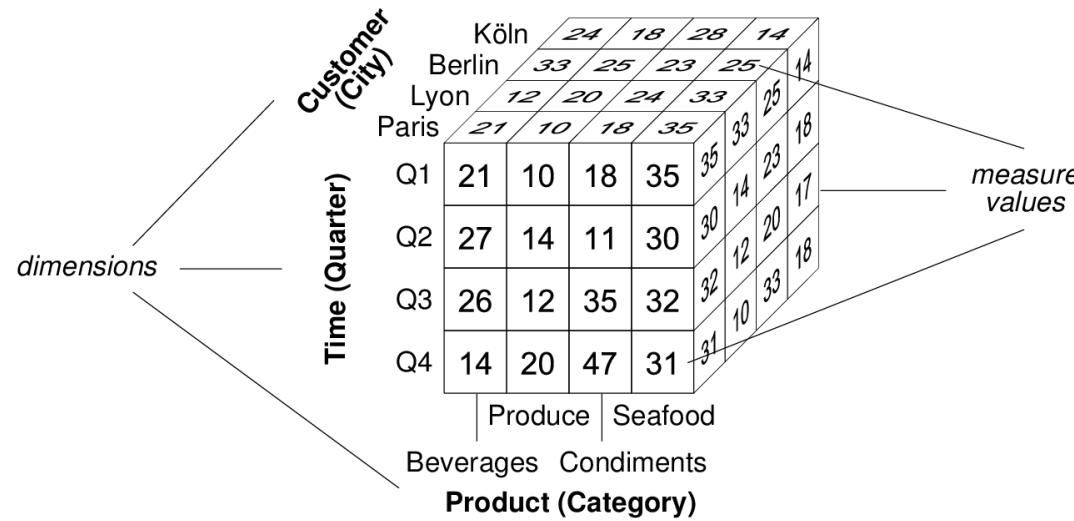


Data Analysis and Integration

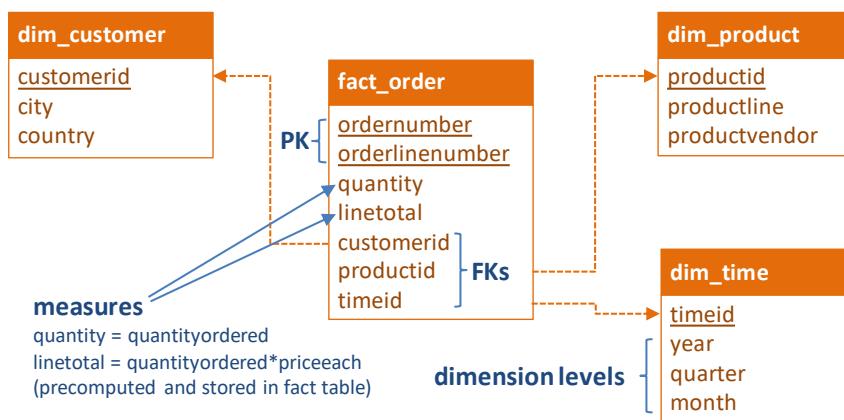
Defining the OLAP cube

Introduction

OLAP cube
OLAP server
MDX queries



DW tables
database system
SQL queries



OLAP cube
definition
(XML)

OLAP server

- What is an OLAP server?
 - serves data as a cube
 - data may or may not come from a star schema
 - allows a client to run queries over the data cube
 - we will talk about MDX in the next lectures
 - knows how to perform OLAP operations
 - drill-down, roll-up, slice, dice, pivot, etc.
 - automatically calculates and aggregates measures
 - according to the requested dimension levels
 - with a certain aggregation operation (sum, count, average, etc.)

OLAP server

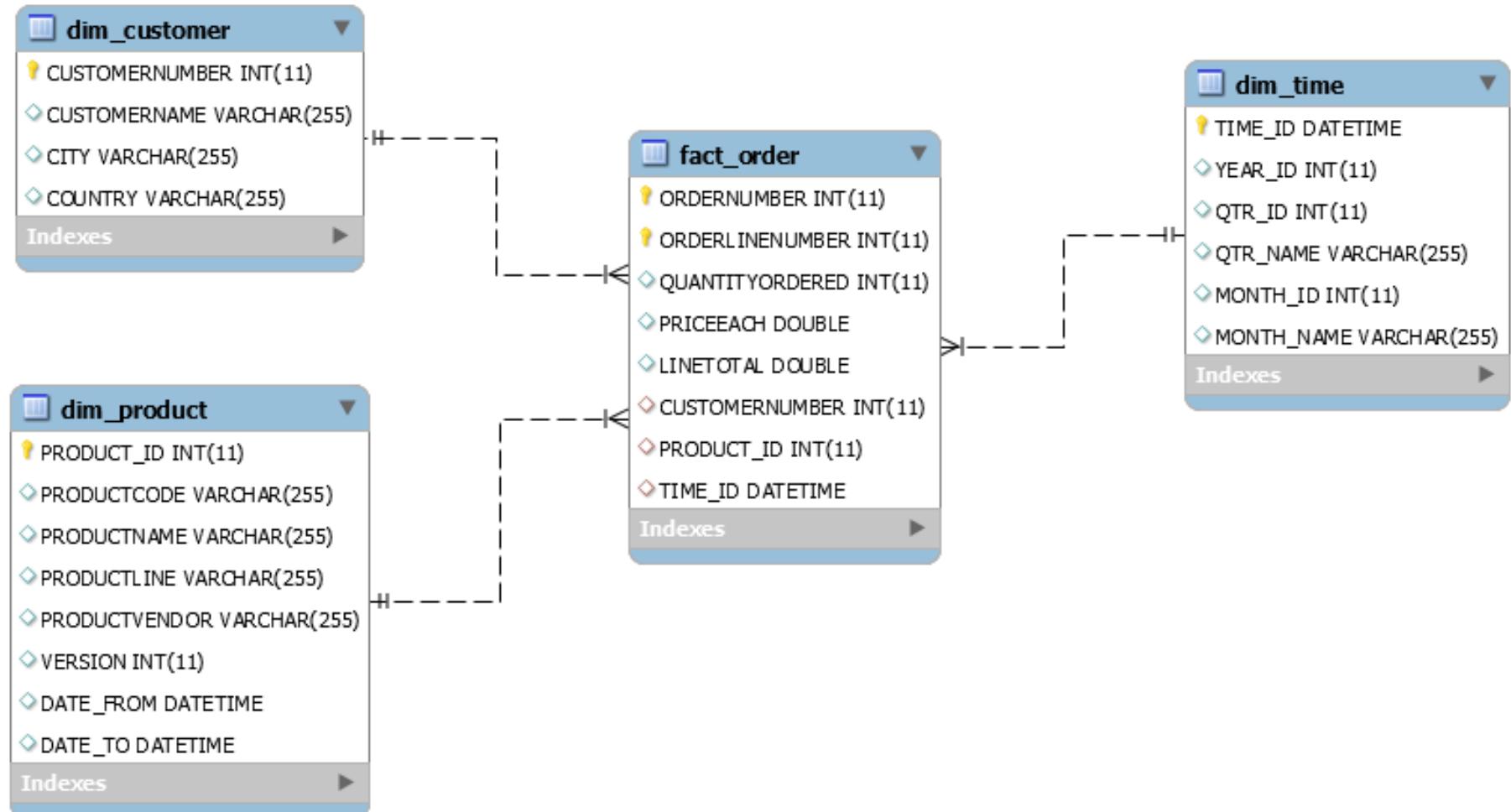
- An OLAP server needs a cube definition
 - where is the fact table?
 - where are the dimensions?
 - where are the hierarchies for each dimension?
 - where are the levels for each hierarchy?
 - where are the tables where those levels can be found?
 - is it a regular dimension or a time dimension?
 - where are the measures?
 - which columns should be aggregated?
 - which aggregation operations should be used?

OLAP server

- Such cube definition is usually provided in an XML file

```
<Schema ...>
  <Cube ...>
    <Table ... />
    <Dimension ...>
      <Hierarchy ...>
        <Table ... />
        <Level ... />
      </Hierarchy>
    </Dimension>
    <Measure ... />
  </Cube>
</Schema>
```

Data warehouse



OLAP cube

- Defining the cube and its fact table

```
<Schema name="steelwheels_dw">
  <Cube name="Orders" ...>
    <Table name="fact_order">
      </Table>
      ...
    </Cube>
</Schema>
```

OLAP cube

- Defining the customer dimension and its hierarchy

```
<Dimension name="Customer"  
          primaryKey="CUSTOMERNUMBER"  
          type="StandardDimension">  
    <Hierarchy name="Customer Hierarchy"  
              primaryKey="CUSTOMERNUMBER"  
              allMemberName="All Customers">  
      <Table name="dim_customer">  
      </Table>  
      ...  
    </Hierarchy>  
</Dimension>
```

OLAP cube

- Defining the levels of the customer hierarchy

```
<Level name="Country" column="COUNTRY"  
       type="String" levelType="Regular">  
</Level>  
  
<Level name="City" column="CITY"  
       type="String" levelType="Regular">  
</Level>  
  
<Level name="Customer Name" column="CUSTOMERNAME"  
       type="String" levelType="Regular">  
</Level>
```

OLAP cube

- Defining the product dimension and its hierarchy

```
<Dimension name="Product"
            primaryKey="PRODUCT_ID"
            type="StandardDimension">
    <Hierarchy name="Product Hierarchy"
                primaryKey="PRODUCT_ID"
                allMemberName="All Products">
        <Table name="dim_product">
        </Table>
        ...
    </Hierarchy>
</Dimension>
```

OLAP cube

- Defining the levels of the product hierarchy

```
<Level name="Product Line" column="PRODUCTLINE"
       type="String" levelType="Regular">
</Level>

<Level name="Product Vendor" column="PRODUCTVENDOR"
       type="String" levelType="Regular">
</Level>

<Level name="Product Name" column="PRODUCTNAME"
       type="String" levelType="Regular">
</Level>
```

OLAP cube

- Defining the time dimension and its hierarchy

```
<Dimension name="Time"
            primaryKey="TIME_ID"
            type="TimeDimension">
    <Hierarchy name="Time Hierarchy"
                primaryKey="TIME_ID"
                allMemberName="All Years">
        <Table name="dim_time">
        </Table>
        ...
    </Hierarchy>
</Dimension>
```

OLAP cube

- Defining the levels of the time hierarchy

```
<Level name="Year" column="YEAR_ID"
       type="Integer" levelType="TimeYears">
</Level>

<Level name="Quarter" column="QTR_NAME"
       ordinalColumn="QTR_ID"
       type="String" levelType="TimeQuarters">
</Level>

<Level name="Month" column="MONTH_NAME"
       ordinalColumn="MONTH_ID"
       type="String" levelType="TimeMonths">
</Level>
```

OLAP cube

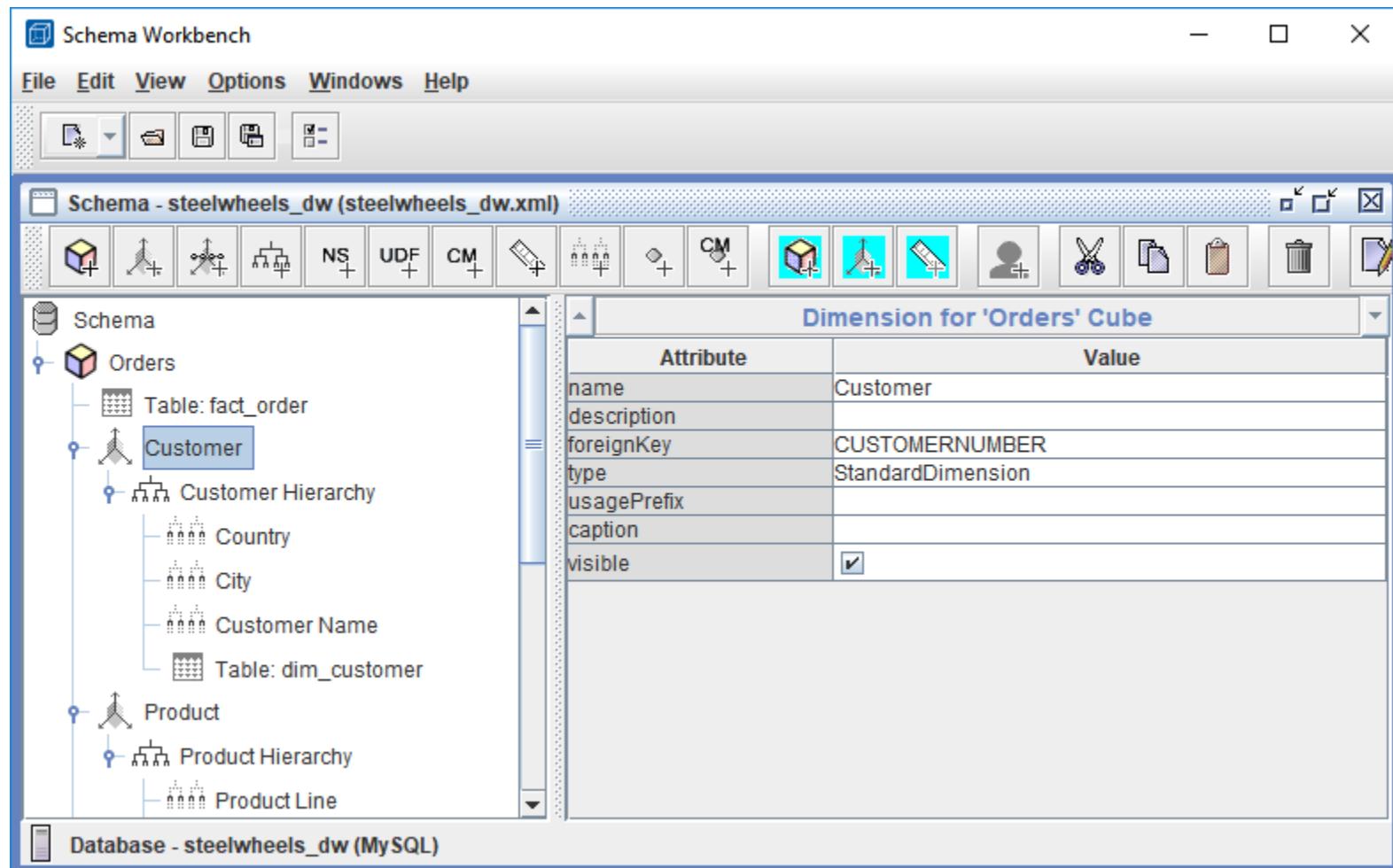
- Defining the measures

```
<Measure name="Sales" column="LINETOTAL"
    aggregator="sum" datatype="Numeric"
    formatString="$ #,###.00">
</Measure>

<Measure name="Quantity" column="QUANTITYORDERED"
    aggregator="sum" datatype="Integer"
    formatString="#,###">
</Measure>
```

OLAP cube

- Pentaho Schema Workbench (PSW)



OLAP cube

- Pentaho Schema Workbench (PSW)

The screenshot shows the Pentaho Schema Workbench (PSW) application window. The title bar reads "Schema Workbench". The menu bar includes "File", "Edit", "View", "Options", "Windows", and "Help". The toolbar contains various icons for file operations like Open, Save, and Delete, along with other schema-related tools.

The main workspace is titled "Schema - steelwheels_dw (steelwheels_dw.xml)". On the left, there is a tree view of the schema structure:

- Product Line
- Product Vendor
- Product Name
- Table: dim_product
- Time
 - Time Hierarchy
 - Year
 - Quarter
 - Month
 - Table: dim_time
- Sales
- Quantity

On the right, a detailed configuration panel is open for a "Measure for 'Orders' Cube". It has two columns: "Attribute" and "Value". The configuration is as follows:

Attribute	Value
name	Sales
description	
aggregator	sum
column	LINETOTAL
formatString	\$ #,###.00
datatype	Numeric
formatter	
caption	
visible	<input checked="" type="checkbox"/>

At the bottom of the workspace, there is a tab for "Database - steelwheels_dw (MySQL)".

OLAP cube

- Cube definition is input to OLAP server
 - Mondrian is an OLAP server that can understand such XML cube definitions
 - Mondrian is a JAR file that can be loaded by Java apps
- Running queries over the data cube
 - requires a client tool (or front-end)
 - there are several front-ends for Mondrian
 - here we will use Saiku Analytics as a plug-in for Pentaho Server

OLAP front-end

The screenshot shows the Pentaho Business Analytics home page. At the top, there is a browser header with icons for back, forward, refresh, and home, followed by the URL 'localhost:8080/pentaho/Home'. Below the header is a navigation bar with links for File, View, Tools, and Help. The main content area has a 'Home' dropdown menu. On the left, there is a sidebar titled 'Recents' which displays a message: 'You haven't opened anything recently. Browse your files.' with a 'Browse Files' button. To the right of the sidebar, there is a red box containing four buttons: 'Browse Files', 'Create New', 'Manage Data Sources', and 'Documentation'. To the right of this red box, the text 'Pentaho Business Analytics' is displayed above a horizontal line. Below the line, there is a section titled 'Get help and contribute with your knowledge. Find here some ways how you can do it.' with two buttons: 'Documentation' and 'Forums'.

Pentaho Business Analytics

Get help and contribute with your knowledge.
Find here some ways how you can do it.

Documentation

Forums

Recents

You haven't opened anything recently.
Browse your files.

Browse Files

OLAP front-end

- Manage data sources
 - database connection to the data warehouse
 - location of the XML file with the cube definition

Database Connection

General Advanced Options Pooling

Connection Name: steelwheels_dw

Database Type: MySQL

Access: Native (JDBC)

Settings

Host Name: localhost

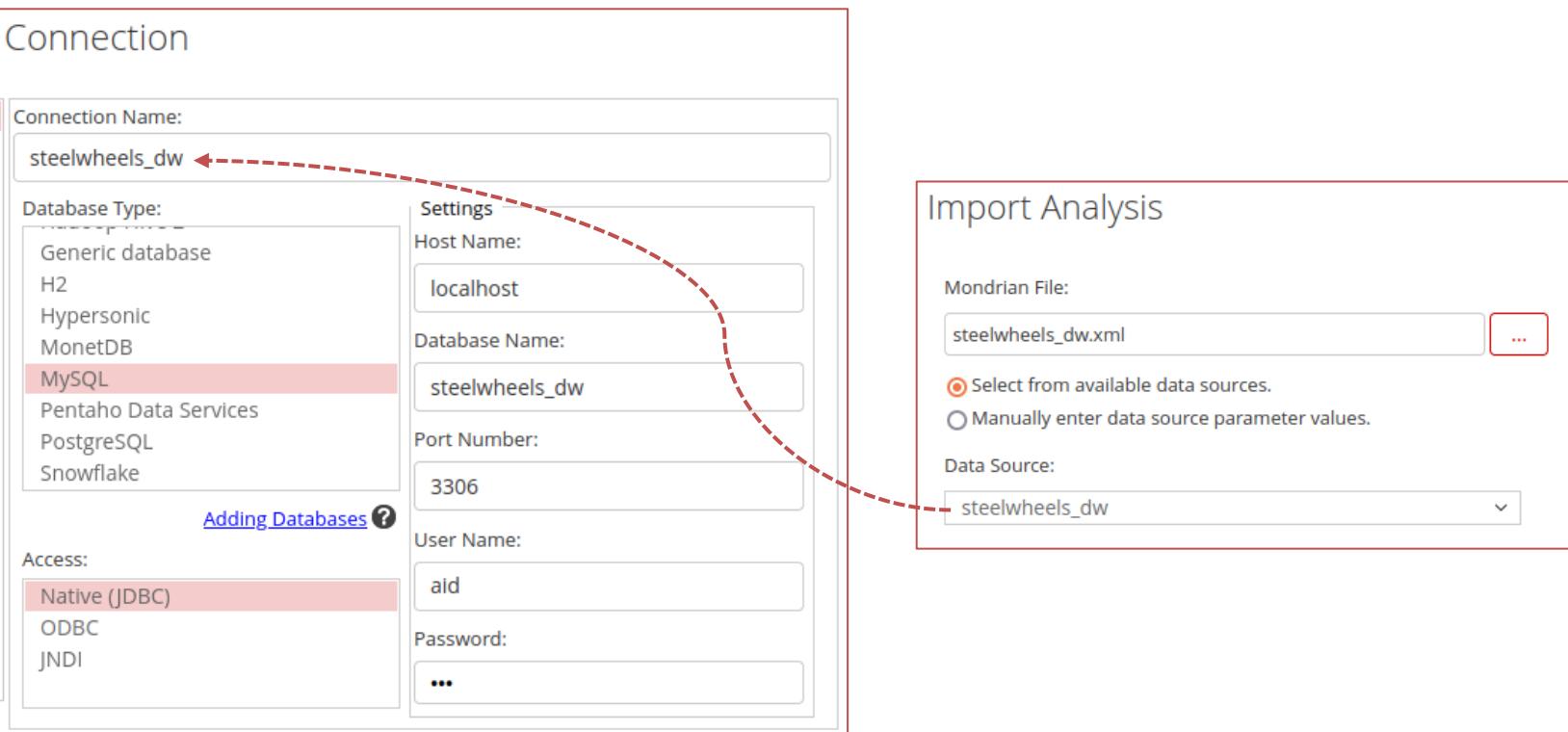
Database Name: steelwheels_dw

Port Number: 3306

User Name: aid

Password: ...

[Adding Databases](#) ?



Import Analysis

Mondrian File: steelwheels_dw.xml

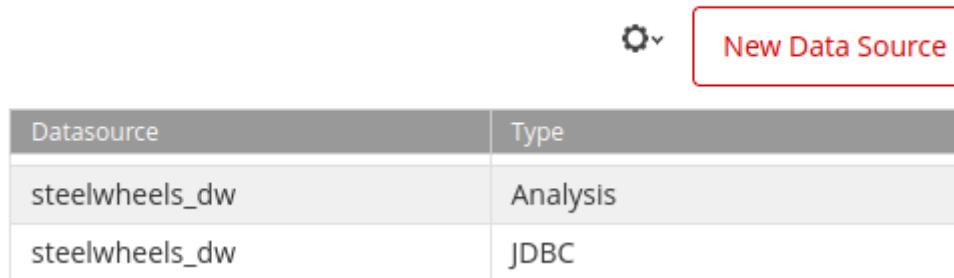
Select from available data sources.
 Manually enter data source parameter values.

Data Source: steelwheels_dw

OLAP front-end

- Manage data sources
 - database connection to the data warehouse
 - location of the XML file with the cube definition

Manage Data Sources



The screenshot shows a user interface for managing data sources. At the top right, there is a 'New Data Source' button with a red border. Below it is a table with two rows. The first row has 'steelwheels_dw' in the Datasource column and 'Analysis' in the Type column. The second row also has 'steelwheels_dw' in the Datasource column and 'JDBC' in the Type column.

Datasource	Type
steelwheels_dw	Analysis
steelwheels_dw	JDBC

OLAP front-end

- Creating a new query

Pentaho Business Analytics

Get help and contribute with your knowledge.
Find here some ways how you can do it.

Recents

You haven't opened anything recently.
Browse your files.

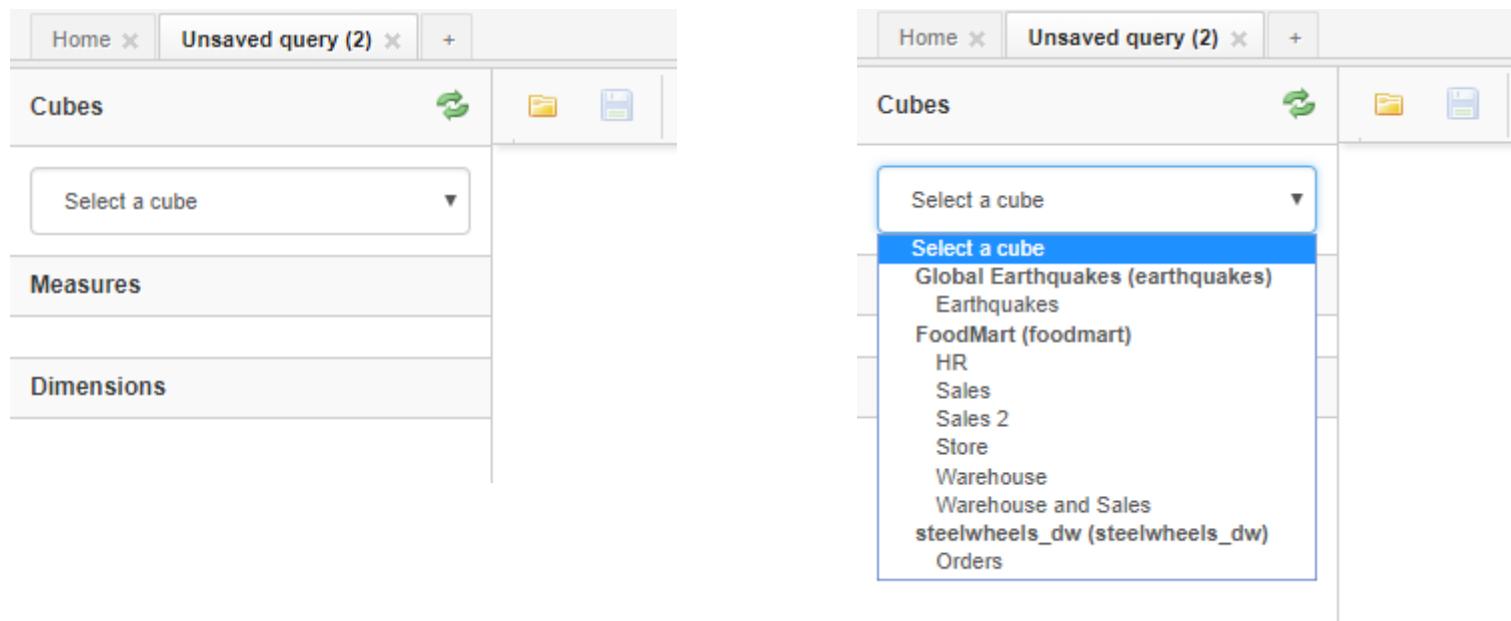
Browse Files

Documentation

Forums

OLAP front-end

- Select the cube
 - if the cube does not show up, there is a problem in the XML
 - check for exceptions in the log file (pentaho.log)
 - go back to PSW and fix the problem



OLAP front-end

- Front-end
 - measures
 - dimensions
 - hierarchies
 - levels

The screenshot shows a user interface for configuring an OLAP cube. At the top, there is a toolbar with various icons: Cubes, Refresh, Folder, Save, New, Delete, Copy, Paste, Undo, Redo, Home, and Help. Below the toolbar, the 'Cubes' section displays 'Orders' as the selected cube. The 'Measures' section contains 'Sales' and 'Quantity'. The 'Dimensions' section is expanded and lists three main categories: Customer, Product, and Time. Under Customer, it includes 'Customer Hierarchy (All)', 'Country', 'City', and 'Customer Name'. Under Product, it includes 'Product Hierarchy (All)', 'Product Line', 'Product Vendor', and 'Product Name'. Under Time, it includes 'Time Hierarchy (All)', 'Year', 'Quarter', and 'Month'. There are also 'Add' and 'Delete' buttons for dimensions.

OLAP front-end

- Drag-and-drop
 - drag measures to
 - Measures
 - drag dimensions to
 - Columns
 - Rows
 - Filter

The screenshot shows a user interface for building an OLAP cube. At the top, there's a toolbar with icons for saving, opening, and other operations. Below the toolbar, there are four main sections: 'Measures' (which currently contains 'Orders'), 'Columns' (empty), 'Rows' (empty), and 'Filter' (empty). On the left side, there's a tree view of dimensions:

- Orders**:
 - Sales
 - Quantity
- Dimensions**:
 - Customer**:
 - Customer Hierarchy (All)
 - Country
 - City
 - Customer Name
 - Product**:
 - Product Hierarchy (All)
 - Product Line
 - Product Vendor
 - Product Name
 - Time**:
 - Time Hierarchy (All)
 - Year
 - Quarter
 - Month

Sales by country

The screenshot shows a data analysis tool interface with the following components:

- Cubes:** A dropdown menu showing "Orders".
- Measures:** A list containing "Sales" (circled in red), which is being added to the cube.
- Dimensions:** A list containing:
 - Customer:** "Country" (circled in red) is selected and highlighted in blue. Other options include "Customer Hierarchy", "(All)", "City", and "Customer Name".
 - Product:** "Product Hierarchy", "(All)", "Product Line", "Product Vendor", and "Product Name".
 - Time:** "Time Hierarchy", "(All)", "Year", "Quarter", and "Month".
- Measures:** A list containing "Sales" (circled in red).
- Columns:** An empty list.
- Rows:** A list containing "Country" (circled in red), which is being assigned to the Rows dimension.
- Filter:** An empty list.
- Toolbars:** Standard icons for refresh, save, print, and search.
- Table:** A summary table showing Sales by Country.

Country	Sales
Australia	\$ 630,638.00
Austria	\$ 202,089.00
Belgium	\$ 108,485.00
Canada	\$ 224,085.00
Denmark	\$ 245,582.00
Finland	\$ 329,472.00
France	\$ 1,111,022.00
Germany	\$ 220,354.00
Hong Kong	\$ 48,766.00
Ireland	\$ 57,788.00
Italy	\$ 403,696.00
Japan	\$ 188,212.00
New Zealand	\$ 535,616.00
Norway	\$ 307,332.00
Philippines	\$ 94,007.00
Singapore	\$ 288,413.00
Spain	\$ 1,215,356.00
Sweden	\$ 210,060.00
Switzerland	\$ 117,745.00
UK	\$ 478,720.00
USA	\$ 4,263,627.00

Sales by country and product line

The screenshot shows a data analysis interface with three main sections: Cubes, Measures, and Dimensions.

Cubes: The 'Orders' cube is selected. The 'Measures' section contains 'Sales' (circled in red). The 'Dimensions' section includes 'Customer' (with 'Country' circled in red), 'Product' (with 'Product Line' circled in red), and 'Time' (with 'Year', 'Quarter', and 'Month').

Measures: The 'Sales' measure is selected.

Dimensions: The 'Product Line' dimension is selected.

Table: A grid of sales data by Country and Product Line.

Product Line	Classic Cars	Motorcycles	Planes	Ships	Trains
Country	Sales	Sales	Sales	Sales	Sales
Australia	\$ 193,013.00	\$ 89,892.00	\$ 74,818.00	\$ 4,152.00	\$ 1,683.00
Austria	\$ 101,460.00	\$ 26,060.00	\$ 17,859.00	\$ 9,028.00	-
Belgium	\$ 20,141.00	-	\$ 5,617.00	\$ 31,709.00	\$ 9,016.00
Canada	\$ 61,634.00	\$ 4,182.00	\$ 25,529.00	\$ 40,303.00	-
Denmark	\$ 157,068.00	-	\$ 7,570.00	\$ 38,696.00	\$ 11,482.00
Finland	\$ 153,537.00	\$ 47,839.00	\$ 34,387.00	\$ 29,750.00	\$ 5,136.00
France	\$ 388,888.00	\$ 226,513.00	\$ 108,184.00	\$ 66,485.00	\$ 27,349.00
Germany	\$ 148,201.00	\$ 7,501.00	\$ 23,031.00	\$ 5,484.00	\$ 5,042.00
Hong Kong	-	\$ 3,850.00	\$ 39,617.00	-	-
Ireland	\$ 31,665.00	\$ 4,972.00	\$ 11,785.00	-	\$ 3,130.00
Italy	\$ 133,185.00	\$ 11,632.00	\$ 113,836.00	\$ 17,672.00	\$ 6,260.00
Japan	\$ 47,250.00	\$ 26,564.00	\$ 49,202.00	\$ 18,831.00	\$ 3,541.00
New Zealand	\$ 167,195.00	\$ 99,844.00	\$ 46,633.00	\$ 34,235.00	\$ 8,225.00
Norway	\$ 134,687.00	\$ 51,746.00	\$ 29,513.00	-	\$ 11,316.00
Philippines	\$ 53,075.00	\$ 18,062.00	\$ 20,926.00	-	-
Singapore	\$ 132,768.00	\$ 4,180.00	-	\$ 14,182.00	\$ 13,273.00
Spain	\$ 476,009.00	\$ 74,065.00	\$ 89,966.00	\$ 124,399.00	\$ 43,356.00
Sweden	\$ 69,134.00	\$ 15,540.00	\$ 8,912.00	\$ 30,912.00	\$ 3,808.00
Switzerland	\$ 117,745.00	-	-	-	-
UK	\$ 159,295.00	\$ 40,755.00	\$ 41,187.00	\$ 72,901.00	\$ 12,628.00
USA	\$ 1,344,539.00	\$ 520,554.00	\$ 328,558.00	\$ 209,630.00	\$ 69,417.00

Sales by country, product line and year

Measures		Product Line		Classic Cars	Motorcycles	Planes	Ships	Trains	Trucks and Buses	Vintage Cars
Sales		Country	Year	Sales	Sales	Sales	Sales	Sales	Sales	Sales
		Australia	2003	\$ 85,355.00	\$ 42,337.00	\$ 22,316.00	-	\$ 1,683.00	\$ 11,301.00	\$ 90,133.00
			2004	\$ 76,198.00	\$ 33,077.00	\$ 41,416.00	\$ 1,080.00	-	\$ 36,171.00	\$ 44,325.00
			2005	\$ 31,460.00	\$ 14,478.00	\$ 11,086.00	\$ 3,072.00	-	\$ 29,956.00	\$ 55,194.00
		Austria	2003	\$ 26,647.00	-	\$ 14,221.00	\$ 9,028.00	-	\$ 20,460.00	\$ 11,775.00
			2004	\$ 15,333.00	\$ 26,060.00	\$ 3,638.00	-	-	-	\$ 6,672.00
			2005	\$ 59,480.00	-	-	-	-	-	\$ 8,775.00
		Belgium	2003	-	-	-	-	\$ 1,701.00	-	\$ 1,640.00
			2004	\$ 3,510.00	-	\$ 5,617.00	\$ 31,709.00	\$ 7,315.00	-	\$ 31,942.00
			2005	\$ 16,631.00	-	-	-	-	-	\$ 8,420.00
		Canada	2003	\$ 28,896.00	-	-	-	-	\$ 10,162.00	\$ 15,526.00
			2004	\$ 20,600.00	\$ 4,182.00	\$ 25,529.00	\$ 40,303.00	-	\$ 22,351.00	\$ 22,826.00
			2005	\$ 12,138.00	-	-	-	-	\$ 19,472.00	\$ 2,100.00
		Denmark	2003	\$ 60,756.00	-	-	\$ 20,444.00	\$ 4,332.00	-	\$ 13,673.00
			2004	\$ 70,338.00	-	\$ 7,570.00	\$ 18,252.00	\$ 7,150.00	\$ 9,581.00	\$ 7,512.00
			2005	\$ 25,974.00	-	-	-	-	-	-
		Finland	2003	\$ 33,063.00	-	\$ 23,111.00	\$ 6,388.00	-	\$ 40,469.00	\$ 8,045.00
			2004	\$ 54,255.00	\$ 32,177.00	-	-	\$ 5,136.00	-	-
			2005	\$ 66,219.00	\$ 15,662.00	\$ 11,276.00	\$ 23,362.00	-	-	\$ 10,309.00
		France	2003	\$ 141,215.00	\$ 89,175.00	\$ 19,075.00	\$ 6,660.00	-	\$ 46,057.00	\$ 10,731.00
			2004	\$ 184,359.00	\$ 95,359.00	\$ 29,755.00	\$ 38,747.00	\$ 18,394.00	\$ 40,077.00	\$ 148,502.00
			2005	\$ 63,314.00	\$ 41,979.00	\$ 59,354.00	\$ 21,078.00	\$ 8,955.00	\$ 30,844.00	\$ 17,392.00
		Germany	2003	\$ 55,476.00	\$ 3,139.00	-	-	-	-	\$ 11,424.00
			2004	\$ 92,725.00	\$ 4,362.00	\$ 23,031.00	\$ 5,484.00	\$ 5,042.00	\$ 10,182.00	\$ 9,489.00

Sales by country, product line and year

Measures		Product Line		Classic Cars			Motorcycles			Planes	
		Year	2003	2004	2005	2003	2004	2005	2003	2004	
Sales		Country	Sales	Sales	Sales	Sales	Sales	Sales	Sales	Sales	
		Australia	\$ 85,355.00	\$ 76,198.00	\$ 31,480.00	\$ 42,337.00	\$ 33,077.00	\$ 14,478.00	\$ 22,316.00	\$ 41,416.00	
		Austria	\$ 26,647.00	\$ 15,333.00	\$ 59,480.00	-	\$ 26,060.00	-	\$ 14,221.00	\$ 3,638.00	
		Belgium	-	\$ 3,510.00	\$ 16,631.00	-	-	-	-	\$ 5,617.00	
		Canada	\$ 28,896.00	\$ 20,600.00	\$ 12,138.00	-	\$ 4,182.00	-	-	\$ 25,529.00	
		Denmark	\$ 60,756.00	\$ 70,338.00	\$ 25,974.00	-	-	-	-	\$ 7,570.00	
		Finland	\$ 33,063.00	\$ 54,255.00	\$ 66,219.00	-	\$ 32,177.00	\$ 15,862.00	\$ 23,111.00	-	
		France	\$ 141,215.00	\$ 184,359.00	\$ 63,314.00	\$ 89,175.00	\$ 95,359.00	\$ 41,979.00	\$ 19,075.00	\$ 29,755.00	
		Germany	\$ 55,476.00	\$ 92,725.00	-	\$ 3,139.00	\$ 4,362.00	-	-	\$ 23,031.00	
		Hong Kong	-	-	-	\$ 3,850.00	-	-	\$ 39,617.00	-	
		Ireland	-	\$ 31,665.00	-	-	\$ 4,972.00	-	-	\$ 11,785.00	
		Italy	\$ 43,248.00	\$ 89,937.00	-	\$ 4,046.00	-	\$ 7,586.00	\$ 54,817.00	\$ 28,563.00	
		Japan	-	\$ 28,412.00	\$ 18,838.00	-	\$ 26,564.00	-	-	\$ 49,202.00	
		New Zealand	\$ 29,675.00	\$ 71,433.00	\$ 66,087.00	\$ 18,450.00	\$ 30,037.00	\$ 51,357.00	\$ 20,375.00	\$ 26,258.00	
		Norway	\$ 121,028.00	\$ 13,659.00	-	\$ 31,973.00	\$ 19,773.00	-	\$ 3,944.00	\$ 25,569.00	
		Philippines	\$ 42,572.00	\$ 10,503.00	-	\$ 12,630.00	\$ 5,432.00	-	\$ 20,926.00	-	
		Singapore	\$ 78,033.00	\$ 54,735.00	-	-	-	\$ 4,180.00	-	-	
		Spain	\$ 129,713.00	\$ 209,484.00	\$ 136,812.00	\$ 13,647.00	\$ 21,284.00	\$ 39,734.00	\$ 21,557.00	\$ 41,496.00	
		Sweden	\$ 13,161.00	\$ 39,944.00	\$ 16,029.00	-	-	\$ 15,540.00	\$ 8,912.00	-	
		Switzerland	-	\$ 117,745.00	-	-	-	-	-	-	
		UK	\$ 66,636.00	\$ 92,659.00	-	-	-	\$ 40,755.00	\$ 8,990.00	\$ 32,197.00	
		USA	\$ 558,524.00	\$ 560,410.00	\$ 225,605.00	\$ 178,145.00	\$ 287,353.00	\$ 55,056.00	\$ 90,063.00	\$ 177,503.00	

Quantity by product line and year

The screenshot shows a user interface for a data analysis tool. On the left, there is a sidebar with the following sections:

- Orders**: A dropdown menu.
- Measures**: A list with "Add" button. "Quantity" is selected and highlighted with a red oval.
- Dimensions**:
 - Orders**: "Sales" and "Quantity" are listed, with "Quantity" highlighted with a red oval.
 - Customer**: "Customer Hierarchy" is expanded, showing "(All)", "Country", "City", and "Customer Name".
 - Product**: "Product Hierarchy" is expanded, showing "(All)", "Product Line", "Product Vendor", and "Product Name". "Product Line" is highlighted with a red oval.
 - Time**: "Time Hierarchy" is expanded, showing "(All)", "Year", "Quarter", and "Month". "Year" is highlighted with a red oval.

In the center, there are four main sections:

- Measures**: A dropdown menu with "Quantity" selected and highlighted with a red oval.
- Columns**: A dropdown menu with "Year" selected and highlighted with a red oval.
- Rows**: A dropdown menu with "Product Line" selected and highlighted with a red oval.
- Filter**: An empty dropdown menu.

Year	2003	2004	2005
Product Line	Quantity	Quantity	Quantity
Classic Cars	12,762	16,085	6,705
Motorcycles	4,031	5,906	2,771
Planes	3,833	5,820	2,207
Ships	2,844	4,309	1,346
Trains	1,000	1,409	409
Trucks and Buses	4,056	5,024	1,921
Vintage Cars	10,003	10,864	4,116

Quantity and sales by product line and year

Measures ▾

Quantity

Sales

Columns ▾

Time Hierarchy

Year

Rows ▾

Product Hierarchy

Product Line

Filter ▾

Year	2003		2004		2005	
Product Line	Quantity	Sales	Quantity	Sales	Quantity	Sales
Classic Cars	12,762	\$ 1,513,998.00	16,085	\$ 1,837,904.00	6,705	\$ 738,587.00
Motorcycles	4,031	\$ 397,392.00	5,906	\$ 590,632.00	2,771	\$ 286,327.00
Planes	3,833	\$ 347,924.00	5,820	\$ 529,129.00	2,207	\$ 200,077.00
Ships	2,844	\$ 244,652.00	4,309	\$ 375,498.00	1,346	\$ 128,219.00
Trains	1,000	\$ 72,857.00	1,409	\$ 124,885.00	409	\$ 36,920.00
Trucks and Buses	4,056	\$ 420,523.00	5,024	\$ 532,024.00	1,921	\$ 201,903.00
Vintage Cars	10,003	\$ 1,315,089.00	10,864	\$ 997,708.00	4,116	\$ 388,817.00

Quantity and sales by product line, country and year

Measures

- Quantity
- Sales

Columns

- Time Hierarchy
- Year

Rows

- Product Hierarchy
- Product Line
- Customer Hierarchy
- Country

Filter

		Year	2003		2004		2005	
Product Line	Country	Quantity	Sales	Quantity	Sales	Quantity	Sales	
Classic Cars	Australia	763	\$ 85,355.00	644	\$ 76,198.00	411	\$ 31,460.00	
	Austria	248	\$ 26,647.00	180	\$ 15,333.00	509	\$ 59,480.00	
	Belgium	-	-	30	\$ 3,510.00	117	\$ 16,631.00	
	Canada	225	\$ 28,896.00	147	\$ 20,600.00	84	\$ 12,138.00	
	Denmark	478	\$ 60,756.00	592	\$ 70,338.00	174	\$ 25,974.00	
	Finland	280	\$ 33,063.00	388	\$ 54,255.00	616	\$ 66,219.00	
	France	1,210	\$ 141,215.00	1,704	\$ 184,359.00	626	\$ 63,314.00	
	Germany	525	\$ 55,476.00	756	\$ 92,725.00	-	-	
	Ireland	-	-	202	\$ 31,665.00	-	-	
	Italy	304	\$ 43,248.00	678	\$ 89,937.00	-	-	
	Japan	-	-	192	\$ 28,412.00	122	\$ 18,838.00	
	New Zealand	289	\$ 29,675.00	633	\$ 71,433.00	604	\$ 66,087.00	
	Norway	1,001	\$ 121,028.00	157	\$ 13,659.00	-	-	
	Philippines	391	\$ 42,572.00	87	\$ 10,503.00	-	-	
	Singapore	507	\$ 78,033.00	536	\$ 54,735.00	-	-	
Motorcycles	Spain	1,072	\$ 129,713.00	2,070	\$ 209,484.00	1,238	\$ 136,812.00	
	Sweden	73	\$ 13,161.00	296	\$ 39,944.00	183	\$ 16,029.00	
	Switzerland	-	-	1,078	\$ 117,745.00	-	-	
	UK	682	\$ 66,636.00	845	\$ 92,659.00	-	-	
	USA	4,734	\$ 558,524.00	4,870	\$ 560,410.00	2,021	\$ 225,605.00	
Motorcycles	Australia	431	\$ 42,337.00	324	\$ 33,077.00	121	\$ 14,478.00	
	Austria	-	-	197	\$ 26,060.00	-	-	
	Canada	-	-	41	\$ 4,182.00	-	-	
	Finland	-	-	301	\$ 32,177.00	146	\$ 15,662.00	

Quantity and sales by product line, country and quarter

Measures

Quantity
Sales

Columns

Time Hierarchy

Year
Quarter

Rows

Product Hierarchy

Product Line

Customer Hierarchy

Country

Filter

Year

Quarter

Product Line

Country

Filter

		Year	2003							
		Quarter	Q1		Q2		Q3		Q4	
Product Line	Country	Quantity	Sales	Quantity	Sales	Quantity	Sales	Quantity	Sales	
Classic Cars	Australia	-	-	-	-	479	\$ 52,520.00	284	\$ 32,835.00	
	Austria	-	-	46	\$ 5,014.00	-	-	202	\$ 21,633.00	
	Belgium	-	-	-	-	-	-	-	-	
	Canada	-	-	-	-	-	-	225	\$ 28,896.00	
	Denmark	120	\$ 20,445.00	-	-	-	-	358	\$ 40,311.00	
	Finland	-	-	-	-	248	\$ 28,551.00	32	\$ 4,512.00	
	France	-	-	780	\$ 83,884.00	240	\$ 32,409.00	190	\$ 24,922.00	
	Germany	-	-	-	-	-	-	525	\$ 55,476.00	
	Ireland	-	-	-	-	-	-	-	-	
	Italy	-	-	-	-	-	-	304	\$ 43,248.00	
	Japan	-	-	-	-	-	-	-	-	
	New Zealand	-	-	-	-	196	\$ 19,434.00	93	\$ 10,241.00	
	Norway	110	\$ 15,278.00	-	-	-	-	891	\$ 105,750.00	
	Philippines	391	\$ 42,572.00	-	-	-	-	-	-	
	Singapore	-	-	137	\$ 20,630.00	85	\$ 16,280.00	285	\$ 41,123.00	
Motorcycles	Spain	224	\$ 25,915.00	105	\$ 15,268.00	111	\$ 17,332.00	632	\$ 71,198.00	
	Sweden	29	\$ 7,221.00	-	-	-	-	44	\$ 5,940.00	
	Switzerland	-	-	-	-	-	-	-	-	
	UK	297	\$ 27,795.00	33	\$ 4,389.00	-	-	332	\$ 34,452.00	
	USA	212	\$ 27,419.00	636	\$ 79,050.00	1,080	\$ 132,984.00	2,806	\$ 319,071.00	
	Australia	-	-	212	\$ 23,448.00	-	-	219	\$ 18,889.00	
	Austria	-	-	-	-	-	-	-	-	
	Canada	-	-	-	-	-	-	-	-	
	Finland	-	-	-	-	-	-	-	-	

Quantity and sales by product line, country and month

Measures

Quantity
Sales

Columns

Time Hierarchy

Year
Quarter
Month

Rows

Product Hierarchy

Product Line

Customer Hierarchy

Country

Filter

Year

Quarter

Month

Product Line

Country

Filter

		Year								
		Quarter	Q1							
		Month	Jan		Feb		Mar		Apr	
Product Line	Country	Quantity	Sales	Quantity	Sales	Quantity	Sales	Quantity	Sales	Quantity
Classic Cars	Australia	-	-	-	-	-	-	-	-	-
	Austria	-	-	-	-	-	-	-	46	\$ 5,014.00
	Belgium	-	-	-	-	-	-	-	-	-
	Canada	-	-	-	-	-	-	-	-	-
	Denmark	-	-	120	\$ 20,445.00	-	-	-	-	-
	Finland	-	-	-	-	-	-	-	-	-
	France	-	-	-	-	-	-	-	145	\$ 17,983.00
	Germany	-	-	-	-	-	-	-	-	-
	Ireland	-	-	-	-	-	-	-	-	-
	Italy	-	-	-	-	-	-	-	-	-
Motorcycles	Japan	-	-	-	-	-	-	-	-	-
	New Zealand	-	-	-	-	-	-	-	-	-
	Norway	110	\$ 15,278.00	-	-	-	-	-	-	-
	Philippines	-	-	-	-	391	\$ 42,572.00	-	-	-
	Singapore	-	-	-	-	-	-	-	137	\$ 20,630.00
	Spain	224	\$ 25,915.00	-	-	-	-	-	-	-
	Sweden	-	-	-	-	29	\$ 7,221.00	-	-	-
	Switzerland	-	-	-	-	-	-	-	-	-
	UK	-	-	-	-	297	\$ 27,795.00	-	-	-
	USA	-	-	-	-	212	\$ 27,419.00	137	\$ 16,191.00	-