Data Warehousing & Business Intelligence

Assignment I

2022

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1. Data Set Selection and Introduction

'LA RESTAURANTS AND MARKET HEALTH DATA' is a collection of transactional data which is used as the source data set here. The following is the link to the original data set:

https://www.kaggle.com/datasets/cityofLA/la-restaurant-market-health-data?select=restaurant-and-market-health-violations.csv

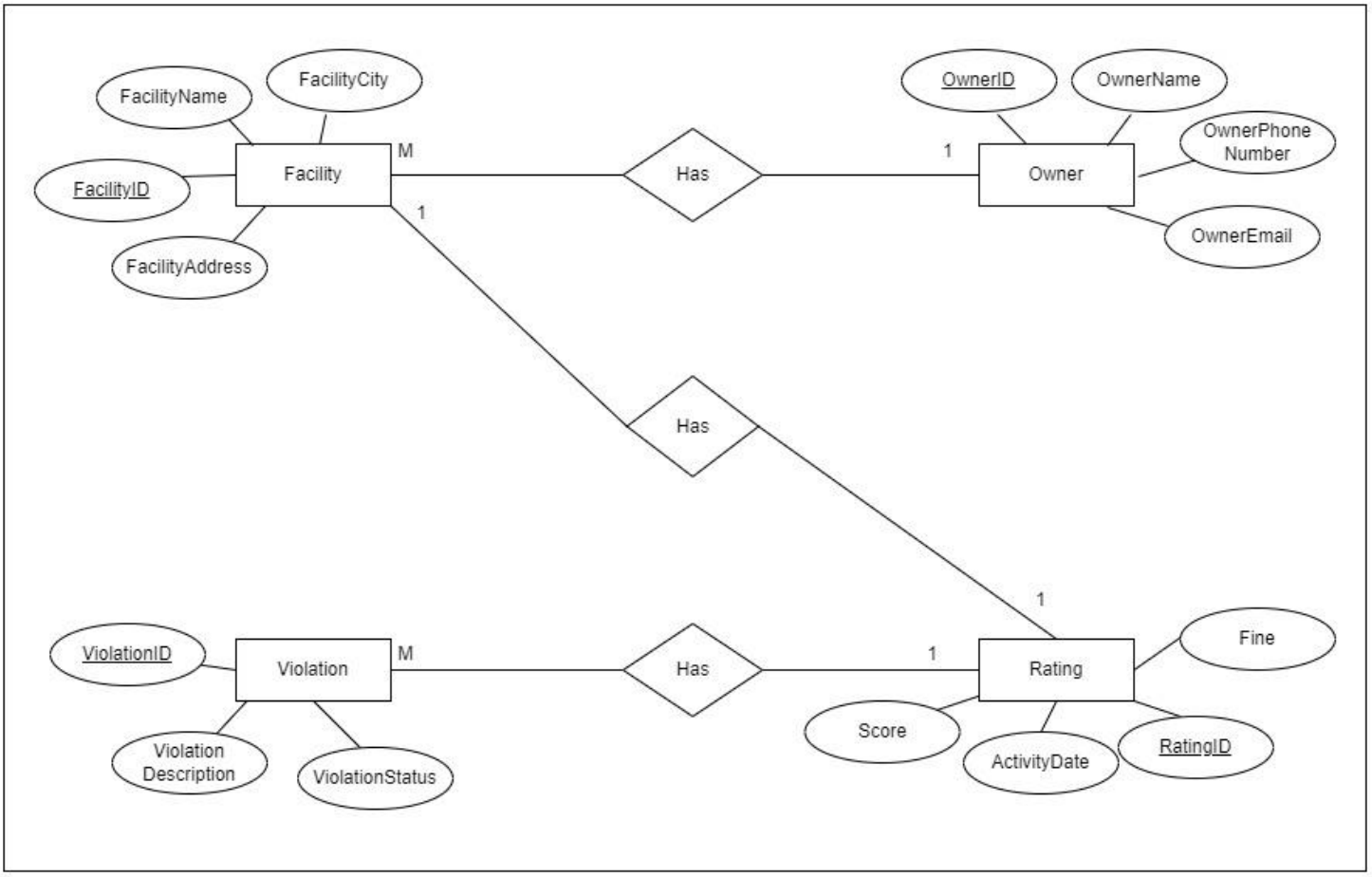
Modifications were made accordingly to the data set derived from the source. This data set reflects the restaurants' and market's health data in Los Angeles, California. The derived data set 'HV' (Health Violations) mainly focuses on the violations that happened in restaurants within the range of 2018 to 2020.

In this Data set Owner has many facilities and owner is considered as a place where lot of facilities (Target, Subway etc.) are located. These facilities are rated by taking records on Violations and given a score and fine for the relevant facility.

Description of the Data Set

Table name	Column name	Data type	Description
Violations	ViolationID	nvarchar(50)	Contains the Details of Violations associated with the rated facilities.
	ViolationDescription	nvarchar(100)	
	ViolationStatus	nvarchar(50)	
Facility	FacilityID	nvarchar(50)	Contains the Details of the facilities Owned by the Owners
	FacilityName	nvarchar(200)	
	FacilityCity	nvarchar(50)	
	FacilityAddress	nvarchar(200)	
	OwnerID	nvarchar(50)	
Owner	OwnerID	nvarchar(50)	Contains the details of the Owners
	OwnerName	nvarchar(50)	
	OwnerPhoneNumber	numeric(18,0)	
	OwnerEmail	nvarchar(50)	
Rating	RatingID	nvarchar(50)	Details of the ratings associated with the facilities and violations. This contains the score for a given rating and a fine for that rating as measurable values
	FacilityID	nvarchar(50)	
	ViolationID	nvarchar(50)	
	ActivityDate	datetime	
	Score	int	
	Fine	int	

ER Diagram



This diagram shows the connection between the entities in the data set.

2. Preparation of Data Sources

A database named Health Violations (HV) was created including the database, csv, and txt source files.

- Dbo.Violations
- Owner.txt
- Facility.csv
- Rating.txt

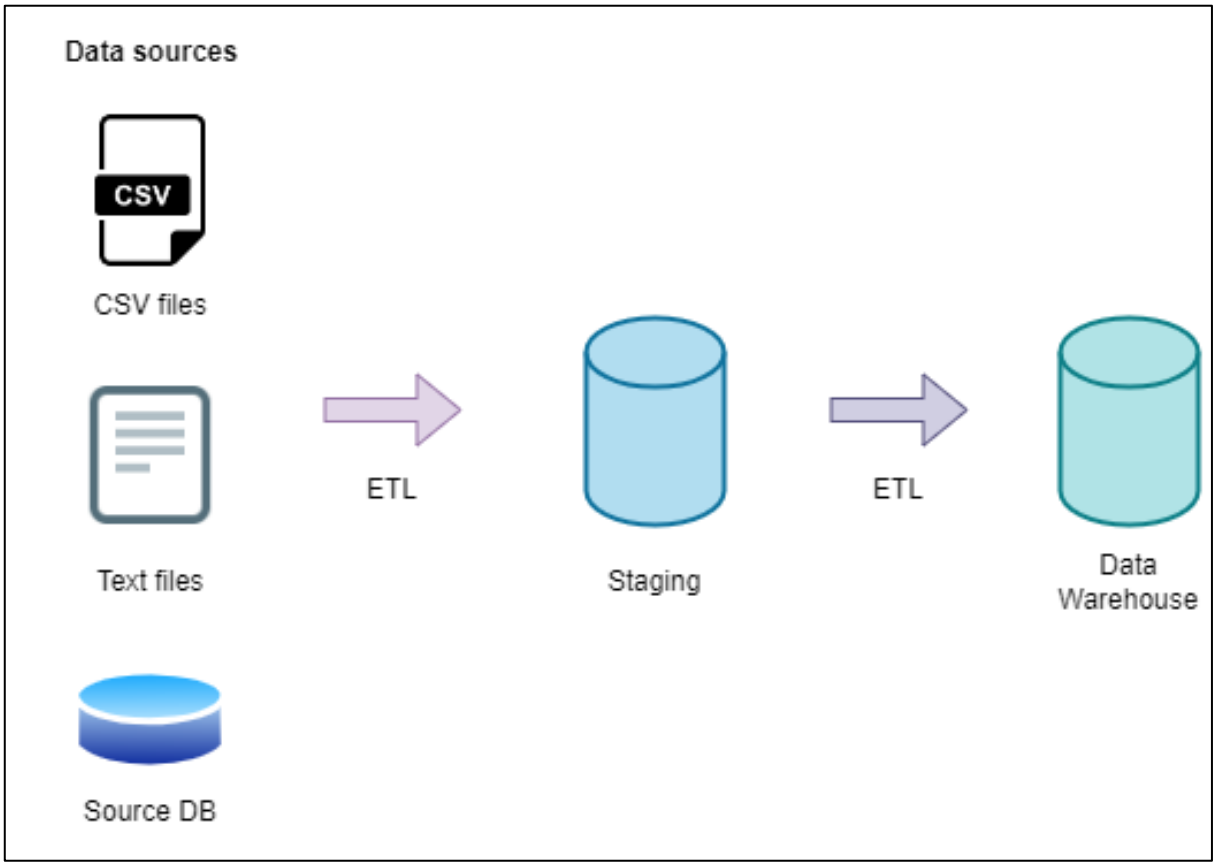
A new database named HV_DW was built for the data warehouse which contains the dimensions and the fact table.

- DimViolation
- DimDate
- DimOwner
- DimFacility
- FactRating

The HV_Staging database was created to extract and load the data to the database.

A script file was used to create the DimDate relation in the Data Warehouse.

3. Solution Architecture



Data Sources: locations where the Data is needed for DB coming from, in this scenario primary data source is database and others are csv file, and txt files.

ETL: Extract-Transform-Load is an ETL standard. It is the process of transferring data from one or more sources into a destination system that has a different representation of the data than the source (s).

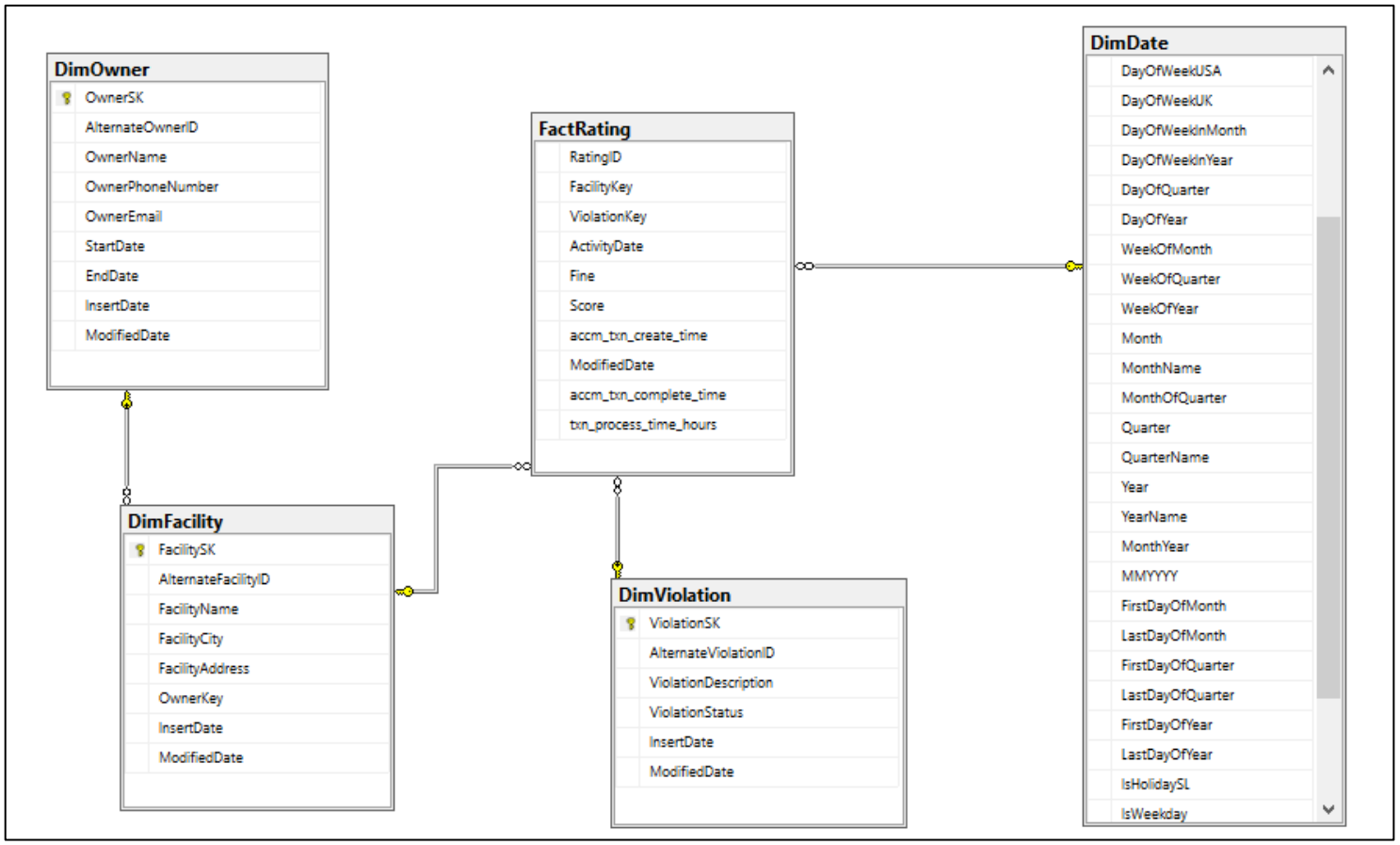
Staging: As explained next step is staging the source data set. After the staging layer the below mentioned staging tables are created:

1. stgViolations
2. stgOwner
3. stgFacility
4. stgRating

Data warehouse: Following staging, the staging database's contents will be used as sources for the transformation process. Data is transformed and loaded into tables in the Datawarehouse database.

4. Data Warehouse Design and Development

Data Warehouse Schema



Snowflake schema is used to design the Datawarehouse design. There is one fact table as transactions and four dimensions including the Date dimension.

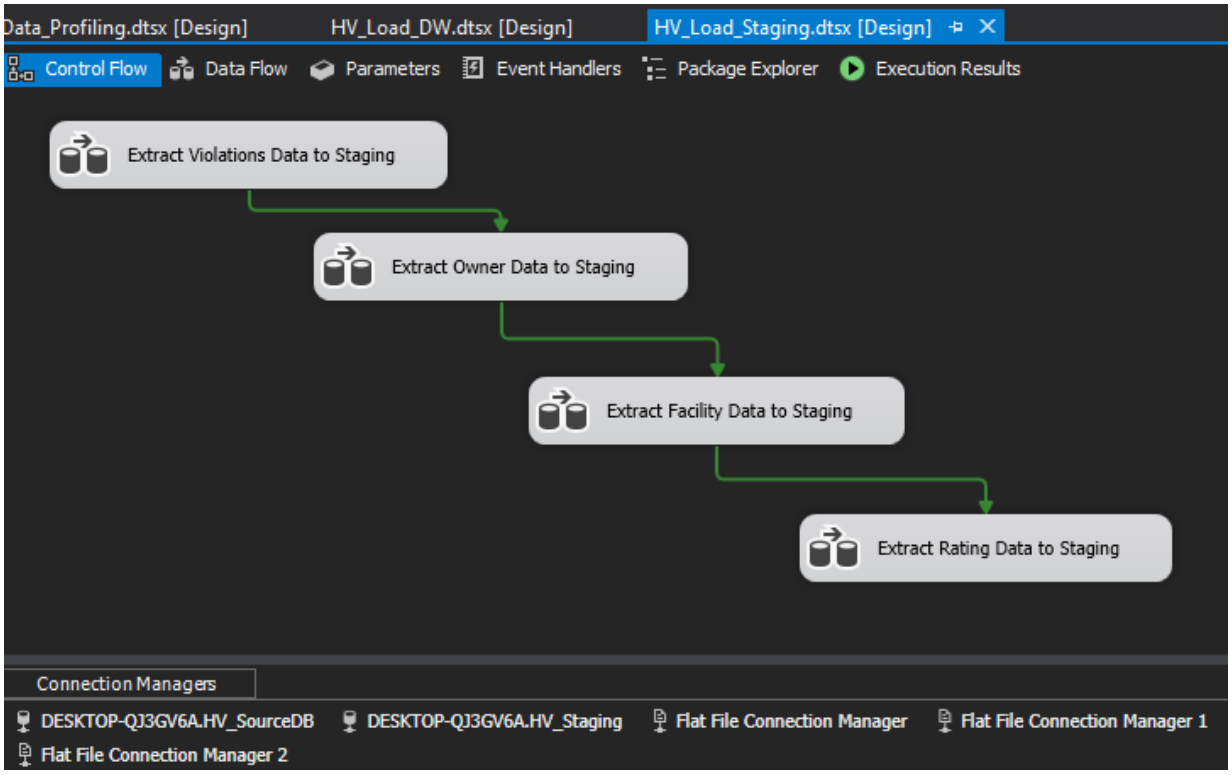
Assumptions:

DimOwner is considered as a slowly changing dimension. OwnerName (Here the Owner is a restaurant or a marketplace which contains lot of facilities like Target, Subway etc.) as a historical attribute and OwnerPhoneNumber and the OwnerEmail are taken as changing attributes.

5. ETL Development

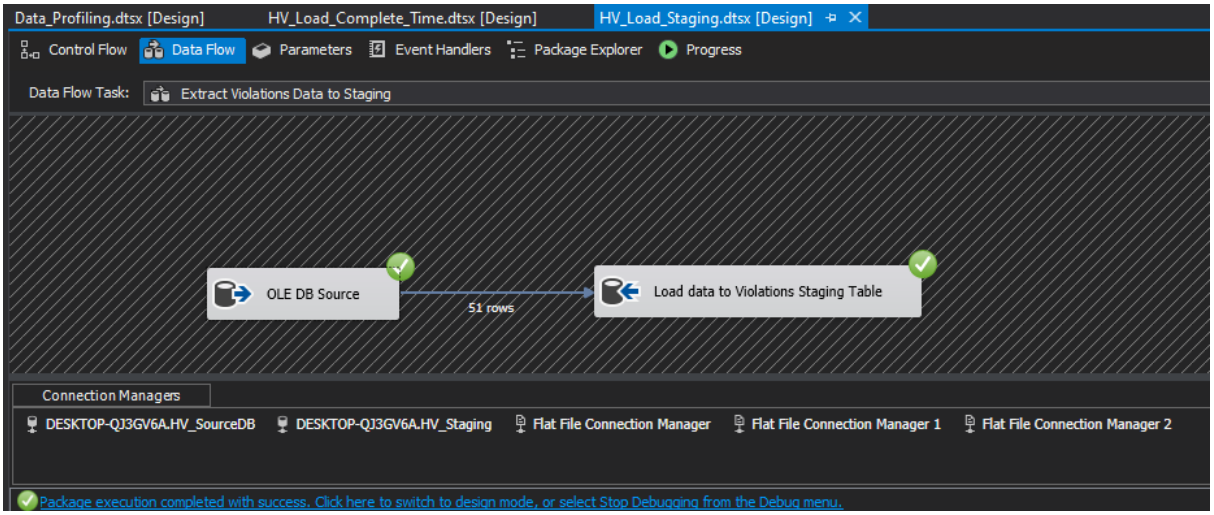
Extraction from Source Database to Staging Area

Data was extracted from the sources in the first step (DB source, CSV file & text files). Data was extracted from the source to the staging table using a data flow job for each extraction. A truncate table was then generated for every staging table. At the conclusion, all the data flow jobs were merged as follows:

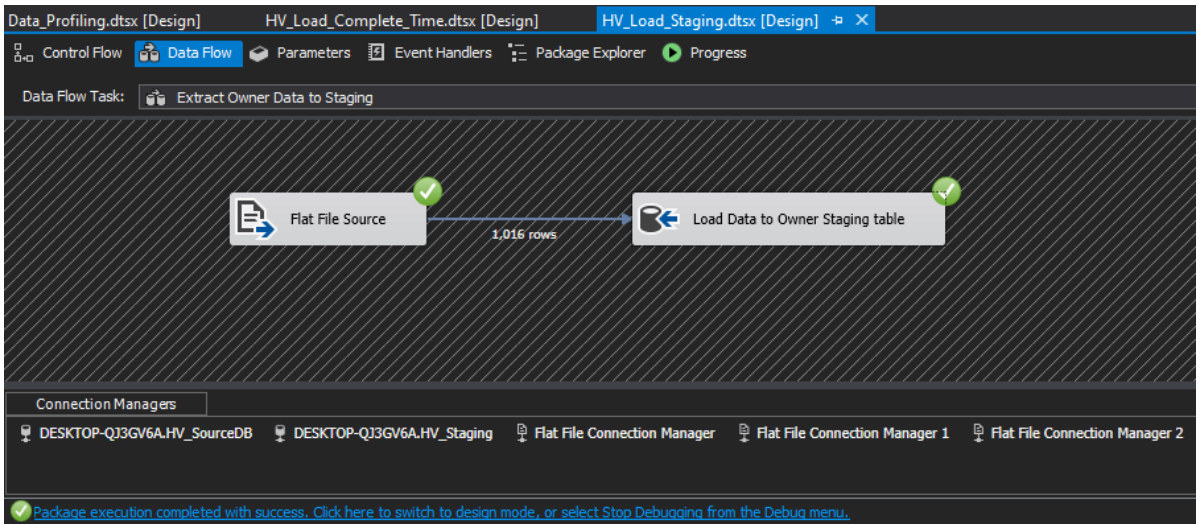


Below are screenshots of all the data sources that were staged and the truncate tables that were created:

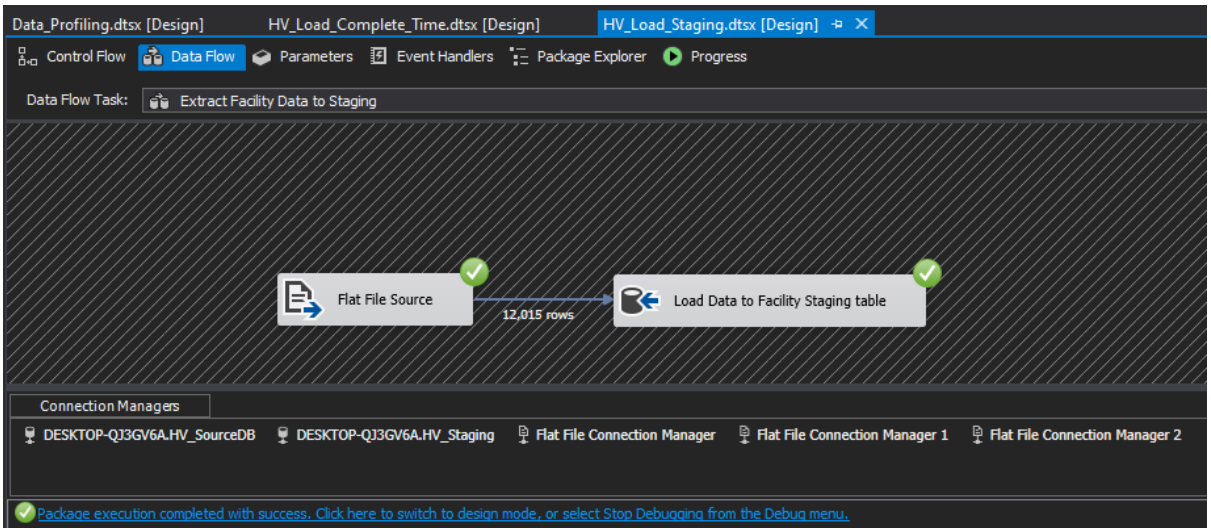
Staging Violations table



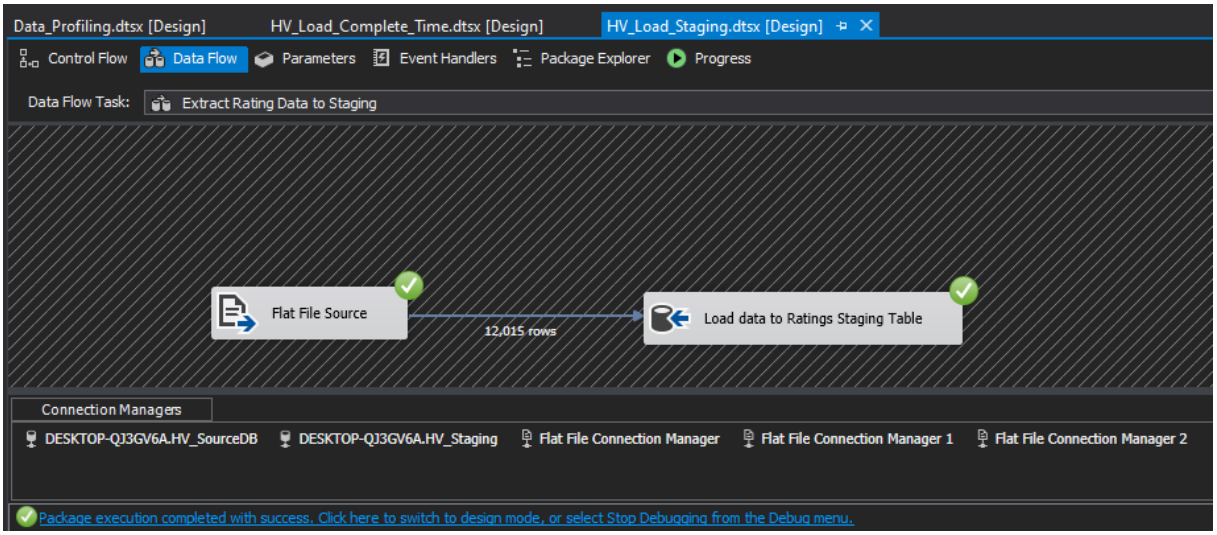
Staging Owner table



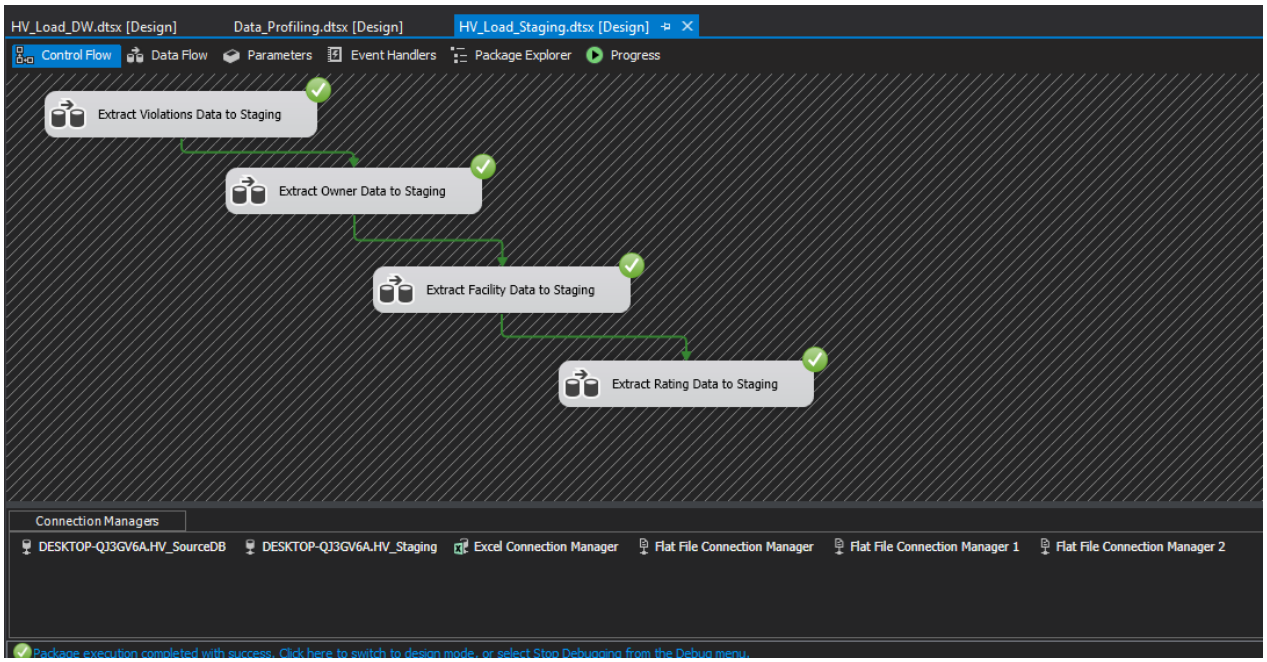
Staging Facility table



Staging Rating Table

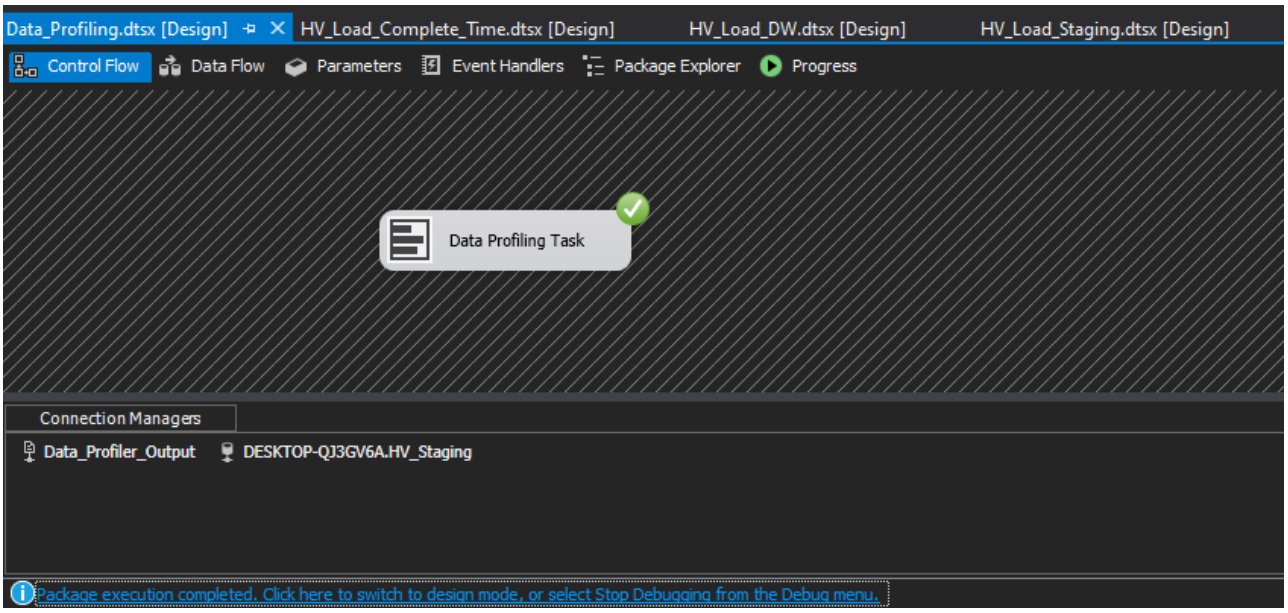


After following the above steps and executing Staging



Next step is data profiling, and it is done as shown below:

Data Profiling

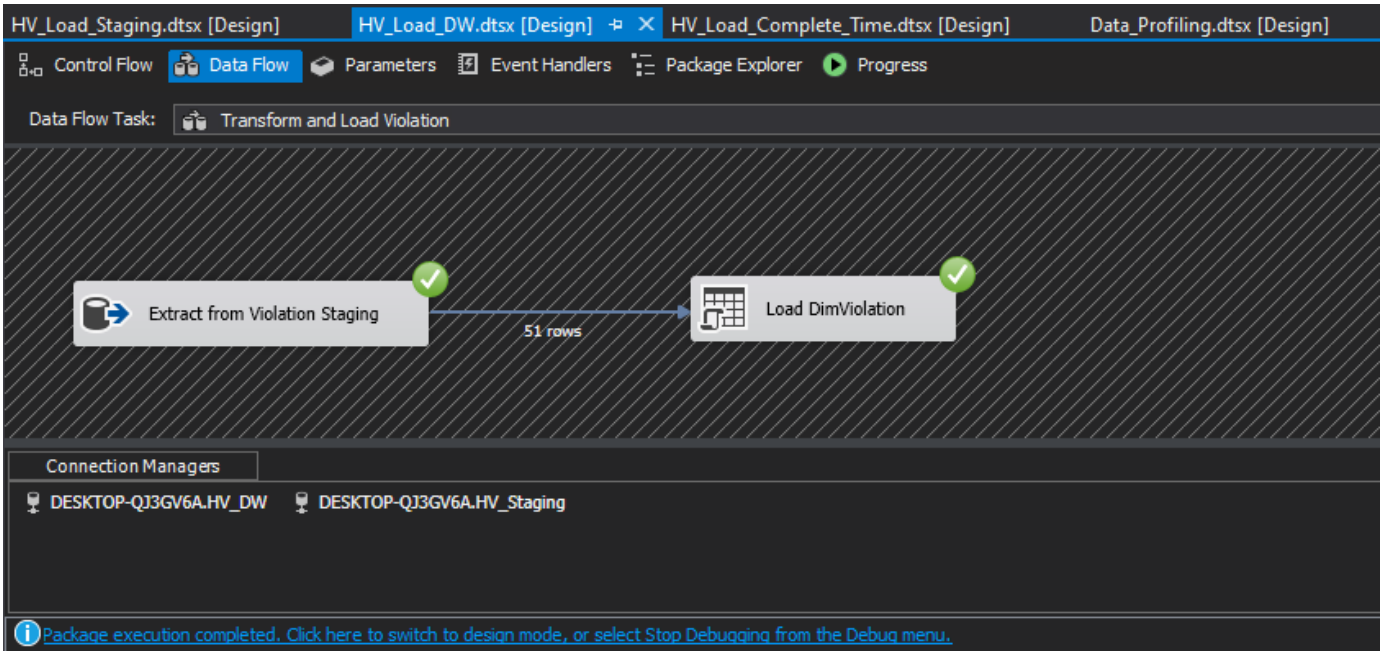


Every staging table is profiled and saved in a specific location.

Data Warehouse Design and Development

Load Data to the Violation Dimension

First Data was loaded from the Violation staging table (stgViolations)to the Violation Dimension (DimViolation).



Stored procedure used for the DimViolation can be found below:

```
CREATE PROCEDURE dbo.UpdateDimViolation
@ViolationID nvarchar(50),
@ViolationDescription nvarchar(100),
@ViolationStatus nvarchar(50)
AS
BEGIN
if not exists (select ViolationSK
from dbo.DimViolation
where AlternateViolationID = @ViolationID)
BEGIN
insert into dbo.DimViolation
(AlternateViolationID, ViolationDescription, ViolationStatus, InsertDate, ModifiedDate)
values
(@ViolationID, @ViolationDescription, @ViolationStatus, GETDATE(), GETDATE())
END;
if exists (select ViolationSK
from dbo.DimViolation
where AlternateViolationID = @ViolationID)
BEGIN
update dbo.DimViolation
set ViolationDescription = @ViolationDescription,
ViolationStatus = @ViolationStatus,
ModifiedDate = GETDATE()
where AlternateViolationID = @ViolationID
END;
END;
```

Load Data to the Owner Dimension

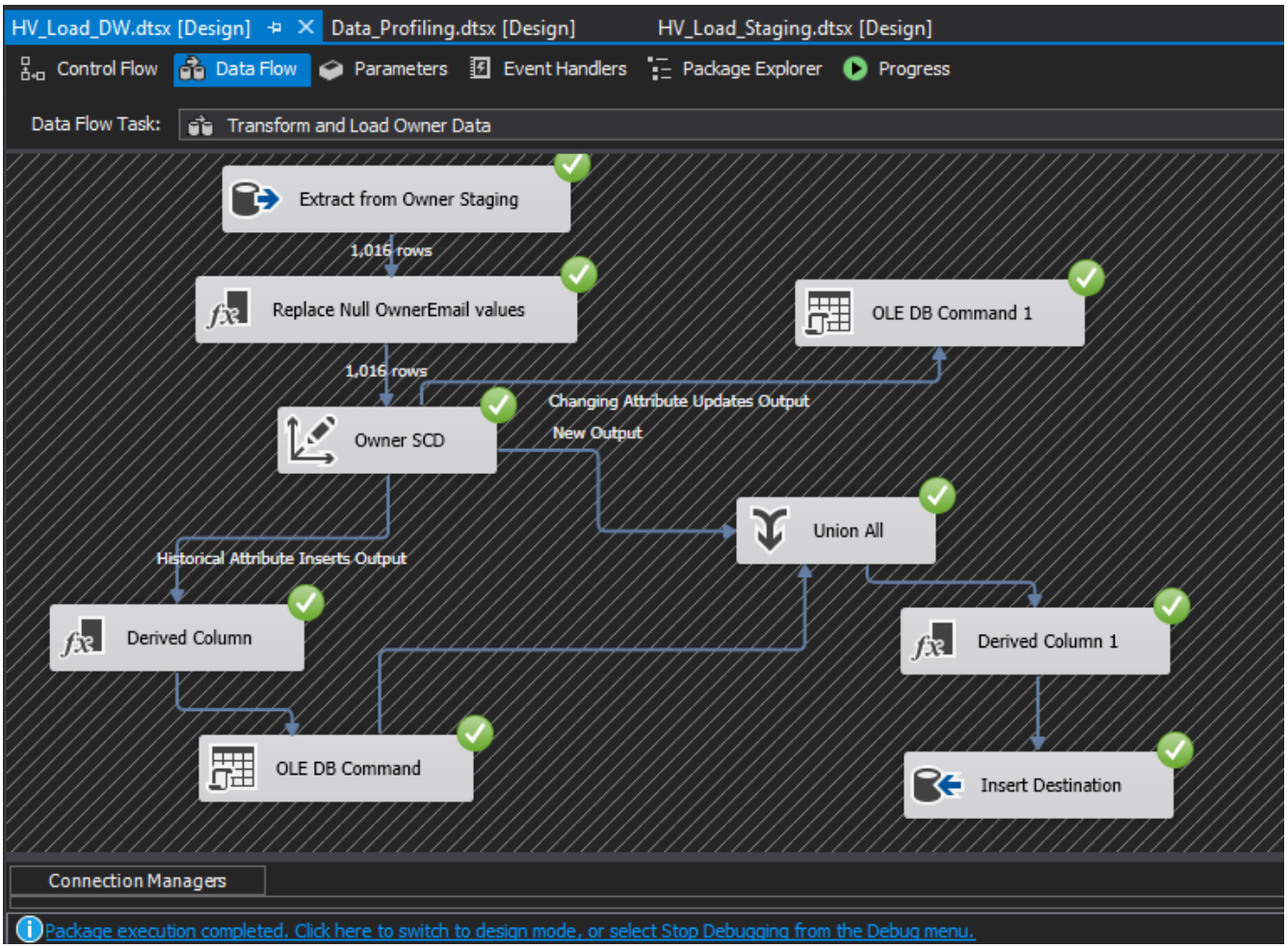
As mentioned earlier under assumptions, Owner was considered as a slowlychanging dimension.

The below mentioned columns were set as changing attributes:

1. OwnerPhoneNumber (Phone number of the Owner)
2. Owner Email (Email of the Owner)

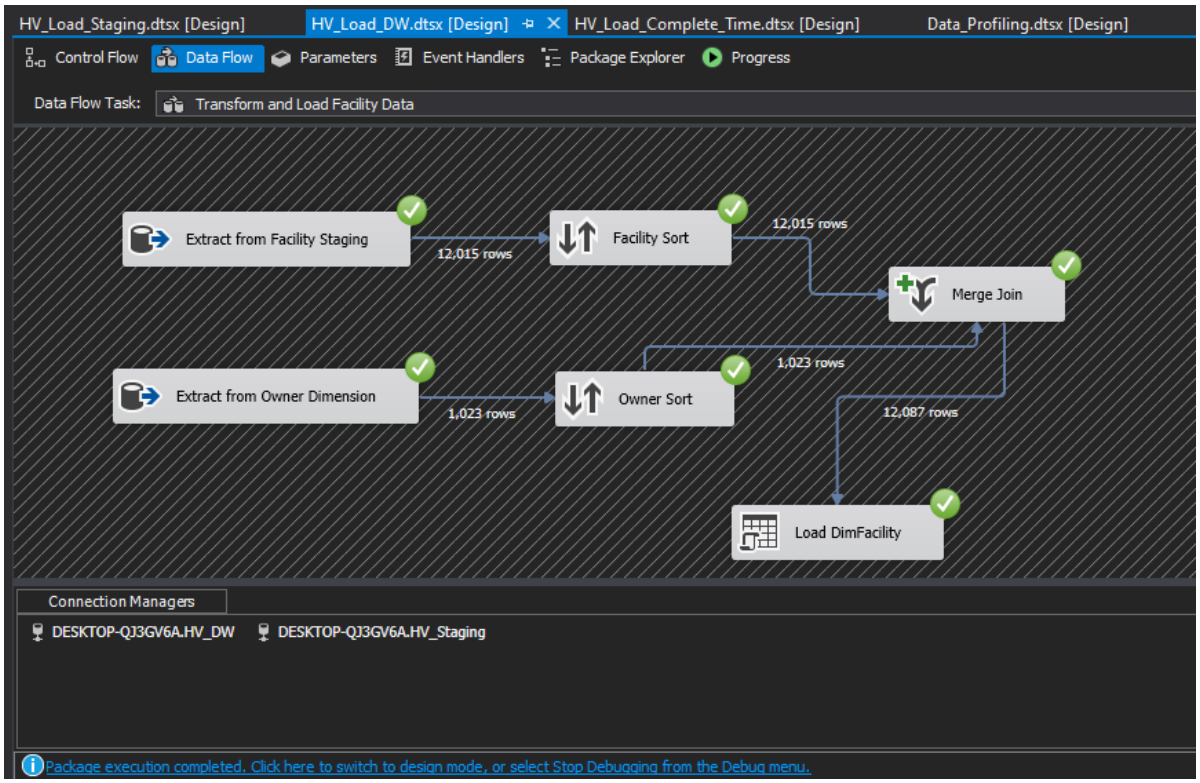
Owner Name was taken as a historical attribute. (Ex: Target, Subway)

After extracting data from the Owner staging table, then after replacing the null ownerEmail values with a 'N' and as it was identified as a slowly changing dimension, it was connected asshown below and loaded data to the Owner dimension table.



Load Data to the Facility Dimension

After merging the Facility staging table with the Owner dimension table, data was loaded from the Facility staging table to the Facility dimension. Before loading, both the Facility staging table and the Owner dimension were sorted by OwnerID and then merge joined to extract Facility details from the Facility staging table and Owner surrogate key (OwnerSK) from the Owner dimension.

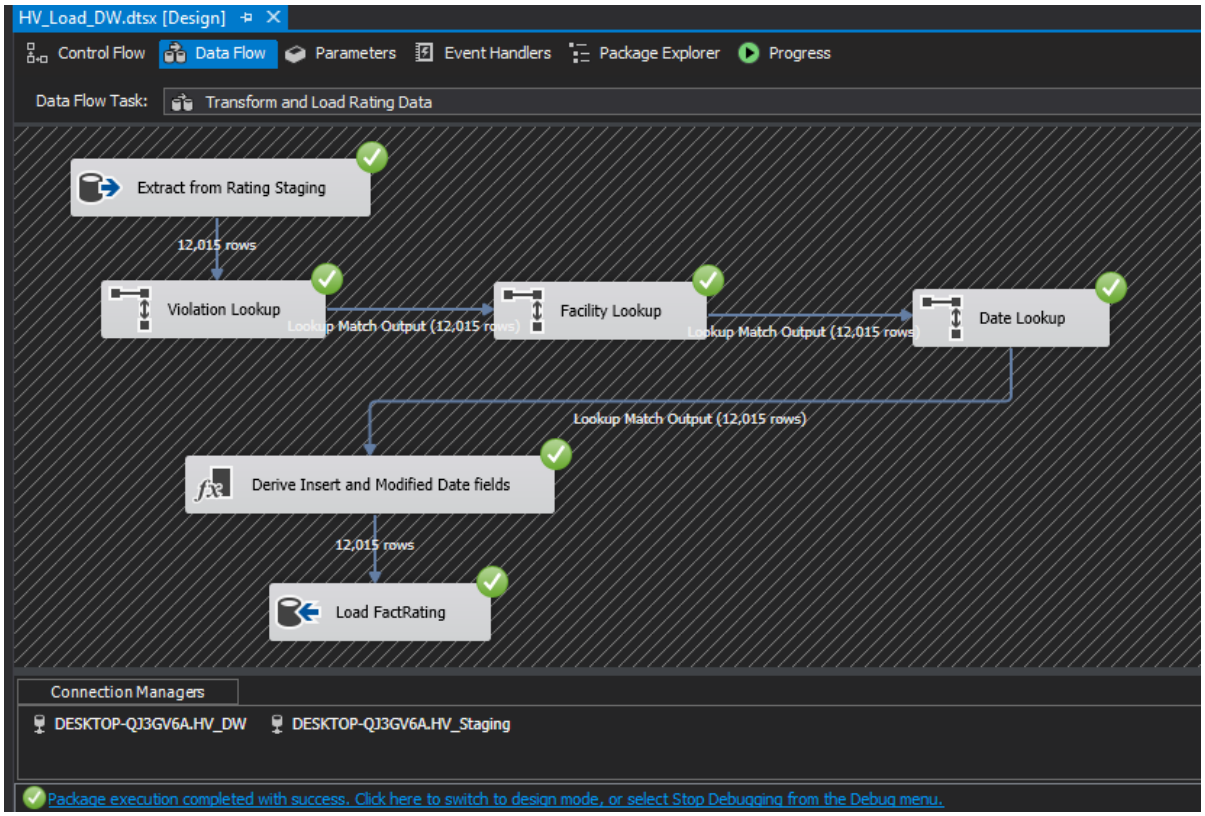


Stored procedure used for the DimFacility can be found below:

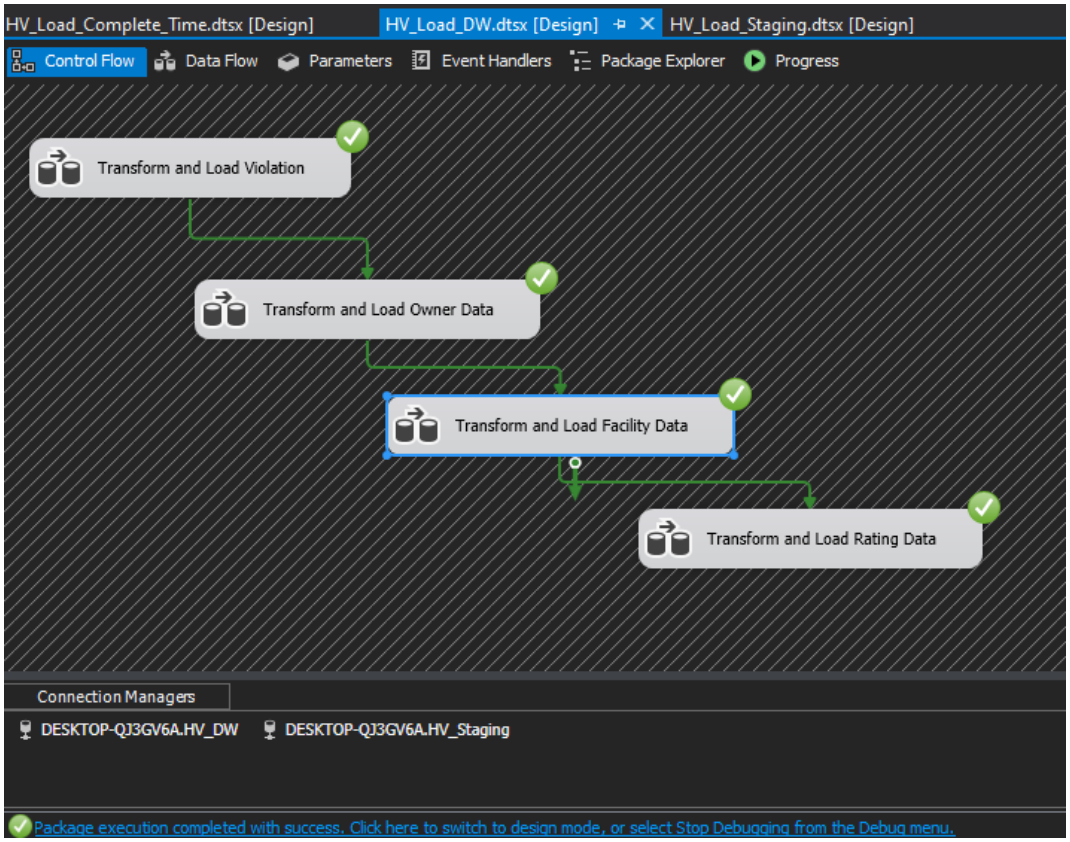
```
CREATE PROCEDURE dbo.UpdateDimFacility
@FacilityID nvarchar(50),
@FacilityName nvarchar(200),
@FacilityCity nvarchar(50),
@FacilityAddress nvarchar(200),
@OwnerKey int
AS
BEGIN
if not exists (select FacilitySK
from dbo.DimFacility
where AlternateFacilityID= @FacilityID)
BEGIN
insert into dbo.DimFacility
(AlternateFacilityID, FacilityName, FacilityCity, FacilityAddress, OwnerKey, InsertDate, ModifiedDate)
values
(@FacilityID, @FacilityName, @FacilityCity, @FacilityAddress, @OwnerKey, GETDATE(), GETDATE())
END;
if exists (select FacilitySK
from dbo.DimFacility
where AlternateFacilityID = @FacilityID)
BEGIN
update dbo.DimFacility
set OwnerKey = @OwnerKey,
FacilityName = @FacilityName,
FacilityCity = @FacilityCity,
FacilityAddress = @FacilityAddress,
ModifiedDate = GETDATE()
where AlternateFacilityID = @FacilityID
END;
END;
```

After loading all the dimensions, lastly data is loaded to the fact table. The below steps were followed:

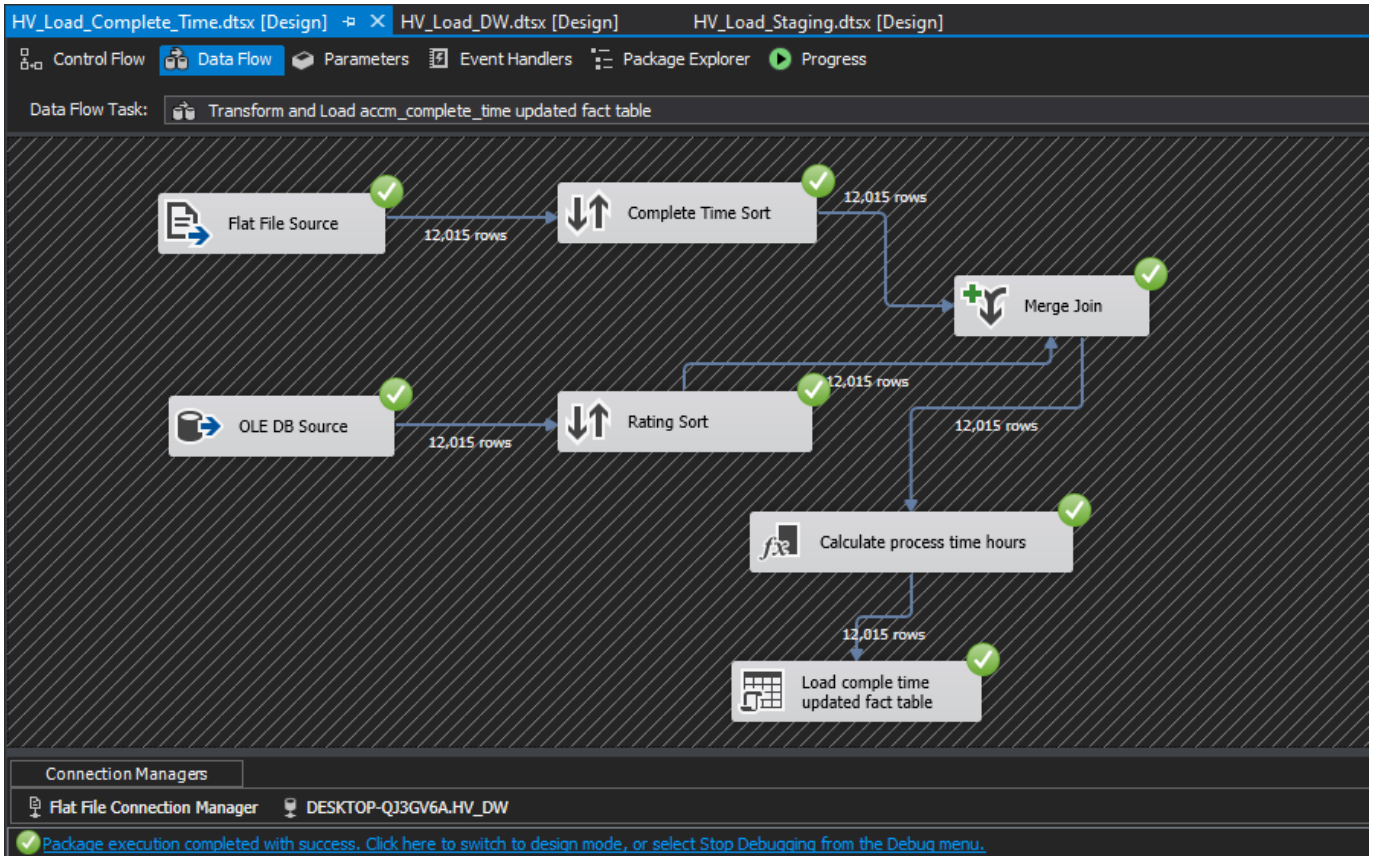
After extracting the Data from the Rating staging table, Next; to join relevant dimension tables with the FactRating table, Surrogate keys which are required namely, 'ViolationID' , 'FacilityID' , 'ActivityDate' are taken using Lookup component and then insert Data to the FactRating table



After loading data to all the dimensions and the fact table:



6. ETL development – Accumulating fact tables



A print screen of the fact table can be found below: