



INSTITUTO SUPERIOR TÉCNICO

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## Data Analysis and Integration Project

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# 1 Data Warehouse for Northwind\_dw

```
1 DROP DATABASE IF EXISTS northwind_dw;
2
3 CREATE DATABASE northwind_dw;
4
5 USE northwind_dw;
6
7 CREATE TABLE dim_customer (
8     CUSTOMER_ID VARCHAR(5) NOT NULL,
9     COMPANY_NAME VARCHAR(40) NOT NULL,
10    CITY VARCHAR(255),
11    COUNTRY VARCHAR(255),
12    PRIMARY KEY (CUSTOMER_ID)
13 );
14
15 CREATE TABLE dim_product (
16     PRODUCT_KEY INTEGER,
17     PRODUCT_NAME varchar(70),
18     PRODUCT_ID INTEGER default 0,
19     CATEGORY_NAME varchar(70),
20     VERSION INT,
21     DATE_FROM DATETIME,
22     DATE_TO DATETIME,
23     PRIMARY KEY (PRODUCT_KEY)
24 );
25
26 CREATE TABLE dim_supplier (
27     SUPPLIER_ID INTEGER NOT NULL,
28     COMPANY_NAME VARCHAR(40),
29     CITY VARCHAR(255),
30     COUNTRY VARCHAR(255),
31     PRIMARY KEY (SUPPLIER_ID)
32 );
33
34 CREATE TABLE dim_shipper (
35     SHIPPER_ID INTEGER NOT NULL,
36     COMPANY_NAME VARCHAR(40),
37     PRIMARY KEY (SHIPPER_ID)
38 );
39
40 CREATE TABLE dim_time (
41     TIME_ID DATETIME,
42     DAY INT,
43     MONTH_ID INT,
44     MONTH_NAME VARCHAR(255),
45     YEAR INT,
46     PRIMARY KEY (TIME_ID)
47 );
48
```

```
49 | CREATE TABLE fact_order (
50 |     ORDER_ID INT,
51 |     PRODUCT_KEY INT,
52 |     CUSTOMER_ID VARCHAR(5),
53 |     SUPPLIER_ID INT,
54 |     SHIPPER_ID INT,
55 |     QUANTITY INT,
56 |     TOTAL_PRICE DECIMAL(10, 4) NOT NULL,
57 |     TIME_ID DATETIME,
58 |     PRIMARY KEY (ORDER_ID, PRODUCT_KEY),
59 |     FOREIGN KEY (PRODUCT_KEY) REFERENCES dim_product(PRODUCT_KEY),
60 |     FOREIGN KEY (CUSTOMER_ID) REFERENCES dim_customer(CUSTOMER_ID),
61 |     FOREIGN KEY (SUPPLIER_ID) REFERENCES dim_supplier(SUPPLIER_ID),
62 |     FOREIGN KEY (SHIPPER_ID) REFERENCES dim_shipper (SHIPPER_ID)
63 | );
```

## 2 Transformation for Northwind\_dw

We implemented 6 transformations (.ktr) and 1 job (.kjb):

- dim\_customer.ktr
- dim\_shipper.ktr
- dim\_supplier.ktr
- dim\_time.ktr
- fact\_order.ktr
- dim\_product.ktr
- load\_dw.kjb

### 2.1 Populating dim\_customer

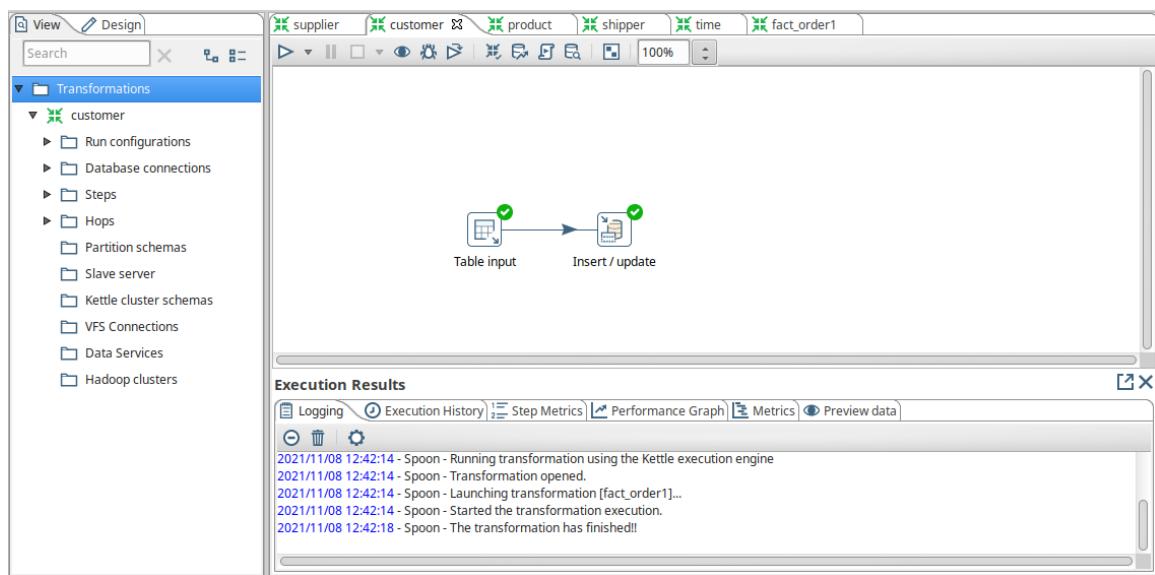


Figure 1: Transformation of dim\_customer.ktr

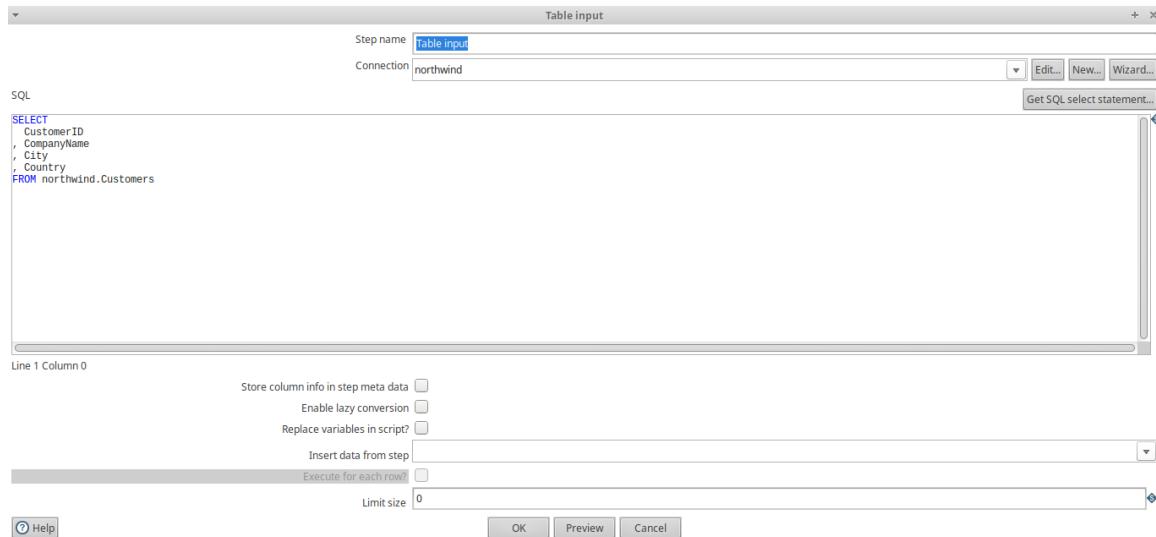


Figure 2: Configuration for Table input

Rows of step: Table input (93 rows)				Examine preview data
	CustomerID	CompanyName	City	Country
1	ALFKI	Alfreds Futterkiste	Berlin	Germany
2	ANATR	Ana Trujillo Emparedados y helados	Mxico D.F.	Mexico
3	ANTON	Antonio Moreno Taquera	Mxico D.F.	Mexico
4	AROUT	Around the Horn	London	UK
5	BERGS	Berglunds snabbköp	Lule	Sweden
6	BLAUS	Blauer See Delikatessen	Mannheim	Germany
7	BLONP	Blondesdssl pre et fils	Strasbourg	France
8	BOLID	Blíido Comidas preparadas	Madrid	Spain
9	BONAP	Bon app'	Marseille	France
10	BOTTM	Bottom-Dollar Markets	Tsawassen	Canada
11	BSBEV	B's Beverages	London	UK
12	CACTU	Cactus Comidas para llevar	Buenos Aires	Argentina
13	CENTC	Centro comercial Moctezuma	Mxico D.F.	Mexico
14	CHOPS	Chop-suey Chinese	Bern	Switzerland
15	COMMI	Comrcio Mineiro	Sao Paulo	Brazil
16	CONSH	Consolidated Holdings	London	UK
17	DRACD	Drachenblt Delikatessen	Aachen	Germany
18	DUMON	Du monde entier	Nantes	France
19	EASTC	Eastern Connection	London	UK
20	ERNSH	Ernst Handel	Graz	Austria
21	FAMIL	Familia Arquibaldo	Sao Paulo	Brazil
22	FISSA	FISSA Fabrica Inter. Salchichas S.A.	Madrid	Spain

Figure 3: Preview of Table input

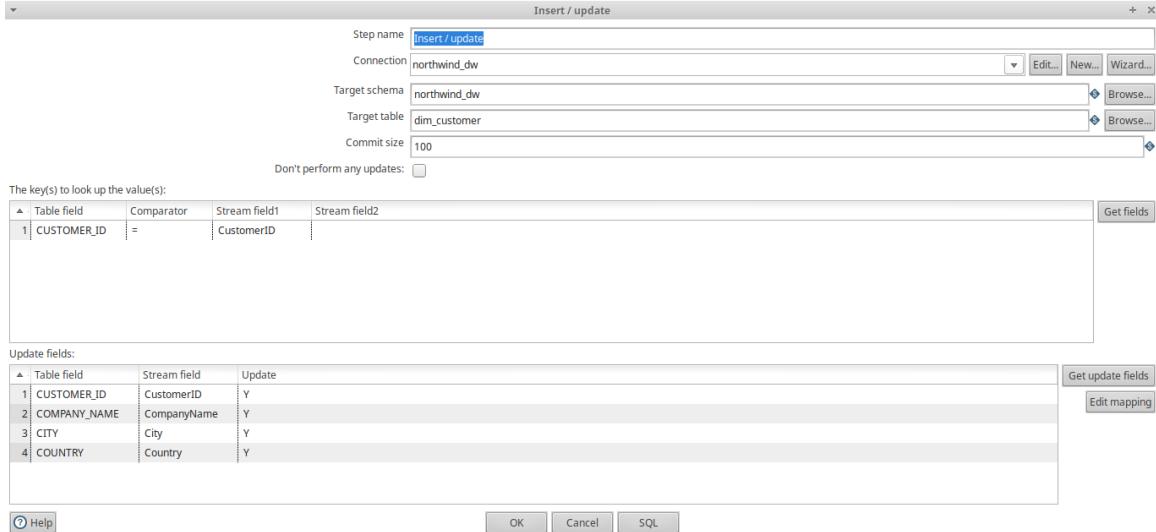


Figure 4: Configuration for Insert/Update

Rows of step: Insert / update (93 rows)				Examine preview data
	CustomerID	CompanyName	City	Country
1	ALFKI	Alfreds Futterkiste	Berlin	Germany
2	ANATR	Ana Trujillo Emparedados y helados	Mxico D.F.	Mexico
3	ANTON	Antonio Moreno Taquera	Mxico D.F.	Mexico
4	AROUT	Around the Horn	London	UK
5	BERGS	Berglunds snabbköp	Lule	Sweden
6	BLAUS	Blauer See Delikatessen	Mannheim	Germany
7	BLONP	Blondesdssl pre et fils	Strasbourg	France
8	BOLID	Bilido Comidas preparadas	Madrid	Spain
9	BONAP	Bon app'	Marseille	France
10	BOTTM	Bottom-Dollar Markets	Tsawassen	Canada
11	BSEV	B's Beverages	London	UK
12	CACTU	Cactus Comidas para llevar	Buenos Aires	Argentina
13	CENTC	Centro comercial Moctezuma	Mxico D.F.	Mexico
14	CHOPS	Chop-suey Chinese	Bern	Switzerland
15	COMMI	Comrcio Mineiro	Sao Paulo	Brazil
16	CONSH	Consolidated Holdings	London	UK
17	DRACD	Drachenblut Delikatessen	Aachen	Germany
18	DUMON	Du monde entier	Nantes	France
19	EASTC	Eastern Connection	London	UK
20	ERNSH	Ernst Handel	Graz	Austria
21	FAMIA	Familia Arquibaldo	Sao Paulo	Brazil
22	FISSA	FISSA Fabrica Inter. Salchichas S.A.	Madrid	Spain

Figure 5: Preview of Insert/Update

## 2.2 Populating dim\_shipper

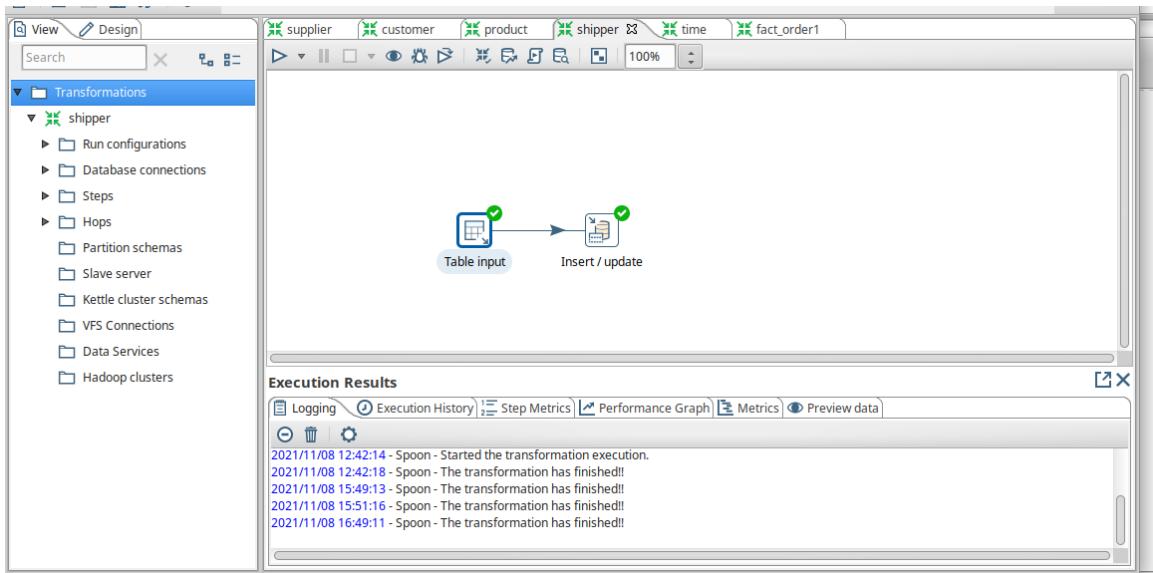


Figure 6: Transformation of dim\_shipper.ktr

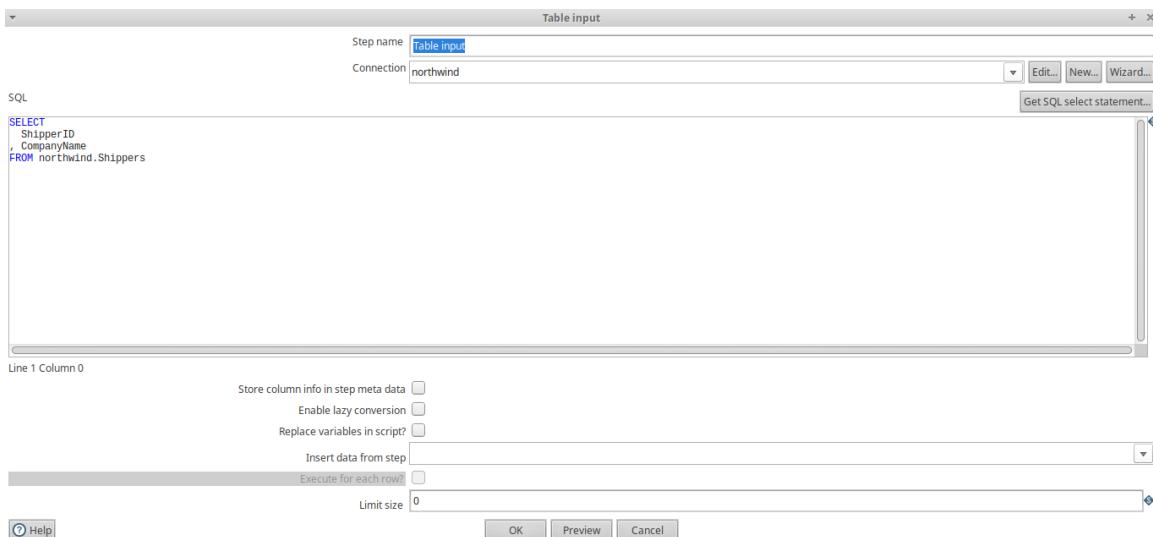


Figure 7: Configuration for Table input

Examine preview data

Rows of step: Table input (3 rows)

	ShipperID	CompanyName
1	1	Speedy Express
2	2	United Package
3	3	Federal Shipping

Close Show Log

Figure 8: Preview of Table input

Insert / update

Step name: **Insert / update**

Connection: **northwind\_dw**

Target schema: **northwind\_dw**

Target table: **dim\_shipper**

Commit size: **100**

Don't perform any updates:

The key(s) to look up the value(s):

Table field	Comparator	Stream field1	Stream field2
SHIPPER_ID	=	ShipperID	

Update fields:

Table field	Stream field	Update
SHIPPER_ID	ShipperID	Y
COMPANY_NAME	CompanyName	Y

Figure 9: Configuration for Insert/Update

Rows of step: Insert / update (3 rows)

	ShipperID	CompanyName
1	1	Speedy Express
2	2	United Package
3	3	Federal Shipping

Figure 10: Preview of Insert/Update

## 2.3 Populating dim\_supplier

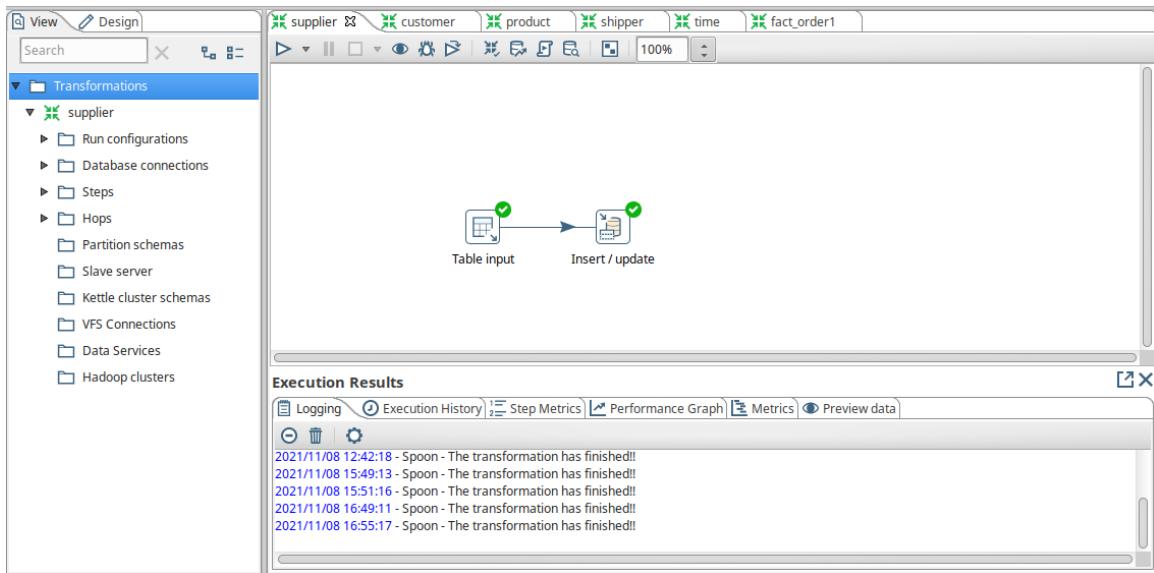


Figure 11: Transformation of dim\_supplier.ktr

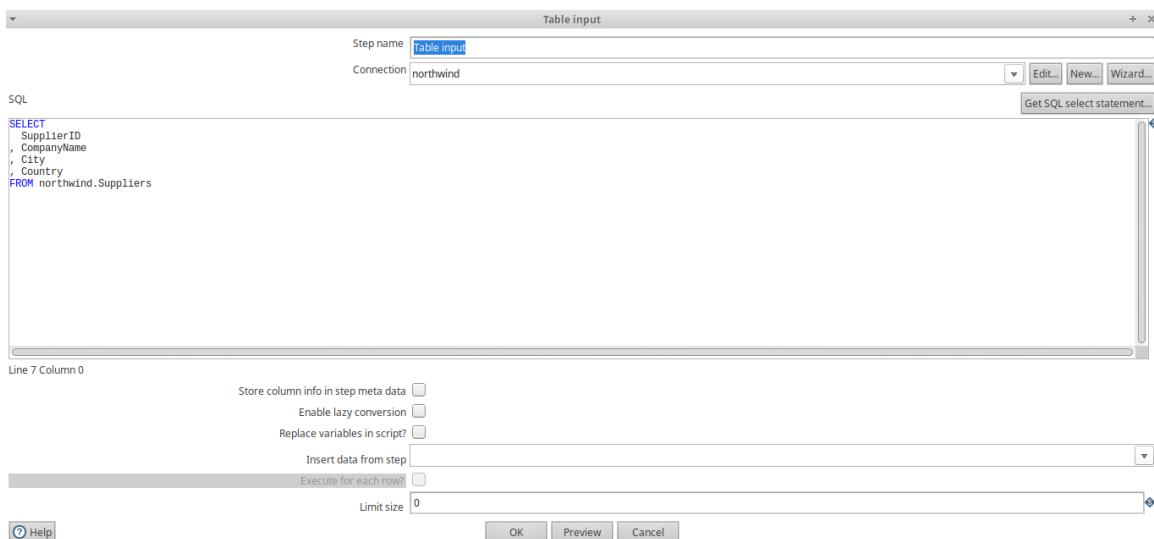


Figure 12: Configuration for Table input

Rows of step: Table input (29 rows)

	SupplierID	CompanyName	City	Country
1	1	Exotic Liquids	London	UK
2	2	New Orleans Cajun Delights	New Orleans	USA
3	3	Grandma Kelly's Homestead	Ann Arbor	USA
4	4	Tokyo Traders	Tokyo	Japan
5	5	Cooperativa de Quesos 'Las Cabras'	Oviedo	Spain
6	6	Mayumi's	Osaka	Japan
7	7	Pavlova, Ltd.	Melbourne	Australia
8	8	Specialty Biscuits, Ltd.	Manchester	UK
9	9	PB Knickebrd AB	Gteborg	Sweden
10	10	Refrescos Americanas LTDA	So Paulo	Brazil
11	11	Heli Swaren GmbH & Co. KG	Berlin	Germany
12	12	Plutzer Lebensmittelgruppe AG	Frankfurt	Germany
13	13	Nord-Ost-Fisch Handelsgesellschaft mbH	Cuxhaven	Germany
14	14	Formaggi Fortini s.r.l.	Ravenna	Italy
15	15	Norske Meierier	Sandvika	Norway
16	16	Bigfoot Breweries	Bend	USA
17	17	Svensk Sjöfata AB	Stockholm	Sweden
18	18	Aux joyeux ecclasiastiques	Paris	France
19	19	New England Seafood Cannery	Boston	USA
20	20	Leka Trading	Singapore	Singapore
21	21	Lyngebsild	Lyngeby	Denmark
22	22	Zaanse Snoepfabriek	Zaandam	Netherlands

[Close](#) [Show Log](#)

Figure 13: Preview of Table input

Insert / update

Step name:

Connection:  [Edit...](#) [New...](#) [Wizard...](#)

Target schema:  [Browse...](#)

Target table:  [Browse...](#)

Commit size:

Don't perform any updates:

The key(s) to look up the value(s):

Table field	Comparator	Stream field1	Stream field2
1 SUPPLIER_ID	=	SupplierID	

[Get fields](#)

Update fields:

Table field	Stream field	Update
1 SUPPLIER_ID	SupplierID	Y
2 COMPANY_NAME	CompanyName	Y
3 CITY	City	Y
4 COUNTRY	Country	Y

[Get update fields](#) [Edit mapping](#)

[Help](#) [OK](#) [Cancel](#) [SQL](#)

Figure 14: Configuration for Insert/Update

Examine preview data

Rows of step: Insert / update (29 rows)

	SupplierID	CompanyName	City	Country
1	1	Exotic Liquids	London	UK
2	2	New Orleans Cajun Delights	New Orleans	USA
3	3	Grandma Kelly's Homestead	Ann Arbor	USA
4	4	Tokyo Traders	Tokyo	Japan
5	5	Cooperativa de Quesos 'Las Cabras'	Oviedo	Spain
6	6	Mayum's	Osaka	Japan
7	7	Pavlova, Ltd.	Melbourne	Australia
8	8	Specialty Biscuits, Ltd.	Manchester	UK
9	9	PB Knckebrd AB	Gteborg	Sweden
10	10	Refrescos Americanas LTDA	So Paulo	Brazil
11	11	Heli Swaren GmbH & Co. KG	Berlin	Germany
12	12	Plutzer Lebensmittelgruppe AG	Frankfurt	Germany
13	13	Nord-Ost-Fisch Handelsgesellschaft mbH	Cuxhaven	Germany
14	14	Formaggi Fortini s.r.l.	Ravenna	Italy
15	15	Norske Meierier	Sandvika	Norway
16	16	Bigfoot Breweries	Bend	USA
17	17	Svensk Sjöfda AB	Stockholm	Sweden
18	18	Aux joyeux ecclasiastiques	Paris	France
19	19	New England Seafood Cannery	Boston	USA
20	20	Leka Trading	Singapore	Singapore
21	21	Lyngbysild	Lyngby	Denmark
22	22	Zaanse Snoepfabriek	Zaandam	Netherlands

Figure 15: Preview of Insert/Update

## 2.4 Populating dim\_time

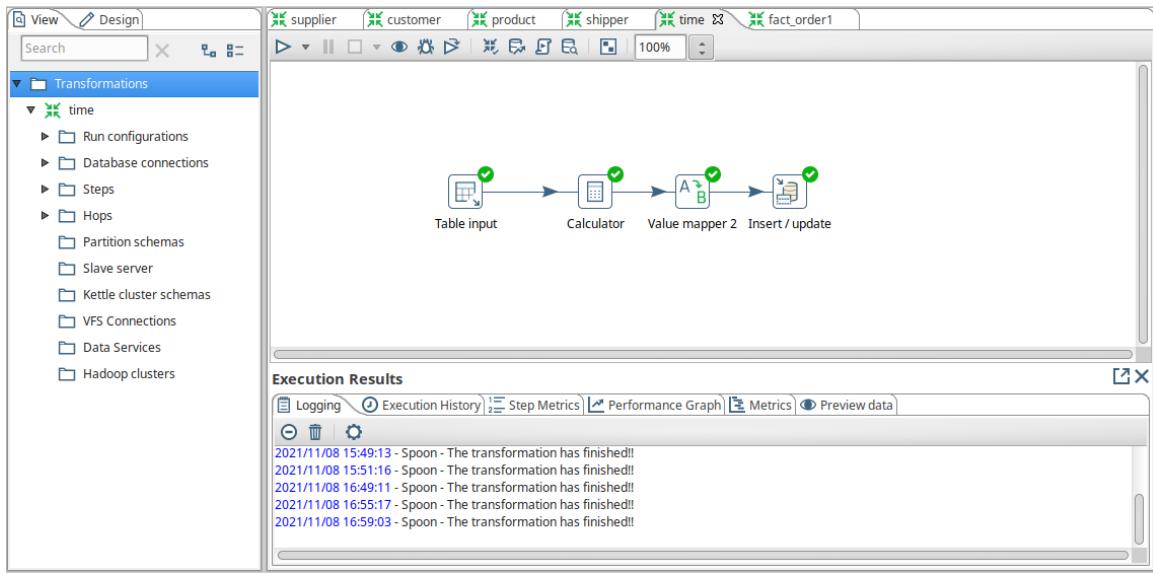


Figure 16: Transformation of dim\_time.ktr

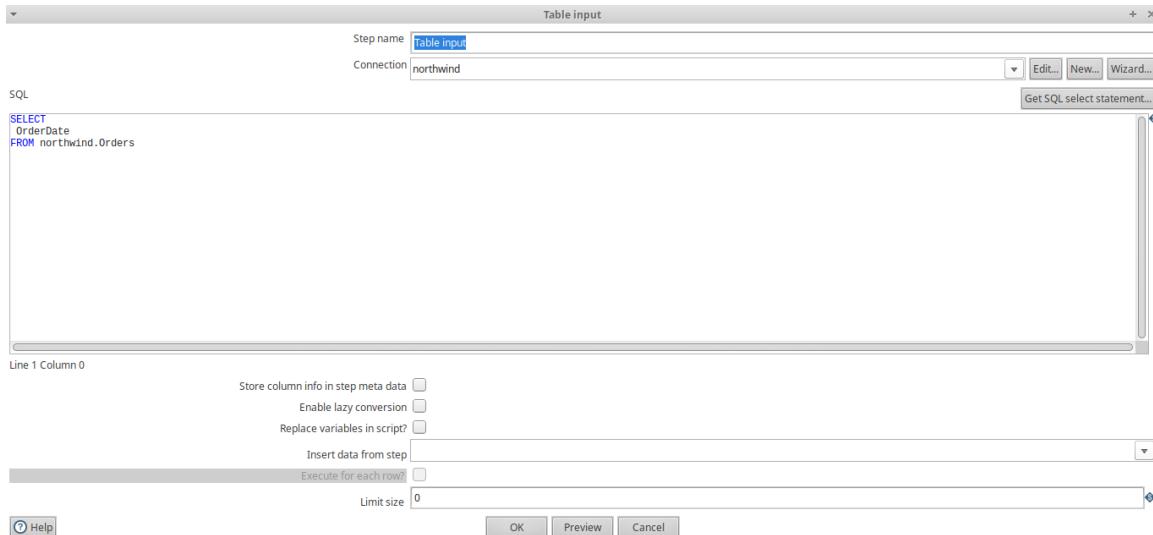


Figure 17: Configuration for Table input

Examine preview data

Rows of step: Table input (830 rows)

▲ OrderDate

1	1996/07/04 00:00:00.000
2	1996/07/05 00:00:00.000
3	1996/07/08 00:00:00.000
4	1996/07/08 00:00:00.000
5	1996/07/09 00:00:00.000
6	1996/07/10 00:00:00.000
7	1996/07/11 00:00:00.000
8	1996/07/12 00:00:00.000
9	1996/07/15 00:00:00.000
10	1996/07/16 00:00:00.000
11	1996/07/17 00:00:00.000
12	1996/07/18 00:00:00.000
13	1996/07/19 00:00:00.000
14	1996/07/19 00:00:00.000
15	1996/07/22 00:00:00.000
16	1996/07/23 00:00:00.000
17	1996/07/24 00:00:00.000
18	1996/07/25 00:00:00.000
19	1996/07/26 00:00:00.000
20	1996/07/29 00:00:00.000
21	1996/07/30 00:00:00.000
22	1996/07/31 00:00:00.000

Figure 18: Preview of Table input

Calculator

Step name:

Throw an error on non existing files

Fields:

New field	Calculation	Field A	Field B	Field C	Value type	Length	Precision	Remove	Conversion mask	Decimal symbol	Grouping symbol	Currency symbol
1 year_id	Year of date A	OrderDate			None			N				
2 month_id	Month of date A	OrderDate			None			N				
3 day_id	Day of month of date A	OrderDate			None			N				

Figure 19: Configuration for Calculator

Examine preview data

Rows of step: Calculator (830 rows)

	OrderDate	year_id	month_id	day_id
1	1996/07/04 00:00:00.000	1996	7	4
2	1996/07/05 00:00:00.000	1996	7	5
3	1996/07/08 00:00:00.000	1996	7	8
4	1996/07/08 00:00:00.000	1996	7	8
5	1996/07/09 00:00:00.000	1996	7	9
6	1996/07/10 00:00:00.000	1996	7	10
7	1996/07/11 00:00:00.000	1996	7	11
8	1996/07/12 00:00:00.000	1996	7	12
9	1996/07/15 00:00:00.000	1996	7	15
10	1996/07/16 00:00:00.000	1996	7	16
11	1996/07/17 00:00:00.000	1996	7	17
12	1996/07/18 00:00:00.000	1996	7	18
13	1996/07/19 00:00:00.000	1996	7	19
14	1996/07/19 00:00:00.000	1996	7	19
15	1996/07/22 00:00:00.000	1996	7	22
16	1996/07/23 00:00:00.000	1996	7	23
17	1996/07/24 00:00:00.000	1996	7	24
18	1996/07/25 00:00:00.000	1996	7	25
19	1996/07/26 00:00:00.000	1996	7	26
20	1996/07/29 00:00:00.000	1996	7	29
21	1996/07/30 00:00:00.000	1996	7	30
22	1996/07/31 00:00:00.000	1996	7	31

Close

Figure 20: Preview of Calculator

Value mapper

Step name : **Value mapper 2**

Fieldname to use : **month\_id**

Target field name (empty=overwrite) : **month\_name**

Default upon non-matching :

Field values:

▲	Source value	Target value
1	1	Jan
2	2	Feb
3	3	Mar
4	4	Apr
5	5	May
6	6	Jun
7	7	Jul
8	8	Aug
9	9	Set
10	10	Oct
11	11	Nov
12	12	Dec

**OK**    **Cancel**

**Help**

Figure 21: Configuration for Value Mapper

Rows of step: Value mapper 2 (830 rows)

	OrderDate	year_id	month_id	day_id	month_name
1	1996/07/04 00:00:00.000	1996	7	4	Jul
2	1996/07/05 00:00:00.000	1996	7	5	Jul
3	1996/07/08 00:00:00.000	1996	7	8	Jul
4	1996/07/08 00:00:00.000	1996	7	8	Jul
5	1996/07/09 00:00:00.000	1996	7	9	Jul
6	1996/07/10 00:00:00.000	1996	7	10	Jul
7	1996/07/11 00:00:00.000	1996	7	11	Jul
8	1996/07/12 00:00:00.000	1996	7	12	Jul
9	1996/07/15 00:00:00.000	1996	7	15	Jul
10	1996/07/16 00:00:00.000	1996	7	16	Jul
11	1996/07/17 00:00:00.000	1996	7	17	Jul
12	1996/07/18 00:00:00.000	1996	7	18	Jul
13	1996/07/19 00:00:00.000	1996	7	19	Jul
14	1996/07/19 00:00:00.000	1996	7	19	Jul
15	1996/07/22 00:00:00.000	1996	7	22	Jul
16	1996/07/23 00:00:00.000	1996	7	23	Jul
17	1996/07/24 00:00:00.000	1996	7	24	Jul
18	1996/07/25 00:00:00.000	1996	7	25	Jul
19	1996/07/26 00:00:00.000	1996	7	26	Jul
20	1996/07/29 00:00:00.000	1996	7	29	Jul
21	1996/07/30 00:00:00.000	1996	7	30	Jul
22	1996/07/31 00:00:00.000	1996	7	31	Jul

Figure 22: Preview of Value Mapper

Insert / update

Step name:

Connection:

Target schema:

Target table:

Commit size:

Don't perform any updates:

The key(s) to look up the value(s):

Table field	Comparator	Stream field1	Stream field2
1 TIME_ID	=	OrderDate	...

Update fields:

Table field	Stream field	Update
1 TIME_ID	OrderDate	Y
2 YEAR	year_id	Y
3 MONTH_ID	month_id	Y
4 MONTH_NAME	month_name	Y
5 DAY	day_id	Y

Figure 23: Configuration for Insert/Update

Examine preview data

Rows of step: Insert / update (830 rows)

	OrderDate	year_id	month_id	day_id	month_name
1	1996/07/04 00:00:00.000	1996	7	4	Jul
2	1996/07/05 00:00:00.000	1996	7	5	Jul
3	1996/07/08 00:00:00.000	1996	7	8	Jul
4	1996/07/09 00:00:00.000	1996	7	9	Jul
5	1996/07/10 00:00:00.000	1996	7	10	Jul
6	1996/07/11 00:00:00.000	1996	7	11	Jul
8	1996/07/12 00:00:00.000	1996	7	12	Jul
9	1996/07/15 00:00:00.000	1996	7	15	Jul
10	1996/07/16 00:00:00.000	1996	7	16	Jul
11	1996/07/17 00:00:00.000	1996	7	17	Jul
12	1996/07/18 00:00:00.000	1996	7	18	Jul
13	1996/07/19 00:00:00.000	1996	7	19	Jul
14	1996/07/19 00:00:00.000	1996	7	19	Jul
15	1996/07/22 00:00:00.000	1996	7	22	Jul
16	1996/07/23 00:00:00.000	1996	7	23	Jul
17	1996/07/24 00:00:00.000	1996	7	24	Jul
18	1996/07/25 00:00:00.000	1996	7	25	Jul
19	1996/07/26 00:00:00.000	1996	7	26	Jul
20	1996/07/29 00:00:00.000	1996	7	29	Jul
21	1996/07/30 00:00:00.000	1996	7	30	Jul
22	1996/07/31 00:00:00.000	1996	7	31	Jul

[Close](#)

Figure 24: Preview of Insert/Update

## 2.5 Populating dim\_product

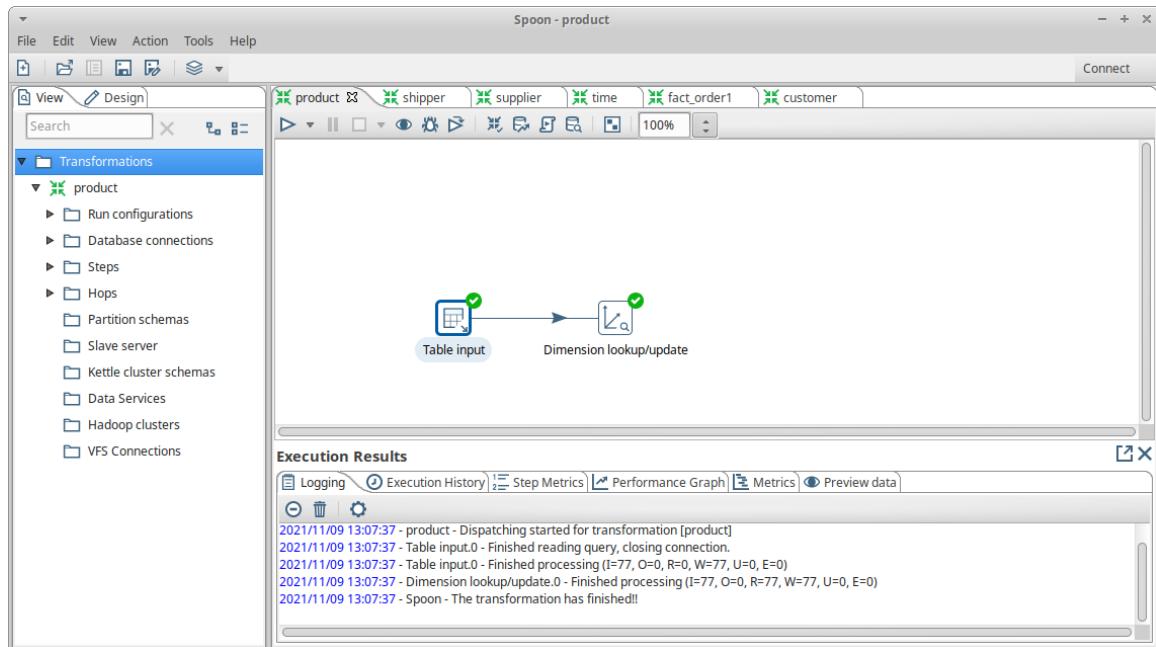


Figure 25: Transformation of dim\_product.ktr

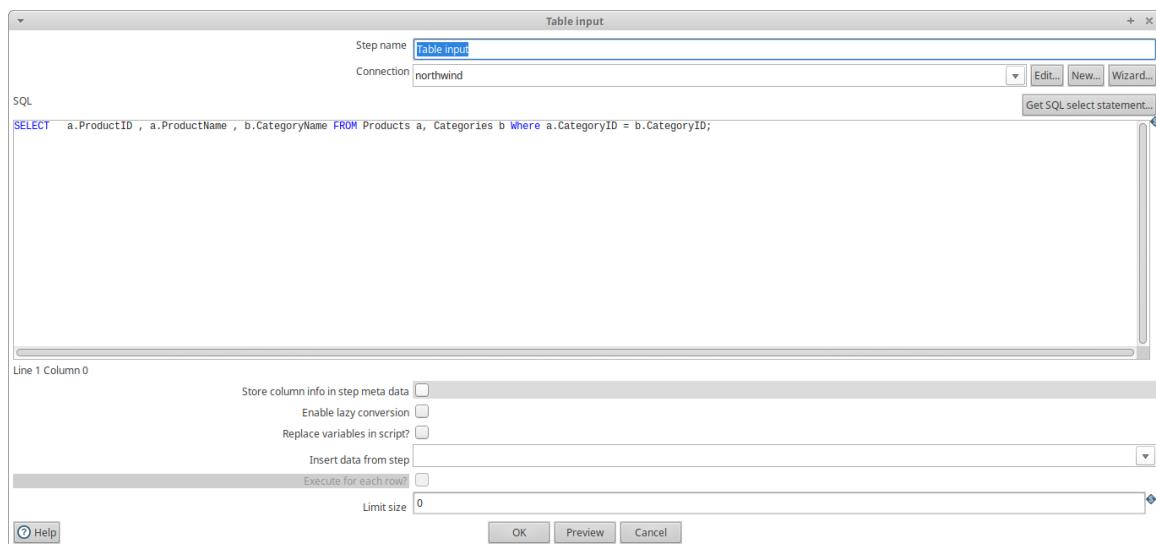


Figure 26: Configuration for Table input

Rows of step: Table input (77 rows)

	ProductID	ProductName	CategoryName
1	1	Chai	Beverages
2	2	Chang	Beverages
3	24	Guaran Fantstica	Beverages
4	34	Sasquatch Ale	Beverages
5	35	Steeleye Stout	Beverages
6	38	Cte de Blaye	Beverages
7	39	Chartreuse verte	Beverages
8	43	Ipoh Coffee	Beverages
9	67	Laughing Lumberjack Lager	Beverages
10	70	Outback Lager	Beverages
11	75	Rhnbru Klosterbier	Beverages
12	76	Lakalikri	Beverages
13	3	Aniseed Syrup	Condiments
14	4	Chef Anton's Cajun Seasoning	Condiments
15	5	Chef Anton's Gumbo Mix	Condiments
16	6	Grandma's Boysenberry Spread	Condiments
17	8	Northwoods Cranberry Sauce	Condiments
18	15	Genen Shoyu	Condiments
19	44	Gula Malacca	Condiments
20	61	Sirop d'able	Condiments
21	63	Vegie-spread	Condiments
22	65	Louisiana Fiery Hot Pepper Sauce	Condiments

Figure 27: Preview of Table input

Dimension lookup/update

Step name

Update the dimension?

Connection

Target schema

Target table

Commit size

Enable the cache?

Pre-load the cache?

Cache size in rows (0 = cache all)

Keys  Fields

Key fields (to look up row in dimension):

Dimension field	Field in stream
PRODUCT_NAME	ProductName

Technical key field

Figure 28: Configuration for lookup input part 1

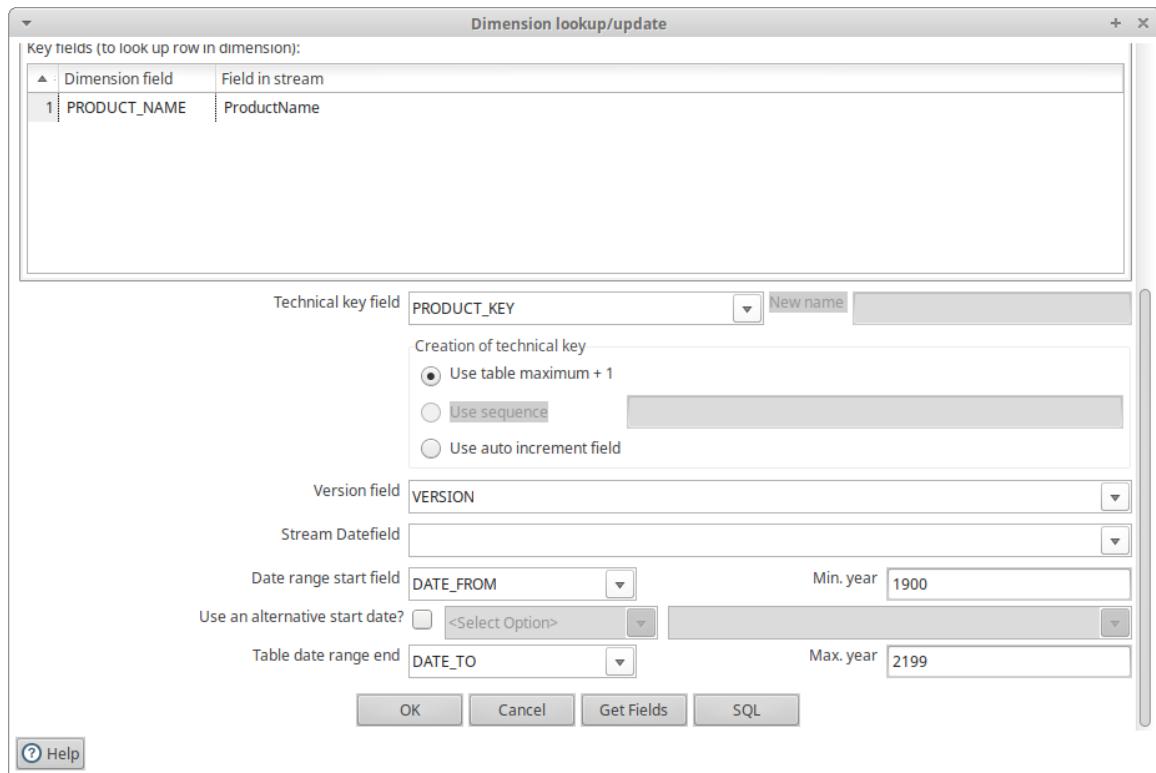


Figure 29: Configuration for lookup input part 2

Rows of step: Dimension lookup/update (77 rows)				Examine preview data
	ProductID	ProductName	CategoryName	PRODUCT_KEY
1	1	Chai	Beverages	1
2	2	Chang	Beverages	2
3	24	Guaran Fantstica	Beverages	3
4	34	Sasquatch Ale	Beverages	4
5	35	Steeleye Stout	Beverages	5
6	38	Cte de Blaye	Beverages	6
7	39	Chartreuse verte	Beverages	7
8	43	Ipoh Coffee	Beverages	8
9	67	Laughing Lumberjack Lager	Beverages	9
10	70	Outback Lager	Beverages	10
11	75	Rhnbri Klosterbier	Beverages	11
12	76	Lakalikri	Beverages	12
13	3	Aniseed Syrup	Condiments	13
14	4	Chef Anton's Cajun Seasoning	Condiments	14
15	5	Chef Anton's Gumbo Mix	Condiments	15
16	6	Grandma's Boysenberry Spread	Condiments	16
17	8	Northwoods Cranberry Sauce	Condiments	17
18	15	Genen Shouyu	Condiments	18
19	44	Gula Malacca	Condiments	19
20	61	Sirop d'rable	Condiments	20
21	63	Vegie-spread	Condiments	21
22	65	Louisiana Fiery Hot Pepper Sauce	Condiments	22

Figure 30: Preview of lookup

## 2.6 Populating fact\_order

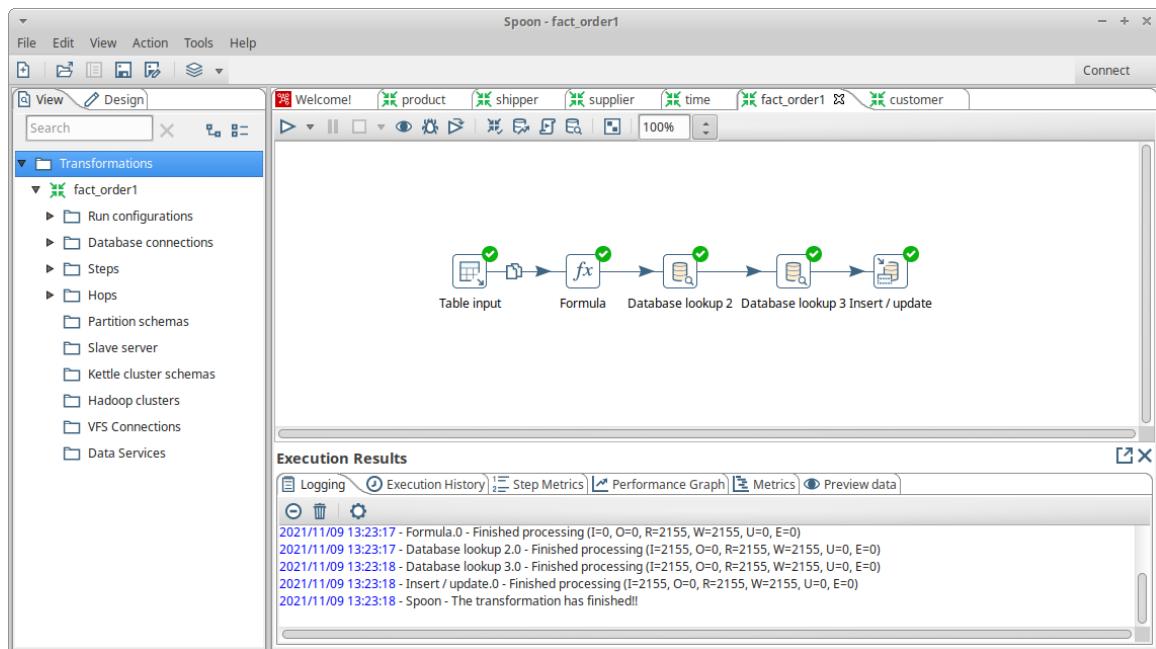


Figure 31: Transformation of fact\_order.ktr

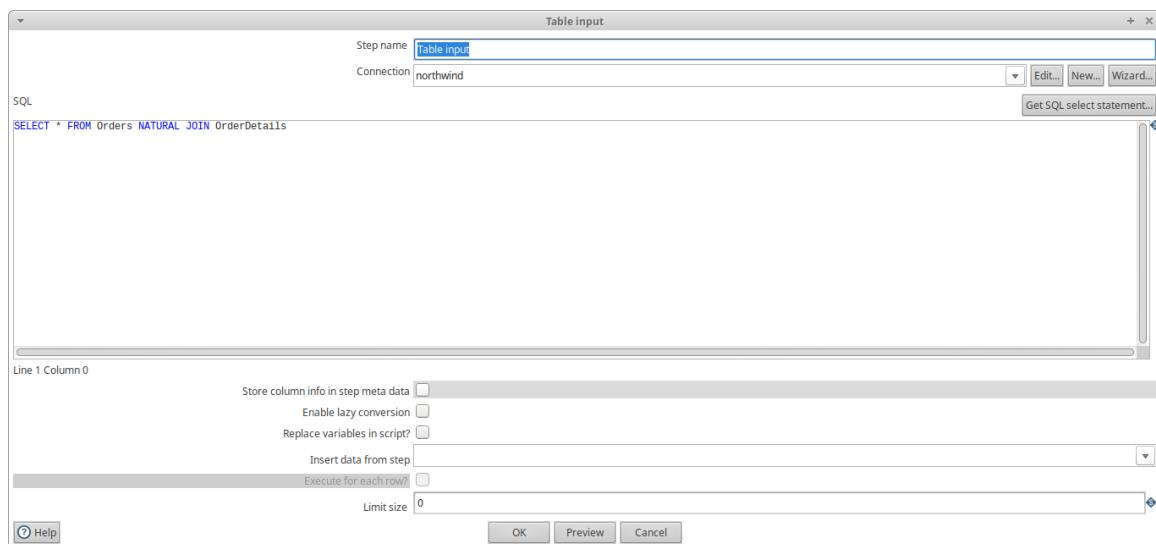


Figure 32: Configuration of Table input

Examine preview data

Rows of step: Table input (1000 rows)

	OrderID	CustomerID	EmployeeID	OrderDate	RequiredDate	ShippedDate	ShipVia	Freight	ShipName	ShipAddress
1	10248	VINET	5	1996/07/04 00:00:00.000	1996/08/01 00:00:00.000	1996/07/16 00:00:00.000	3	32.38	Vins et alcools Chevalier	59 rue de l'Abbaye
2	10248	VINET	5	1996/07/04 00:00:00.000	1996/08/01 00:00:00.000	1996/07/16 00:00:00.000	3	32.38	Vins et alcools Chevalier	59 rue de l'Abbaye
3	10248	VINET	5	1996/07/04 00:00:00.000	1996/08/01 00:00:00.000	1996/07/16 00:00:00.000	3	32.38	Vins et alcools Chevalier	59 rue de l'Abbaye
4	10249	TOMSP	6	1996/07/05 00:00:00.000	1996/08/16 00:00:00.000	1996/07/10 00:00:00.000	1	11.61	Toms Spezialitten	Luisenstr. 48
5	10249	TOMSP	6	1996/07/05 00:00:00.000	1996/08/16 00:00:00.000	1996/07/10 00:00:00.000	1	11.61	Toms Spezialitten	Luisenstr. 48
6	10250	HANAR	4	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/12 00:00:00.000	2	65.83	Hanari Carnes	Rua do Pao, 67
7	10250	HANAR	4	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/12 00:00:00.000	2	65.83	Hanari Carnes	Rua do Pao, 67
8	10250	HANAR	4	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/12 00:00:00.000	2	65.83	Hanari Carnes	Rua do Pao, 67
9	10251	VICTE	3	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/15 00:00:00.000	1	41.34	Victuailles en stock	2, rue du Commerce
10	10251	VICTE	3	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/15 00:00:00.000	1	41.34	Victuailles en stock	2, rue du Commerce
11	10251	VICTE	3	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/15 00:00:00.000	1	41.34	Victuailles en stock	2, rue du Commerce
12	10252	SUPRD	4	1996/07/08 00:00:00.000	1996/08/06 00:00:00.000	1996/07/12 00:00:00.000	2	51.3	Suprmes dlices	Boulevard Tirou, 255
13	10252	SUPRD	4	1996/07/09 00:00:00.000	1996/08/06 00:00:00.000	1996/07/11 00:00:00.000	2	51.3	Suprmes dlices	Boulevard Tirou, 255
14	10252	SUPRD	4	1996/07/09 00:00:00.000	1996/08/06 00:00:00.000	1996/07/11 00:00:00.000	2	51.3	Suprmes dlices	Boulevard Tirou, 255
15	10253	HANAR	3	1996/07/10 00:00:00.000	1996/07/24 00:00:00.000	1996/07/16 00:00:00.000	2	58.17	Hanari Carnes	Rua do Pao, 67
16	10253	HANAR	3	1996/07/10 00:00:00.000	1996/07/24 00:00:00.000	1996/07/16 00:00:00.000	2	58.17	Hanari Carnes	Rua do Pao, 67
17	10253	HANAR	3	1996/07/10 00:00:00.000	1996/07/24 00:00:00.000	1996/07/16 00:00:00.000	2	58.17	Hanari Carnes	Rua do Pao, 67
18	10254	CHOPS	5	1996/07/11 00:00:00.000	1996/08/08 00:00:00.000	1996/07/23 00:00:00.000	2	22.98	Chop-suey Chinese	Hauptstr. 31
19	10254	CHOPS	5	1996/07/11 00:00:00.000	1996/08/08 00:00:00.000	1996/07/23 00:00:00.000	2	22.98	Chop-suey Chinese	Hauptstr. 31
20	10254	CHOPS	5	1996/07/11 00:00:00.000	1996/08/08 00:00:00.000	1996/07/23 00:00:00.000	2	22.98	Chop-suey Chinese	Hauptstr. 31
21	10255	RICSU	9	1996/07/12 00:00:00.000	1996/08/09 00:00:00.000	1996/07/15 00:00:00.000	3	148.33	Richter Supermarkt	Starenweg 5

Close Stop Get more rows

Figure 33: Preview of Table input part 1

Examine preview data

Rows of step: Table input (1000 rows)

Freight	ShipName	ShipAddress	ShipCity	ShipRegion	ShipPostalCode	ShipCountry	ProductID	UnitPrice	Quantity	Discount
32.38	Vins et alcools Chevalier	59 rue de l'Abbaye	Reims	<null>	51100	France	11	14.0	12	0.0
32.38	Vins et alcools Chevalier	59 rue de l'Abbaye	Reims	<null>	51100	France	42	9.8	10	0.0
32.38	Vins et alcools Chevalier	59 rue de l'Abbaye	Reims	<null>	51100	France	72	34.8	5	0.0
11.61	Toms Spezialitten	Luisenstr. 48	Mnster	<null>	44087	Germany	14	18.6	9	0.0
11.61	Toms Spezialitten	Luisenstr. 48	Mnster	<null>	44087	Germany	51	42.4	40	0.0
65.83	Hanari Carnes	Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	41	7.7	10	0.0
65.83	Hanari Carnes	Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	51	42.4	35	0.15
65.83	Hanari Carnes	Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	65	16.8	15	0.15
41.34	Victuailles en stock	2, rue du Commerce	Lyon	<null>	69004	France	22	16.8	6	0.05
41.34	Victuailles en stock	2, rue du Commerce	Lyon	<null>	69004	France	57	15.6	15	0.05
41.34	Victuailles en stock	2, rue du Commerce	Lyon	<null>	69004	France	65	16.8	20	0.0
51.3	Suprmes dlices	Boulevard Tirou, 255	Charleroi	<null>	B-6000	Belgium	20	64.8	40	0.05
51.3	Suprmes dlices	Boulevard Tirou, 255	Charleroi	<null>	B-6000	Belgium	33	2.0	25	0.05
51.3	Suprmes dlices	Boulevard Tirou, 255	Charleroi	<null>	B-6000	Belgium	60	27.2	40	0.0
58.17	Hanari Carnes	Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	31	10.0	20	0.0
58.17	Hanari Carnes	Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	39	14.4	42	0.0
58.17	Hanari Carnes	Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	49	16.0	40	0.0
22.98	Chop-suey Chinese	Hauptstr. 31	Bern	<null>	3012	Switzerland	24	3.6	15	0.15
22.98	Chop-suey Chinese	Hauptstr. 31	Bern	<null>	3012	Switzerland	55	19.2	21	0.15
22.98	Chop-suey Chinese	Hauptstr. 31	Bern	<null>	3012	Switzerland	74	8.0	21	0.0
148.33	Richter Supermarkt	Starenweg 5	Genve	<null>	1204	Switzerland	2	15.2	20	0.0

Close Stop Get more rows

Figure 34: Preview of Table input part 2

Formula

Step name **Formula**

Fields:

New field	Formula	Value type	Length	Precision	Replace value
1	TOTAL_PRICE [UnitPrice]*[Quantity]*(1-[Discount])	Number			

Help OK Cancel

Figure 35: Configuration for Formula

Examine preview data

Rows of step: Formula (1000 rows)

	OrderID	CustomerID	EmployeeID	OrderDate	RequiredDate	ShippedDate	ShipVia	Freight	ShipName	ShipAddress
1	10248	VINET	5	1996/07/04 00:00:00.000	1996/08/01 00:00:00.000	1996/07/16 00:00:00.000	3	32.38	Vins et alcools Chevalier	59 rue de l'Abbaye
2	10248	VINET	5	1996/07/04 00:00:00.000	1996/08/01 00:00:00.000	1996/07/16 00:00:00.000	3	32.38	Vins et alcools Chevalier	59 rue de l'Abbaye
3	10248	VINET	5	1996/07/04 00:00:00.000	1996/08/01 00:00:00.000	1996/07/16 00:00:00.000	3	32.38	Vins et alcools Chevalier	59 rue de l'Abbaye
4	10249	TOMSP	6	1996/07/05 00:00:00.000	1996/08/15 00:00:00.000	1996/07/10 00:00:00.000	1	11.61	Toms Spezialitäten	Luisenstr. 48
5	10249	TOMSP	6	1996/07/05 00:00:00.000	1996/08/15 00:00:00.000	1996/07/10 00:00:00.000	1	11.61	Toms Spezialitäten	Luisenstr. 48
6	10250	HANAR	4	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/12 00:00:00.000	2	65.83	Hanari Carnes	Rua do Pao, 67
7	10250	HANAR	4	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/12 00:00:00.000	2	65.83	Hanari Carnes	Rua do Pao, 67
8	10250	HANAR	4	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/12 00:00:00.000	2	65.83	Hanari Carnes	Rua do Pao, 67
9	10251	VICTE	3	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/15 00:00:00.000	1	41.34	Victuailles en stock	2, rue du Commerce
10	10251	VICTE	3	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/15 00:00:00.000	1	41.34	Victuailles en stock	2, rue du Commerce
11	10251	VICTE	3	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/15 00:00:00.000	1	41.34	Victuailles en stock	2, rue du Commerce
12	10252	SUPRD	4	1996/07/09 00:00:00.000	1996/08/06 00:00:00.000	1996/07/11 00:00:00.000	2	51.3	Suprèmes dîmes	Boulevard Tirou, 255
13	10252	SUPRD	4	1996/07/09 00:00:00.000	1996/08/06 00:00:00.000	1996/07/11 00:00:00.000	2	51.3	Suprèmes dîmes	Boulevard Tirou, 255
14	10252	SUPRD	4	1996/07/09 00:00:00.000	1996/08/06 00:00:00.000	1996/07/11 00:00:00.000	2	51.3	Suprèmes dîmes	Boulevard Tirou, 255
15	10253	HANAR	3	1996/07/10 00:00:00.000	1996/07/24 00:00:00.000	1996/07/16 00:00:00.000	2	58.17	Hanari Carnes	Rua do Pao, 67
16	10253	HANAR	3	1996/07/10 00:00:00.000	1996/07/24 00:00:00.000	1996/07/16 00:00:00.000	2	58.17	Hanari Carnes	Rua do Pao, 67
17	10253	HANAR	3	1996/07/10 00:00:00.000	1996/07/24 00:00:00.000	1996/07/16 00:00:00.000	2	58.17	Hanari Carnes	Rua do Pao, 67
18	10254	CHOPS	5	1996/07/11 00:00:00.000	1996/08/08 00:00:00.000	1996/07/23 00:00:00.000	2	22.98	Chop-suey Chinese	Hauptstr. 31
19	10254	CHOPS	5	1996/07/11 00:00:00.000	1996/08/08 00:00:00.000	1996/07/23 00:00:00.000	2	22.98	Chop-suey Chinese	Hauptstr. 31
20	10254	CHOPS	5	1996/07/11 00:00:00.000	1996/08/08 00:00:00.000	1996/07/23 00:00:00.000	2	22.98	Chop-suey Chinese	Hauptstr. 31
21	10255	RICSU	9	1996/07/12 00:00:00.000	1996/08/09 00:00:00.000	1996/07/15 00:00:00.000	3	148.33	Richter Supermarkt	Starenweg 5

Close Stop Get more rows

Figure 36: Preview of Formula input part 1

Examine preview data

Rows of step: Formula (1000 rows)

Name	ShipAddress	ShipCity	ShipRegion	ShipPostalCode	ShipCountry	ProductID	UnitPrice	Quantity	Discount	TOTAL_PRICE
Vins et alcools Chevalier	59 rue de l'Abbaye	Reims	<null>	51100	France	11	14.0	12	0.0	168.0
Vins et alcools Chevalier	59 rue de l'Abbaye	Reims	<null>	51100	France	42	9.8	10	0.0	98.0
Vins et alcools Chevalier	59 rue de l'Abbaye	Reims	<null>	51100	France	72	34.8	5	0.0	174.0
Suprèmes dîmes	Luisenstr. 48	Münster	<null>	44087	Germany	14	18.6	9	0.0	167.4
Suprèmes dîmes	Luisenstr. 48	Münster	<null>	44087	Germany	51	42.4	40	0.0	1696.0
Hanari Carnes	Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	41	7.7	10	0.0	77.0
Hanari Carnes	Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	51	42.4	35	0.15	1261.4
Hanari Carnes	Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	65	16.8	15	0.15	214.2
Victuailles en stock	2, rue du Commerce	Lyon	<null>	69004	France	22	16.8	6	0.05	95.76
Victuailles en stock	2, rue du Commerce	Lyon	<null>	69004	France	57	15.6	15	0.05	222.3
Victuailles en stock	2, rue du Commerce	Lyon	<null>	69004	France	65	16.8	20	0.0	336.0
Suprèmes dîmes	Boulevard Tirou, 255	Charleroi	<null>	B-6000	Belgium	20	64.8	40	0.05	2462.4
Suprèmes dîmes	Boulevard Tirou, 255	Charleroi	<null>	B-6000	Belgium	33	2.0	25	0.05	47.5
Suprèmes dîmes	Boulevard Tirou, 255	Charleroi	<null>	B-6000	Belgium	60	27.2	40	0.0	1088.0
Hanari Carnes	Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	31	10.0	20	0.0	200.0
Hanari Carnes	Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	39	14.4	42	0.0	604.8
Hanari Carnes	Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	49	16.0	40	0.0	640.0
Chop-suey Chinese	Hauptstr. 31	Bern	<null>	3012	Switzerland	24	3.6	15	0.15	45.9
Chop-suey Chinese	Hauptstr. 31	Bern	<null>	3012	Switzerland	55	19.2	21	0.15	342.72
Chop-suey Chinese	Hauptstr. 31	Bern	<null>	3012	Switzerland	74	8.0	21	0.0	168.0
Richter Supermarkt	Starenweg 5	Genève	<null>	1204	Switzerland	2	15.2	20	0.0	304.0

Close Stop Get more rows

Figure 37: Preview of Formula input part 2

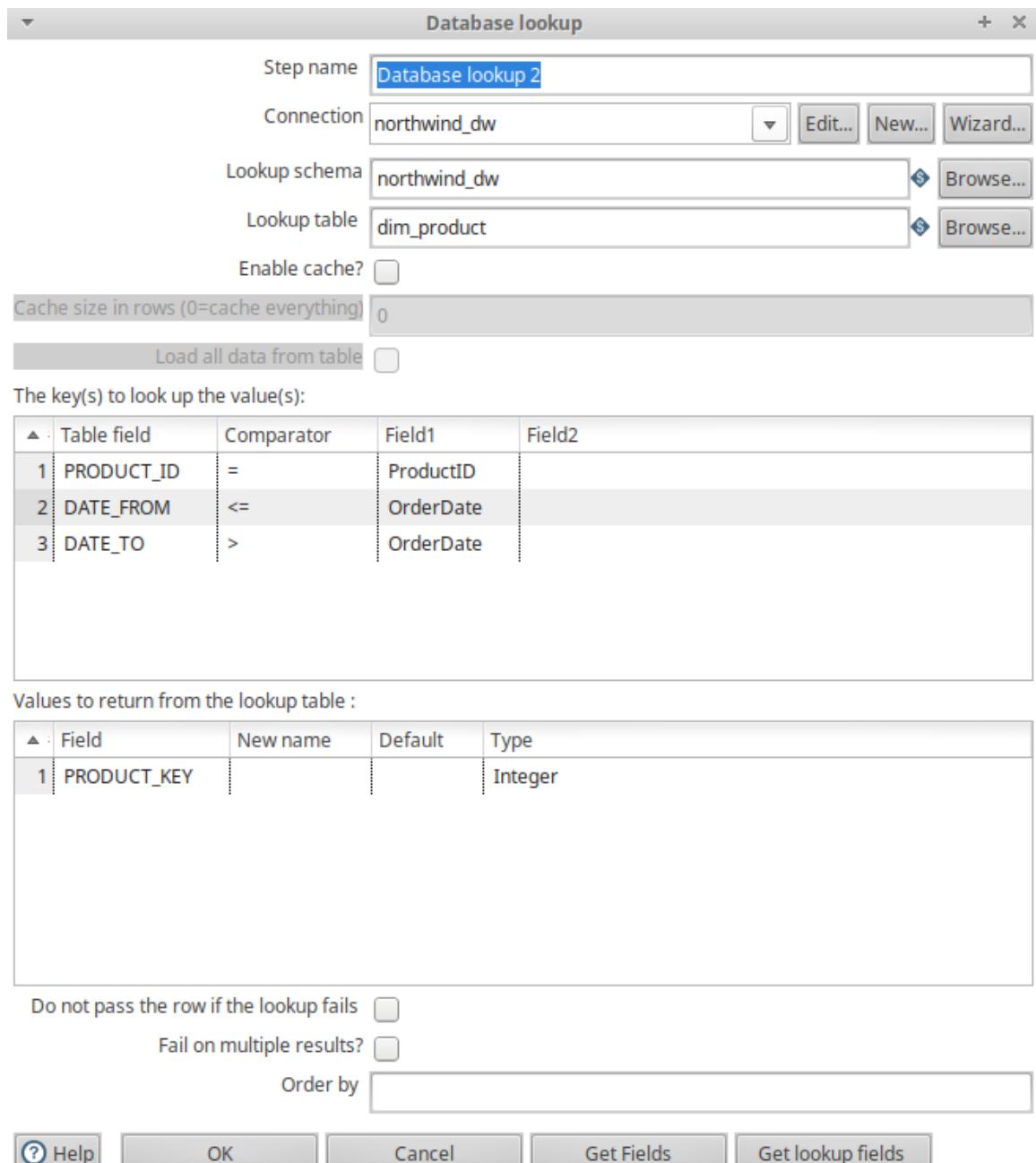


Figure 38: Configuration for lookup 2

Examine preview data										
Rows of step: Database lookup 2 (1000 rows)										
▲	OrderID	CustomerID	EmployeeID	OrderDate	RequiredDate	ShippedDate	ShipVia	Freight	ShipName	ShipAddress
1	10248	VINET	5	1996/07/04 00:00:00.000	1996/08/01 00:00:00.000	1996/07/16 00:00:00.000	3	32.38	Vins et alcools Chevalier	59 rue de l'Abbaye
2	10248	VINET	5	1996/07/04 00:00:00.000	1996/08/01 00:00:00.000	1996/07/16 00:00:00.000	3	32.38	Vins et alcools Chevalier	59 rue de l'Abbaye
3	10248	VINET	5	1996/07/04 00:00:00.000	1996/08/01 00:00:00.000	1996/07/16 00:00:00.000	3	32.38	Vins et alcools Chevalier	59 rue de l'Abbaye
4	10249	TOMSP	6	1996/07/05 00:00:00.000	1996/08/16 00:00:00.000	1996/07/10 00:00:00.000	1	11.61	Toms Spezialitten	Luisenstr. 48
5	10249	TOMSP	6	1996/07/05 00:00:00.000	1996/08/16 00:00:00.000	1996/07/10 00:00:00.000	1	11.61	Toms Spezialitten	Luisenstr. 48
6	10250	HANAR	4	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/12 00:00:00.000	2	65.83	Hanari Carnes	Rua do Pao, 67
7	10250	HANAR	4	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/12 00:00:00.000	2	65.83	Hanari Carnes	Rua do Pao, 67
8	10250	HANAR	4	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/12 00:00:00.000	2	65.83	Hanari Carnes	Rua do Pao, 67
9	10251	VICTE	3	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/15 00:00:00.000	1	41.34	Victuailles en stock	2, rue du Commerce
10	10251	VICTE	3	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/15 00:00:00.000	1	41.34	Victuailles en stock	2, rue du Commerce
11	10251	VICTE	3	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/15 00:00:00.000	1	41.34	Victuailles en stock	2, rue du Commerce
12	10252	SUPRD	4	1996/07/09 00:00:00.000	1996/08/06 00:00:00.000	1996/07/11 00:00:00.000	2	51.3	Suprmes dices	Boulevard Tirou, 255
13	10252	SUPRD	4	1996/07/09 00:00:00.000	1996/08/06 00:00:00.000	1996/07/11 00:00:00.000	2	51.3	Suprmes dices	Boulevard Tirou, 255
14	10252	SUPRD	4	1996/07/09 00:00:00.000	1996/08/06 00:00:00.000	1996/07/11 00:00:00.000	2	51.3	Suprmes dices	Boulevard Tirou, 255
15	10253	HANAR	3	1996/07/10 00:00:00.000	1996/07/24 00:00:00.000	1996/07/16 00:00:00.000	2	58.17	Hanari Carnes	Rua do Pao, 67
16	10253	HANAR	3	1996/07/10 00:00:00.000	1996/07/24 00:00:00.000	1996/07/16 00:00:00.000	2	58.17	Hanari Carnes	Rua do Pao, 67
17	10253	HANAR	3	1996/07/10 00:00:00.000	1996/07/24 00:00:00.000	1996/07/16 00:00:00.000	2	58.17	Hanari Carnes	Rua do Pao, 67
18	10254	CHOPS	5	1996/07/11 00:00:00.000	1996/08/08 00:00:00.000	1996/07/23 00:00:00.000	2	22.98	Chop-suey Chinese	Hauptstr. 31
19	10254	CHOPS	5	1996/07/11 00:00:00.000	1996/08/08 00:00:00.000	1996/07/23 00:00:00.000	2	22.98	Chop-suey Chinese	Hauptstr. 31
20	10254	CHOPS	5	1996/07/11 00:00:00.000	1996/08/08 00:00:00.000	1996/07/23 00:00:00.000	2	22.98	Chop-suey Chinese	Hauptstr. 31
21	10255	RICSU	9	1996/07/12 00:00:00.000	1996/08/09 00:00:00.000	1996/07/15 00:00:00.000	3	148.33	Richter Supermarkt	Starenweg 5

[Close](#) [Stop](#) [Get more rows](#)

Figure 39: Preview of lookup 2 part 1

Examine preview data										
Rows of step: Database lookup 2 (1000 rows)										
ShipAddress	ShipCity	ShipRegion	ShipPostalCode	ShipCountry	ProductID	UnitPrice	Quantity	Discount	TOTAL_PRICE	PRODUCT_KEY
59 rue de l'Abbaye	Reims	<null>	51100	France	11	14.0	12	0.0	168.0	38
59 rue de l'Abbaye	Reims	<null>	51100	France	42	9.8	10	0.0	98.0	50
59 rue de l'Abbaye	Reims	<null>	51100	France	72	34.8	5	0.0	174.0	47
Luisenstr. 48	Mnster	<null>	44087	Germany	14	18.6	9	0.0	167.4	62
Luisenstr. 48	Mnster	<null>	44087	Germany	51	42.4	40	0.0	1696.0	64
Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	41	7.7	10	0.0	77.0	73
Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	51	42.4	35	0.15	1261.4	64
Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	65	16.8	15	0.15	214.2	22
2, rue du Commerce	Lyon	<null>	69004	France	22	16.8	6	0.05	95.76	48
2, rue du Commerce	Lyon	<null>	69004	France	57	15.6	15	0.05	222.3	53
2, rue du Commerce	Lyon	<null>	69004	France	65	16.8	20	0.0	336.0	22
Boulevard Tirou, 255	Charleroi	<null>	B-6000	Belgium	20	64.8	40	0.05	2462.4	27
Boulevard Tirou, 255	Charleroi	<null>	B-6000	Belgium	33	2.0	25	0.05	47.5	42
Boulevard Tirou, 255	Charleroi	<null>	B-6000	Belgium	60	27.2	40	0.0	1088.0	44
Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	31	10.0	20	0.0	200.0	40
Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	39	14.4	42	0.0	604.8	7
Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	49	16.0	40	0.0	640.0	34
Hauptstr. 31	Bern	<null>	3012	Switzerland	24	3.6	15	0.15	45.9	3
Hauptstr. 31	Bern	<null>	3012	Switzerland	55	19.2	21	0.15	342.72	60
Hauptstr. 31	Bern	<null>	3012	Switzerland	74	8.0	21	0.0	168.0	65
Starenweg 5	Genve	<null>	1204	Switzerland	2	15.2	20	0.0	304.0	2

[Close](#) [Stop](#) [Get more rows](#)

Figure 40: Preview of lookup 2 part 2

**Database lookup**

Step name	Database lookup 3			
Connection	northwind			
Lookup schema	northwind			
Lookup table	Products			
Enable cache?	<input type="checkbox"/>			
Cache size in rows (0=cache everything)	0			
Load all data from table	<input type="checkbox"/>			
The key(s) to look up the value(s):				
▲	Table field	Comparator	Field1	Field2
1	ProductID	=	ProductID	
Values to return from the lookup table :				
▲	Field	New name	Default	Type
1	SupplierID			Integer
Do not pass the row if the lookup fails <input type="checkbox"/>				
Fail on multiple results? <input type="checkbox"/>				
Order by <input type="text"/>				

Figure 41: Configuration for lookup 3

Examine preview data

Rows of step: Database lookup 3 (1000 rows)

	OrderID	CustomerID	EmployeeID	OrderDate	RequiredDate	ShippedDate	ShipVia	Freight	ShipName	ShipAddress
1	10248	VINET	5	1996/07/04 00:00:00.000	1996/08/01 00:00:00.000	1996/07/16 00:00:00.000	3	32.38	Vins et alcools Chevalier	59 rue de l'Abbaye
2	10248	VINET	5	1996/07/04 00:00:00.000	1996/08/01 00:00:00.000	1996/07/16 00:00:00.000	3	32.38	Vins et alcools Chevalier	59 rue de l'Abbaye
3	10248	VINET	5	1996/07/04 00:00:00.000	1996/08/01 00:00:00.000	1996/07/16 00:00:00.000	3	32.38	Vins et alcools Chevalier	59 rue de l'Abbaye
4	10249	TOMSP	6	1996/07/05 00:00:00.000	1996/08/16 00:00:00.000	1996/07/10 00:00:00.000	1	11.61	Toms Spezialitten	Luisenstr. 48
5	10249	TOMSP	6	1996/07/05 00:00:00.000	1996/08/16 00:00:00.000	1996/07/10 00:00:00.000	1	11.61	Toms Spezialitten	Luisenstr. 48
6	10250	HANAR	4	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/12 00:00:00.000	2	65.83	Hanari Carnes	Rua do Pao, 67
7	10250	HANAR	4	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/12 00:00:00.000	2	65.83	Hanari Carnes	Rua do Pao, 67
8	10250	HANAR	4	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/12 00:00:00.000	2	65.83	Hanari Carnes	Rua do Pao, 67
9	10251	VICTE	3	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/10 00:00:00.000	1	41.34	Victuailles en stock	2, rue du Commerce
10	10251	VICTE	3	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/15 00:00:00.000	1	41.34	Victuailles en stock	2, rue du Commerce
11	10251	VICTE	3	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/15 00:00:00.000	1	41.34	Victuailles en stock	2, rue du Commerce
12	10252	SUPRD	4	1996/07/09 00:00:00.000	1996/08/06 00:00:00.000	1996/07/11 00:00:00.000	2	51.3	Suprmes dlices	Boulevard Tirou, 255
13	10252	SUPRD	4	1996/07/09 00:00:00.000	1996/08/06 00:00:00.000	1996/07/11 00:00:00.000	2	51.3	Suprmes dlices	Boulevard Tirou, 255
14	10252	SUPRD	4	1996/07/09 00:00:00.000	1996/08/06 00:00:00.000	1996/07/11 00:00:00.000	2	51.3	Suprmes dlices	Boulevard Tirou, 255
15	10253	HANAR	3	1996/07/10 00:00:00.000	1996/07/24 00:00:00.000	1996/07/16 00:00:00.000	2	58.17	Hanari Carnes	Rua do Pao, 67
16	10253	HANAR	3	1996/07/10 00:00:00.000	1996/07/24 00:00:00.000	1996/07/16 00:00:00.000	2	58.17	Hanari Carnes	Rua do Pao, 67
17	10253	HANAR	3	1996/07/10 00:00:00.000	1996/07/24 00:00:00.000	1996/07/16 00:00:00.000	2	58.17	Hanari Carnes	Rua do Pao, 67
18	10254	CHOPS	5	1996/07/11 00:00:00.000	1996/08/08 00:00:00.000	1996/07/23 00:00:00.000	2	22.98	Chop-suey Chinese	Hauptstr. 31
19	10254	CHOPS	5	1996/07/11 00:00:00.000	1996/08/08 00:00:00.000	1996/07/23 00:00:00.000	2	22.98	Chop-suey Chinese	Hauptstr. 31
20	10254	CHOPS	5	1996/07/11 00:00:00.000	1996/08/08 00:00:00.000	1996/07/23 00:00:00.000	2	22.98	Chop-suey Chinese	Hauptstr. 31
21	10255	RICSU	9	1996/07/12 00:00:00.000	1996/08/09 00:00:00.000	1996/07/15 00:00:00.000	3	148.33	Richter Supermarkt	Starenweg 5

Close Stop Get more rows

Figure 42: Preview of lookup 3 part 1

Examine preview data

Rows of step: Database lookup 3 (1000 rows)

ShipAddress	ShipCity	ShipRegion	ShipPostalCode	ShipCountry	ProductID	UnitPrice	Quantity	Discount	TOTAL_PRICE	PRODUCT_KEY	SupplierID
59 rue de l'Abbaye	Reims	<null>	51100	France	11	14.0	12	0.0	168.0	38	5
59 rue de l'Abbaye	Reims	<null>	51100	France	42	9.8	10	0.0	98.0	50	20
59 rue de l'Abbaye	Reims	<null>	51100	France	72	34.8	5	0.0	174.0	47	14
Luisenstr. 48	Mnster	<null>	44087	Germany	14	18.6	9	0.0	167.4	62	6
Luisenstr. 48	Mnster	<null>	44087	Germany	51	42.4	40	0.0	1696.0	64	24
Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	41	7.7	10	0.0	77.0	73	19
Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	51	42.4	35	0.15	1261.4	64	24
Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	65	16.8	15	0.15	214.2	22	2
2, rue du Commerce	Lyon	<null>	69004	France	22	16.8	6	0.05	95.76	48	9
2, rue du Commerce	Lyon	<null>	69004	France	57	15.6	15	0.05	222.3	53	26
2, rue du Commerce	Lyon	<null>	69004	France	65	16.8	20	0.0	336.0	22	2
Boulevard Tirou, 255	Charleroi	<null>	B-6000	Belgium	20	64.8	40	0.05	2462.4	27	8
Boulevard Tirou, 255	Charleroi	<null>	B-6000	Belgium	33	2.0	25	0.05	47.5	42	15
Boulevard Tirou, 255	Charleroi	<null>	B-6000	Belgium	60	27.2	40	0.0	1088.0	44	28
Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	31	10.0	20	0.0	200.0	40	14
Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	39	14.4	42	0.0	604.8	7	18
Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	49	16.0	40	0.0	640.0	34	23
Hauptstr. 31	Bern	<null>	3012	Switzerland	24	3.6	15	0.15	45.9	3	10
Hauptstr. 31	Bern	<null>	3012	Switzerland	55	19.2	21	0.15	342.72	60	25
Hauptstr. 31	Bern	<null>	3012	Switzerland	74	8.0	21	0.0	168.0	65	4
Starenweg 5	Genve	<null>	1204	Switzerland	2	15.2	20	0.0	304.0	2	1

Close Stop Get more rows

Figure 43: Preview of lookup 3 part 2

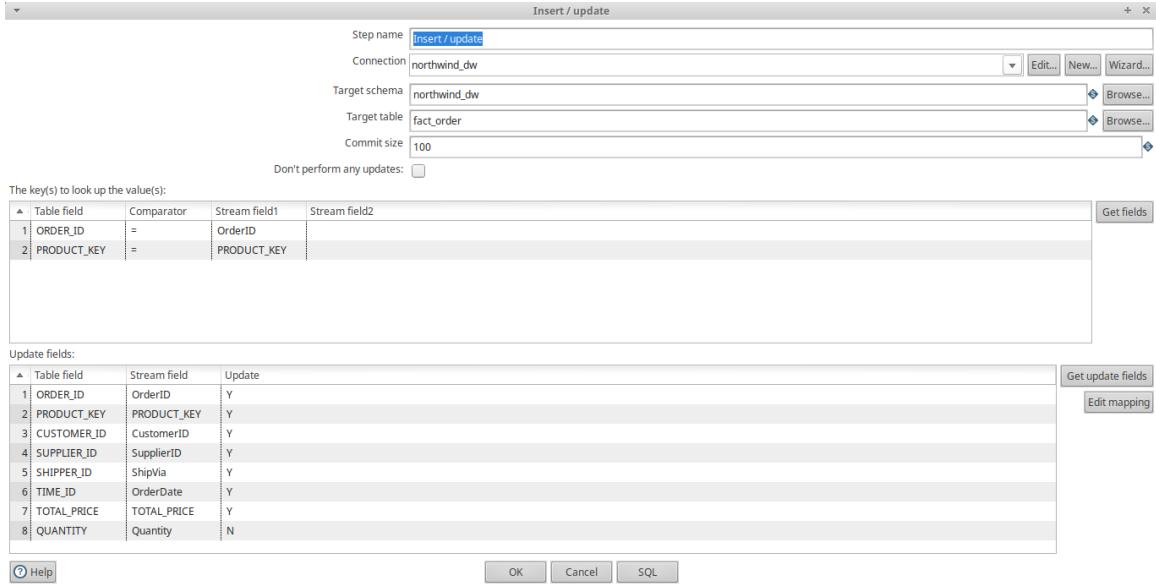


Figure 44: Configuration for Insert/Update

Examine preview data										
	OrderID	CustomerID	EmployeeID	OrderDate	RequiredDate	ShippedDate	ShipVia	Freight	ShipName	ShipAddress
1	10248	VINET	5	1996/07/04 00:00:00.000	1996/08/01 00:00:00.000	1996/07/16 00:00:00.000	3	32.38	Vins et alcools Chevalier	59 rue de l'Abbaye
2	10248	VINET	5	1996/07/04 00:00:00.000	1996/08/01 00:00:00.000	1996/07/16 00:00:00.000	3	32.38	Vins et alcools Chevalier	59 rue de l'Abbaye
3	10248	VINET	5	1996/07/04 00:00:00.000	1996/08/01 00:00:00.000	1996/07/16 00:00:00.000	3	32.38	Vins et alcools Chevalier	59 rue de l'Abbaye
4	10249	TOMSP	6	1996/07/05 00:00:00.000	1996/08/16 00:00:00.000	1996/07/10 00:00:00.000	1	11.61	Toms Spezialitäten	Luisenstr. 48
5	10249	TOMSP	6	1996/07/05 00:00:00.000	1996/08/16 00:00:00.000	1996/07/10 00:00:00.000	1	11.61	Toms Spezialitäten	Luisenstr. 48
6	10250	HANAR	4	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/12 00:00:00.000	2	65.83	Hanari Carnes	Rua do Pao, 67
7	10250	HANAR	4	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/12 00:00:00.000	2	65.83	Hanari Carnes	Rua do Pao, 67
8	10250	HANAR	4	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/12 00:00:00.000	2	65.83	Hanari Carnes	Rua do Pao, 67
9	10251	VICTE	3	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/15 00:00:00.000	1	41.34	Victuailles en stock	2, rue du Commerce
10	10251	VICTE	3	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/15 00:00:00.000	1	41.34	Victuailles en stock	2, rue du Commerce
11	10251	VICTE	3	1996/07/08 00:00:00.000	1996/08/05 00:00:00.000	1996/07/15 00:00:00.000	1	41.34	Victuailles en stock	2, rue du Commerce
12	10252	SUPRD	4	1996/07/09 00:00:00.000	1996/08/06 00:00:00.000	1996/07/11 00:00:00.000	2	51.3	Suprèmes délices	Boulevard Tirou, 255
13	10252	SUPRD	4	1996/07/09 00:00:00.000	1996/08/06 00:00:00.000	1996/07/11 00:00:00.000	2	51.3	Suprèmes délices	Boulevard Tirou, 255
14	10252	SUPRD	4	1996/07/09 00:00:00.000	1996/08/06 00:00:00.000	1996/07/11 00:00:00.000	2	51.3	Suprèmes délices	Boulevard Tirou, 255
15	10253	HANAR	3	1996/07/10 00:00:00.000	1996/07/24 00:00:00.000	1996/07/16 00:00:00.000	2	58.17	Hanari Carnes	Rua do Pao, 67
16	10253	HANAR	3	1996/07/10 00:00:00.000	1996/07/24 00:00:00.000	1996/07/16 00:00:00.000	2	58.17	Hanari Carnes	Rua do Pao, 67
17	10253	HANAR	3	1996/07/10 00:00:00.000	1996/07/24 00:00:00.000	1996/07/16 00:00:00.000	2	58.17	Hanari Carnes	Rua do Pao, 67
18	10254	CHOPS	5	1996/07/11 00:00:00.000	1996/08/08 00:00:00.000	1996/07/23 00:00:00.000	2	22.98	Chop-suey Chinese	Hauptstr. 31
19	10254	CHOPS	5	1996/07/11 00:00:00.000	1996/08/08 00:00:00.000	1996/07/23 00:00:00.000	2	22.98	Chop-suey Chinese	Hauptstr. 31
20	10254	CHOPS	5	1996/07/11 00:00:00.000	1996/08/08 00:00:00.000	1996/07/23 00:00:00.000	2	22.98	Chop-suey Chinese	Hauptstr. 31
21	10255	RICSU	9	1996/07/12 00:00:00.000	1996/08/09 00:00:00.000	1996/07/15 00:00:00.000	3	148.33	Richter Supermarkt	Starenweg 5

Figure 45: Preview of Insert/Update part 1

Examine preview data

Rows of step: Insert / update (1000 rows)

ShipAddress	ShipCity	ShipRegion	ShipPostalCode	ShipCountry	ProductID	UnitPrice	Quantity	Discount	TOTAL_PRICE	PRODUCT_KEY	SupplierID
59 rue de l'Abbaye	Reims	<null>	51100	France	11	14.0	12	0.0	168.0	38	5
59 rue de l'Abbaye	Reims	<null>	51100	France	42	9.8	10	0.0	98.0	50	20
59 rue de l'Abbaye	Reims	<null>	51100	France	72	34.8	5	0.0	174.0	47	14
Luisenstr. 48	Mnster	<null>	44087	Germany	14	18.6	9	0.0	167.4	62	6
Luisenstr. 48	Mnster	<null>	44087	Germany	51	42.4	40	0.0	1696.0	64	24
Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	41	7.7	10	0.0	77.0	73	19
Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	51	42.4	35	0.15	1261.4	64	24
Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	65	16.8	15	0.15	214.2	22	2
2, rue du Commerce	Lyon	<null>	69004	France	22	16.8	6	0.05	95.76	48	9
2, rue du Commerce	Lyon	<null>	69004	France	57	15.6	15	0.05	222.3	53	26
2, rue du Commerce	Lyon	<null>	69004	France	65	16.8	20	0.0	336.0	22	2
Boulevard Tirou, 255	Charleroi	<null>	B-6000	Belgium	20	64.8	40	0.05	2462.4	27	8
Boulevard Tirou, 255	Charleroi	<null>	B-6000	Belgium	33	2.0	25	0.05	47.5	42	15
Boulevard Tirou, 255	Charleroi	<null>	B-6000	Belgium	60	27.2	40	0.0	1088.0	44	28
Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	31	10.0	20	0.0	200.0	40	14
Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	39	14.4	42	0.0	604.8	7	18
Rua do Pao, 67	Rio de Janeiro	RJ	05454-876	Brazil	49	16.0	40	0.0	640.0	34	23
Hauptstr. 31	Bern	<null>	3012	Switzerland	24	3.6	15	0.15	45.9	3	10
Hauptstr. 31	Bern	<null>	3012	Switzerland	55	19.2	21	0.15	342.72	60	25
Hauptstr. 31	Bern	<null>	3012	Switzerland	74	8.0	21	0.0	168.0	65	4
Starenweg 5	Genve	<null>	1204	Switzerland	2	15.2	20	0.0	304.0	2	1

Close Stop Get more rows

Figure 46: Preview of Insert/Update part 2

## 2.7 Load

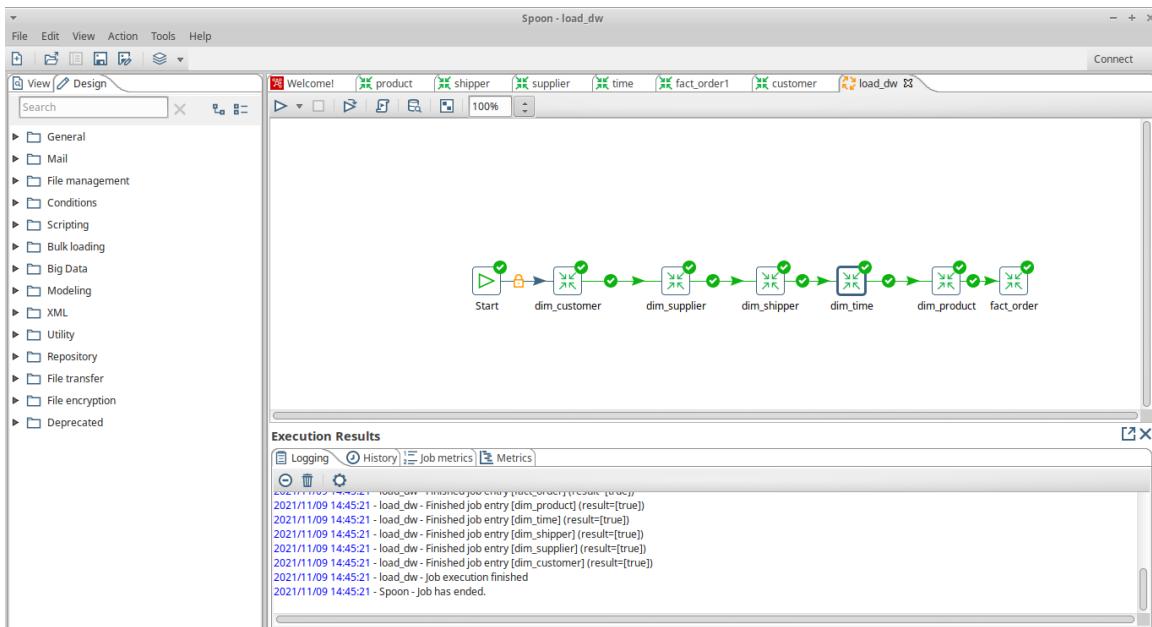


Figure 47: Job for load\_dw.jbt

### 3 Cube Definition XML

```
1 <Schema name="northwind_dw">
2   <Cube name="Orders" visible="true" cache="true" enabled="true">
3     <Table name="fact_order"> </Table>
4     <Dimension type="StandardDimension" visible="true" foreignKey="CUSTOMER_ID"
5       highCardinality="false" name="Customer">
6       <Hierarchy name="Customer Hierarchy" visible="true" hasAll="true"
7         allMemberName="All Customers" primaryKey="CUSTOMER_ID">
8         <Table name="dim_customer"> </Table>
9         <Level name="Country" visible="true" column="COUNTRY" type="String"
10        uniqueMembers="false" levelType="Regular" hideMemberIf="Never"> </Level>
11      <Level name="City" visible="true" column="CITY" type="String" uniqueMembers
12        ="false" levelType="Regular" hideMemberIf="Never"> </Level>
13      <Level name="Company Name" visible="true" column="COMPANY_NAME" type="
14        String" uniqueMembers="false" levelType="Regular" hideMemberIf="Never">
15        </Level>
16    </Hierarchy>
17  </Dimension>
18  <Dimension type="StandardDimension" visible="true" foreignKey="SHIPPER_ID"
19    highCardinality="false" name="Shipper">
20    <Hierarchy name="Shipper Hierarchy" visible="true" hasAll="true"
21      allMemberName="All Shippers" primaryKey="SHIPPER_ID">
22      <Table name="dim_shipper"> </Table>
23      <Level name="Company Name" visible="true" column="COMPANY_NAME" type="
24        String" uniqueMembers="false" levelType="Regular" hideMemberIf="Never">
25        </Level>
26    </Hierarchy>
27  </Dimension>
28  <Dimension type="StandardDimension" visible="true" foreignKey="SUPPLIER_ID"
29    highCardinality="false" name="Supplier">
30    <Hierarchy name="Supplier Hierarchy" visible="true" hasAll="true"
31      allMemberName="All Suppliers" primaryKey="SUPPLIER_ID">
32      <Table name="dim_supplier"> </Table>
33      <Level name="Company Name" visible="true" column="COMPANY_NAME" type="
34        String" uniqueMembers="false" levelType="Regular" hideMemberIf="Never">
35        </Level>
36      <Level name="Country" visible="true" column="COUNTRY" type="String"
37        uniqueMembers="false" levelType="Regular" hideMemberIf="Never"> </Level>
38      <Level name="City" visible="true" column="CITY" type="String" uniqueMembers
39        ="false" levelType="Regular" hideMemberIf="Never"> </Level>
40    </Hierarchy>
41  </Dimension>
42  <Dimension type="TimeDimension" visible="true" foreignKey="TIME_ID"
43    highCardinality="false" name="Time">
44    <Hierarchy name="Time Hierarchy " visible="true" hasAll="true"
45      allMemberName="All Years" primaryKey="TIME_ID">
46      <Table name="dim_time"> </Table>
```

```

29 <Level name="Year" visible="true" column="YEAR" type="Integer"
   uniqueMembers="false" levelType="TimeYears" hideMemberIf="Never"> </
   Level>
30 <Level name="Month" visible="true" column="MONTH_NAME" ordinalColumn="
   MONTH_ID" type="String" uniqueMembers="false" levelType="TimeMonths"
   hideMemberIf="Never"> </Level>
31 </Hierarchy>
32 </Dimension>
33 <Dimension type="StandardDimension" visible="true" foreignKey="PRODUCT_KEY"
   highCardinality="false" name="Product">
34 <Hierarchy name="Product Hierarchy" visible="true" hasAll="true"
   allMemberName="All Products" primaryKey="PRODUCT_KEY">
35 <Table name="dim_product"> </Table>
36 <Level name="Category Name" visible="true" column="CATEGORY_NAME" type="
   String" uniqueMembers="false" levelType="Regular" hideMemberIf="Never">
   </Level>
37 <Level name="Product Name" visible="true" column="PRODUCT_NAME" type="
   String" uniqueMembers="false" levelType="Regular" hideMemberIf="Never">
   </Level>
38 </Hierarchy>
39 </Dimension>
40 <Measure name="Sales" column="TOTAL_PRICE" datatype="Numeric" formatString=
   "$ #,###.00" aggregator="sum" visible="true"> </Measure>
41 <Measure name="Quantity" column="QUANTITY" datatype="Integer" formatString=
   "#,###" aggregator="sum" visible="true"> </Measure>
42 </Cube>
43 </Schema>

```

## 4 MDX Querys

A) - Analyze sales by customer country and year to discover the country, the year, and the pair country-year with the most sales.

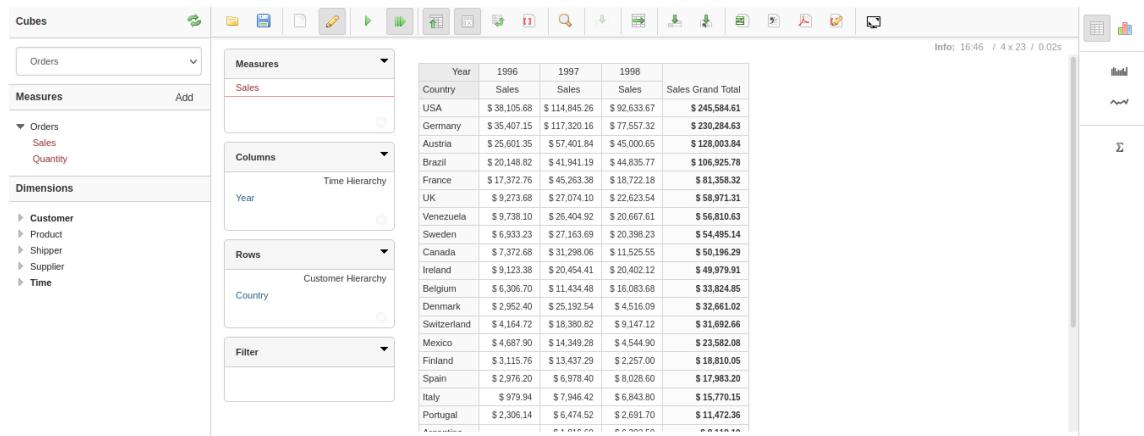


Figure 48: Query (A) drag-and-drop



Figure 49: Query (A) Filter ON COLUMNS Totals Implementation

Measures								
Sales								
Columns								
Year	Filter	>	Country	1997	1998	1996		
	Limit	>	USA	\$ 114,845.26	\$ 92,633.67	\$ 38,105.68		
Row	Sort	>	Germany	\$ 117,320.16	\$ 77,557.32	\$ 35,407.15		
	Totals	>	Austria	\$ 57,401.84	\$ 45,000.65	\$ 25,601.35		
Customer Hier.	Cancel	>	Brazil	\$ 41,941.19	\$ 44,835.77	\$ 20,148.82		
	Customer Hier.		France	\$ 45,263.38	\$ 18,722.18	\$ 17,372.76		
Country	Ascending		UK	\$ 27,074.10	\$ 22,623.54	\$ 9,273.68		
	Descending			\$ 20,667.61	\$ 9,738.10	\$ 56,810.63		
Filter				Sales		\$ 3		
				\$ 54,495.14				
				Quantity		\$ 18		
				Time Hierarchy		\$ 18		
				\$ 16,083.68	\$ 6,306.70	\$ 33,824.85		
				\$ 4,516.09	\$ 2,952.40	\$ 32,661.02		
			Switzerland	\$ 18,380.82	\$ 9,147.12	\$ 4,164.72		
			Mexico	\$ 14,349.28	\$ 4,544.90	\$ 4,687.90		
			Finland	\$ 13,437.29	\$ 2,257.00	\$ 3,115.76		
			Spain	\$ 6,978.40	\$ 8,028.60	\$ 2,976.20		
			Italy	\$ 7,946.42	\$ 6,843.80	\$ 979.94		
			Portugal	\$ 6,474.52	\$ 2,691.70	\$ 2,306.14		
				\$ 11,472.36				

Figure 50: Query (A) Filter ON COLUMNS Sort Implementation

Figure 51: Query (A) Filter ON ROWS Totals Implementation

**Measures**

Year	1996	1997	1998	Sales Grand Total
Country	Sales	Sales	Sales	
USA	\$ 38,105.68	\$ 114,845.26	\$ 92,633.67	<b>\$ 245,584.61</b>
Germany	\$ 35,407.15	\$ 117,320.16	\$ 77,557.32	<b>\$ 230,284.63</b>
Austria	\$ 25,601.35	\$ 57,401.84	\$ 45,000.65	<b>\$ 128,003.84</b>
Brazil	\$ 20,148.82	\$ 41,941.19	\$ 44,835.77	<b>\$ 106,925.78</b>
France	\$ 17,372.76	\$ 45,263.38	\$ 18,722.18	<b>\$ 81,358.32</b>
UK	\$ 9,273.68	\$ 27,074.10	\$ 22,623.54	<b>\$ 58,971.31</b>
Venezuela	\$ 9,738.10	\$ 26,404.92	\$ 20,667.61	<b>\$ 56,810.63</b>
Sweden	\$ 6,933.23	\$ 27,163.69	\$ 20,398.23	<b>\$ 54,495.14</b>
Canada	\$ 7,372.68	\$ 31,298.06	\$ 11,525.55	<b>\$ 50,196.29</b>
Ireland	\$ 9,123.38	\$ 20,454.41	\$ 20,402.12	<b>\$ 49,979.91</b>
Belgium	\$ 6,306.70	\$ 11,434.48	\$ 16,083.68	<b>\$ 33,824.85</b>
Portugal	\$ 2,306.14	\$ 6,474.52	\$ 2,691.70	<b>\$ 11,472.36</b>

**Columns**

Time Hierarchy

Year

**Rows**

Filter > archy

Country Limit >

**Sort** > Ascending

Totals > Descending

Customer Hierarchy

Quantity

Sales

Custom...

Clear Sort

Cancel

Figure 52: Query (A) Filter ON ROWS Sort Implementation

Year	1997	1998	1996	
Country	Sales	Sales	Sales	Sales Grand Total
USA	\$ 114,845.26	\$ 92,633.67	\$ 38,105.68	<b>\$ 245,584.61</b>
Germany	\$ 117,320.16	\$ 77,557.32	\$ 35,407.15	<b>\$ 230,284.63</b>
Austria	\$ 57,401.84	\$ 45,000.65	\$ 25,601.35	<b>\$ 128,003.84</b>
Brazil	\$ 41,941.19	\$ 44,835.77	\$ 20,148.82	<b>\$ 106,925.78</b>
France	\$ 45,263.38	\$ 18,722.18	\$ 17,372.76	<b>\$ 81,358.32</b>
UK	\$ 27,074.10	\$ 22,623.54	\$ 9,273.68	<b>\$ 58,971.31</b>
Venezuela	\$ 26,404.92	\$ 20,667.61	\$ 9,738.10	<b>\$ 56,810.63</b>
Sweden	\$ 27,163.69	\$ 20,398.23	\$ 6,933.23	<b>\$ 54,495.14</b>
Canada	\$ 31,298.06	\$ 11,525.55	\$ 7,372.68	<b>\$ 50,196.29</b>
Ireland	\$ 20,454.41	\$ 20,402.12	\$ 9,123.38	<b>\$ 49,979.90</b>
Belgium	\$ 11,434.48	\$ 16,083.68	\$ 6,306.70	<b>\$ 33,824.85</b>
Denmark	\$ 25,192.54	\$ 4,516.09	\$ 2,952.40	<b>\$ 32,661.02</b>
Switzerland	\$ 18,380.82	\$ 9,147.12	\$ 4,164.72	<b>\$ 31,692.66</b>
Mexico	\$ 14,349.28	\$ 4,544.90	\$ 4,687.90	<b>\$ 23,582.08</b>
Finland	\$ 13,437.29	\$ 2,257.00	\$ 3,115.76	<b>\$ 18,810.05</b>
Spain	\$ 6,978.40	\$ 8,028.60	\$ 2,976.20	<b>\$ 17,983.20</b>
Italy	\$ 7,946.42	\$ 6,843.80	\$ 979.94	<b>\$ 15,770.16</b>
Portugal	\$ 6,474.52	\$ 2,691.70	\$ 2,306.14	<b>\$ 11,472.36</b>
Argentina	\$ 1,816.60	\$ 6,302.50	-	<b>\$ 8,119.10</b>
Norway	\$ 700.00	\$ 3,976.75	\$ 1,058.40	<b>\$ 5,735.15</b>
Poland	\$ 1,207.85	\$ 1,865.10	\$ 459.00	<b>\$ 3,531.95</b>
Grand Total	<b>\$ 617,085.20</b>	<b>\$ 440,623.87</b>	<b>\$ 208,083.97</b>	

Figure 53: Query (A) Results

B) - Analyze sales by product category and year to discover the category, the year, and the pair category-year with the most sales.

The screenshot shows a drag-and-drop interface for querying data. On the left, there are four panels: Measures, Columns, Rows, and Filter. The Measures panel contains "Sales". The Columns panel has "Year" under "Time Hierarchy". The Rows panel has "Category Name" under "Product Hierarchy". The Filter panel is empty. To the right is a generated report table:

Year	1996	1997	1998	Sales Grand Total
Category Name	Sales	Sales	Sales	
Beverages	\$ 47,919.00	\$ 103,924.30	\$ 116,024.88	<b>\$ 267,868.18</b>
Condiments	\$ 17,900.39	\$ 55,368.59	\$ 32,778.11	<b>\$ 106,047.09</b>
Confections	\$ 29,685.55	\$ 82,657.75	\$ 55,013.92	<b>\$ 167,357.23</b>
Dairy Products	\$ 40,980.45	\$ 115,387.64	\$ 78,139.20	<b>\$ 234,507.29</b>
Grains/Cereals	\$ 9,507.92	\$ 56,871.82	\$ 29,364.84	<b>\$ 95,744.59</b>
Meat/Poultry	\$ 28,813.66	\$ 80,975.11	\$ 53,233.59	<b>\$ 163,022.36</b>
Produce	\$ 13,885.78	\$ 54,940.77	\$ 31,158.03	<b>\$ 99,984.58</b>
Seafood	\$ 19,391.23	\$ 66,959.22	\$ 44,911.29	<b>\$ 131,261.74</b>
Grand Total	<b>\$ 208,083.97</b>	<b>\$ 617,085.20</b>	<b>\$ 440,623.87</b>	

Figure 54: Query (B) drag-and-drop

This screenshot shows the same drag-and-drop interface as Figure 54, but with more complex interactions. The Columns panel now includes "Filter", "Limit", "Sort", and "Totals" options. The "Totals" option is expanded, showing "All" and "None" as choices. The Rows panel also has a "Cancel" button. A context menu is open over the "Sales" row in the main table, listing "Sum", "Min", "Max", and "Avg" as aggregation options. The table data remains the same as in Figure 54.

Figure 55: Query (B) Filter Totals Implementation

**Measures**

Sales
-------

**Columns**

Time Hierarchy

Year

**Rows**

Filter > archy  
Limit >  
**Sort** > Ascending  
Descending  
Totals >  
Cancel

**Columns**

Year	1996	1997	1998	Sales Grand Total
Category Name	Sales	Sales	Sales	
Beverages	\$ 47,919.00	\$ 103,924.30	\$ 116,024.88	<b>\$ 267,868.18</b>
Dairy Products	\$ 40,980.45	\$ 115,387.64	\$ 78,139.20	<b>\$ 234,507.29</b>
Confections	\$ 29,685.55	\$ 82,657.75	\$ 55,013.92	<b>\$ 167,357.23</b>
Meat/Poultry	\$ 28,813.66	\$ 80,975.11	\$ 53,233.59	<b>\$ 163,022.36</b>
Seafood	\$ 19,391.23	\$ 66,959.22	\$ 44,911.29	<b>\$ 131,261.74</b>
Condiments	\$ 17,900.39	\$ 55,368.59	\$ 32,778.11	<b>\$ 106,047.09</b>
Produce	\$ 13,885.78	\$ 54,940.77	\$ 31,158.03	<b>\$ 99,984.58</b>
Grains/Cereals	\$ 9,507.92	\$ 56,871.82	\$ 29,364.84	<b>\$ 95,744.59</b>
Grand Total	<b>\$ 208,083.97</b>	<b>\$ 617,085.20</b>	<b>\$ 440,623.87</b>	

Figure 56: Query (B) Filter Sort Implementation

**Measures**

Sales
-------

**Columns**

Time Hierarchy

Year

**Rows**

Filter > archy  
Limit >  
**Sort** >   
Totals > All  
Cancel

**Columns**

Sales: Sum

Year	1996	1997	1998	Sales Grand Total
Category Name	Sales	Sales	Sales	
Beverages	\$ 47,919.00	\$ 103,924.30	\$ 116,024.88	<b>\$ 267,868.18</b>
Dairy Products	\$ 40,980.45	\$ 115,387.64	\$ 78,139.20	<b>\$ 234,507.29</b>
Confections	\$ 29,685.55	\$ 82,657.75	\$ 55,013.92	<b>\$ 167,357.23</b>
Meat/Poultry	\$ 28,813.66	\$ 80,975.11	\$ 53,233.59	<b>\$ 163,022.36</b>
Seafood	\$ 19,391.23	\$ 66,959.22	\$ 44,911.29	<b>\$ 131,261.74</b>
Condiments	\$ 17,900.39	\$ 55,368.59	\$ 32,778.11	<b>\$ 106,047.09</b>
Produce	\$ 13,885.78	\$ 54,940.77	\$ 31,158.03	<b>\$ 99,984.58</b>
Grains/Cereals	\$ 9,507.92	\$ 56,871.82	\$ 29,364.84	<b>\$ 95,744.59</b>
Grand Total	<b>\$ 208,083.97</b>	<b>\$ 617,085.20</b>	<b>\$ 440,623.87</b>	

Figure 57: Query (B) Filter Totals Implementation

Year	1996	1997	1998	Sales Grand Total
Category Name	Sales	Sales	Sales	
Beverages	\$ 47,919.00	\$ 103,924.30	\$ 116,024.88	<b>\$ 267,868.18</b>
Dairy Products	\$ 40,980.45	\$ 115,387.64	\$ 78,139.20	<b>\$ 234,507.29</b>
Confections	\$ 29,685.55	\$ 82,657.75	\$ 55,013.92	<b>\$ 167,357.23</b>
Meat/Poultry	\$ 28,813.66	\$ 80,975.11	\$ 53,233.59	<b>\$ 163,022.36</b>
Seafood	\$ 19,391.23	\$ 66,959.22	\$ 44,911.29	<b>\$ 131,261.74</b>
Condiments	\$ 17,900.39	\$ 55,368.59	\$ 32,778.11	<b>\$ 106,047.09</b>
Produce	\$ 13,885.78	\$ 54,940.77	\$ 31,158.03	<b>\$ 99,984.58</b>
Grains/Cereals	\$ 9,507.92	\$ 56,871.82	\$ 29,364.84	<b>\$ 95,744.59</b>
Grand Total	<b>\$ 208,083.97</b>	<b>\$ 617,085.20</b>	<b>\$ 440,623.87</b>	

Figure 58: Query (B) Results

C) - Analyze quantity by shipping company and year to discover the shipper, the year, and the pair shipper-year with the most quantity.

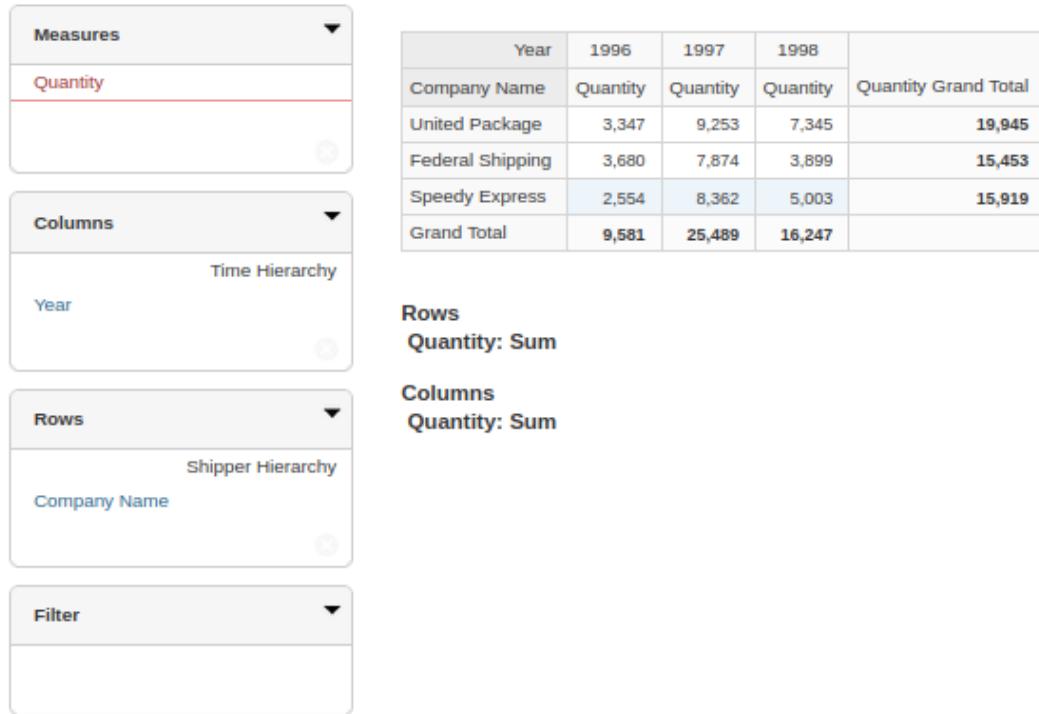


Figure 59: Query (C) drag-and-drop

**Measures**

Year	1996	1997	1998	Quantity Grand Total
Company Name	Quantity	Quantity	Quantity	
United Package	3,347	9,253	7,345	<b>19,945</b>
Federal Shipping	3,680	7,874	3,899	<b>15,453</b>
Speedy Express	2,554	8,362	5,003	<b>15,919</b>
Grand Total	<b>9,581</b>	<b>25,489</b>	<b>16,247</b>	

**Columns**

Year	Filter	> archy
	Limit	>
	Sort	> <input type="button" value="X"/>
	Totals	> All >
Row	Cancel	Quantity >

**Rows**

Quantity: Sum

Shipper Hierarchy	None
Company Name	Sum
	Min
	Max
	Avg

**Filter**

Figure 60: Query (C) Filter Totals ON COLUMNS

**Measures**

Year	1996	1997	1998	Quantity Grand Total
Company Name	Quantity	Quantity	Quantity	
United Package	3,347	9,253	7,345	<b>19,945</b>
Federal Shipping	3,680	7,874	3,899	<b>15,453</b>
Speedy Express	2,554	8,362	5,003	<b>15,919</b>
Grand Total	<b>9,581</b>	<b>25,489</b>	<b>16,247</b>	

**Columns**

Time Hierarchy	
Year	

**Rows**

Quantity: Sum

**Columns**

Quantity: Sum

Filter	Sort	Descending	>
Cancel	Totals	Descending	>
		Ascending (Breaking Hierarchy)	>
		Descending (Breaking Hierarchy)	>
		Custom...	
		Clear Sort	

Figure 61: Query (C) Filter Sort ON ROWS

The screenshot shows a data analysis interface with three main sections:

- Measures:** A dropdown menu showing "Quantity".
- Columns:** A dropdown menu showing "Year" under "Time Hierarchy".
- Rows:** A dropdown menu showing "Quantity: Sum".

To the right of these is a table with the following data:

Year	1996	1997	1998	Quantity Grand Total
Company Name	Quantity	Quantity	Quantity	
United Package	3,347	9,253	7,345	<b>19,945</b>
Federal Shipping	3,680	7,874	3,899	<b>15,453</b>
Speedy Express	2,554	8,362	5,003	<b>15,919</b>
Grand Total	<b>9,581</b>	<b>25,489</b>	<b>16,247</b>	

Below the table, there is a detailed view of the "Rows" configuration:

- Filter:** A dropdown menu with options: Filter, Limit, Sort, and Totals.
- Totals:** A dropdown menu with options: All, None, Sum, Min, Max, and Avg. "Sum" is selected.

Figure 62: Query (C) Filter Totals ON ROWS

Year	1996	1997	1998	Quantity Grand Total
Company Name	Quantity	Quantity	Quantity	
United Package	3,347	9,253	7,345	<b>19,945</b>
Federal Shipping	3,680	7,874	3,899	<b>15,453</b>
Speedy Express	2,554	8,362	5,003	<b>15,919</b>
Grand Total	<b>9,581</b>	<b>25,489</b>	<b>16,247</b>	

Figure 63: Query (C) Results

D) - Analyze sales by customer country and product category to identify the pairs of country-category with no sales at all.



Figure 64: Query (D) drag-and-drop

Category Name	Beverages	Condiments	Confections	Dairy Products	Grains/Cereals	Meat/Poultry	Produce	Seafood
Country	Sales	Sales	Sales	Sales	Sales	Sales	Sales	Sales
Argentina	\$ 1,798.00	\$ 907.00	\$ 2,135.10	\$ 1,143.50	\$ 390.00	-	\$ 1,139.00	\$ 606.50
Austria	\$ 23,317.30	\$ 15,237.24	\$ 13,534.41	\$ 28,106.74	\$ 14,527.70	\$ 10,821.56	\$ 13,120.67	\$ 9,338.23
Belgium	\$ 5,428.68	\$ 2,454.80	\$ 7,479.58	\$ 8,660.00	\$ 3,226.00	\$ 2,138.50	\$ 3,223.20	\$ 1,214.10
Brazil	\$ 37,193.45	\$ 11,180.76	\$ 11,436.10	\$ 15,680.45	\$ 6,121.55	\$ 7,563.11	\$ 4,863.22	\$ 12,887.14
Canada	\$ 11,276.06	\$ 4,760.08	\$ 8,842.48	\$ 9,557.18	\$ 5,557.65	\$ 3,766.80	\$ 2,112.00	\$ 4,324.05
Denmark	\$ 12,025.70	\$ 4,325.15	\$ 2,591.46	\$ 2,644.30	\$ 99.75	\$ 3,162.50	\$ 3,954.90	\$ 3,857.26
Finland	\$ 2,182.40	\$ 1,873.00	\$ 1,025.05	\$ 5,558.11	\$ 2,477.00	\$ 3,340.78	\$ 1,106.41	\$ 1,247.30
France	\$ 12,997.47	\$ 6,486.79	\$ 12,816.27	\$ 8,860.39	\$ 5,873.06	\$ 10,911.29	\$ 8,247.61	\$ 15,165.45
Germany	\$ 54,634.12	\$ 16,736.54	\$ 35,878.60	\$ 49,640.95	\$ 13,639.80	\$ 21,455.80	\$ 16,013.11	\$ 22,285.72
Ireland	\$ 3,145.32	\$ 3,477.63	\$ 1,676.38	\$ 9,010.11	\$ 1,442.40	\$ 20,914.23	\$ 3,414.66	\$ 6,899.18
Italy	\$ 998.94	\$ 1,394.23	\$ 2,674.05	\$ 3,995.14	\$ 1,743.50	\$ 1,056.50	\$ 2,186.80	\$ 1,721.00
Mexico	\$ 7,994.00	\$ 1,235.45	\$ 1,897.73	\$ 4,721.90	\$ 549.75	\$ 2,828.90	\$ 2,517.75	\$ 1,836.60
Norway	\$ 2,756.00	\$ 234.00	\$ 280.15	\$ 786.00	-	\$ 164.00	\$ 578.40	\$ 936.60
Poland	\$ 828.50	\$ 627.00	\$ 779.10	\$ 810.00	-	\$ 22.35	\$ 306.00	\$ 159.00
Portugal	\$ 1,046.40	\$ 3,688.29	\$ 956.15	\$ 997.80	\$ 2,164.40	\$ 1,338.20	\$ 648.72	\$ 632.40
Spain	\$ 1,363.20	\$ 1,688.45	\$ 1,738.75	\$ 646.00	\$ 1,762.06	\$ 6,866.95	\$ 2,120.00	\$ 1,797.79
Sweden	\$ 12,164.00	\$ 4,717.90	\$ 5,169.63	\$ 6,378.95	\$ 3,196.00	\$ 7,656.63	\$ 8,979.20	\$ 6,232.84
Switzerland	\$ 2,149.73	\$ 2,054.30	\$ 3,067.44	\$ 7,488.43	\$ 4,862.60	\$ 6,865.56	\$ 2,132.50	\$ 3,072.11
UK	\$ 7,276.10	\$ 4,415.93	\$ 8,833.04	\$ 14,158.45	\$ 5,172.80	\$ 6,342.44	\$ 7,980.60	\$ 4,791.96
USA	\$ 60,520.98	\$ 16,597.53	\$ 36,314.93	\$ 37,902.05	\$ 19,290.57	\$ 41,635.04	\$ 9,816.33	\$ 23,507.20
Venezuela	\$ 6,771.85	\$ 1,955.05	\$ 8,230.82	\$ 17,760.86	\$ 3,648.00	\$ 4,171.23	\$ 5,523.50	\$ 8,749.32

Figure 65: Query (D) Results

E) - Analyze quantity by supplier country and customer country to identify the pairs of countries with no quantities being shipped between them.

Info: 19:30 / 22 x 31 / 0.04s

Country	Norway	Poland	Argentina	Portugal	Spain	Italy	Finland	Mexico	Denmark	Switzerland	Belgium	Ireland	Canada	Sweden	UK
Country	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity
France	-	15	-	-	-	-	6	-	-	20	30	129	-	30	
Germany	15	-	-	-	17	-	-	-	25	30	-	54	-	85	1 <sup>l</sup>
Netherlands	-	-	-	6	5	5	-	15	-	-	-	-	46	121	4 <sup>l</sup>
Sweden	-	-	-	-	10	40	24	-	-	-	-	-	50	55	12
Spain	-	-	30	-	-	6	31	101	-	-	-	-	40	35	56 <sup>l</sup>
Denmark	-	-	3	-	20	24	40	21	32	30	15	-	-	25	5 <sup>l</sup>
Brazil	23	12	-	10	18	50	20	35	50	15	12	-	60	18	10 <sup>l</sup>
Japan	-	20	-	24	15	5	35	17	43	57	36	68	92	22	3 <sup>l</sup>
Sweden	-	-	10	-	18	30	30	1	30	57	-	46	-	84	9 <sup>l</sup>
France	8	-	2	20	-	2	20	35	50	-	-	3	49	87	2 <sup>l</sup>
Japan	-	-	17	-	-	-	65	35	-	48	-	70	7	22	5 <sup>l</sup>
USA	12	-	6	30	-	40	10	-	10	-	20	30	118	60	15 <sup>l</sup>
Germany	-	-	6	-	5	44	-	30	-	32	113	-	65	50	1 <sup>l</sup>
USA	8	3	43	20	19	40	6	70	60	-	60	30	60	8	9 <sup>l</sup>
Canada	-	3	-	20	19	10	8	10	128	21	49	-	15	92	6 <sup>l</sup>
Canada	-	34	10	-	30	10	30	-	60	21	-	15	137	36	4 <sup>l</sup>
Italy	-	-	20	70	23	10	70	5	-	102	61	30	98	60	12 <sup>l</sup>
USA	-	-	20	89	80	60	35	4	15	10	81	80	10	112	13 <sup>l</sup>

Figure 66: Query (E) drag-and-drop

Info: 19:32 / 22 x 31 / 0.06s

Country	Norway	Poland	Argentina	Portugal	Spain	Italy	Finland	Mexico	Denmark	Switzerland	Belgium	Ireland	Canada	Sweden	UK
Country	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity
France	-	15	-	-	-	-	6	-	-	20	30	129	-	30	
Germany	15	-	-	-	17	-	-	-	25	30	-	54	-	85	1 <sup>l</sup>
Netherlands	-	-	-	6	5	5	-	15	-	-	-	-	46	121	4 <sup>l</sup>
Sweden	-	-	-	-	10	40	24	-	-	-	-	-	50	55	12
Spain	-	-	30	-	-	6	31	101	-	-	-	-	40	35	56 <sup>l</sup>
Denmark	-	-	3	-	20	24	40	21	32	30	15	-	-	25	5 <sup>l</sup>
Country															
Filter Limit > archy															
Sort > Ascending															
Totals > Descending															
Row Cancel > Ascending (Breaking Hierarchy)															
Supplier Hier															
Country															
Filter															

Figure 67: Query (E) Filter ON COLUMNS

Info: 19:32 / 22 x 31 / 0.06s

Country	Norway	Poland	Argentina	Portugal	Spain	Italy	Finland	Mexico	Denmark	Switzerland	Belgium	Ireland	Canada	Sweden	UK	
Country	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
France	-	15	-	-	-	-	6	-	-	20	30	129	-	30		
Germany	15	-	-	-	17	-	-	-	25	30	-	54	-	85	1 <sup>l</sup>	
Netherlands	-	-	-	6	5	5	-	15	-	-	-	-	46	121	4 <sup>l</sup>	
Sweden	-	-	-	-	10	40	24	-	-	-	-	-	50	55	12	
Spain	-	-	30	-	-	6	31	101	-	-	-	-	40	35	56 <sup>l</sup>	
Denmark	-	-	3	-	20	24	40	21	32	30	15	-	-	25	5 <sup>l</sup>	
Brazil	23	12	-	10	18	50	20	35	50	15	12	-	60	18	10 <sup>l</sup>	
Japan	-	20	-	24	15	5	35	17	43	57	36	68	92	22	3 <sup>l</sup>	
Sweden	-	-	10	-	18	30	30	1	30	57	-	46	-	84	9 <sup>l</sup>	
France	8	-	2	20	-	2	20	35	50	-	-	3	49	87	2 <sup>l</sup>	
Japan	-	-	17	-	-	-	65	35	-	48	-	70	7	22	5 <sup>l</sup>	
Canada	-	-	-	-	30	10	30	-	60	21	-	15	137	36	4 <sup>l</sup>	
Canada	-	-	20	70	23	10	70	5	-	102	61	30	98	60	12 <sup>l</sup>	
Italy	-	-	-	20	89	80	60	35	4	15	10	81	80	10	112	13 <sup>l</sup>
USA	-	-	-	20	89	80	60	35	4	15	10	81	80	10	112	13 <sup>l</sup>

Figure 68: Query (E) Filter ON ROWS

Country	Norway	Poland	Argentina	Portugal	Spain	Italy	Finland	Mexico	Denmark	Switzerland	Belgium	Ireland	Canada	Sweden	UK	Venezuela	France	Brazil	Austria	Germany	USA	
Country	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
France	-	15	-	-	-	-	6	-	-	20	30	129	-	30	-	42	-	45	-	130	87	
Germany	15	-	-	-	17	-	-	-	25	30	-	54	-	85	15	62	-	97	60	108	44	
Netherlands	-	-	-	6	5	5	-	15	-	-	-	-	-	46	121	40	-	68	60	70	121	66
Sweden	-	-	-	-	10	40	24	-	-	-	-	-	50	55	123	88	27	23	147	247	94	
Spain	-	-	30	-	-	6	31	101	-	-	-	-	40	35	56	65	67	57	54	158	175	175
Denmark	-	-	3	-	20	24	40	21	32	30	15	-	-	25	58	98	56	94	72	162	306	
Brazil	23	12	-	10	18	50	20	35	50	15	12	-	60	18	105	39	40	145	283	93	97	
Japan	-	20	-	24	15	5	35	17	43	57	36	68	92	22	39	70	115	110	186	79	101	
Sweden	-	-	10	-	18	30	30	1	30	57	-	46	-	84	97	50	93	90	-	260	327	
France	8	-	2	20	-	2	20	35	50	-	-	3	49	87	20	24	96	249	245	294	212	
Japan	-	-	17	-	-	65	35	-	48	-	70	7	22	54	98	59	107	124	298	413	-	
USA	12	-	6	30	-	40	10	-	10	-	20	30	118	60	154	15	204	149	18	356	204	
Germany	-	-	6	-	5	44	-	30	-	32	113	-	65	50	12	157	95	121	80	359	267	
USA	8	3	43	20	19	40	6	70	60	-	60	30	60	8	98	73	89	121	226	233	306	
Canada	-	3	-	20	19	10	8	10	128	21	49	-	15	92	63	112	107	98	145	327	431	
Canada	-	34	10	-	30	10	30	-	60	21	-	15	137	36	42	-	204	24	286	250	497	
Italy	-	-	20	70	23	10	70	5	-	102	61	30	98	60	126	63	118	140	169	131	401	
USA	-	-	20	89	80	60	35	4	15	10	81	80	10	112	130	21	119	203	283	184	195	
Finland	-	-	12	10	14	58	20	60	60	22	48	75	-	104	95	125	154	226	72	348	233	
Singapore	9	-	7	72	4	40	37	96	-	28	150	42	97	86	36	40	142	165	142	405	280	
USA	5	-	30	-	40	44	12	31	100	6	15	150	95	187	50	197	121	74	179	433	315	
Australia	5	2	7	18	90	38	75	71	45	166	2	74	29	125	175	135	122	232	120	293	284	
UK	-	26	-	15	30	10	20	42	14	75	30	62	100	151	138	214	87	98	103	520	478	
Italy	-	30	12	-	-	106	30	40	24	51	50	126	77	36	250	191	176	176	228	498	399	
Norway	15	-	10	-	-	20	110	71	38	111	115	103	79	38	184	95	151	164	301	385	536	
UK	2	15	43	41	52	28	62	44	126	40	157	-	129	74	119	140	89	315	159	661	555	
France	12	15	2	31	19	20	59	39	27	100	130	118	190	85	180	202	24	289	340	742	449	
Australia	23	-	6	40	64	40	17	70	54	117	100	134	247	109	200	244	395	237	546	415	879	
Germany	24	30	43	17	126	42	13	82	179	116	118	205	99	217	74	274	246	341	425	702	699	

Figure 69: Query (E) Results

F) - Analyze quantity by product category and shipping company to identify the pairs of category-shipper with no quantity at all.

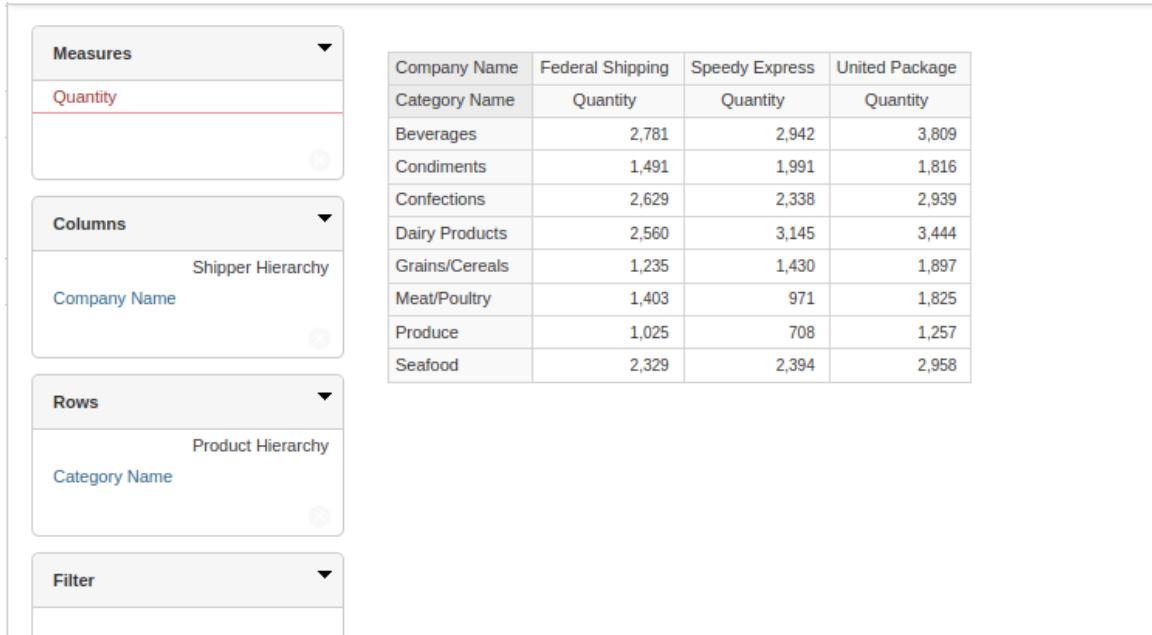


Figure 70: Query (F) drag-and-drop and Results

Note that the table does not contain any entry with no quantity at all. This tells us that there is no pairs of category-shipper with no quantity at all.