

# BI4Dynamics AX/NAV

## Integrate external data sources

Integrate external data sources  
Last update: January 2020  
Version: 2.2

Abbreviation used in this document:

- **EDS:** External Data Source(s) are data that are not a part of Microsoft Dynamics AX/NAV.  
It can come from any format of SQL, Excel, txt, to any other file format and/or any other data source.
- **BI4:** BI4Dynamics
- **ETL:** Extract - Transform - Load

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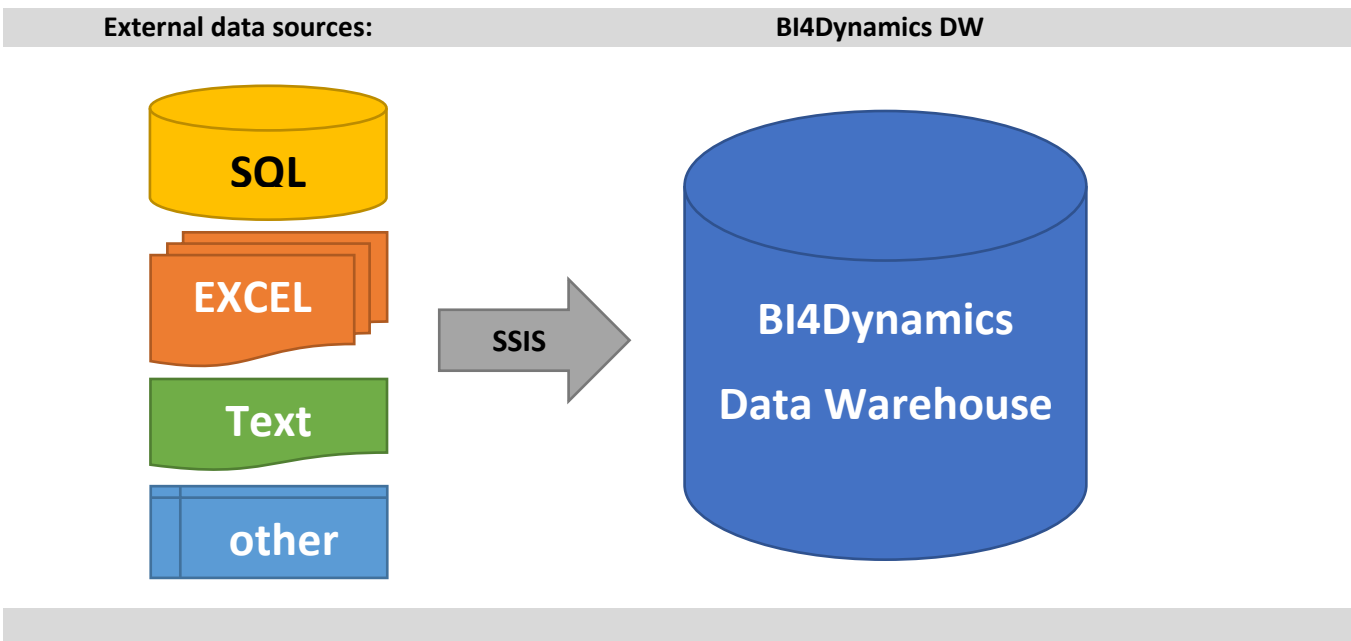
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# 1 Introduction

Integration of external data sources comes in two parts:

1. **Get data from external sources into BI4Dynamics data warehouse database (usually 80% of effort)**  
As a result, EDS tables are copied/transformed from EDS to BI4
2. **Create new BI structures with Wizard (usually 20% of effort)**  
As a result, new data warehouse and cube objects are created within BI4Dynamics DW and SSAS database

In this document, the first part is explained with details and code examples.



## 1.1 ETL tool vs BI tool

BI4Dynamics has not developed an ETL tool or feature. BI4Dynamics uses free Microsoft tools for SSIS package creation and integrates SSIS packages into the BI4Dynamics process flow.

Note:

- ETL tool is not a part of BI4Dynamics software,
- There are no automatic interactions between the ETL tool and BI4Dynamics,
- Files generated by the ETL tool are added into the BI4Dynamics process flow for execution.

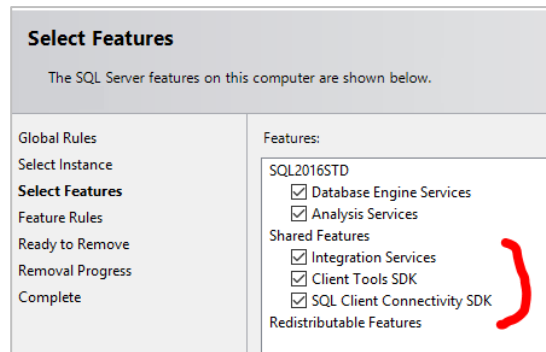
By this approach customer can:

- Use most popular ETL tool from Microsoft (free) – SSDT (SQL Server Data Tool for Visual Studio),
- SSDT can cover almost any import-export scenario with robust structure and flexible design, Very useful resources from [TechBrothersIT](#) with 200+ videos on SSIS,
- Engage internal resources in ETL part of the project (save costs),
- Takes responsibility for correct data

## 1.2 Prerequisite

In order to facilitate loading external sources, we recommend using following Microsoft tools. Both Microsoft tools are free of charge, available from the internet:

1. SSMS (SQL Server Management Studio)
  - Download the latest version;
  - This tool is not related to target SQL server version.
  - Link: <https://docs.microsoft.com/en-us/sql/ssms/download-sql-server-management-studio-ssms?view=sql-server-2017>
2. SSDT (SQL Server Data Tool for Visual Studio)
  - Download the latest version that is related to target SQL server version.  
Only limitation: SSIS creation on SSDT (VS 2013) & SSIS target execution DB SQL 2008R2
  - Link : <https://docs.microsoft.com/en-us/sql/ssdt/download-sql-server-data-tools-ssdt?view=sql-server-2017>
3. SQL server database engine (target)
  - Install shared features



## 1.3 Videos on BI4Dynamics YouTube channel

Use BI4Dynamics videos to show step-by-step data transformation:

<https://www.youtube.com/user/BI4Dynamics/>

## 2 Part 1 – Integrate external sources into the DW database

In this document we describe the following scenario:

1. The source is LIVE: new data is coming to source on a daily basis
2. FULL load: data is always loaded from source to DW in full

We will use ETL tool to get data from an external source into BI4Dynamics data warehouse.

Note:

- ETL tool is not a part of BI4Dynamics software,
- There are no automatic interactions between ETL tool and BI4Dynamics,
- Files that are generated by the ETL tool, are added into the BI4Dynamics process flow for execution.

Table with detailed steps

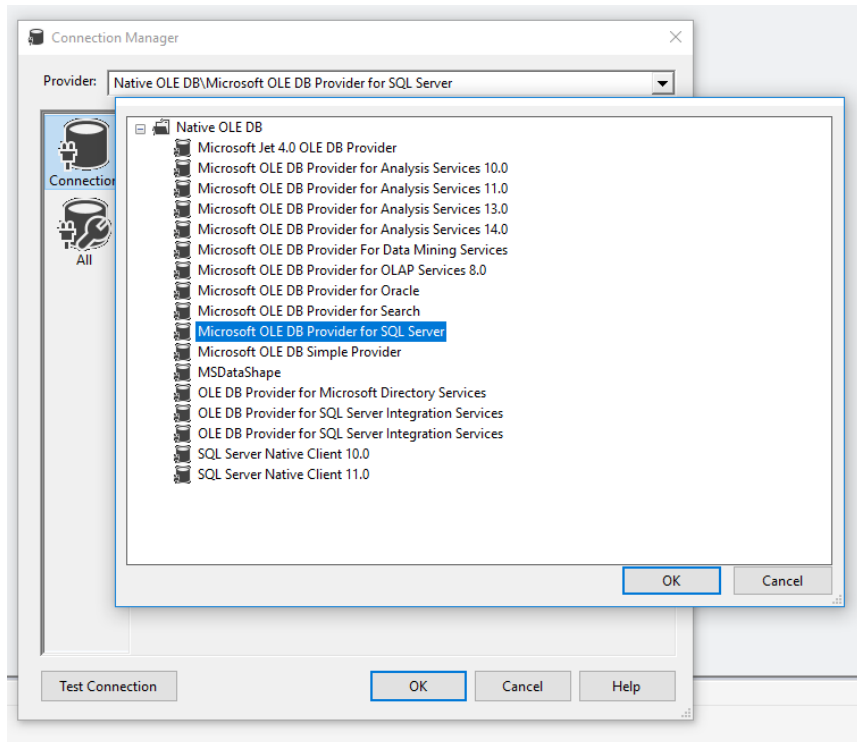
| No                          | Description                                   | Tool        | Comment  |
|-----------------------------|---|-------------|--|
| <b>Phase 1: ETL</b>         |   |             |  |
| 1                           | Create an SSIS package                        | SSDT        | Use ETL tool and fine-tune package and scrips for execution  |
|                             | Update SSIS package                           |             |  |
| 2                           | Update Drop table                             | SSDT, SSMS  | Example: <a href="#">DROP TABLE IF EXISTS</a>  |
| 3                           | Update Create table                           | SSDT, SSMS  | Depending on the SQL version and selected connector you may address some issues like: <ul style="list-style-type: none"> <li>• Replace NON NULL with NULL for all columns (not PK)</li> <li>• Replace smalldatetime with datetime</li> </ul> |
| 4                           | Add Primary Key to the table                  | SSDT, SSMS  | For tables used as primary dim or fact tables  |
| 5                           | Test SSIS package (standalone)                | SSDT, SSMS  |  |
| <b>Phase 2: BI4Dynamics</b> |   |             |  |
| 6                           | Keep schema on deploy                         | BI4Dynamics | Keep schema or tables from being deleted on deploy   |
| 7                           | Add SSIS package to BI4Dynamics process flow  | BI4Dynamics |  |
| 8                           | Test SSIS package (standalone) in BI4Dynamics | BI4Dynamics |  |

## 2.1 Create an SSIS package

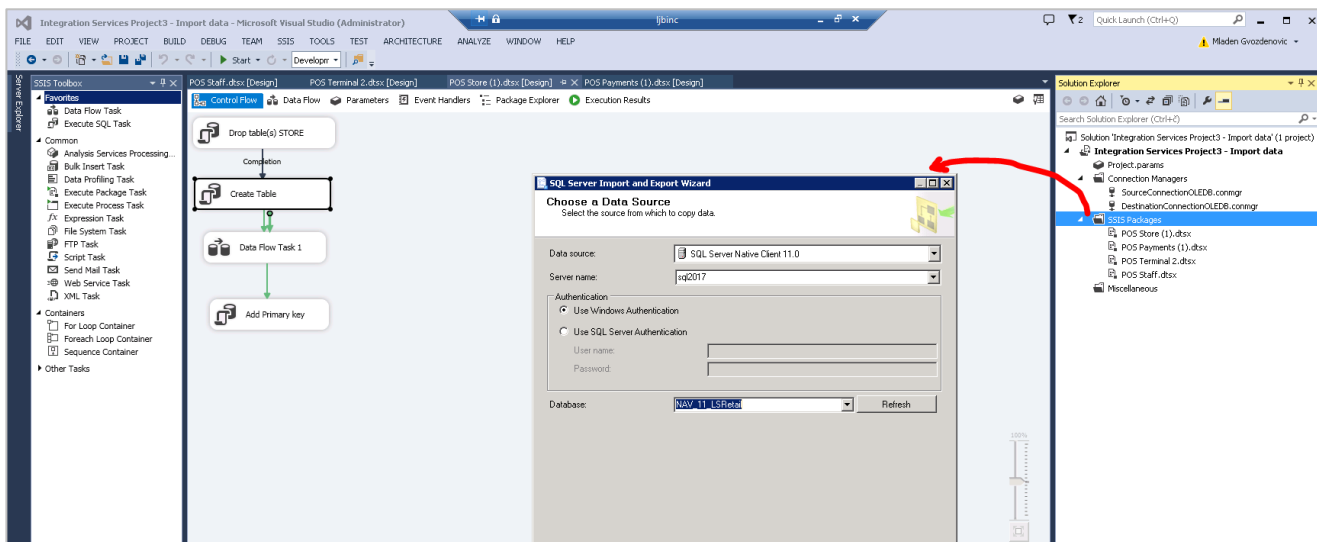
Create a package with SQL Server Import and Export Wizard by using SSDT or SSMS.

Select the right Provider:

It is not recommended to use this **SQL server native client (SNAC)** for new development. The new OLE DB provider is called the **Microsoft OLE DB Driver for SQL Server (MSOLEDBSQL)** which will be updated with the most recent server features going forward.



- Rename Table name and Schema name:



Follow the wizard steps to the finish.

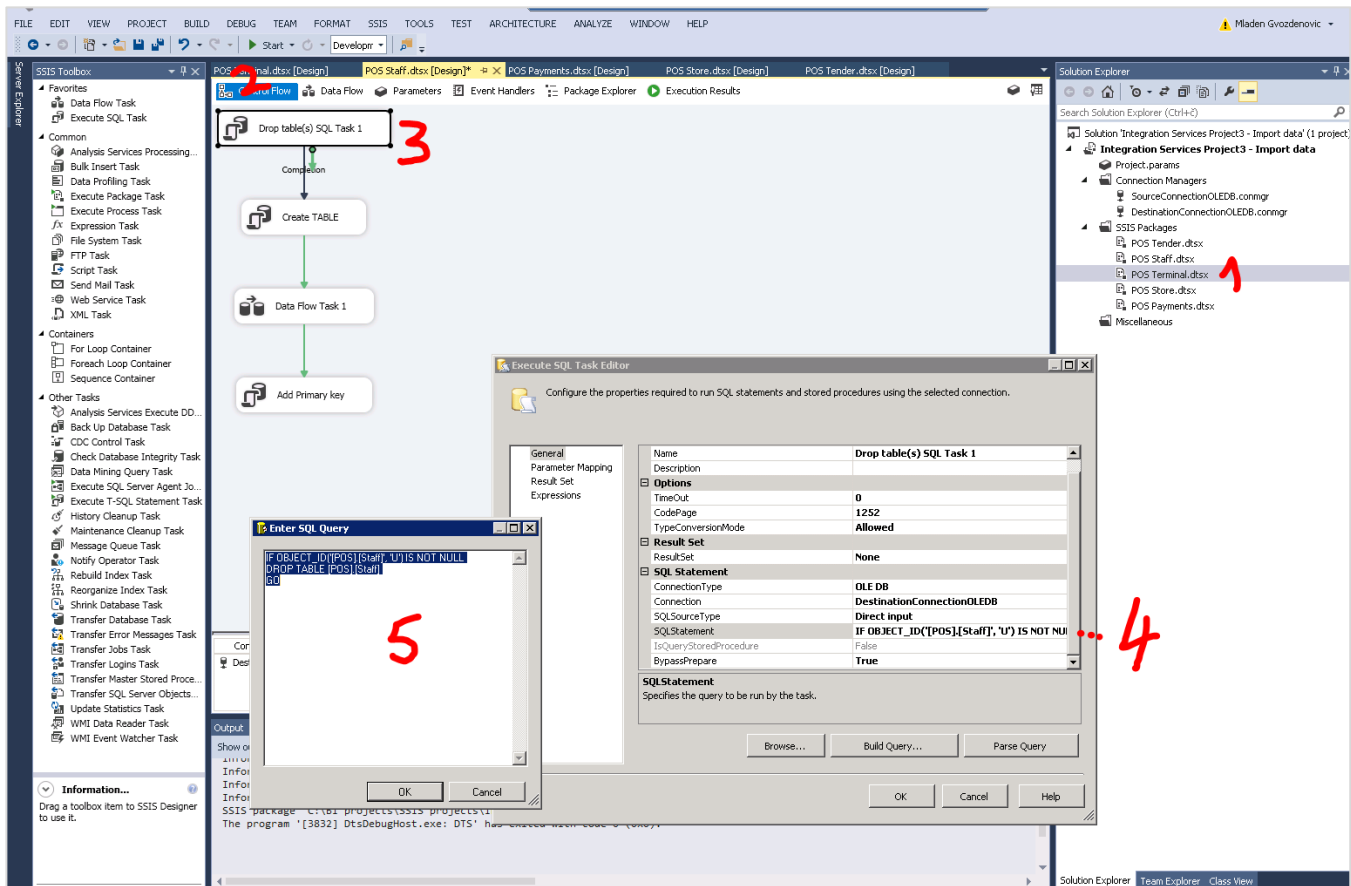
## 2.2 Create SCHEMA if not there

```
IF NOT EXISTS (SELECT name FROM sys.schemas WHERE name = N'TEST')
BEGIN
    EXEC('CREATE SCHEMA [TEST] AUTHORIZATION [dbo]')
END
```

**IMPORTANT NOTE:** The name of the schema **must not be/must not contain** the word 'stage'

## 2.3 Update DROP TABLE

As script "Create table" will run many times, we should make sure the table is always deleted before created.



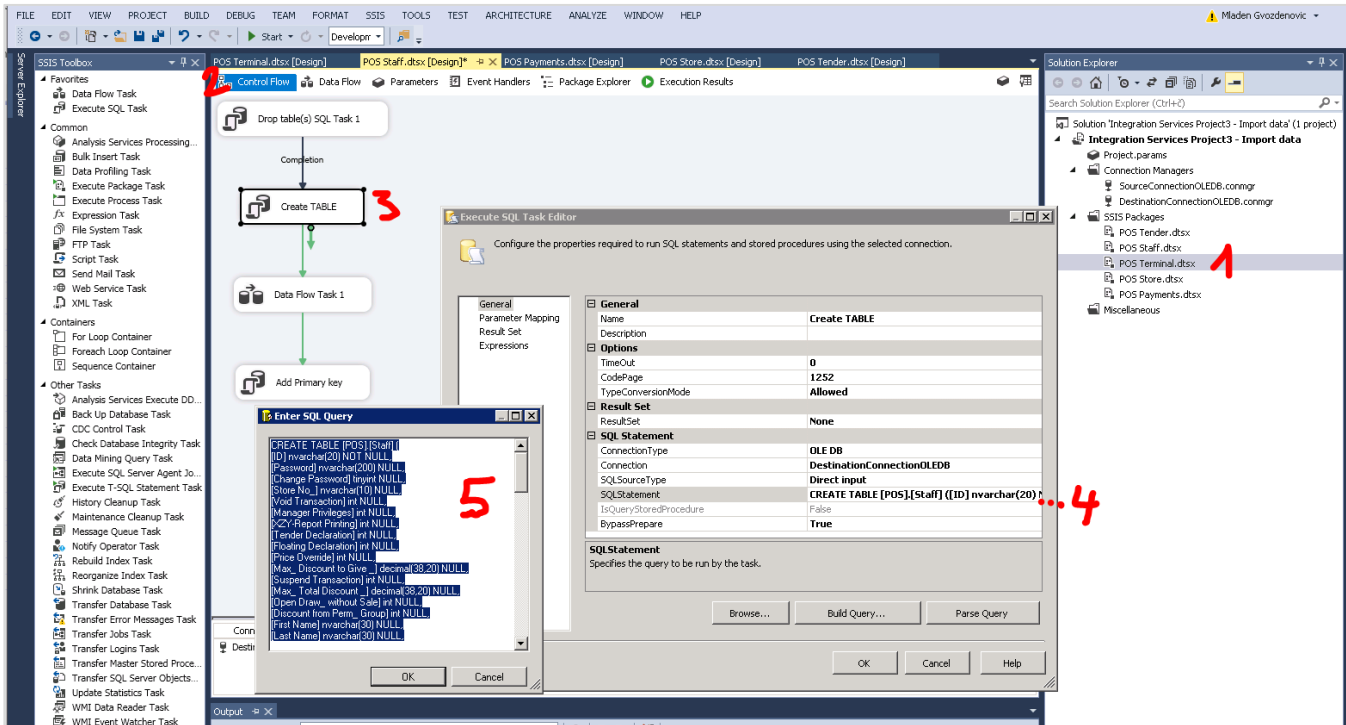
Script example

| Step       | Description  | Comment   |
|------------|--|---|
| Drop table | IF OBJECT_ID('[POS].[Store]', 'U') IS NOT NULL<br>DROP TABLE [POS].[Store];  | More code with older SQL versions   |
|            | DROP TABLE IF EXISTS [POS].[Store]   | Less code in SQL 2016   |
| Note       | Object type can be one of these object types:<br>C = CHECK constraint<br>D = Default or DEFAULT constraint<br>F = FOREIGN KEY constraint<br>L = Log<br>FN = Scalar function<br>IF = Inlined table-function | RF = Replication filter stored procedure<br>S = System table<br>TF = Table function<br>TR = Trigger<br>U = User table<br>UQ = UNIQUE constraint (type is K) |

|  |   |   |
|--|---|---|
|  | P = Stored procedure<br>PK = PRIMARY KEY constraint (type is K) | V = View<br>X = Extended stored procedure |
|--|---|---|



## 2.4 Update CREATE TABLE

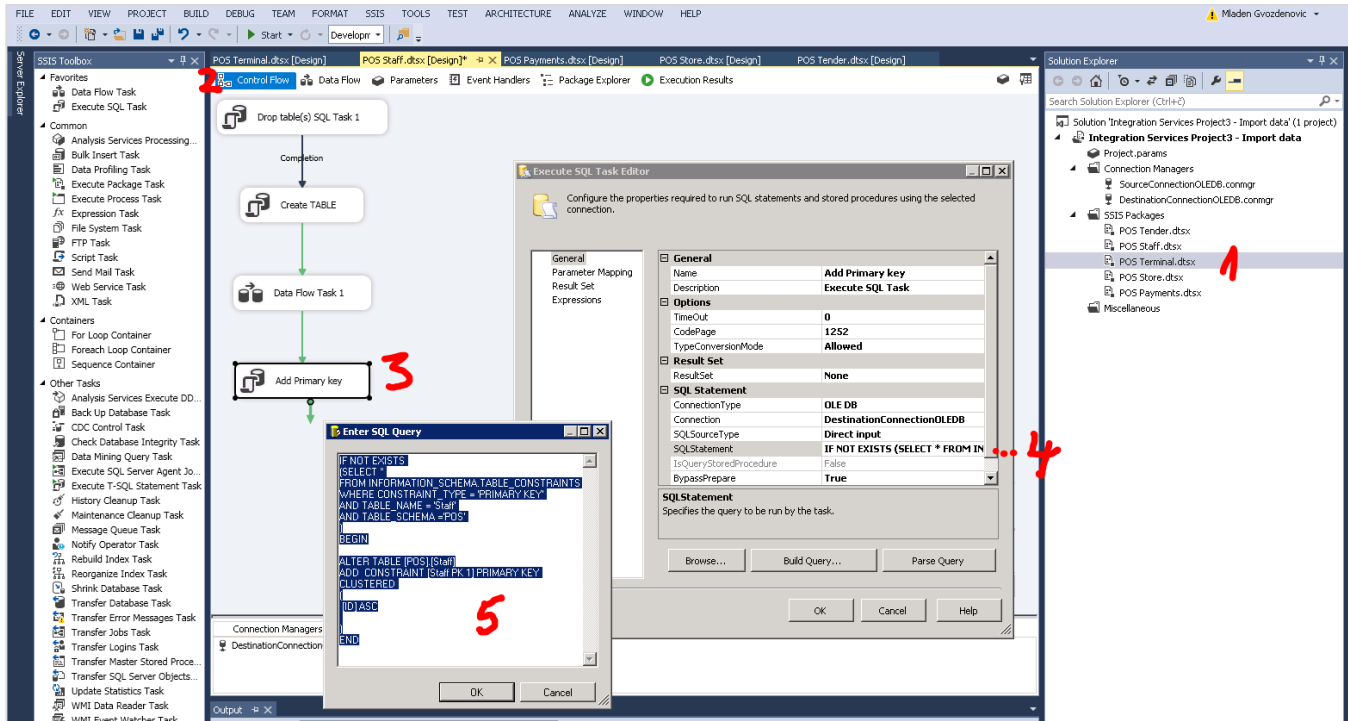


As there are various ways (SQL version, database connectors, ETL tools) to do the “Create table” step, check and fix following issues (in case occurred):

1. Replace **NOT NULL** to **NULL** for all fields except the Primary Key (you must know which field is a table primary key!)
2. Replace column format of smalldatetime to datetime

| Before   | After   |
|--|---|
| <pre>CREATE TABLE [POS].[Store] ( [No_] [nvarchar](10) NOT NULL, [Name] [nvarchar](30) NOT NULL, [City] [nvarchar](30) NOT NULL, [Post Code] [nvarchar](20) NOT NULL, [Country Code] [nvarchar](10) NOT NULL, [Last Date Modified] [smalldatetime] NOT NULL,</pre> | <pre>CREATE TABLE [POS].[Store] ( [No_] [nvarchar](10) NOT NULL, [Name] [nvarchar](30) NULL, [City] [nvarchar](30) NULL, [Post Code] [nvarchar](20) NULL, [Country Code] [nvarchar](10) NULL, [Last Date Modified] [datetime] NULL,</pre> |

## 2.5 Add Primary Key to the table



Primary key is needed (only) for tables used as:

- Base or **primary table** in data warehouse **fact**
- Base or **primary table** in data warehouse **dimension**

Based on primary key columns an index for fact or dimension table will be generated. Table would still load into DW without primary keys, but script generated by BI4Dynamics will not be correct and execution of such script will cause an error.

| Example                                       | Comment   |
|---|---|
| Example 1:<br>generated by SSMS<br>one column | <pre>IF NOT EXISTS ( SELECT * FROM INFORMATION_SCHEMA.TABLE_CONSTRAINTS WHERE CONSTRAINT_TYPE = 'PRIMARY KEY' AND TABLE_SCHEMA = 'POS' AND TABLE_NAME = 'Store' ) BEGIN ALTER TABLE [POS].[Store] ADD CONSTRAINT [Store PK 1] PRIMARY KEY CLUSTERED (     [No_] ASC ) END</pre> |
| Example 2<br>Generated by SSMS<br>Two columns | <pre>IF NOT EXISTS ( SELECT * FROM sys.indexes WHERE object_id = OBJECT_ID(N'[POS].[Tender Type]') AND name = N'PK_Tender Type') BEGIN ALTER TABLE [POS].[Tender Type] ADD CONSTRAINT [PK_Tender Type] PRIMARY KEY CLUSTERED (     [Store No_] ASC,     [Code] ASC ) END</pre>  |

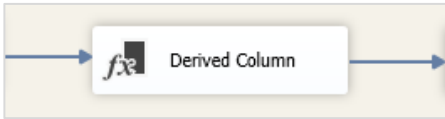
If you do not add primary key to table, BI4Dynamics will report an error:

The screenshot shows the 'Manage Dimensions' window for 'GL Account NAV'. The 'Source Tables' list contains 'UK 2009\$G\_L Account' and 'UK 2009\$G\_L Entry'. A red arrow points from 'UK 2009\$G\_L Account' to an error dialog box on the right. The error dialog box contains the following text:

**Error**  
Error Code: ERROR\_W52  
Description: Cannot add selected table as primary!  
Detailed description  
Code: ERROR\_W52  
Method name: SelectDimensionTableViewModel.AddTableToFact  
Source: BI4Dynamics.Common  
B4Message: Source table without primary key defined cannot be added as primary table on dimension. One or more errors occurred.

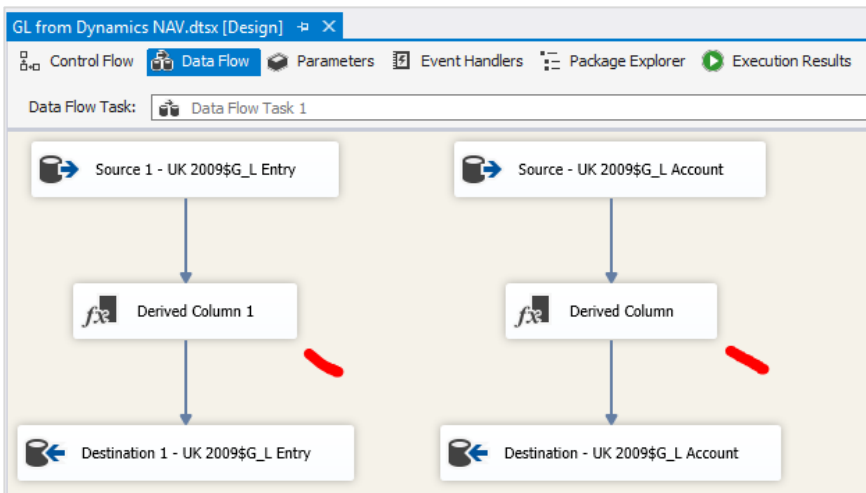
## 2.6 Add new field to result set

When we want to add a column, we add this object between source and destination:



The object is used to add column when column is:

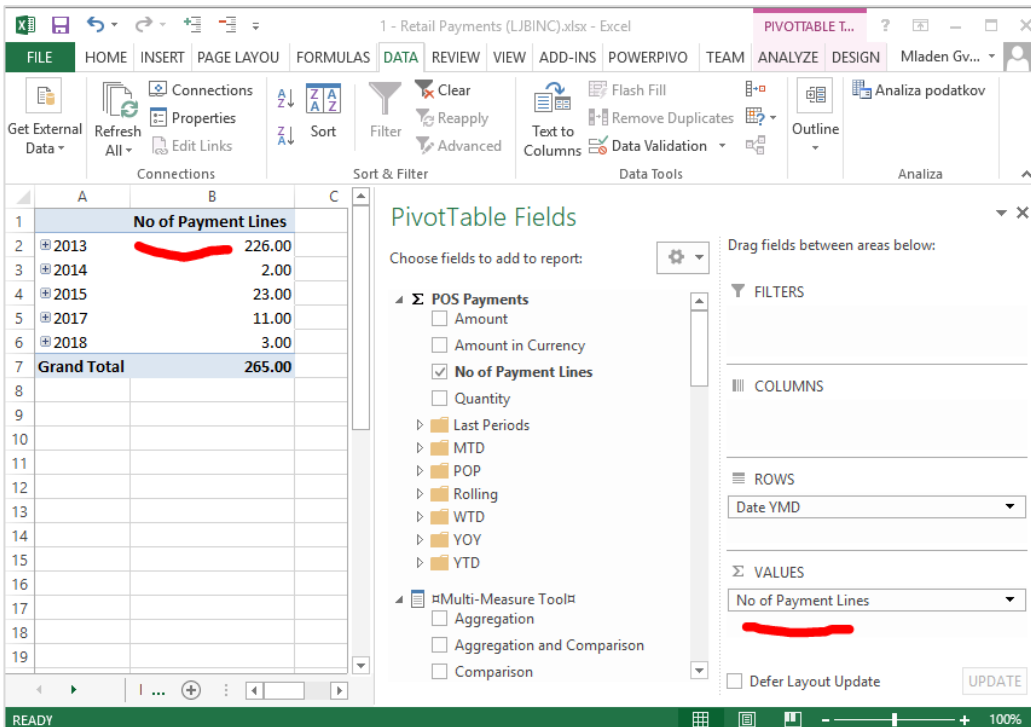
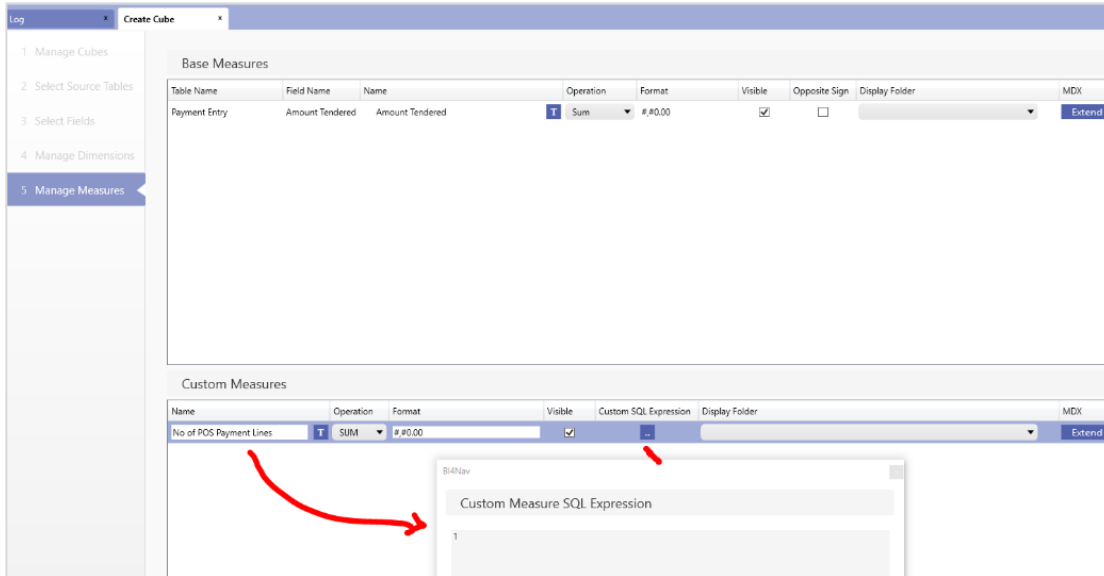
- not available in the source;  
Example: **CompanyID, Count**
- calculated join on existing columns  
Example: **"First name"+" "+ "Last name" = Name**



| Derived Column Name  | Derived Column      | Expression               | Data Type                      | Length | Precision | Scale | Code Page |
|----------------------|---------------------|--------------------------|--------------------------------|--------|-----------|-------|-----------|
| New Fixed Value      | <add as new column> | 1                        | four-byte signed integer [...] |        |           |       |           |
| New Expression Value | <add as new column> | REPLACENULL([ITEMID], 0) | Unicode string [DT_WSTR]       | 42     |           |       |           |
| New Calculated Value | <add as new column> | [QTY]+ [QTYSETTLED]      | numeric [DT_NUMERIC]           |        | 33        | 16    |           |
| ...                  | <add as new column> |                          |                                |        |           |       |           |

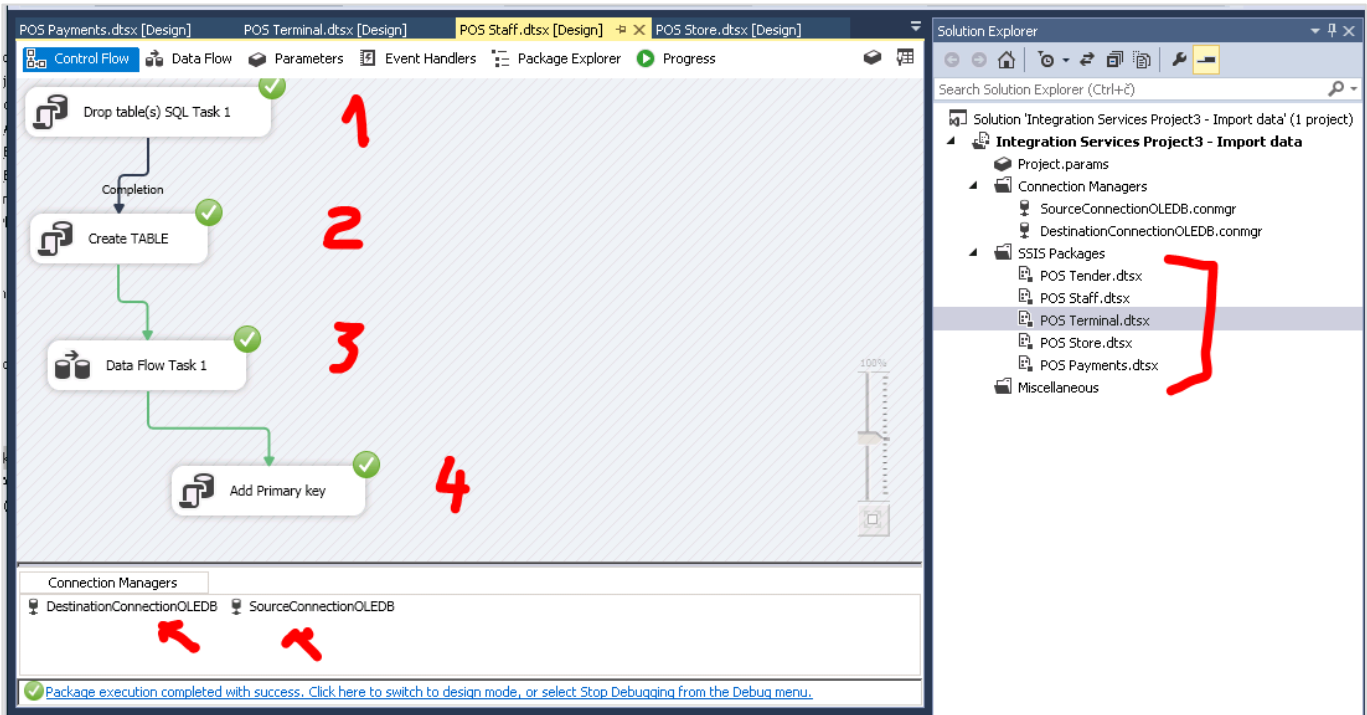
## 2.7 Add measure “No of Transactions”

An absolute must to control input and output:

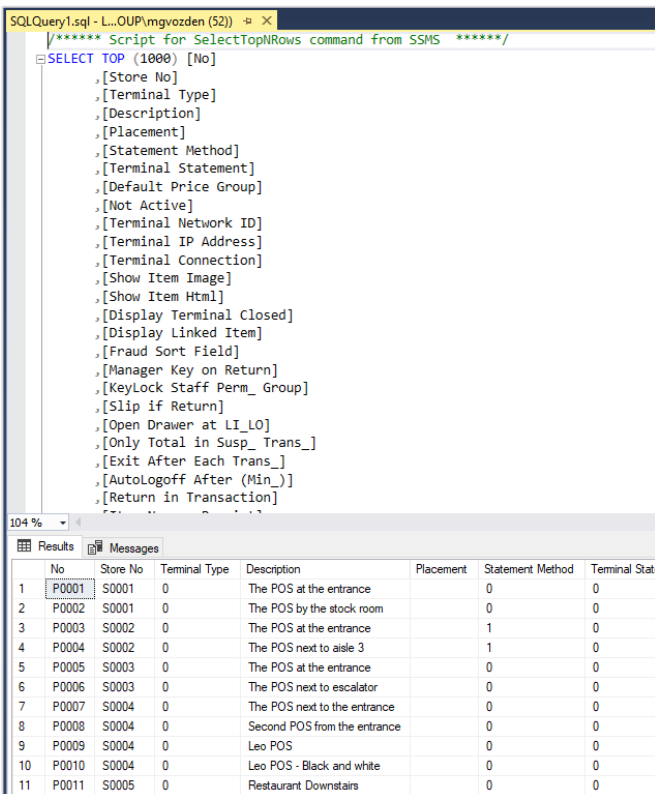


## 2.8 Test SSIS package (standalone in SQL Server Data Tools)

Run SSIS package in ETL tool many times and check (SELECT TOP 1000 in destination table) that correct data are available in the destination table:

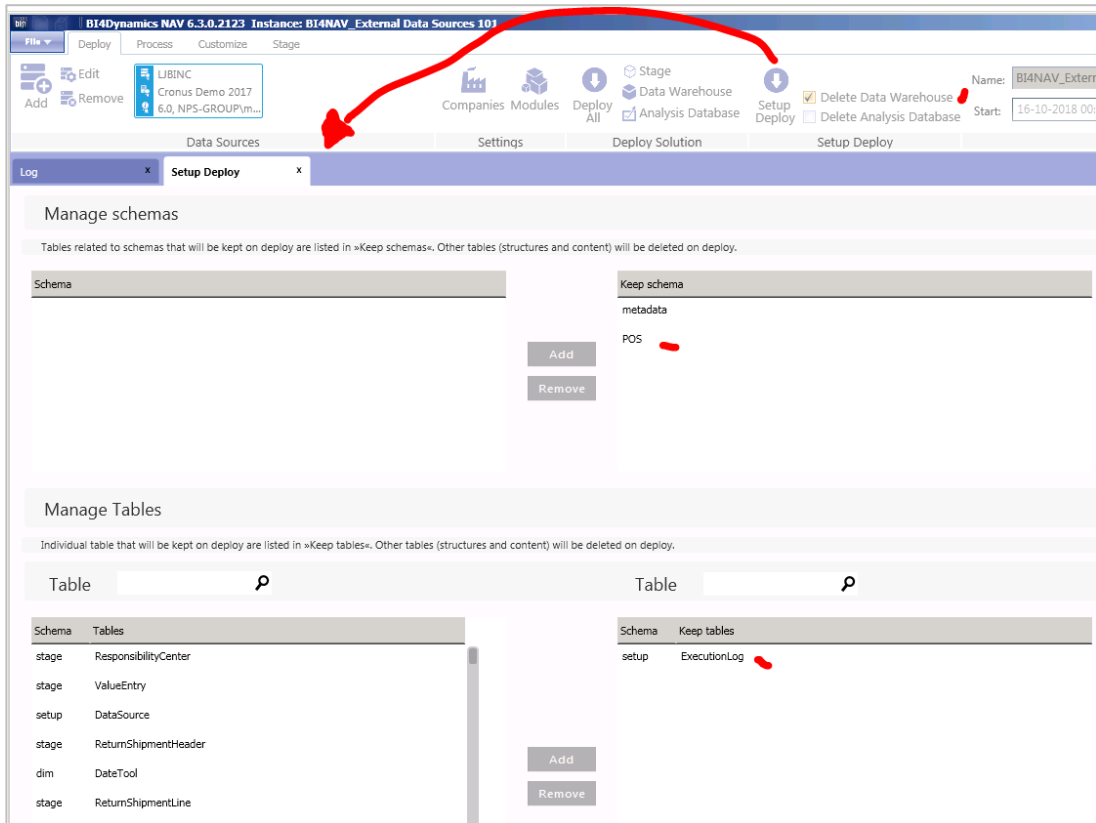


And results in SQL server (destination):



## 2.9 Setup BI4Dynamics deploy and keep schemas on deploy

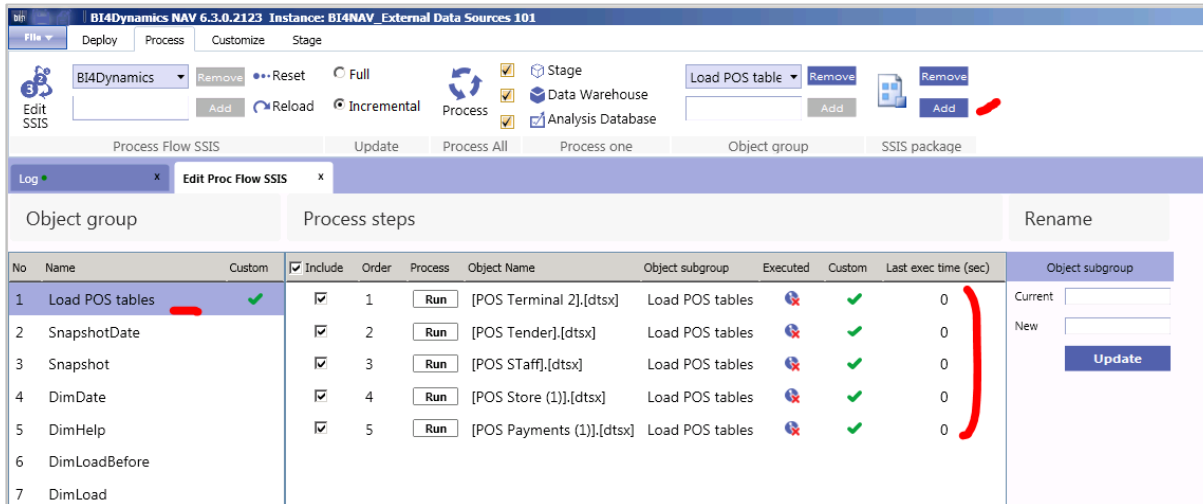
If you are integrating historical data that do not change, then one-time import should be enough. With this setup, you select schemas or tables that you want to keep (do not want to be deleted) during deploy data warehouse:



If no setup is applied then all tables in the data warehouse are deleted on deploy.

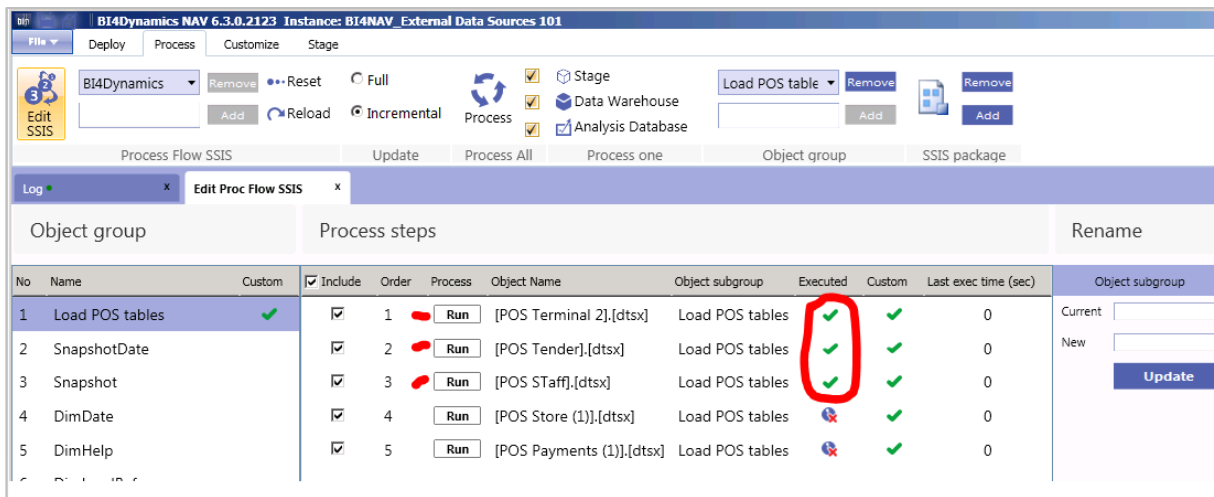
## 2.10 Add SSIS package to the BI4Dynamics process flow

You can create one or several Object groups to store SSIS packages for execution. We recommend creating one Object group for each data source (schema):



## 2.11 Test SSIS package (standalone) in BI4Dynamics

After running each process in the process flow, the Executed flag should be checked:



When Job Agent runs BI4Dynamics process flow, these packages are executed as a part of that process flow.



### 3 Part 2 – Create new BI structures with Wizard

Working with tables from EDS only slightly differs from working with AX/NAV tables. The only difference is that AX/NAV tables always have CompanyID, while EDS may or may not have this information.

Please refer to videos on BI4Dynamics YouTube channel:

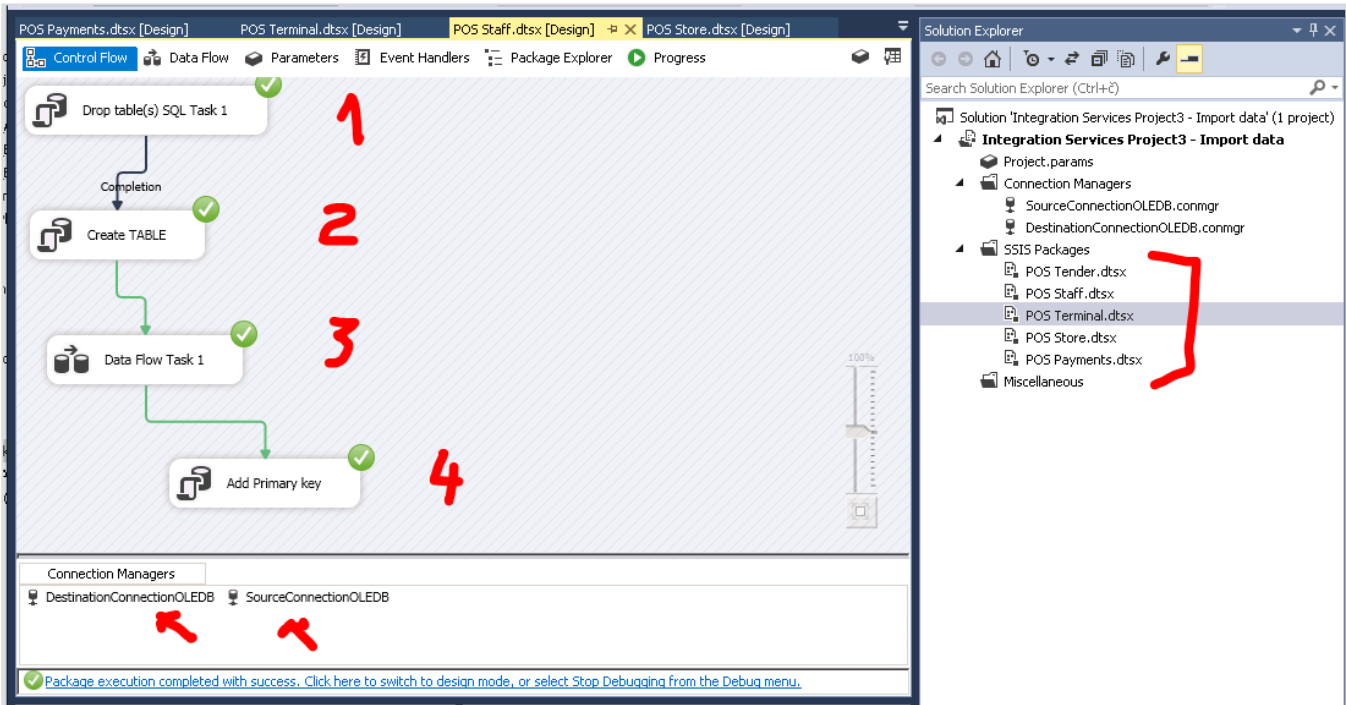
<https://www.youtube.com/user/BI4Dynamics>

## 4 Final results

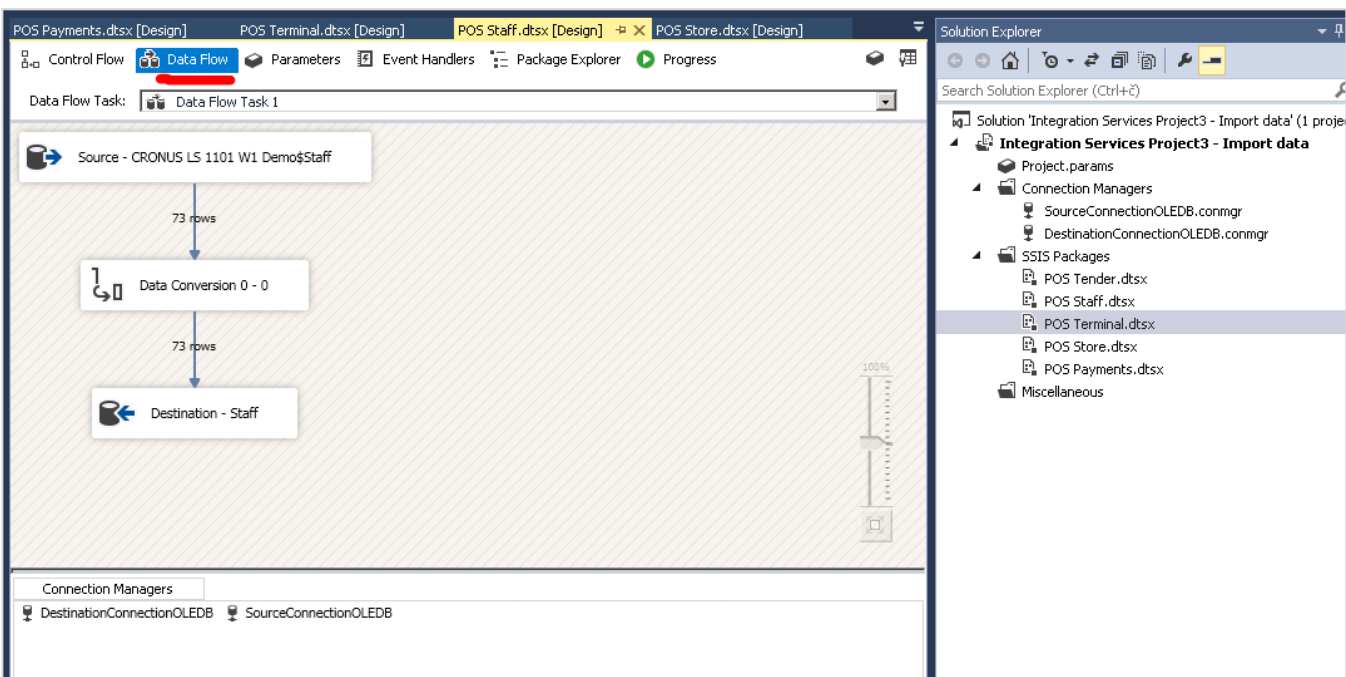
### 4.1 SSIS packages

We have a scenario with 5 tables loading from an external data source (SQL). We created 5 separate packages

#### 1 Control flow for table POS.Terminal

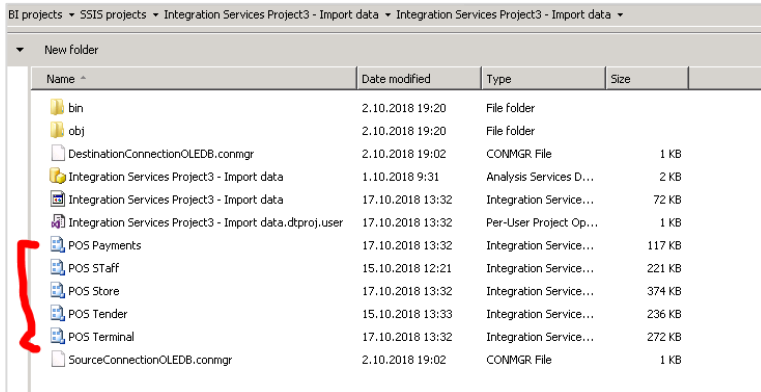


#### 2 Data flow for table POS.Terminal

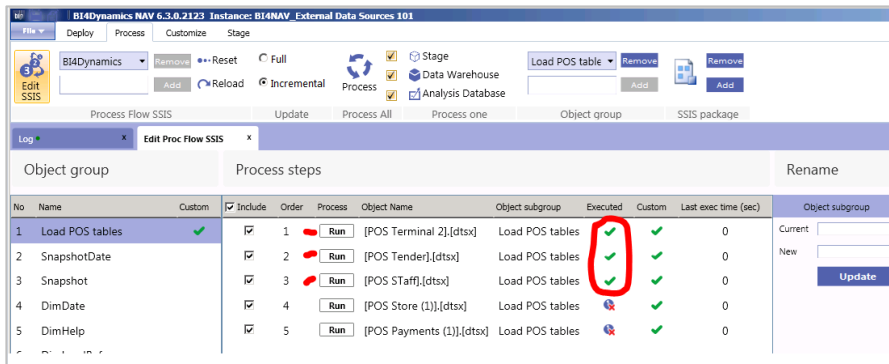


## 4.2 SSIS package files

These files are saved in project development folder:

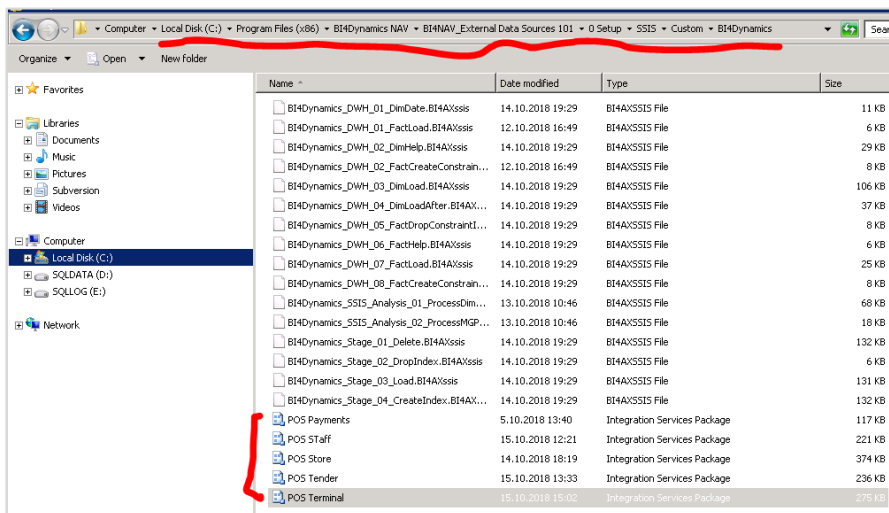


## 4.3 SSIS packages imported into the BI4Dynamics process flow



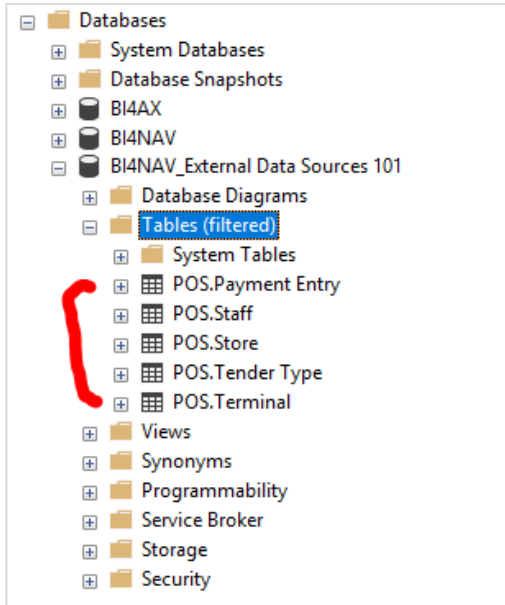
## 4.4 SSIS package files imported into the BI4Dynamics process flow

When files are added into the process flow, they are automatically copied from SSIS development environment to BI4Dynamics instance folder.



### 4.5 SQL tables imported to the Data warehouse

When filtering schema, apply filter 'POS' and imported tables will be listed below:



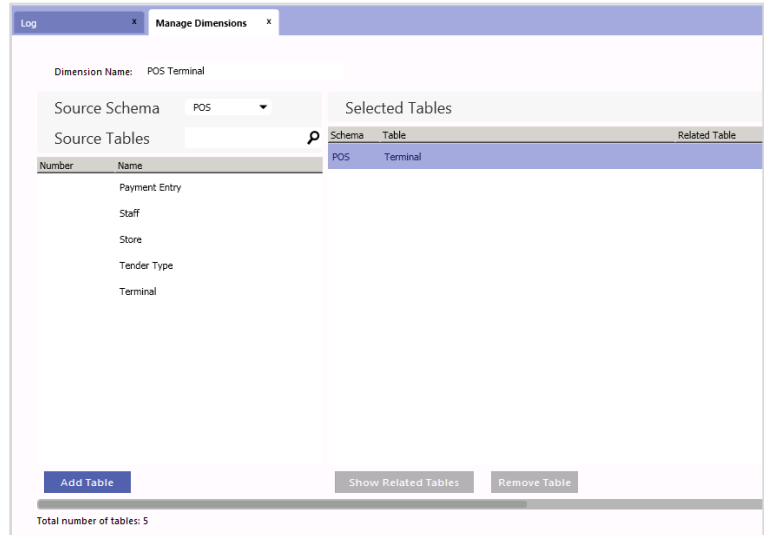
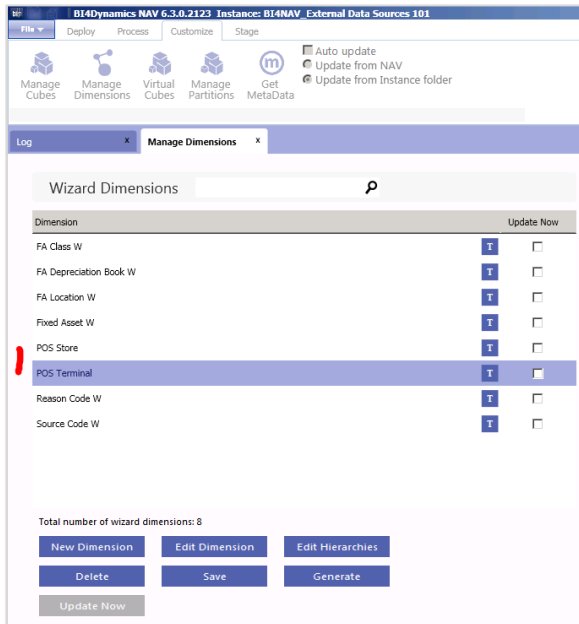
Filter Settings

Server: LJBINC  
 Database: BI4NAV\_External Data Sources 101

Filter Criteria:

| Property      | Operator | Value |
|---------------|----------|-------|
| Name          | Contains |       |
| Schema        | Contains | POS   |
| Owner         | Equals   |       |
| Creation Date | Equals   |       |

### 4.6 Dimensions created by Wizard



### 4.7 Facts created by the wizard

### 4.8 Excel report

| Row Labels                             | Amount Tendered | Amount in Currency | Quantity | Change Line Company | All | Change Line Company | All | Change Line Company | All | Change Line Company | All | Change Line Company | All |
|--|-----------------|--------------------|----------|---------------------|-----|---------------------|-----|---------------------|-----|---------------------|-----|---------------------|-----|
| GB                                     | 100,778.00      | 100,802.17         | 256.00   |                     |     |                     |     |                     |     |                     |     |                     |     |
| Headfoot                               | 79,090.01       | 79,090.01          | 185.00   |                     |     |                     |     |                     |     |                     |     |                     |     |
| S0002 - Cronus Food Market North SM    | 2,323.12        | 2,323.12           | 4.00     |                     |     |                     |     |                     |     |                     |     |                     |     |
| P0003                                  | 3,233.12        | 3,233.12           | 3.00     |                     |     |                     |     |                     |     |                     |     |                     |     |
| P0004                                  | 2,000.00        | 2,000.00           | 1.00     |                     |     |                     |     |                     |     |                     |     |                     |     |
| S0003 - Cronus Fashion Store North     | 76,766.89       | 76,766.89          | 181.00   |                     |     |                     |     |                     |     |                     |     |                     |     |
| P0005                                  | 76,766.89       | 76,766.89          | 181.00   |                     |     |                     |     |                     |     |                     |     |                     |     |
| Grand Total                            | 100,778.00      | 100,802.17         | 256.00   |                     |     |                     |     |                     |     |                     |     |                     |     |
| Brighton                               | 0.00            | 0.00               | 4.00     |                     |     |                     |     |                     |     |                     |     |                     |     |
| S0007 - Cronus Electronics Store South | 0.00            | 0.00               | 4.00     |                     |     |                     |     |                     |     |                     |     |                     |     |
| P0022                                  | 0.00            | 0.00               | 4.00     |                     |     |                     |     |                     |     |                     |     |                     |     |
| London                                 | 21,687.99       | 21,712.16          | 60.00    |                     |     |                     |     |                     |     |                     |     |                     |     |
| S0001 - Cronus Super Market South      | 3,233.29        | 3,237.46           | 20.00    |                     |     |                     |     |                     |     |                     |     |                     |     |
| P0001                                  | 3,202.91        | 3,227.08           | 18.00    |                     |     |                     |     |                     |     |                     |     |                     |     |
| P0060                                  | 10.38           | 10.38              | 2.00     |                     |     |                     |     |                     |     |                     |     |                     |     |
| S0004 - Cronus Fashion Store South     | 18,438.35       | 18,438.35          | 37.00    |                     |     |                     |     |                     |     |                     |     |                     |     |
| P0007                                  | 18,438.35       | 18,438.35          | 37.00    |                     |     |                     |     |                     |     |                     |     |                     |     |
| S0005 - Cronus Restaurant              | 36.35           | 36.35              | 3.00     |                     |     |                     |     |                     |     |                     |     |                     |     |
| P0011                                  | 36.35           | 36.35              | 3.00     |                     |     |                     |     |                     |     |                     |     |                     |     |
| Manchester                             | 0.00            | 0.00               | 7.00     |                     |     |                     |     |                     |     |                     |     |                     |     |
| S0009 - Cronus Home Furniture          | 0.00            | 0.00               | 7.00     |                     |     |                     |     |                     |     |                     |     |                     |     |
| P0023                                  | 0.00            | 0.00               | 7.00     |                     |     |                     |     |                     |     |                     |     |                     |     |
| Grand Total                            | 100,778.00      | 100,802.17         | 256.00   |                     |     |                     |     |                     |     |                     |     |                     |     |

## 5 Scenario # 1: Mapping master file values old to new

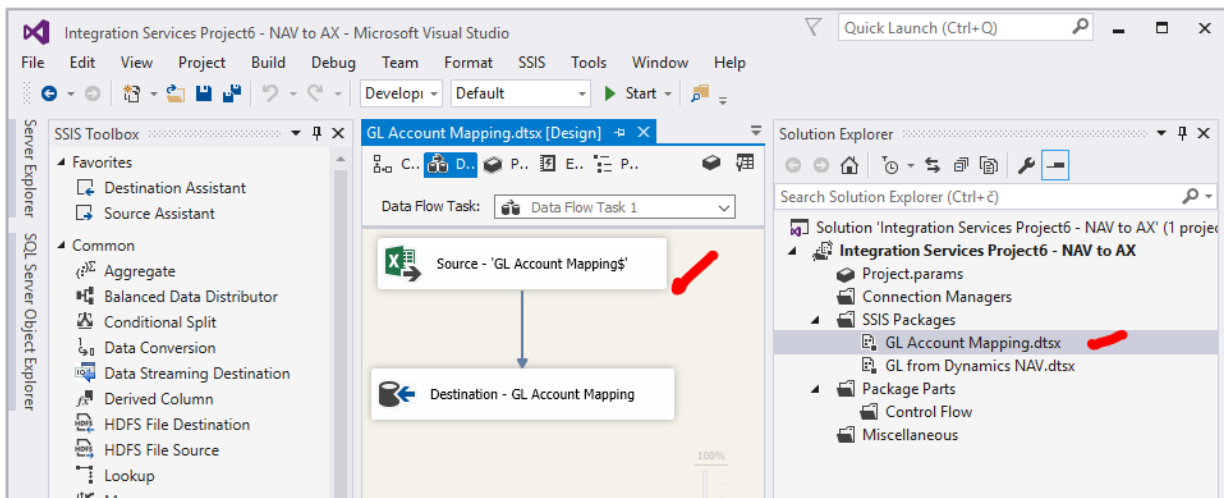
In this scenario, we will join general ledger from AX and NAV:

1. Create BI project based on AX
2. Add GL Entries from external source – Microsoft Dynamics NAV (SQL) into BI4Dynamics AX
3. Map GL accounts from NAV to GL Accounts in AX

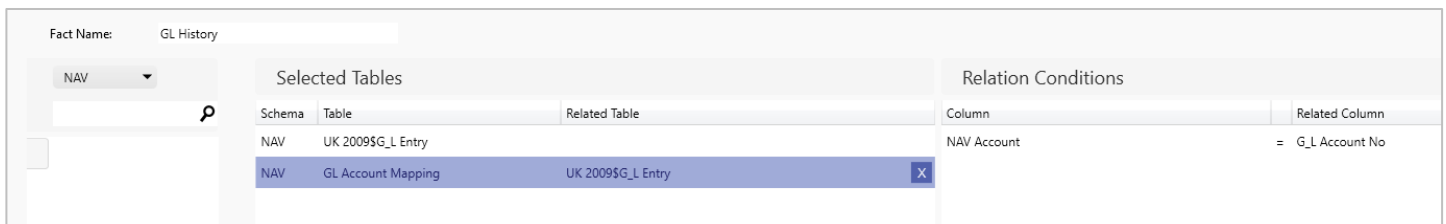
### 1 Add Excel with mapping old to new master:

|    | A           | B          |
|----|-------------|------------|
| 1  | NAV Account | AX Account |
| 2  | 10          | 110110     |
| 3  | 100         | 110130     |
| 4  | 1000        | 110160     |
| 5  | 1005        | 112100     |
| 6  | 1100        | 112110     |
| 7  | 1110        | 112120     |
| 8  | 1120        | 112140     |
| 9  | 1130        | 112160     |
| 10 | 1140        | 130100     |
| 11 | 1190        | 140200     |
| 12 | 1200        | 200100     |
| 13 | 1210        | 200140     |
| 14 | 1220        | 202100     |
| 15 | 1230        | 202110     |
| 16 | 1240        | 202140     |
| 17 | 1290        | 202150     |
| 18 | 1300        | 202160     |

### 2 Create an SSIS package:



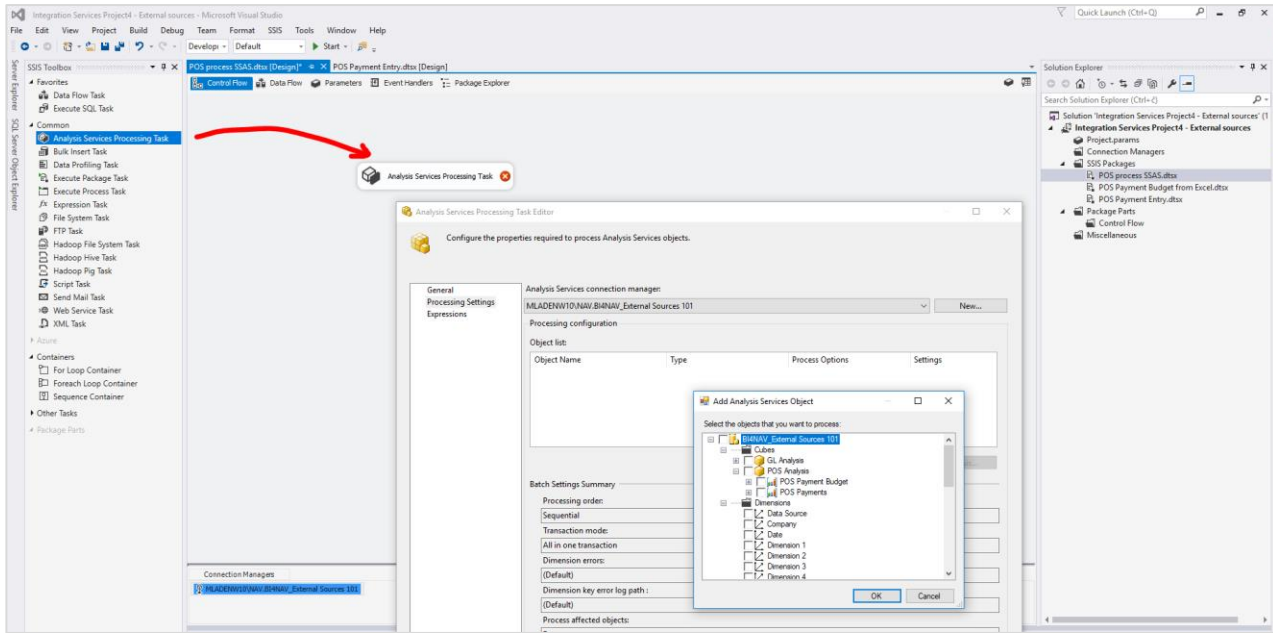
### 3 Join as new table to FACT.



## 6 Scenario #2: Creating job for processing only external data

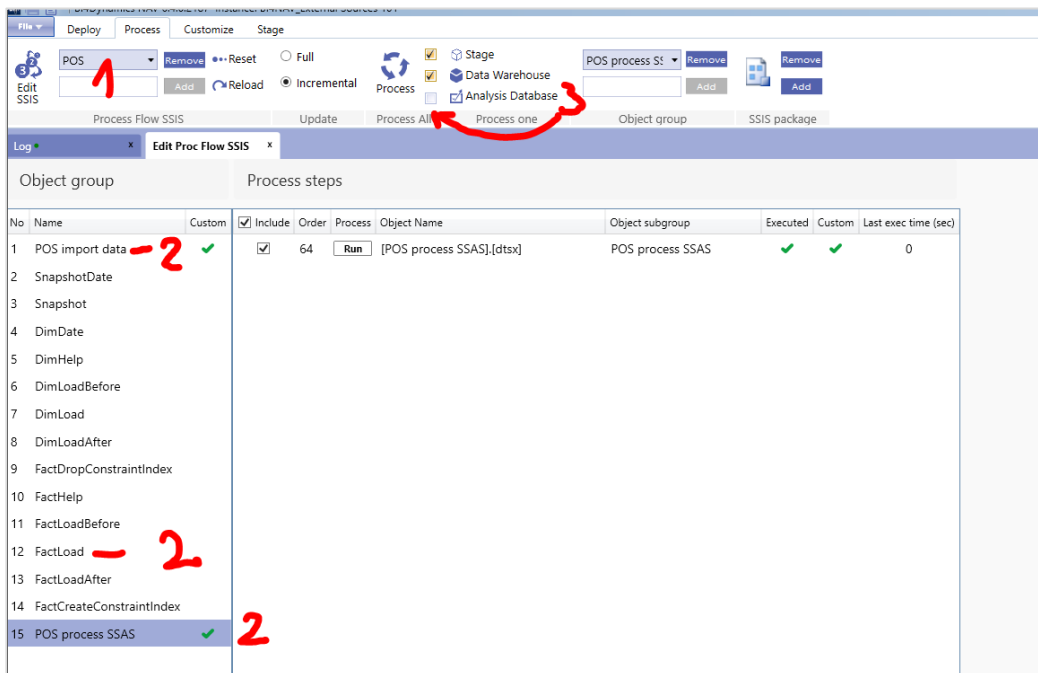
In the following scenario, we want to separate all procedures and SSIS packages related to external data source as new Process flow in BI4Dynamics and create an Agent job that is updating external data with a different frequency (for example hourly) as the main process flow (usually daily).

### 1 Create an SSIS package to process cube

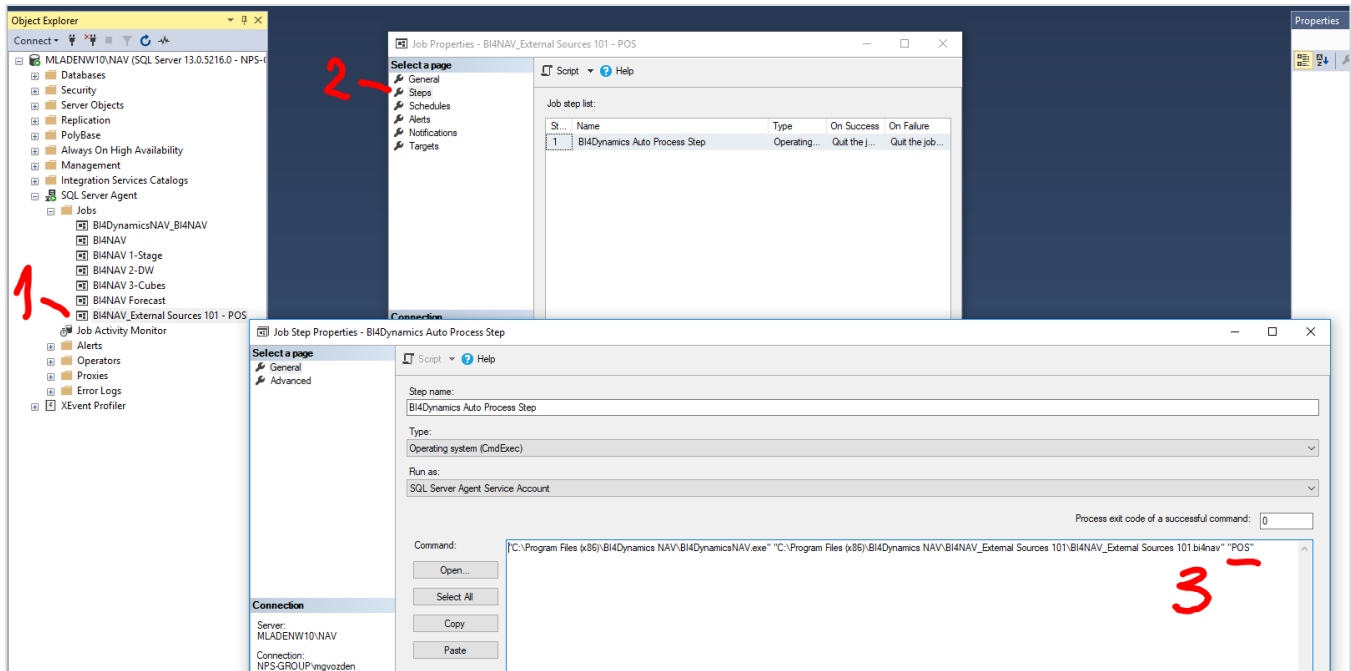


### 2 Create new process flow

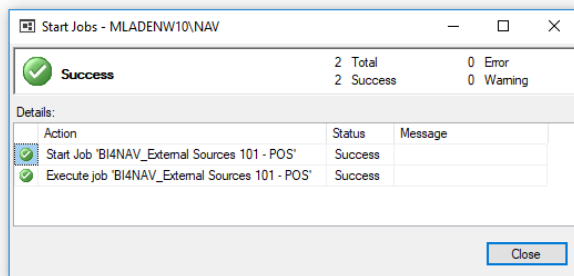
Select the correct SSIS packages, load procedures and a SSIS package for processing cube:



### 3 Creat and set up a new Job



Test by executing manually:





## 7 Scenario #3: Loading data

### 1 Load historical data only once

The screenshot shows the BI4Dynamics NAV 6.4.0.2187 interface. The main window is titled "Setup Deploy" and is divided into two main sections: "Manage schemas" and "Manage Tables".

**Manage schemas:** This section contains a "Schema" list on the left and a "Keep schema" list on the right. The "Keep schema" list currently contains "POS" and "metadata". A red "2" is placed over the "Add" button between the two lists.

**Manage Tables:** This section contains a "Table" list on the left and a "Keep tables" list on the right. The "Table" list contains several entries with their respective schemas:

| Schema | Tables               |
|--------|----------------------|
| stage  | CustomerPostingGroup |
| stage  | VendorPostingGroup   |
| help   | Dimension8           |
| stage  | GLBudgetName         |
| stage  | GLBudgetEntry        |
| stage  | SalesShipmentHeader  |
| stage  | SalesShipmentLine    |

The "Keep tables" list is currently empty. A red "1" is placed over the "Setup Deploy" button in the top right corner of the window.

### 2 Full load

Select "DROP TABLE IF EXISTS" in first SSIS object for loading table. It will delete table before loading and is considered as a safest approach if data size is not too big (table size > X 100 million rows).

Example:

- Loading 5 million rows = 2 minutes
- Loading 500 million rows?

### 3 Load by partitions

Archive partition = up to this year

Current partition = this year +

### 4 Incremental load

Custom project, depending on the source.