Sri Lanka Institute of Information Technology

Data Warehousing and Business Intelligence
(IT3021)

Loan Data for Dummy Bank
Assignment 2

IT20201678
Sandarangi R.M.N
Y3S1 Group 5.2
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(DS – Weekday)

Step 1: Data source for the assignment 2

DataWarehouse:

- Dummy_BankLoan_DW

Dimension Tables:

- dbo.DimBank
- dbo.DimBorrower → This is the slowly changing dimension.
- dbo.DimDate
- dbo.DimDisbursementMethod
- dbo.DimLoanDetails
- dbo.DimLoanPurpose

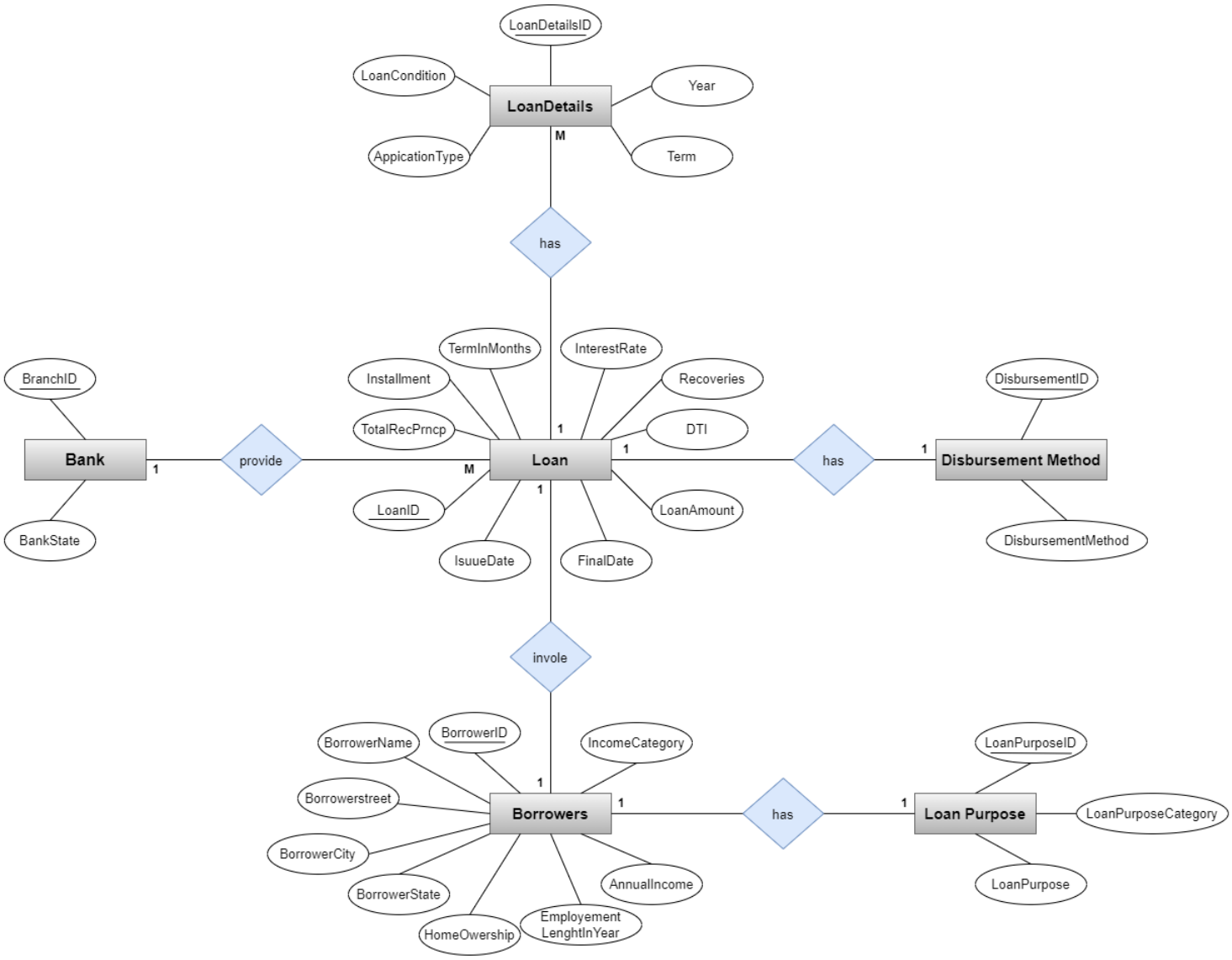
Fact Table:

- dbo.FactLoan

Hierarchies:

- DimDate hierarchical breakdown from Year, Quarter, Week, Date
- DimBorrower hierarchical breakdown from BorrowerState, BorrowerCity, BorrowerStreet

ER Diagram


LoanDetailsID
LoanCondition
LoanDetails
Year
AppicationType
Term
M
has
TermInMonths
InterestRate
BranchID
Installment
Recoveries
DisbursementID
TotalRecPrncp
DTI
1
Bank
provide
Loan
has
Disbursement Method
1
M
1
1
1
LoanID
LoanAmount
BankState
IsuueDate
FinalDate
DisbursementMethod
invole
BorrowerName
BorrowerID
IncomeCategory
LoanPurposeID
1
Borrowerstreet
Borrowers
has
Loan Purpose
LoanPurposeCategory
BorrowerCity
BorrowerState
AnnualIncome
HomeOwership
Employement
LenghtInYear
LoanPurpose

Step 2: SSAS Cube implementation

STEPS:

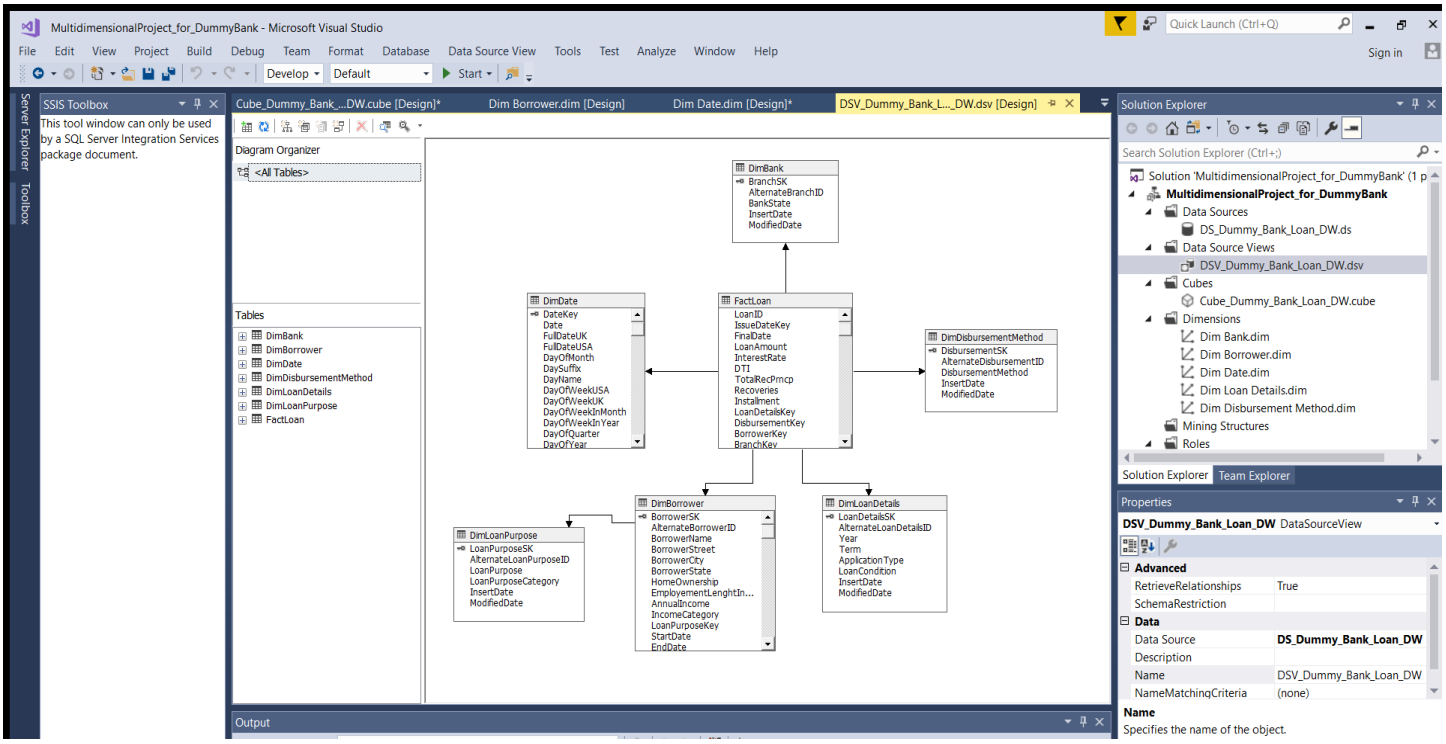
- First, Open the SQL Server Data Tools.
- Create Analysis Services Multidimensional and Data Mining Project named **"MultidimensionalProject_for_DummyBank."**

Creating Data Source

- Right Click on the Data Sources and select Add New Data Source. Then it will prompt a Data Source Wizard and click on next to continue.
- Select the previously created Data warehouse to create a cube in SSAS.
- Then provide the correct Windows Username and Password.
- Give the data source name; '**DS_Dummy_Bank_DW'** and finish the process.

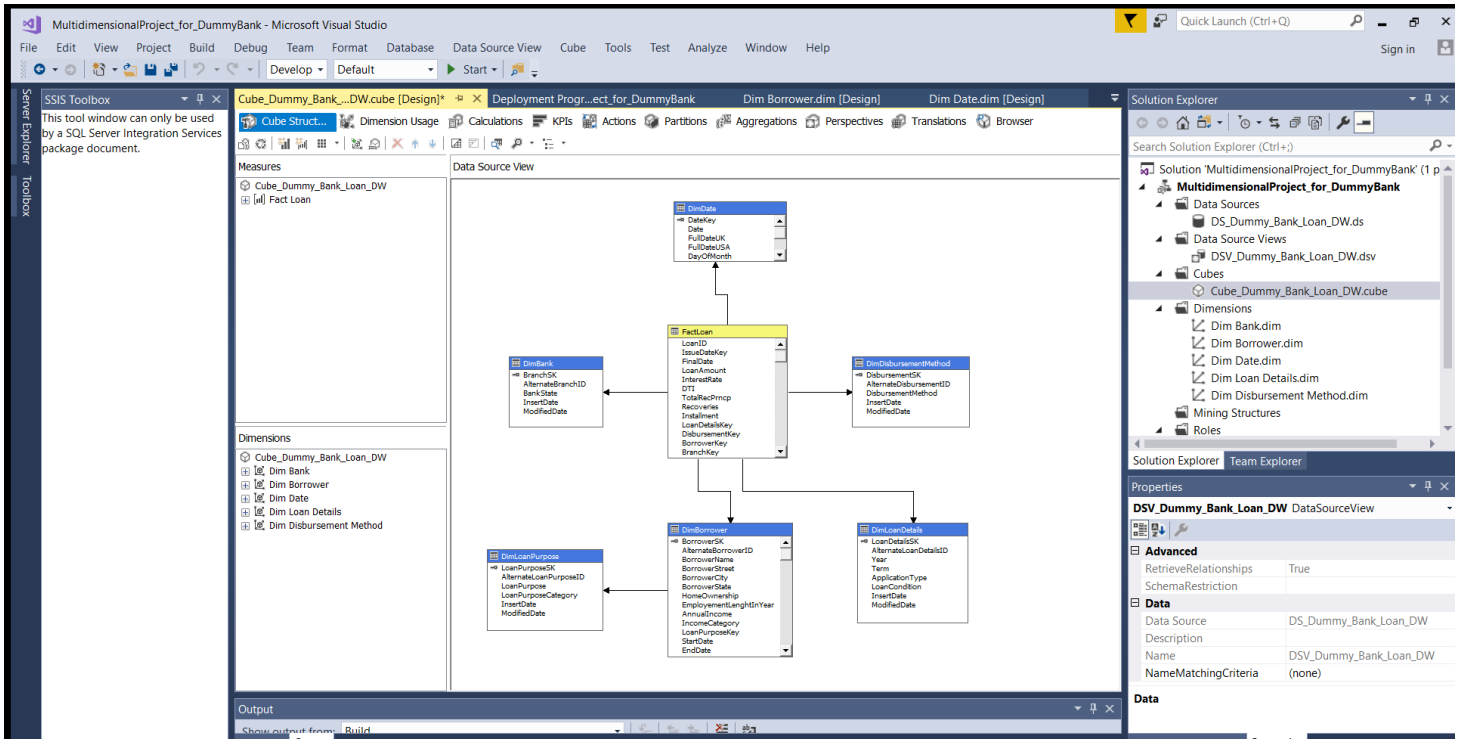
Creating Data Source View

- Right click on Data Source Views and select New Data Source View.
- In the Select a Data Source page, select the data source that created under the Data source.
- Select the Same key as primary key option and click on Next.
- In the Select Tables and Views page, first click on '**dbo.FactLoan'**and click on "<" button to move it to the Included objects window. Then click on **"Add Related Tables**" button.
- Provide a data source view naming that '**DSV_Dummy_Loan_DW'** and finish.
- The tables are connected in the design view once completed.



Creating the Cube

- Right click on Cubes and select New Cube.
- In the Cube Wizard, click on the Next.
- In the Select Creation Method page, select Use existing tables option and click Next.
- In the Select Measure Group Tables page, select the data source view called '**DSV_Dummy_Bank_DW'** from the dropdown list.
- Select '**FactLoan'** and click Next.
- In the Select Measures page, select all the Measure fields and click Next.
- In the Select New Dimensions page, select all the dimension tables and click Next.
- Provide a cube name; '**Cube_Dummy_Bank_DW'** and click Finish.
- It displays the same snowflake schema is built as a cube.

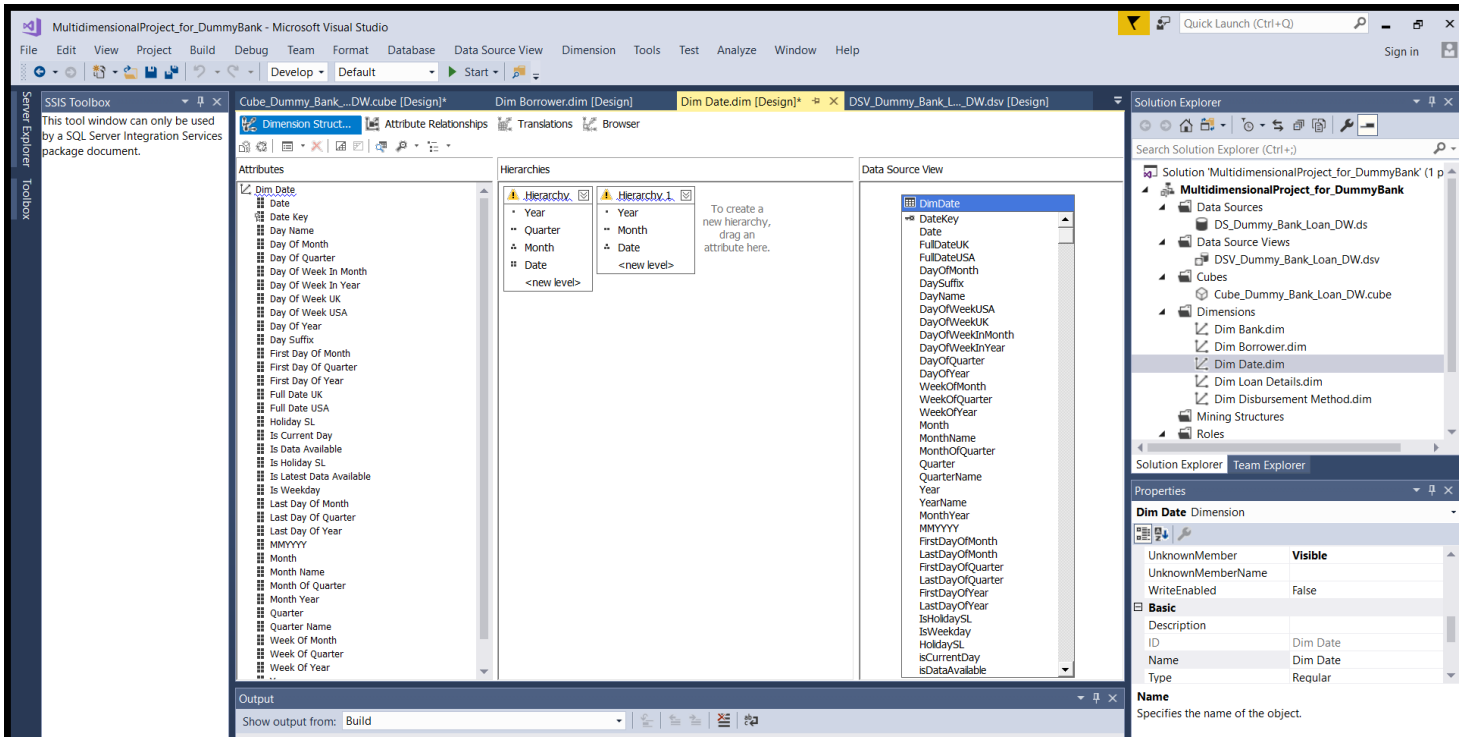


Creating Hierarchy

DimDate

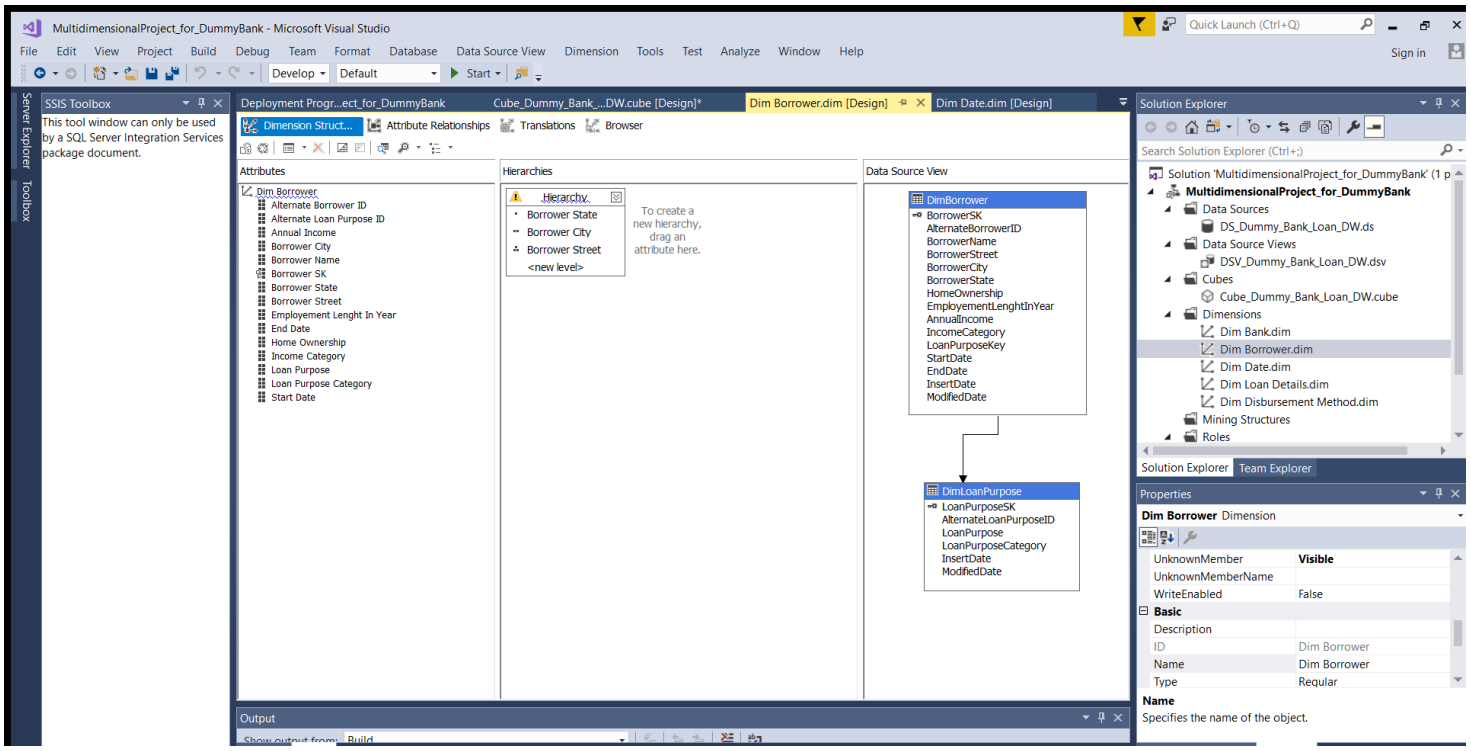
- In Dimension editor window for ‘DimDate’, drag and drop the attributes to Hierarchy window to create hierarchies.

- In ‘DimDate’ Created Two hierarchies,
  - ✓ **Year => Quarter => Month => Date**
  - ✓ **Year => Month => Date**



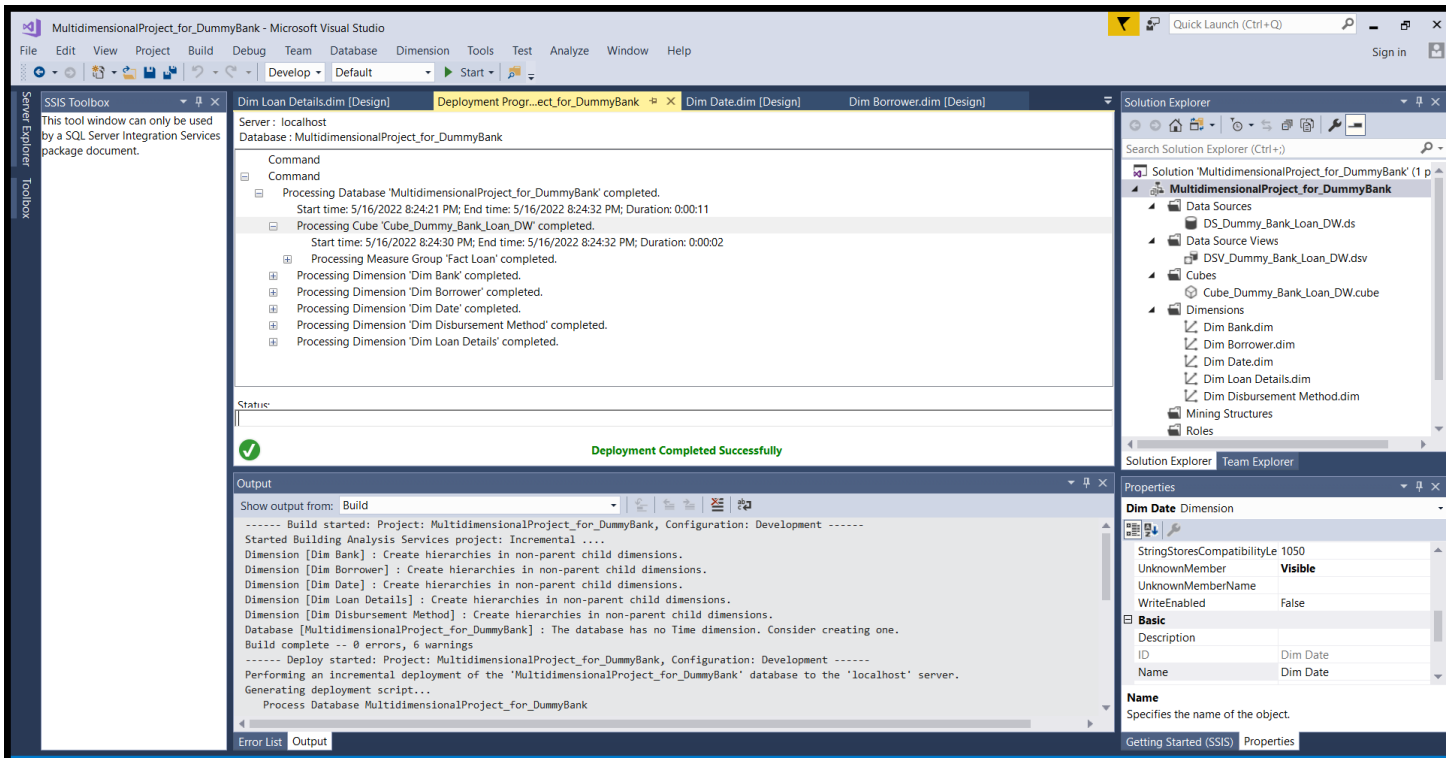
DimBorrower

- DimBorrower hierarchical breakdown from BorrState, BorrCity, BorrStreet



Deploying the Cube

- The Cube must be deployed to be used for analysis.
- Right click on the project name **MultidimensionalProject_for_DummyBank.**in solution explorer and click on Deploy.
- It will generate a pop-up window displaying the progress of the deployment.
- To check the deployment in SSMS, open SQL Server Management Studio, select Analysis Service and click on Connect.



Connecting Excel to SSAS Cube using a MDX Query

- To enable Power Pivot add-in for Excel, click File an Options.
- Go to Add-Ins tab and select COM Add-ins under Manage and click GO.
- In the COM Add-Ins window, select both Microsoft Office PowerPivot for Excel and Microsoft Office Power View for Excel options and click OK.
- A new tab named 'POWERPIVOT' is available in the Excel workbook now. Go to new tab 'POWERPIVOT' and click on Manage.
- Power Pivot for Excel <Excel Workbook Name> will open.
- In the Home tab of this new window, click on From Database -> From Analysis Services or Power Pivot.
- In the Table Import Wizard window, provide connection details to connect to SSAS Server.
- Provide the database name **MultidimensionalProject_for_DummyBank."**, test the connection, and click Next.
- In the next window, paste the MDX query copied, and click on Validate button to ensure there are no errors and click Finish.

Step 3: Demonstration of OLAP operations

Roll-up:

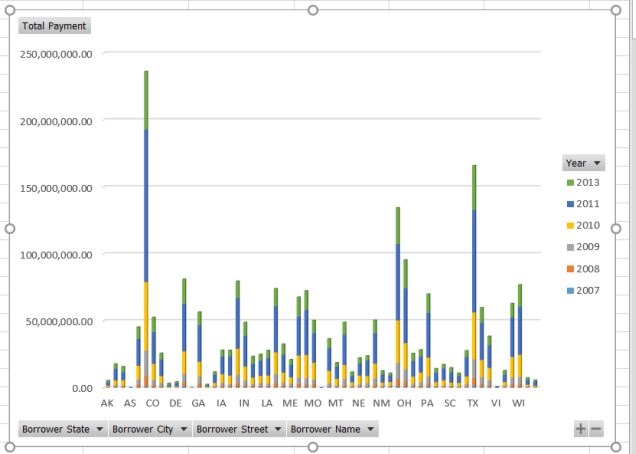
- Climbing up a hierarchy of a dimension to aggregate data.

Example from the project

- In the following it shows that the Hierarchy of Dim Borrower according to ROLL_UP

(BorrowerState<--BorrowerCity<--BorrowerStreet<--BorrowerName)

Total Payment	Column Labels						
Row Labels	2007	2008	2009	2010	2011	2013	Grand Total
AK	26,720.37	277,379.02	450,943.64	984,229.90	2,309,396.68	1,474,777.92	5,523,447.52
AL	131,317.93	598,324.80	1,598,267.90	3,258,876.29	8,727,919.24	3,587,156.64	17,901,862.80
AR	146,448.67	776,787.61	860,665.30	3,996,653.89	5,802,029.74	4,272,415.58	15,855,000.79
AS					86,947.82		86,947.82
AZ	480,014.25	2,025,158.34	3,800,797.20	10,207,134.33	20,145,056.60	8,780,446.95	45,438,607.68
CA	1,092,102.92	7,788,830.26	18,964,857.77	51,251,547.47	113,774,688.78	43,438,212.68	236,310,239.88
CO	475,913.94	1,589,317.97	3,828,903.29	12,147,349.06	23,706,381.30	10,898,553.16	52,646,418.73
CT	57,034.50	715,784.98	2,865,004.40	5,173,012.09	12,383,445.10	4,679,132.11	25,873,413.17
DC	8,827.44	61,778.46	136,729.99	712,880.74	1,446,325.35	1,040,280.53	3,406,822.51
DE	22,266.97	221,139.62	213,688.40	586,587.12	2,512,899.57	1,073,178.16	4,629,759.84
FL	1,028,673.47	2,890,987.34	6,612,286.37	16,797,905.59	35,500,178.80	18,374,339.64	81,204,371.21
FM			54,218.21				54,218.21
GA	527,619.04	2,699,805.56	5,071,212.43	11,230,882.62	27,331,993.25	9,781,297.40	56,642,810.30
GU	31,707.71	132,477.98	181,882.66	649,702.61	1,071,804.59	561,725.66	2,629,301.20
HI	33,022.82	412,388.70	1,161,846.47	2,110,795.05	6,136,441.69	2,069,362.31	11,923,857.04
IA	172,611.18	1,043,779.43	2,439,669.07	6,553,269.88	13,194,926.36	4,677,628.97	28,081,884.89
ID	114,866.50	816,856.16	1,812,354.38	6,465,238.30	14,351,752.58	4,501,068.59	28,062,136.50
IL	760,233.17	2,555,955.92	6,496,717.89	19,476,724.36	37,768,124.96	12,640,320.66	79,698,076.97
IN	684,244.69	1,298,128.52	3,411,905.21	10,551,265.03	22,952,536.24	9,988,912.33	48,886,992.02
KS	16,185.16	999,323.67	1,956,683.86	4,662,628.05	10,241,443.13	5,630,454.49	23,506,718.36
KY	176,388.55	937,027.18	2,497,023.64	5,434,256.62	11,204,518.81	4,833,700.70	25,082,915.51
LA	199,208.49	1,031,588.27	1,967,311.17	6,011,095.47	13,210,187.56	5,511,501.17	27,930,892.13
MA	346,486.98	3,022,867.23	7,181,690.99	15,965,361.57	34,570,230.06	13,007,379.20	74,094,016.04
MD	142,028.70	1,335,400.56	2,469,169.72	7,524,901.61	13,188,780.77	8,000,492.80	32,660,774.16
ME		395,030.28	2,676,005.80	4,908,222.20	9,200,081.90	3,876,435.60	21,055,775.78
MI	450,772.98	2,297,788.39	4,994,142.10	16,451,185.56	28,933,304.25	14,692,733.75	67,819,927.03
MN	691,712.23	1,872,937.68	4,665,128.46	17,367,766.10	33,575,556.94	14,311,057.19	72,484,158.60
MO	416,858.62	2,111,422.18	3,731,549.78	12,540,369.53	21,950,842.42	9,617,647.50	50,368,690.03
MP					18,810.48		18,810.48
MS	195,402.72	612,086.13	2,753,929.58	9,121,245.94	16,984,801.79	7,017,487.69	36,684,953.85
MT	70,345.40	347,960.84	1,443,258.29	4,902,234.59	9,226,558.26	2,909,227.47	18,899,584.85
NC	440,327.85	1,657,176.50	4,594,489.25	10,449,251.92	22,618,790.23	9,214,680.21	48,974,715.95
ND	113,199.60	462,342.01	860,795.92	2,794,625.67	4,800,209.78	2,839,856.44	11,871,029.41
NE	112,189.51	769,407.57	1,836,041.28	6,529,265.17	9,124,940.74	3,971,171.35	22,343,015.62
NH	316,318.11	690,371.50	2,664,671.06	5,192,229.77	11,596,172.11	3,500,178.05	23,959,940.61
NJ	203,557.04	2,114,219.14	4,881,654.89	10,888,011.40	22,714,339.66	9,743,184.27	50,544,966.39
NM	159,284.65	358,506.86	1,203,981.55	2,281,835.25	5,872,903.30	2,948,247.45	12,824,759.06
NV	22,384.48	258,154.68	1,595,030.22	2,535,863.50	4,774,709.10	1,719,498.32	10,905,640.30
NY	1,151,390.57	5,320,316.23	12,187,222.82	31,755,266.15	57,046,316.85	27,106,462.08	134,566,974.70
OH	998,054.30	3,699,508.46	9,178,280.25	19,606,829.32	40,958,014.62	21,119,775.13	95,560,462.09
OK	236,935.04	859,867.05	2,041,680.26	5,298,120.96	11,618,433.67	5,683,542.80	25,738,579.79
OR	265,175.35	1,247,940.30	2,640,124.05	7,317,079.76	12,001,641.66	4,939,371.24	28,411,332.35
PA	1,052,369.98	1,818,287.03	5,616,156.32	14,216,740.91	33,345,806.19	14,064,484.64	70,113,845.07
PR	22,121.55	342,847.96	1,077,909.55	2,888,842.10	6,977,602.86	3,039,151.70	14,348,475.71
RI	65,190.30	507,164.11	1,009,514.91	4,012,792.94	8,934,508.37	2,931,558.55	17,460,729.18
SC	131,193.19	634,487.99	1,116,527.63	2,099,918.31	7,558,944.21	3,474,227.24	15,015,298.58
SD	144,962.87	355,140.84	784,213.69	2,487,847.79	5,285,476.51	1,915,619.50	10,973,261.21
TN	31,808.51	722,055.38	1,953,744.51	5,873,017.04	14,486,591.90	4,675,919.69	27,743,137.04
TX	1,595,630.34	5,742,126.56	14,082,807.76	34,991,594.48	76,447,033.31	33,170,129.15	166,029,321.60
UT	655,681.41	1,834,072.61	5,574,898.75	12,797,113.26	27,709,199.91	11,333,353.10	59,904,319.04
VA	617,679.12	1,031,421.79	4,041,918.07	9,241,125.28	16,856,737.88	6,724,478.83	38,513,360.98
VI				146,274.62	703,590.25		849,864.87
VT	21,459.11	148,710.07	1,501,735.49	2,768,686.78	5,357,593.48	3,111,813.78	12,909,998.70
WA	434,971.29	2,196,425.54	5,083,055.16	15,448,738.28	29,426,163.23	10,514,869.44	63,104,222.94
WI	627,976.43	2,062,760.65	5,621,857.67	16,419,718.37	35,949,411.34	16,307,673.40	76,989,397.87
WV	17,376.90	326,996.89	664,892.62	1,459,518.34	3,303,384.61	1,689,166.21	7,461,335.58
WY		134,191.48	434,177.98	925,530.91	3,288,116.24	1,014,977.95	5,796,994.57
Grand Total	17,936,252.91	76,162,812.28	188,545,225.63	497,469,159.86	1,030,264,597.05	438,000,317.38	2,248,378,365.10



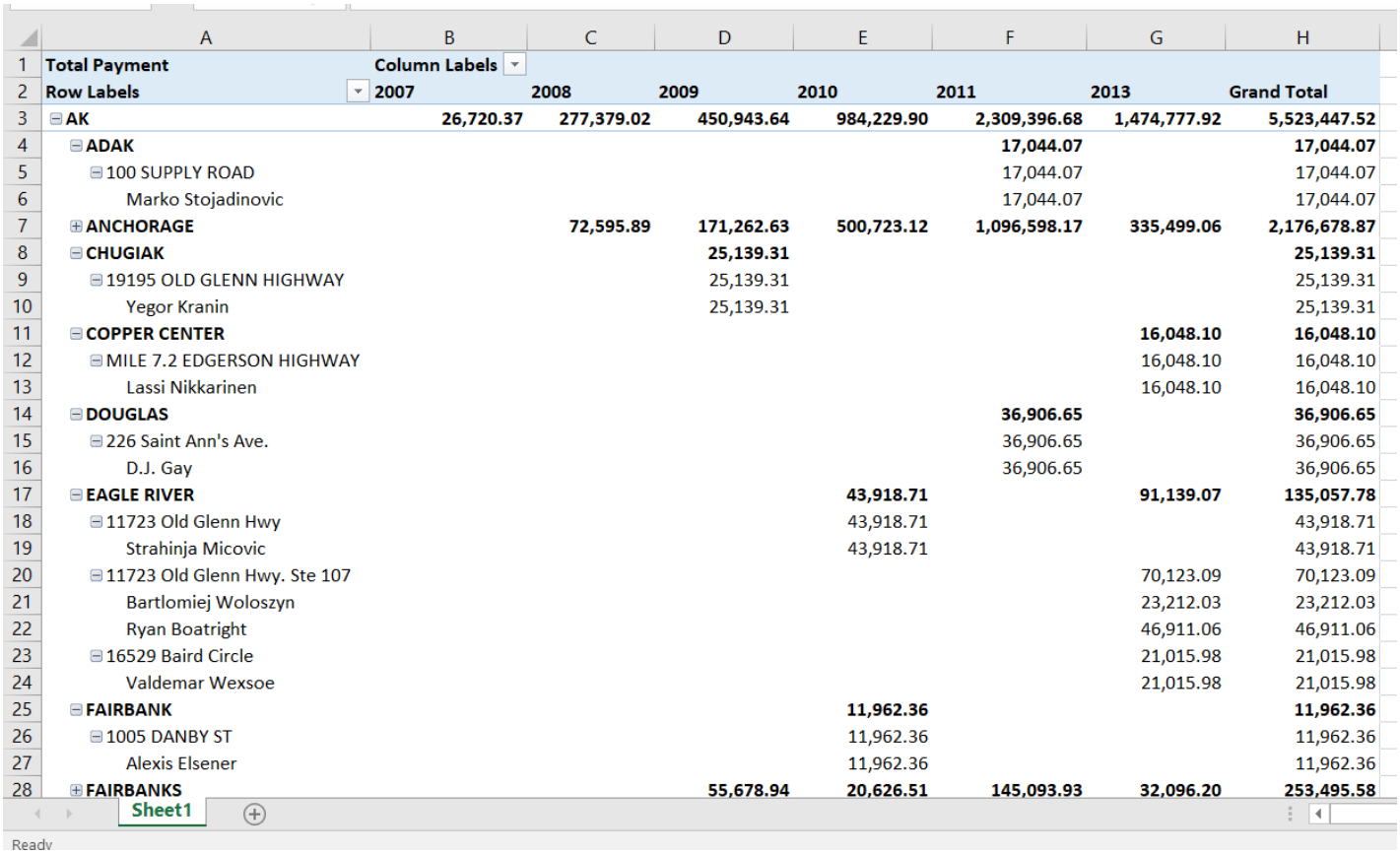
Drill-down:

- Stepping down a hierarchy of a dimension to allowing navigation through details.

Example from the project.

- The folowing shows that the Hierarchy of Dim Borrower according to DRILL DOWN.

(BorrowerState-→BorrowerCity→BorrowerStreet→BorrowerName)



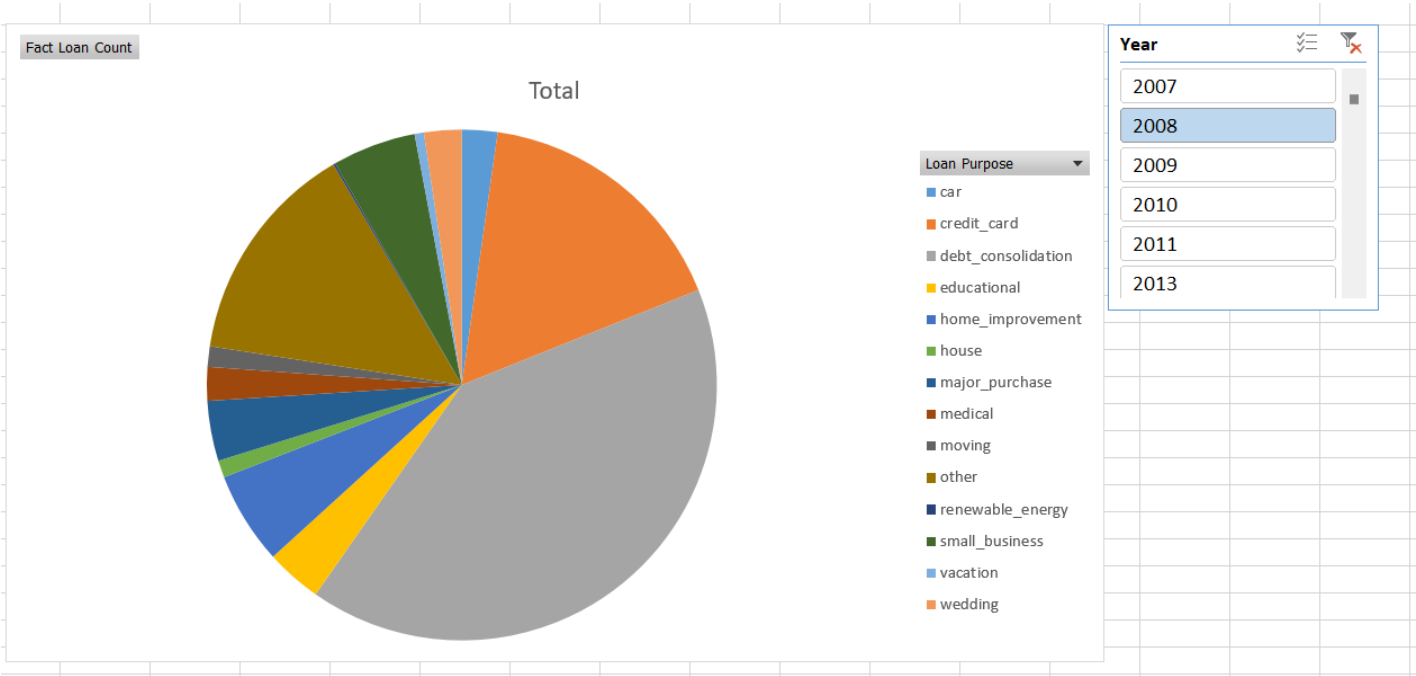
	A	B	C	D	E	F	G	H
1	**Total Payment**	**Column Labels**						
2	**Row Labels**	**2007**	**2008**	**2009**	**2010**	**2011**	**2013**	**Grand Total**
3	**AK**	**26,720.37**	**277,379.02**	**450,943.64**	**984,229.90**	**2,309,396.68**	**1,474,777.92**	**5,523,447.52**
4	**ADAK**					**17,044.07**		**17,044.07**
5	100 SUPPLY ROAD					17,044.07		17,044.07
6	Marko Stojadinovic					17,044.07		17,044.07
7	**ANCHORAGE**		**72,595.89**	**171,262.63**	**500,723.12**	**1,096,598.17**	**335,499.06**	**2,176,678.87**
8	**CHUGIAK**			**25,139.31**				**25,139.31**
9	19195 OLD GLENN HIGHWAY			25,139.31				25,139.31
10	Yegor Kranin			25,139.31				25,139.31
11	**COPPER CENTER**						**16,048.10**	**16,048.10**
12	MILE 7.2 EDGERSON HIGHWAY						16,048.10	16,048.10
13	Lassi Nikkarinen						16,048.10	16,048.10
14	**DOUGLAS**					**36,906.65**		**36,906.65**
15	226 Saint Ann's Ave.					36,906.65		36,906.65
16	D.J. Gay					36,906.65		36,906.65
17	**EAGLE RIVER**				**43,918.71**		**91,139.07**	**135,057.78**
18	11723 Old Glenn Hwy				43,918.71			43,918.71
19	Strahinja Micovic				43,918.71			43,918.71
20	11723 Old Glenn Hwy. Ste 107						70,123.09	70,123.09
21	Bartlomiej Woloszyn						23,212.03	23,212.03
22	Ryan Boatright						46,911.06	46,911.06
23	16529 Baird Circle						21,015.98	21,015.98
24	Valdemar Wexsoe						21,015.98	21,015.98
25	**FAIRBANK**				**11,962.36**			**11,962.36**
26	1005 DANBY ST				11,962.36			11,962.36
27	Alexis Elsener				11,962.36			11,962.36
28	**FAIRBANKS**			**55,678.94**	**20,626.51**	**145,093.93**	**32,096.20**	**253,495.58**

Sheet1

Ready

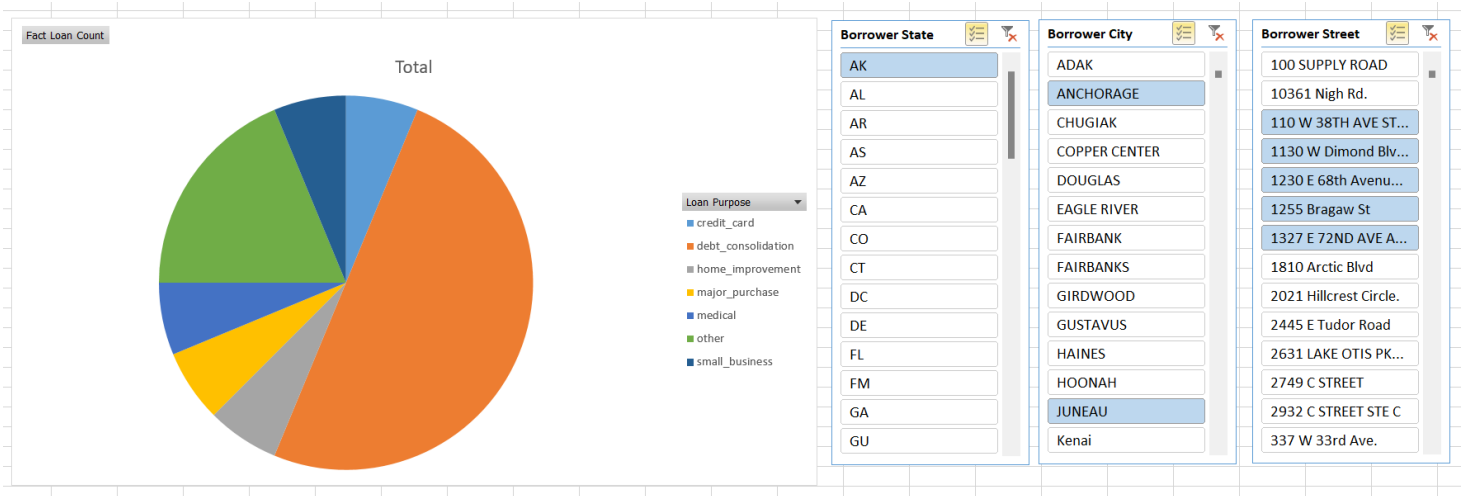
Slicing:

- Slice performs a selection on one dimension of the given cube, thus resulting in a sub cube.



Dice:

- The dice operation defines a sub cube by performing a selection on two or more dimensions.



Step 4: SSRS Reports

- MDX query used for creating Reports,

```
select bd.AlternateBorrowerID, bd.State, bd.BorrowerName, bd.BorrowerStreet,
bd.BorrowerCity, bd.State, bd.HomeOwnership, bd.EmployementLenghtYear, bd.AnualIncome,
bd.IncomeCategory,
dmd.AlternateDisbursementID, dmd.DisbursementMethod,
bnd.AlternteBranchID, bnd.BankState,
ldd.AlternateLoanDetailsID, ldd.year,ldd.Term, ldd.ApplicationType,ldd.LoanCondition,
pd.AlternateLoanPurposeID,pd.LoanPurpose, pd.LoanPurposeCategory,
dd.Month, dd.MonthName, dd.Quarter, dd.QuarterName, dd.Year, dd.Date,
from FactLoan fl
inner join  DimBorrower bd on fl.BorrowerKey= bd.BorrowerSK
inner join DimDisbursementMethod dmd on fl. DisbursementMethodKey= dmd.
DisbursementMethodSK
inner join DimBank bnd on fl.BranchKey= bnd.BranchSK
inner join DimLoanDetails ldd on fl.LoanDetailsKey=ldd.LoanDetailsSK
inner join DimLoanPurpose ldd on fl.LoanPurposeKey=ldd.LoanPurposeSK
inner join DateDim dd on lf.OrderAcceptedTimeKey = dd.DateKey
```