Sri Lanka Institute of Information Technology

Assignment II

Data Warehouse & Business Intelligence – 2021

Student information

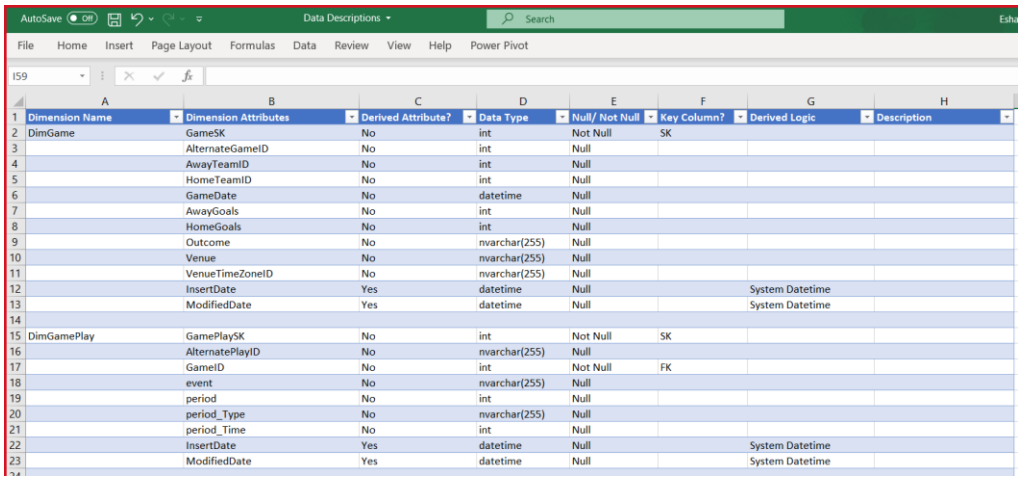
Name	Batch	Registration number
Lekamge E. L	Y3S1 Data Science	IT19052984

Contents

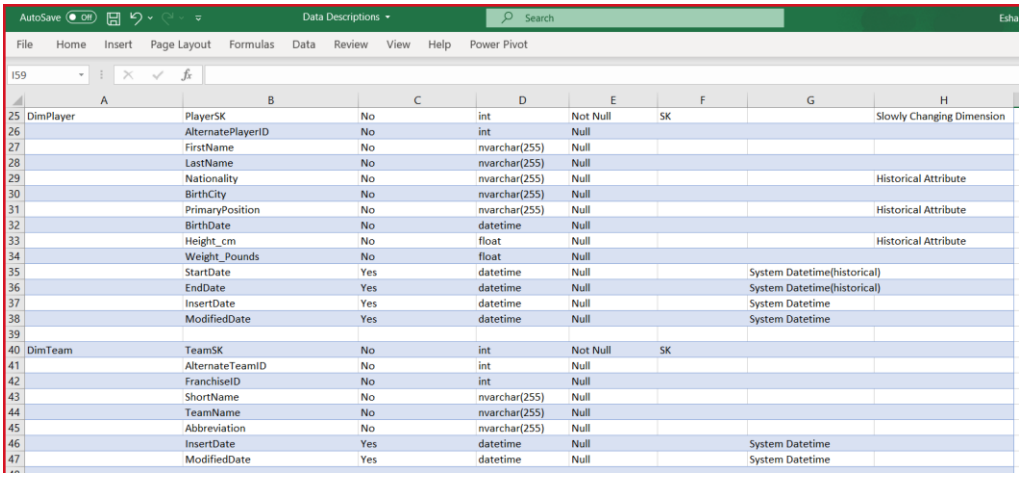
Data warehouse design

Tables in the Data Warehouse are arranged in a snowflake schema. The high-level design of the Data Warehouse is included below.

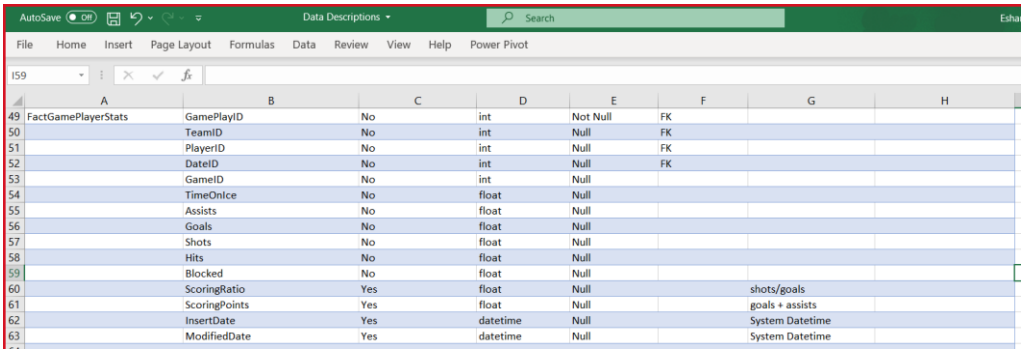
Data Warehouse table design



Dimension Name	Dimension Attributes	Derived Attribute?	Data Type	Null/ Not Null	Key Column?	Derived Logic	Description
DimGame	GameSK	No	int	Not Null	SK		
	AlternateGameID	No	int	Null			
	AwayTeamID	No	int	Null			
	HomeTeamID	No	int	Null			
	GameDate	No	datetime	Null			
	AwayGoals	No	int	Null			
	HomeGoals	No	int	Null			
	Outcome	No	nvarchar(255)	Null			
	Venue	No	nvarchar(255)	Null			
	VenueTimeZoneID	No	nvarchar(255)	Null			
	InsertDate	Yes	datetime	Null		System Datetime	
	ModifiedDate	Yes	datetime	Null		System Datetime	
DimGamePlay	GamePlaySK	No	int	Not Null	SK		
	AlternatePlayID	No	nvarchar(255)	Null			
	GameID	No	int	Not Null	FK		
	event	No	nvarchar(255)	Null			
	period	No	int	Null			
	period_Type	No	nvarchar(255)	Null			
	period_Time	No	int	Null			
	InsertDate	Yes	datetime	Null		System Datetime	
	ModifiedDate	Yes	datetime	Null		System Datetime	



DimPlayer	PlayerSK	No	int	Not Null	SK		Slowly Changing Dimension
	AlternatePlayerID	No	int	Null			
	FirstName	No	nvarchar(255)	Null			
	LastName	No	nvarchar(255)	Null			
	Nationality	No	nvarchar(255)	Null			Historical Attribute
	BirthCity	No	nvarchar(255)	Null			
	PrimaryPosition	No	nvarchar(255)	Null			Historical Attribute
	BirthDate	No	datetime	Null			
	Height_cm	No	float	Null			Historical Attribute
	Weight_Pounds	No	float	Null			
	StartDate	Yes	datetime	Null		System Datetime(historical)	
	EndDate	Yes	datetime	Null		System Datetime(historical)	
	InsertDate	Yes	datetime	Null		System Datetime	
	ModifiedDate	Yes	datetime	Null		System Datetime	
DimTeam	TeamSK	No	int	Not Null	SK		
	AlternateTeamID	No	int	Null			
	FranchiseID	No	int	Null			
	ShortName	No	nvarchar(255)	Null			
	TeamName	No	nvarchar(255)	Null			
	Abbreviation	No	nvarchar(255)	Null			
	InsertDate	Yes	datetime	Null		System Datetime	
	ModifiedDate	Yes	datetime	Null		System Datetime	



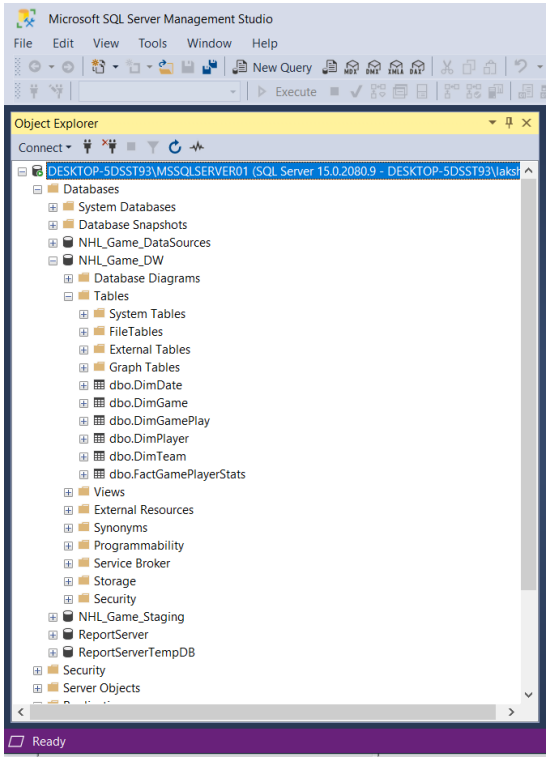
FactGamePlayerStats	GamePlayID	No	int	Not Null	FK		
	TeamID	No	int	Null	FK		
	PlayerID	No	int	Null	FK		
	DateID	No	int	Null	FK		
	GameID	No	int	Null			
	TimeOnIce	No	float	Null			
	Assists	No	float	Null			
	Goals	No	float	Null			
	Shots	No	float	Null			
	Hits	No	float	Null			
	Blocked	No	float	Null			
	ScoringRatio	Yes	float	Null		shots/goals	
	ScoringPoints	Yes	float	Null		goals + assists	
	InsertDate	Yes	datetime	Null		System Datetime	
	ModifiedDate	Yes	datetime	Null		System Datetime	

65	DimDate	DateKey	int	Unchecked	Not Null	SK		Static Table
66		Date	datetime	Checked				
67		FullDateUK	char(10)	Checked				
68		FullDateUSA	char(10)	Checked				
69		DayOfMonth	varchar(2)	Checked				
70		DaySuffix	varchar(4)	Checked				
71		DayName	varchar(9)	Checked				
72		DayOfWeekUSA	char(1)	Checked				
73		DayOfWeekUK	char(1)	Checked				
74		DayOfWeekInMonth	varchar(2)	Checked				
75		DayOfWeekInYear	varchar(2)	Checked				
76		DayOfQuarter	varchar(3)	Checked				
77		DayOfYear	varchar(3)	Checked				
78		WeekOfMonth	varchar(1)	Checked				
79		WeekOfQuarter	varchar(2)	Checked				
80		WeekOfYear	varchar(2)	Checked				
81		Month	varchar(2)	Checked				
82		MonthName	varchar(9)	Checked				
83		MonthOfQuarter	varchar(2)	Checked				
84		Quarter	char(1)	Checked				
85		QuarterName	varchar(9)	Checked				
86		Year	char(4)	Checked				
87		YearName	char(7)	Checked				
88		MonthYear	char(10)	Checked				
89		MMYYYY	char(6)	Checked				
90		FirstDayOfMonth	date	Checked				
91		LastDayOfMonth	date	Checked				

Source Details | Staging Table Details | **Dimensions & Facts** | ETL Mapping Document

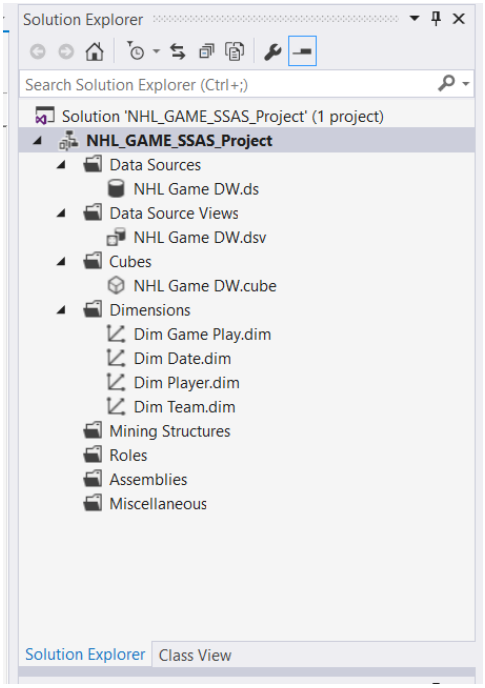
Step 1: Data Source

- The previously implemented Data Warehouse is used as data source for building the reports. NHL_Game_DW has 5 dimension tables called as DimDate, DimGame, DimGamePlay, DimPlayer, DimTeam and a one fact table as FactGamePlayerStats.

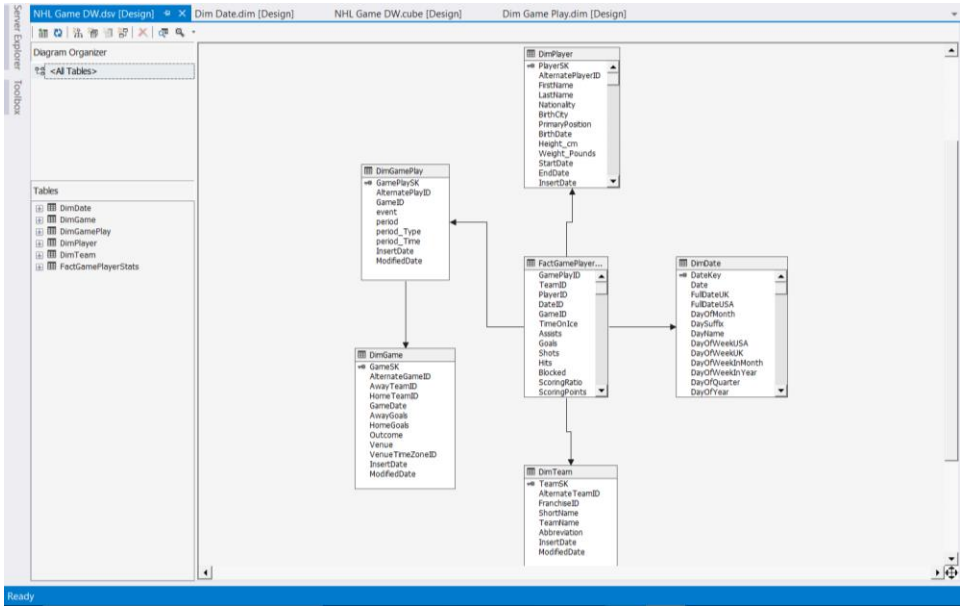


Step 2: SSAS Cube implementation

- A new Analysis Services Multidimensional and Data Mining project is created in SSAS.
  A Data source is created using the previously implemented data warehouse NHL_Game_DW.

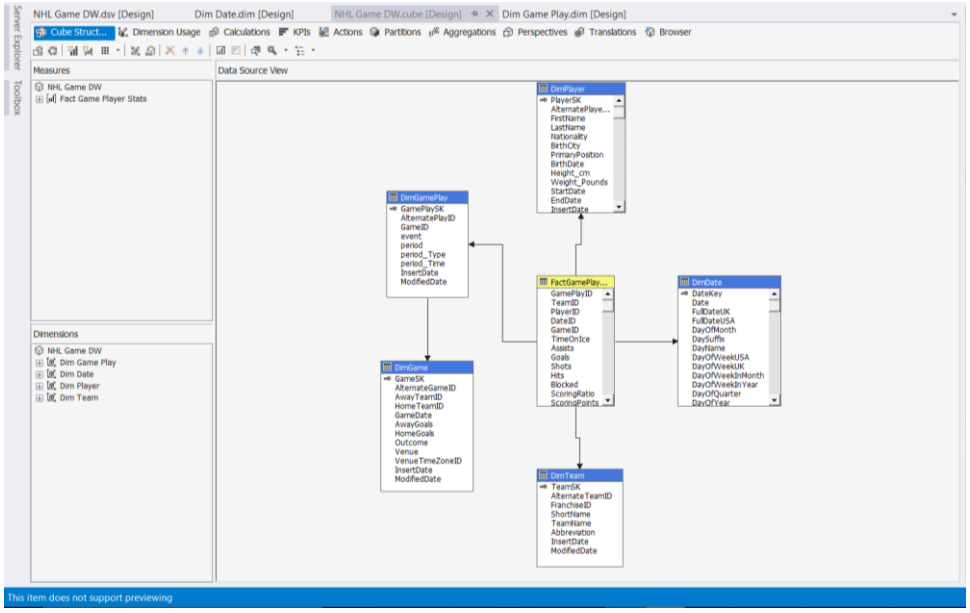


- Create a Data Source view for the created Data Source.

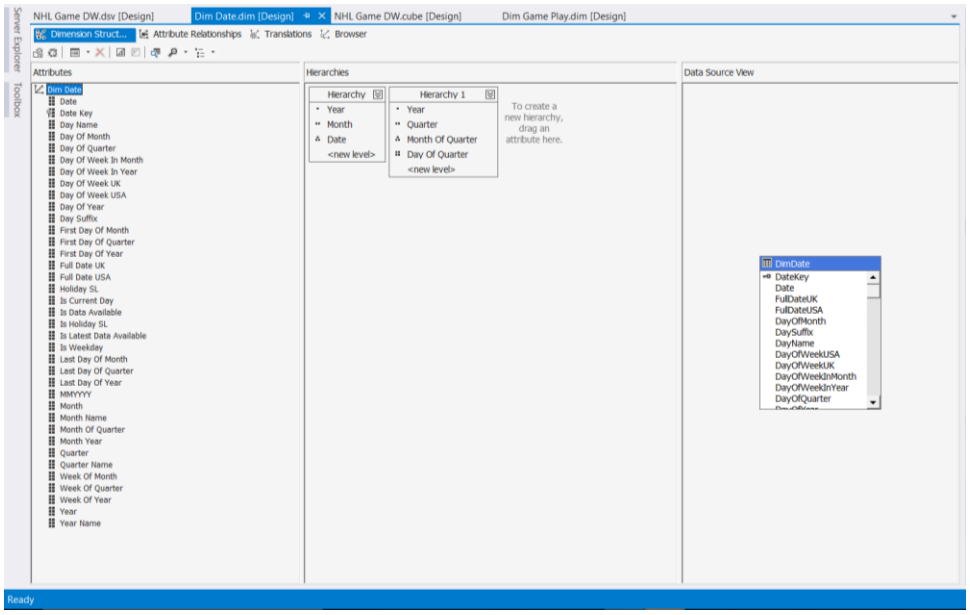


- As the next step a SSAS Cube is designed using necessary measures in the FactGamePlayerStats. Hierarchies are created for the Date Dimension (DimDate) and Game Play Dimension (DimGameplay). There are two hierarchies for the Date Dimension and one hierarchy for the Game Play Dimension.

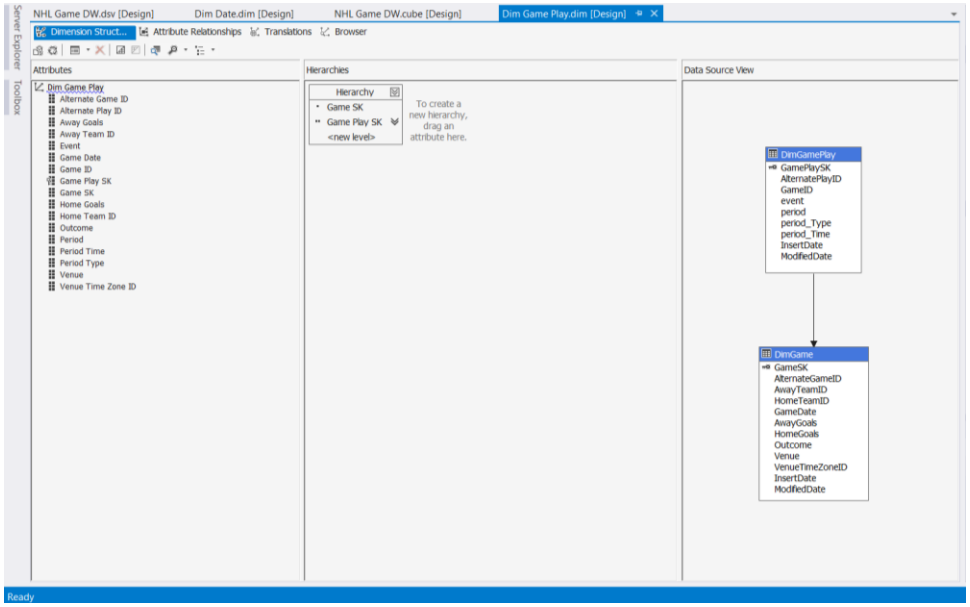
    - hierarchy 01 of Date Dimension – Year > Month > Date
    - hierarchy 02 of Date Dimension – Year > Quarter > Month of Quarter > Day of Quarter
    - hierarchy 01 of Game Play Dimension – GameSK > GamePlaySK



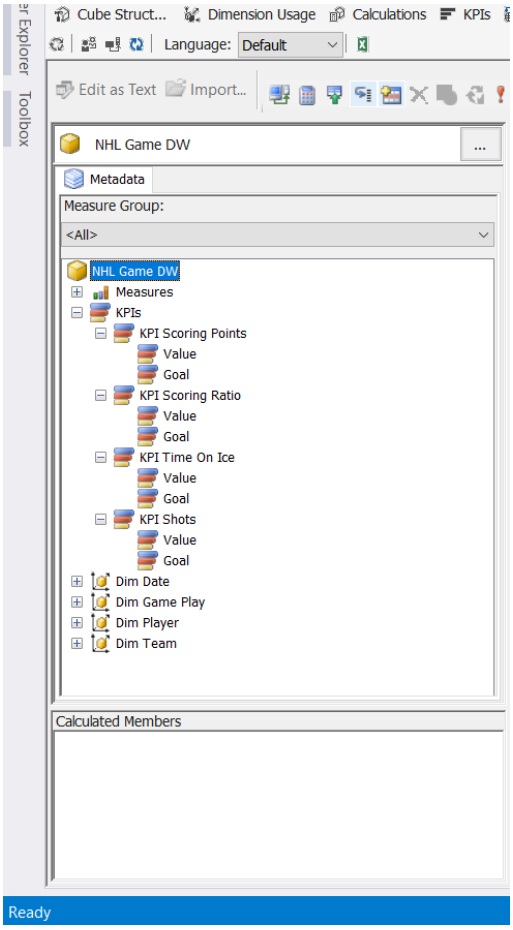
Hierarchies created for the Date Dimension.



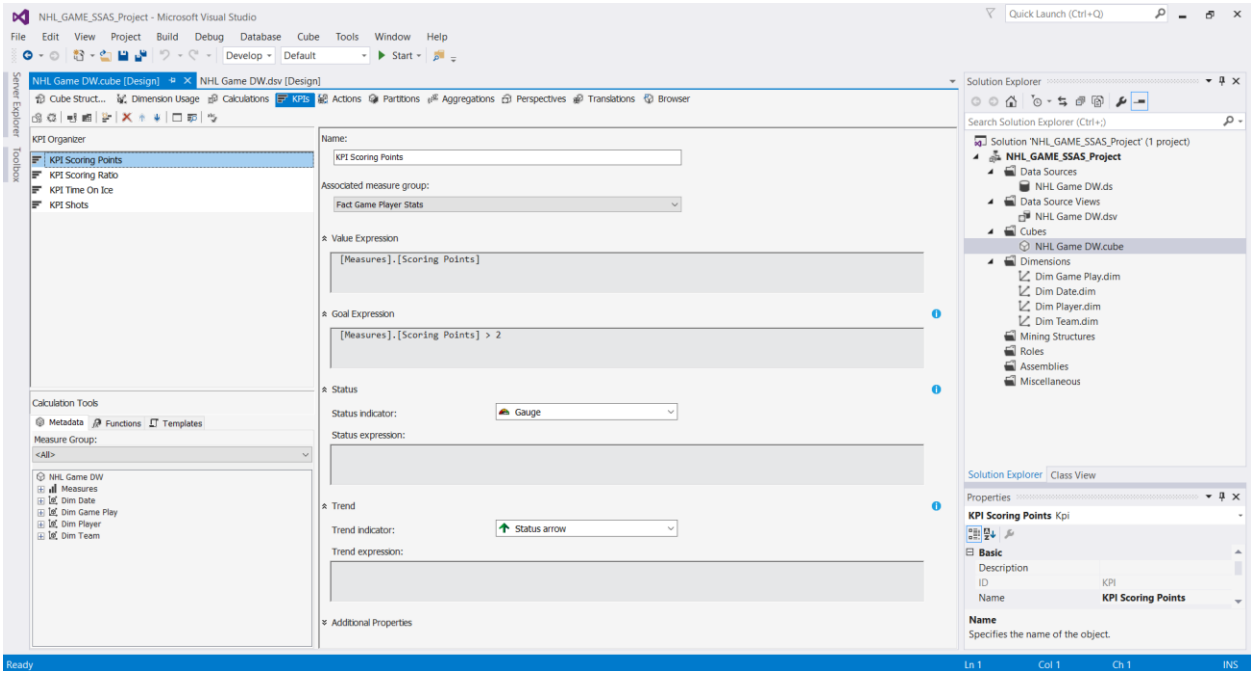
Hierarchies created for the Game Play Dimension.



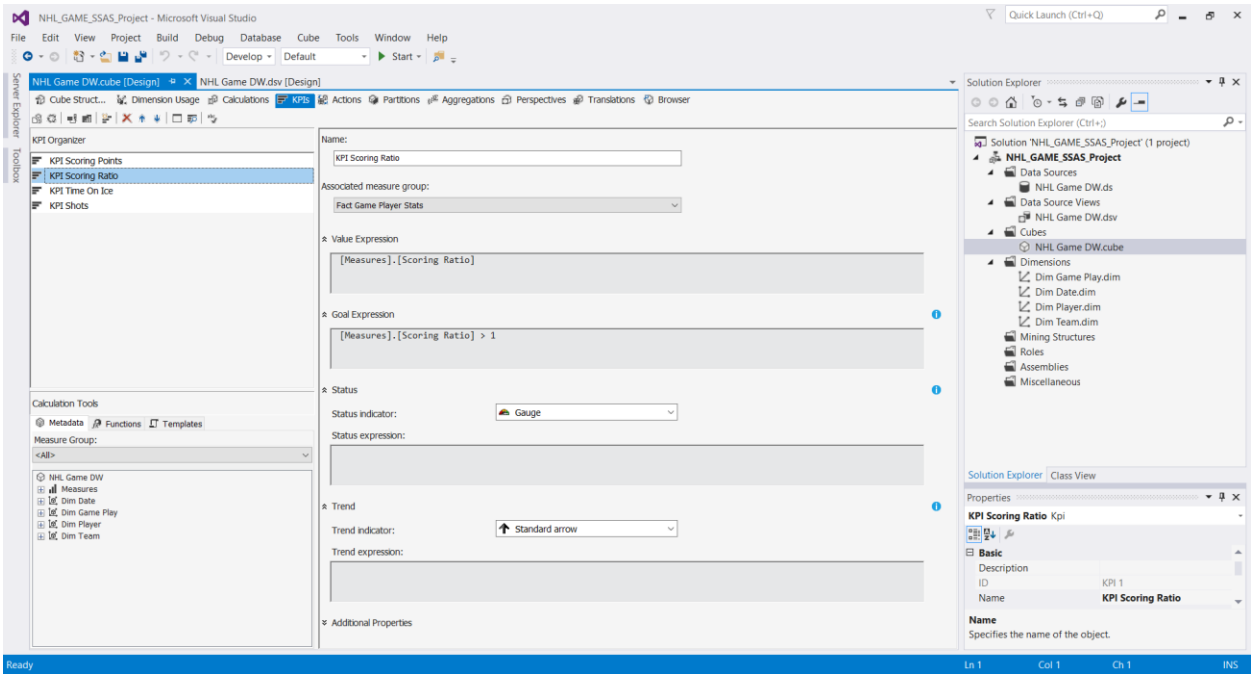
KPIs are created using the measures of the NHL Game DW Cube (SSAS Cube)



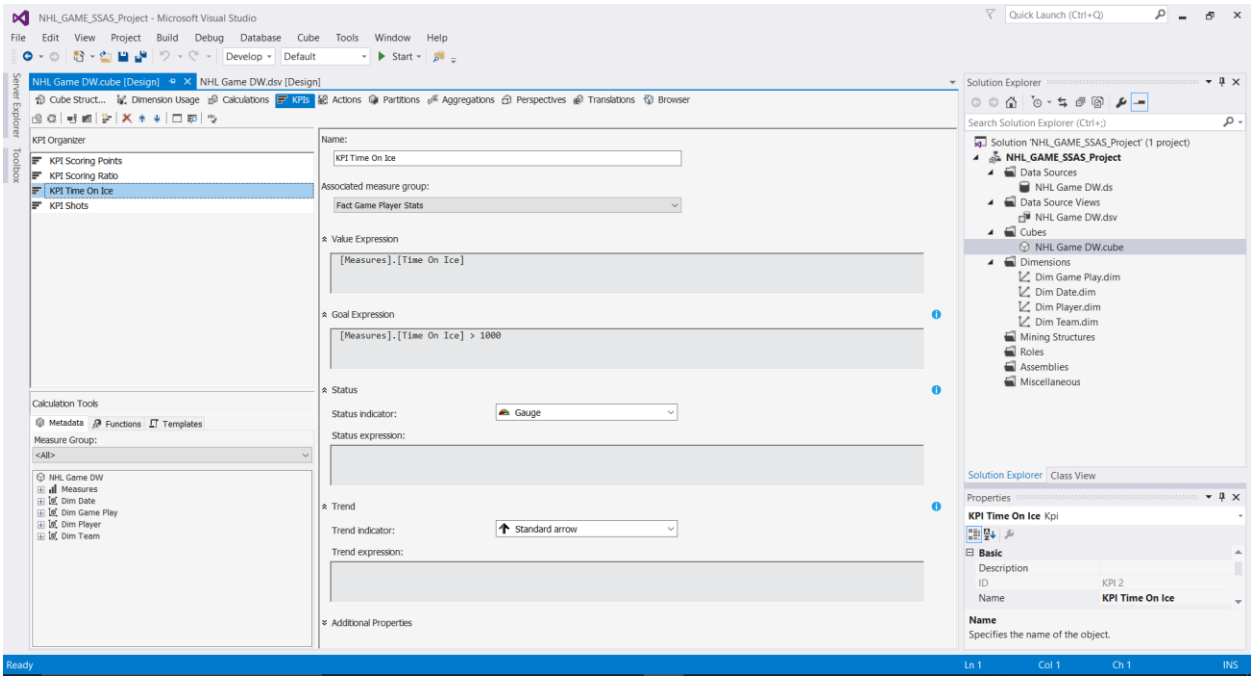
KPI Scoring Points



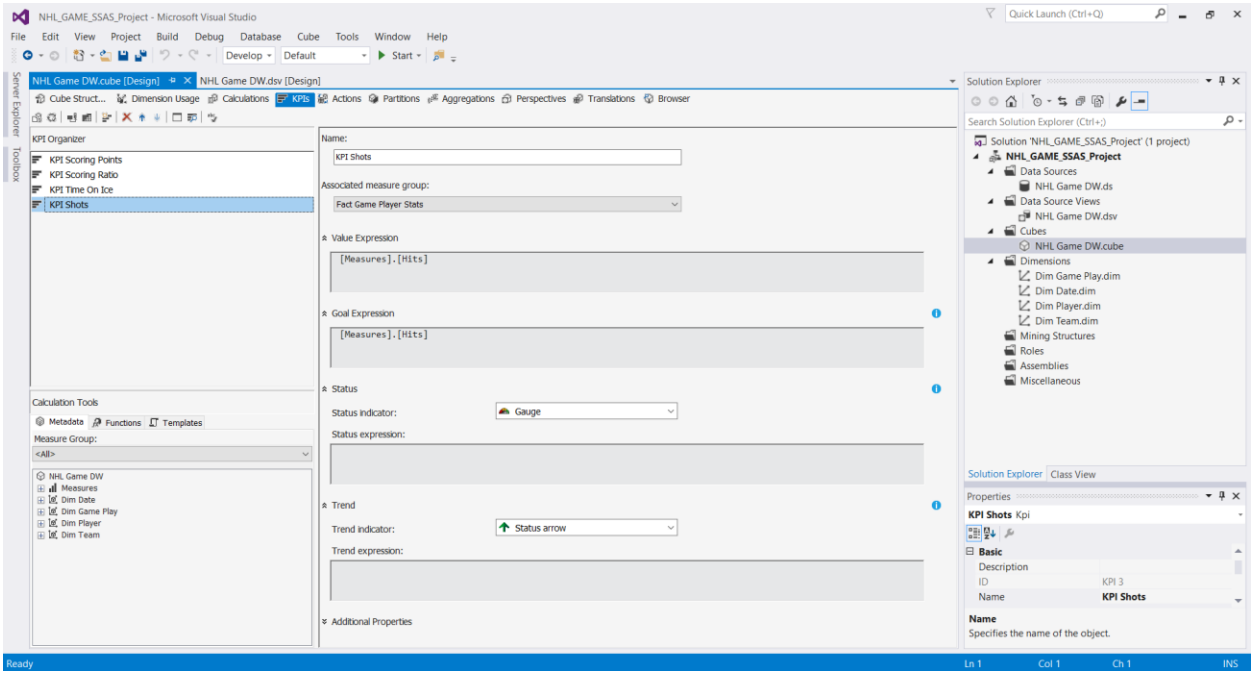
KPI Scoring Ratio



KPI Time On Ice



KPI Shots

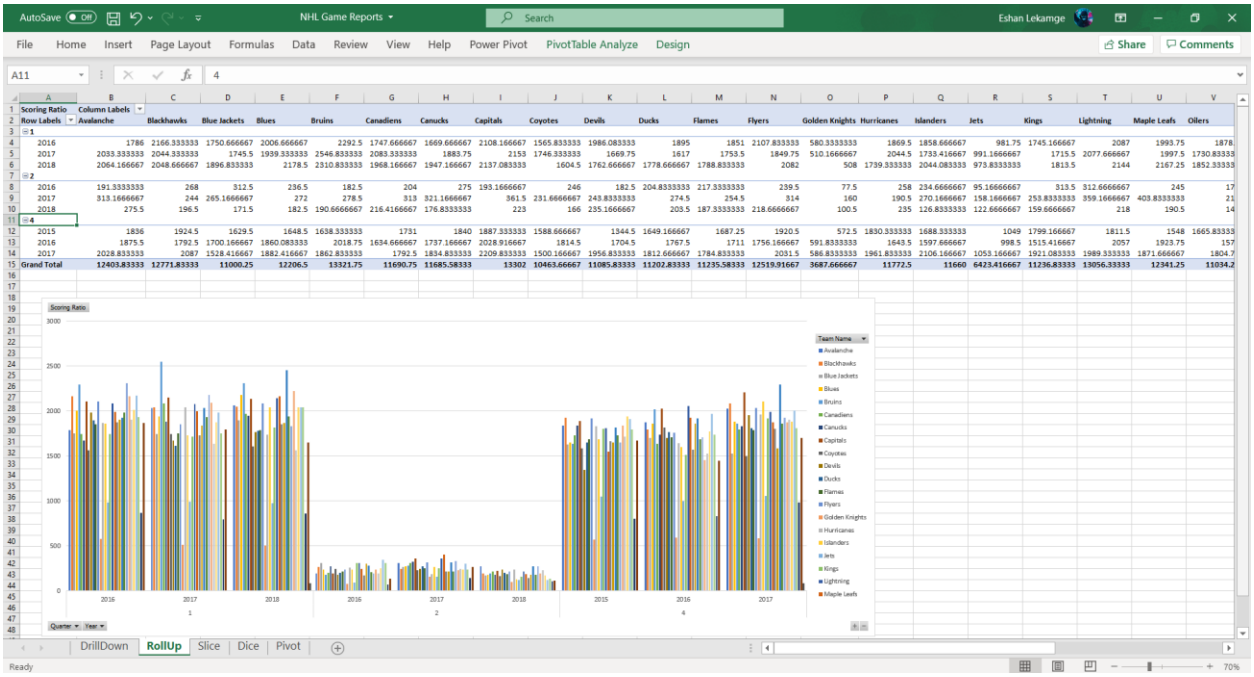

NHL_GAME_SSAS_Project - Microsoft Visual Studio
File Edit View Project Build Debug Database Cube Tools Window Help
Develop Default Start
NHL Game DW.cube [Design]
NHL Game DW.dsv [Design]
Cube Struct... Dimension Usage Calculations KPIs Actions Partitions Aggregations Perspectives Translations Browser
KPI Organizer
KPI Scoring Points
KPI Scoring Ratio
KPI Time On Ice
KPI Shots
Name:
KPI Shots
Associated measure group:
Fact Game Player Stats
Value Expression
[Measures].[Hits]
Goal Expression
[Measures].[Hits]
Status
Status indicator:
Gauge
Status expression:
Trend
Trend indicator:
Status arrow
Trend expression:
Additional Properties
Calculation Tools
Metadata Functions Templates
Measure Group:
<All>
NHL Game DW
Measures
Dim Date
Dim Game Play
Dim Player
Dim Team
Solution Explorer
Search Solution Explorer (Ctrl+;)
Solution 'NHL_GAME_SSAS_Project' (1 project)
NHL_GAME_SSAS_Project
Data Sources
NHL Game DW.ds
Data Source Views
NHL Game DW.dsv
Cubes
NHL Game DW.cube
Dimensions
Dim Game Play.dim
Dim Date.dim
Dim Player.dim
Dim Team.dim
Mining Structures
Roles
Assemblies
Miscellaneous
Solution Explorer Class View
Properties
KPI Shots Kpi
Basic
Description
ID KPI 3
Name KPI Shots
Name
Specifies the name of the object.
Ready
Ln 1 Col 1 Ch 1 INS

Step 3: Demonstration of OLAP operations

The excel workbook is connected to the SSAS database and the cube. The Analysis Service is connected as a data Source to the excel workbook without using MDX Queries.

1.Roll-up

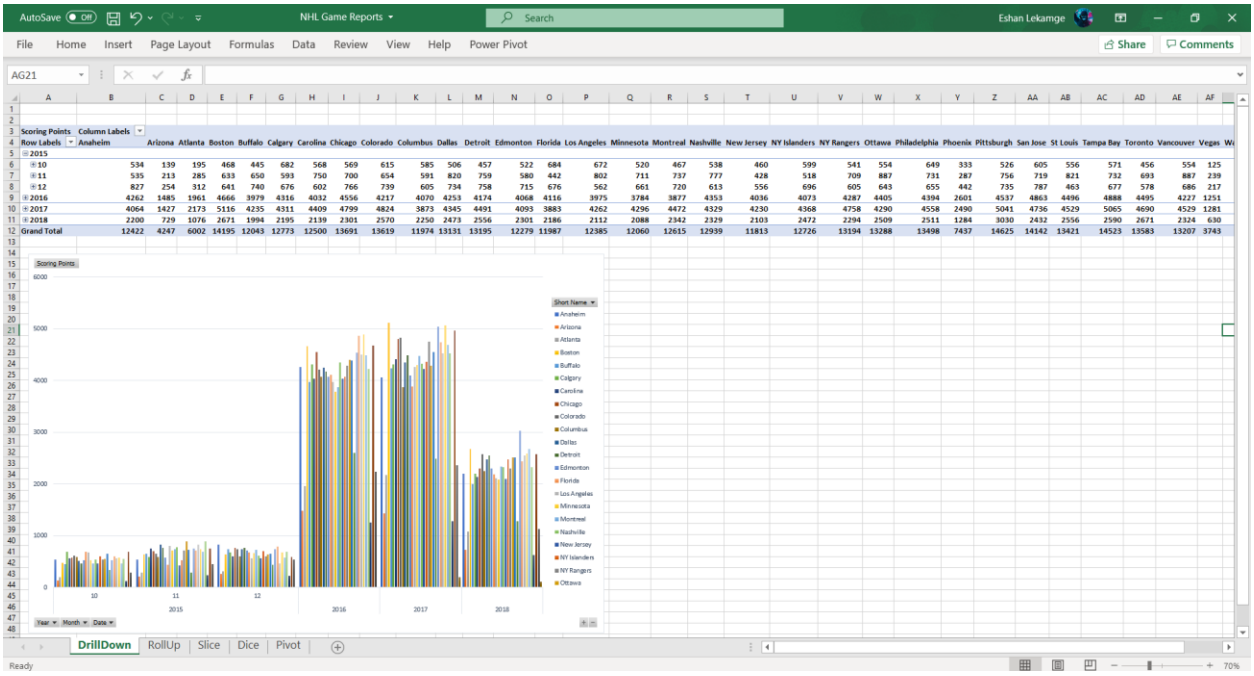
- Climbing up a hierarchy of a dimension to aggregate data means the Rollup.



In above sheet Total Scoring Ratio of each Team is displayed for each year. Year is the top level of the hierarchy. The report will display the Quarter-wise Scoring Ratio and it can be rolled up to display year-wise Scoring Ratio.

2.Drill-Down

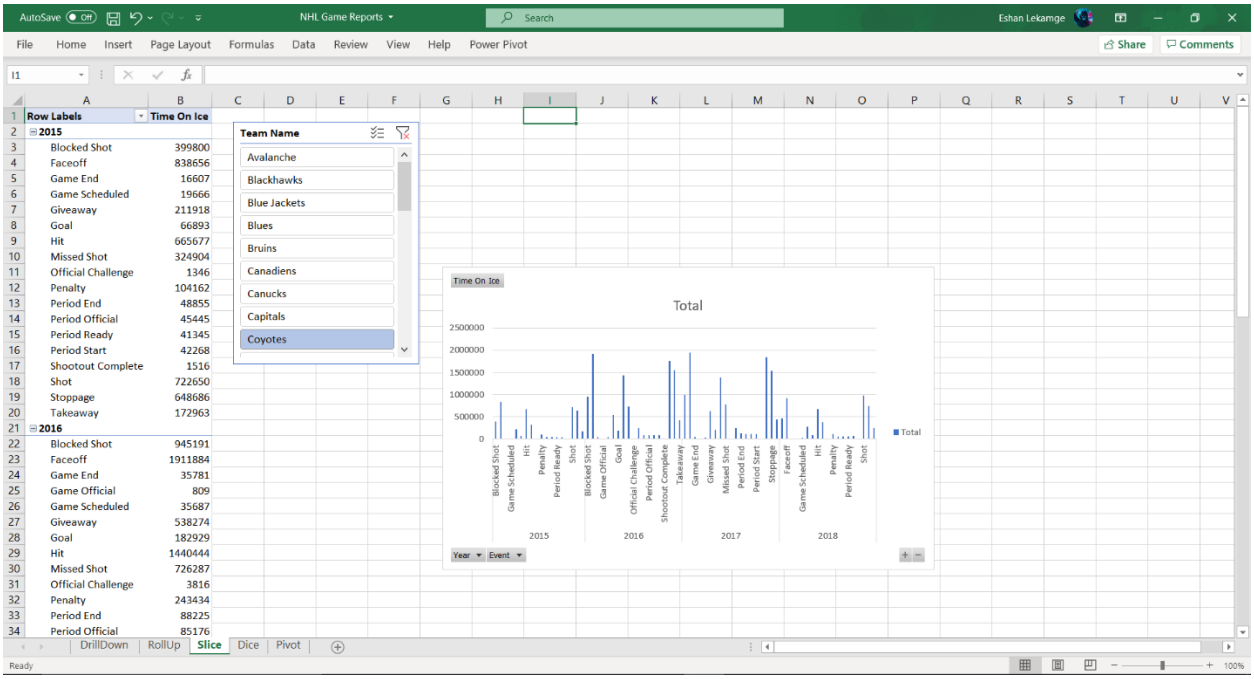
- Stepping down a hierarchy of a dimension allowing navigation through details means the Drill-down.



In above sheet Total Scoring Points of each Team is displayed for each year. Year is the top level of the hierarchy. The report will display the Year-wise Scoring points initially and it can be drilled down to display month-wise Scoring points and can drill down another level to see date-wise Scoring points.

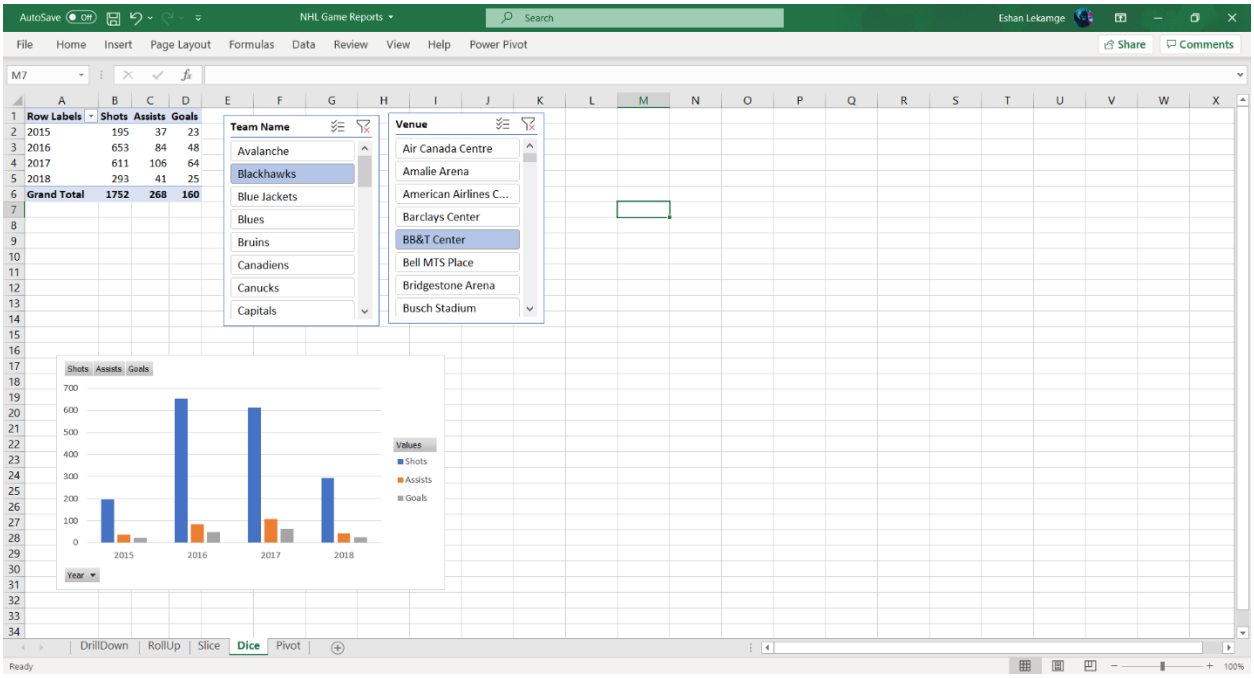
(hierarchy = Year > Month > date)

3.Slice



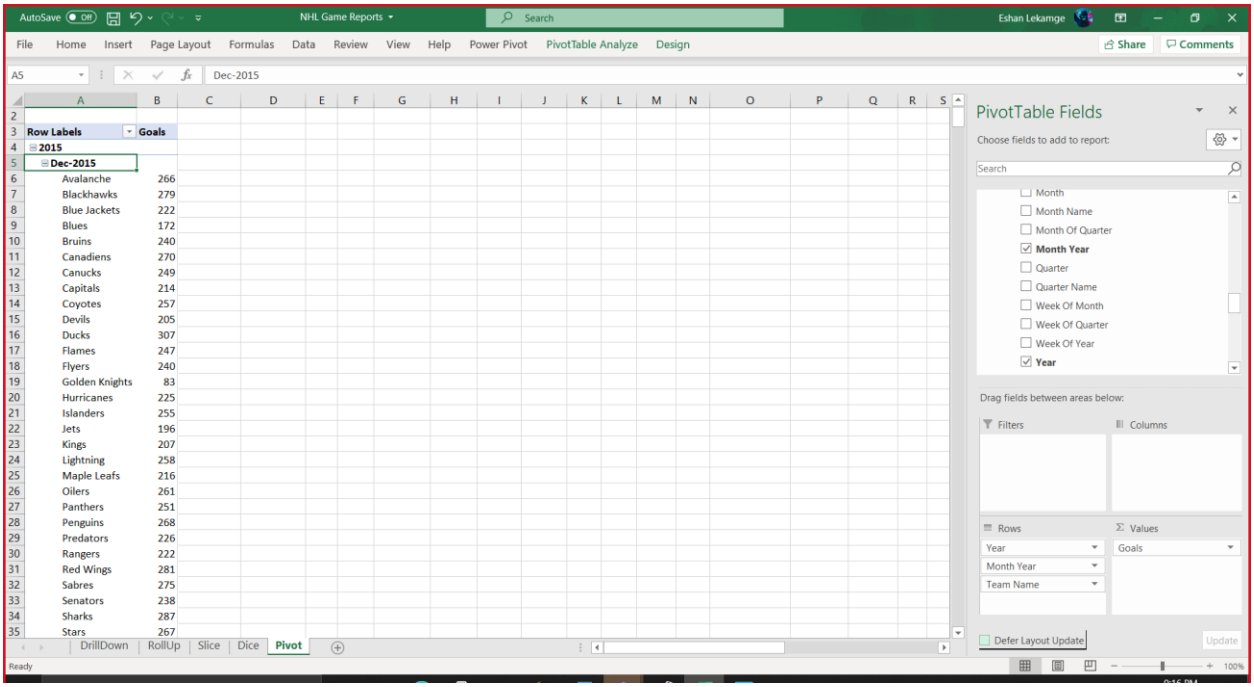
In above sheet Total Time on Ice of each event is displayed for each year. A Slicer is created using the Team Names. A team name or set of team names can be selected from the slicer and the report will display the Team-wise time on Ice for each event of each year (Sliced by the Team name).

4.Dice

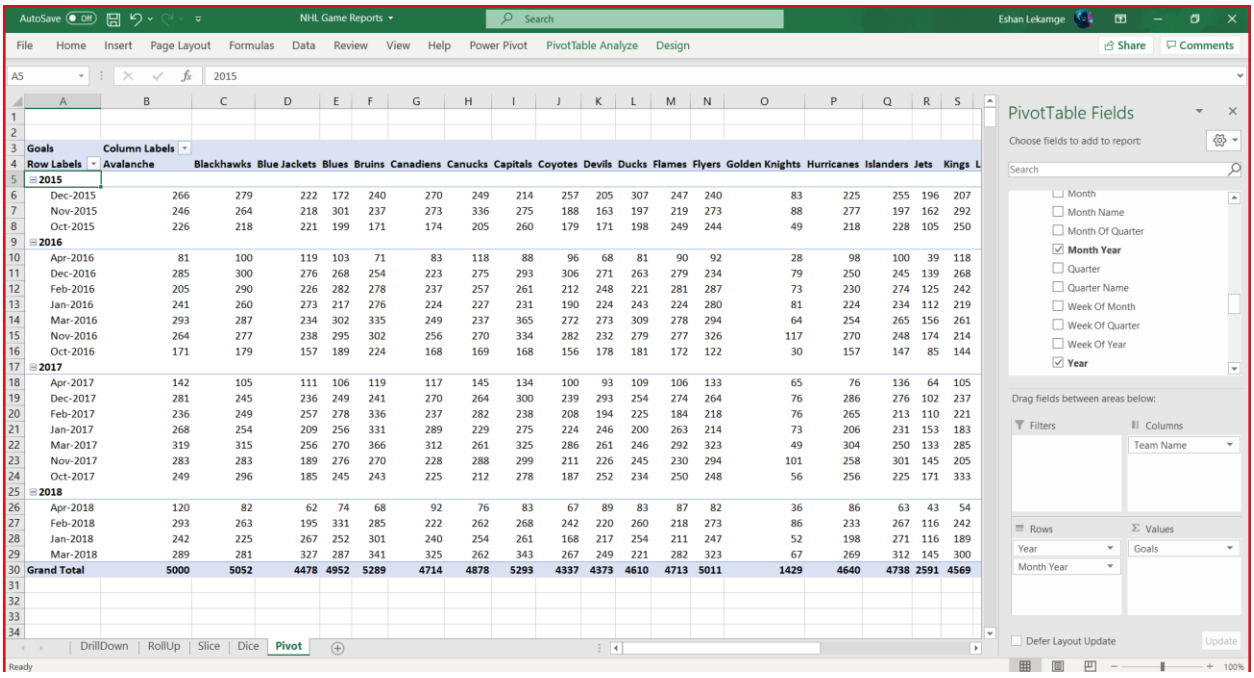


In above sheet Total number of shots, assists and goals for each year is displayed. Two Slicers are created using Team Names and Venues. A team name or set of team names can be selected from the Team Name slicer and a venue or set of venues can be selected from the Venue slicer and the report will display Goals, Shots and Assists for each year sliced by Team name and Venue.

5.Pivot



Row Labels	Goals
2015	
Dec-2015	
Avalanche	266
Blackhawks	279
Blue Jackets	222
Blues	172
Bruins	240
Canadiens	270
Canucks	249
Capitals	214
Coyotes	257
Devils	205
Ducks	307
Flames	247
Flyers	240
Golden Knights	83
Hurricanes	225
Islanders	255
Jets	196
Kings	207
Lightning	258
Maple Leafs	216
Oilers	261
Panthers	251
Penguins	268
Predators	226
Rangers	222
Red Wings	281
Sabres	275
Senators	238
Sharks	287
Stars	267

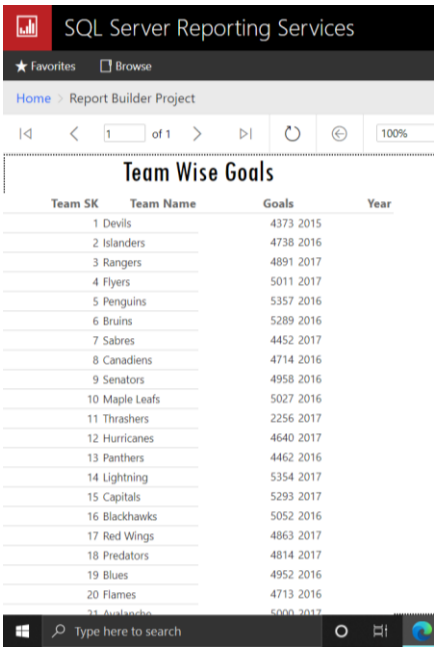


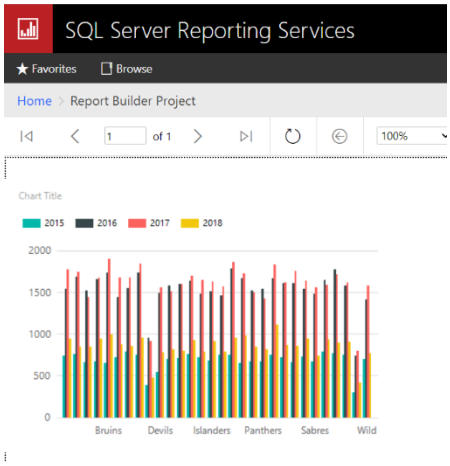
Goals	Column Labels																			
Row Labels	Avalanche	Blackhawks	Blue Jackets	Blues	Bruins	Canadiens	Canucks	Capitals	Coyotes	Devils	Ducks	Flames	Flyers	Golden Knights	Hurricanes	Islanders	Jets	Kings	L
2015																			
Dec-2015	266	279	222	172	240	270	249	214	257	205	307	247	240	83	225	255	196	207	
Nov-2015	246	264	218	301	237	273	336	275	188	163	197	219	273	88	277	197	162	292	
Oct-2015	226	218	221	199	171	174	205	260	179	171	198	249	244	49	218	228	105	250	
2016																			
Apr-2016	81	100	119	103	71	83	118	88	96	68	81	90	92	28	98	100	39	118	
Dec-2016	285	300	276	268	254	223	275	293	306	271	263	279	234	79	250	245	139	268	
Feb-2016	205	290	226	282	278	237	257	261	212	248	221	281	287	73	230	274	125	242	
Jan-2016	241	260	273	217	276	224	227	231	190	224	243	224	280	81	224	234	112	219	
Mar-2016	293	287	234	302	335	249	237	365	272	273	309	278	294	64	254	265	156	261	
Nov-2016	264	277	238	295	302	256	270	334	282	232	279	277	326	117	270	248	174	214	
Oct-2016	171	179	157	189	224	168	169	168	156	178	181	172	122	30	157	147	85	144	
2017																			
Apr-2017	142	105	111	106	119	117	145	134	100	93	109	106	133	65	76	136	64	105	
Dec-2017	281	245	236	249	241	270	264	300	239	293	254	274	264	76	286	276	102	237	
Feb-2017	236	249	257	278	336	237	282	238	208	194	225	184	218	76	265	213	110	221	
Jan-2017	268	254	209	256	331	289	229	275	224	246	200	263	214	73	206	231	153	183	
Mar-2017	319	315	256	270	366	312	261	325	286	261	246	292	323	49	304	250	133	285	
Nov-2017	283	283	189	276	270	228	288	299	211	226	245	230	294	101	258	301	145	205	
Oct-2017	249	296	185	245	243	225	212	278	187	252	234	250	248	56	256	225	171	333	
2018																			
Apr-2018	120	82	62	74	68	92	76	83	67	89	83	87	82	36	86	63	43	54	
Feb-2018	293	263	195	331	285	222	262	268	242	220	260	218	273	86	233	267	116	242	
Jan-2018	242	225	267	252	301	240	254	261	168	217	254	211	247	52	198	271	116	189	
Mar-2018	289	281	327	287	341	325	262	343	267	249	221	282	323	67	269	312	145	300	
Grand Total	5000	5052	4478	4952	5289	4714	4878	5293	4337	4373	4610	4713	5011	1429	4640	4738	2591	4569	

The column fields are not categorized into sub fields. The data axis can be rotated to display the data in various ways.

Step 4: SSRS Reports

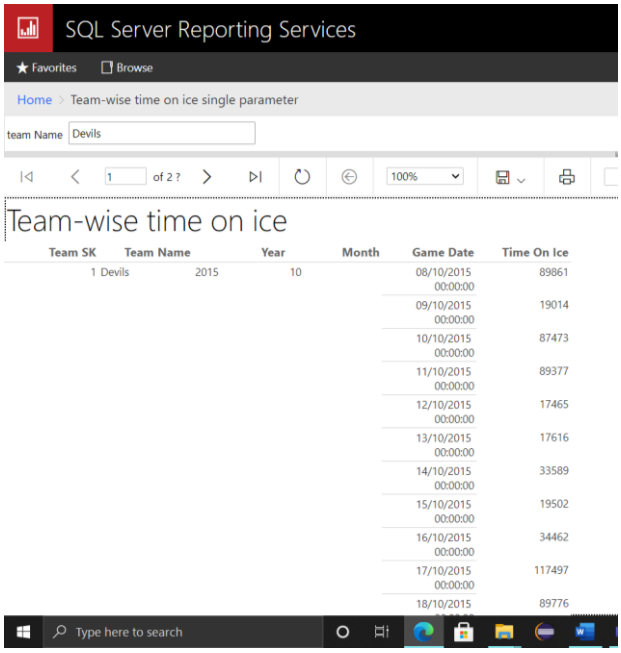
1.Matrix Report

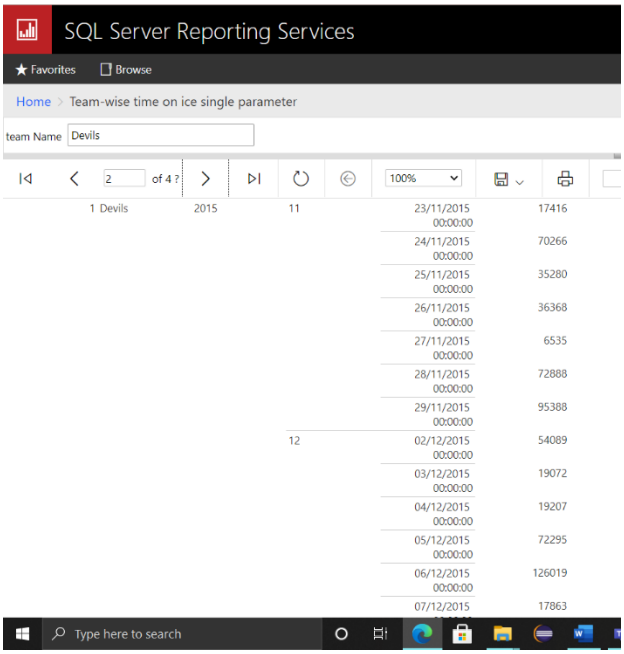


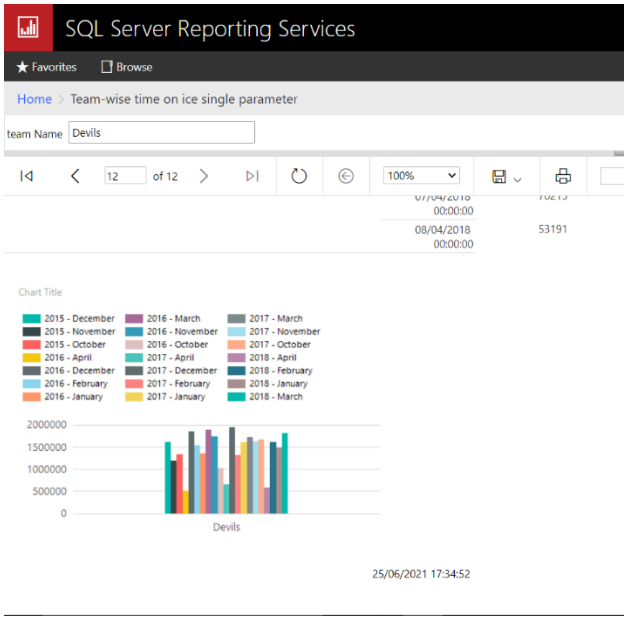


The above report displays Team-wise goals per each year. The graph shows Surrogate Key of each team, Team Name and Total number of goals per each year.

2. Parameterized Report





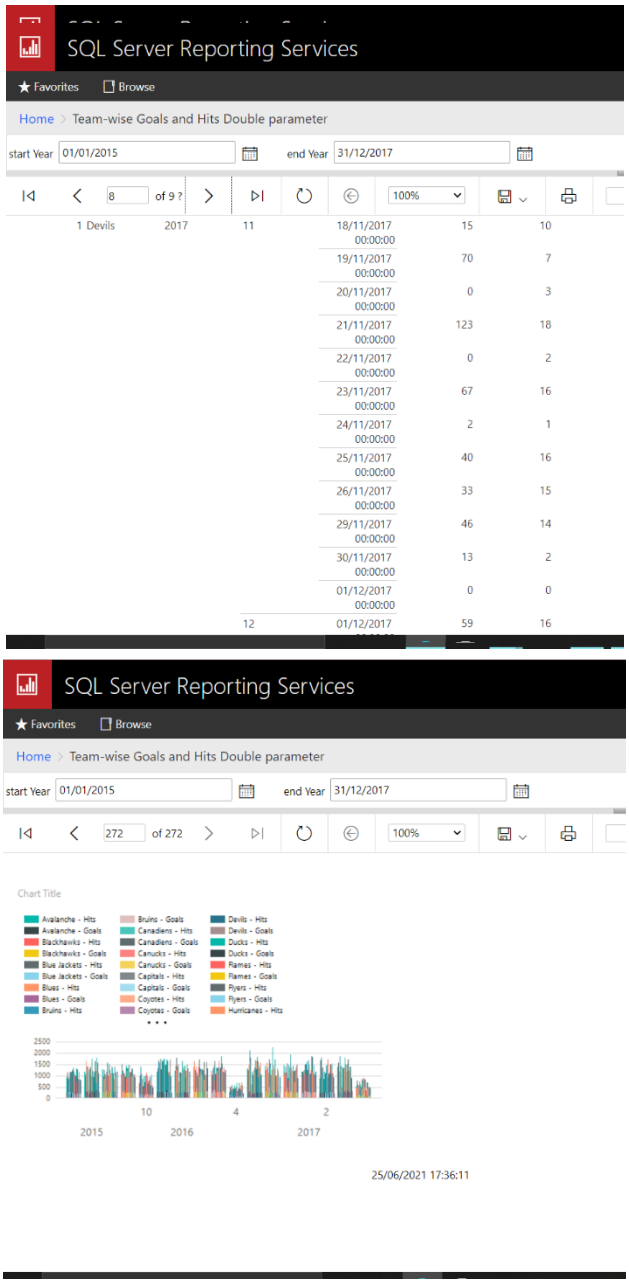


A simple parameter is added to the data set in order to fliter the result of the report using the below sql command.

where dt.TeamName = @teamName

A parameter will be created as teamName. The viewer will be able to enter the team name to get the Team-wise time on ice per each year. The report will display Team-wise total time on ice (Amount of time a player played) per year for the given team name.

3. Multi-Parameter Report

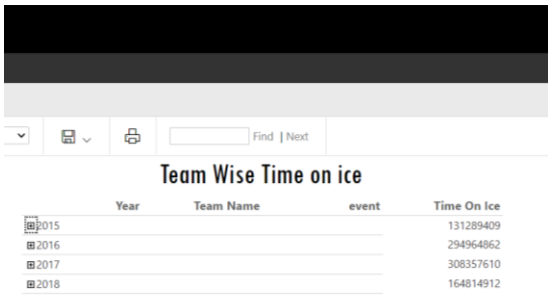


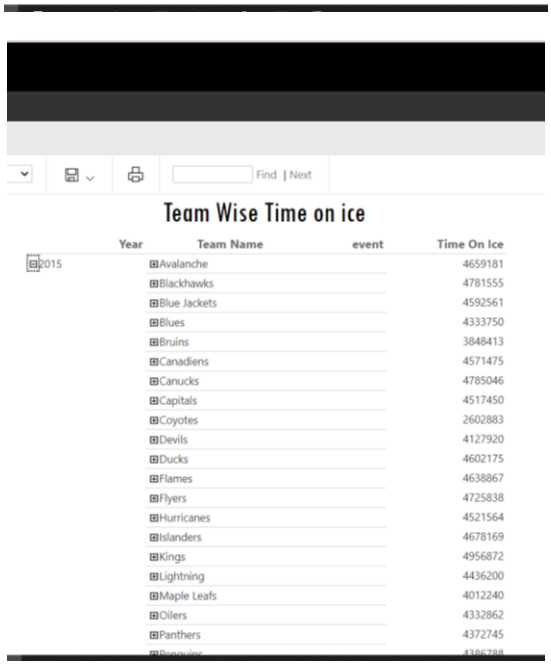
Two parametera are added to the data set in order to fliter the result of the report using the below sql command.

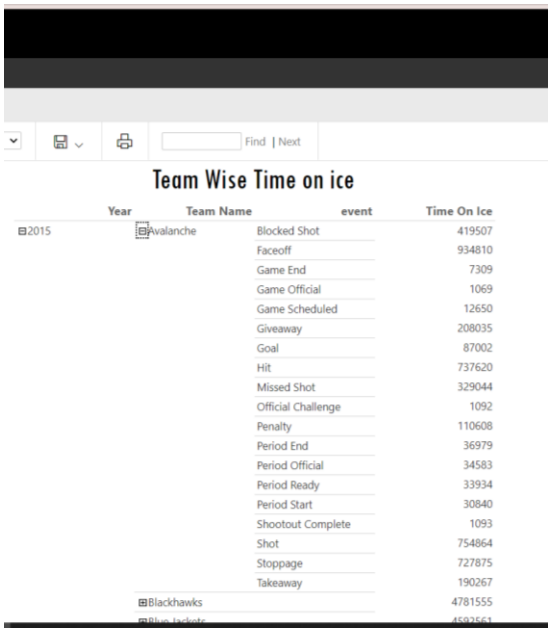
where dd.Year between @startYear and @endYear

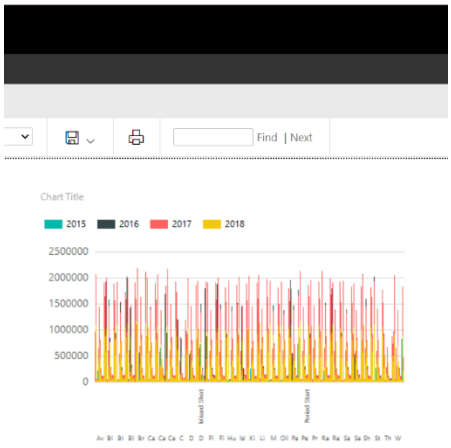
Two parameters will be created as startYear and endYear. The user will be able to enter two years to filter the result of the Report. As an example a user can enter 2015/01/01 as the starting year and 2017/12/31 as the ending year. The report will display the Team-wise goals and hits between 2015/01/01 to 2017/12/31.

4. Drill-Down Report



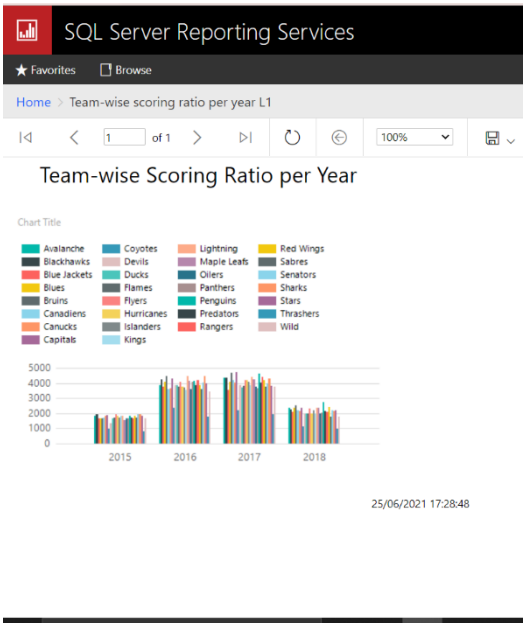




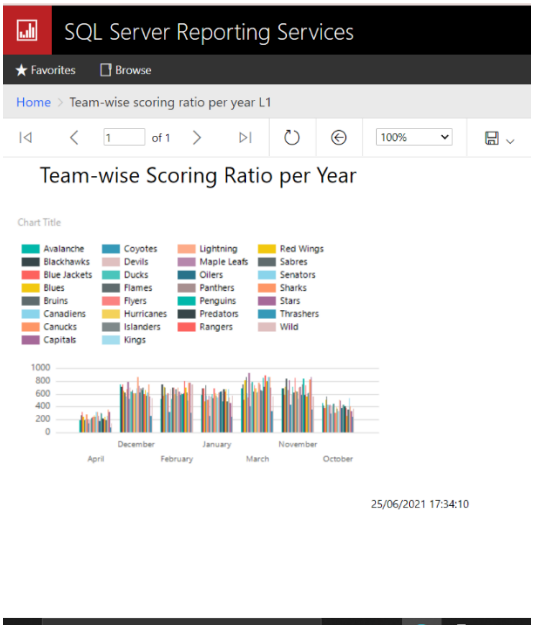


The above report initially displays the total time on ice of all the teams per each year. It can be drilled down one level and the report will display the total time on ice of each team, furthermore it can be drilled down to another level which will display the total time on ice of each team per each event held on the year. The drill down can be enabled when creating the report by ticking the expand/collapse groups.

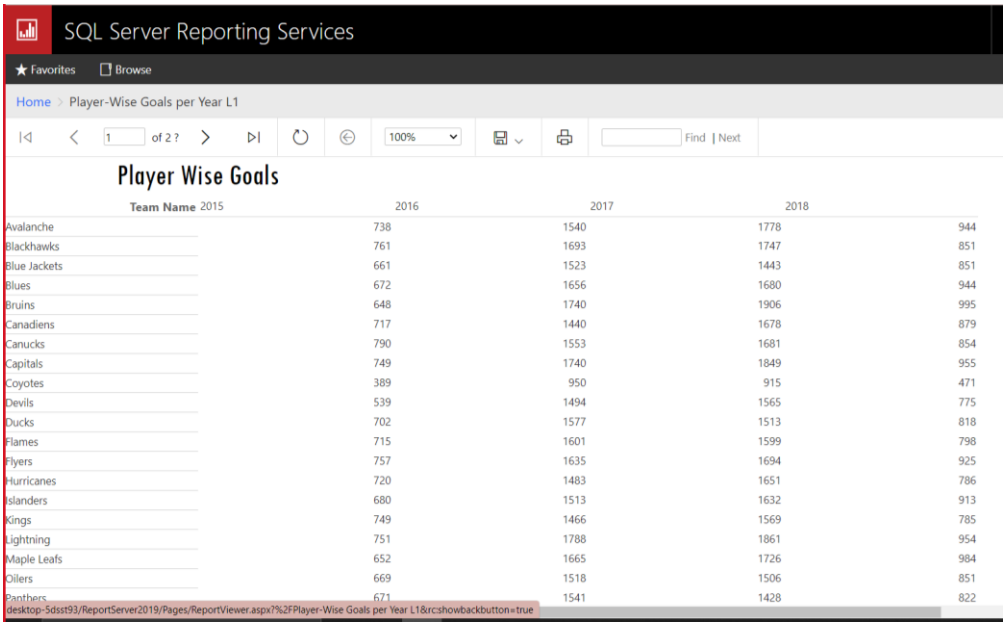
5. Drill-Through Report



The above report displays Team-Wise Scoring Ratio per year. By clicking on a bar which belongs to a particular year it will display another report which has Team-Wise Scoring Ratio per month of the particular selected year.



The Drill-Through report is generated using a hidden parameter. 2nd level report has the parameter. When clicking on a bar belongs to a specific year the year will be passed to the 2nd level parameter and the report will be generated according to the parameter value. As an example, if the year 2017 bar is selected, the level 2 report will display the data according to the months of year 2017.



The above report displays Team-Wise goals per year. By clicking on a team name, it will display another report which has player-Wise goals per year of that particular team.