# 1 Introduction

This document is the report for the data warehouse part of the lecture *DWO*. Before the *SSIS* and *SSAS* project can be used you need to ensure that the database with name *MDE_DWO_WS1617* exists on your local SQL Server instance and has proper permissions set for *SSAS* services user.

The source in the *SSIS* project needs to be modified to point to the proper *.mdb file.

# 2 Integration Services

This section deals with the *SSIS Integration Services* part of the hands on. The image **??** shows the implemented *Control Flow*. The container *Database Preparation Sequence* holds the components for drop create the warehouse tables which was useful during the development.

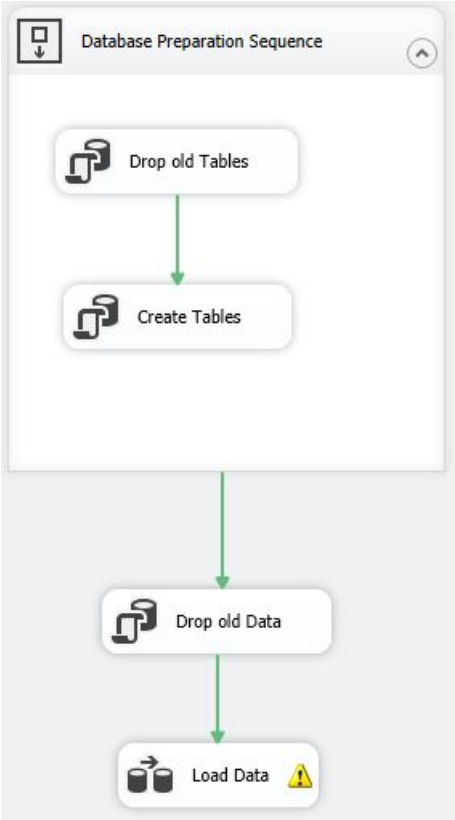


Abbildung 1: Integration Service Control Flow

The following listing describes the components in the control flow:

- *Drop old Tables* component drops the existing warehouse tables.
- *Create tables* component creates the warehouse tables via an native SQL statement.
- *Drop old Data* component drops the old data before data load.
- *Load Data* component holds the data flow for data cleanup and restructure.

The yellow warn icon is caused by data type changes between the raw data and the prepared data. the data type change is caused by the change of the length of some *nvarchar* typed columns.

The image shows the implemented *Data Flow* for the data preparation of the raw data of table *exam* and *student_group* which will be represented by the tables *exam* and *student* in the warehouse.

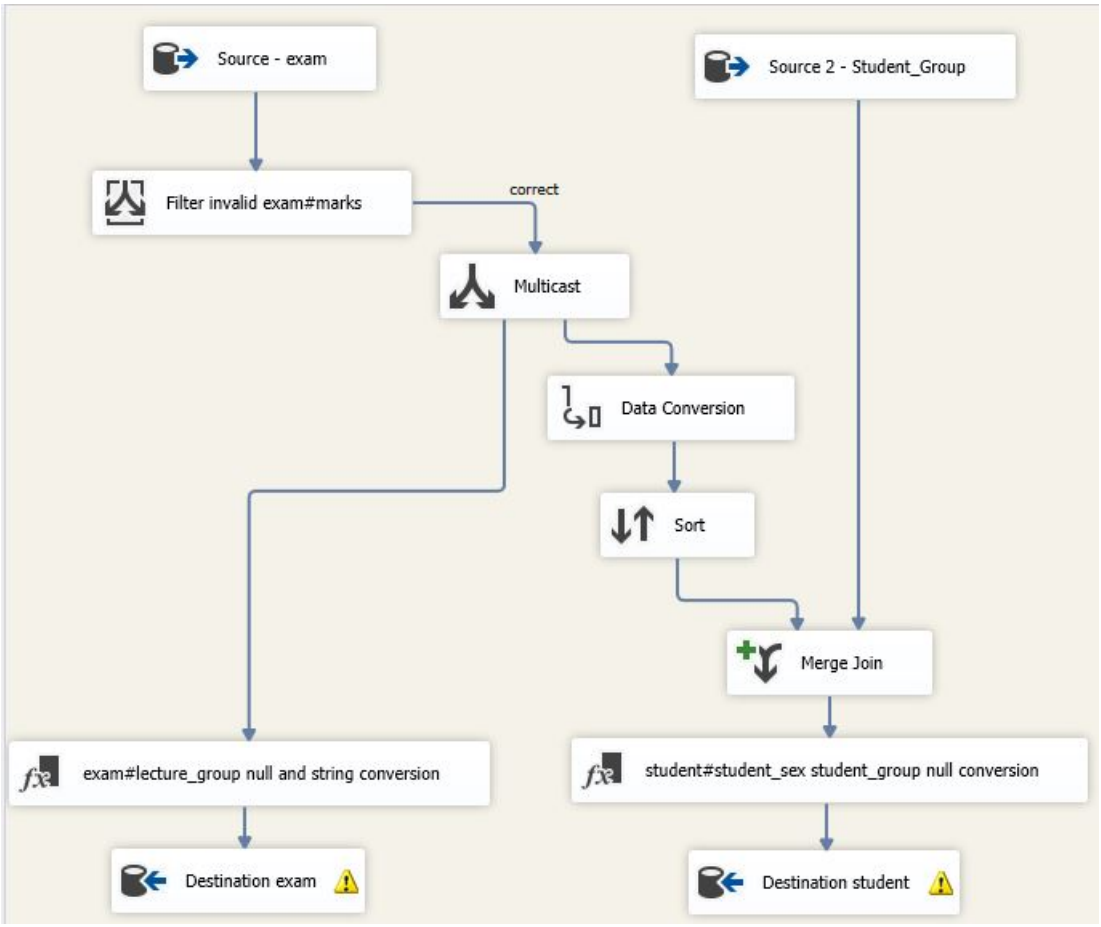


Abbildung 2: Integration Service Data Flow for *exam*

The exam input stream gets duplicated for the *student* stream because there are some students in the *exam* table which are not present in the *student_group* table, therefore the missing students need to be captured from the cleaned up *exam* stream. There are also some students in the *student_group* table, which have no exam entries, but they are considered to be worthless for the further analysis. The *student_code* column gets interpreted as a *DT_WSTR* and in the *student* stream as a *four-byte-signed-integer*. Therefore a cast was necessary to get the proper type for the *Merg Join* component.

The yellow warn icon is caused by some data type changes of some columns. For instance *student_sex* was changed from *nvarchar(2)* to *nchar(1)*.

The result are the two tables *exam* and *student* where the *student* table will only contain students which have *exam* entries. Students not present in the *student_group* table before, will get the *student_group* set to *U* which stands for unknown. The exam table was cleaned of the attribute *student_sex* which is part of the table *student*.

The image shows the implemented *Data Flow* for the data preparation of the raw data of table *lehrer_prod* and *teacher_group* which will be represented by the tables *teacher* in the warehouse.

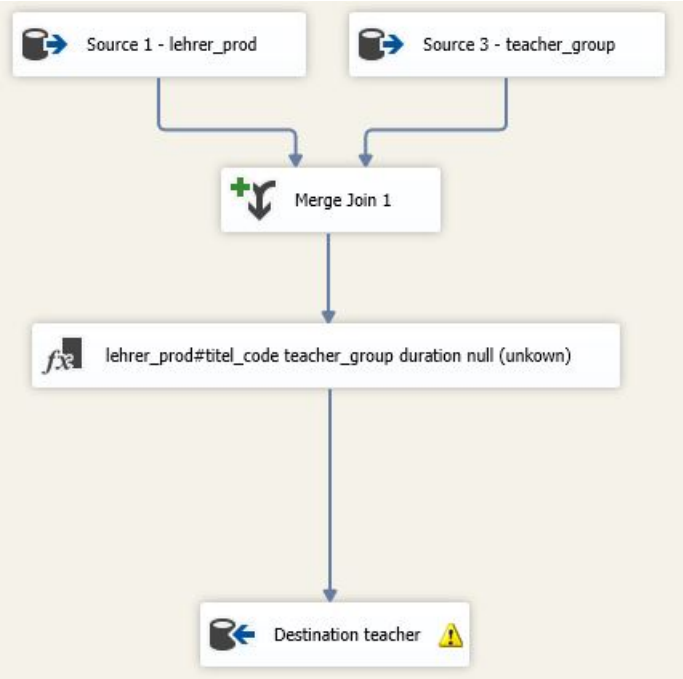


Abbildung 3: Integration Service Data Flow for *lehrer_prod* and *teacher_group*

The *teacher_group* and *lehrer_prod* tables get merged to the *teacher* table. If teachers are missing in the *teacher_group* table or the *typ* column in the *teacher_group* table is null, then they get assigned to the group *unknown*. The duration gets converted to a string of the form *Duration 1* or to *unknown* if no duration is present.

The yellow warn icon is caused by some data type changes of some columns. For instance *teacher_sex* was changed from *nvarchar(2)* to *nchar(1)*.

The result is the table *teacher* which holds all teachers present in the *exam* table with all their attributes.

# 3 Analysis Services

This section deals with the *SSAS Analysis Services* part of the hands on.

## 3.1 Implemented Project

This section deals with the implemented project for the analysis part of the hands on.

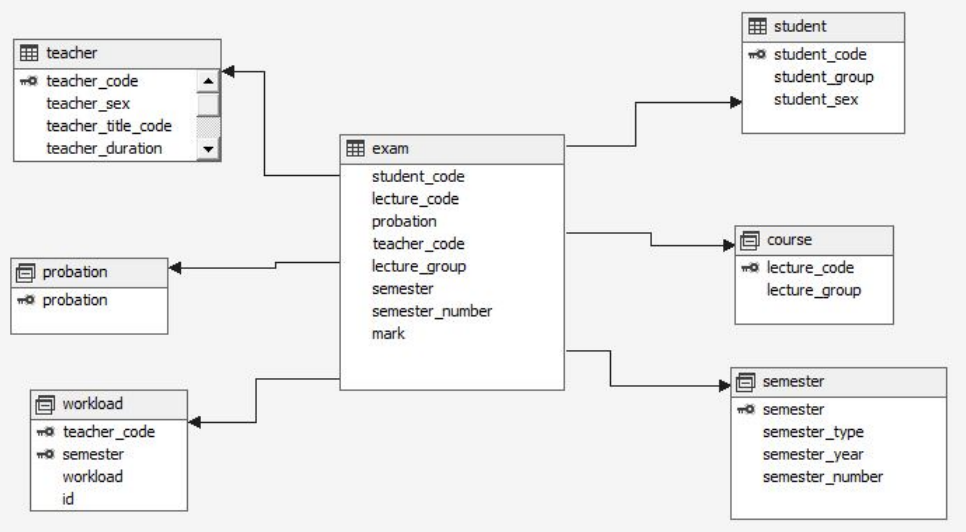


Abbildung 4: Data source view of the warehouse database

The tables *workload*, *probation*, *course* and *semester* were create as named queries.

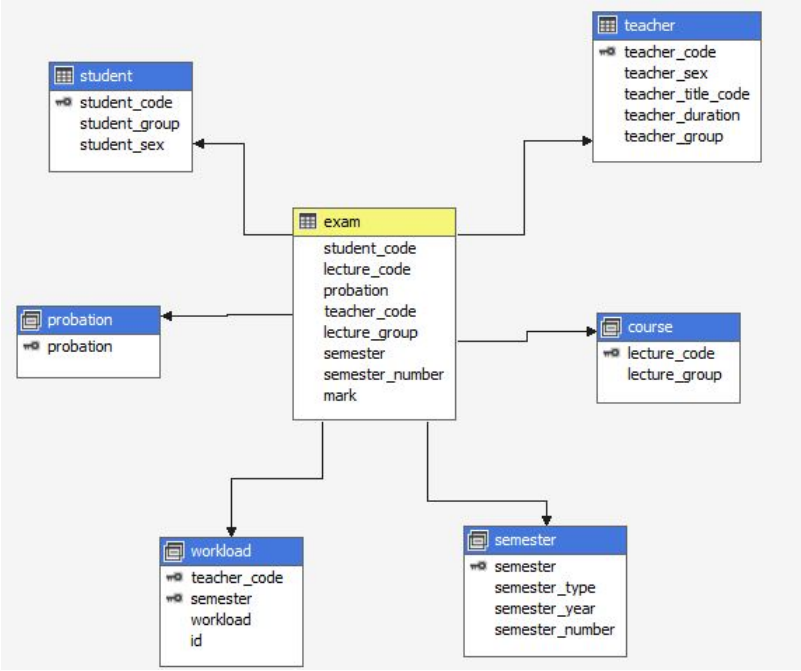


Abbildung 5: Implemented cube

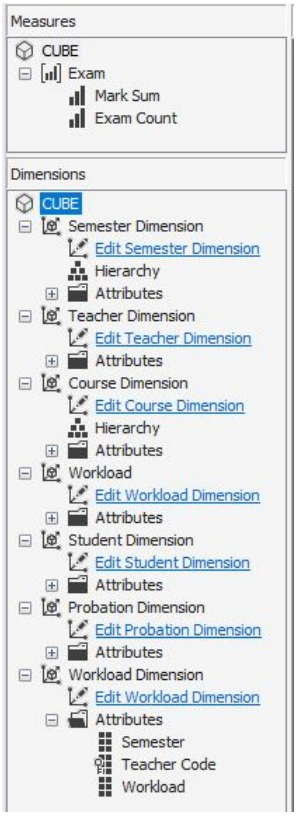


Abbildung 6: Cube measures and dimensions

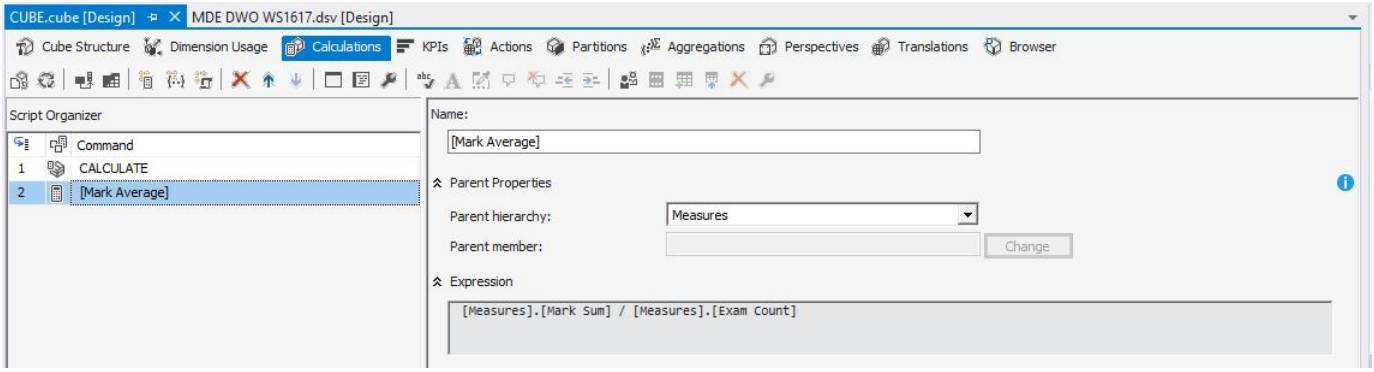


Abbildung 7: Cube measures and dimensions

## 3.2 Reports

The following images are showing the result of the made reports based on the implemented cube.

| Zeilenbeschriftungen | Mark Average |
|---|---|
| Duration 1 | 2.075107296 |
| Duration 2 | 2.00390625 |
| Duration 3 | 1.756819055 |
| Duration 4 | 2.35611742 |
| Duration 5 | 1.927128517 |
| Duration 6 | 2.154867936 |
| Duration 7 | 2.239262424 |
| Duration 8 | 2.547920596 |
| **Gesamtergebnis** | **2.188585512** |

Abbildung 8: Report Teachers seniority

| Zeilenbeschriftungen | Mark Average |
|---|---|
| ⊞ **Group 0** | **1.913610356** |
| ⊞ **Group 1** | **2.323254671** |
| ⊞ **Group 10** | **1.980667838** |
| ⊞ **Group 2** | **2.139311044** |
| ⊞ **Group 3** | **2.500674521** |
| ⊞ **Group 4** | **2.096781979** |
| ⊟ **unknown** | **2.208333333** |
| E1 | 2.320754717 |
| E10 | 2.738461538 |
| E11 | 2.056603774 |
| E12 | 1.981132075 |
| E13 | 1 |
| E2 | 1.886792453 |
| E3 | 2.754385965 |
| E4 | 1.928571429 |
| E5 | 3.283333333 |
| E6 | 1 |
| E7 | 3.283333333 |
| E8 | 1.529411765 |
| E9 | 2.490566038 |
| **Gesamtergebnis** | **2.188585512** |

Abbildung 9: Report Course type

| Zeilenbeschriftungen | Mark Average |
|---|---|
| 004005007 | 2.516605166 |
| 004011016 | 1.896943852 |
| 005 | 2.55361596 |
| 006 | 2.273162939 |
| 006006 | 1.807017544 |
| 006007 | 2.12147651 |
| 006022019 | 2.311111111 |
| 008 | 1.946564885 |
| 010 | 1 |
| 011016 | 3.153846154 |
| 011016019 | 3 |
| 012 | 1.500745156 |
| 015 | 1.874166667 |
| 016 | 2.558139535 |
| 019 | 2.377622378 |
| 020006 | 1.666666667 |
| 020019022 | 2.078431373 |
| 022 | 2.068216816 |
| 022007 | 2.325 |
| 022019 | 2.347075671 |
| 022019013 | 2.444444444 |
| 022020 | 1.729166667 |
| 039 | 2.272256729 |
| 039019 | 3.203252033 |
| 041 | 2.445783133 |
| 042 | 2.153846154 |
| 042019 | 2.526466654 |
| 043 | 2.484705882 |
| 502 | 2.363867684 |
| 999 | 2.268914255 |
| 999011016 | 1.693877551 |
| 999013 | 1.204724409 |
| 999016 | 2.333333333 |
| 999022 | 1.969924812 |
| unknown | 1.65870098 |
| **Gesamtergebnis** | **2.188585512** |

Abbildung 10: Report Teacher job title

| Zeilenbeschriftungen | Mark Average |
|---|---|
| M | 2.18729535 |
| W | 2.212223472 |
| **Gesamtergebnis** | **2.188585512** |

Abbildung 11: Report Teacher sex

| Zeilenbeschriftungen | Mark Average |
|---|---|
| 1 | 2.142065268 |
| 2 | 3.341477603 |
| 3 | 3.810945274 |
| **Gesamtergebnis** | **2.188585512** |

Abbildung 12: Report Probation

| Zeilenbeschriftungen | Mark Average |
|---|---|
| 1 | 2 |
| 10 | 3.371794872 |
| 100 | 2.927710843 |
| 101 | 3.131147541 |
| 102 | 2.19089317 |
| 103 | 2.95 |
| 104 | 3.047619048 |
| 105 | 2.790948276 |

Abbildung 13: Report teacher code (truncated)

| Zeilenbeschriftungen | Mark Average |
|---|---|
| **SS** | **2.167948768** |
| 00 | 2.113297669 |
| 01 | 2.086235489 |
| 95 | 2.394039735 |
| 96 | 2.359360301 |
| 97 | 2.209196355 |
| 98 | 2.329795496 |
| 99 | 2.137848432 |
| **WS** | **2.208973073** |
| 00/01 | 2.087050263 |
| 01/02 | 1.354545455 |
| 94/95 | 2.689986283 |
| 95/96 | 2.399470899 |
| 96/97 | 2.269874477 |
| 97/98 | 2.272251309 |
| 98/99 | 2.324797844 |
| 99/00 | 2.100312256 |
| **Gesamtergebnis** | **2.188585512** |

Abbildung 14: Report over time (semesters)

| Zeilenbeschriftungen | Mark Average |
|---|---|
| **M** | **2.221655786** |
| A | 2.112563544 |
| B | 1.915895062 |
| C | 2.157303371 |
| D | 1.862068966 |
| E | 2.679012346 |
| F | 2.115384615 |
| U | 2.235813652 |
| **W** | **2.091409355** |
| A | 2.039215686 |
| B | 1.956321839 |
| C | 2.440677966 |
| E | 1.294117647 |
| F | 1.514285714 |
| U | 2.103614458 |
| **Gesamtergebnis** | **2.188585512** |

Abbildung 15: Report student and student group

| Zeilenbeschriftungen | Mark Average |
|---|---|
| **SS00** | **2.113297669** |
| 102 - 127 | 1.9566787 |
| 131 - 156 | 1.927209705 |
| 164 - 195 | 2.355029586 |
| 198 - 220 | 2.430952381 |
| 2 - 28 | 2 |
| 263 - 287 | 2.254681648 |
| 29 - 48 | 2.202398801 |
| 292 - 328 | 1.737201365 |
| 342 - 350 | 2.01754386 |
| 49 - 84 | 2.406494961 |
| 85 - 101 | 1.900516796 |
| **SS01** | **2.086235489** |
| **SS95** | **2.394039735** |
| **SS96** | **2.359360301** |
| **SS97** | **2.209196355** |
| **SS98** | **2.329795496** |
| **SS99** | **2.137848432** |
| **WS00/01** | **2.087050263** |
| **WS01/02** | **1.354545455** |
| **WS94/95** | **2.689986283** |
| **WS95/96** | **2.399470899** |
| **WS96/97** | **2.269874477** |
| **WS97/98** | **2.272251309** |
| **WS98/99** | **2.324797844** |
| **WS99/00** | **2.100312256** |
| **Gesamtergebnis** | **2.188585512** |

Abbildung 16: Report workload over semesters

| Zeilenbeschriftungen | Mark Average |
|---|---|
| **M** | **2.18729535** |
| M | 2.223328827 |
| W | 2.083775858 |
| **W** | **2.212223472** |
| M | 2.194090909 |
| W | 2.29764454 |
| **Gesamtergebnis** | **2.188585512** |

Abbildung 17: Report teacher and student sex