Sri Lanka Institute of Information Technology

Data warehousing and Business Intelligence

Assignment 1

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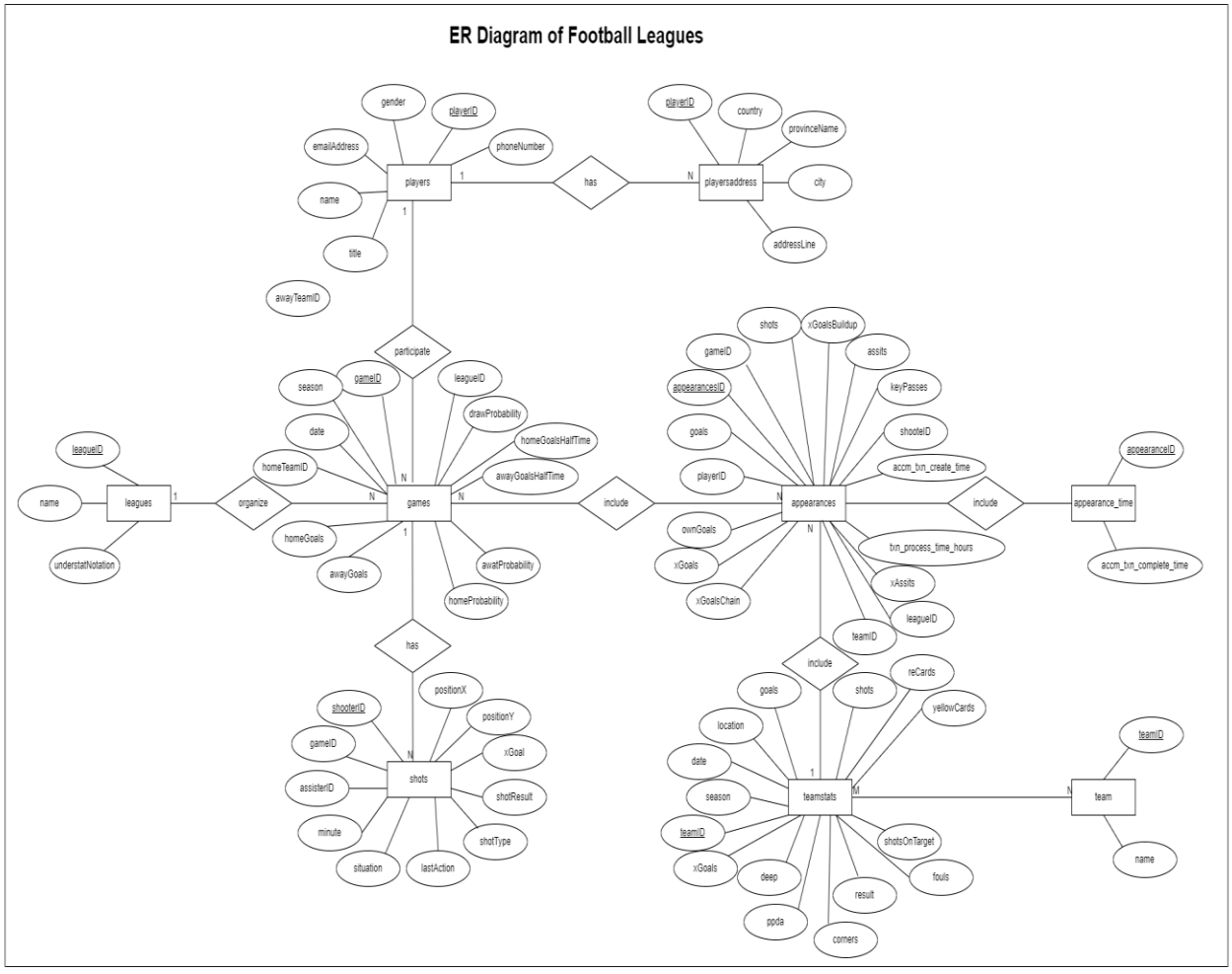
Step 1: Data Set Selection

This dataset contains football-related data covering the Top5 leagues in Europe from 2014-2020. Mainly players, leagues, games, teams, shots and appearances are interacted with this data set. Some modifications were done accordingly to the tables of above data set. Two .csv files added to the data source additionally. This .csv files are playersaddress.csv and appearance_time.csv.

The link to the source data set is mentioned below:

URL:- https://www.kaggle.com/datasets/technika148/football-database

Following ER- diagram will describe the scenario of the selected dataset.



Step 2: Preparation of Data Sources

The whole of data was in ‘csv’ file type and they were separated into the following data sources, Database, Text and csv. And they were used to create the following,

1. Database (.bak)
Players.csv, games.csv, appearances.csv, appearance.time.csv and teamstats.csv were imported to the Football Leagues Source Database. This data was used as the DB source data.

2. Text (.txt)
teams.txt and shots.txt were used directly.

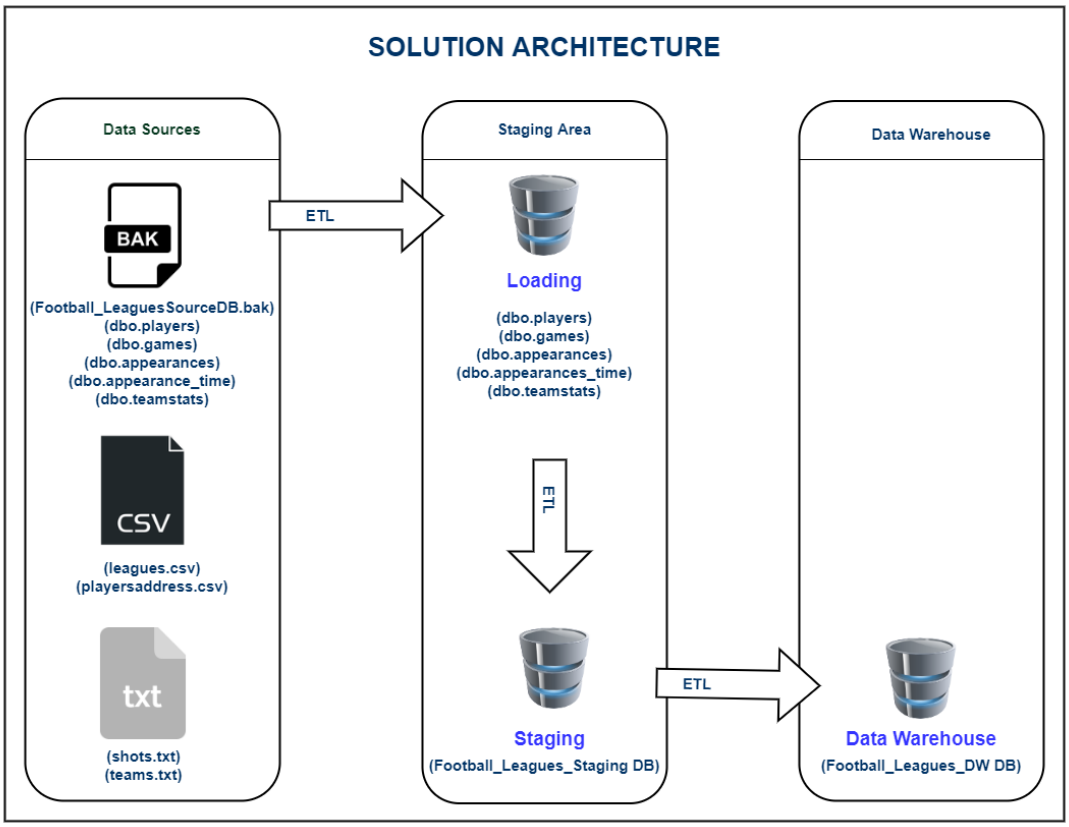
3. Comma Separated Values (.csv)
leagues.csv and playersaddress.csv were used

Data Source Type	Source Name	Column Name	Data Type	Description
Database File(.bak)	dbo.players	playerID	numeric	Players details of Football Leagues.
		gender	nvarchar(50)	
		name	nvarchar(50)	
		title	nvarchar(50)	
		phoneNumber	nvarchar(50)	
		emailAddress	nvarchar(50)	
	dbo.games	gameID	numeric	Games details of Football Leagues.
		leagueID	numeric	
		season	int	
		date	datetime	
		homeTeamID	int	
		awayTeamID	int	
		homeGoals	int	
		awayGoals	int	
		homeProbability	int	
		awayProbability	int	
		dawProbability	int	
		homeGoalsHaltTime	int	
		awayGoalsHalfTime	int	
	dbo.appearances	appearancesID	numeric	Summary of games, players, teams, shots and leagues
		gameID	numeric	
		playerID	numeric	
		teamID	numeric	
		goals	int	
		ownGoals	int	
		shots	int	
		date	datetime	
		xGoals	int	
		xGoalsChain	int	

		xGoalsBuildup	int	
		assists	int	
		keyPasses	int	
		xAssists	int	
		position	nvarchar(50)	
		positionOrder	int	
		yellowCard	nvarchar(50)	
		redCard	int	
		substituteIn	int	
		substitueOut	int	
		leagueID	numeric	
	dbo.appearance_time	appearancesID	numeric	Additional Appearances table.
		accm_txn_complete_time	datetime	
	dbo.teamstats	teamID	numeric	Teams performance details of Football Leagues.
		season	int	
		date	datetime	
		location	nvarchar(50)	
		goals	int	
		xGoals	int	
		shots	int	
		shotsOnTarget	int	
		deep	int	
		ppda	int	
		fouls	int	
		corners	int	
		yellowCards	nvarchar(50)	
		redCards	int	
		result	nvarchar(50)	
CSV File	leagues.csv	leagueID	numeric	Leagues details of Football Leagues.
		name	nvarchar(50)	
		understatNotation	nvarchar(50)	
	playersaddress.csv	playerID	numeric	Players

		addressLine	nvarchar(50)	Addresses detail -s of Football Leagues.
		city	nvarchar(50)	
		provinceName	nvarchar(50)	
		country	nvarchar(50)	
Text File	shots.txt	gameID	numeric	Shots details of Football Leagues
		shooterID	numeric	
		assisterID	nvarchar(50)	
		minute	nvarchar(50)	
		situation	nvarchar(50)	
		lastAction	nvarchar(50)	
		shotType	nvarchar(50)	
		shotResult	nvarchar(50)	
		xGoal	int	
		PositionX	int	
		positionY	int	
	teams.txt	teamID	numeric	Teams details of Football Leagues.
		name	nvarchar(50)	

Step 3: Solution Architecture



Above architecture shows the high-level BI solution to the warehouse design.

Data Sources

'.txt' component represents Text files, '.csv' component is used to display Comma Separated files and '.bak' component represents database files.

Staging Area

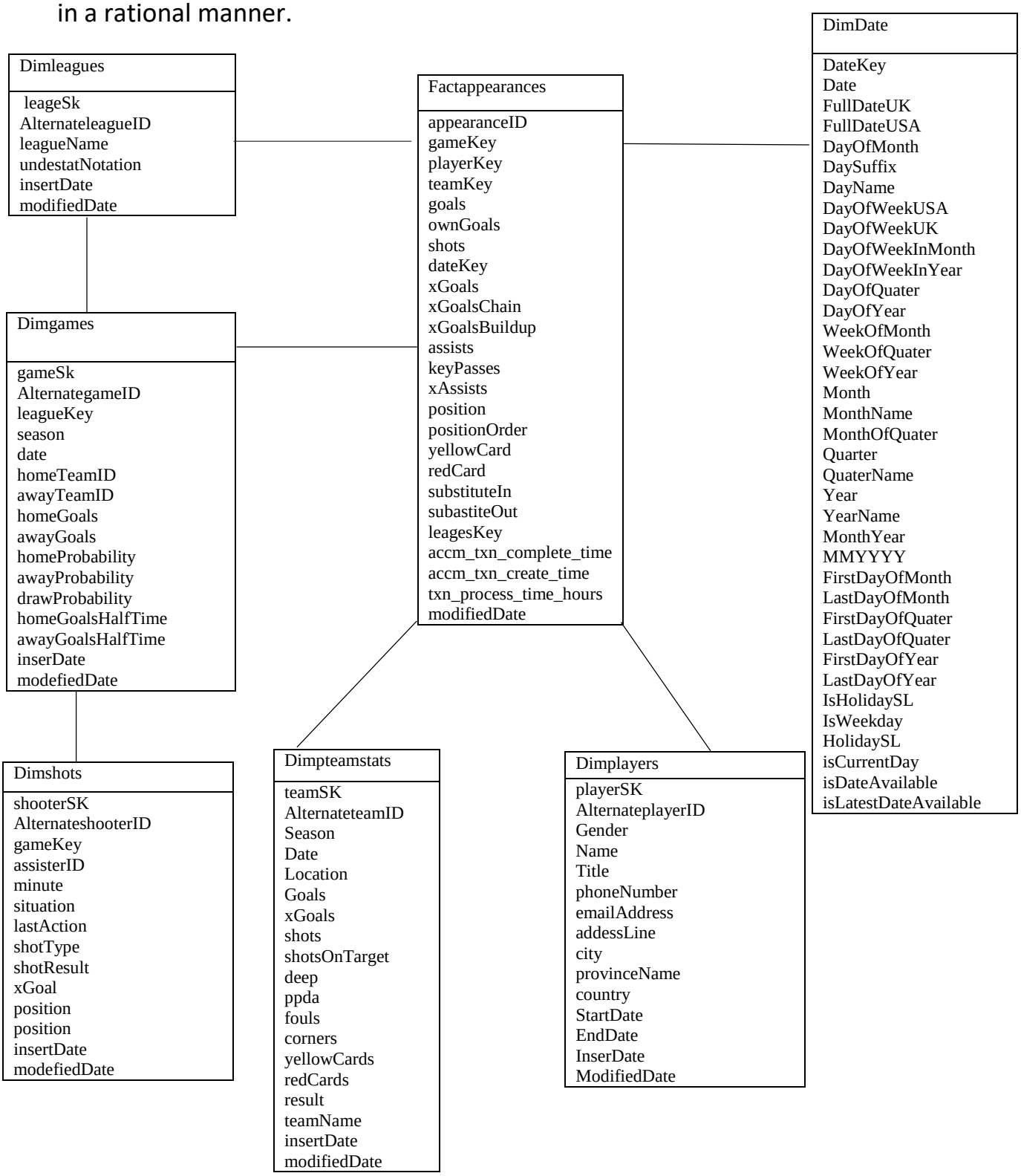
Loading DB component represents the process of the creating database tables. The games.csv, players.csv, appearances.csv, appearance_time.csv and teamstats.csv files were imported to the database and was used to create the tables. And these tables were used as the DB source data.
Staging DB component represents creating staging level tables through the 'Extract'.

Data Warehouse

Data warehouse DB component is used display the cratering dimension tables in the warehouse using 'Transform' and 'Load.'

Step 4: Data Warehouse Design & Development

Following figure will show how the fact table and dimension tables was combined in a rational manner.



Schema Type

For this scenario, snowflake schema type was used.

Dimension Types

- ✓ Hierarchical Dimension
  - Date – all the hierarchies in date
  - players – country→ province name → city → address line
- ✓ Slowly Changing Dimension
  - players – changing attribute →Phone Number
- ✓ Fact Table
  - Numbers – accm_txn_create_time, accm-txn_complete_time, txn_process_time_hours
  - FK - gameID, playerD, teamID, Date Key, leagueID

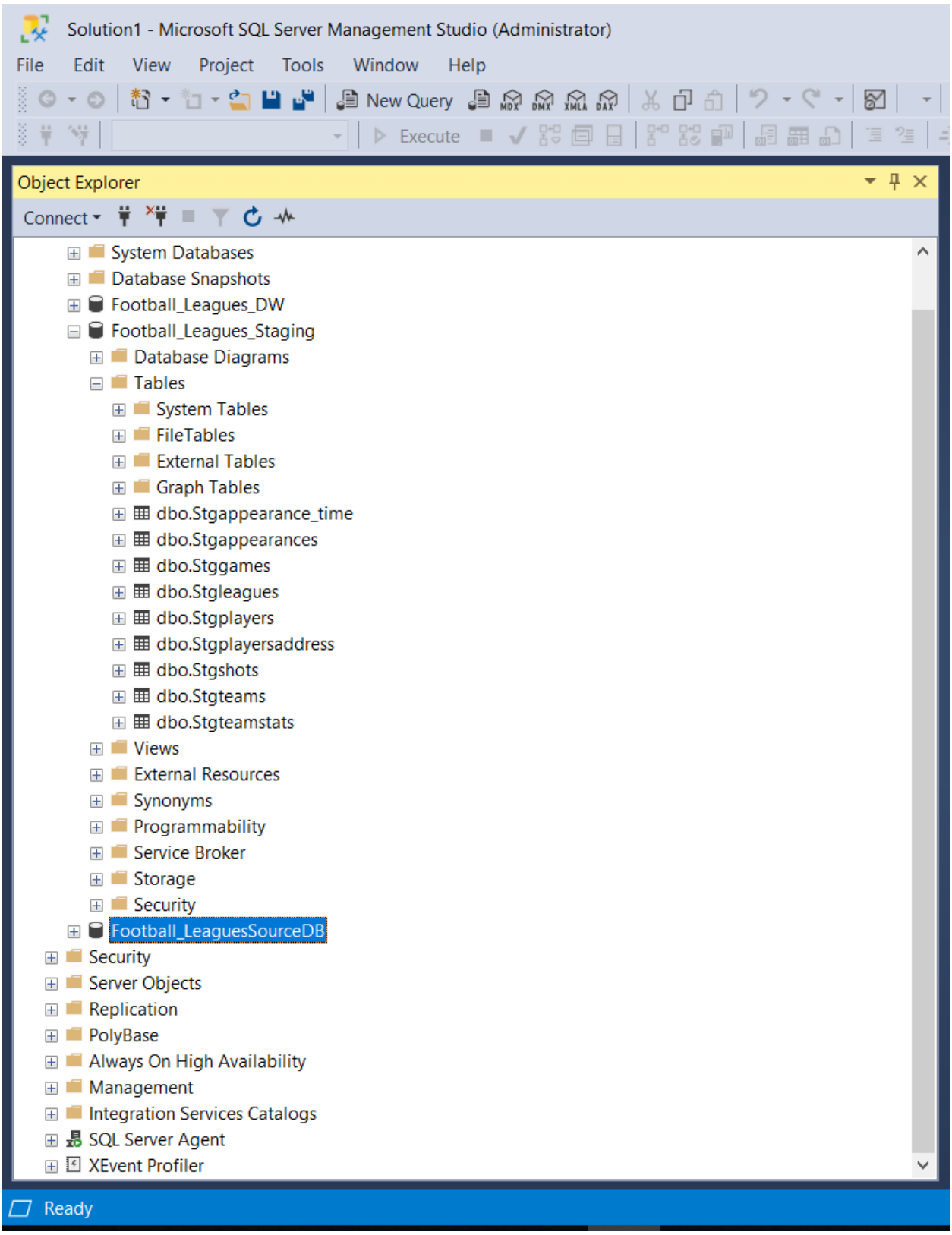
Step 5: ETL development

1. Extract

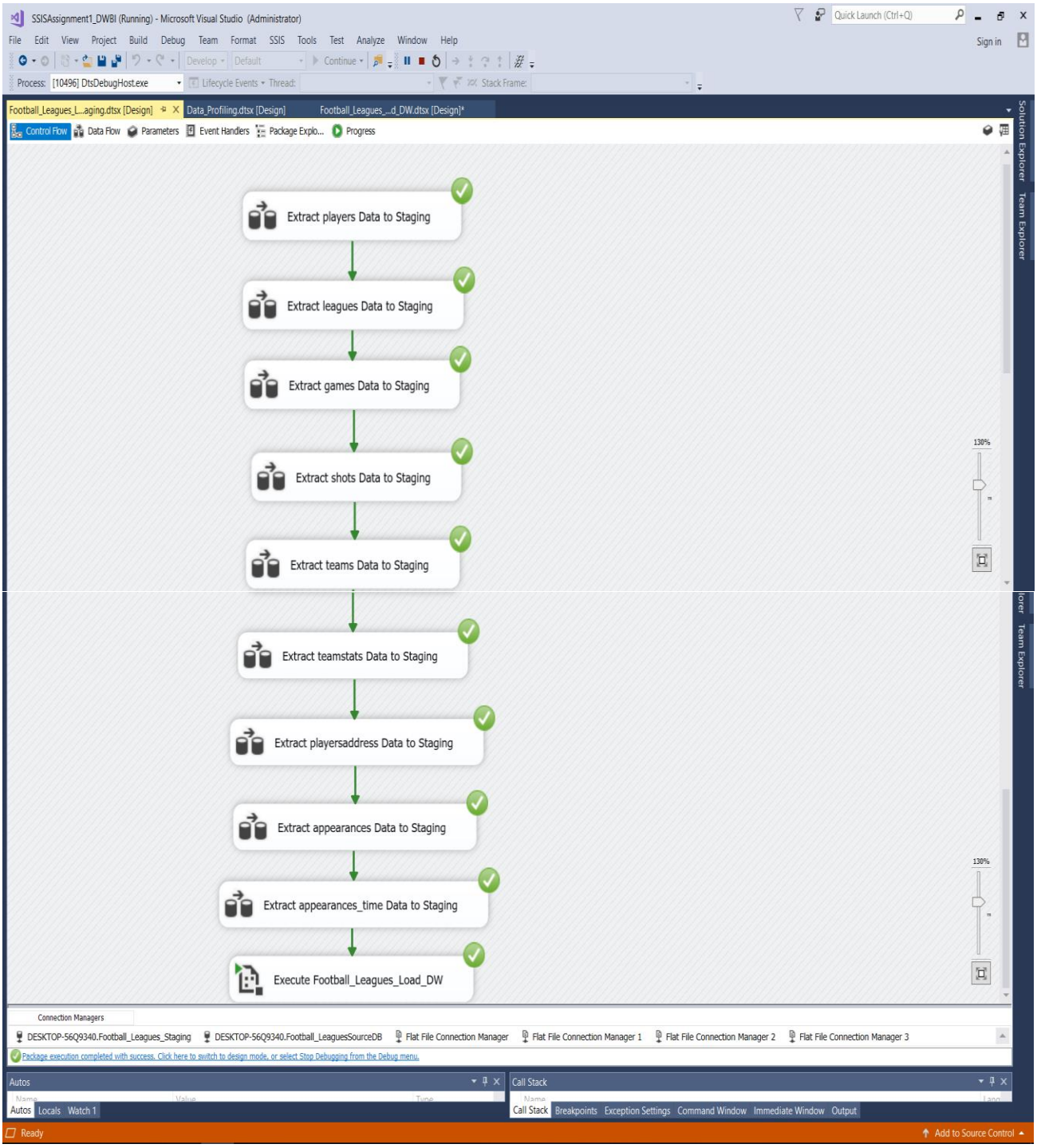
In this step, all the data sources were imported to the staging tables by using the relevant Data connection.
Flat file connection was used for text files and csv files, DB source connection for DB file. All those tables were imported to the Footbal_Leagues_Staging DB, which contains the below tables,

1) dbo.Stgappearance_time
2) dbo.Stgappearances
3) dbo.Stggames
4) dbo.Stgleagues
5) dbo.Stgplayers
6) dbo.Stgplayersaddress
7) dbo.Stgshots
8) dbo.Stgteams
9) dbo.Stgteamstats

- **Snapshot of SSMS Staging Database**

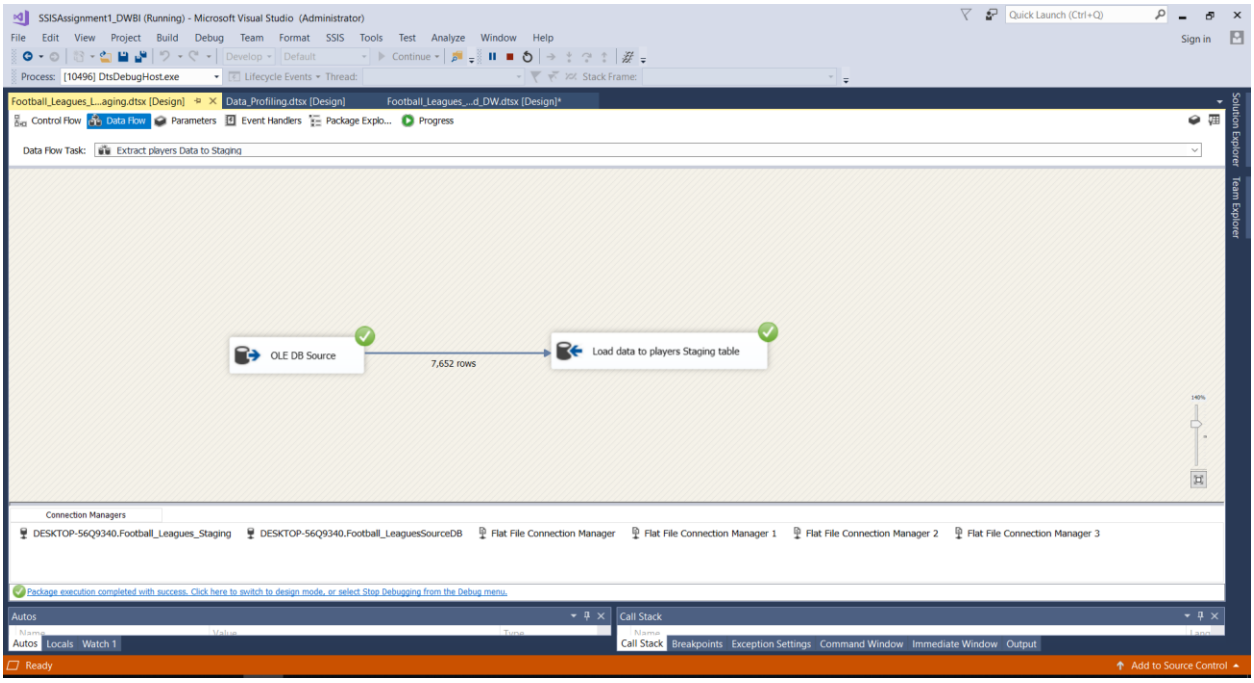


- **Snapshot of Visual Studio Control Flow of Extract**

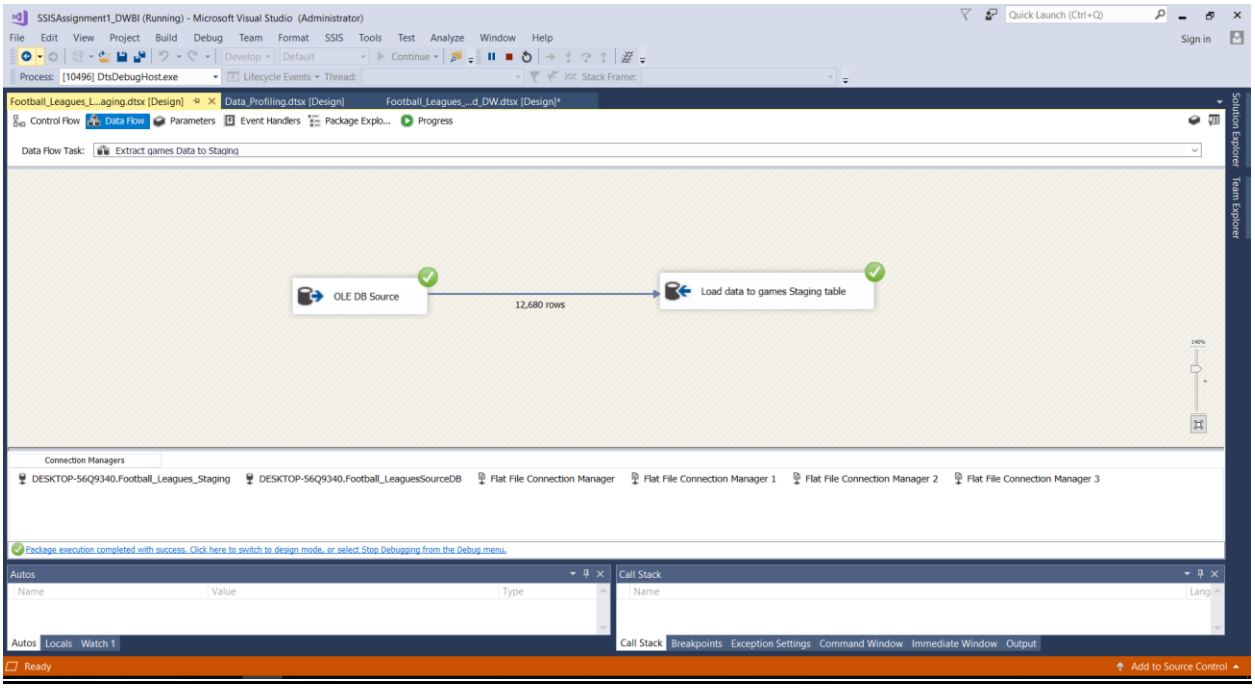


- **Snapshots of several data types of Data Flows**

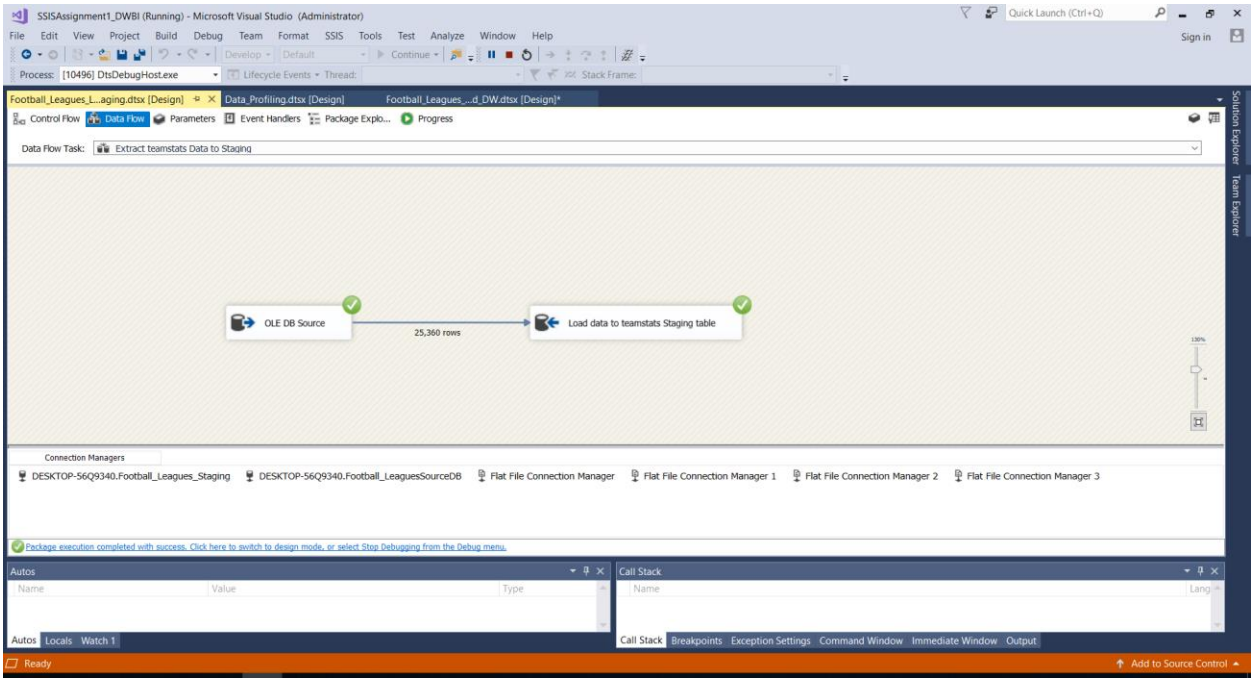
  - **<u>PLAYERS DATA STAGING</u>**



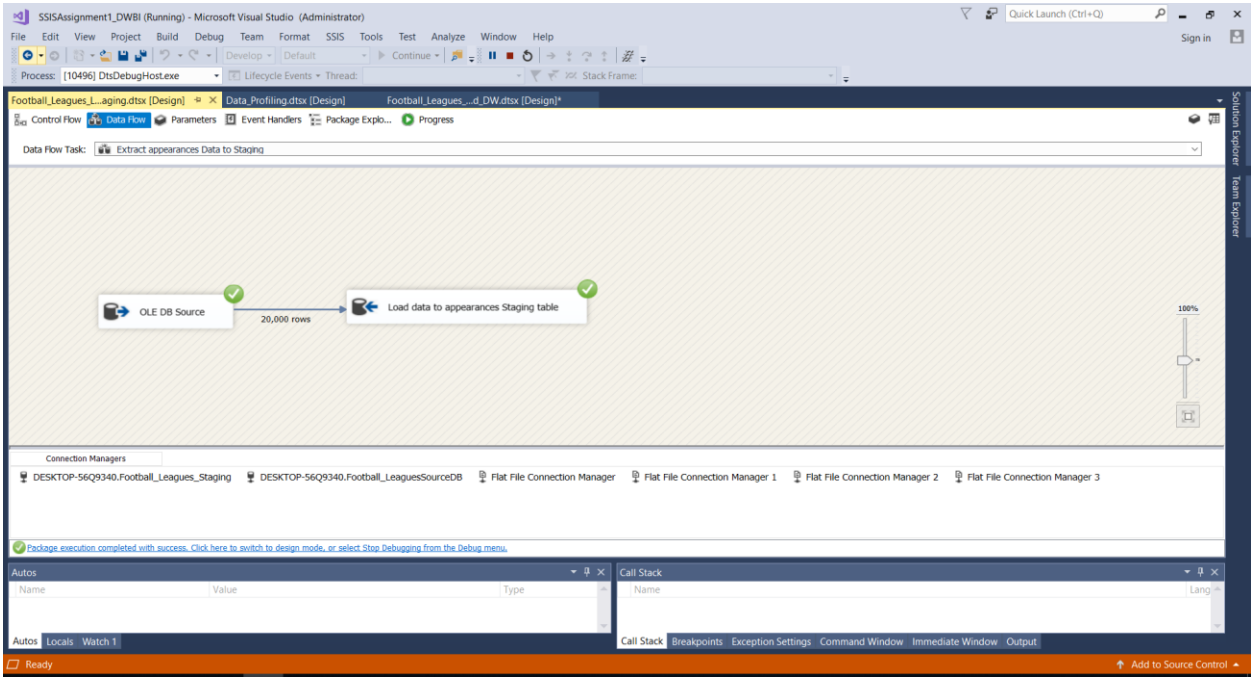
  - **<u>GAMES DATA STAGING</u>**



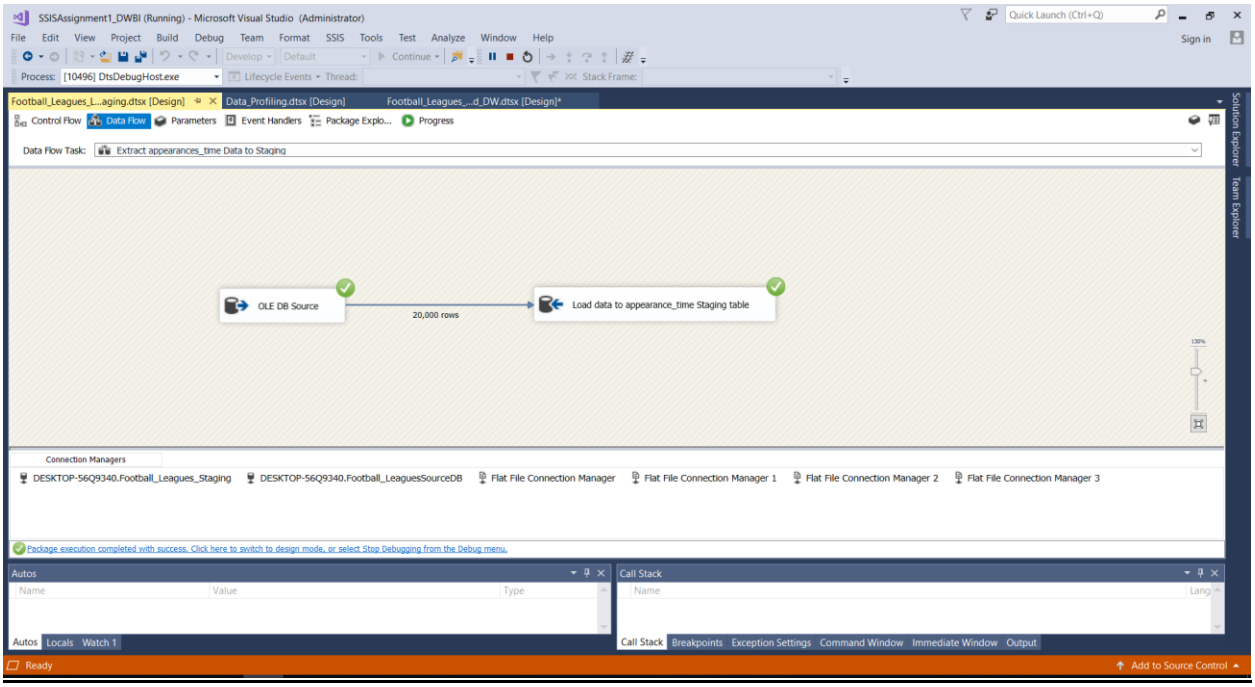
- **TEAMSTATS DATA STAGING**



- **APPEARANCES DATA STAGING**

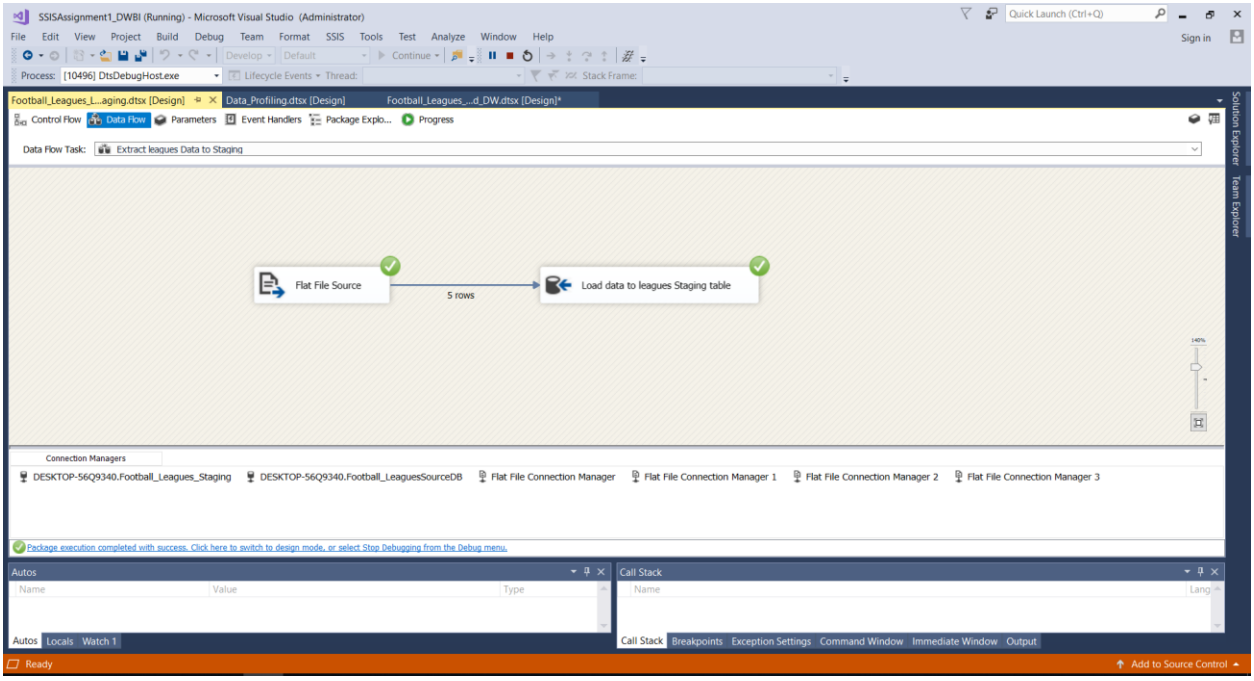


- **APPEARANCE TIME DATA STAGING**

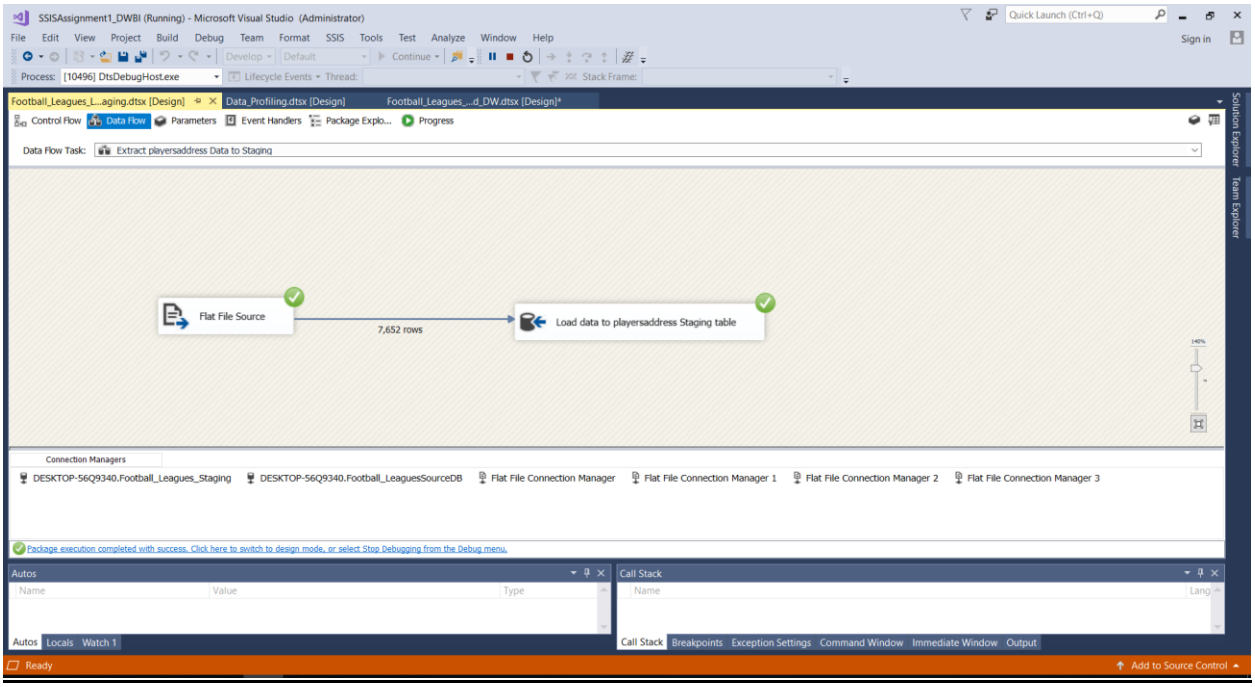


• Snapshots of several data types of Data Flows

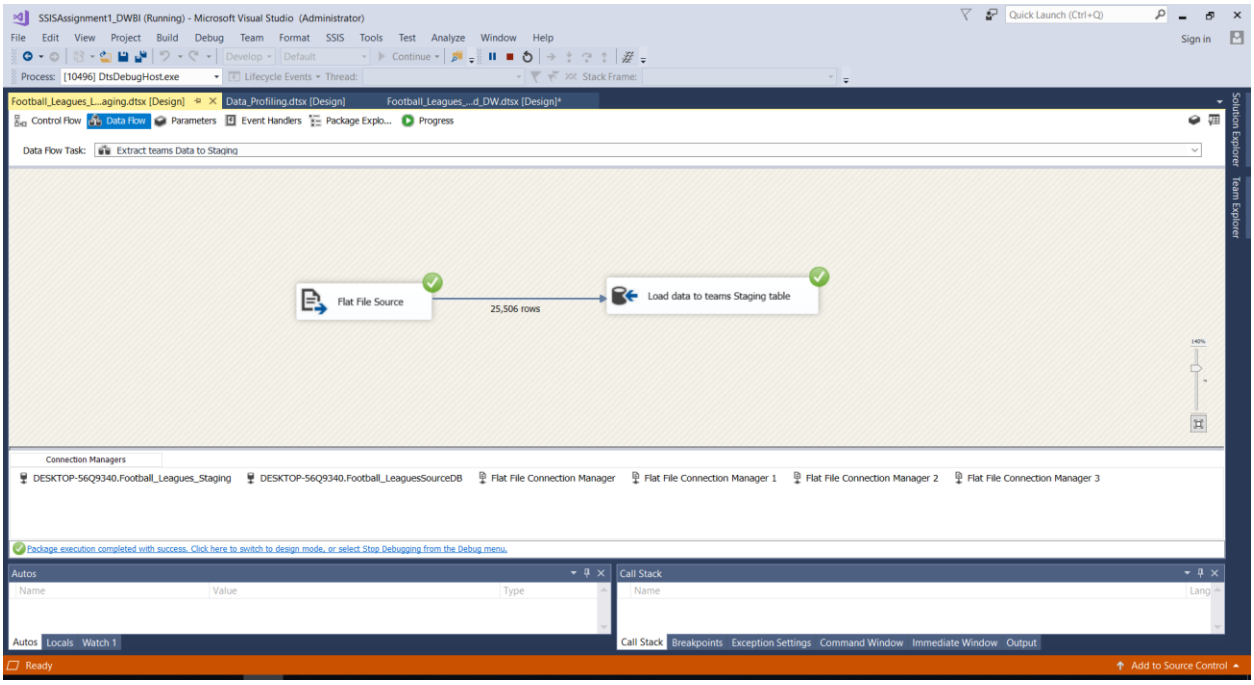
- **LEAGUES DATA STAGING**



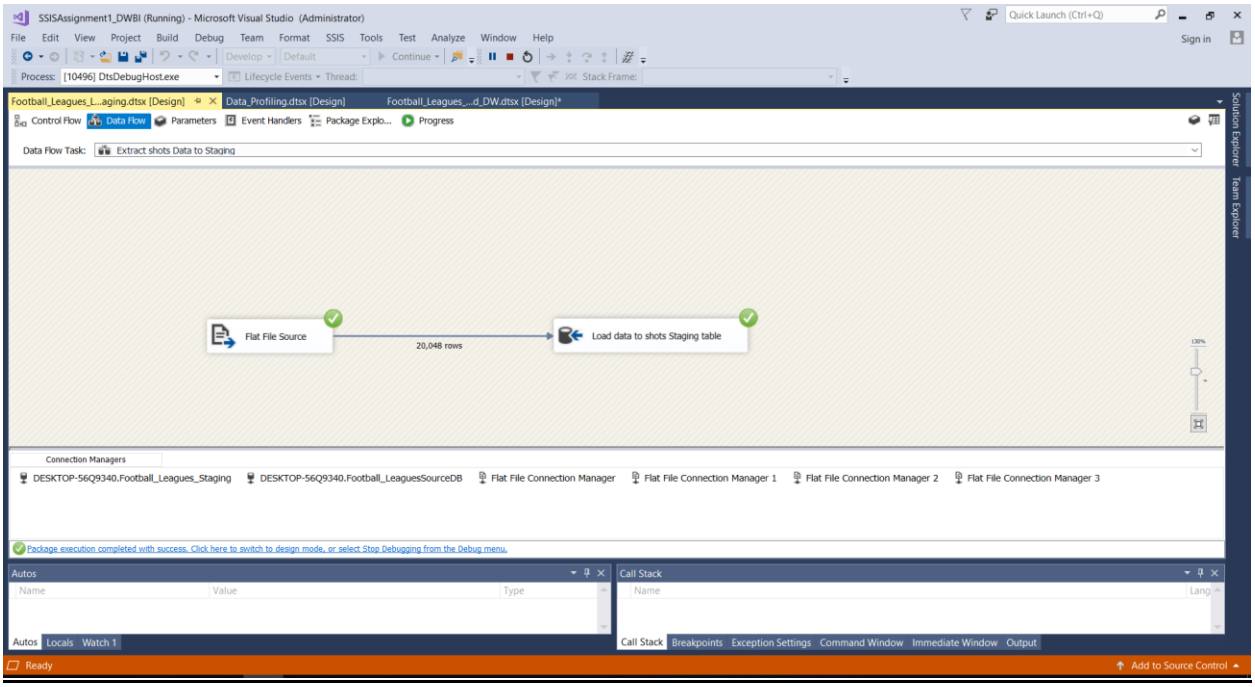
- **PLAYERS ADDRESS DATA STAGING**



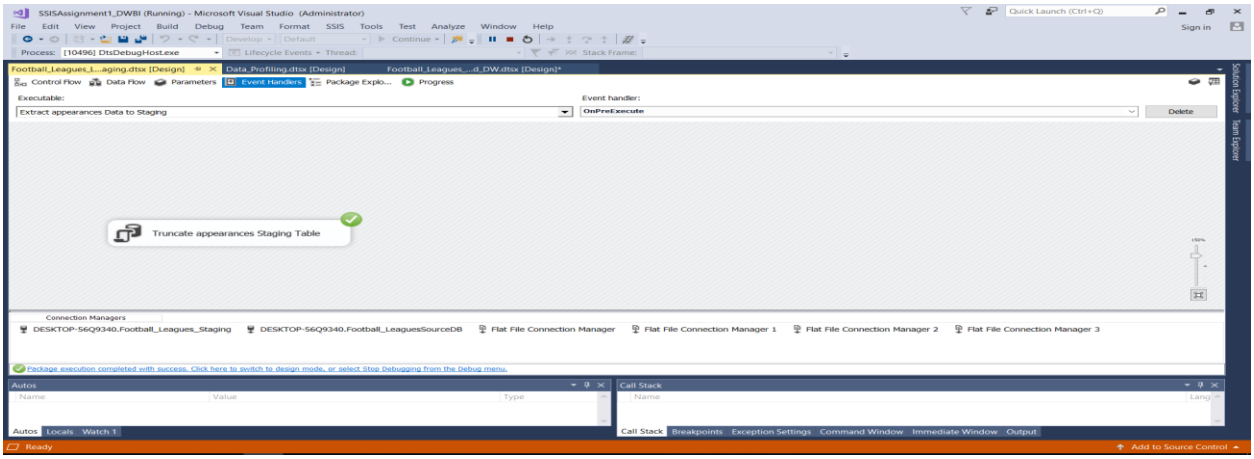
- **TEAMS DATA STAGING**

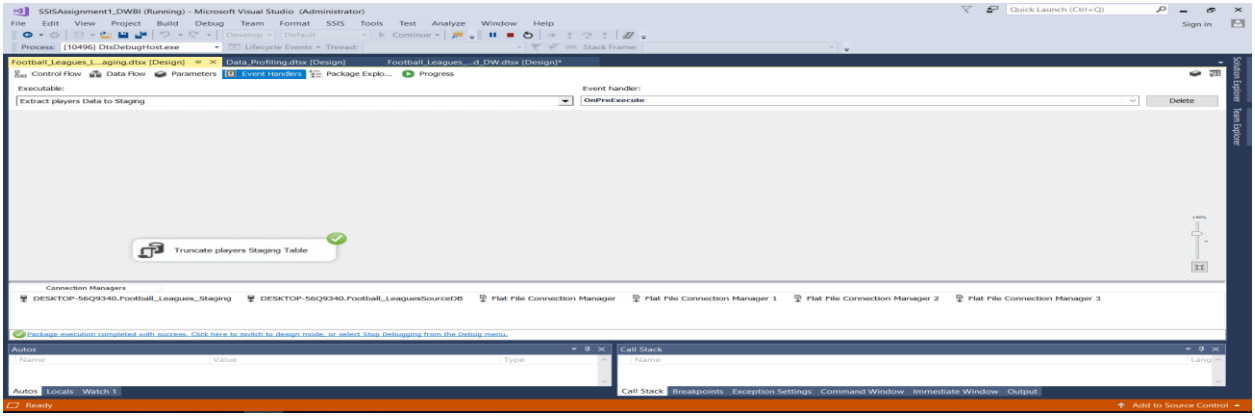


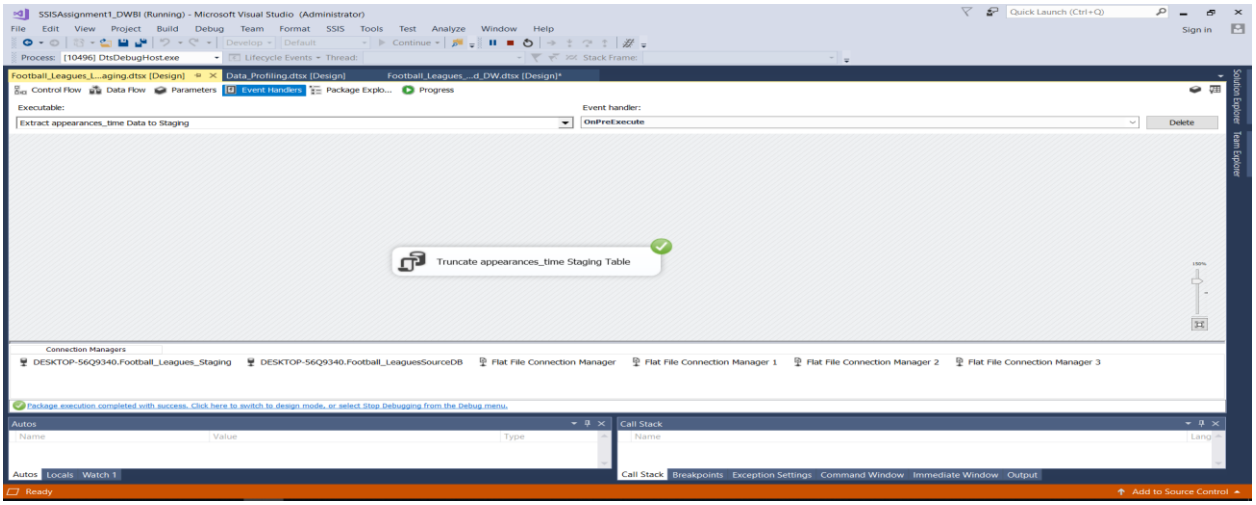
- **SHOTS DATA STAGING**

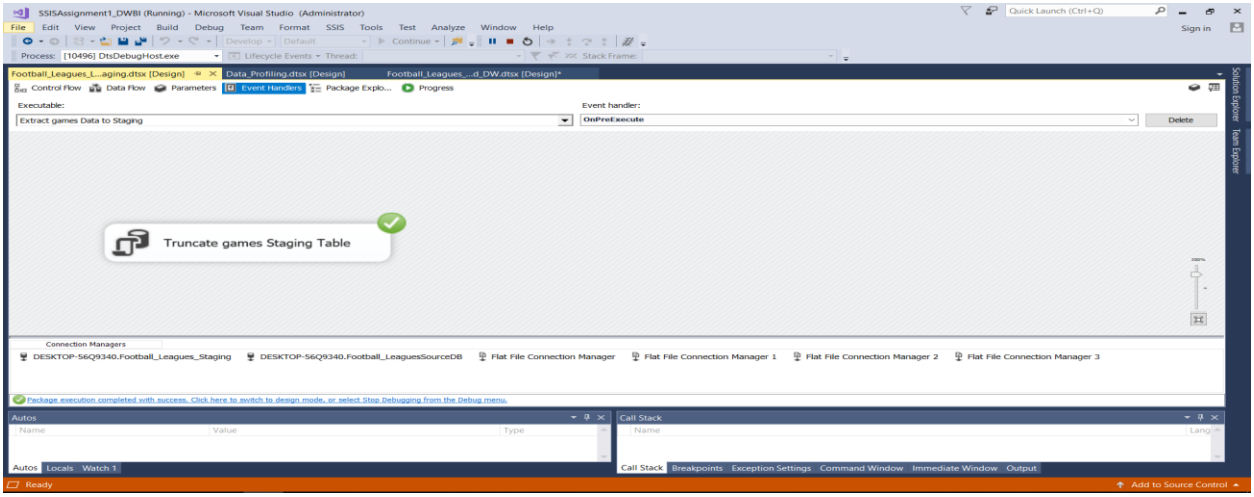


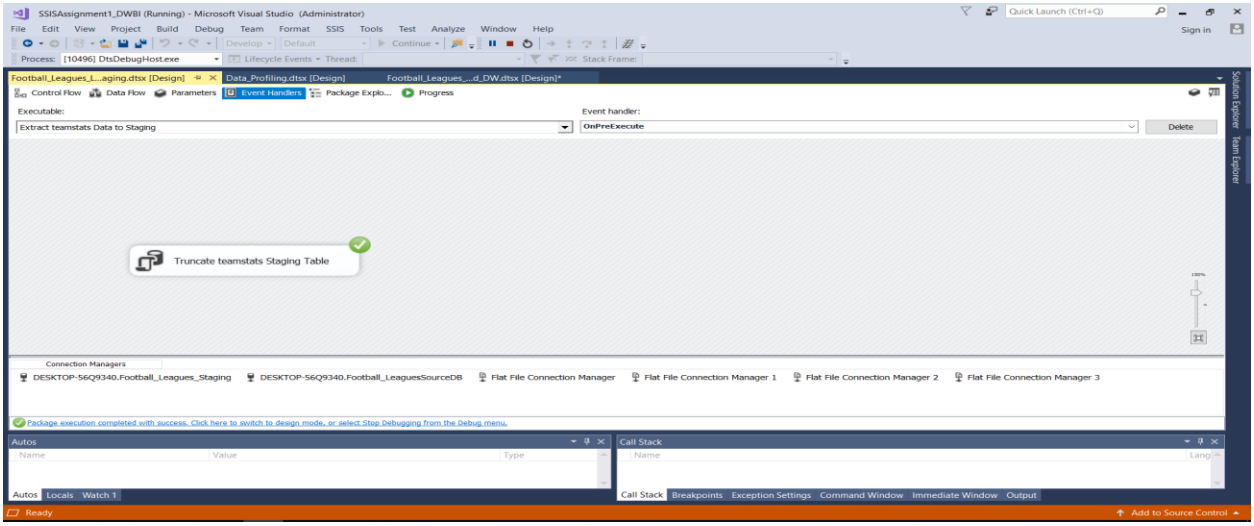
- **Event Handling (Truncate Staging Data)**

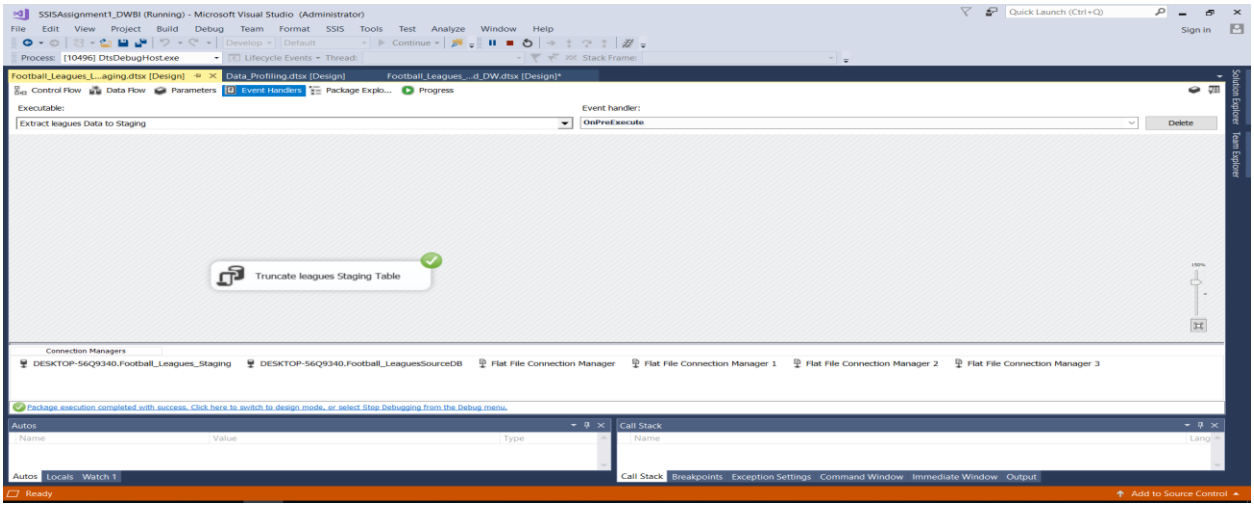


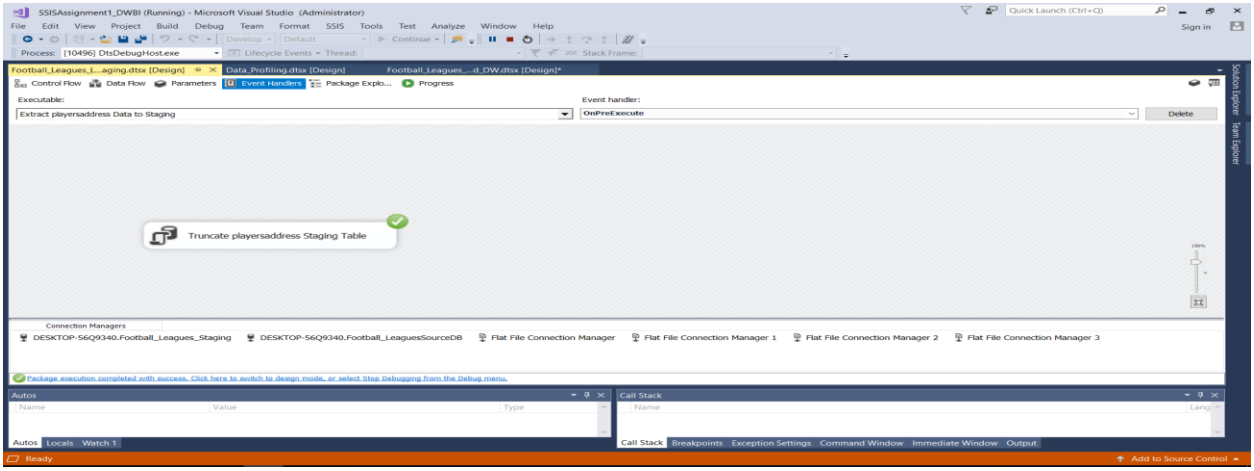


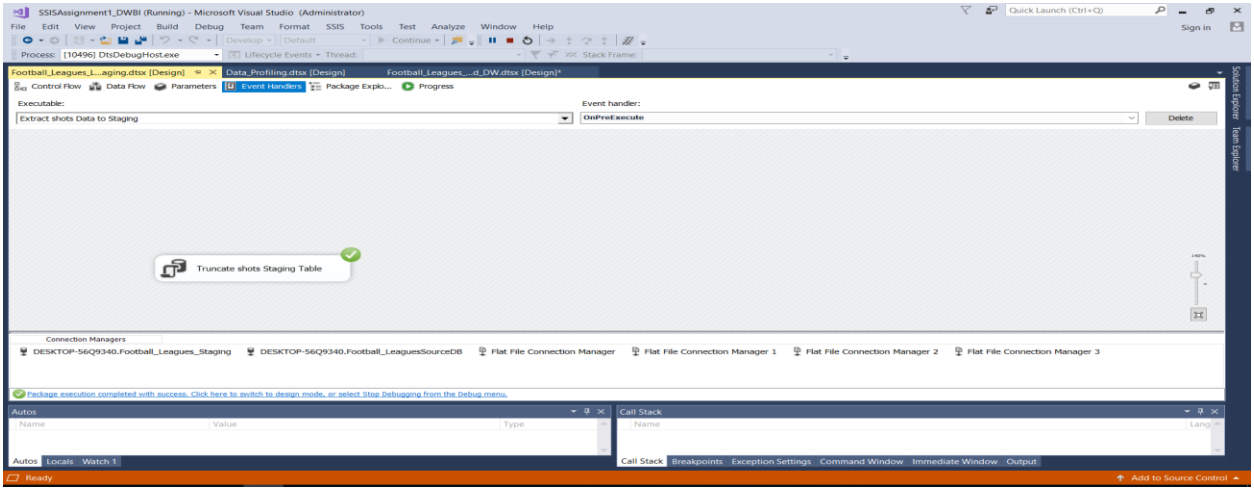


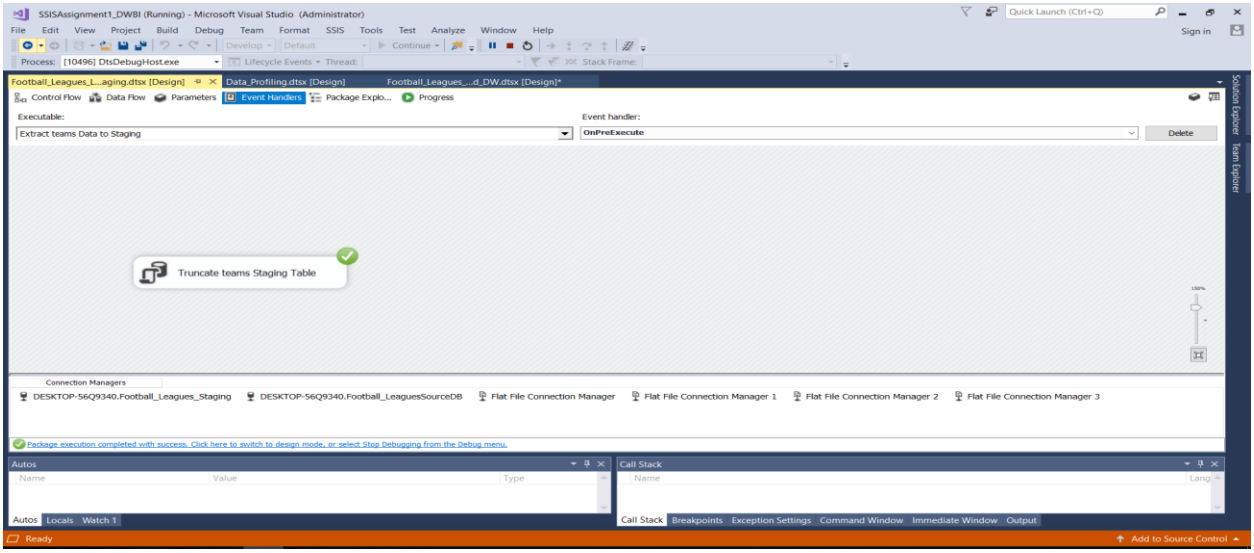

SSISAssignment1_DWBI (Running) - Microsoft Visual Studio (Administrator)
Executable:
Extract games Data to Staging
Event handler:
OnPreExecute
Truncate games Staging Table
Connection Managers
DESKTOP-S6Q9340.Football_Leagues_Staging
DESKTOP-S6Q9340.Football_LeaguesSourceDB
Flat File Connection Manager
Flat File Connection Manager 1
Flat File Connection Manager 2
Flat File Connection Manager 3
Package execution completed with success. Click here to switch to design mode, or select Stop Debugging from the Debug menu.
Ready


SSISAssignment1_DWBI (Running) - Microsoft Visual Studio (Administrator)
Executable:
Extract teamstats Data to Staging
Event handler:
OnPreExecute
Truncate teamstats Staging Table
Connection Managers
DESKTOP-S6Q9340.Football_Leagues_Staging
DESKTOP-S6Q9340.Football_LeaguesSourceDB
Flat File Connection Manager
Flat File Connection Manager 1
Flat File Connection Manager 2
Flat File Connection Manager 3
Package execution completed with success. Click here to switch to design mode, or select Stop Debugging from the Debug menu.
Ready


SSISAssignment1_DWBI (Running) - Microsoft Visual Studio (Administrator)
Executable:
Extract leagues Data to Staging
Event handler:
OnPreExecute
Truncate leagues Staging Table
Connection Managers
DESKTOP-S6Q9340.Football_Leagues_Staging
DESKTOP-S6Q9340.Football_LeaguesSourceDB
Flat File Connection Manager
Flat File Connection Manager 1
Flat File Connection Manager 2
Flat File Connection Manager 3
Package execution completed with success. Click here to switch to design mode, or select Stop Debugging from the Debug menu.
Ready

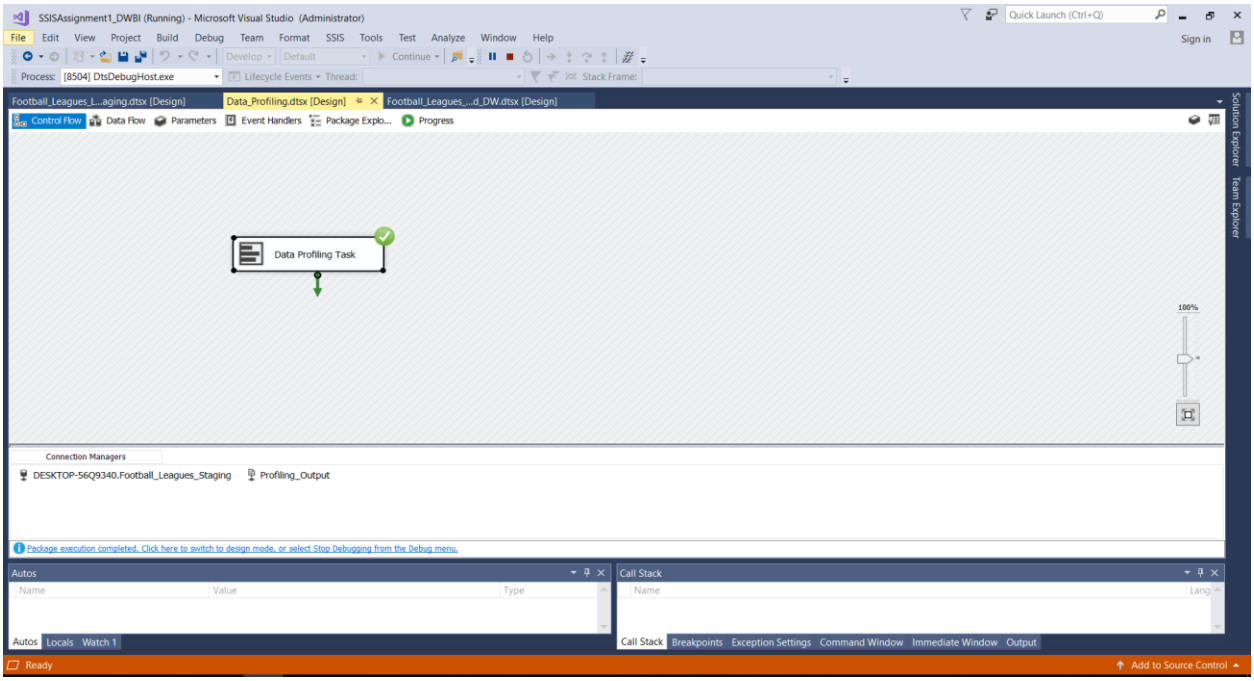

SSISAssignment1_DWBI (Running) - Microsoft Visual Studio (Administrator)
Executable:
Extract playersaddress Data to Staging
Event handler:
OnPreExecute
Truncate playersaddress Staging Table
DESKTOP-56Q9340.Football_Leagues_Staging
DESKTOP-56Q9340.Football_LeaguesSourceDB
Flat File Connection Manager
Flat File Connection Manager 1
Flat File Connection Manager 2
Flat File Connection Manager 3
Package execution completed with success. Click here to switch to design mode, or select Stop Debugging from the Debug menu.
Ready

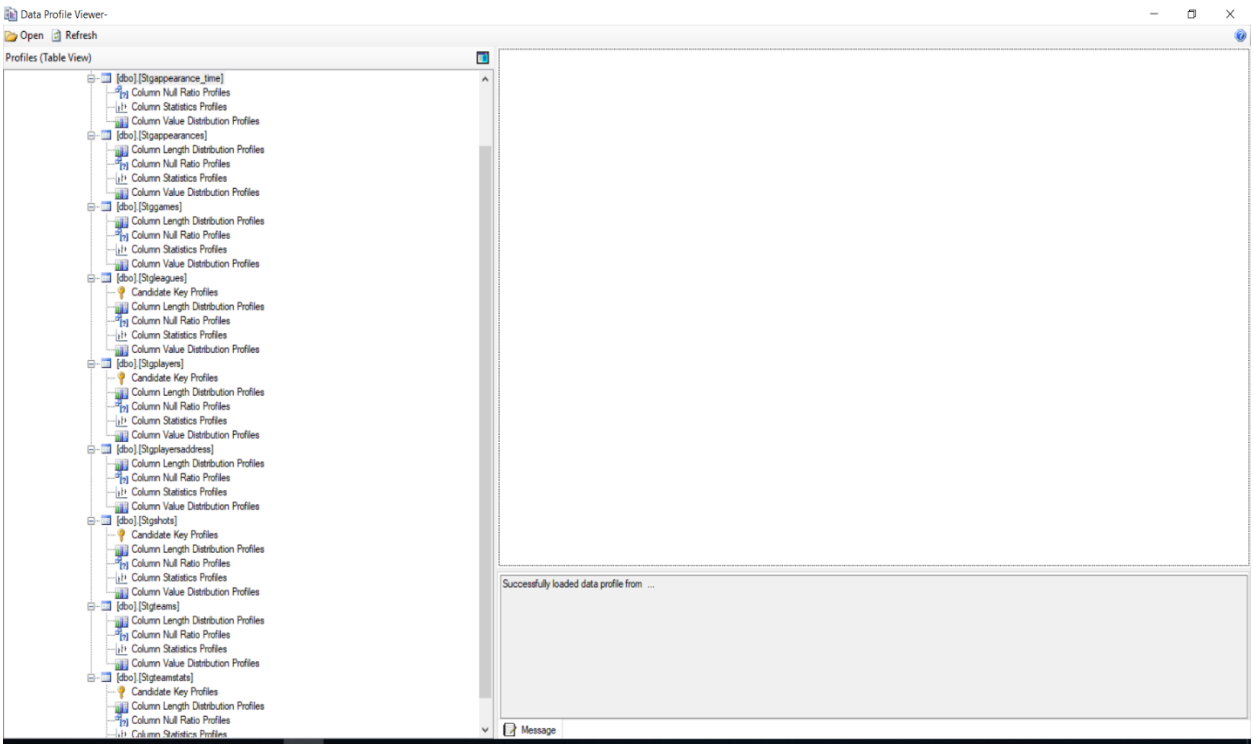

SSISAssignment1_DWBI (Running) - Microsoft Visual Studio (Administrator)
Executable:
Extract shots Data to Staging
Event handler:
OnPreExecute
Truncate shots Staging Table
DESKTOP-56Q9340.Football_Leagues_Staging
DESKTOP-56Q9340.Football_LeaguesSourceDB
Flat File Connection Manager
Flat File Connection Manager 1
Flat File Connection Manager 2
Flat File Connection Manager 3
Package execution completed with success. Click here to switch to design mode, or select Stop Debugging from the Debug menu.
Ready


SSISAssignment1_DWBI (Running) - Microsoft Visual Studio (Administrator)
Executable:
Extract teams Data to Staging
Event handler:
OnPreExecute
Truncate teams Staging Table
DESKTOP-56Q9340.Football_Leagues_Staging
DESKTOP-56Q9340.Football_LeaguesSourceDB
Flat File Connection Manager
Flat File Connection Manager 1
Flat File Connection Manager 2
Flat File Connection Manager 3
Package execution completed with success. Click here to switch to design mode, or select Stop Debugging from the Debug menu.
Ready

- **Data profiling**

Used one Data_Profiling package to profiling the staging tables.





3. Transform & Load

In this step, both the 'Transform' and 'Load' are done. Firstly, The Dimension tables in the Datawarehouse DB data were created. Then, using the relevant components, data from the staging tables was loaded into the warehouse tables, Football_Leagues_DW, which contains the below tables,

1) dbo.DimDate
2) dbo.Dimgames
3) dbo.Dimleagues
4) dbo.Dimplayers
5) dbo.Dimshots
6) dbo.Dimteamstats
7) dbo.Factappearances

Used Transformation Tasks

1. Lookups

   Mainly lookups used for Appearances fact table transform and loading process. These lookups are Date lookup, game lookup, players lookup, leagues ookup, teamstats lookup.

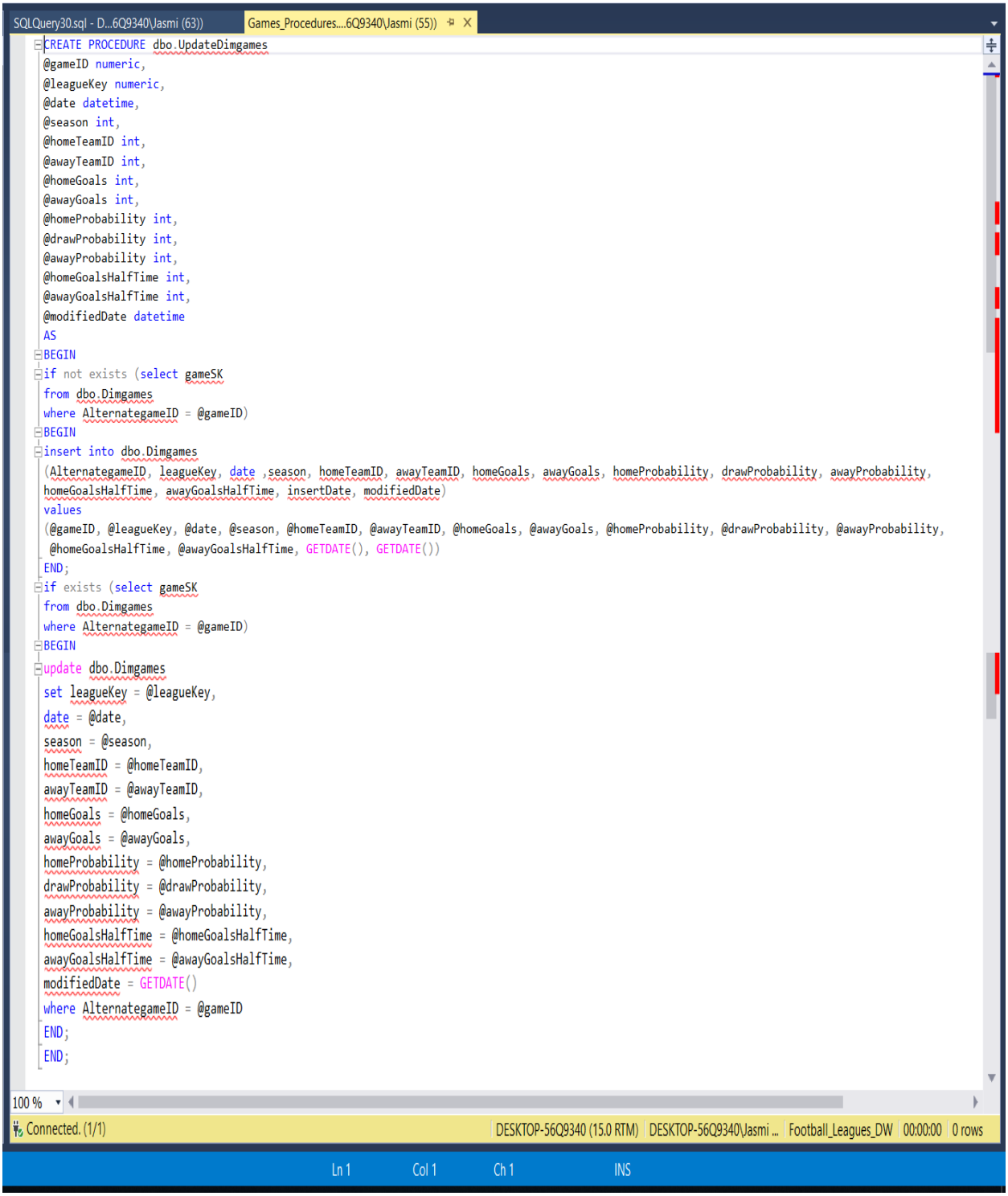
2. Derived Columns
   - Replace Null gender Values and title values in players Dim Table.
   - Calculate txn_process_time in appearances Fact Table.
   - Modified date field in appearances Fact Table.

3. Union
   - Union is used in the Extract step to combine and get all the data from both players and players address data files.

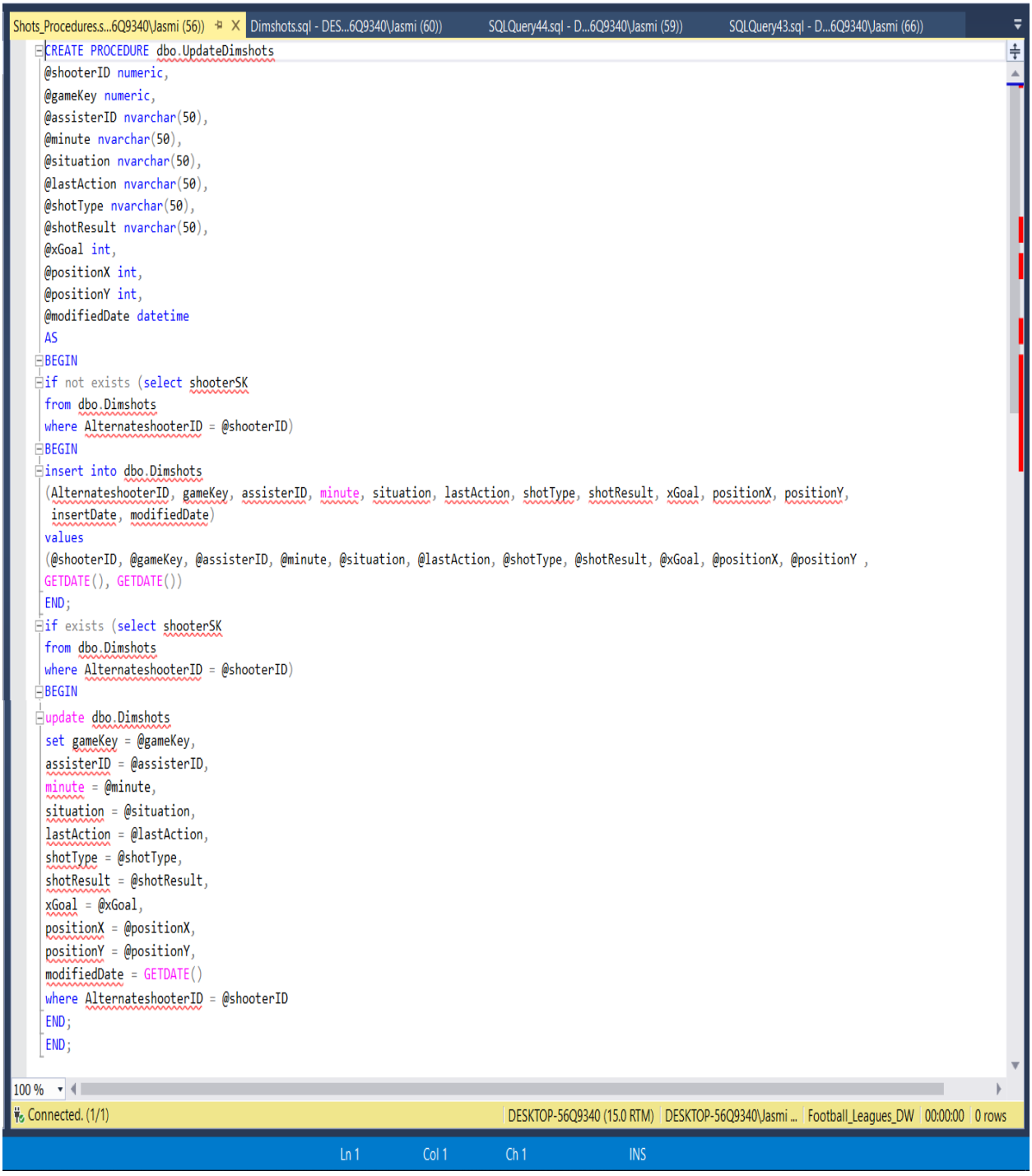
4. Sort and Merge
   - 'Sort' is used sort out the players and players address data and they are merged 'Merge' using playerID.
   - 'Sort' is used sort out the teams and teamstats data and they are merged 'Merge' using teamID.
   - 'Sort' is used sort out the shots and games dimesion data and they are merged 'Merge' using gameSK and AlternategameID.
   - 'Sort' is used sort out the appearances and appearance_time data and they are merged 'Merge' using appearncesID.
   - 'Sort' is used sort out the games and leagues dimesion data and they are merged 'Merge' using leagueSK and AlternateleagueID.

- **Update Functions**

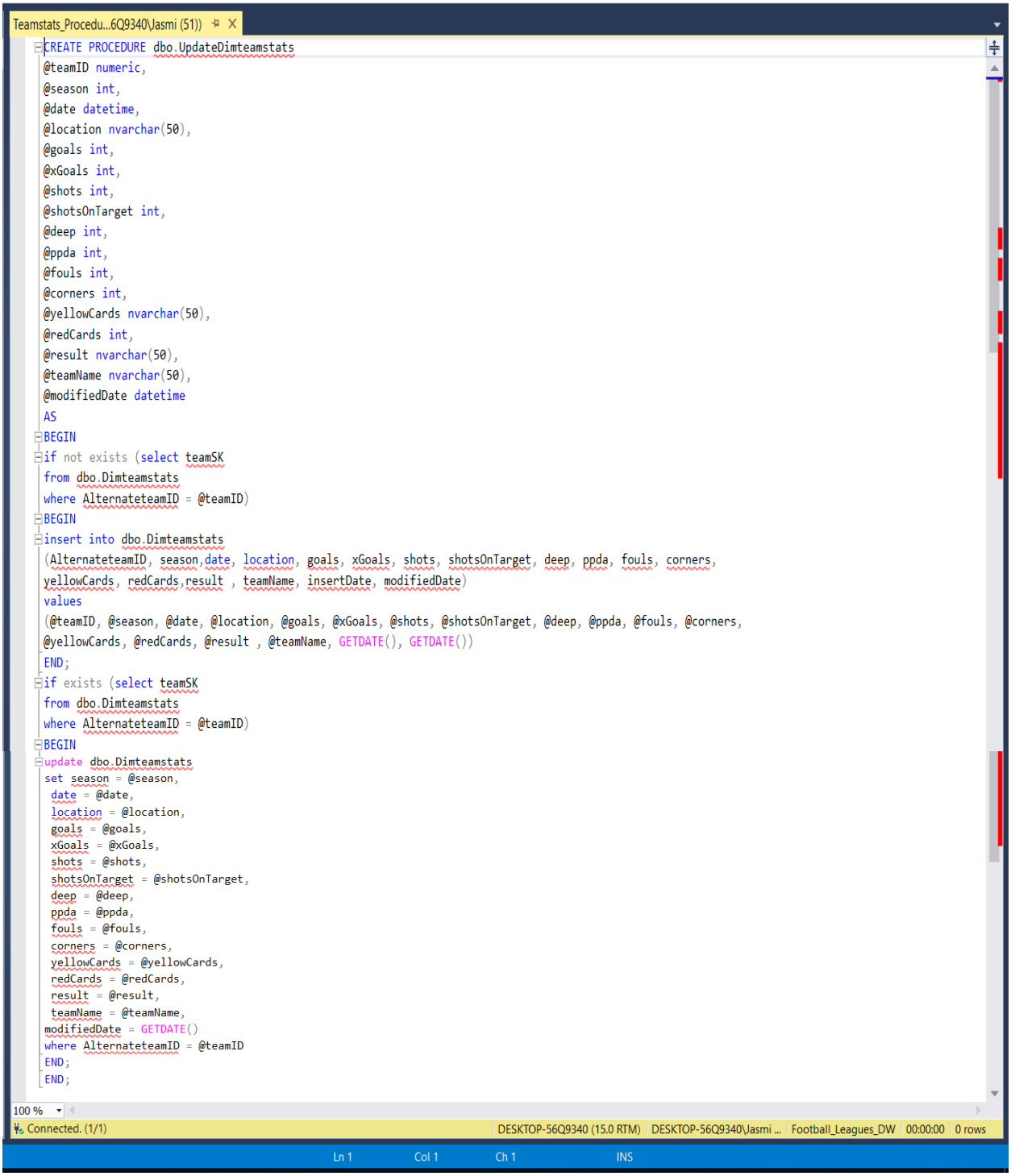
dbo.UpdateDimgames



dbo.UpdateDimshots

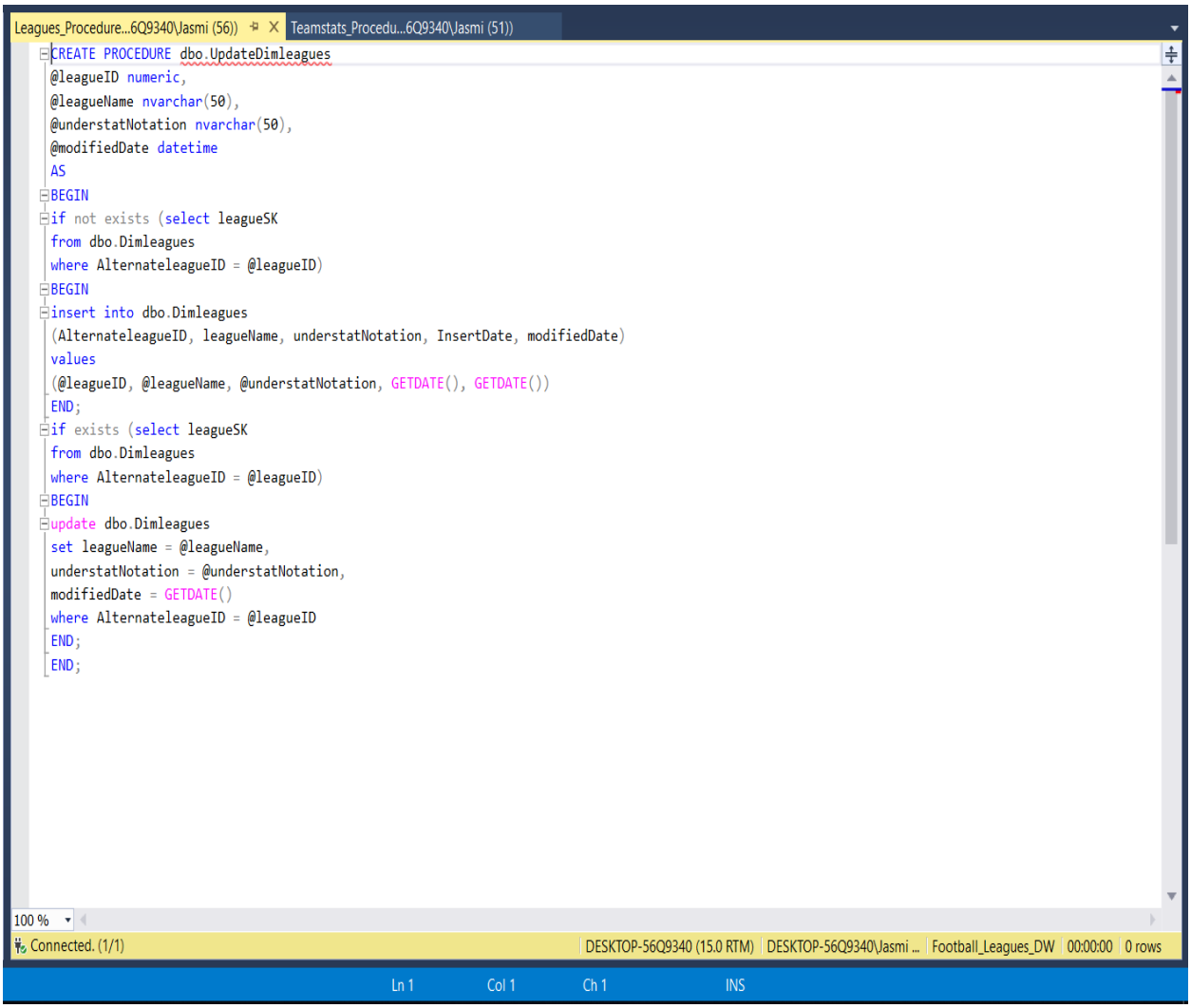


dbo.UpadteDimteamstats

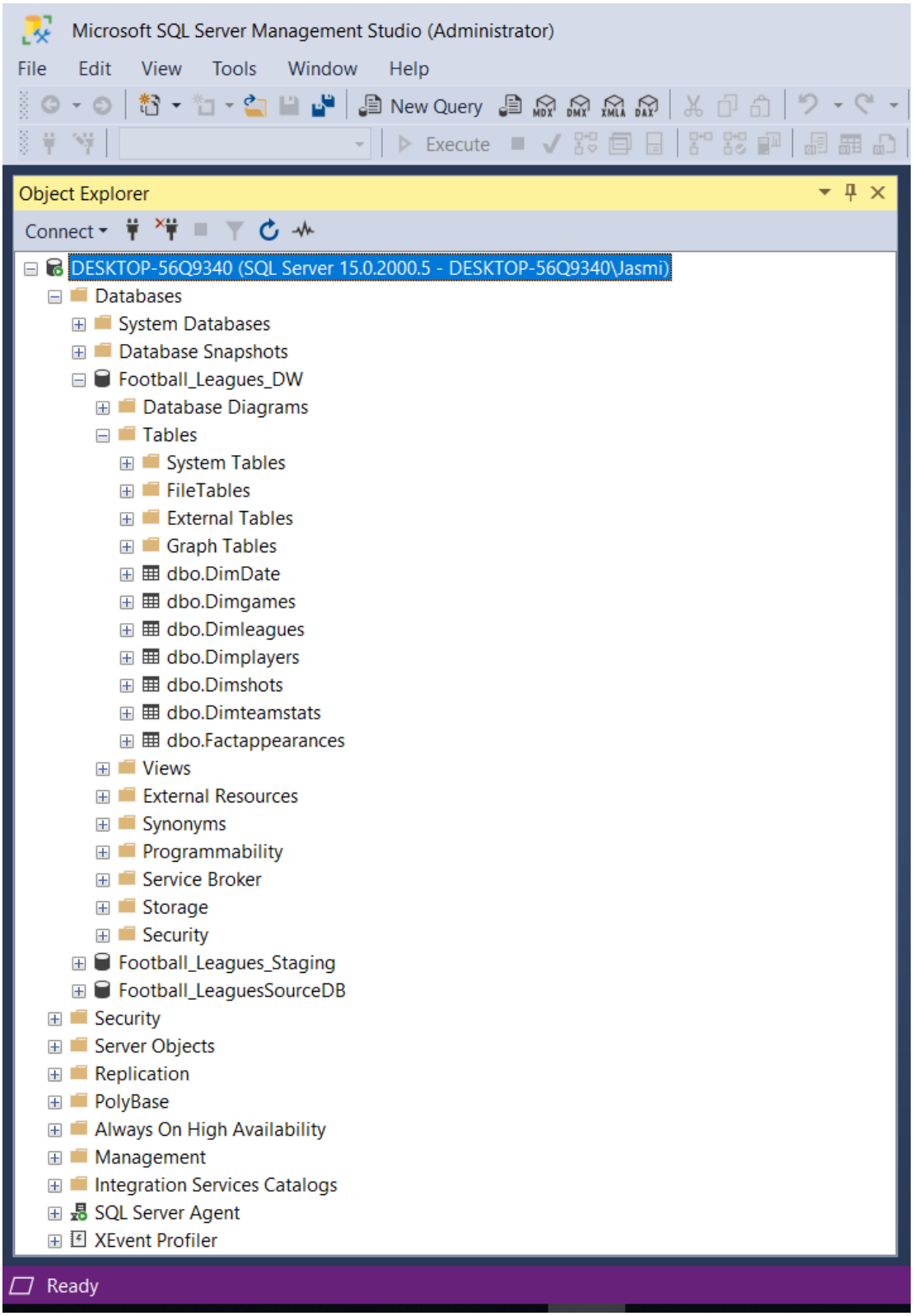


```
Teamstats_Procedu...6Q9340\Jasmi (51))

CREATE PROCEDURE dbo.UpdateDimteamstats
@teamID numeric,
@season int,
@date datetime,
@location nvarchar(50),
@goals int,
@xGoals int,
@shots int,
@shotsOnTarget int,
@deep int,
@ppda int,
@fouls int,
@corners int,
@yellowCards nvarchar(50),
@redCards int,
@result nvarchar(50),
@teamName nvarchar(50),
@modifiedDate datetime
AS
BEGIN
if not exists (select teamSK
from dbo.Dimteamstats
where AlternateteamID = @teamID)
BEGIN
insert into dbo.Dimteamstats
(AlternateteamID, season,date, location, goals, xGoals, shots, shotsOnTarget, deep, ppda, fouls, corners,
yellowCards, redCards,result , teamName, insertDate, modifiedDate)
values
(@teamID, @season, @date, @location, @goals, @xGoals, @shots, @shotsOnTarget, @deep, @ppda, @fouls, @corners,
@yellowCards, @redCards, @result , @teamName, GETDATE(), GETDATE())
END;
if exists (select teamSK
from dbo.Dimteamstats
where AlternateteamID = @teamID)
BEGIN
update dbo.Dimteamstats
set season = @season,
 date = @date,
 location = @location,
 goals = @goals,
 xGoals = @xGoals,
 shots = @shots,
 shotsOnTarget = @shotsOnTarget,
 deep = @deep,
 ppda = @ppda,
 fouls = @fouls,
 corners = @corners,
 yellowCards = @yellowCards,
 redCards = @redCards,
 result = @result,
 teamName = @teamName,
modifiedDate = GETDATE()
where AlternateteamID = @teamID
END;
END;

100 %
Connected. (1/1)   DESKTOP-56Q9340 (15.0 RTM)   DESKTOP-56Q9340\Jasmi ...   Football_Leagues_DW   00:00:00   0 rows
Ln 1   Col 1   Ch 1   INS
```

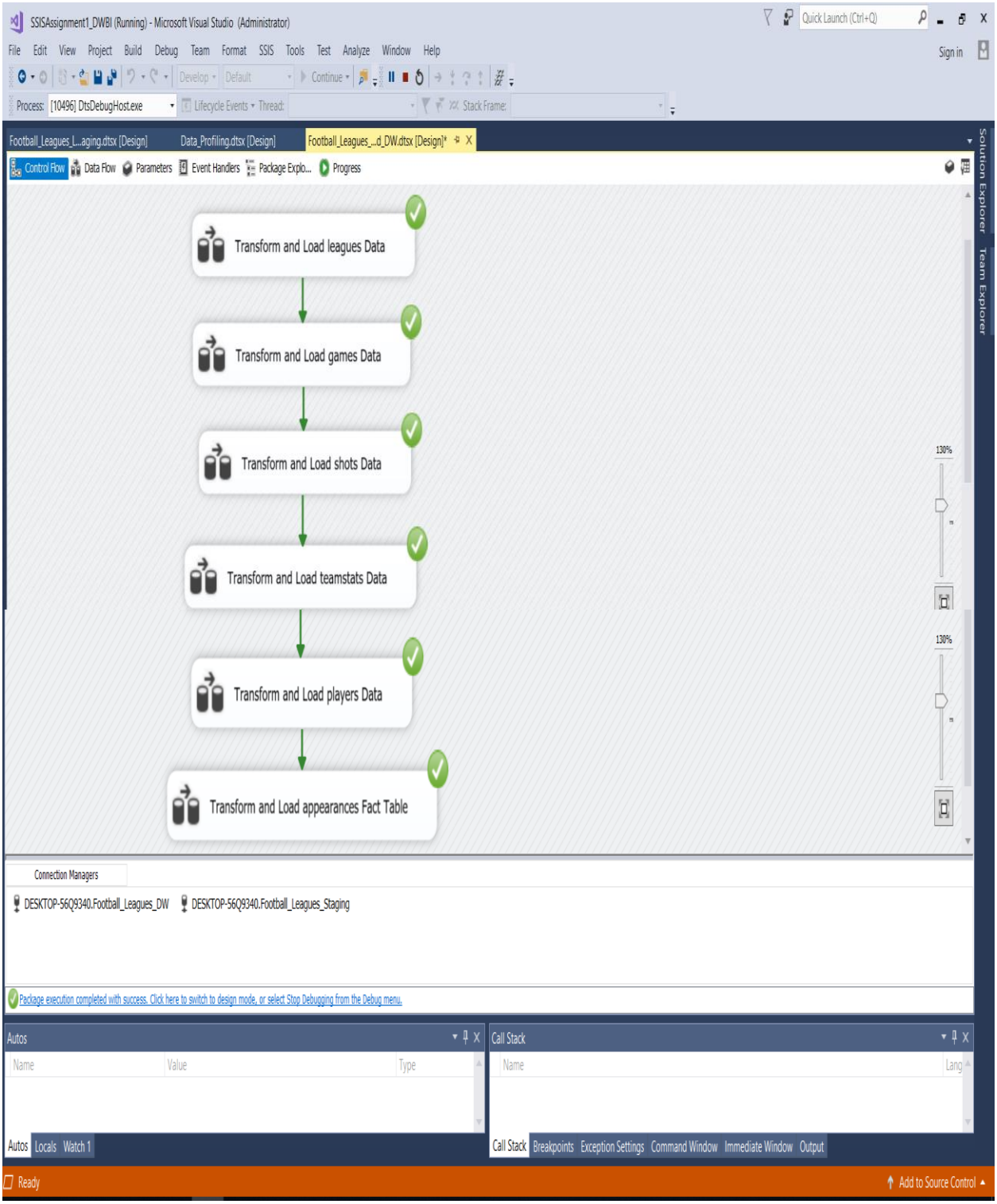
dbo.UpdateDimleagues



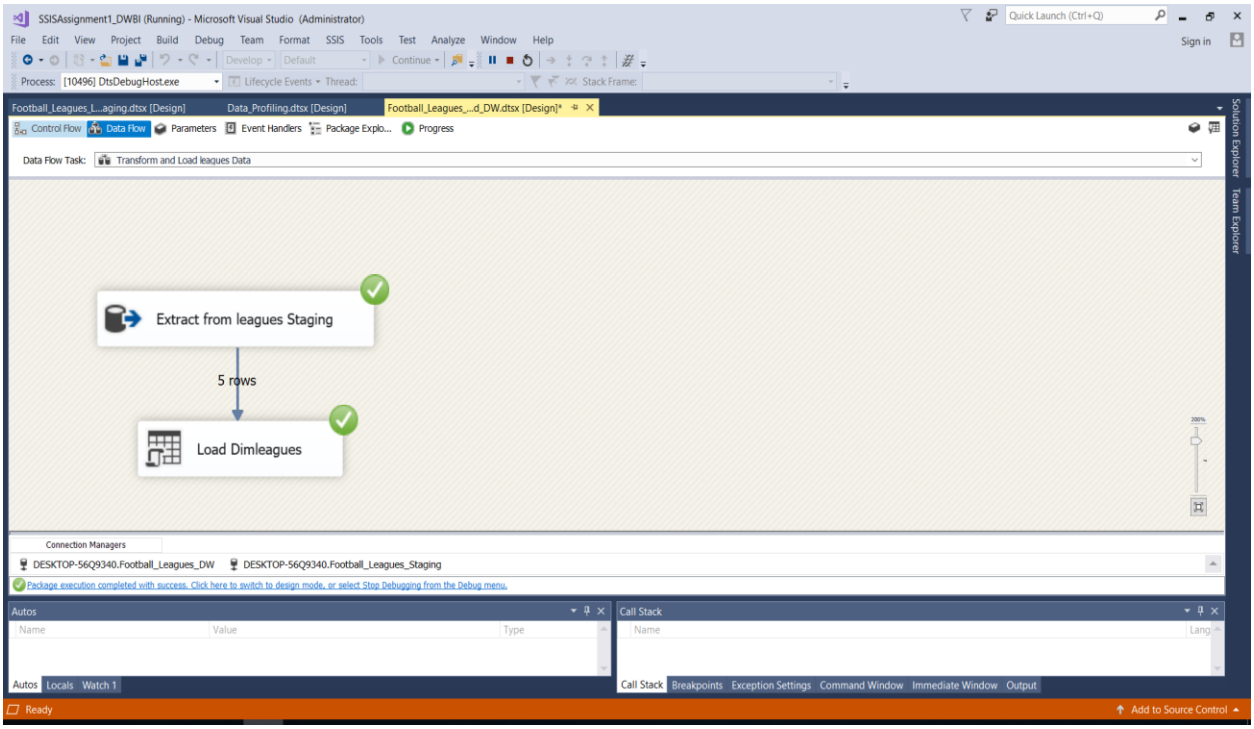
- **Snapshot of SQL server Data warehouse Database**



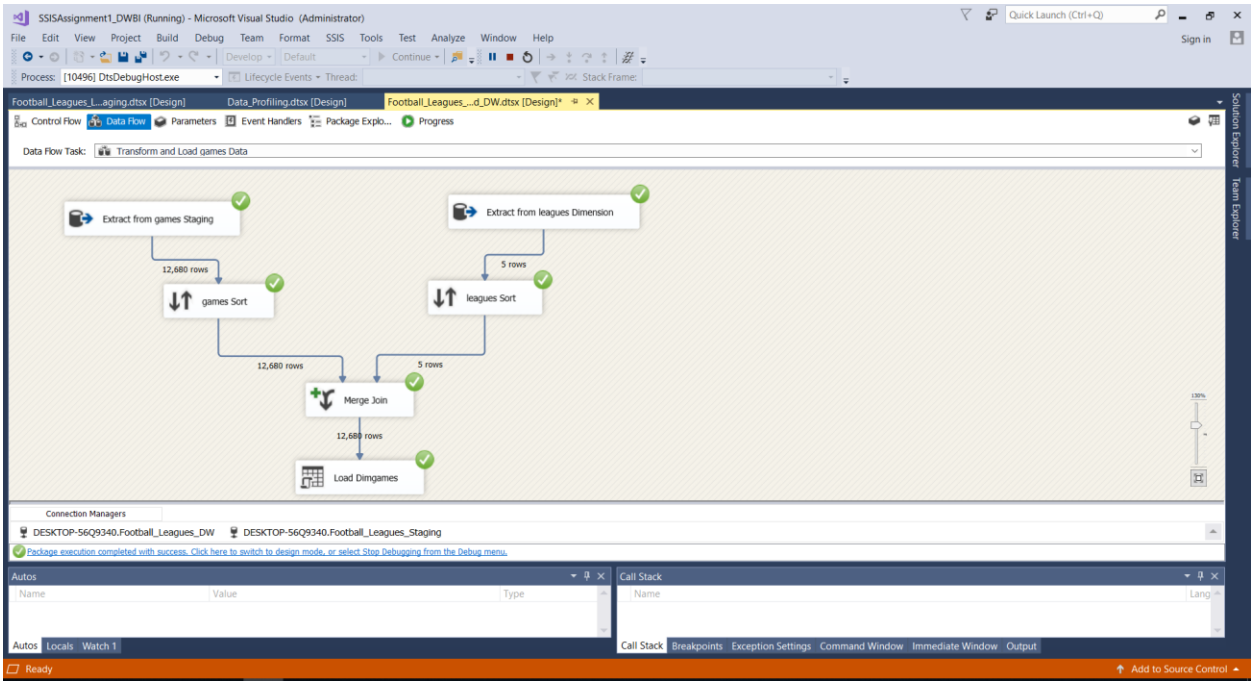
- **Snapshot of Visual Studio Control Flow of Extraction**



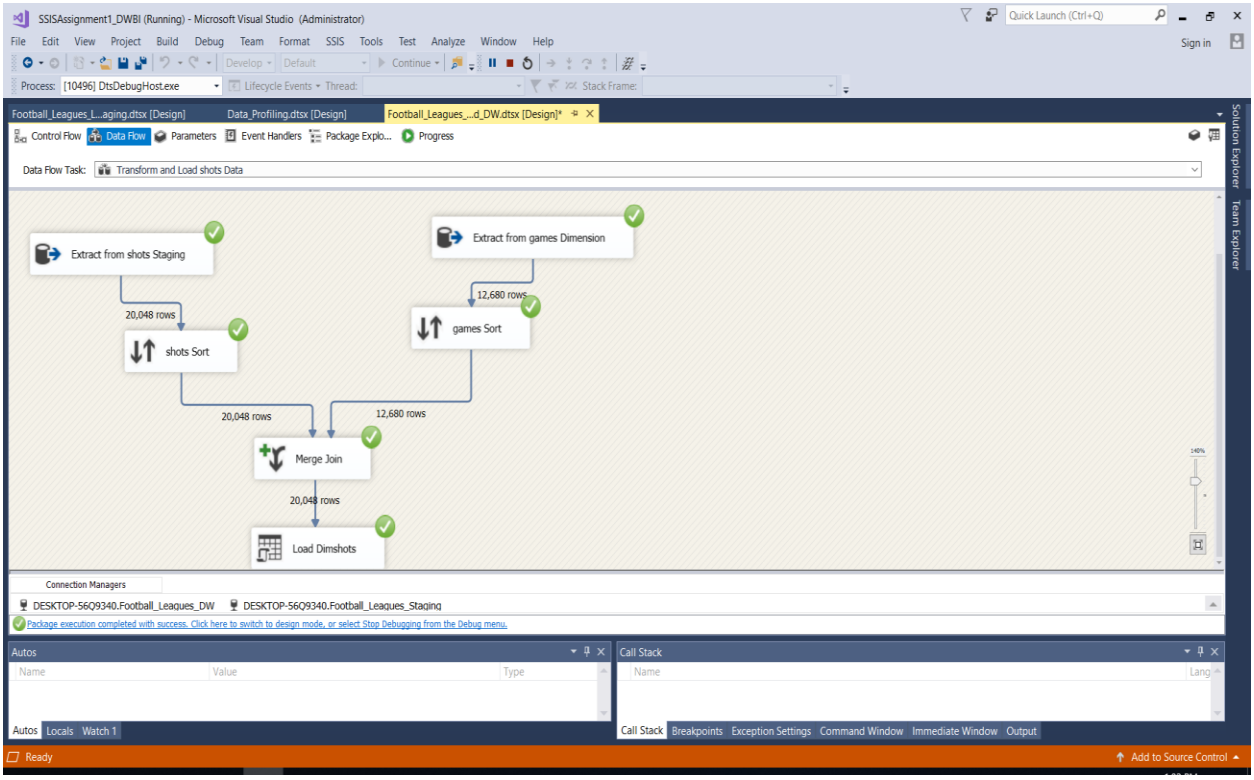
- **LEAGUES DATA TRANSFORM AND LOADING**



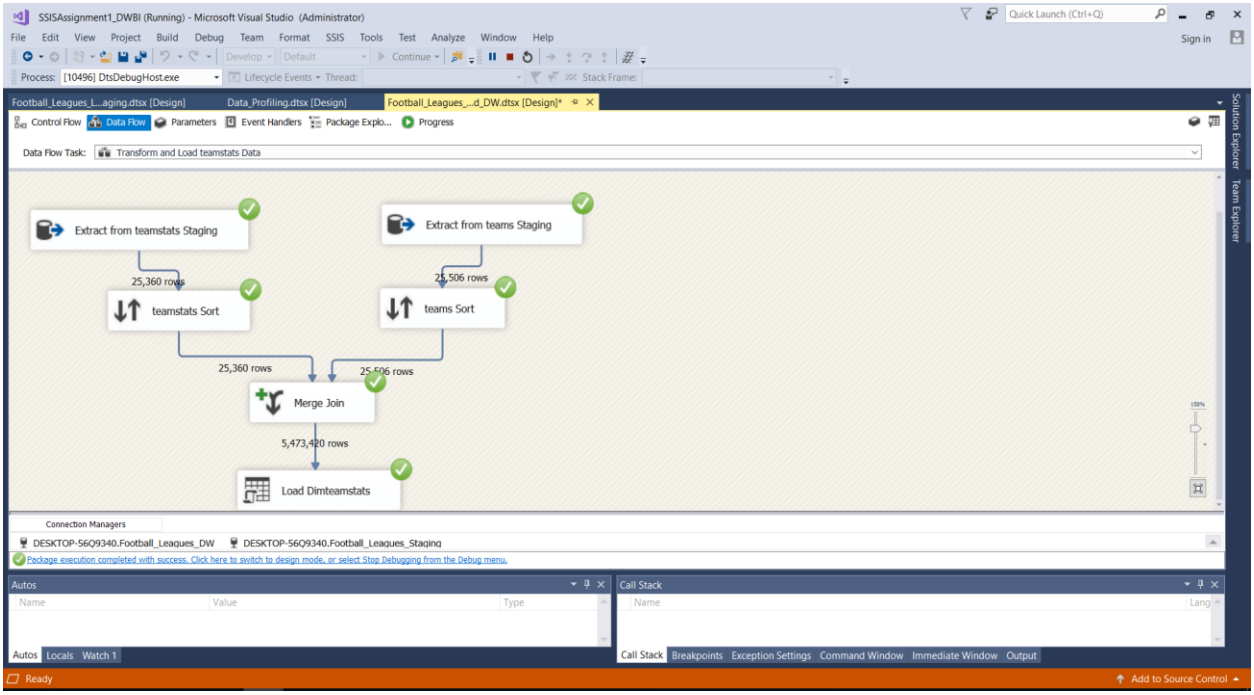
- **GAMES DATA TRANAFORM AND LOADING**



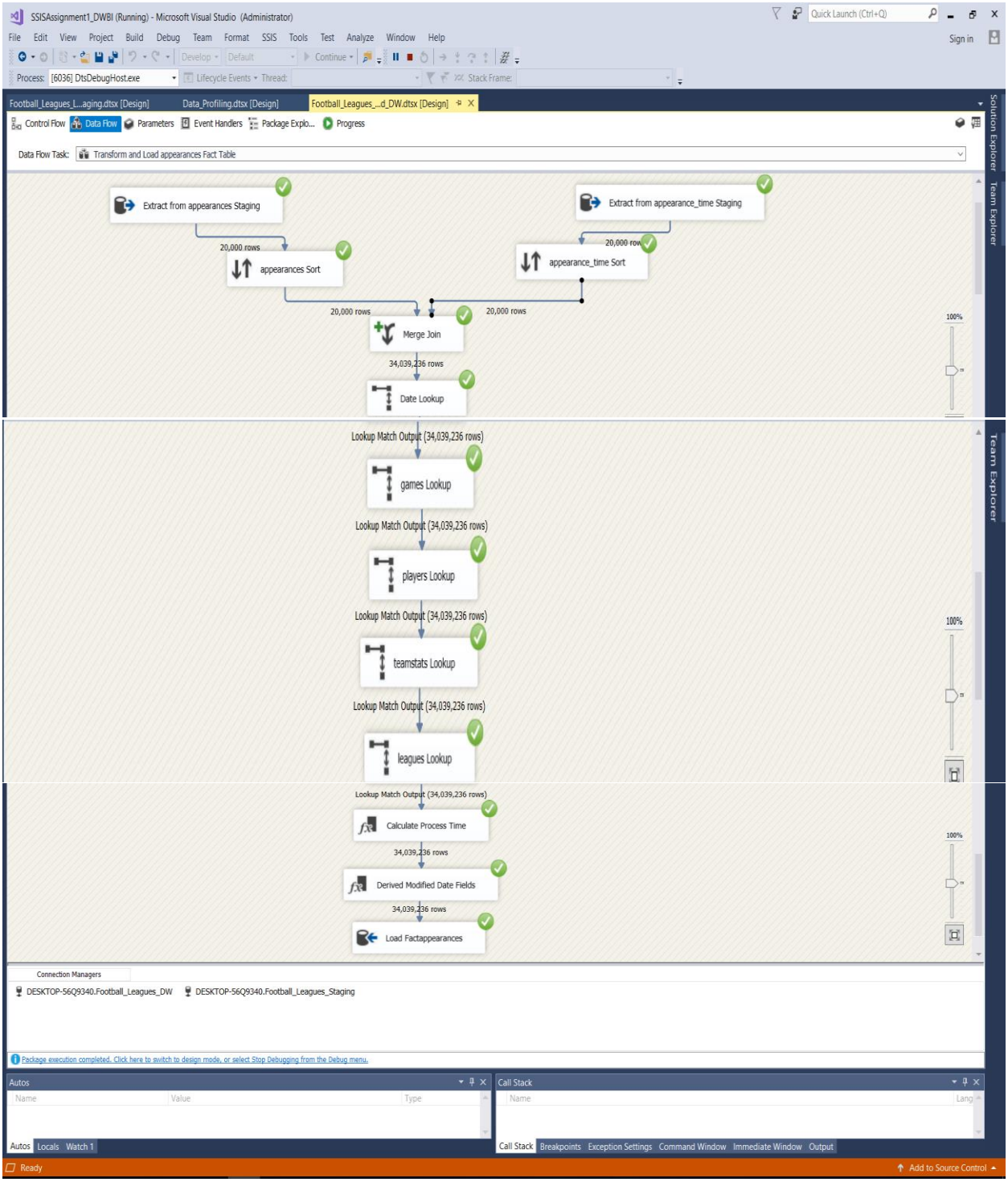
- **SHOTS DATA TRANSFORM AND LOADING**



- **TEAMSTATS DATA TRANSFORM AND LOADING**



- **APPEARANCES DATA TRANSFORM AND LOADING**



- **PLAYERS DATA TRANSFORM AND LOADING**