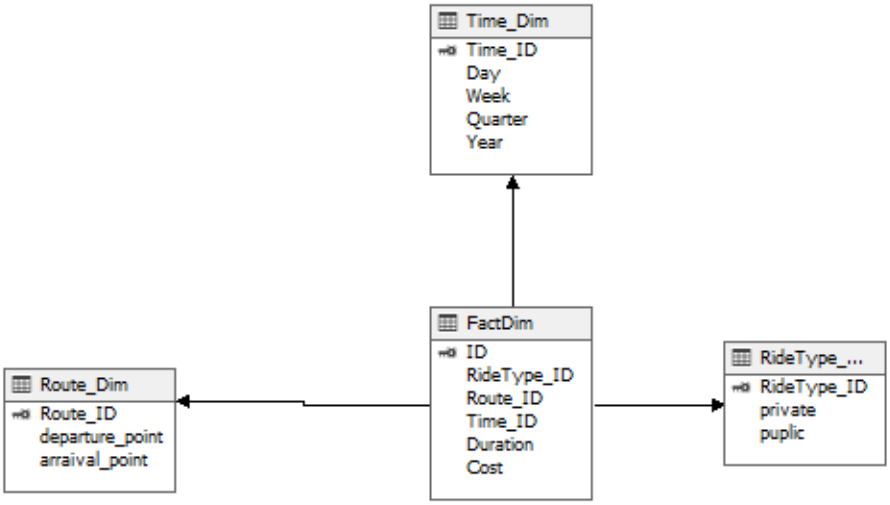
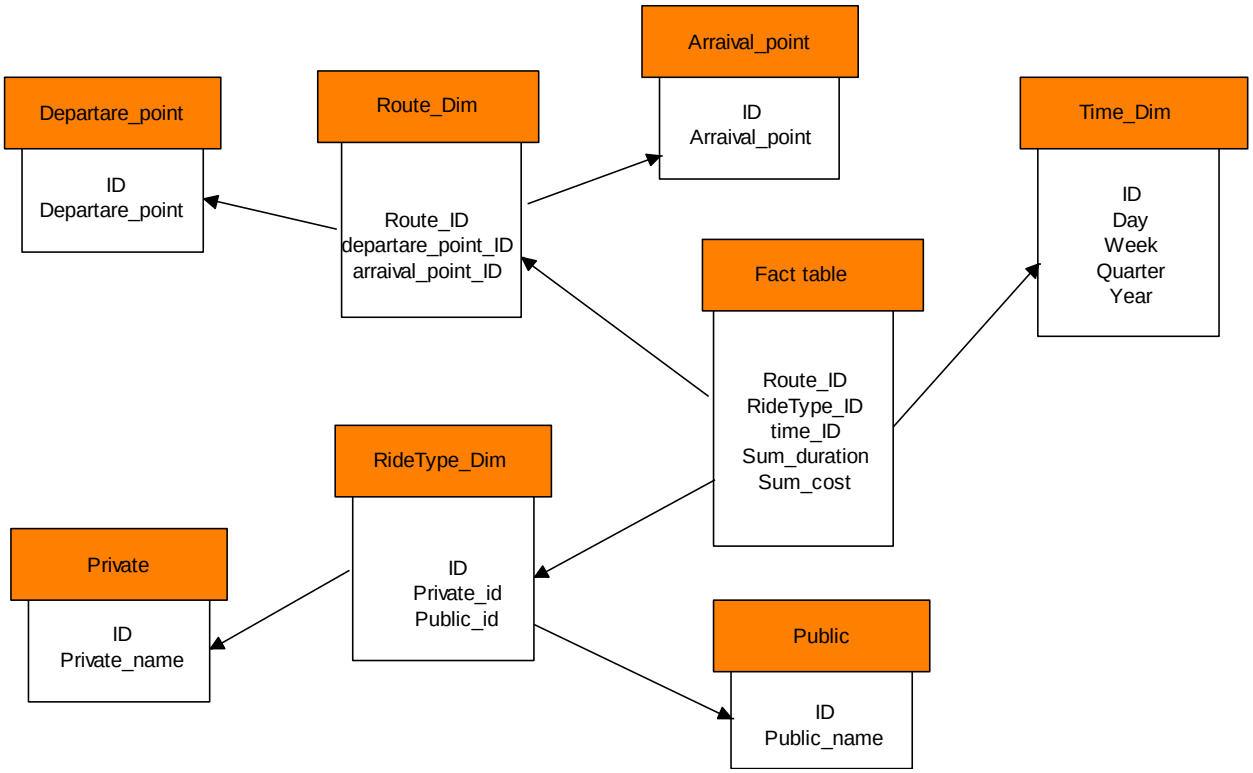
1.1 Star Schema in data warehouse, in which the center of the star can have one fact table and a number of associated dimension tables. It is known as star schema as its structure resembles a star. The Star Schema data model is the simplest type of Data Warehouse schema. It is also known as Star Join Schema and is optimized for querying large data sets.

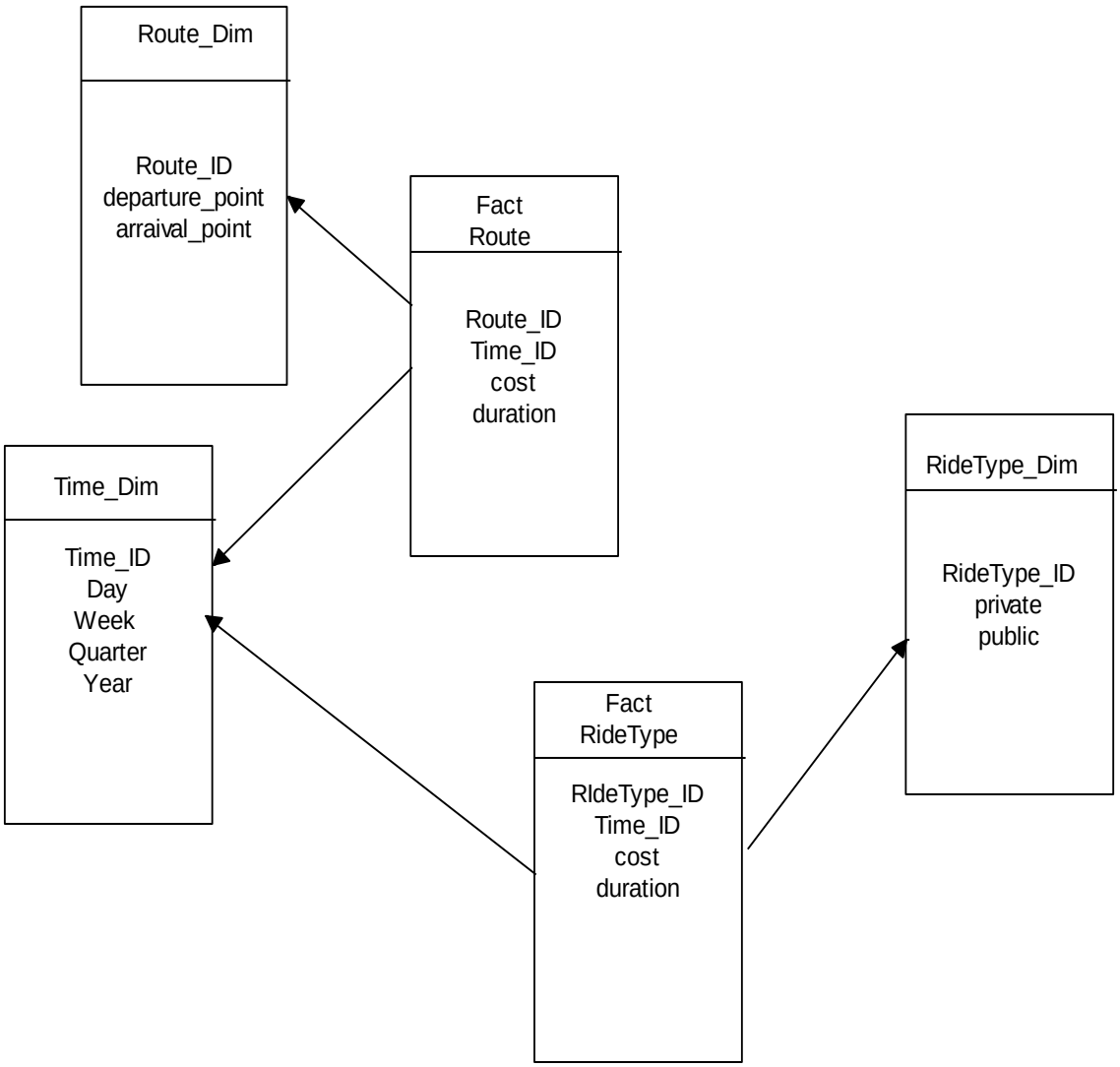


1.2 Snowflake Schema in data warehouse is a logical arrangement of tables in a multidimensional database such that the ER diagram resembles a snowflake shape. A Snowflake Schema is an extension of a Star Schema, and it adds additional dimensions. The dimension tables are normalized which splits data into additional tables.

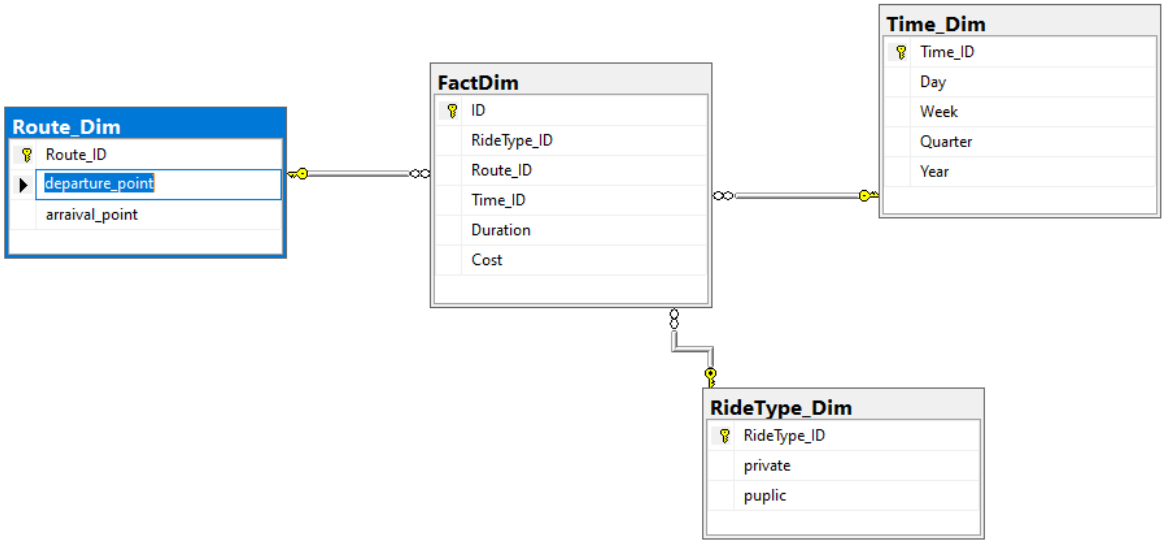


1.3 Fact canstellation schema

is a schema for representing multidimensional model. It is a collection of multiple fact tables having some common dimension tables. It can be viewed as a collection of several star schemas and hence, also known as *Galaxy schema*. It is one of the widely used schema for Data warehouse designing and it is much more complex than star and snowflake schema.



1.4 ER diagram :



2.**A.1: Drill Down using SQL:**

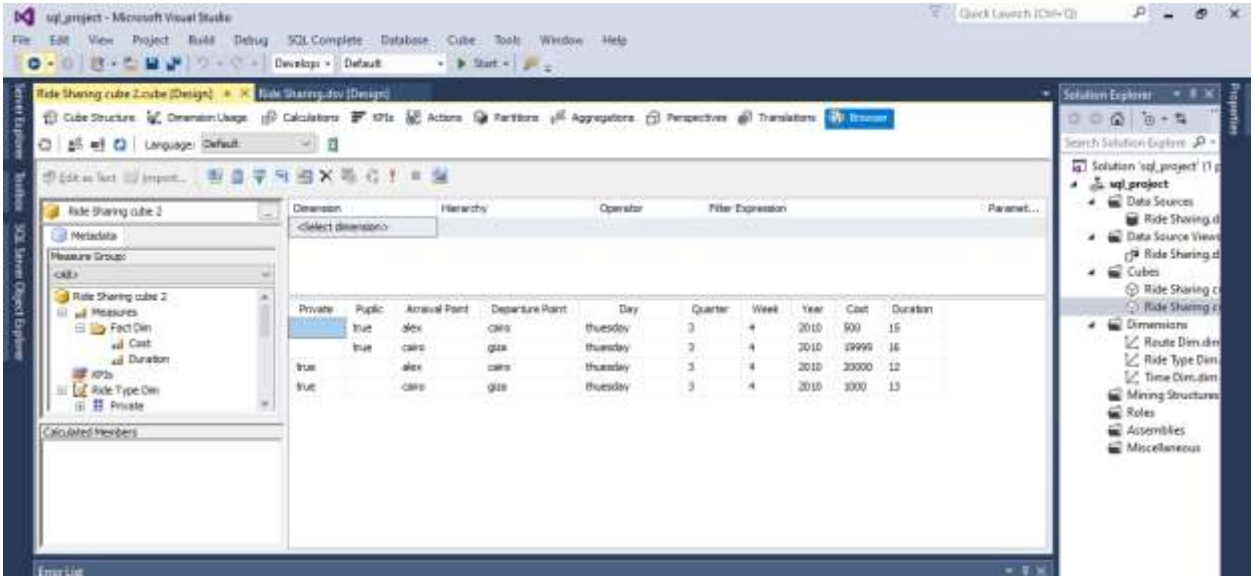
Drill Down and Drill Up (also known as Data Drilling) means to navigate in hierarchical dimensions of data stored in Data Warehouses. There are two opposite ways of data drilling: Drill Down is used within Online Analytical Processing (OLAP) to zoom in to more detailed data by Changing Dimensions.

```
Select Route_Dim.departure_point, Route_Dim.arraival_point,
 Time_Dim.Day, Time_Dim.Week, Time_Dim.Quarter, Time_Dim.Year, RideType_Dim.private,
  RideType_Dim.puplic ,Sum (FactDim.Duration) as Duration,
Sum (FactDim.Cost) as Cost


from Route_Dim, Time_Dim, RideType_Dim,FactDim
where Route_Dim.Route_ID=FactDim.Route_ID AND FactDim.RideType_ID=
RideType_Dim.RideType_ID AND
FactDim.Time_ID =Time_Dim.Time_ID

GROUP By Route_Dim.departure_point, Route_Dim.arraival_point , RideType_Dim.private,
RideType_Dim.puplic,Time_Dim.Day, Time_Dim.Week, Time_Dim.Quarter, Time_Dim.Year
```

2.B.1: Drill Down using SQL server analysis server:

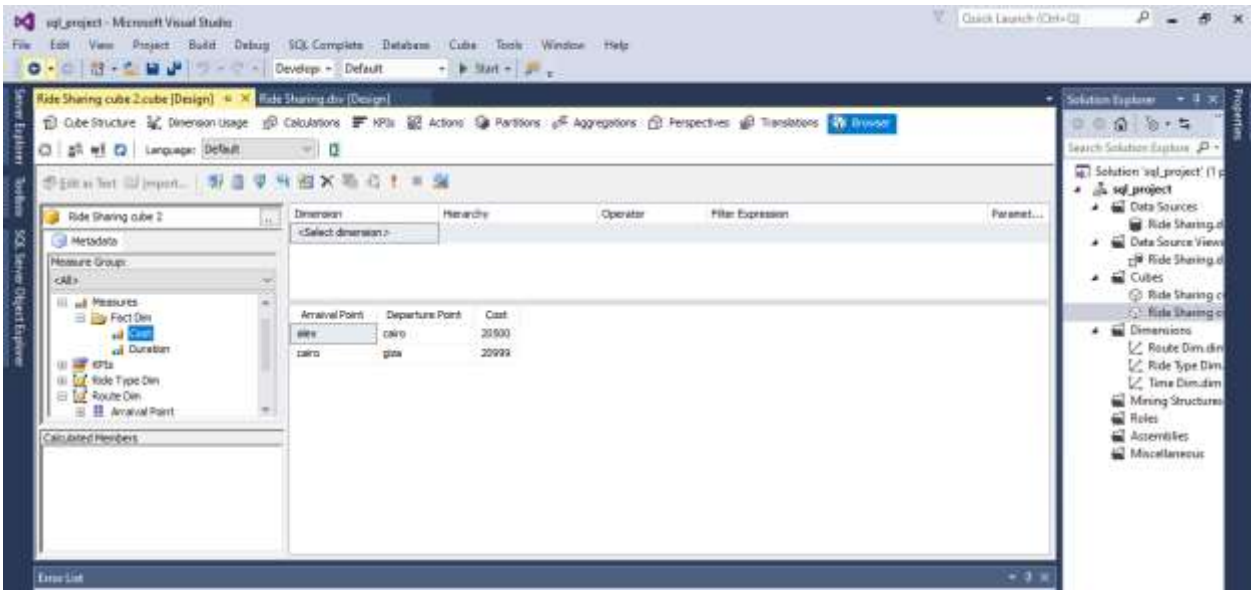


2.A.2: Roll Up using SQL Query:

Roll-up allows us to look at coarser, “big picture” data by dropping one or more dimensions or climbing up along the dimension hierarchies.

```
Select  Route_Dim.departure_point,Route_Dim.arraival_point,SUM(FactDim.Cost)
From Route_Dim,FactDim
where Route_Dim.Route_ID=FactDim.Route_ID
        Group By Route_Dim.departure_point,Route_Dim.arraival_point
```

2.B.2: Roll Up using SQL server analysis server:

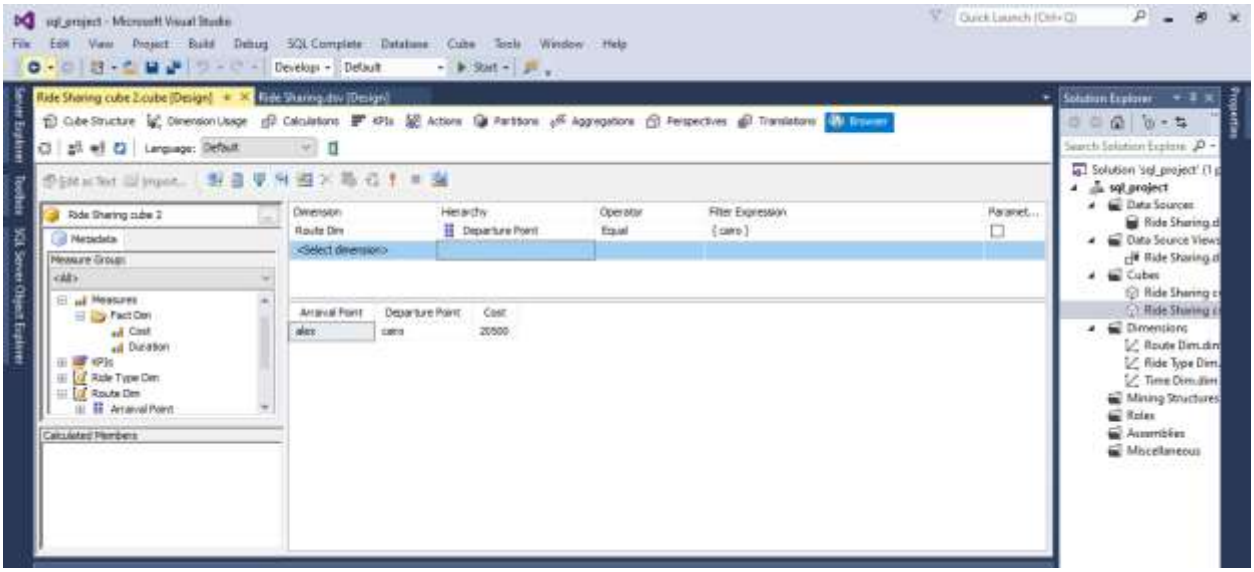


2.A.3: Slice Operation using SQL Query:

A slice in a multidimensional array is a column of data corresponding to a single value for one or more members of the dimension. Slicing is the act of divvying up the cube to extract this information for a given slice.

```
SELECT Route_Dim.departure_point , Time_Dim.Time_ID
,SUM(FactDim.Cost)
From Route_Dim,FactDim,Time_Dim
where Route_Dim.Route_ID=FactDim.Route_ID AND
FactDim.Time_ID=Time_Dim.Time_ID AND Route_Dim.departure_point='cairo'
Group by Route_Dim.departure_point, Time_Dim.Time_ID
```

2.B.3: Slice Operation using SQL server analysis server:



3. Overall look considering all levels of dimension hierarchy: