

AID-Project

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1. Creation of the airports database

Once connected to the MySQL server, we execute the command to create the provided airport database:

`source airports.sql`

In airport database, we create a view called **moreperformance** to use in the fact_flight transformation to be faster.

Here is the query to **moreperformance**:

```
create or replace view moreperformance(flight_id, passengernumber,
total_receive, airline_id, airplane_id, from, to, departure, arrival) as
select b.flight_id, count(passenger_id) as passengernumber, sum(price) as
total_receive, airline_id, airplane_id, from, to, departure, arrival from
flight as f, booking as b where f.flight_id = b.flight_id group by
b.flight_id order by b.flight_id;
```

2. Creation of the airports data warehouse

We create 4 dimension tables and 1 fact table into the data warehouse airports_dw :

- dim_airline : Airline dimension
- dim_airplane : Airplane dimension
- dim_airport : Airport dimension for origin and destination
- dim_time : Time dimension for departure and arrival
- fact_flight : Fact table for flight

Here is the code:

```
DROP DATABASE IF EXISTS airports_dw;

CREATE DATABASE airports_dw;

USE airports_dw;

CREATE TABLE dim_airline (
    AIRLINE_ID INT,
    AIRLINE_NAME VARCHAR(255),
    PRIMARY KEY (AIRLINE_ID)
);
```

```
CREATE TABLE dim_airplane (
    AIRPLANE_ID INT,
    AIRPLANE_TYPE VARCHAR(255),
    PRIMARY KEY (AIRPLANE_ID)
);

CREATE TABLE dim_airport(
    AIRPORT_ID INT,
    AIRPORT_NAME VARCHAR(255),
    CITY VARCHAR(255),
    COUNTRY VARCHAR(255),
    PRIMARY KEY (AIRPORT_ID)
);

CREATE TABLE dim_time(
    TIME_ID DATETIME,
    YEAR_ID INT,
    MONTH_ID INT,
    MONTH_NAME VARCHAR(255),
    DAY_ID INT,
    PRIMARY KEY (TIME_ID)
);

CREATE TABLE fact_flight(
    FLIGHT_ID INT,
    PASSENGERS_NUMBER INT,
    RECEIVE_TOTAL DOUBLE,
    AIRLINE_ID INT,
    AIRPLANE_ID INT,
    ORIGIN_AIRPORT_ID INT,
    DESTINATION_AIRPORT_ID INT,
    DEPARTURE_TIME_ID DATETIME,
    ARRIVAL_TIME_ID DATETIME,
    PRIMARY KEY (FLIGHT_ID),
    FOREIGN KEY (AIRLINE_ID) REFERENCES dim_airline (AIRLINE_ID),
    FOREIGN KEY (AIRPLANE_ID) REFERENCES dim_airplane (AIRPLANE_ID),
    FOREIGN KEY (ORIGIN_AIRPORT_ID) REFERENCES dim_airport (AIRPORT_ID),
    FOREIGN KEY (DESTINATION_AIRPORT_ID) REFERENCES dim_airport
(AIRPORT_ID),
    FOREIGN KEY (DEPARTURE_TIME_ID) REFERENCES dim_time (TIME_ID),
    FOREIGN KEY (ARRIVAL_TIME_ID) REFERENCES dim_time (TIME_ID)
);
```

Then to create the airports data warehouse we execute the following command: `source airports_dw.sql`

3. Transformations developed in PDI

Airline dimension

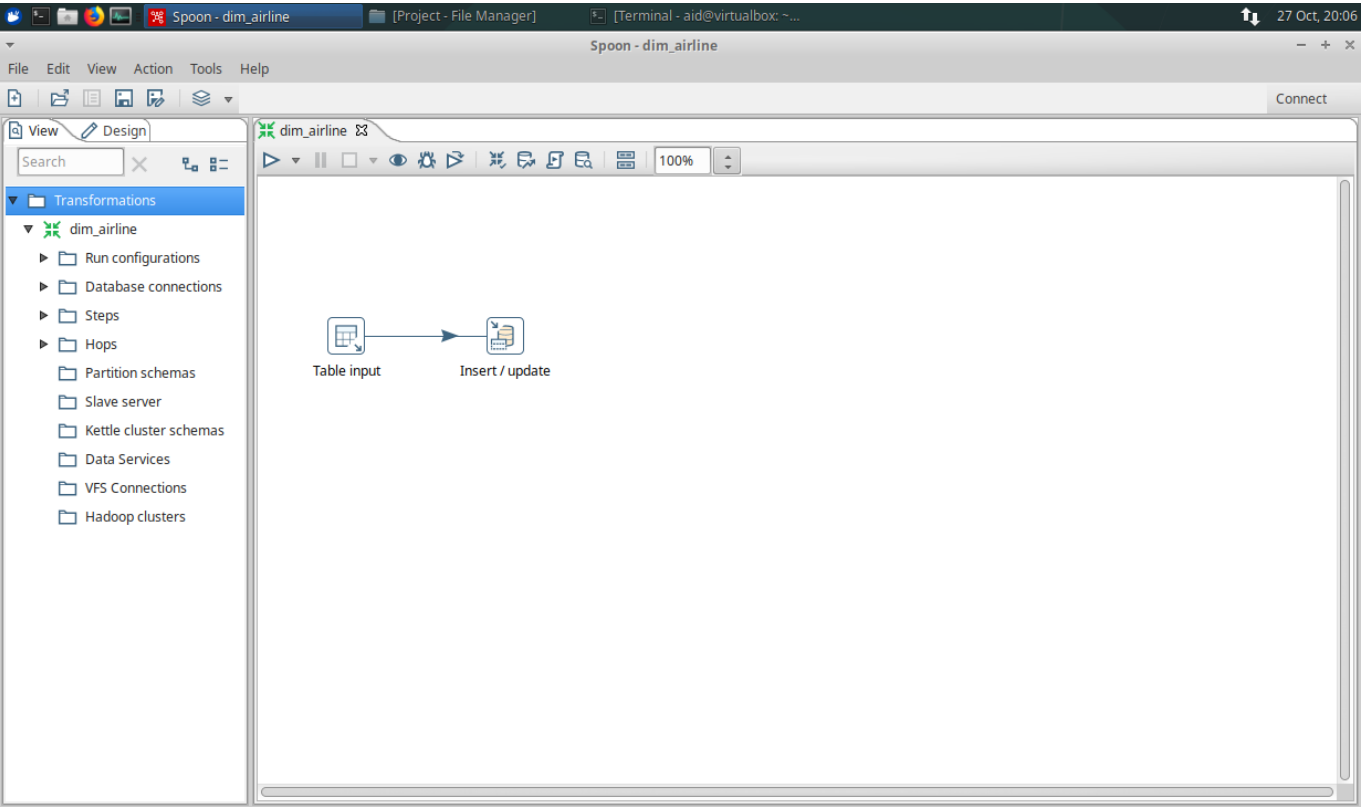


Figure 1 - dim_airline entire transformation

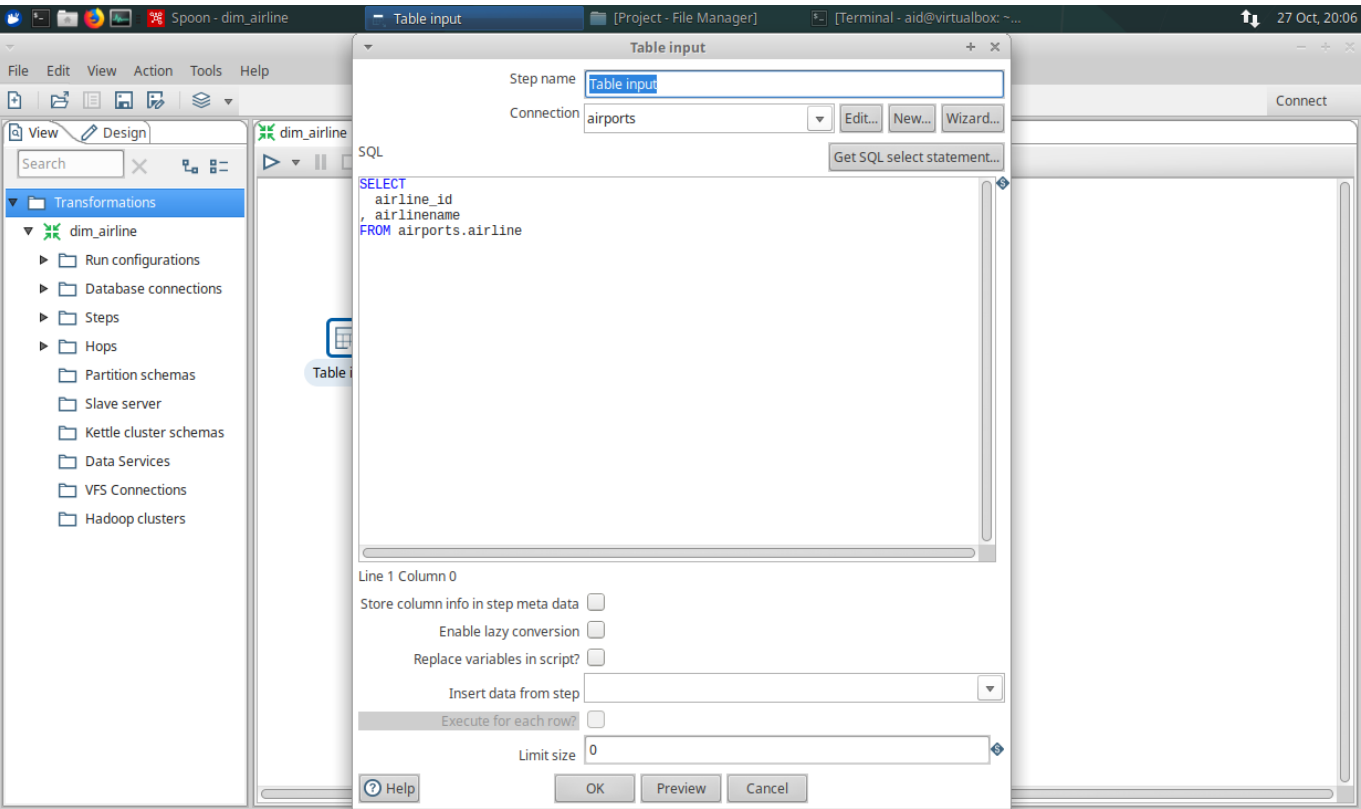


Figure 2 - dim_airline table input window

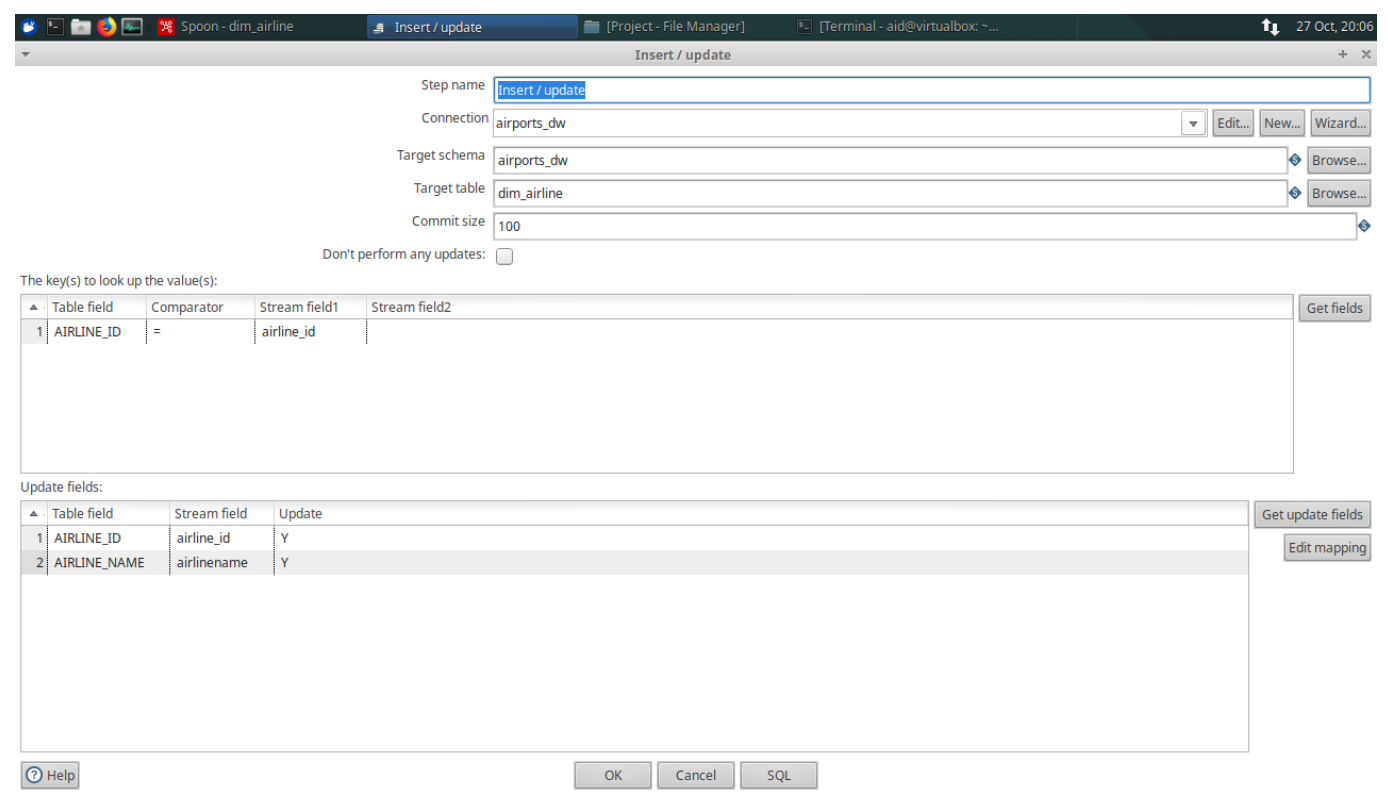


Figure 3 - dim_airline insert/update window

Airplane dimension

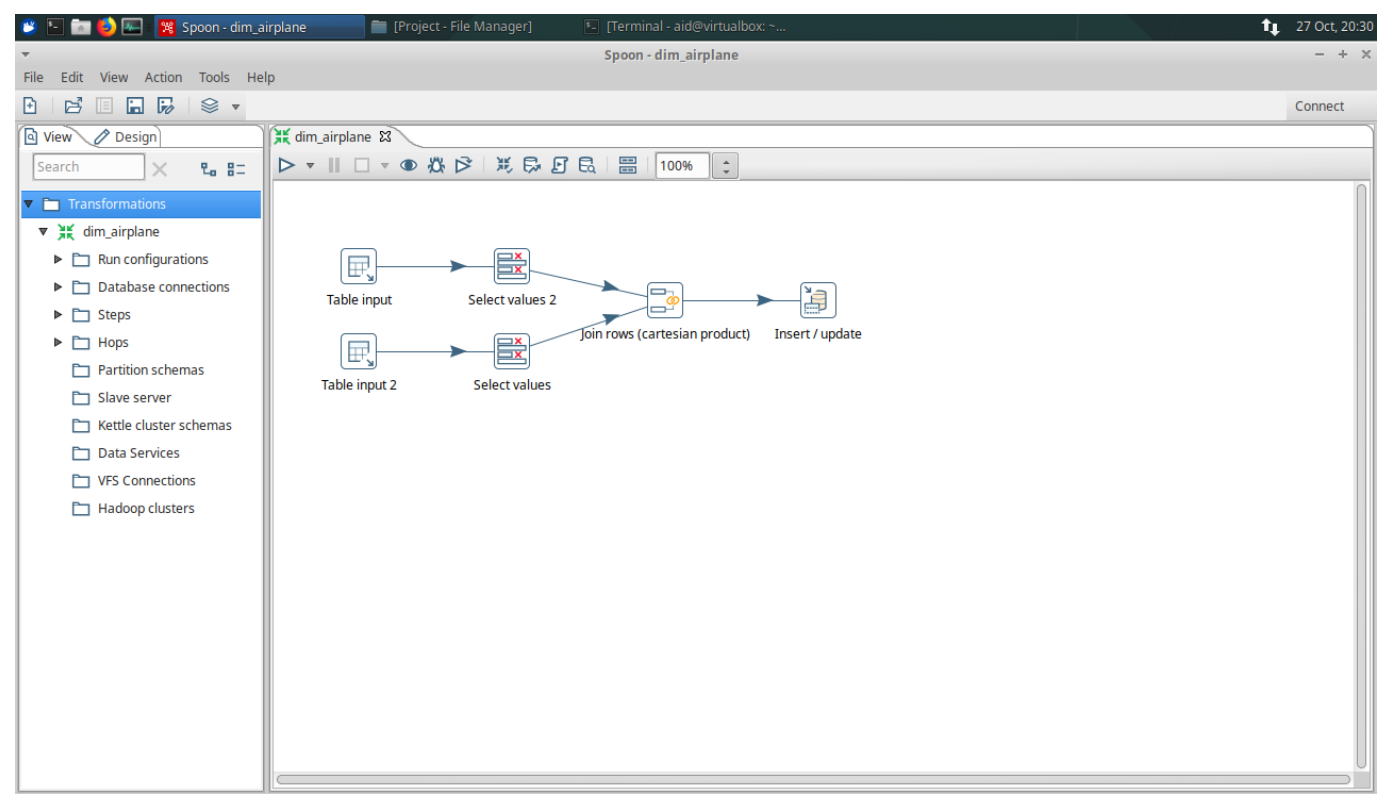
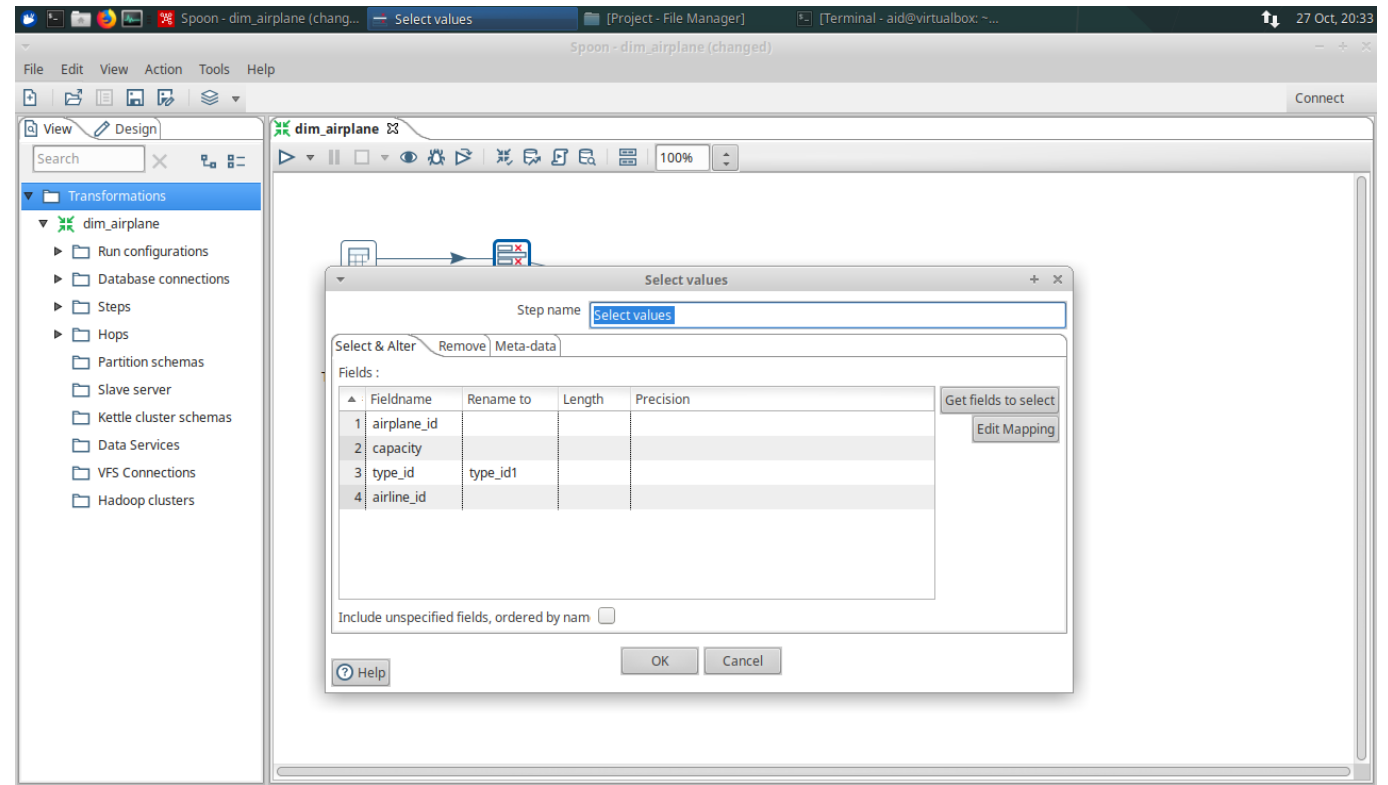
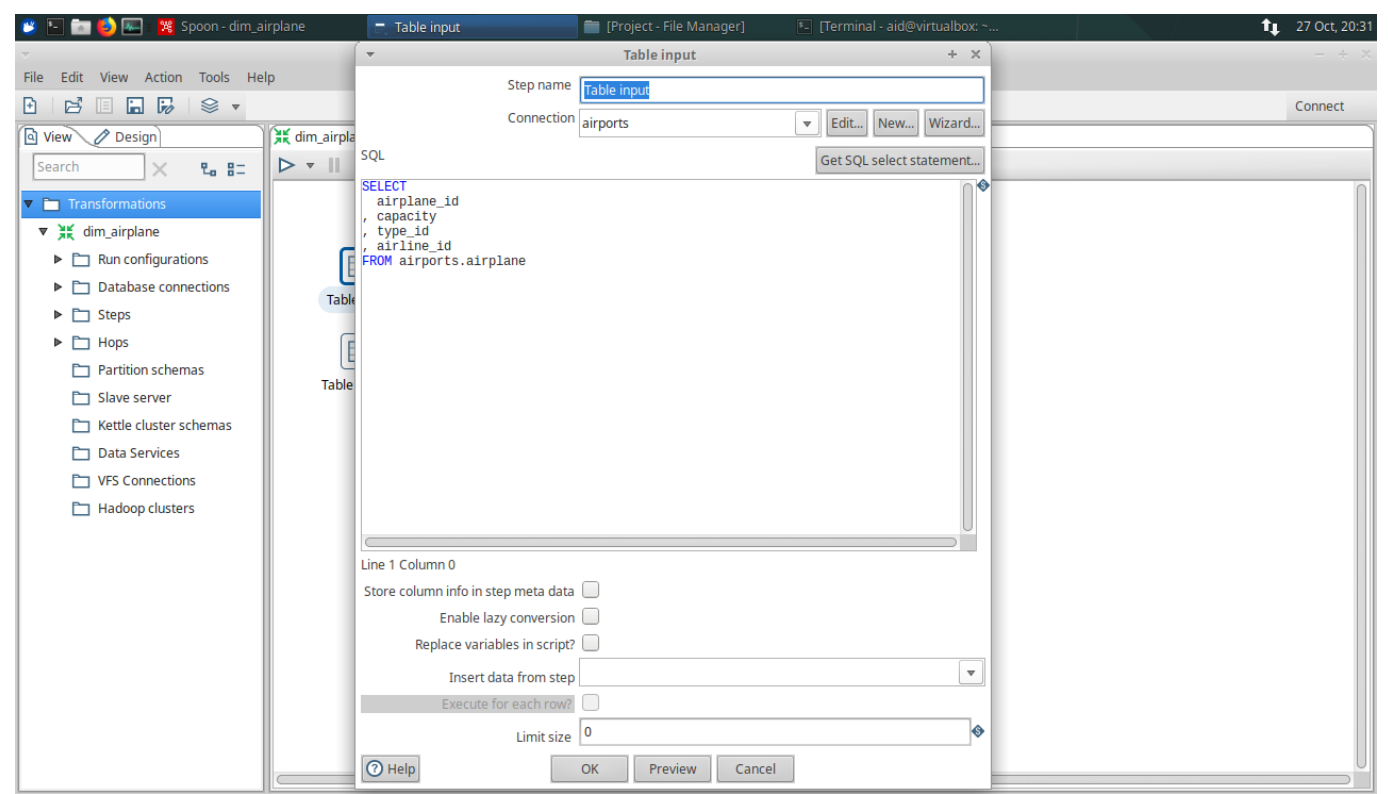


Figure 4 - dim_airplane entire transformation



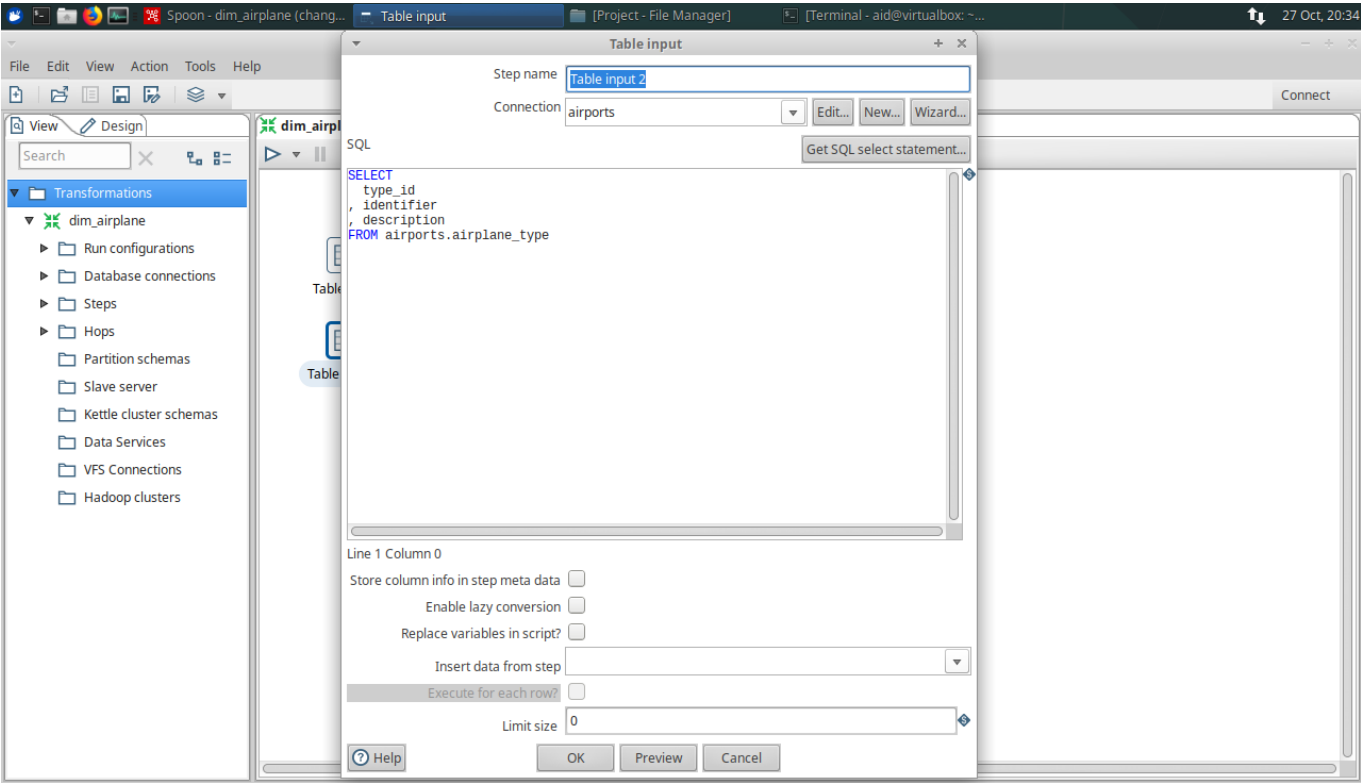


Figure 7 - dim_airplane table input 2 window

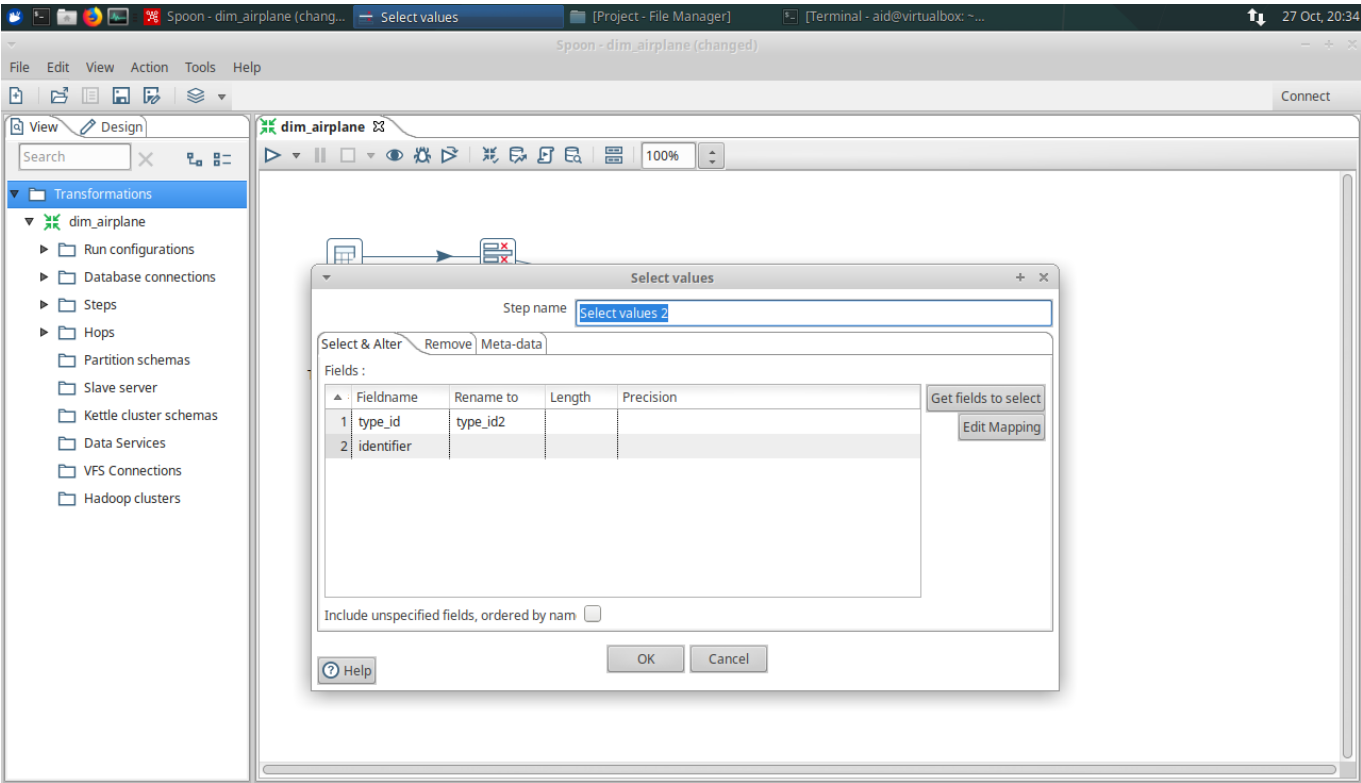


Figure 8 - dim_airplane select values 2 window

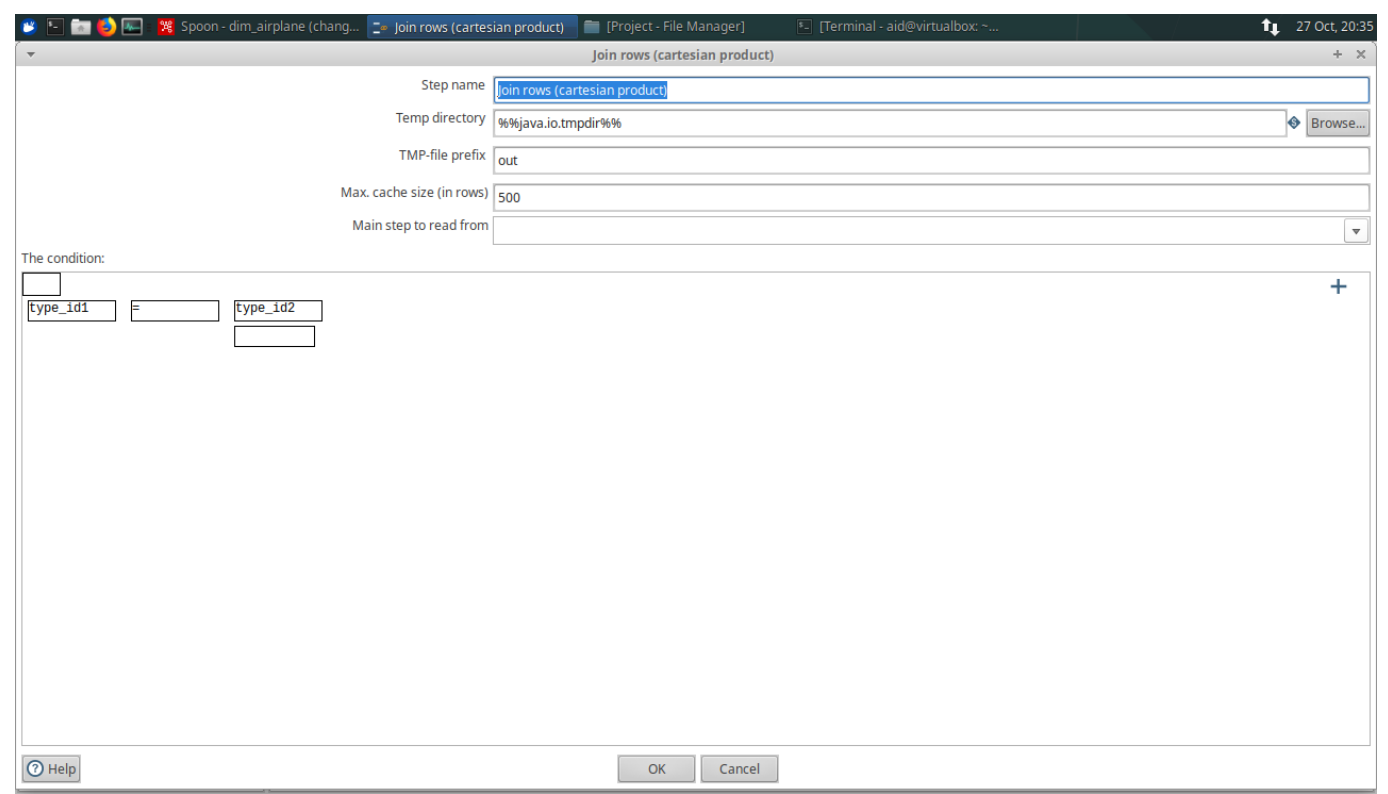


Figure 9 - dim_airplane join rows window

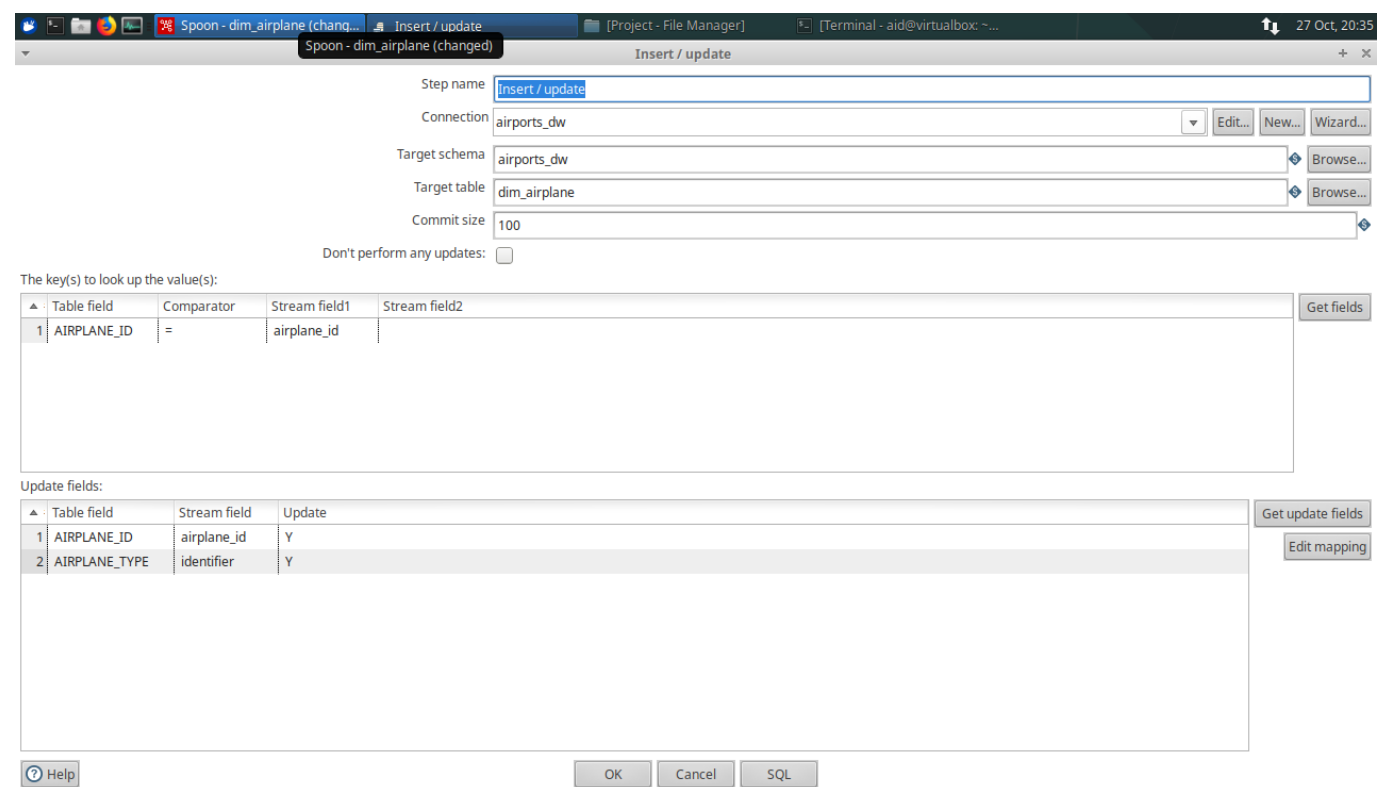


Figure 10 - dim_airplane insert/update window

Airport dimension

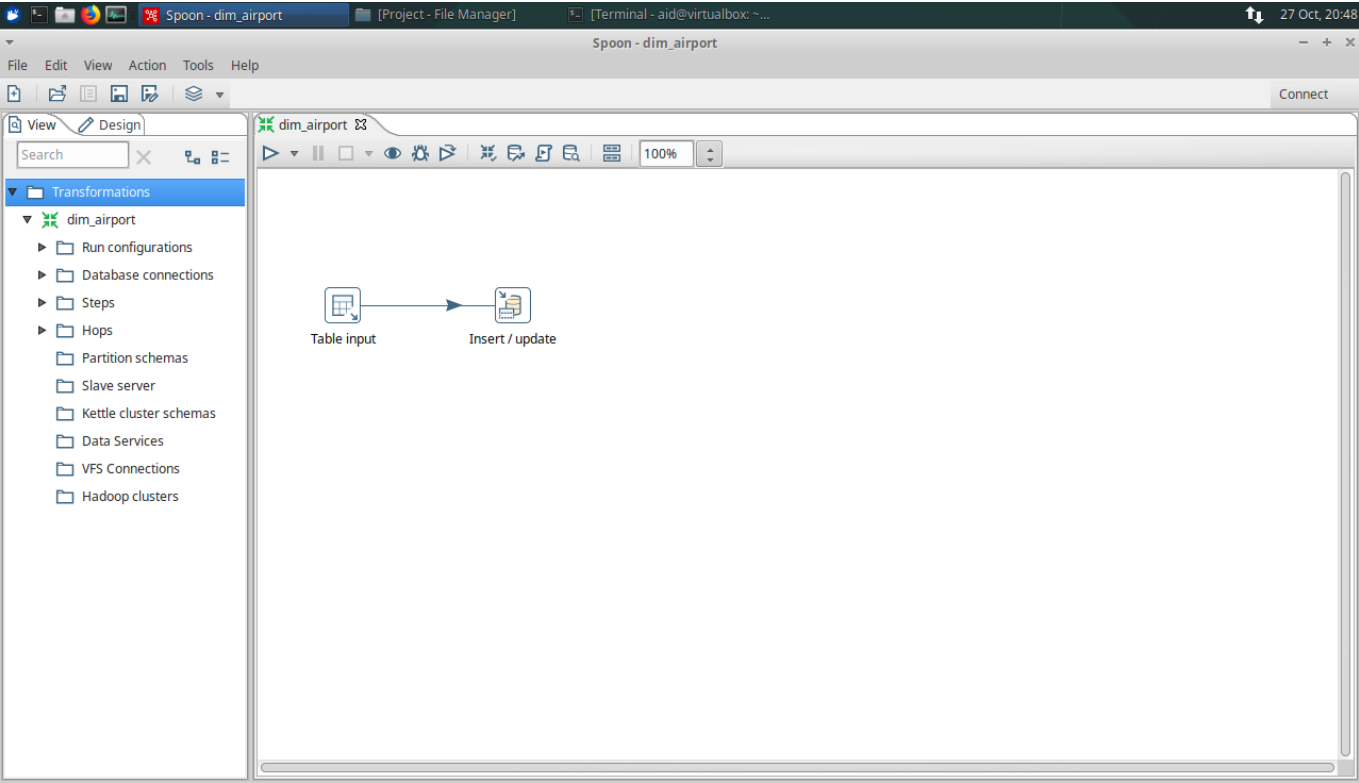


Figure 11 - dim_airport entire transformation

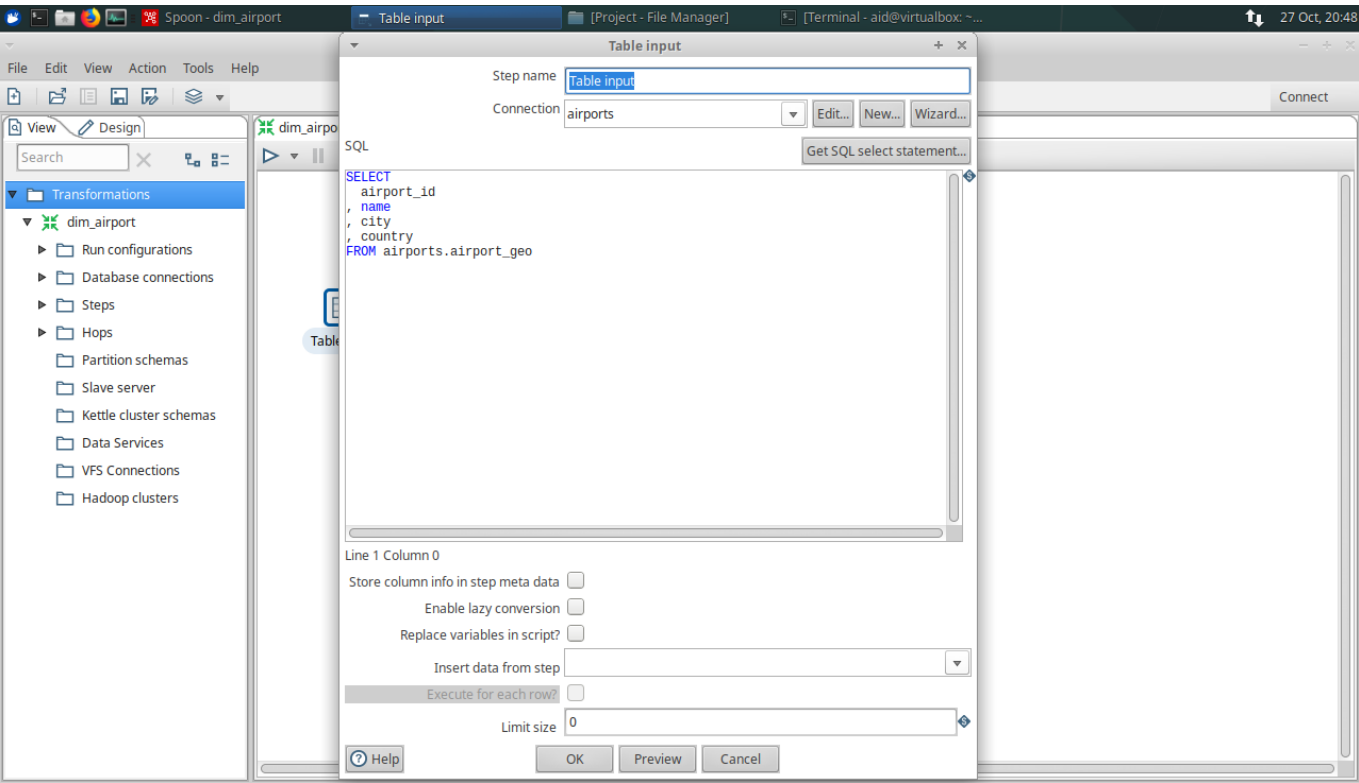


Figure 12 - dim_airport input table window

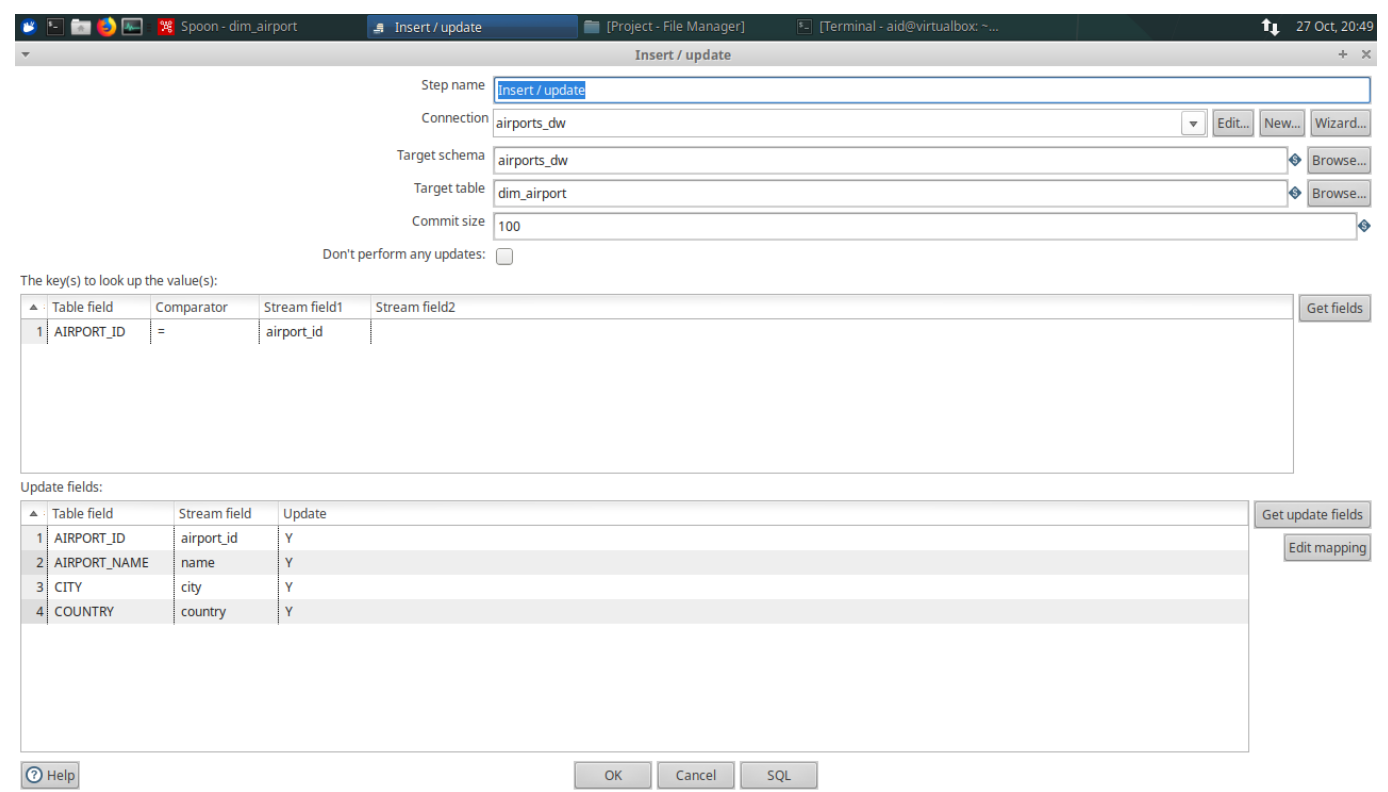


Figure 13 - dim_airport insert/update window

Time dimension

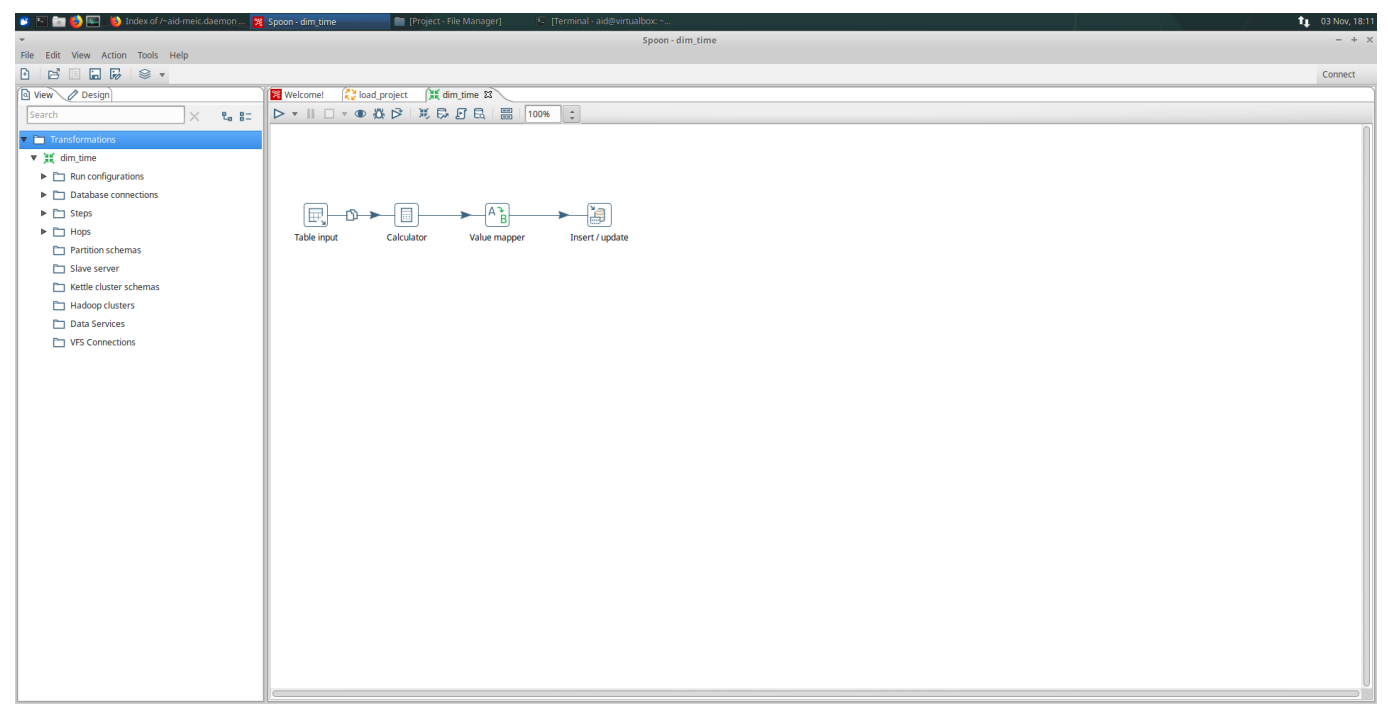


Figure 14 - dim_time entire transformation

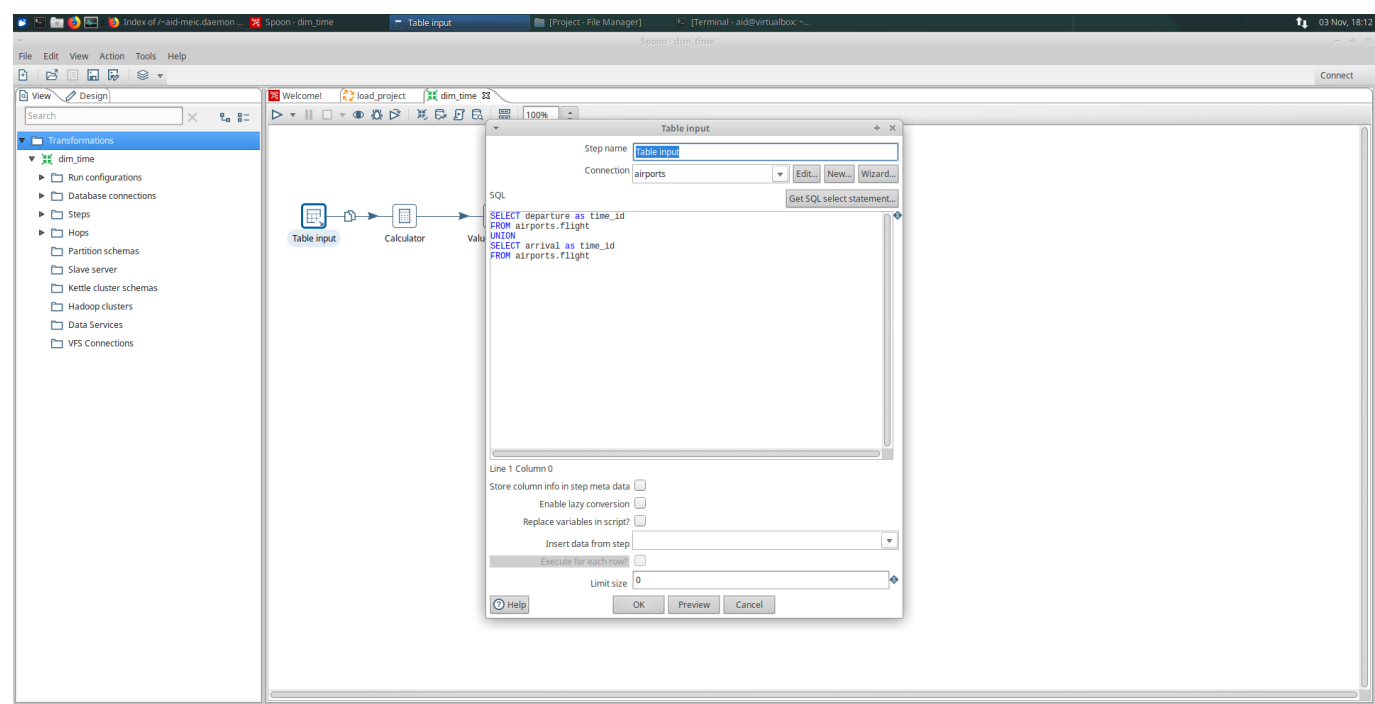


Figure 15 - dim_time table input window (union between departures and arrivals)

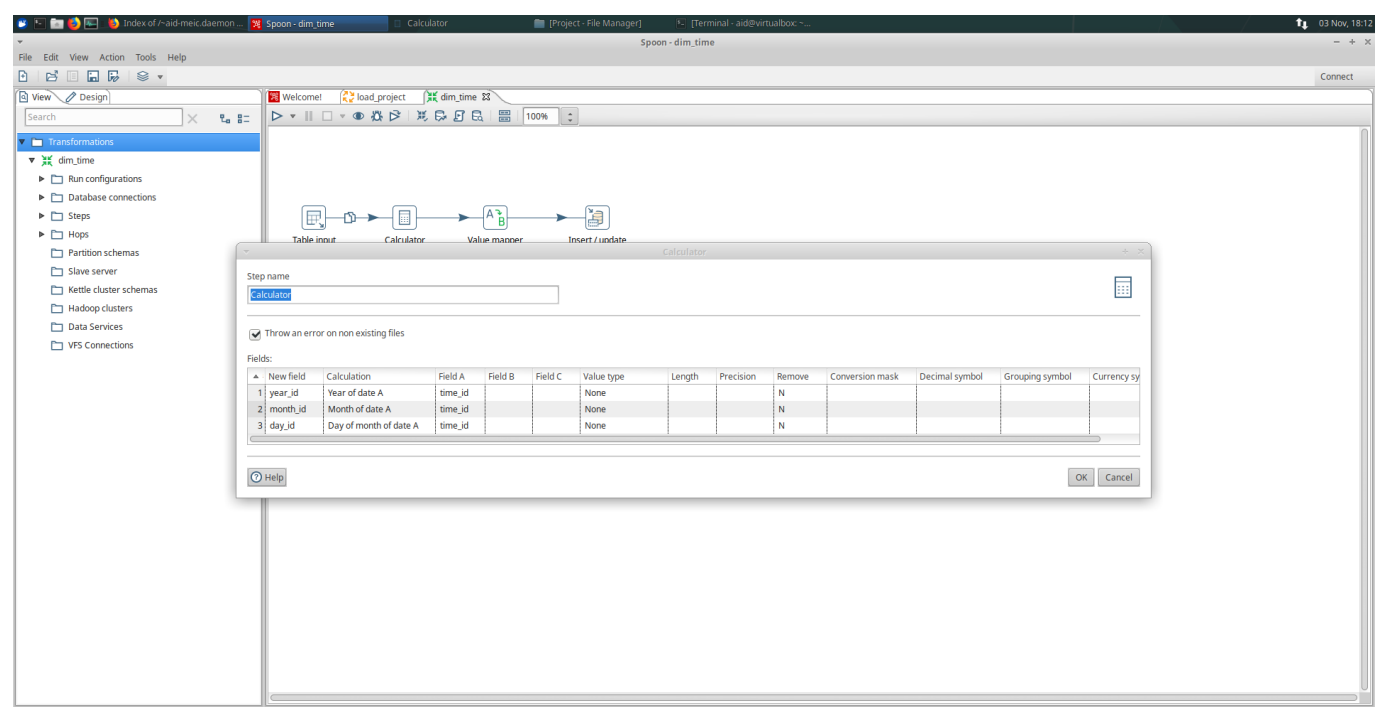


Figure 16 - dim_time calculator window

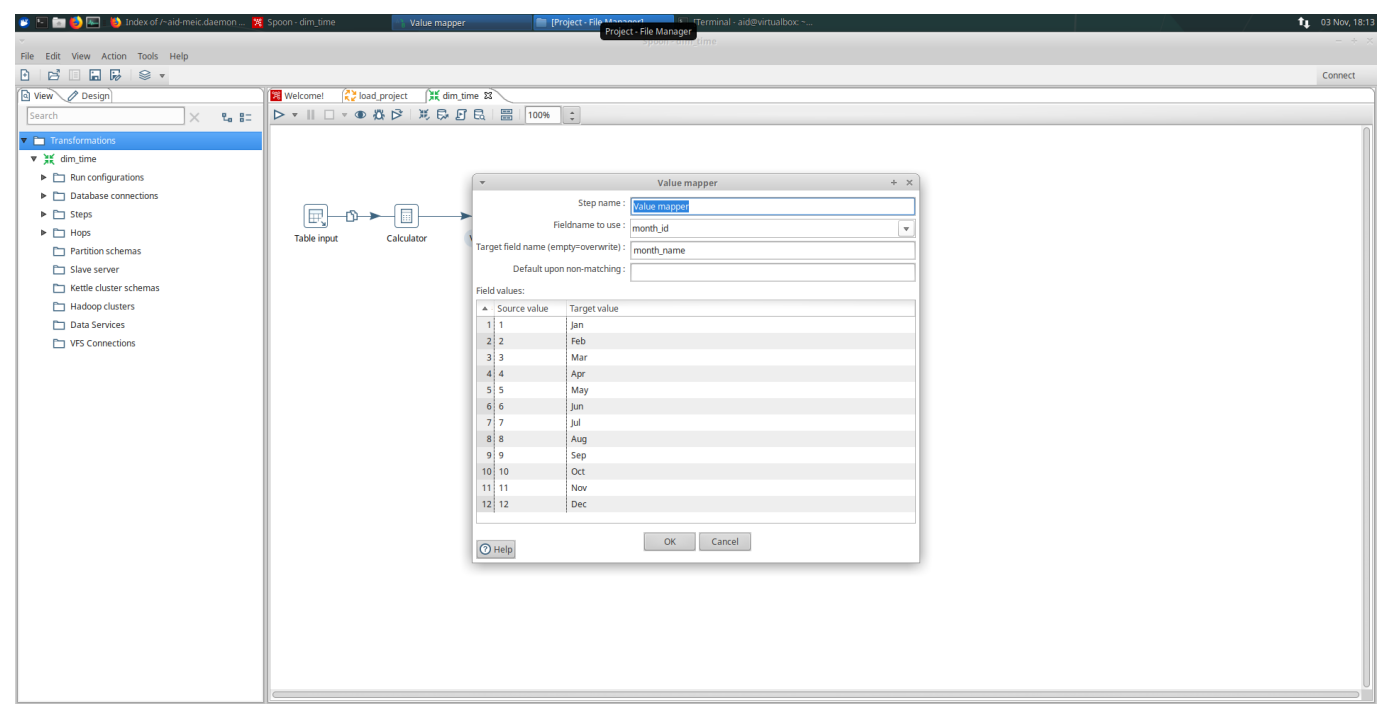


Figure 17 - dim_time value mapper window

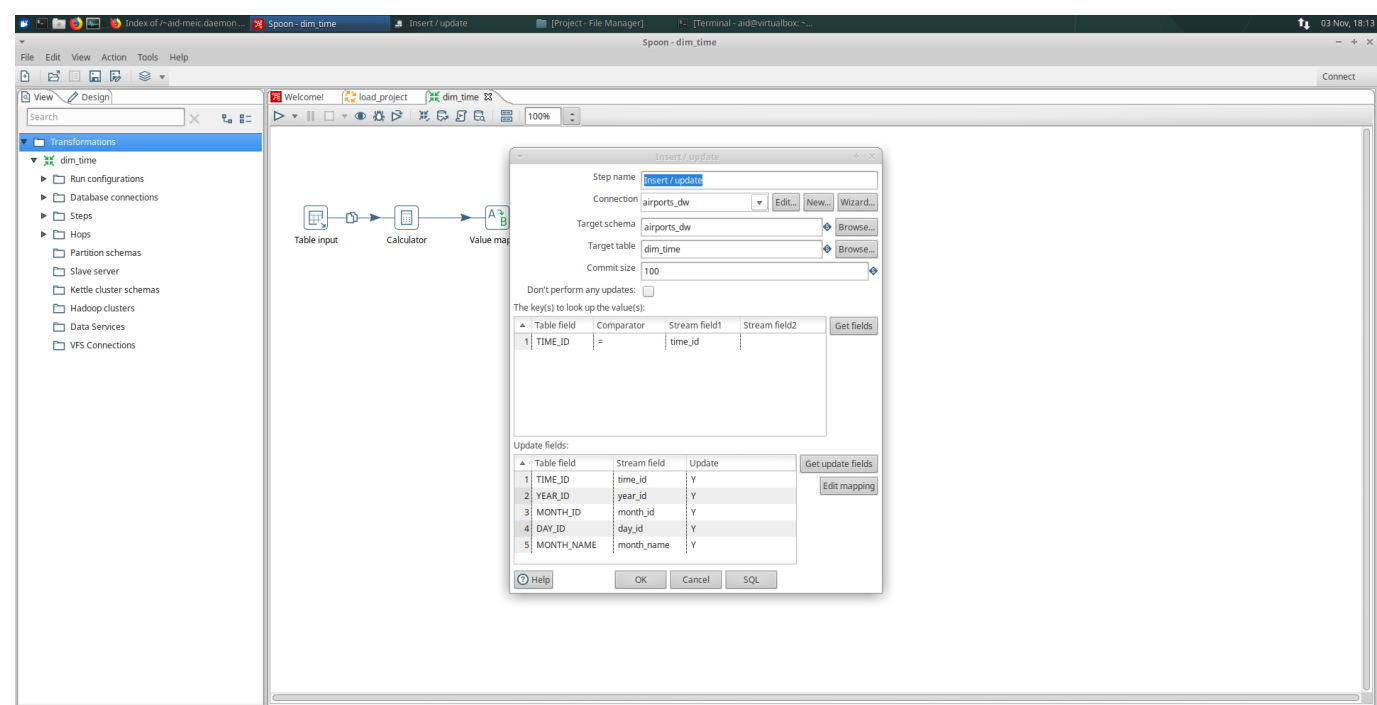


Figure 18 - dim_time insert/update window

Flight fact

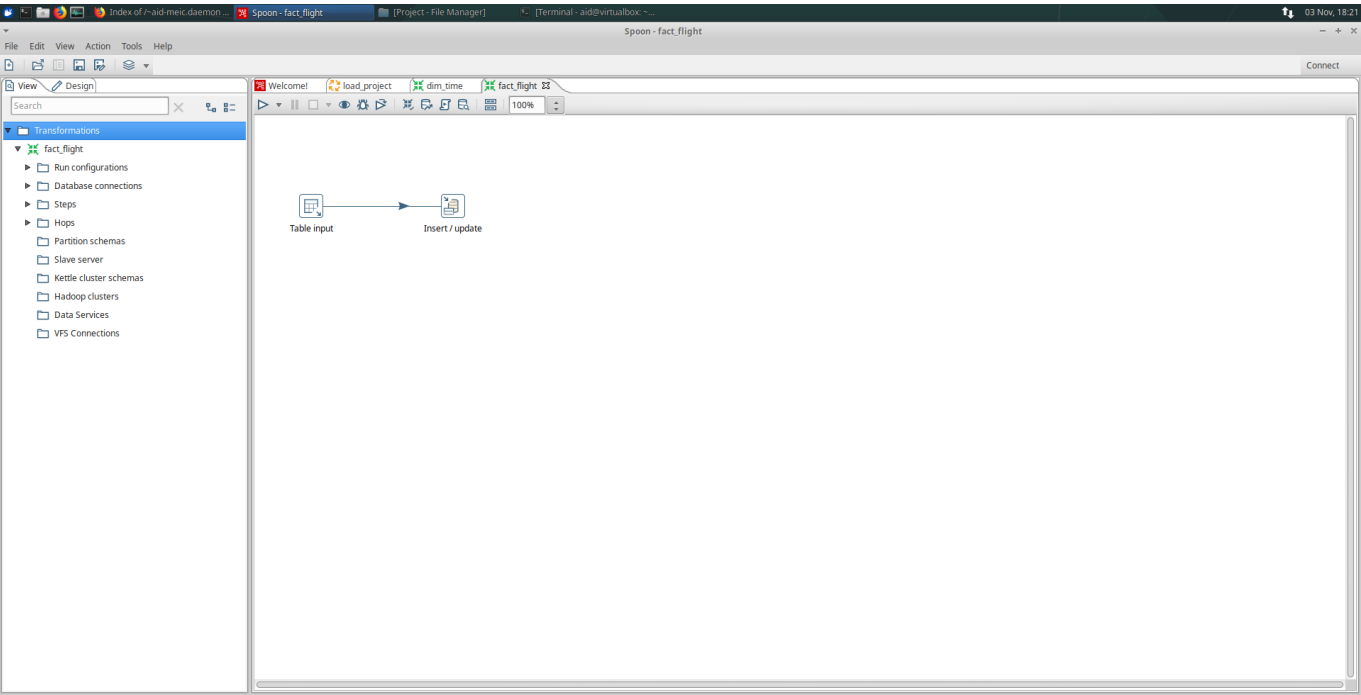


Figure 19 - fact_flight entire transformation

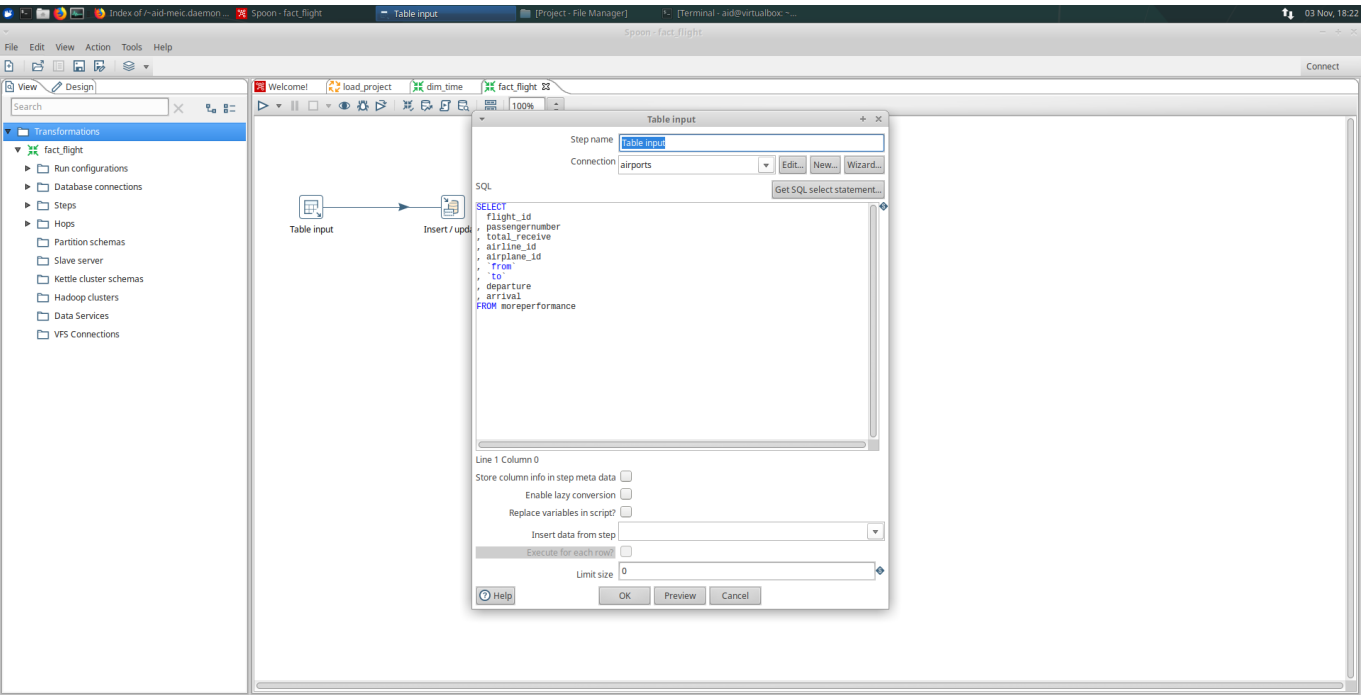


Figure 20 - fact_flight table input window (Here we use the view moreperformance to be faster in the largest databases)

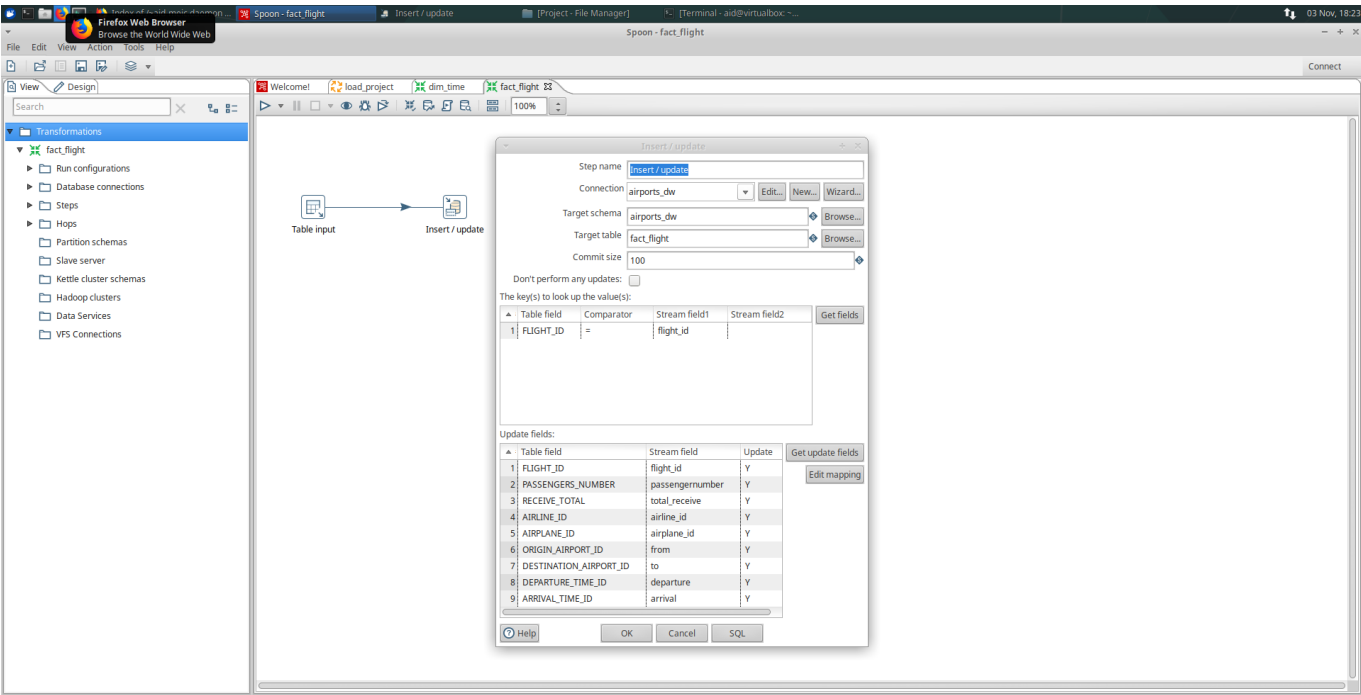


Figure 21 - fact_flight insert/update window

Final Job

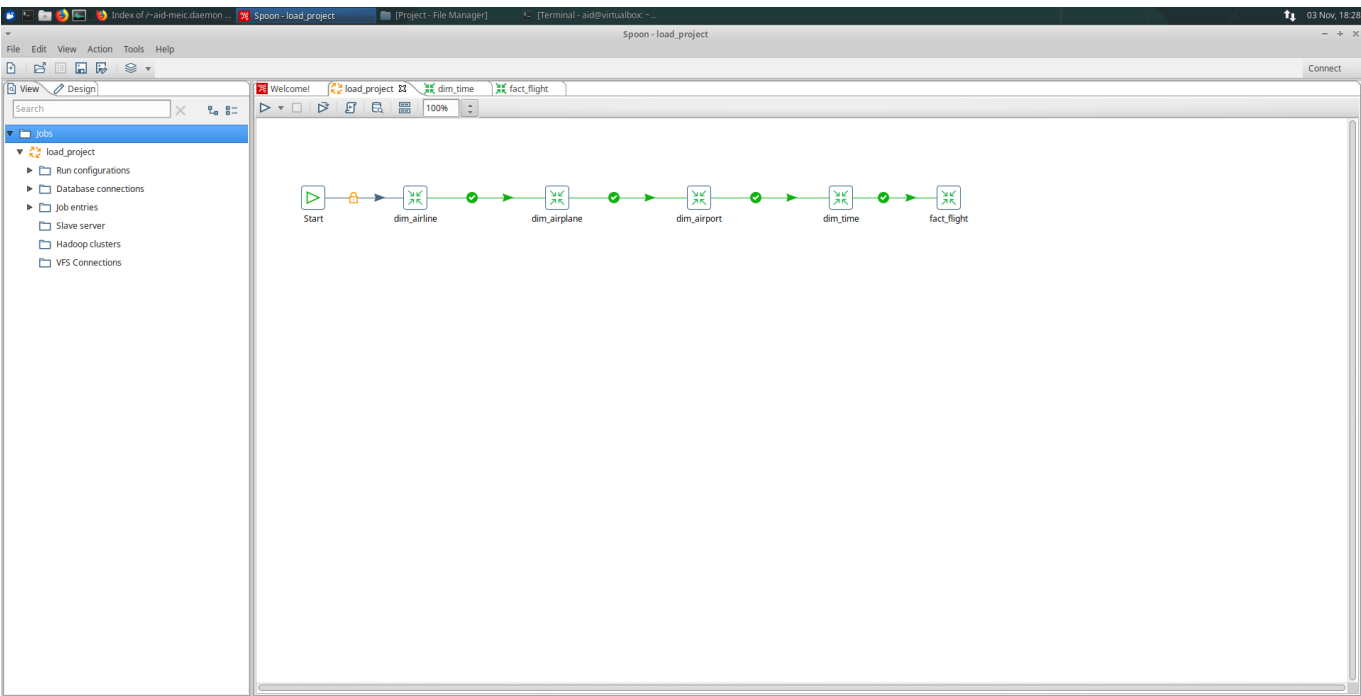


Figure 22 - Complete job

4. XML Code for the cube definition

```

<Schema name="airports_dw">
  <Cube name="Flights" visible="true" cache="true" enabled="true">
    <Table name="fact_flight">
    </Table>
    <Dimension type="StandardDimension" visible="true"
foreignKey="AIRLINE_ID" highCardinality="false" name="Airline">
      <Hierarchy name="Airline Hierarchy" visible="true" hasAll="true"
allMemberName="All Arlines" primaryKey="AIRLINE_ID">
        <Table name="dim_airline">
        </Table>
        <Level name="Name" visible="true" column="AIRLINE_NAME"
type="String" uniqueMembers="false" levelType="Regular"
hideMemberIf="Never">
          </Level>
        </Hierarchy>
      </Dimension>
      <Dimension type="StandardDimension" visible="true"
foreignKey="ORIGIN_AIRPORT_ID" highCardinality="false"
name="OriginAirport">
        <Hierarchy name="Origin Airport Hierarchy" visible="true"
hasAll="true" allMemberName="All Origin Airports" primaryKey="AIRPORT_ID">
          <Table name="dim_airport">
          </Table>
          <Level name="OriginCountry" visible="true" column="COUNTRY"
type="String" uniqueMembers="false" levelType="Regular"
hideMemberIf="Never">
            </Level>
            <Level name="OriginCity" visible="true" column="CITY"
type="String" uniqueMembers="false" levelType="Regular"
hideMemberIf="Never">
              </Level>
              <Level name="OriginName" visible="true" column="AIRPORT_NAME"
type="String" uniqueMembers="false" levelType="Regular"
hideMemberIf="Never">
                </Level>
              </Hierarchy>
            </Dimension>
            <Dimension type="StandardDimension" visible="true"
foreignKey="DESTINATION_AIRPORT_ID" highCardinality="false"
name="DestinationAirport">
              <Hierarchy name="Destination Airport Hierarchy" visible="true"
hasAll="true" allMemberName="All Destination Airports"
primaryKey="AIRPORT_ID">
                <Table name="dim_airport">
                </Table>
                <Level name="DestinationCountry" visible="true" column="COUNTRY"
type="String" uniqueMembers="false" levelType="Regular"
hideMemberIf="Never">
                  </Level>
                  <Level name="DestinationCity" visible="true" column="CITY"

```

```

type="String" uniqueMembers="false" levelType="Regular"
hideMemberIf="Never">
    </Level>
    <Level name="DestinationName" visible="true" column="AIRPORT_NAME"
type="String" uniqueMembers="false" levelType="Regular"
hideMemberIf="Never">
    </Level>
</Hierarchy>
</Dimension>
<Dimension type="TimeDimension" visible="true"
foreignKey="DEPARTURE_TIME_ID" highCardinality="false" name="Time">
    <Hierarchy name="Time Hierarchy" visible="true" hasAll="true"
allMemberName="All Years" primaryKey="TIME_ID">
        <Table name="dim_time">
        </Table>
        <Level name="Year" visible="true" column="YEAR_ID" type="Integer"
uniqueMembers="false" levelType="TimeYears" hideMemberIf="Never">
            </Level>
            <Level name="Month" visible="true" column="MONTH_NAME"
ordinalColumn="MONTH_ID" type="String" uniqueMembers="false"
levelType="TimeMonths" hideMemberIf="Never">
                </Level>
                <Level name="Day" visible="true" column="DAY_ID" type="Integer"
uniqueMembers="false" levelType="TimeDays" hideMemberIf="Never">
                    </Level>
                </Hierarchy>
            </Dimension>
            <Dimension type="StandardDimension" visible="true"
foreignKey="AIRPLANE_ID" name="Airplane">
                <Hierarchy name="Airplane Hierarchy" visible="true" hasAll="true"
allMemberName="All Airplanes" primaryKey="AIRPLANE_ID">
                    <Table name="dim_airplane">
                    </Table>
                    <Level name="Type" visible="true" column="AIRPLANE_TYPE"
type="String" uniqueMembers="false" levelType="Regular">
                        </Level>
                    </Hierarchy>
                </Dimension>
                <Measure name="TotalNumberPassengers" column="PASSENGERS_NUMBER"
datatype="Integer" formatString="#,###" aggregator="sum" visible="true">
                    </Measure>
                    <Measure name="TotalRevenue" column="RECEIVE_TOTAL" datatype="Numeric"
formatString="$ #,###.00" aggregator="sum" visible="true">
                        </Measure>
                    </Cube>
                </Schema>

```

5. Database queries

Query1: passengers and revenue by airline and month (There is not a query because we don't use MDX mode)

Query2 code: Top5 airlines with better revenue

```
SELECT Measures.Members ON COLUMNS,
TOPCOUNT(Airline.[Name].Members, 5, Measures.TotalRevenue) ON ROWS
FROM Flights
```

Query3 code: Average price per passenger from other countries to germany

```
WITH MEMBER Measures.AveragePricePerTicket AS (Measures.TotalRevenue /
Measures.TotalNumberPassengers)
SELECT Measures.AveragePricePerTicket ON COLUMNS,
ORDER(OriginAirport.OriginCountry.Members, Measures.AveragePricePerTicket,
DESC) ON ROWS
FROM Flights WHERE (DestinationAirport.GERMANY)
```

5.1. Small database (airports.sql) queries

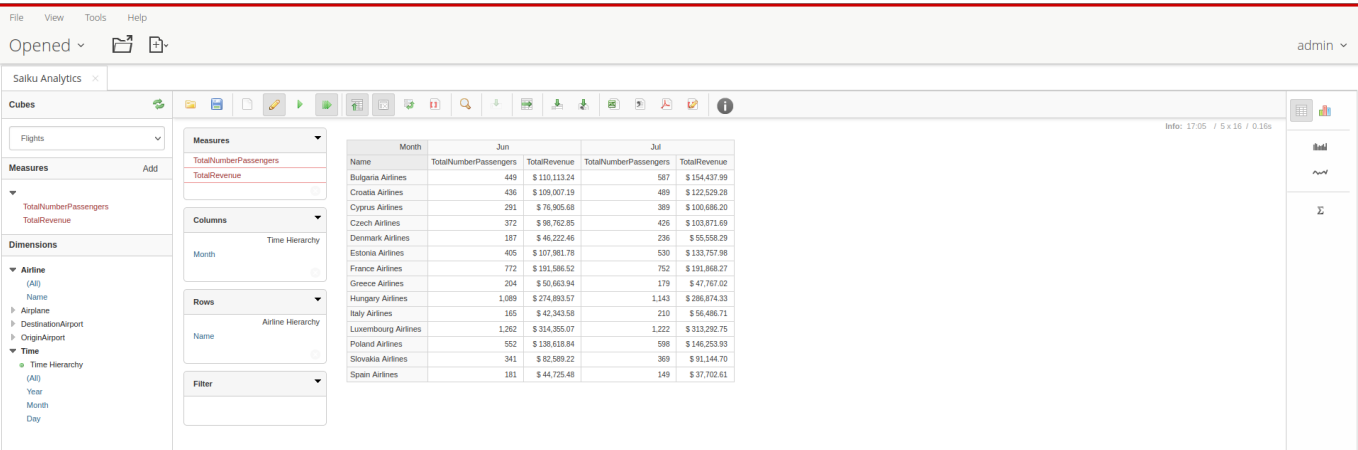


Figure 23 - Query1: passengers and revenue by airline and month (small database - airports.sql)

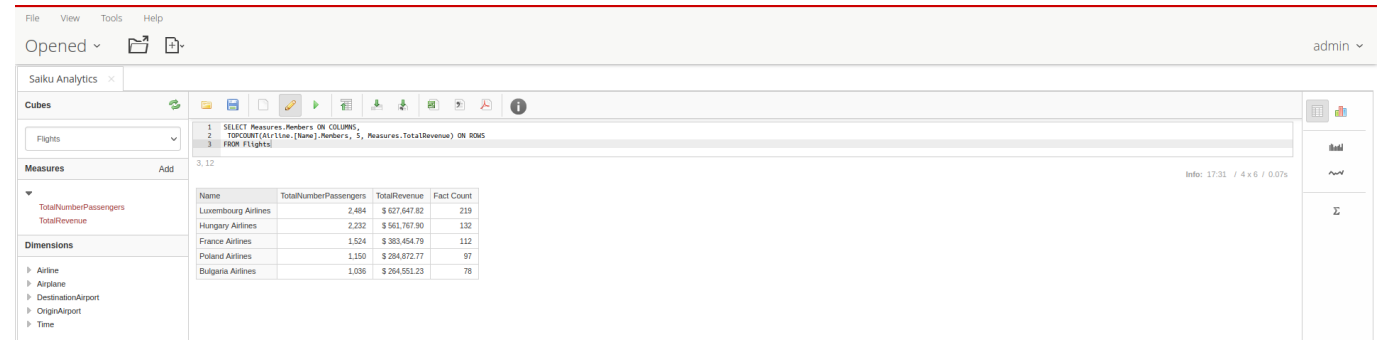


Figure 24 - Query2: Top5 airlines with better revenue (small database - airports.sql)

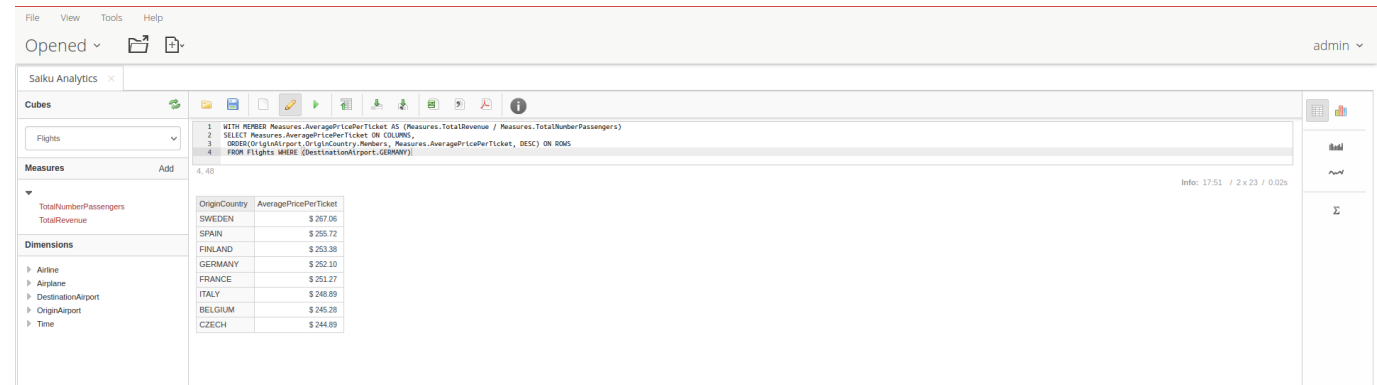


Figure 25 - Query3: Average price per passenger from other countries to germany (small database - airports.sql)

5.2. Larger database (airports-larger.sql) queries

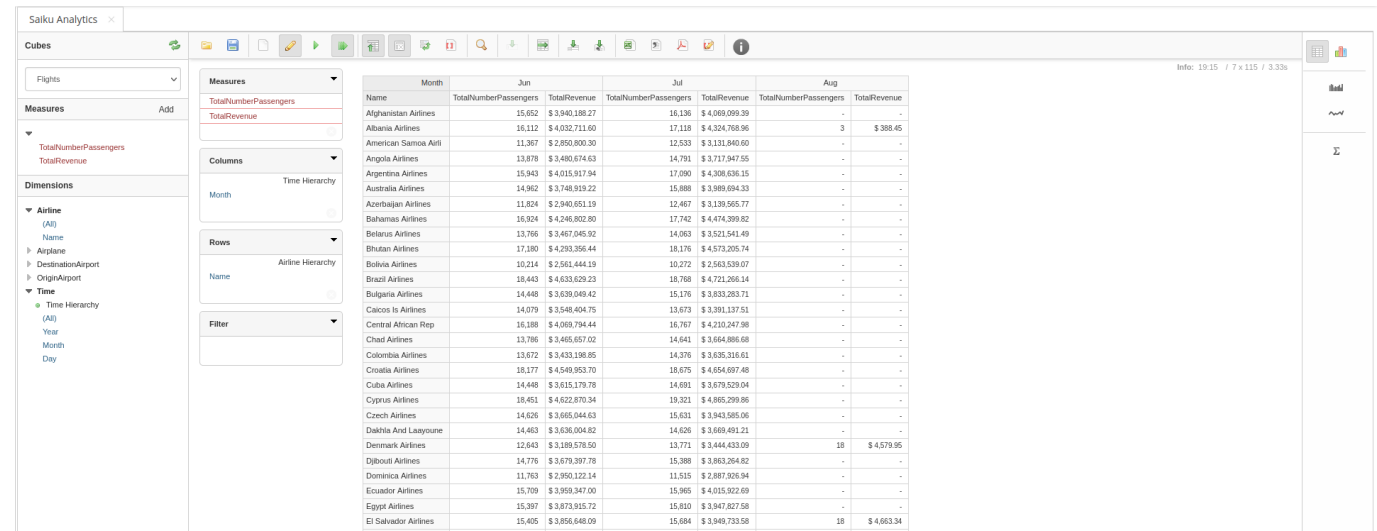


Figure 26 - Query1: passengers and revenue by airline and month pt1 (larger database - airports-larger.sql)

Saiku Analytics

Cubes

Flights

Measures

Dimensions

Measures

Columns

Rows

Filter

El Salvador Airlines

Equatorial Guinea Airlines

Entrea Airlines

Estonia Airlines

Ethiopia Airlines

Falkland Is Airlines

Fiji Is Airlines

France Airlines

Gabon Airlines

Georgia Airlines

Ghana Airlines

Gibraltar Airlines

Greece Airlines

Guadeloupe Airlines

Haiti Airlines

Honduras Airlines

Hungary Airlines

Iceland Airlines

India Airlines

Iran Airlines

Isla De Pascua Airlines

Italy Airlines

Ivory Coast Airlines

Jamaica Airlines

Jerusalem Airlines

Johnston Atoll Airlines

Kazakhstan Airlines

Kenya Airlines

Kiribati Airlines

Korea Airlines

Kuwait Airlines

15,405

17,836

16,509

16,551

21,990

21,935

13,399

15,483

13,751

16,770

14,369

13,853

13,567

14,211

17,980

12,599

22,326

15,175

19,285

16,776

17,364

17,291

14,049

15,534

12,455

14,957

17,009

17,295

13,903

10,182

14,638

\$ 3,856,648.09

\$ 4,474,686.99

\$ 4,169,109.04

\$ 4,145,786.85

\$ 5,509,049.03

\$ 5,492,867.76

\$ 3,354,302.44

\$ 3,894,965.21

\$ 3,439,636.82

\$ 4,236,458.39

\$ 3,597,812.60

\$ 3,457,088.03

\$ 3,428,424.19

\$ 3,552,391.80

\$ 4,519,057.29

\$ 3,180,330.62

\$ 5,606,494.69

\$ 3,812,945.08

\$ 4,890,562.88

\$ 4,186,887.57

\$ 4,384,031.42

\$ 4,352,270.38

\$ 3,519,256.45

\$ 3,906,344.82

\$ 3,137,307.33

\$ 3,767,329.33

\$ 4,277,780.48

\$ 4,311,432.91

\$ 3,554,229.61

\$ 2,554,236.02

\$ 3,656,493.18

15,684

17,990

16,319

17,658

21,249

22,246

13,686

16,402

14,161

17,006

14,549

14,125

13,745

14,348

18,749

12,389

23,272

16,267

19,158

16,283

17,795

17,772

14,228

14,120

13,119

16,045

17,357

17,907

14,777

10,280

15,539

\$ 3,949,733.58

\$ 4,516,198.30

\$ 4,090,833.39

\$ 4,400,780.83

\$ 5,320,214.04

\$ 5,544,876.75

\$ 3,474,690.80

\$ 4,167,329.80

\$ 3,549,402.49

\$ 4,245,644.77

\$ 3,672,029.26

\$ 3,566,587.32

\$ 3,412,365.53

\$ 3,583,872.07

\$ 4,704,840.92

\$ 3,095,747.16

\$ 5,855,338.25

\$ 4,070,428.31

\$ 4,813,803.26

\$ 4,122,444.34

\$ 4,435,784.00

\$ 4,470,394.44

\$ 3,572,393.39

\$ 3,565,046.65

\$ 3,292,444.49

\$ 4,031,039.96

\$ 4,360,508.52

\$ 4,520,172.86

\$ 3,700,740.03

\$ 2,572,481.91

\$ 3,856,333.12

18

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21

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\$ 4,663.34

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\$ 4,118.92

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Info: 19:15 / 7 x 115 / 3.33s

Grid

Print

Σ

Figure 27 - Query1: passengers and revenue by airline and month pt2 (larger database - airports-larger.sql)

Saiku Analytics

Cubes

Flights

Measures

Dimensions

Measures

TotalNumberPassengers

TotalRevenue

Columns

Month

Rows

Name

Filter

Kiribati Airlines

13,993

\$ 3,504,229.61

14,777

\$ 3,700,740.03

-

-

Korea Airlines

10,182

\$ 2,554,235.02

10,280

\$ 2,572,481.91

-

-

Kuwait Airlines

14,638

\$ 3,656,493.18

15,539

\$ 3,856,333.12

-

-

Kyrgyzstan Airlines

12,022

\$ 3,006,789.69

12,936

\$ 3,225,941.64

-

-

Laos Airlines

15,385

\$ 3,828,050.80

15,147

\$ 3,828,635.25

-

-

Lebanon Airlines

10,687

\$ 2,685,393.09

11,442

\$ 2,856,960.32

-

-

Liberia Airlines

15,518

\$ 3,889,081.04

15,436

\$ 3,893,132.78

-

-

Luxembourg Airlines

16,520

\$ 4,130,717.98

16,553

\$ 4,160,720.19

-

-

Macau Airlines

14,568

\$ 3,650,886.81

14,893

\$ 3,749,960.60

-

-

Malilla Airlines

17,849

\$ 4,489,553.19

18,500

\$ 4,653,345.98

-

-

Micronesia Airlines

22,625

\$ 5,681,789.90

23,512

\$ 5,898,317.06

-

-

Moldova Airlines

16,150

\$ 4,057,435.60

16,980

\$ 4,247,890.59

-

-

Myanmar Airlines

16,498

\$ 4,127,653.31

16,813

\$ 4,213,971.63

-

-

Namibia Airlines

18,213

\$ 4,554,200.84

18,427

\$ 4,604,633.49

-

-

Nepal Airlines

13,655

\$ 3,425,744.02

13,665

\$ 3,428,451.36

-

-

Nicaragua Airlines

15,472

\$ 3,883,310.07

16,509

\$ 4,142,072.61

-

-

Northern Mariana Is

15,462

\$ 3,889,254.98

15,660

\$ 3,910,673.37

-

-

Oman Airlines

18,279

\$ 4,570,259.31

20,024

\$ 5,013,017.64

-

-

Pakistan Airlines

6,748

\$ 1,481,382.42

6,867

\$ 1,710,616.97

-

-

Peru Airlines

23,249

\$ 5,855,998.16

23,277

\$ 5,862,094.51

-

-

Philippines Airlines

5,903

\$ 1,492,135.48

6,120

\$ 1,533,958.08

-

-

Poland Airlines

17,483

\$ 4,396,794.19

19,030

\$ 4,764,543.62

-

-

Puerto Rico Airlines

19,036

\$ 4,791,649.65

20,323

\$ 5,087,510.31

-

-

Qatar Airlines

13,900

\$ 3,478,427.01

14,124

\$ 3,551,543.70

-

-

Reunion Airlines

17,200

\$ 4,328,093.17

17,947

\$ 4,500,722.54

-

-

Romania Airlines

16,297

\$ 4,109,671.25

16,711

\$ 4,203,754.17

-

-

Russia Airlines

19,440

\$ 4,871,386.94

19,745

\$ 4,940,399.37

-

-

Rwanda Airlines

16,901

\$ 4,233,444.83

17,646

\$ 4,404,315.12

-

-

San Andres Airlines

12,430

\$ 3,129,988.47

13,592

\$ 3,402,829.30

-

-

Senegal Airlines

17,164

\$ 4,285,140.57

17,683

\$ 4,457,747.32

-

-

Info: 19:15 / 7 x 115 / 3.33s

Grid

Full

Σ

Figure 28 - Query1: passengers and revenue by airline and month pt3 (larger database - airports-larger.sql)

Saiku Analytics

Cubes

Flights

Measures

TotalNumberPassengers

TotalRevenue

Columns

Month

Rows

Name

Filter

Dimensions

Airline

Plane

DestinationAirport

OriginAirport

Time

Measures

TotalNumberPassengers

TotalRevenue

Columns

Month

Rows

Name

Filter

Dimensions

Airline

Plane

DestinationAirport

OriginAirport

Time

Measures

TotalNumberPassengers

TotalRevenue

Columns

Month

Rows

Name

Filter

Dimensions

Airline

Plane

DestinationAirport

OriginAirport

Time

Measures

TotalNumberPassengers

TotalRevenue

Columns

Month

Rows

Name

Filter

Dimensions

Airline

Plane

DestinationAirport

OriginAirport

Time

Measures

TotalNumberPassengers

TotalRevenue

Columns

Month

Rows

Name

Filter

Dimensions

Airline

Plane

DestinationAirport

OriginAirport

Time

Measures

TotalNumberPassengers

TotalRevenue

Columns

Month

Rows

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Figure 29 - Query1: passengers and revenue by airline and month pt4 (larger database - airports-larger.sql)

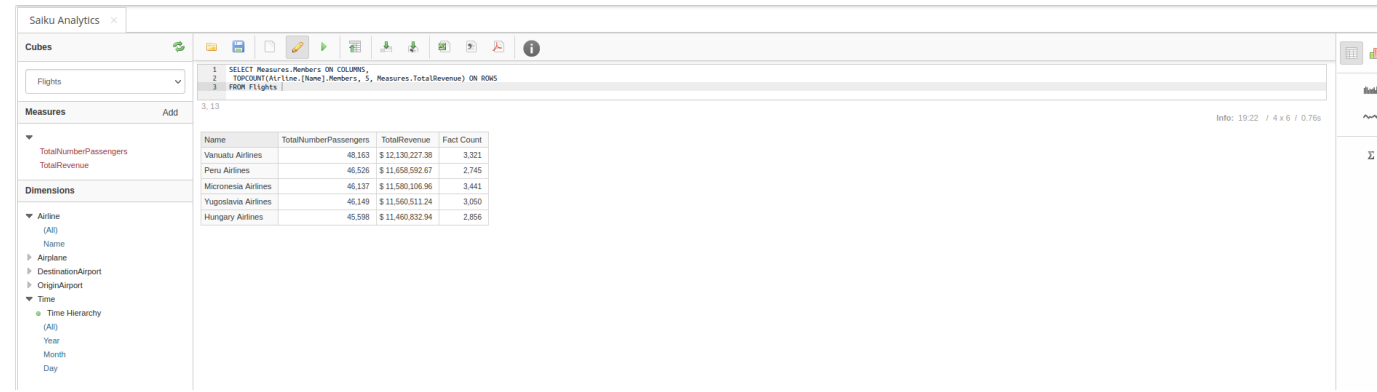


Figure 30 - Query2: Top5 airlines with better revenue (larger database - airports-larger.sql)

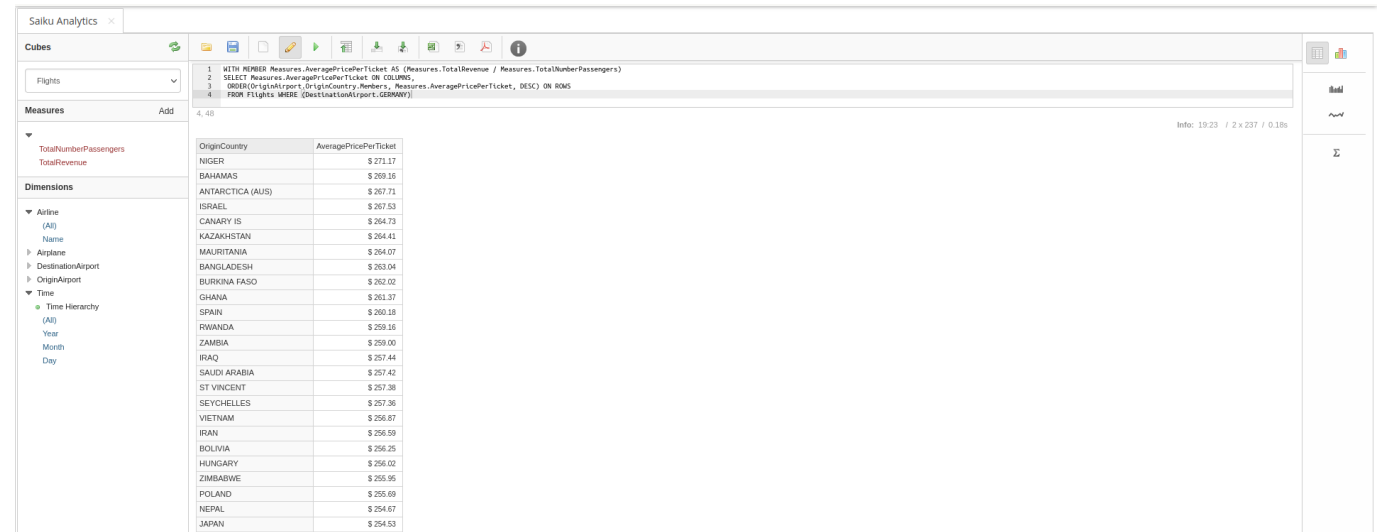


Figure 31 - Query3: Average price per passenger from other countries to germany pt1 (larger database - airports-larger.sql)

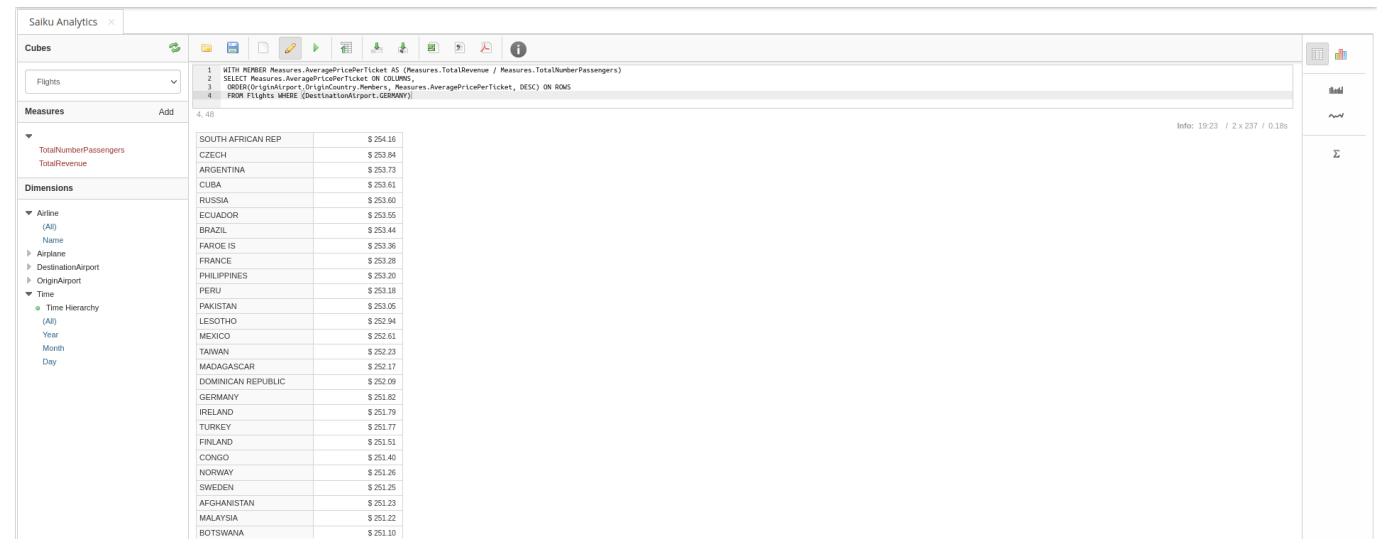


Figure 32 - Query3: Average price per passenger from other countries to germany pt2 (larger database - airports-larger.sql)

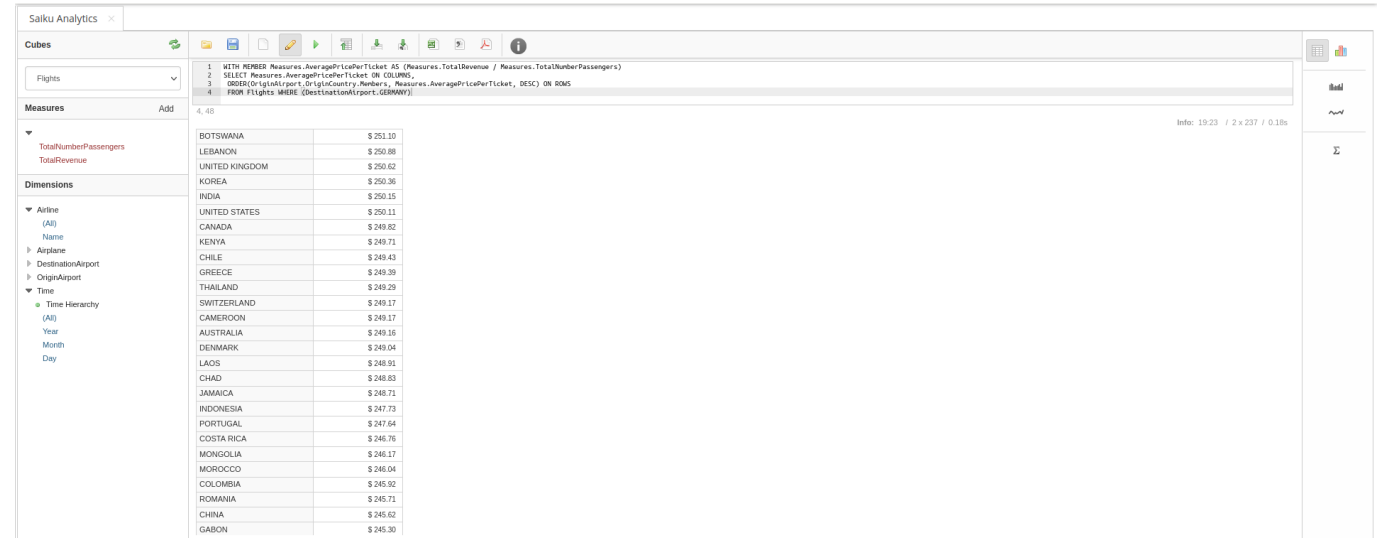


Figure 33 - Query3: Average price per passenger from other countries to germany pt3 (larger database - airports-larger.sql)

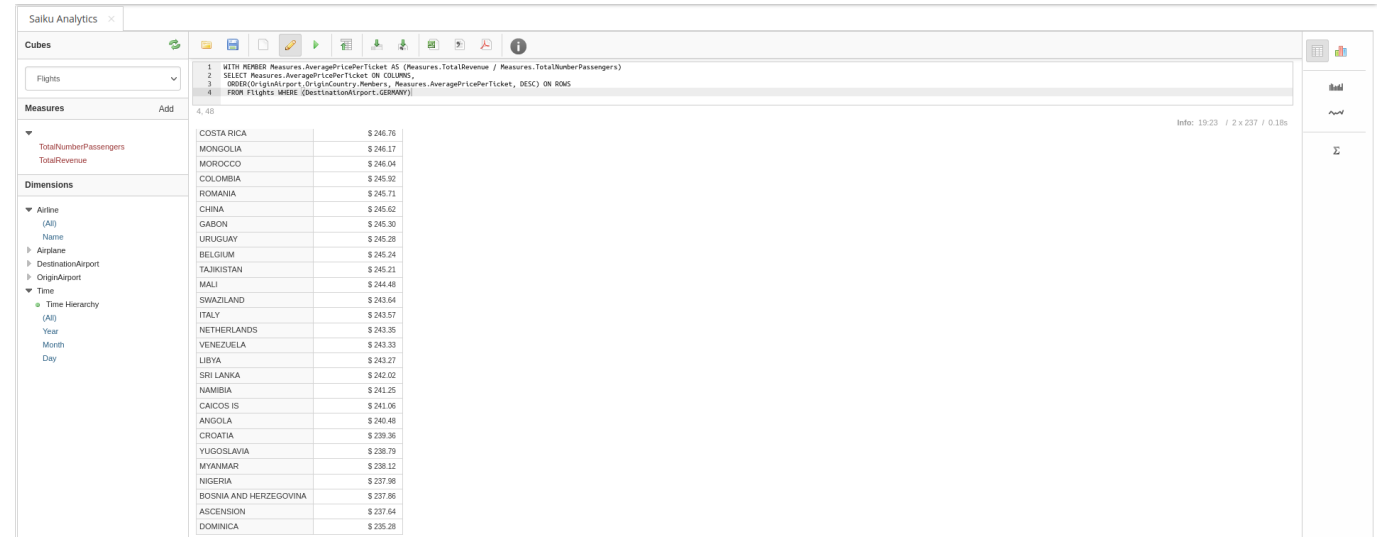


Figure 34 - Query3: Average price per passenger from other countries to germany pt4 (larger database - airports-larger.sql)