CALL CENTER DATA MANGEMENT

ETL Project

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II. Introduction

To be able to use and extract value from available data, it first needs to be integrated into an IT system. This implies that all the data coming from various sources needed to be unified and standardized to be used by other programs. One way to achieve this is to implement a Data Warehouse.

In this project, we are going to design and implement a Data Warehouse with data from a call center named ServiceSpot. For this project we will use SQL Server and SSIS.

III. Data Presentation

Our data is composed of seven Excel files .

The first file “Employees”.csv” has data of employees from ServiceSpot company. The data is arranged as follow :

- Each column represent an information about an employee, we have “EmployeeID”,”EmployeeName”,”Site”,”ManagerName”,
- Each line represent an Employee,

The second file “Us States.csv” represents data about the Us State. The data is arranged as follow :

- Each column represent an Information about a Us State, we have “StateCD”,”Name”,”Region”,
- Each line represent a Us State,

The third file “ Call types.csv” represents data about the different call types of the call center “ServiceSpot”. The data is arranged as follow :

- “CallTypeID” ID of the different call
- “CallTypeName” The name of call

The fourth file “Call charges.csv” represents data about the charges of each call through yeah. The data is arranged as follow :

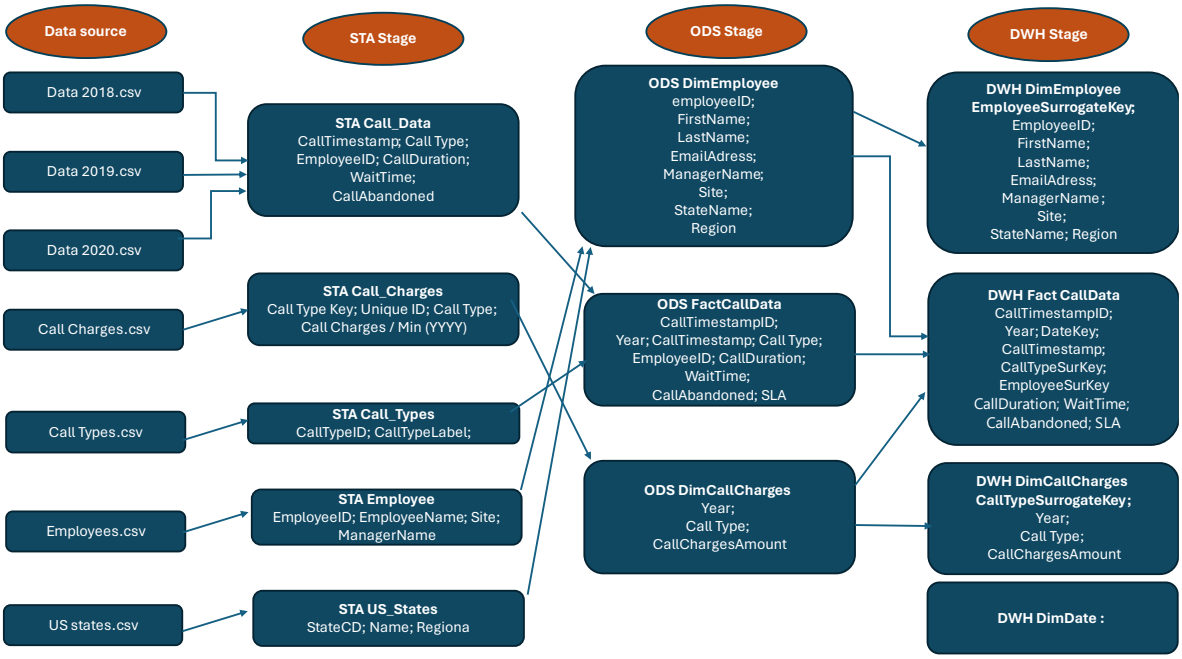
- Each column represent call charges for each year (2018,2019,2020,2021)
- Each line represent a call types “Sales”,”Biling”,”TechSupport”,

The next three files are in a folder named “Calls Data”, we find three files called “Data 2018.csv”, “Data 2019.csv”, “Data 2020.csv” each one representing data from one year. The data is arranged as follow :

- “CallTimeStamp” Date about a call, year,month,day,hours,minute,second
- “CallType” which type of call
- “EmployeeID” which employee receive the call

- “CallDuration” How much second the call last
- “WaitTime” How much time the client wait before an employee answer
- “CallAbandoned” If the call have been answer or no
- Each line represent a call

IV. Data Model



V. Pipeline Design

The pipeline will be done in three steps:

- The Staging area (STA) will allow to load the data as is, or with minimal changes.

- The Operational Data Store area (ODS) will allow to clean and standardize the data. If the data don't pass the quality criteriums, they will be put in the "Technical_Rejects" table as technical rejects.

- The Data WareHouse area (DWH) will organize the data in one fact table related to multiple dimensions tables. If records can't be integrated in the schema, they will be put in the "Functional_Rejects" table as functional reject. Alternatively, some placeholder relations can be created.

There will be one STA and ODS package per file.

VI. Staging database

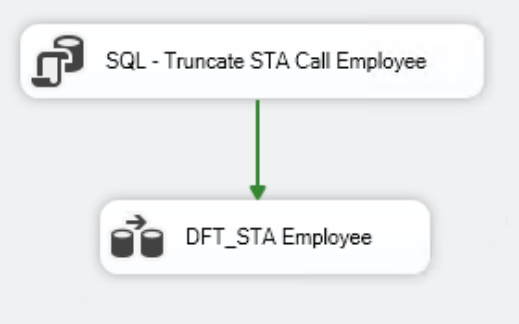
Here, the role of the staging database is to store all the data coming from the different sources. We want to access all available data.

1. Employee Table

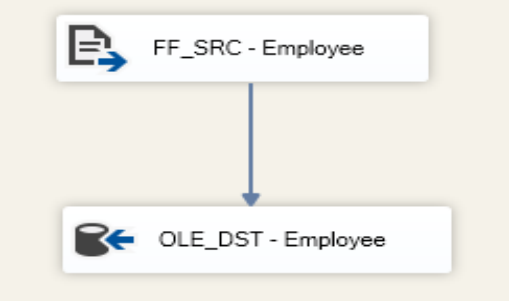
Here is an extract from the file "Employee.csv"

EmployeeID	EmployeeName	Site	ManagerName
N772493	Onita Trojan	Spokane, WA	Deidre Robbs
F533051	Stormy Seller	Aurora, CO	Elsie Taplin
S564705	Mable Ayoub	Aurora, CO	Shala Lion
I281837	Latrisha Buckalew	Aurora, CO	Rana Taub
Y193775	Adrianna Duque	Spokane, WA	Collin Trotman
J632516	Keiko Daulton	Spokane, WA	Jamar Prahl
G727038	Dolores Lundeen	Aurora, CO	Shala Lion
V126561	Wilbur Mohl	Jacksonville, FL	Casey Bainbridge
E243130	Ileen Bornstein	Jacksonville, FL	Gonzalo Lesage

For this table, we don't need to add additional data. Here we just make sure to truncate the table "Employee" before running the package:



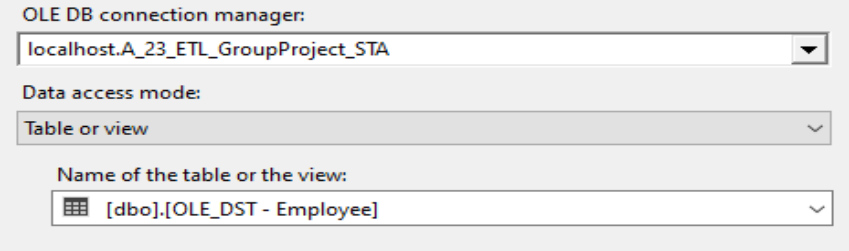
The dataflow is an import of a flat file :



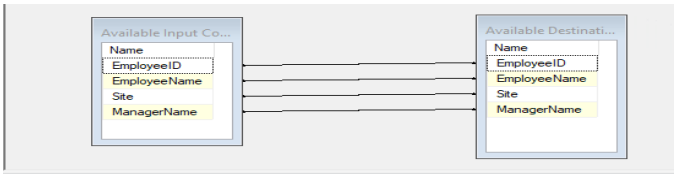
We need to create the destination table with the following command:

```
CREATE TABLE [OLE_DST - Employee] (
    [EmployeeID] varchar(50),
    [EmployeeName] varchar(50),
    [Site] varchar(50),
    [ManagerName] varchar(50)
)
```

The data is then loaded into the table “Employee”:



We also make sure to change some of the names to avoid problems with accents, spaces and SQL reserved words:



Input Column	Destination Column
EmployeeID	EmployeeID
EmployeeName	EmployeeName
Site	Site
ManagerName	ManagerName

Here is the first ten lines of the results:

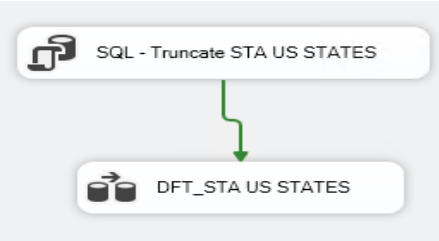
	EmployeeID	EmployeeName	Site	ManagerName
1	N772493	Onita Trojan	Spokane, WA	Deidre Robbs
2	F533051	Stormy Seller	Aurora, CO	Elsie Taplin
3	S564705	Mable Ayoub	Aurora, CO	Shala Lion
4	I281837	Latrisha Buckalew	Aurora, CO	Rana Taub
5	Y193775	Adrianna Duque	Spokane, WA	Collin Trotman
6	J632516	Keiko Daulton	Spokane, WA	Jamar Prahl
7	G727038	Dolores Lundeen	Aurora, CO	Shala Lion
8	V126561	Wilbur Mohl	Jacksonville, FL	Casey Bainbridge
9	E243130	Ileen Bomstein	Jacksonville, FL	Gonzalo Lesage
10	C206355	Janeth Roesler	Spokane, WA	Miyoko Degraw

2. US States Table

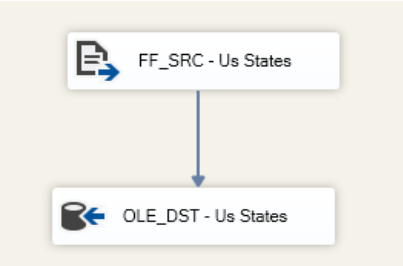
Here is an extract from the file “US STATES.csv”

	StateCD	Name	Region
1	AK	Alaska	West
2	AL	Alabama	South
3	AR	Arkansas	South
4	AZ	Arizona	West
5	CA	California	West
6	CO	Colorado	West
7	CT	Connectic	Northeast
8	DC	District of	South
9	DE	Delaware	South

For this table, we don’t need to add additional data. Here we just make sure to truncate the table “US STATES” before running the package:



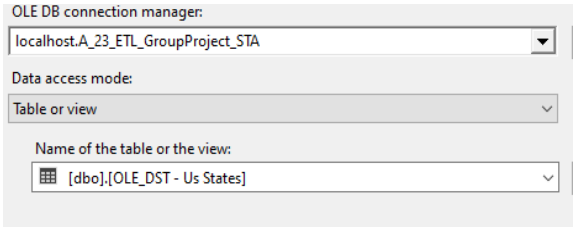
The dataflow is an import of a flat file:



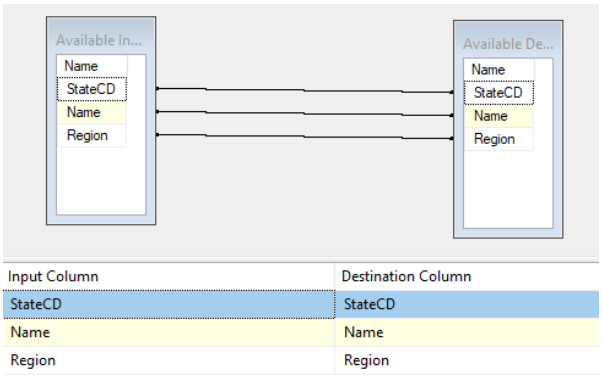
We need to create the destination table with the following command:

```
CREATE TABLE [OLE_DST - Us States] (
    [StateCD] varchar(50),
    [Name] varchar(50),
    [Region] varchar(50)
)
```

The data is then loaded into the table “US States”:



We also make sure to change some of the names to avoid problems with accents, spaces and SQL reserved words:



Input Column	Destination Column
StateCD	StateCD
Name	Name
Region	Region

Here is the first ten lines of the results:

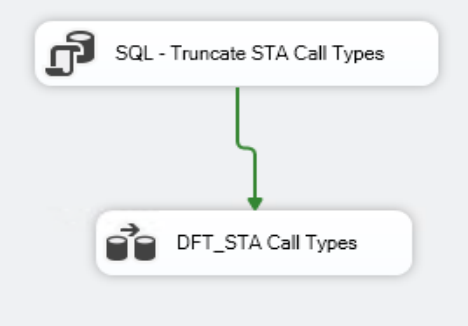
	StateCD	Name	Region
1	AK	Alaska	West
2	AL	Alabama	South
3	AR	Arkansas	South
4	AZ	Arizona	West
5	CA	California	West
6	CO	Colorado	West
7	CT	Connecticut	Northeast
8	DC	District of Columbia	South
9	DE	Delaware	South
10	FL	Florida	South

3. Call Types Table

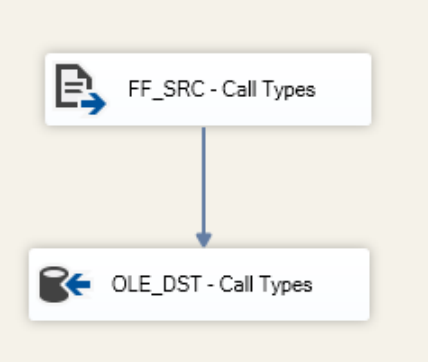
Here is an extract from the file “Call Types Table.csv”,

	A	B
1	CallTypeID	CallTypeLabel
2	1	Sales
3	2	Billing
4	3	Tech Support

For this table, we don’t need to add additional data. Here we just make sure to truncate the table “Call Types” before running the package:



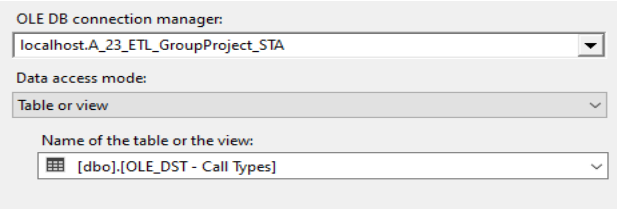
The dataflow is an import of a flat file :



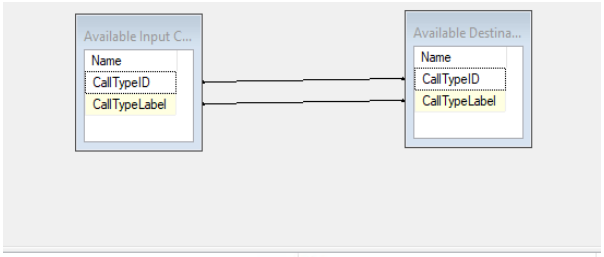
We need to create the destination table with the following command:

```
CREATE TABLE [OLE_DST - Call Types] (
    [CallTypeID] varchar(50),
    [CallTypeLabel] varchar(50)
)
```

The data is then loaded into the table “Call Types”:



We also make sure to change some of the names to avoid problems with accents, spaces and SQL reserved words:



Input Column	Destination Column
CallTypeID	CallTypeID
CallTypeLabel	CallTypeLabel

Here are the lines of the results:

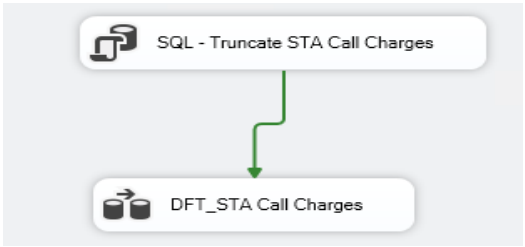
	CallTypeID	CallTypeLabel
1	1	Sales
2	2	Billing
3	3	Tech Support

4. Call Charges

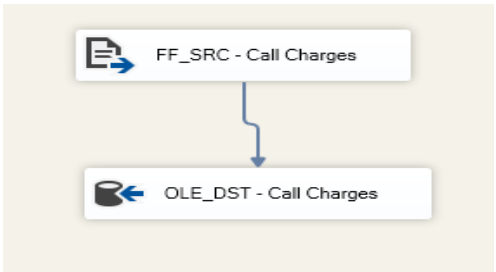
Here is an extract from the file “Call Charges Table.csv”,

Call Type	Call Charges (2018)	Call Charges (2019)	Call Charges (2020)	Call Charges (2021)
Sales	1.52 / min	1.56 / min	1.60 / min	1.71 / min
Billing	1.2 / min	1.32 / min	1.41 / min	1.45 / min
Tech Support	0.95 / min	0.98 / min	1.04 / min	1.12 / min

For this table, we don’t need to add additional data. Here we just make sure to truncate the table “Call Types” before running the package:



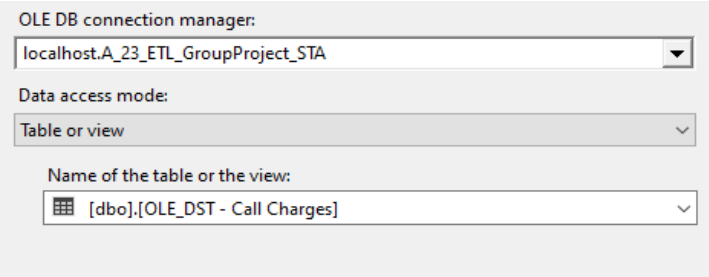
The dataflow is an import of a flat file :



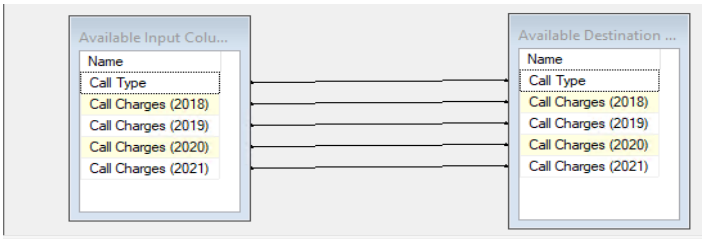
We need to create the destination table with the following command:

```
CREATE TABLE [OLE_DST - Call Charges] (
    [Call Type ] varchar(50),
    [Call Charges (2018)] varchar(50),
    [Call Charges (2019)] varchar(50),
    [Call Charges (2020)] varchar(50),
    [Call Charges (2021)] varchar(50)
)
```

The data is then loaded into the table “Call Charges”:



We also make sure to change some of the names to avoid problems with accents, spaces and SQL reserved words:



Input Column	Destination Column
[Call Type]	Call Type
Call Charges (2018)	Call Charges (2018)
Call Charges (2019)	Call Charges (2019)
Call Charges (2020)	Call Charges (2020)
Call Charges (2021)	Call Charges (2021)

Here is the lines of the results:

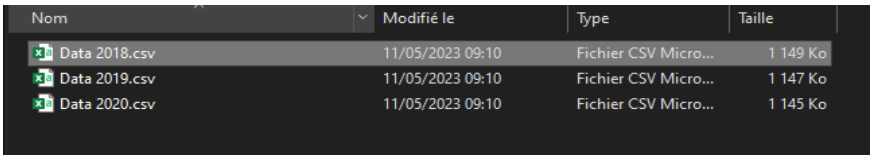
	Call Type	Call Charges (2018)	Call Charges (2019)	Call Charges (2020)	Call Charges (2021)
1	Sales	1.52 / min	1.56 / min	1.60 / min	1.71 / min
2	Billing	1.2 / min	1.32 / min	1.41 / min	1.45 / min
3	Tech Support	0.95 / min	0.98 / min	1.04 / min	1.12 / min

5. Call Data Table

Here is an extract of one file of “Data.csv”:

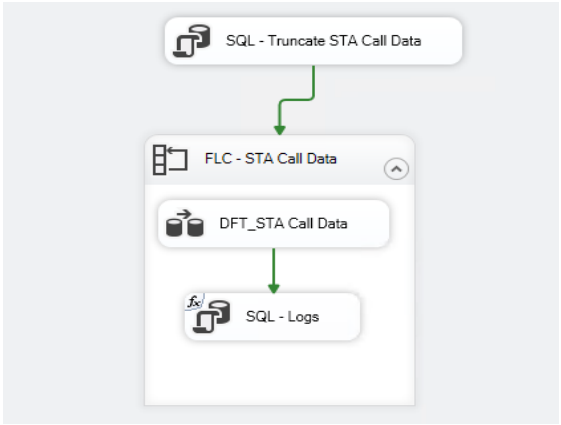
	A
1	CallTimestamp,Call Type,EmployeeID,CallDuration,WaitTime,CallAbandoned
2	5/4/2018 16:33,3,U559430,486,2,0
3	6/21/2018 18:28,3,A166733,945,0,0
4	6/21/2018 15:13,1,B971624,379,11,0
5	11/21/2018 13:02,3,U641256,1044,0,0
6	2/25/2018 13:36,1,P286634,1357,0,0
7	10/28/2018 10:04,3,M855788,570,23,0
8	12/17/2018 16:39,3,M794992,26,26,0
9	7/28/2018 19:09,2,I281837,8,8,0
10	11/6/2018 18:57,1,J192194,800,0,0

The data is separated into different files :

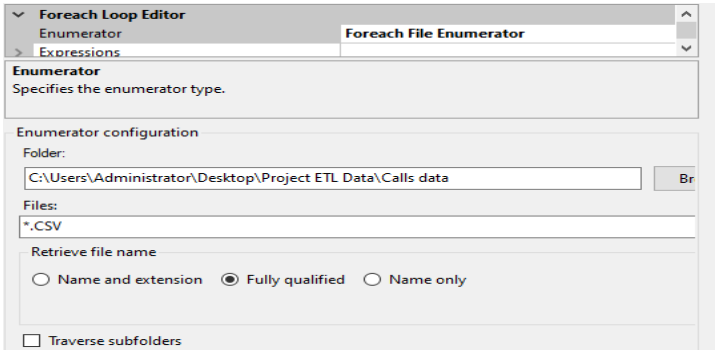


To be able to use the data in the file, we need to put it into one table. This means that we need to extract the data from each data file.

To go into all data files, we use a “Foreach Loop Container” where we put the extraction dataflow inside. The data flow in the container will be able to load one files at the time. Here, we also truncate the data from the previous runs.

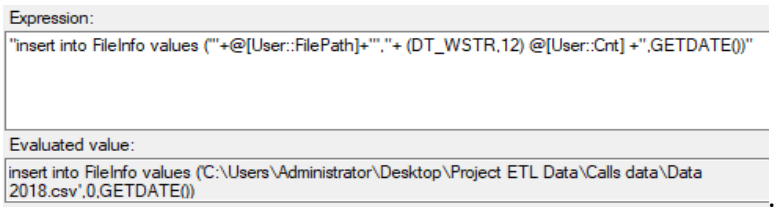


We use the enumerator “Foreach File Enumerator” to be able to iterate over the data files of the folder, it will loop over the files with .csv.



To keep track of the file we created a sql logs table, so we can see if every file has been extracted.

We use this expression to have all informations about the loop,



We need to create the destination table with the following command:

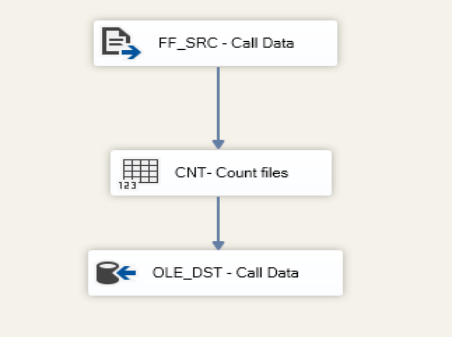
```
Create table FileInfo(

    Id int identity ,
    FilePath text,
    RecordCount int,
    Dated datetime
)
GO
```

Here are the lines of the results:

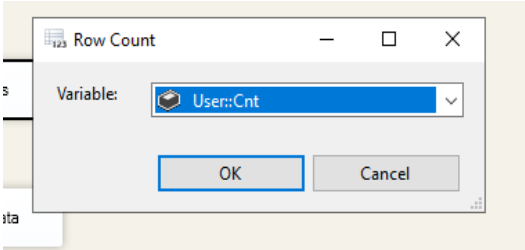
	Id	FilePath	RecordCount	Dated
1	1	C:\Users\Administrator\Desktop\Project ETL Data\...	33057	2024-05-12 11:24:50.603
2	2	C:\Users\Administrator\Desktop\Project ETL Data\...	33057	2024-05-12 11:25:10.873
3	3	C:\Users\Administrator\Desktop\Project ETL Data\...	33057	2024-05-12 11:25:31.670

Next, the dataflow is defined as follow:



To keep track of the line in all different data files we use a count file from the folder

We use the variable CNT to count the line from the folder,

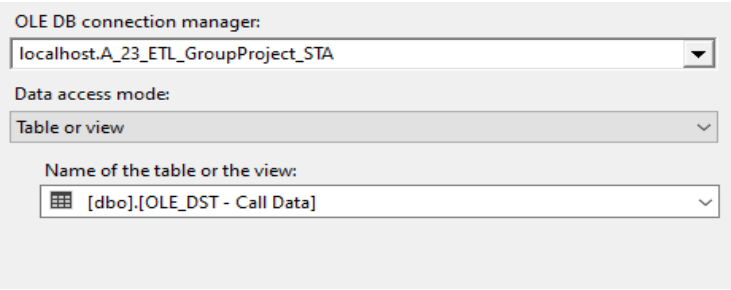


Once we have extracted the data, we can load it into our target table “Call Data” into the STA database.

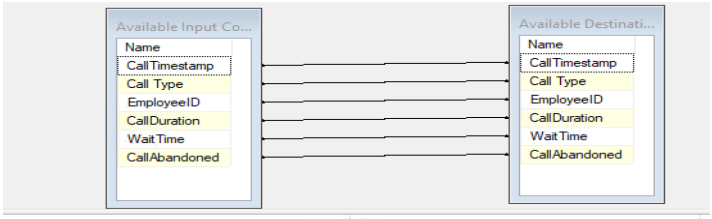
First, we create the table with the following script:

```
CREATE TABLE [OLE_DST - Call Data] (
    [CallTimestamp] varchar(50),
    [Call Type] varchar(50),
    [EmployeeID] varchar(50),
    [CallDuration] varchar(50),
    [WaitTime] varchar(50),
    [CallAbandoned] varchar(50)
)
```

We can now define the target destination.



And finally, we define the columns mapping as follow:



Input Column	Destination Column
CallTimestamp	CallTimestamp
Call Type	Call Type
EmployeeID	EmployeeID
CallDuration	CallDuration
WaitTime	WaitTime
CallAbandoned	CallAbandoned

Here is the first ten lines of the results:

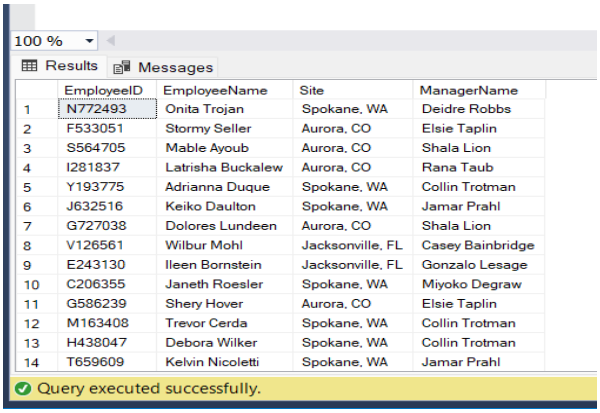
	CallTimestamp	Call Type	EmployeeID	CallDuration	WaitTime	CallAbandoned
1	5/4/2018 16:33	3	U559430	486	2	0
2	6/21/2018 18:28	3	A166733	945	0	0
3	6/21/2018 15:13	1	B971624	379	11	0
4	11/21/2018 13:02	3	U641256	1044	0	0
5	2/25/2018 13:36	1	P286634	1357	0	0
6	10/28/2018 10:04	3	M855788	570	23	0
7	12/17/2018 16:39	3	M794992	26	26	0
8	7/28/2018 19:09	2	I281837	8	8	0
9	11/6/2018 18:57	1	J192194	800	0	0
10	6/18/2018 15:32	2	F542348	651	111	0

VII. ODS Database

Here, the role of the ODS database is to connect to the STA database and make all the transformations to clean the data.

1. ODS - Employee Table

Here is an extract from the file “STA-Employee.csv” which represents our sources for the transformation:



100 %

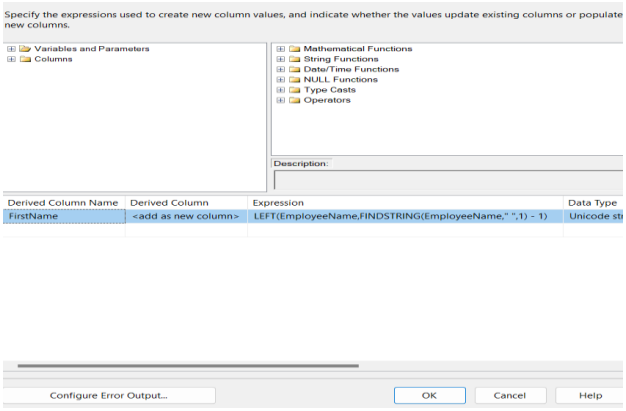
Results Messages

	EmployeeID	EmployeeName	Site	ManagerName
1	N772493	Onita Trojan	Spokane, WA	Deidre Robbs
2	F533051	Stormy Seller	Aurora, CO	Elsie Taplin
3	S564705	Mable Ayoub	Aurora, CO	Shala Lion
4	I281837	Latrisha Buckalew	Aurora, CO	Rana Taub
5	Y193775	Adrianna Duque	Spokane, WA	Collin Trotman
6	J632516	Keiko Daulton	Spokane, WA	Jamar Prahl
7	G727038	Dolores Lundeen	Aurora, CO	Shala Lion
8	V126561	Wilbur Mohl	Jacksonville, FL	Casey Bainbridge
9	E243130	Ileen Bornstein	Jacksonville, FL	Gonzalo Lesage
10	C206355	Janeth Roesler	Spokane, WA	Miyoko Degraw
11	G586239	Shery Hover	Aurora, CO	Elsie Taplin
12	M163408	Trevor Cerda	Spokane, WA	Collin Trotman
13	H438047	Debora Wilker	Spokane, WA	Collin Trotman
14	T659609	Kelvin Nicoletti	Spokane, WA	Jamar Prahl

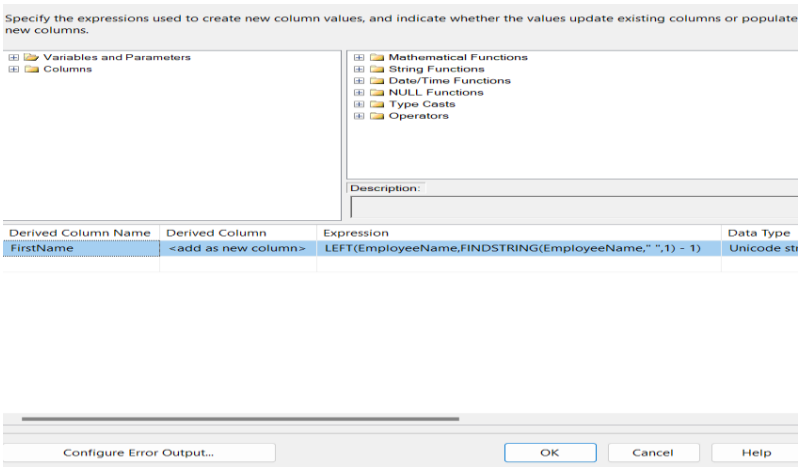
Query executed successfully.

We made the following transformation in this table:

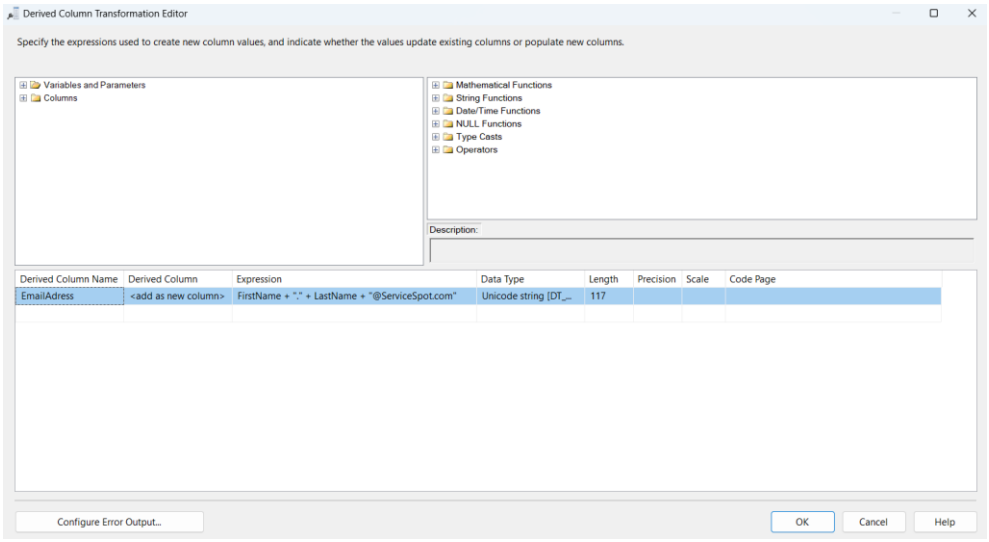
- A derived column transformation to extract the first name of employee.



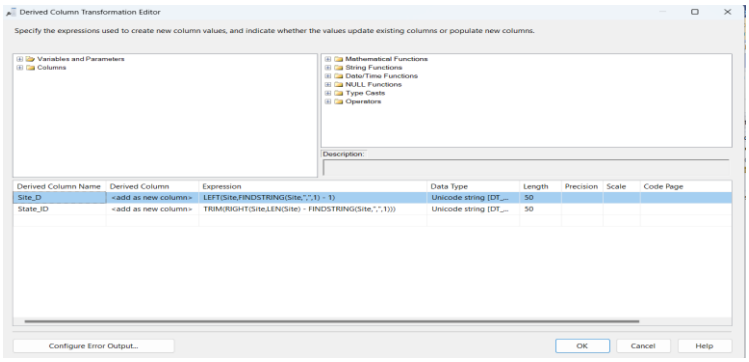
- A second derived column transformation to extract the last name of employee.



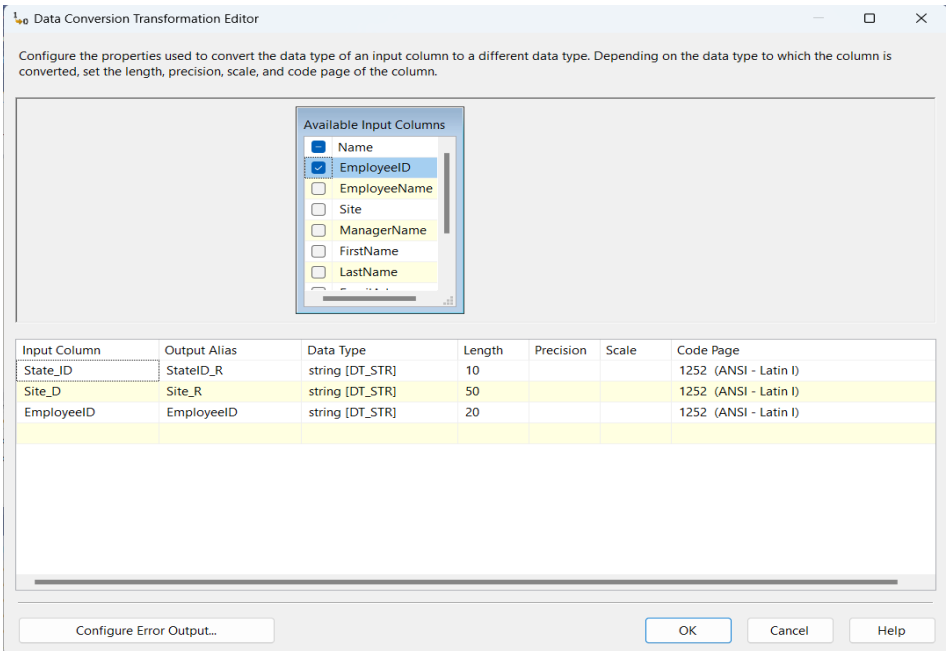
- We created the Email Address of each Employee by concatenating FirstName, LastName and Domain address which we chose as ServiceSpot.com



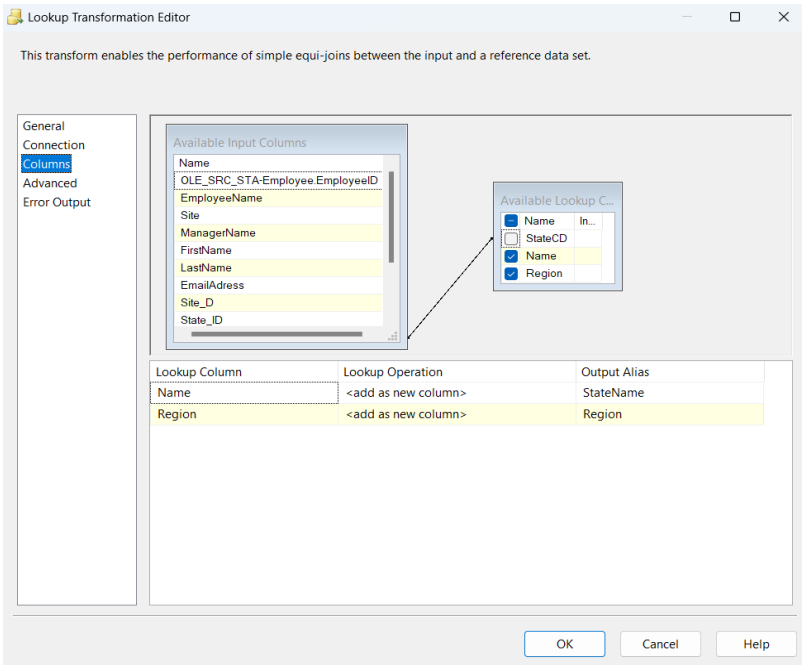
- We separated the site column to have the SiteName and StateID



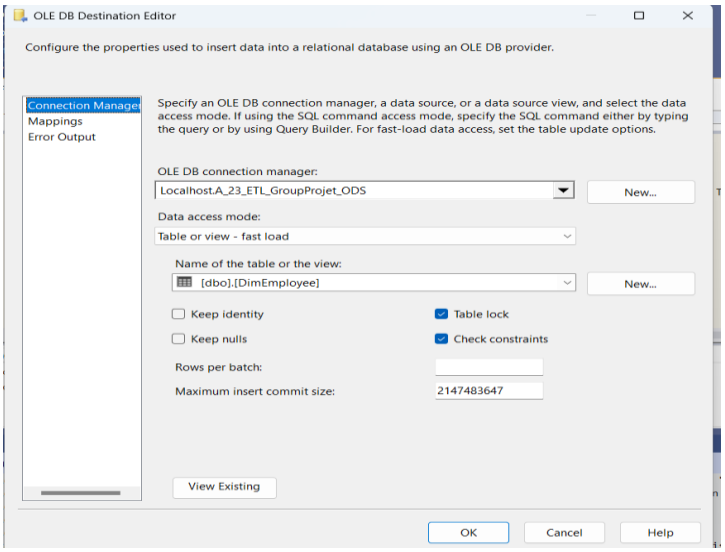
- Resizing of SiteName, StateID and EmployeeID



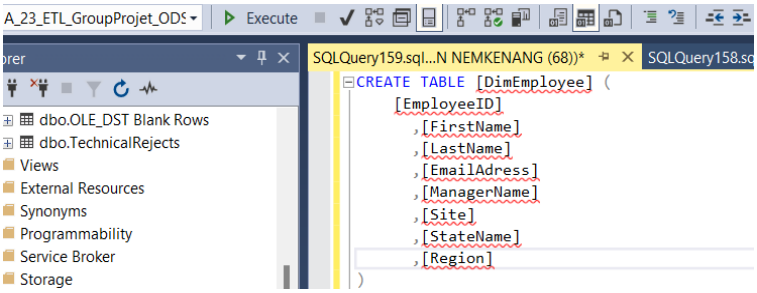
- Getting StateName and the region of each Employee from the STA - US STATE TABLE



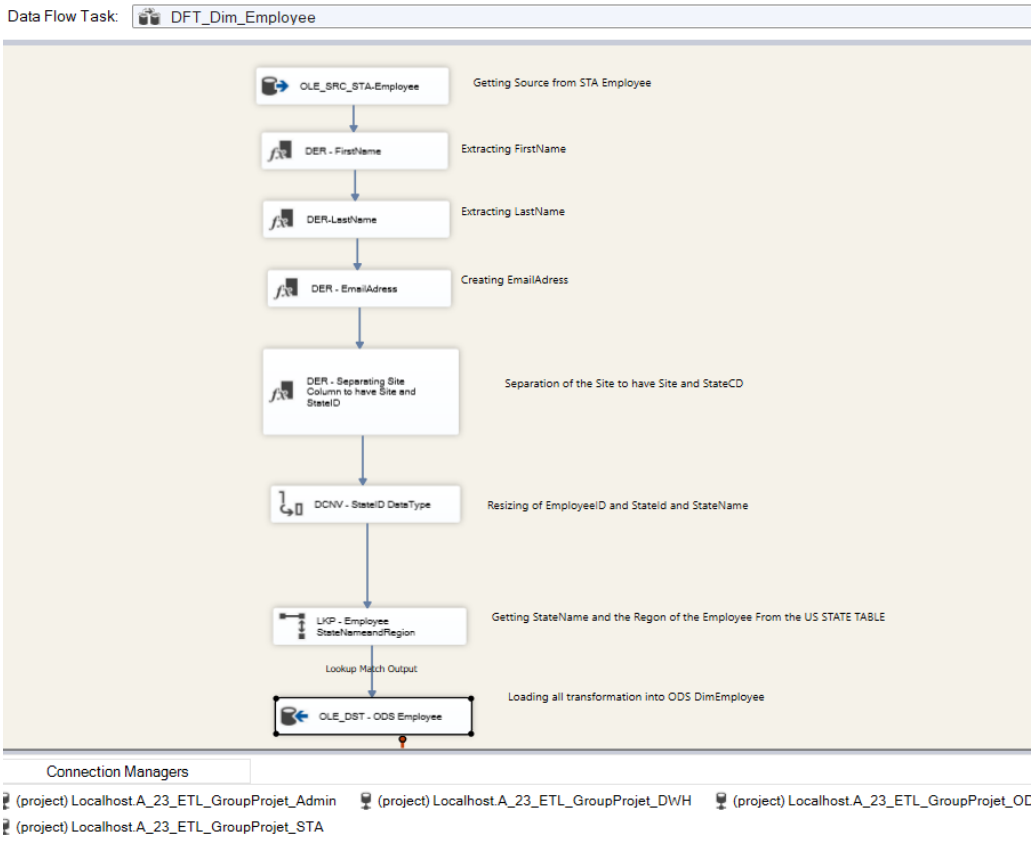
- Loading all the transformations into ODS - DimEmployee



We had to create a table with this script :



Here is the result in the Data Flow view:



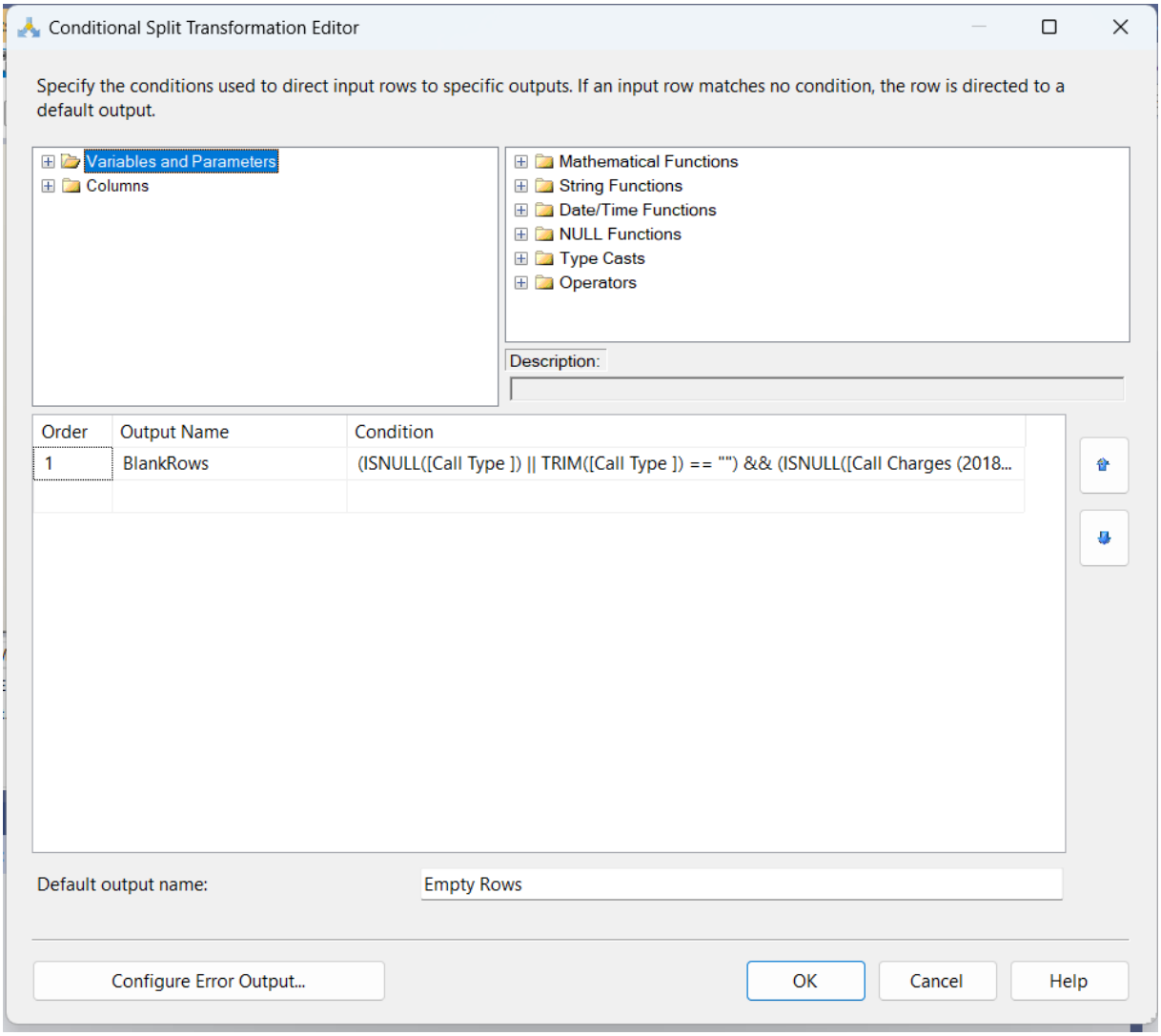
2. ODS - Call Charges Table

Getting sources from the STA - Call Charges:

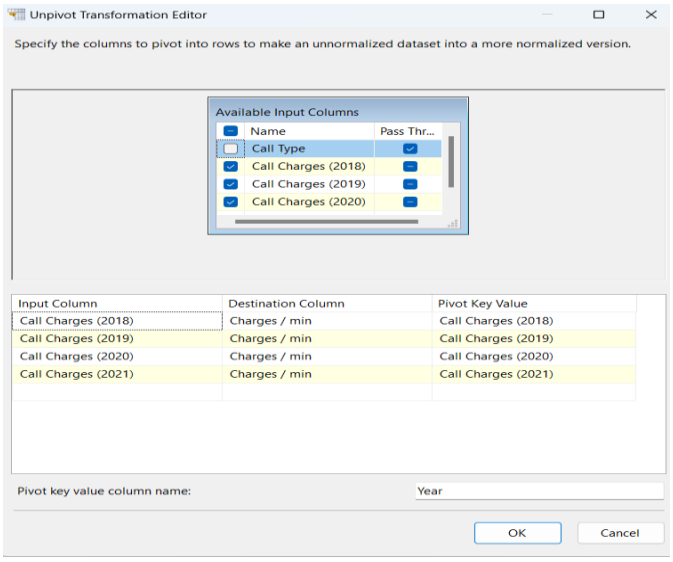
100 % Results Messages

	Call Type	Call Charges (2018)	Call Charges (2019)	Call Charges (2020)	Call Charges (2021)
1	Sales	1.52 / min	1.56 / min	1.60 / min	1.71 / min
2	Billing	1.2 / min	1.32 / min	1.41 / min	1.45 / min
3	Tech Support	0.95 / min	0.98 / min	1.04 / min	1.12 / min

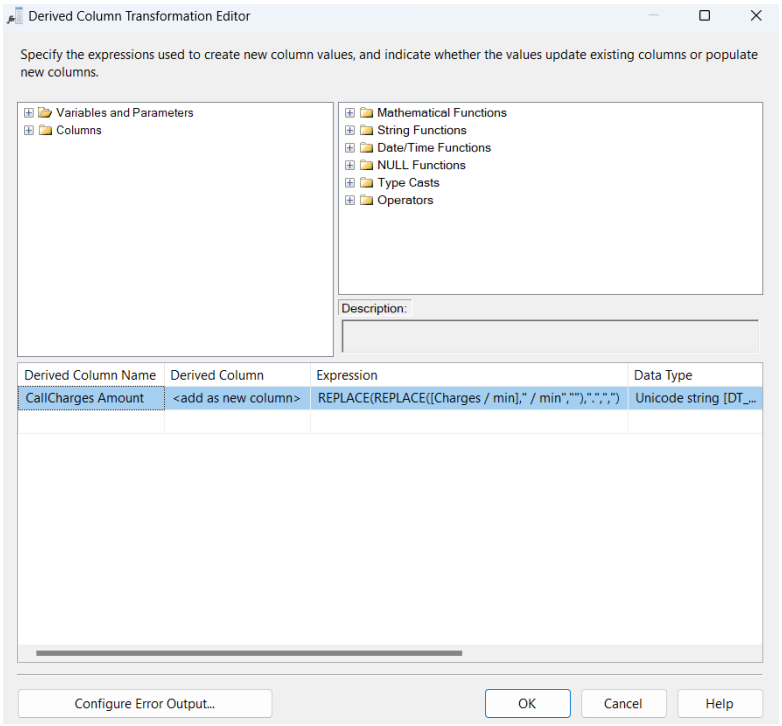
Before the unpivoting, we make a conditional split to delete the empty rows in the STA - CallCharges table:



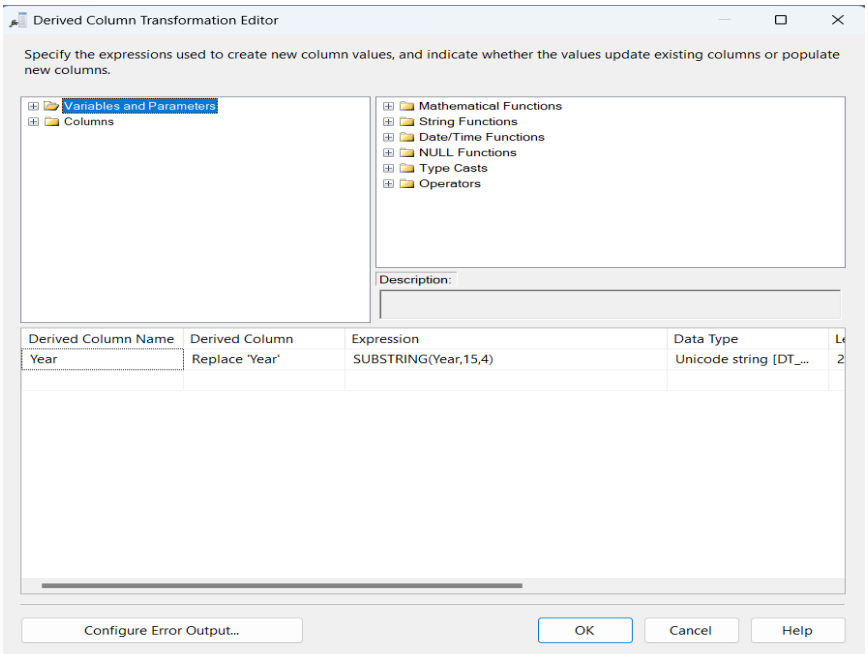
Unpivoting the STA - Call Charges table:



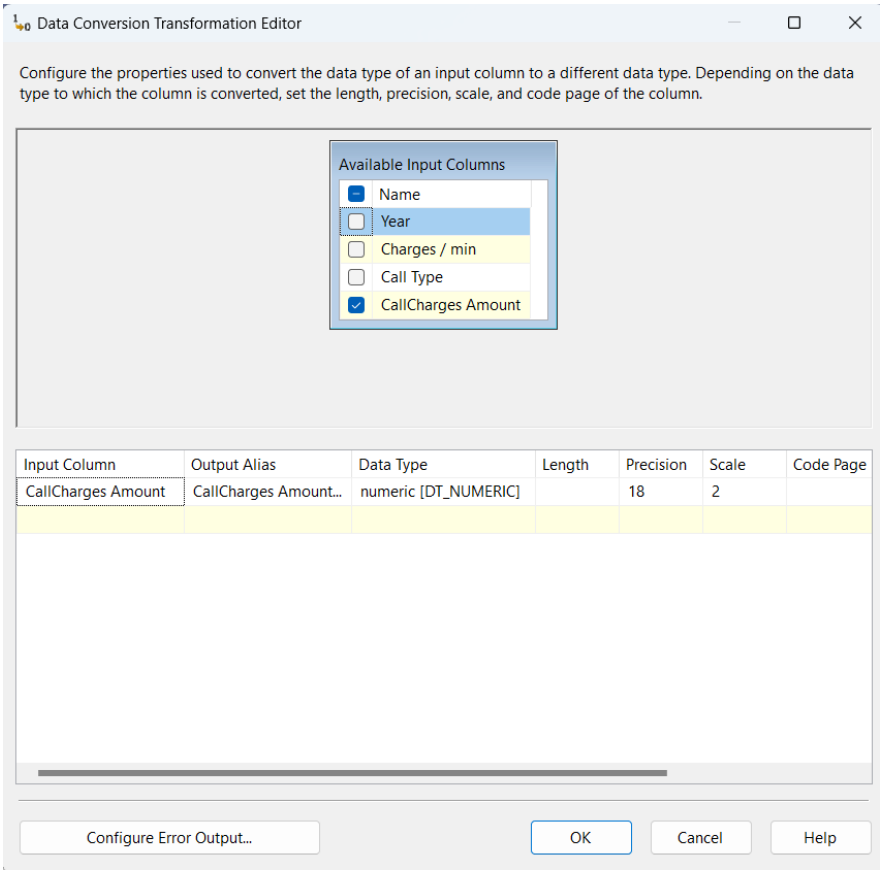
Extracting Charges Amount with the derived column:



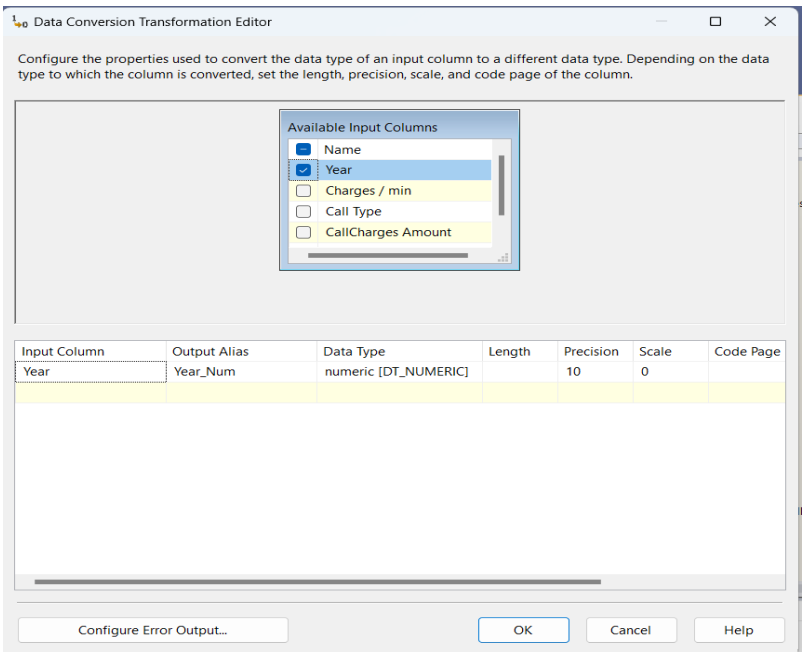
Extracting the Year with the derived column in a new column:



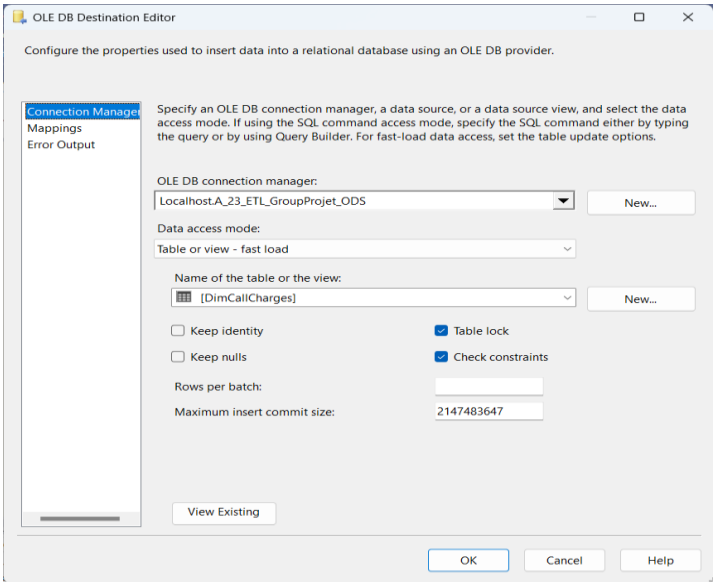
Converting ChargesAmount to numeric DataType:



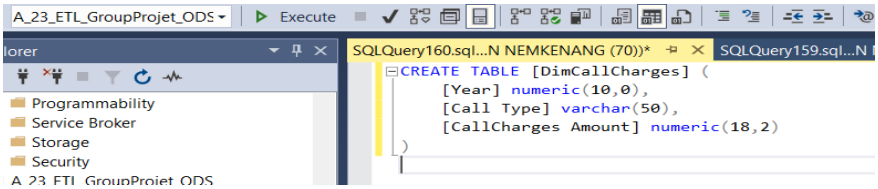
Converting the Year STR obtained to numeric:



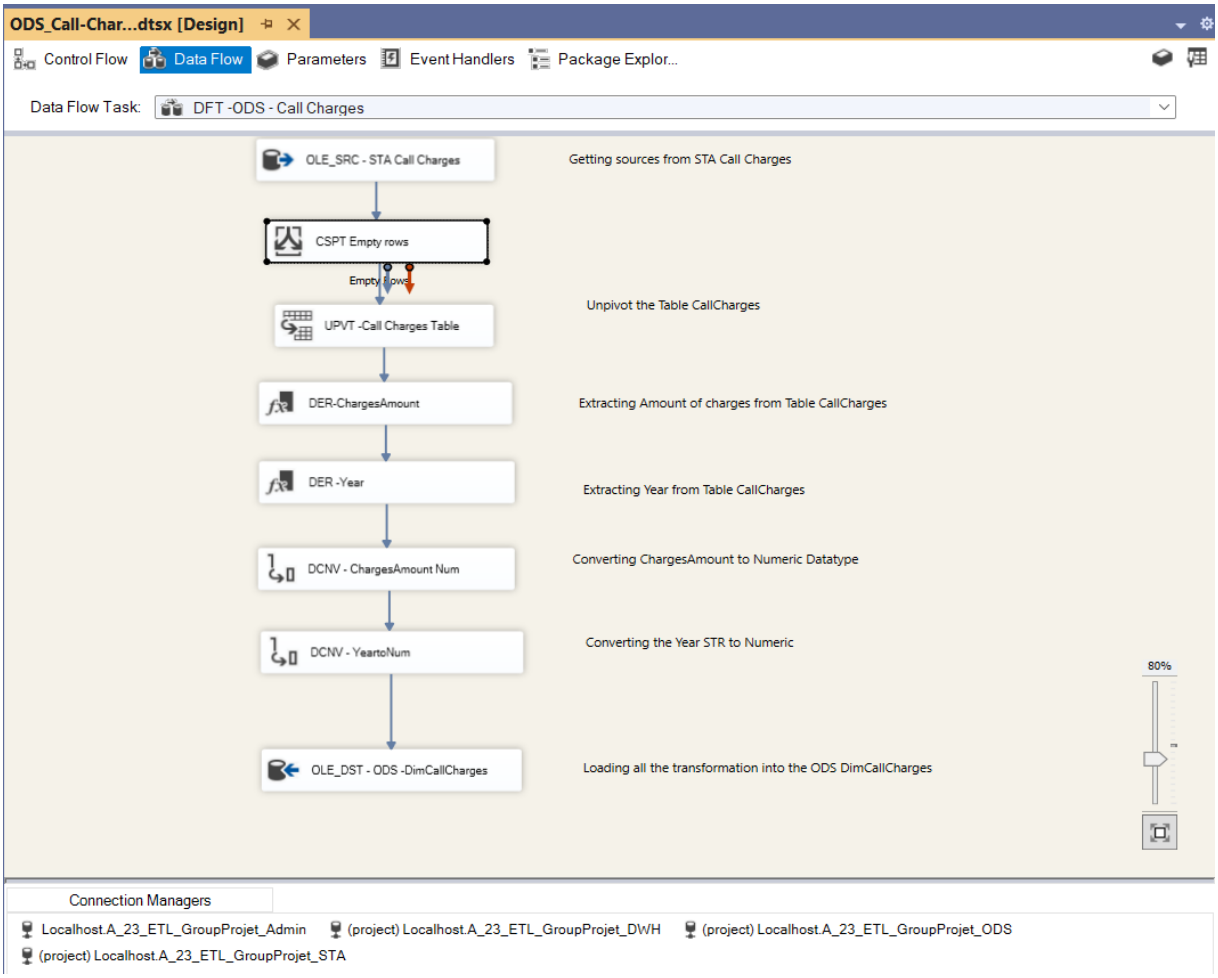
Loading all the transformation into ODS - DimCallCharges:



For that we created the destination table in the ODS database using this query:



Here is the result in the Data Flow view:



3. ODS - Call Data Table

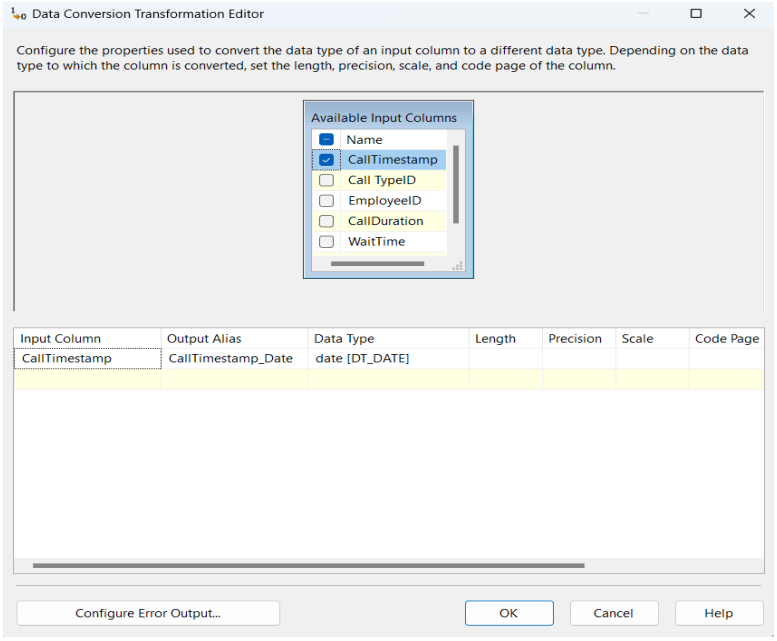
Getting the source from the STA - CallData, here is an extract from the file:

Results | Messages

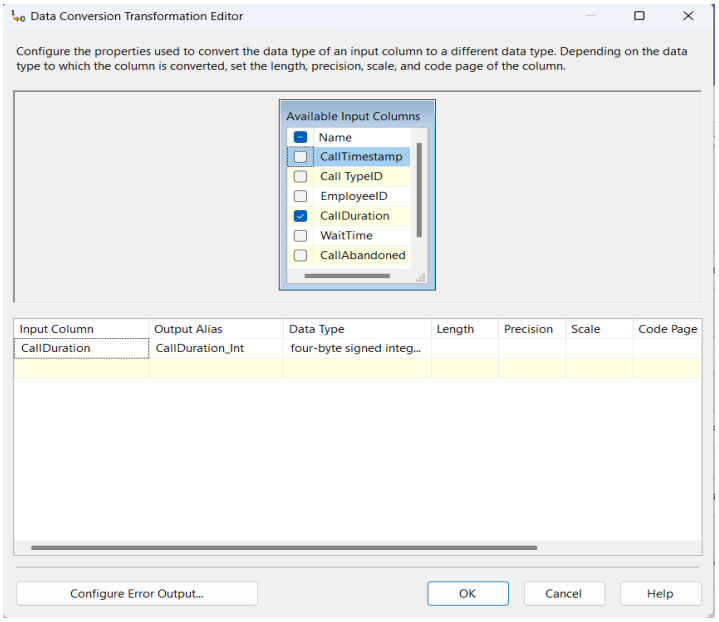
	CallTimestamp	Call Type	EmployeeID	CallDuration	WaitTime	CallAbandoned
1	5/4/2018 16:33	3	U559430	486	2	0
2	6/21/2018 18:28	3	A166733	945	0	0
3	6/21/2018 15:13	1	B971624	379	11	0
4	11/21/2018 13:02	3	U641256	1044	0	0
5	2/25/2018 13:36	1	P286634	1357	0	0
6	10/28/2018 10:04	3	M855788	570	23	0
7	12/17/2018 16:39	3	M794992	26	26	0
8	7/28/2018 19:09	2	I281837	8	8	0
9	11/6/2018 18:57	1	J192194	800	0	0
10	6/18/2018 15:32	2	F542348	651	111	0
11	5/14/2018 16:24	2	J632516	229	10	0
12	6/2/2018 12:57	3	U194381	467	23	0
13	6/20/2018 12:01	3	G586239	1290	7	0
14	12/20/2018 16:27	3	N772493	504	0	0

Query executed successfully.

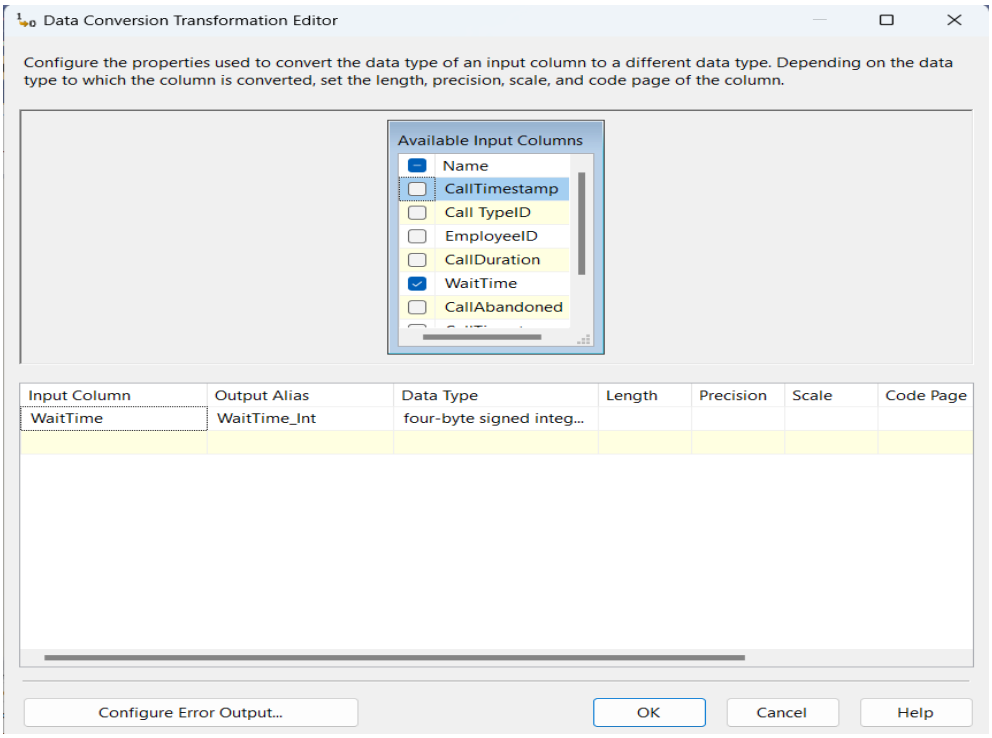
Converting CallTimeStamp to Date:



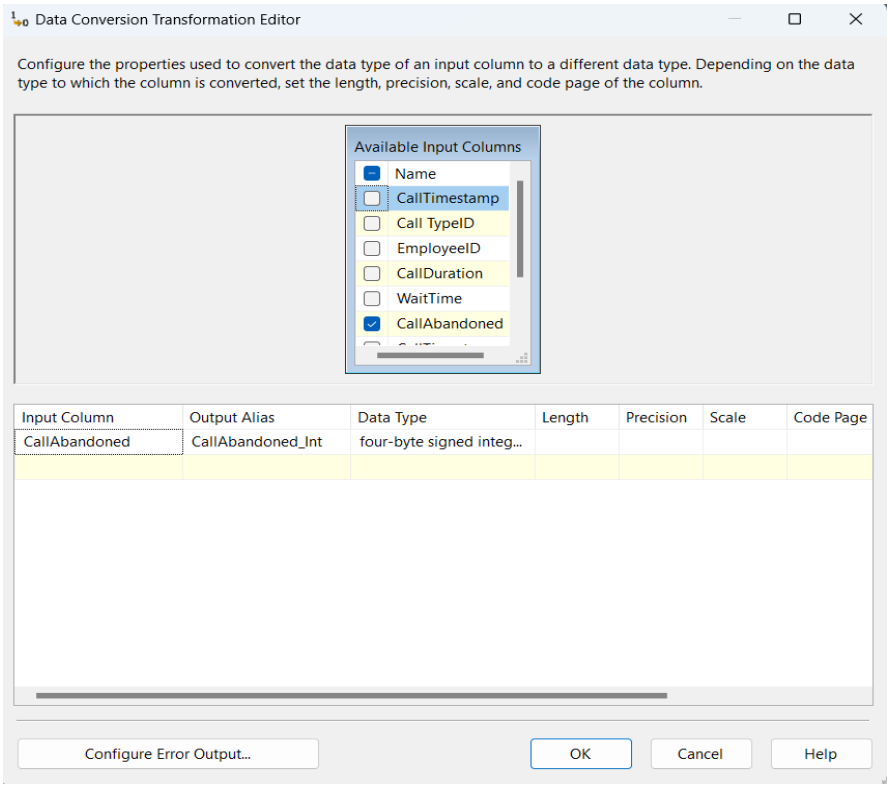
Converting CallDuration to INT :



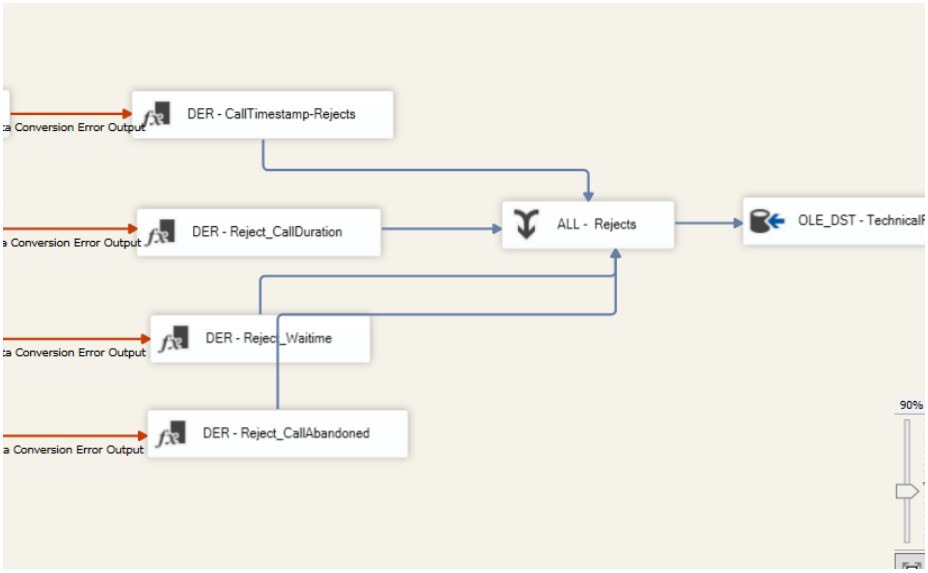
Converting WaitTime to INT:



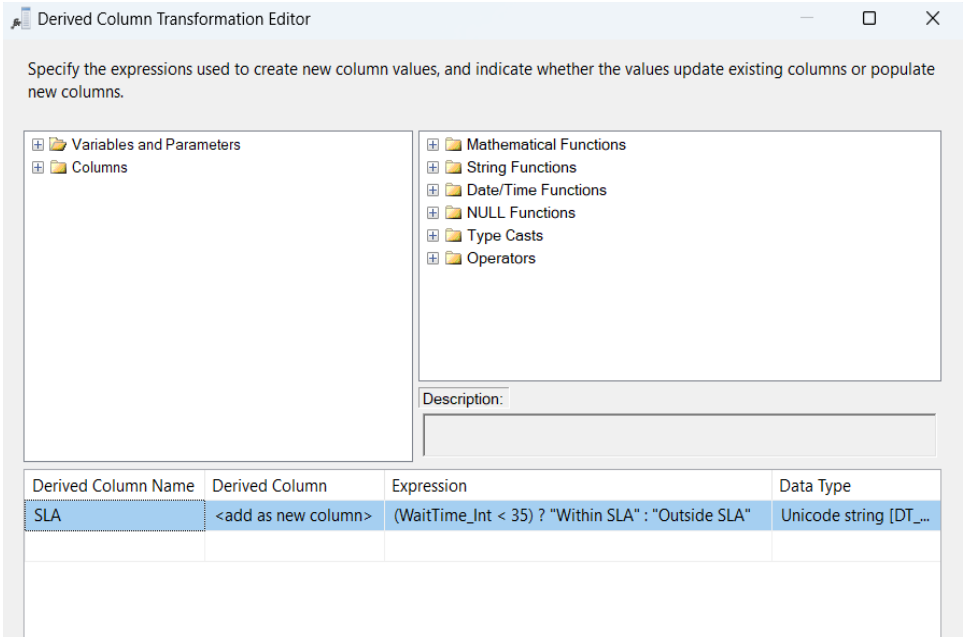
Converting AbandonedCall to INT:



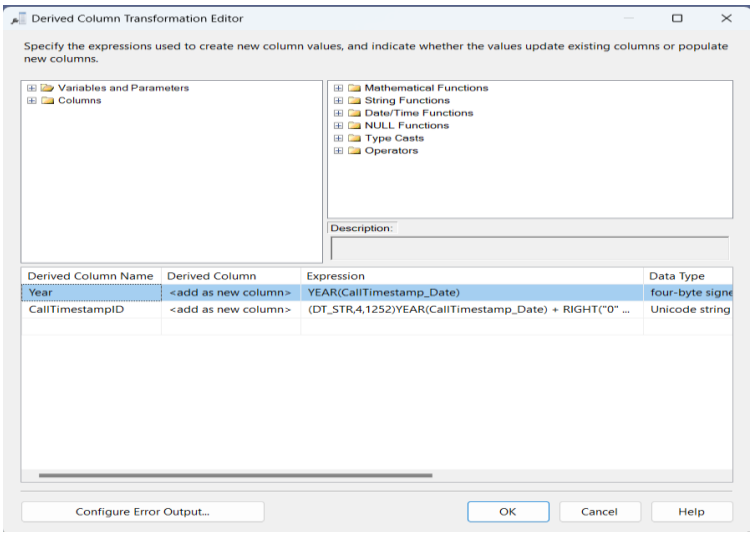
Pushing all the potential rejects by creating derived columns and sending them to the Admin Database in the table TechnicalRejects:



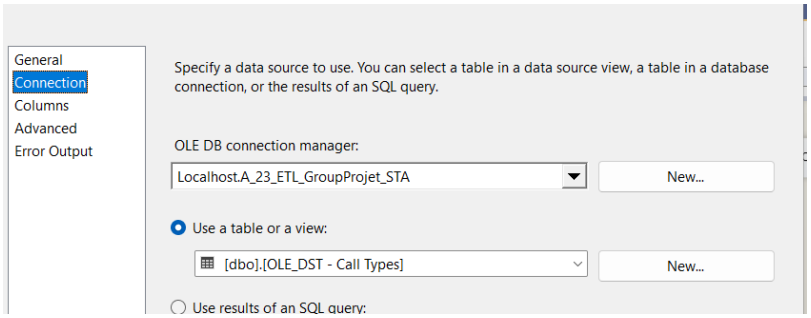
Adding the Service Legal Agreement status in a new column :



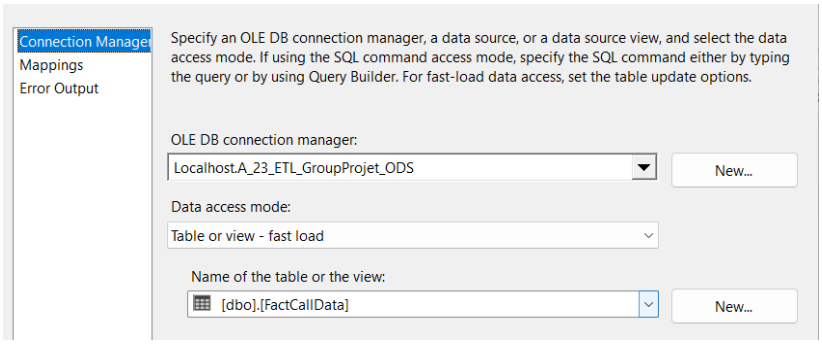
Creation of two new columns to compute the CallTimeStamp Identifier and Year of Call :



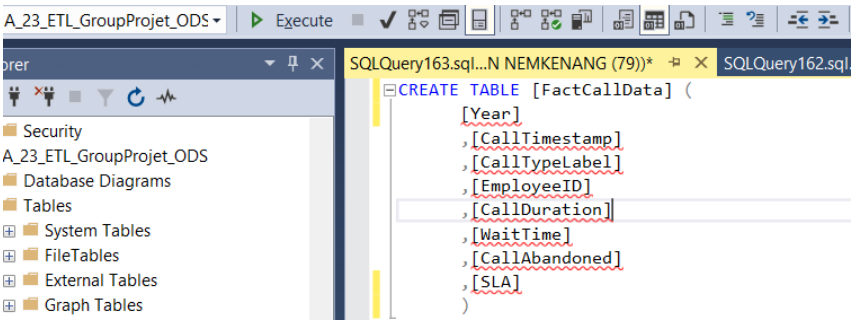
Getting the CallTypesLabel from the STA - Call Types table :



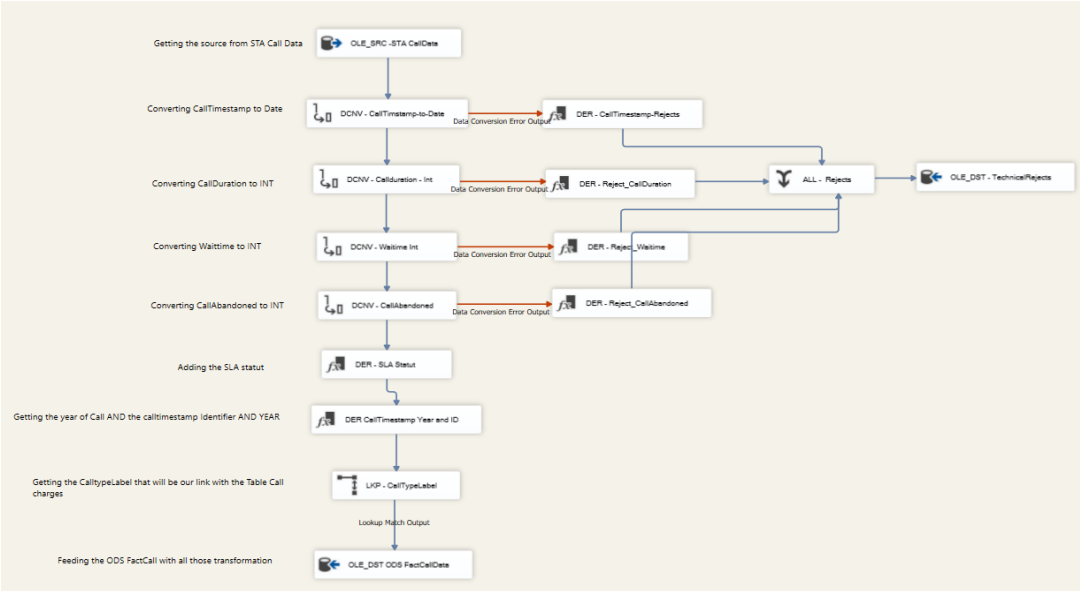
Loading all the transformation into the ODS - FactCallData :



For that we created the destination table in the ODS database using this query:



Here is the result in the Data Flow view:



VIII. DWH Database

Here, the role of the DWH Database is to connect to the ODS Database and see if there are any changes, update it and push it to the DWH Database.

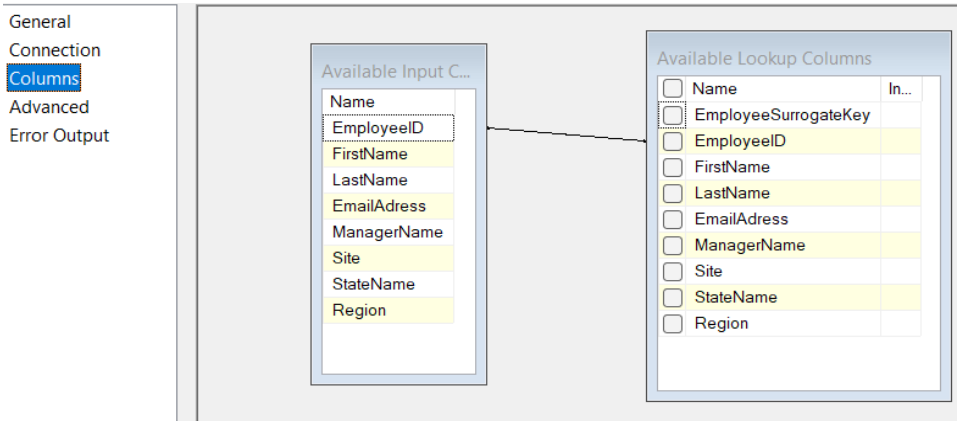
4. DimEmployee

Getting the ODS - Employee table, here is an extract of the table:

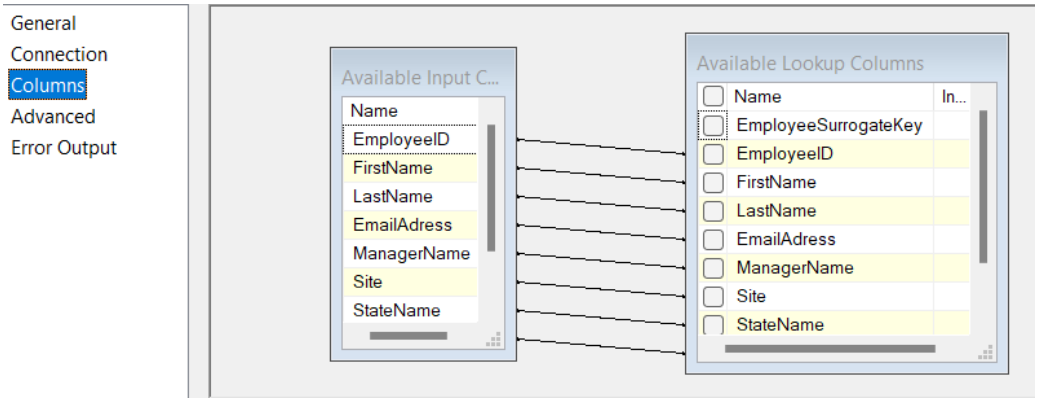
Results | Messages

	EmployeeID	FirstName	LastName	EmailAdress	ManagerName	Site	StateName	Region
1	N772493	Onita	Trojan	Onita.Trojan@ServiceSpot.com	Deidre Robbs	Spokane	Washington	West
2	F533051	Stormy	Seller	Stormy.Seller@ServiceSpot.com	Elsie Taplin	Aurora	Colorado	West
3	S564705	Mable	Ayoub	Mable.Ayoub@ServiceSpot.com	Shala Lion	Aurora	Colorado	West
4	I281837	Latrisha	Buckalew	Latrisha.Buckalew@ServiceSpot.com	Rana Taub	Aurora	Colorado	West
5	Y193775	Adrianna	Duque	Adrianna.Duque@ServiceSpot.com	Collin Trotman	Spokane	Washington	West
6	J632516	Keiko	Daulton	Keiko.Daulton@ServiceSpot.com	Jamar Prahl	Spokane	Washington	West
7	G727038	Dolores	Lundeen	Dolores.Lundeen@ServiceSpot.com	Shala Lion	Aurora	Colorado	West
8	V126561	Wilbur	Mohl	Wilbur.Mohl@ServiceSpot.com	Casey Bainbridge	Jacksonville	Florida	South
9	E243130	Ileen	Bornstein	Ileen.Bornstein@ServiceSpot.com	Gonzalo Lesage	Jacksonville	Florida	South
10	C206355	Janeth	Roesler	Janeth.Roesler@ServiceSpot.com	Miyoko Degraw	Spokane	Washington	West

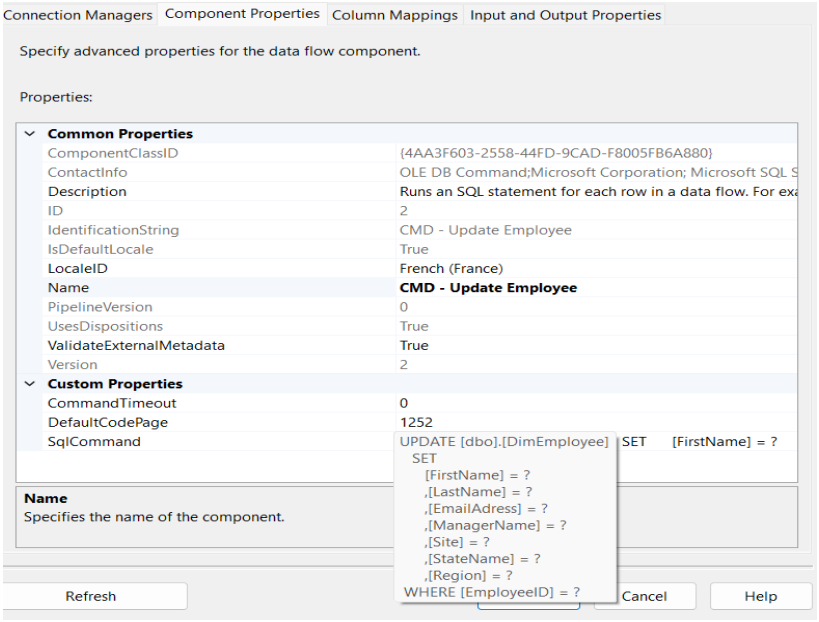
Lookup the EmployeeID which represents the connection between the ODS - Employee table and DWH - Employee table:

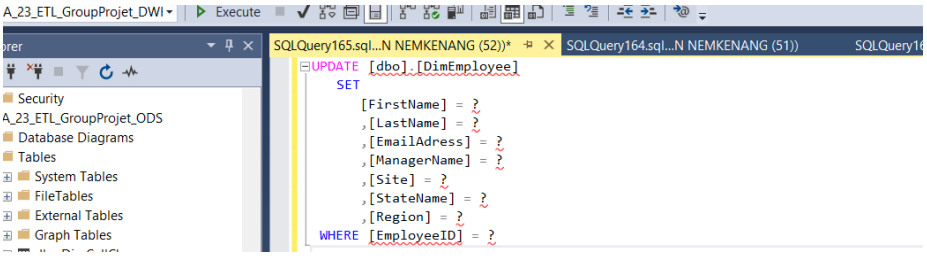


For the Match Output Lookup, we made a second Lookup to see if there are any changes:

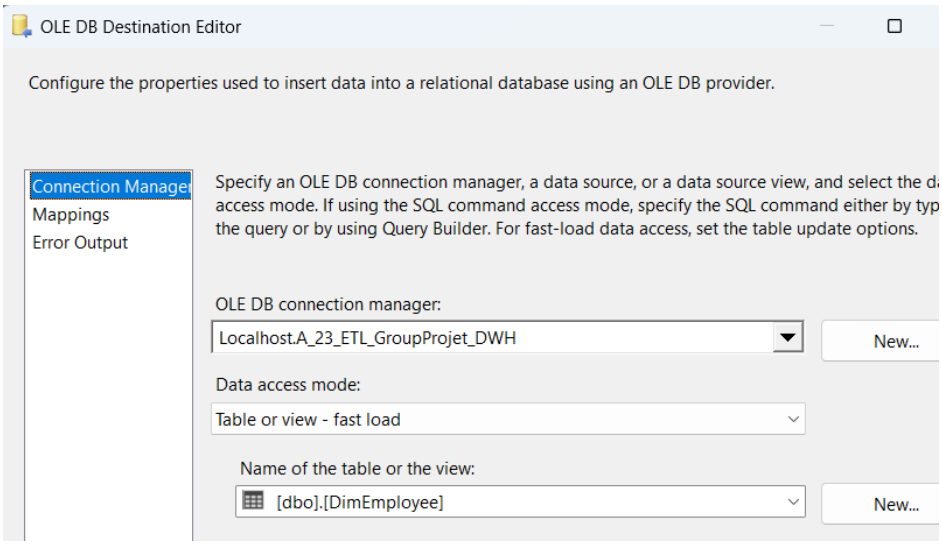


In case of changes, we made an Update :

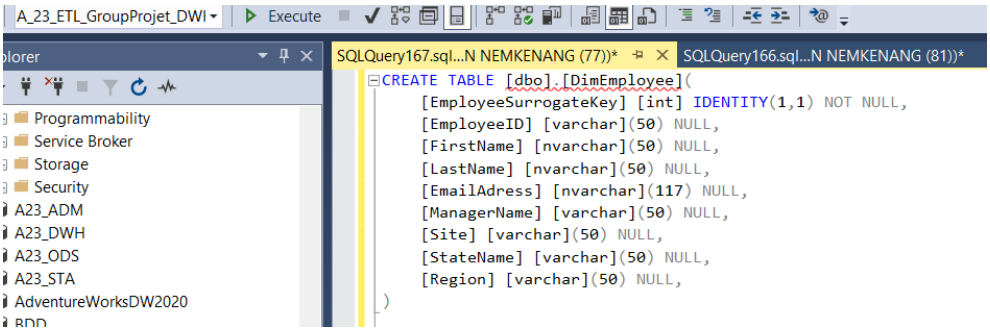




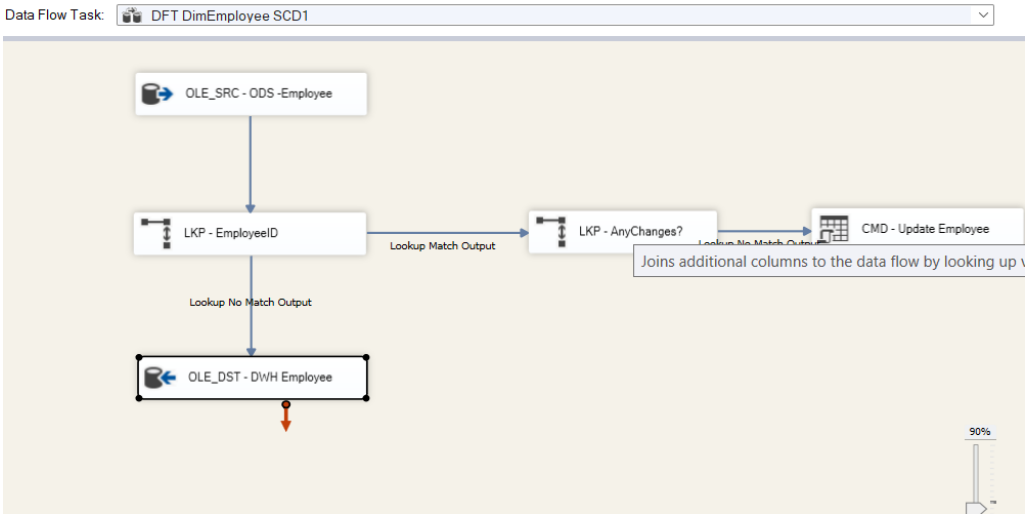
Loading all the transformation into the DWH - DimEmployee:



For that we created the destination table in the DWH database using this query :



Here is the result in the Data Flow view:



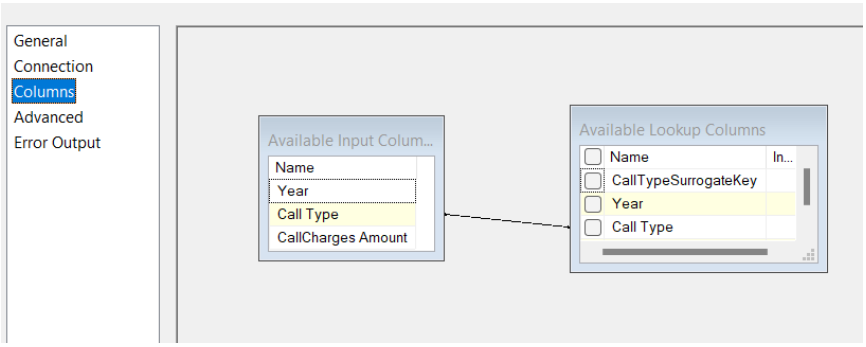
5. DimCallCharges

Getting the ODS - DimCallCharges table, here is an extract of the table:

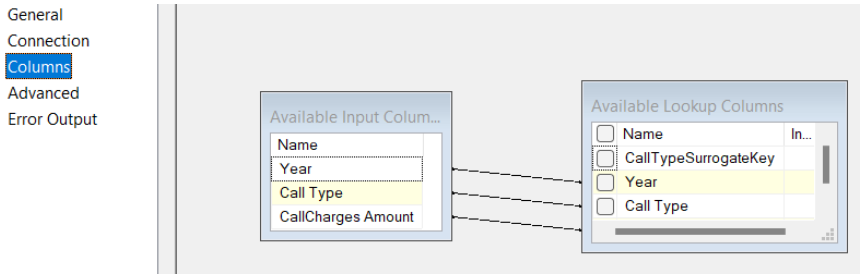
Results | Messages

	Year	Call Type	CallCharges Amount
1	2018	Sales	1.52
2	2019	Sales	1.56
3	2020	Sales	1.60
4	2021	Sales	1.71
5	2018	Billing	1.20
6	2019	Billing	1.32
7	2020	Billing	1.41
8	2021	Billing	1.45
9	2018	Tech Support	0.95
10	2019	Tech Support	0.98
11	2020	Tech Support	1.04
12	2021	Tech Support	1.12

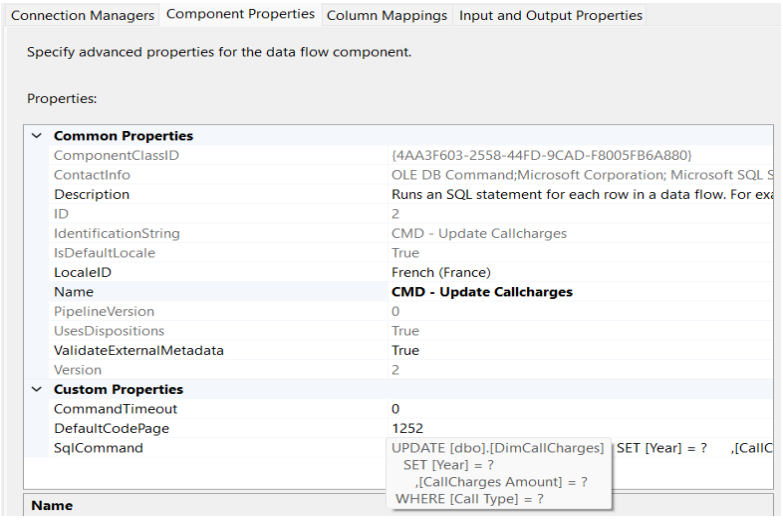
Lookup the Call Types which represents the connection between the ODS - DimCallCharges table and DWH - DimCallCharges:

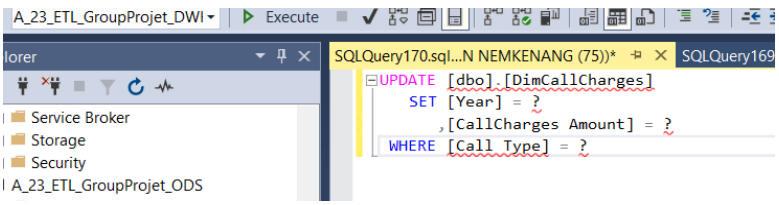


For the Match Output Lookup, we made a second Lookup to see if there are any changes:

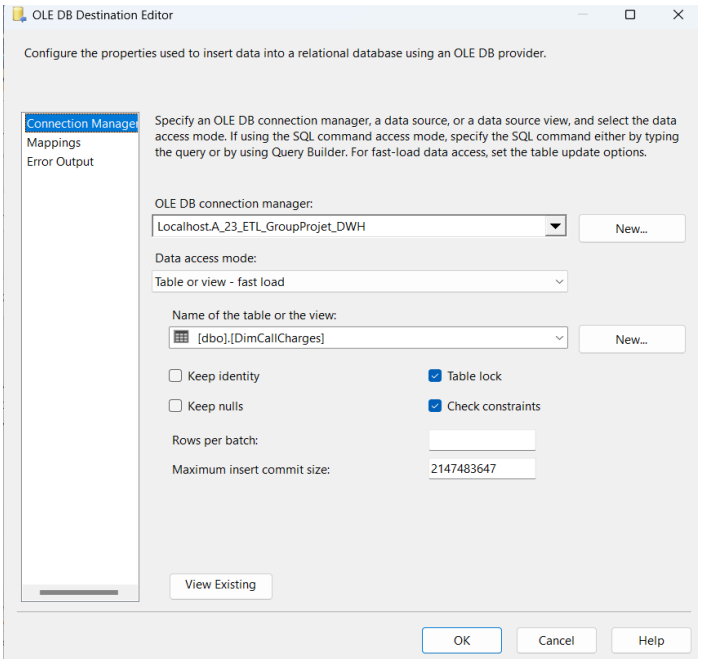


In case of changes, we made an Update:

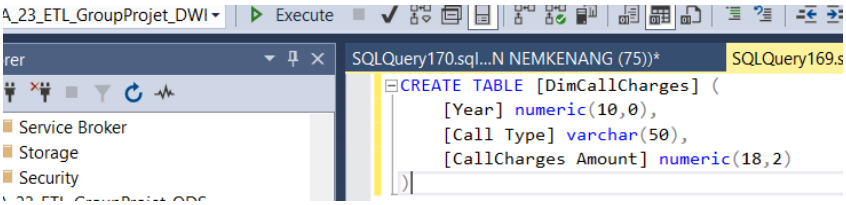




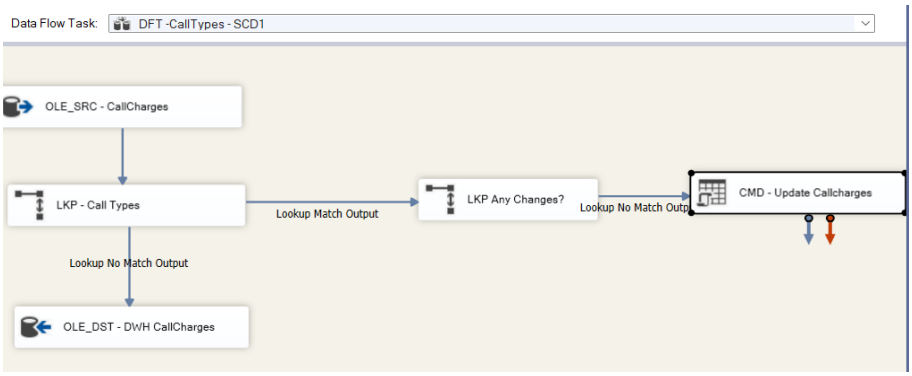
Loading all the transformation into the DWH - Call Charges:



For that we created the destination table in the DWH database using this query:



Here is the result in the Data Flow view:



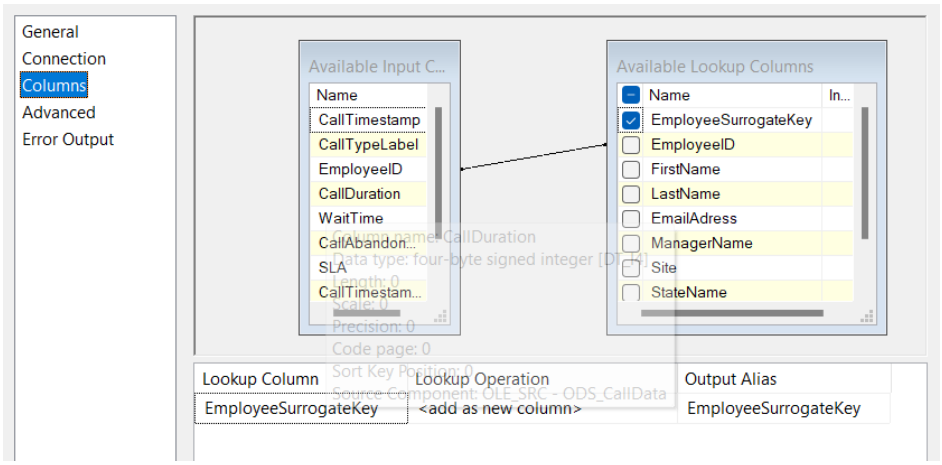
6. Fact Table Call Data

Getting source from ODS - Call Data, here is an extract of the table:

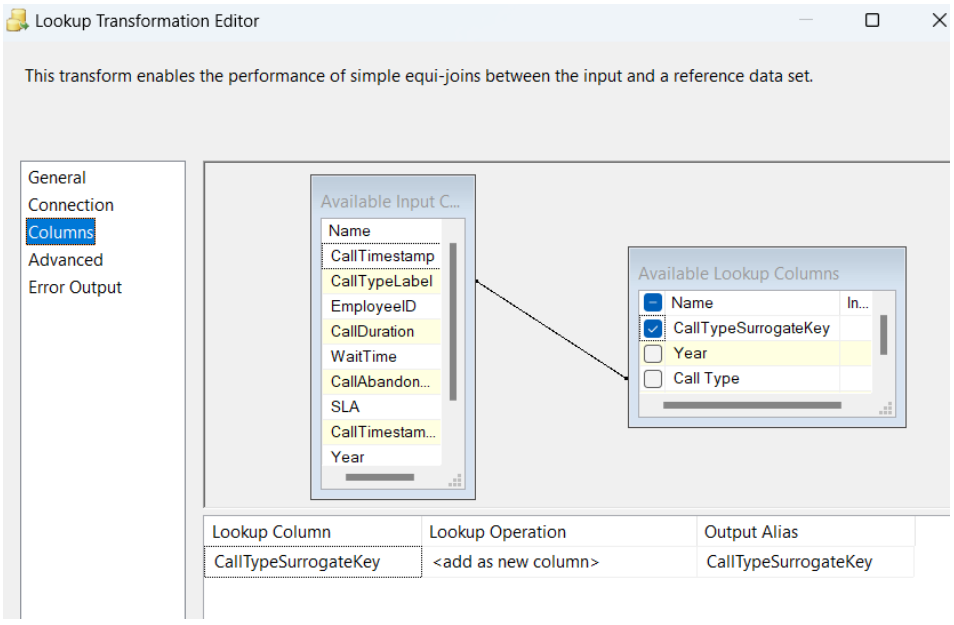
Results | Messages

	CallTimestampID	Year	CallTimestamp	CallTypeLabel	EmployeeID	CallDuration	WaitTime	CallAbandoned	SLA
1	201803131930000128O	2018	2018-03-13 19:30:00.000	Sales	J173690	1280	203	0	Outside SLA
2	201807291945000412	2018	2018-07-29 19:45:00.000	Billing	D411745	412	146	0	Outside SLA
3	20180811083000011	2018	2018-08-11 08:30:00.000	Billing	J549755	11	11	0	Within SLA
4	201809201809000992	2018	2018-09-20 18:09:00.000	Billing	K399501	992	25	0	Within SLA
5	201805091606000545	2018	2018-05-09 16:06:00.000	Sales	L736768	545	24	0	Within SLA
6	2018100313120001397	2018	2018-10-03 13:12:00.000	Tech Support	C206355	1397	0	0	Within SLA
7	20180807150000073	2018	2018-08-07 15:00:00.000	Billing	A475155	73	0	0	Within SLA
8	2018083017150001426	2018	2018-08-30 17:15:00.000	Tech Support	X991580	1426	12	0	Within SLA
9	201803281012000913	2018	2018-03-28 10:12:00.000	Billing	Y193775	913	5	0	Within SLA
10	201811201734000892	2018	2018-11-20 17:34:00.000	Sales	J192194	892	0	0	Within SLA
11	201808030947000600	2018	2018-08-03 09:47:00.000	Billing	D411745	600	0	0	Within SLA
12	201811151725000486	2018	2018-11-15 17:25:00.000	Tech Support	N620104	486	19	0	Within SLA
13	201804161941000690	2018	2018-04-16 19:41:00.000	Tech Support	T398672	690	7	0	Within SLA

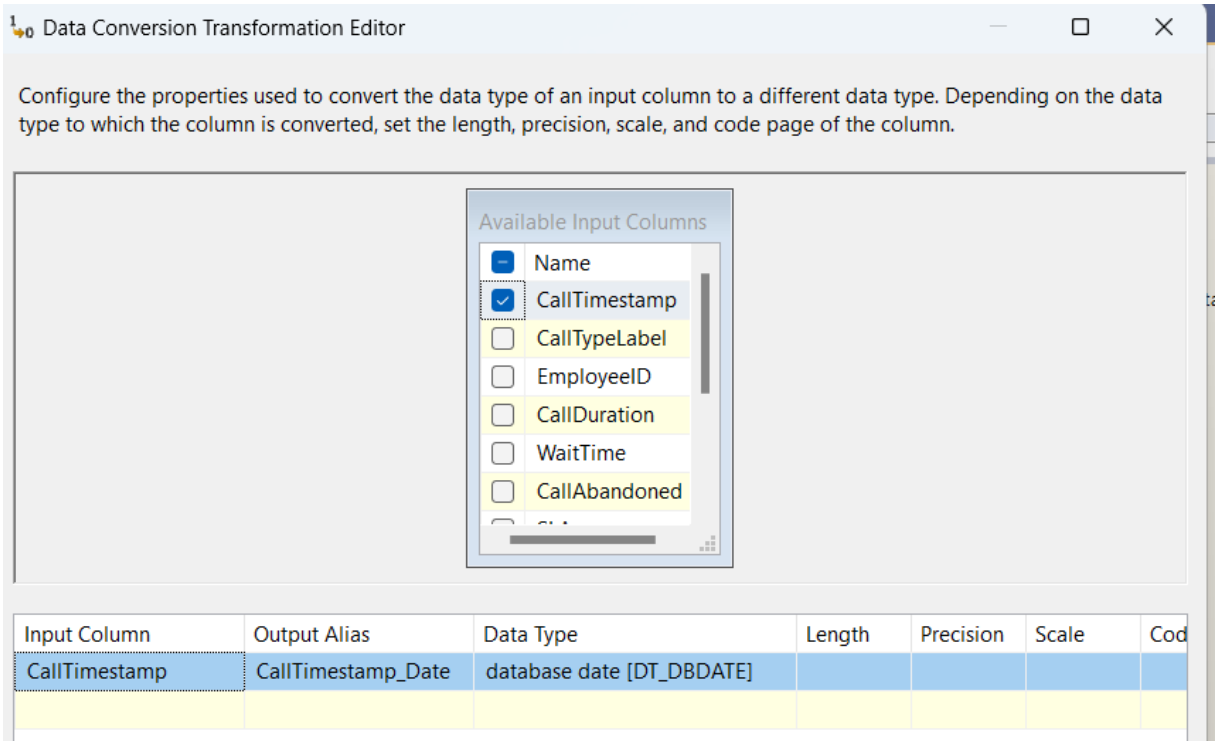
Lookup EmployeeID in DimEmployee to retrieve EmployeeSurrogateKey:



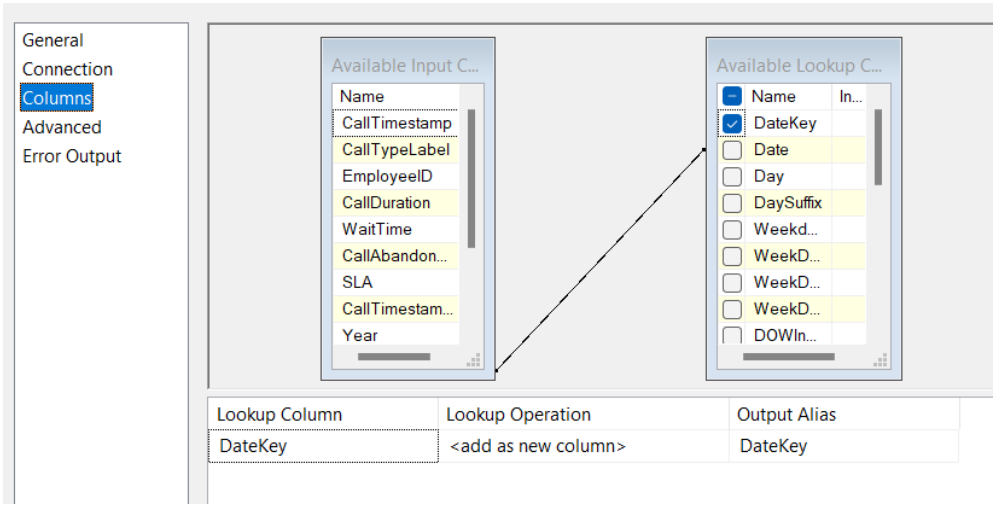
For the Match Output Lookup, we made a second Lookup to retrieve CallTypeSurrogateKey:



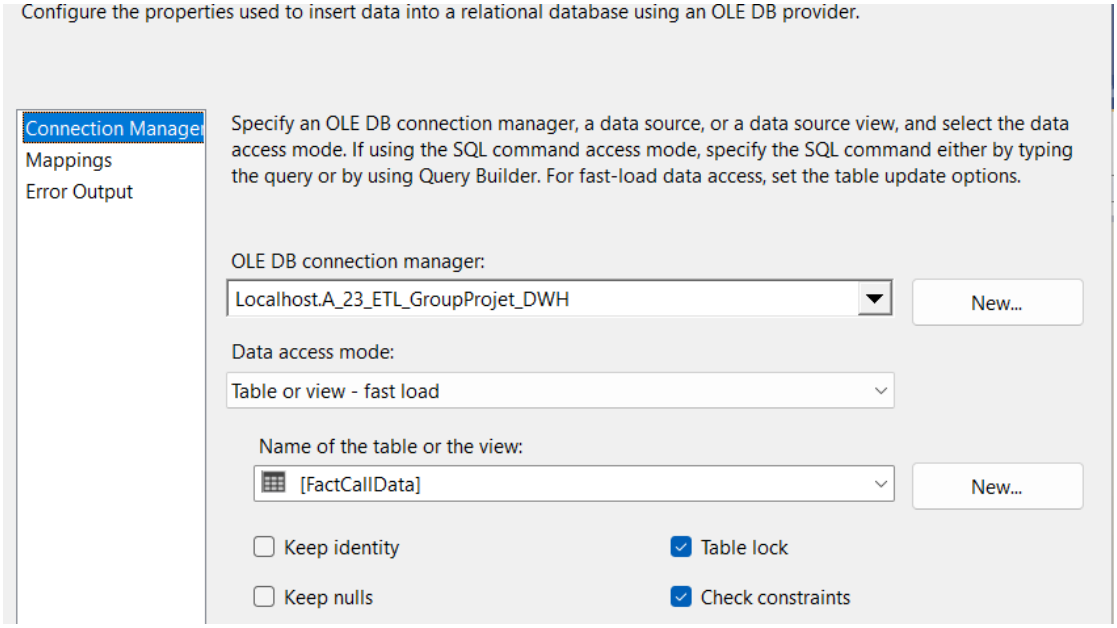
We coberted CallTimeStamps to DateType (DT_DBDATE):



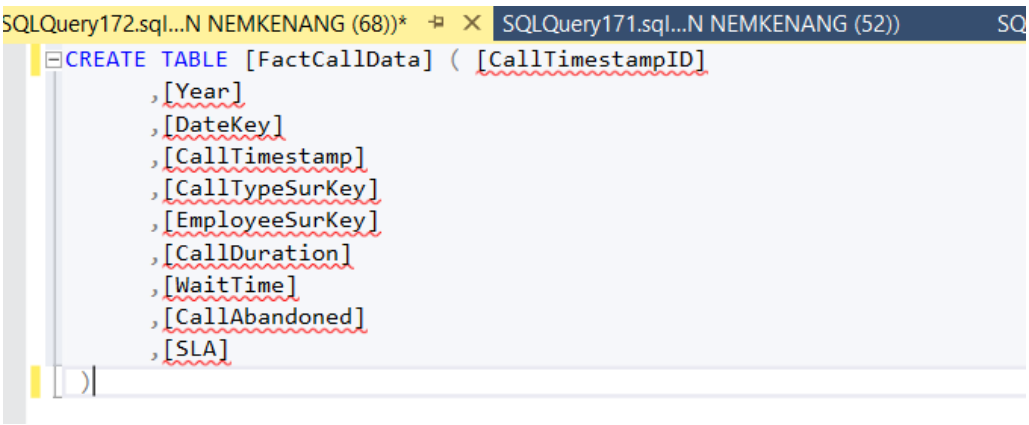
Lookup DimDate to retrieve DateKey :



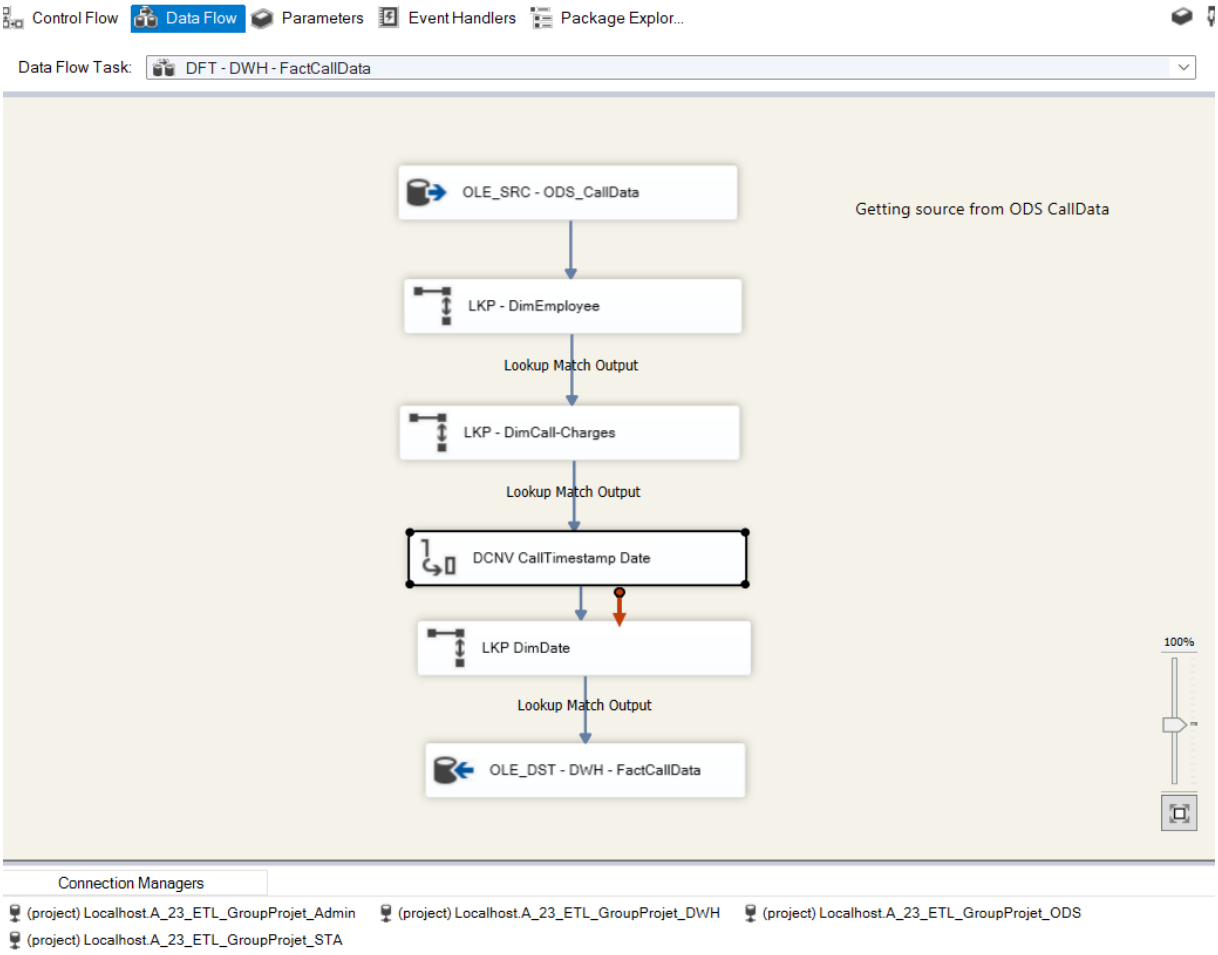
Loading all the transformation into the DWH - FactCallData:



For that we created the destination table in the DWH database using this query:



Here is the result in the Data Flow view:


Control Flow
Data Flow
Parameters
Event Handlers
Package Explor...
Data Flow Task:
DFT - DWH - FactCallData
OLE_SRC - ODS_CallData
Getting source from ODS CallData
LKP - DimEmployee
Lookup Match Output
LKP - DimCall-Charges
Lookup Match Output
DCNV CallTimestamp Date
LKP DimDate
Lookup Match Output
OLE_DST - DWH - FactCallData
100%
Connection Managers
(project) Localhost.A_23_ETL_GroupProjet_Admin
(project) Localhost.A_23_ETL_GroupProjet_DWH
(project) Localhost.A_23_ETL_GroupProjet_ODS
(project) Localhost.A_23_ETL_GroupProjet_STA