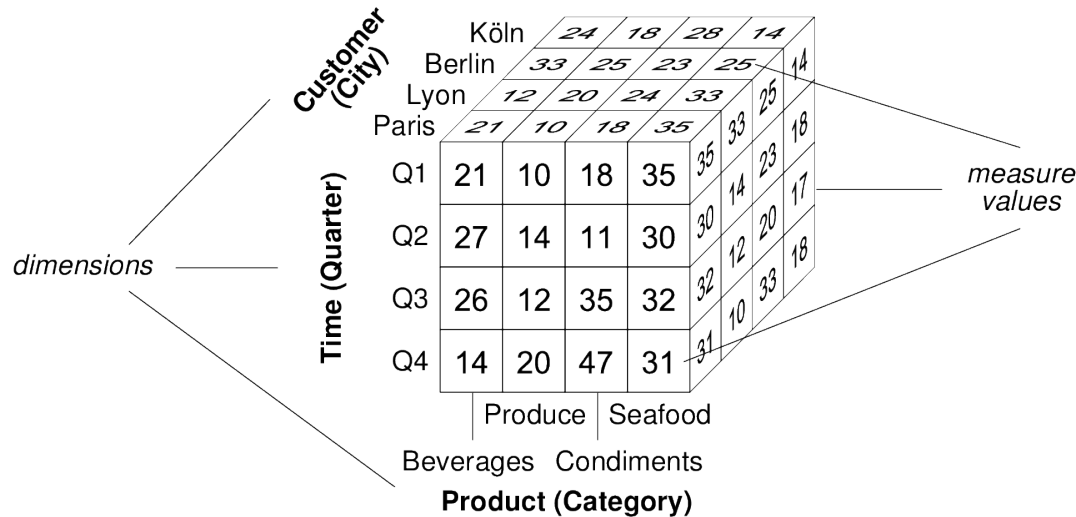


Data Analysis and Integration

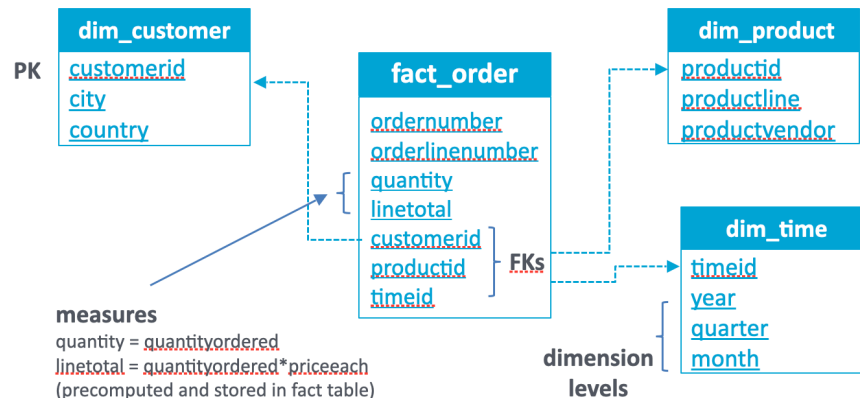
Defining the OLAP cube

Introduction

OLAP cube
OLAP server
MDX queries



DW tables
database system
SQL queries



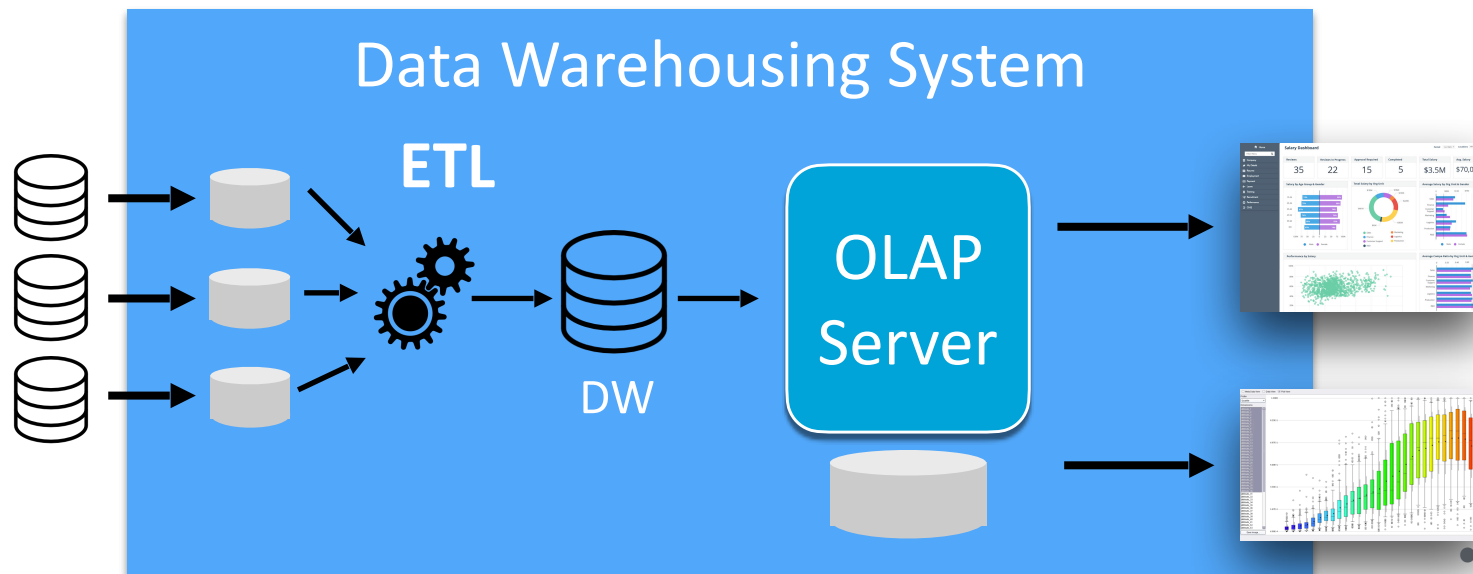
OLAP cube
definition
(XML)

The OLAP Server

OLAP Server

- Apache Kylin
- Essbase
- Microstrategy
- Microsoft Analysis Services
- **Pentaho Mondrian**

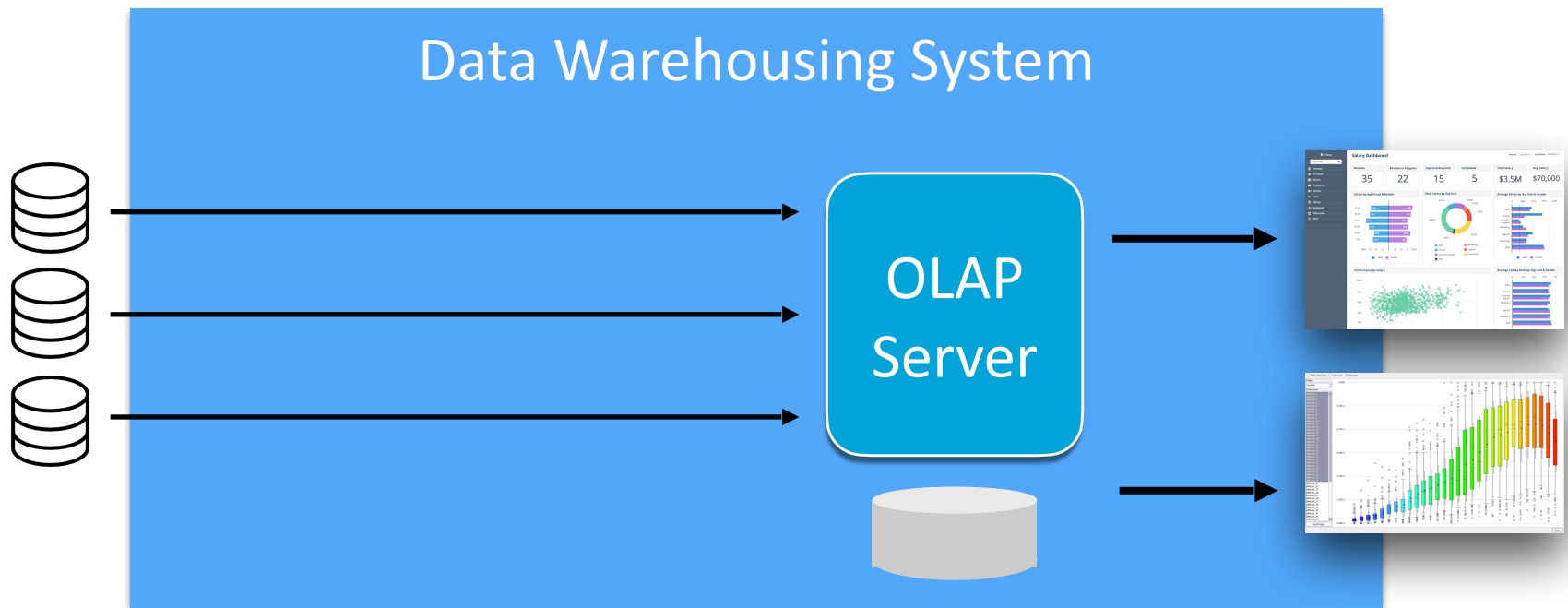
Mapping from an integrated multidimensional model



- Tableau
- Power BI
- **Saiku Analytics**
- Metabase
- Microsoft Excel
- ...

OLAP Server

Direct mapping from data sources (operational systems)



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?

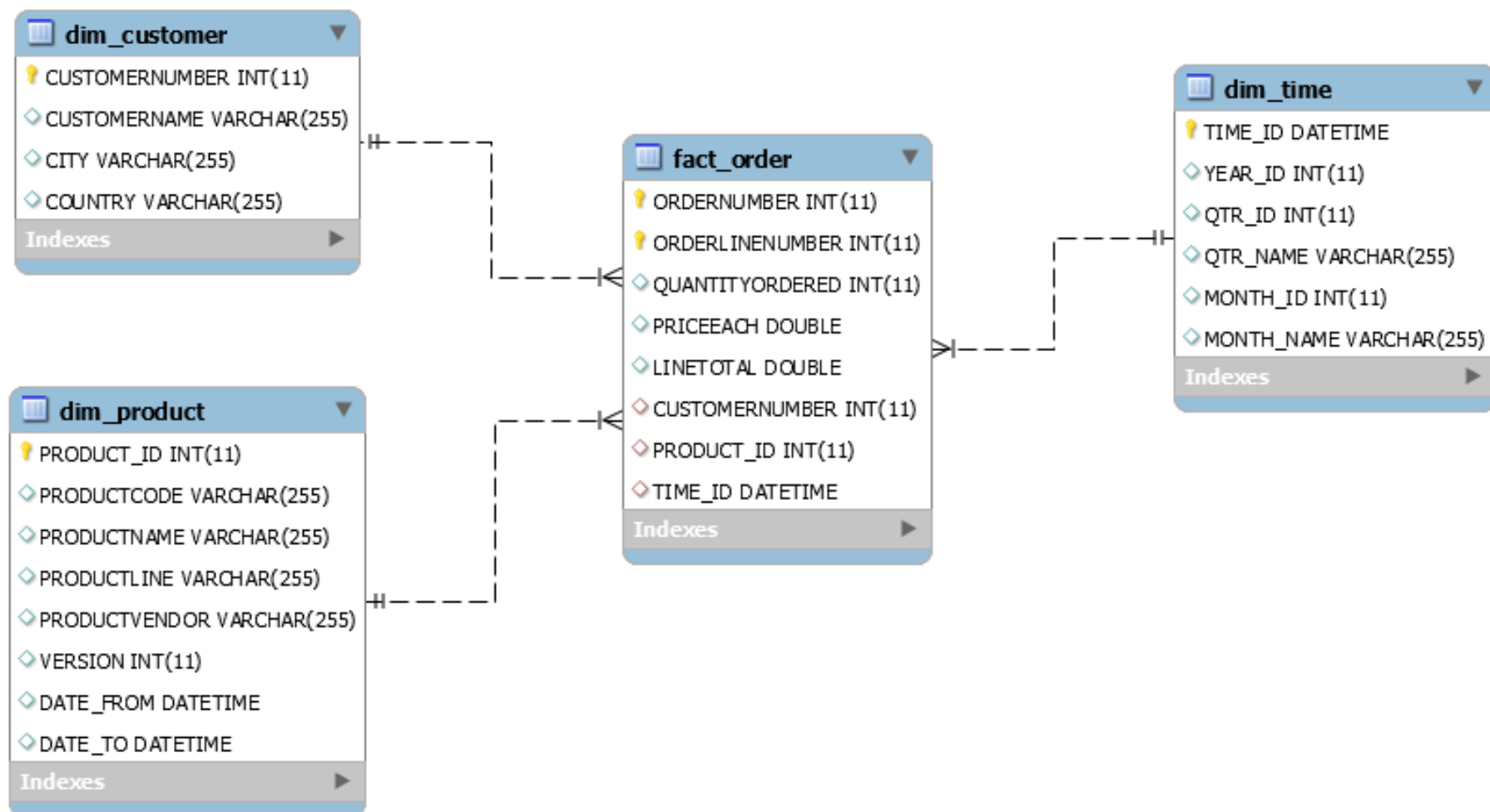
Defining OLAP cubes

OLAP server - XMLA (XML for Analysis)

- Cube definition 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"
    foreignKey="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"
            foreignKey="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"
    foreignKey="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>
```

Pentaho Schema Workbench

OLAP cube

- Pentaho Schema Workbench (PSW)

Dimension definition

The screenshot shows the Pentaho Schema Workbench (PSW) interface. The main window is titled 'Schema Workbench' and contains a menu bar (File, Edit, View, Options, Windows, Help) and a toolbar. The central area displays a tree view of the schema 'Schema - steelwheels_dw (steelwheels_dw.xml)'. The tree shows a cube 'Orders' with a fact table 'fact_order' and two dimensions: 'Customer' and 'Product'. The 'Customer' dimension is selected, and its properties are shown in the right pane. The right pane is titled 'Dimension for 'Orders' Cube' and contains a table with the following data:

Attribute	Value
name	Customer
description	
foreignKey	CUSTOMERNUMBER
type	StandardDimension
usagePrefix	
caption	
visible	<input checked="" type="checkbox"/>

The bottom status bar indicates the database is 'steelwheels_dw (MySQL)'.

OLAP cube

- Pentaho Schema Workbench (PSW)

Measure definition

Schema Workbench

File Edit View Options Windows Help

Schema - steelwheels_dw (steelwheels_dw.xml)

Measure for 'Orders' Cube

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

Database - steelwheels_dw (MySQL)

OLAP cube

- Cube definition is the input to OLAP server
 - Mondrian is an OLAP server that can understand such XML cube definitions
 - Mondrian server is a JAR file that can be loaded from 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

Pentaho Analytics

OLAP Front-End - Saiku Analytics

The screenshot shows the Pentaho Business Analytics web interface. At the top is a browser window with the address bar showing 'localhost:8080/pentaho/Home'. Below the browser window is a navigation bar with 'File', 'View', 'Tools', and 'Help' menus. The main content area is divided into two columns. The left column contains four buttons: 'Browse Files', 'Create New', 'Manage Data Sources' (highlighted in red), and 'Documentation'. Below these buttons is a section titled 'Recents' which contains a message: 'You haven't opened anything recently. Browse your files.' and a 'Browse Files' button. The right column contains the title 'Pentaho Business Analytics' followed by a horizontal line, then the text 'Get help and contribute with your knowledge. Find here some ways how you can do it.' At the bottom right are two buttons: 'Documentation' and 'Forums'.

localhost:8080/pentaho/Home

File View Tools Help

Home ▾

Browse Files

Create New

Manage Data Sources

Documentation

Recents

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

Browse Files

Pentaho Business Analytics

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

Documentation Forums

OLAP Front-End

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

The screenshot displays two panels from the OLAP Front-End interface. The 'Database Connection' panel on the left has a sidebar with 'General', 'Advanced', 'Options', and 'Pooling'. The 'General' tab is active, showing fields for 'Connection Name' (steelwheels_dw), 'Database Type' (MySQL selected), 'Settings' (Host Name: localhost, Database Name: steelwheels_dw, Port Number: 3306), and 'Access' (Native (JDBC) selected). A link 'Adding Databases ?' is visible. The 'Import Analysis' panel on the right shows 'Mondrian File' (steelwheels_dw.xml), a radio button selection for 'Select from available data sources' (which is selected), and a 'Data Source' dropdown menu showing 'steelwheels_dw'. A dashed blue arrow connects the 'steelwheels_dw' connection name in the 'Database Connection' panel to the 'steelwheels_dw.xml' file in the 'Import Analysis' panel.

Database Connection

General
Advanced
Options
Pooling

Connection Name:
steelwheels_dw

Database Type:
Generic database
H2
Hypersonic
MonetDB
MySQL
Pentaho Data Services
PostgreSQL
Snowflake

Adding Databases ?

Access:
Native (JDBC)
ODBC
JNDI

Settings
Host Name:
localhost
Database Name:
steelwheels_dw
Port Number:
3306
User Name:
aid
Password:
...

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



New Data Source

Datasource	Type
steelwheels_dw	Analysis
steelwheels_dw	JDBC

OLAP Front-End

- Creating a new query

The screenshot displays the Pentaho Business Analytics web interface. At the top, a browser address bar shows 'localhost:8080/pentaho/Home'. Below it is a navigation bar with 'File', 'View', 'Tools', and 'Help' menus. The 'File' menu is open, showing options like 'New', 'Open...', 'Manage Data Sources...', 'Recent', 'Favorites', 'Save', 'Save As...', and 'Log Out'. A sub-menu for 'Saiku Analytics' is also visible, containing 'CDE Dashboard' and 'Data Source'. The main dashboard area features four large buttons: 'Browse Files', 'Create New', 'Manage Data Sources', and 'Documentation'. To the right, a section titled 'Pentaho Business Analytics' provides a brief introduction and links to 'Documentation' and 'Forums'. Below the main buttons, a 'Recents' section indicates that no files have been opened recently and provides a 'Browse Files' button.

localhost:8080/pentaho/Home

File View Tools Help

New > Saiku Analytics

Open... CDE Dashboard

Manage Data Sources... Data Source

Recent >

Favorites >

Save

Save As...

Log Out

Browse Files

Create New

Manage Data Sources

Documentation

Pentaho Business Analytics

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

Documentation Forums

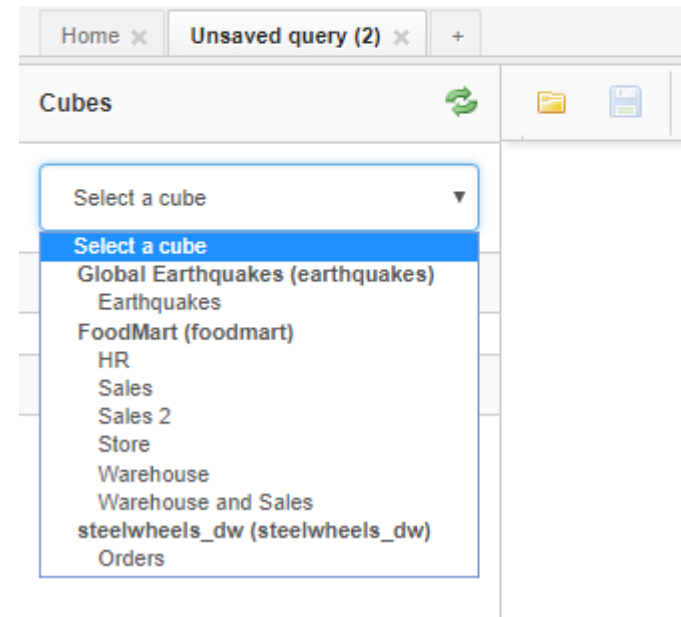
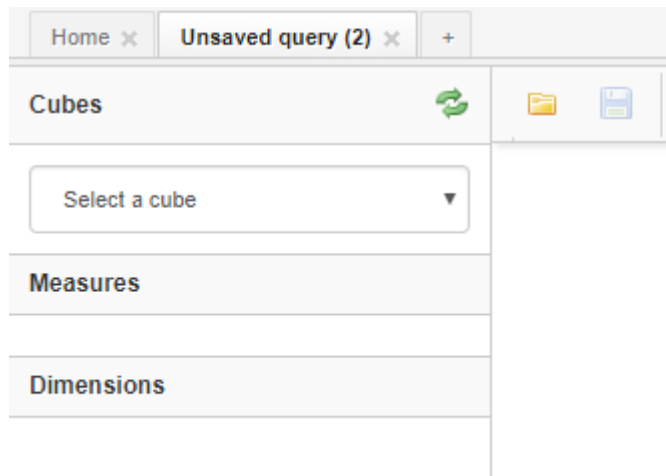
Recents

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

Browse Files

OLAP Front-End

- 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



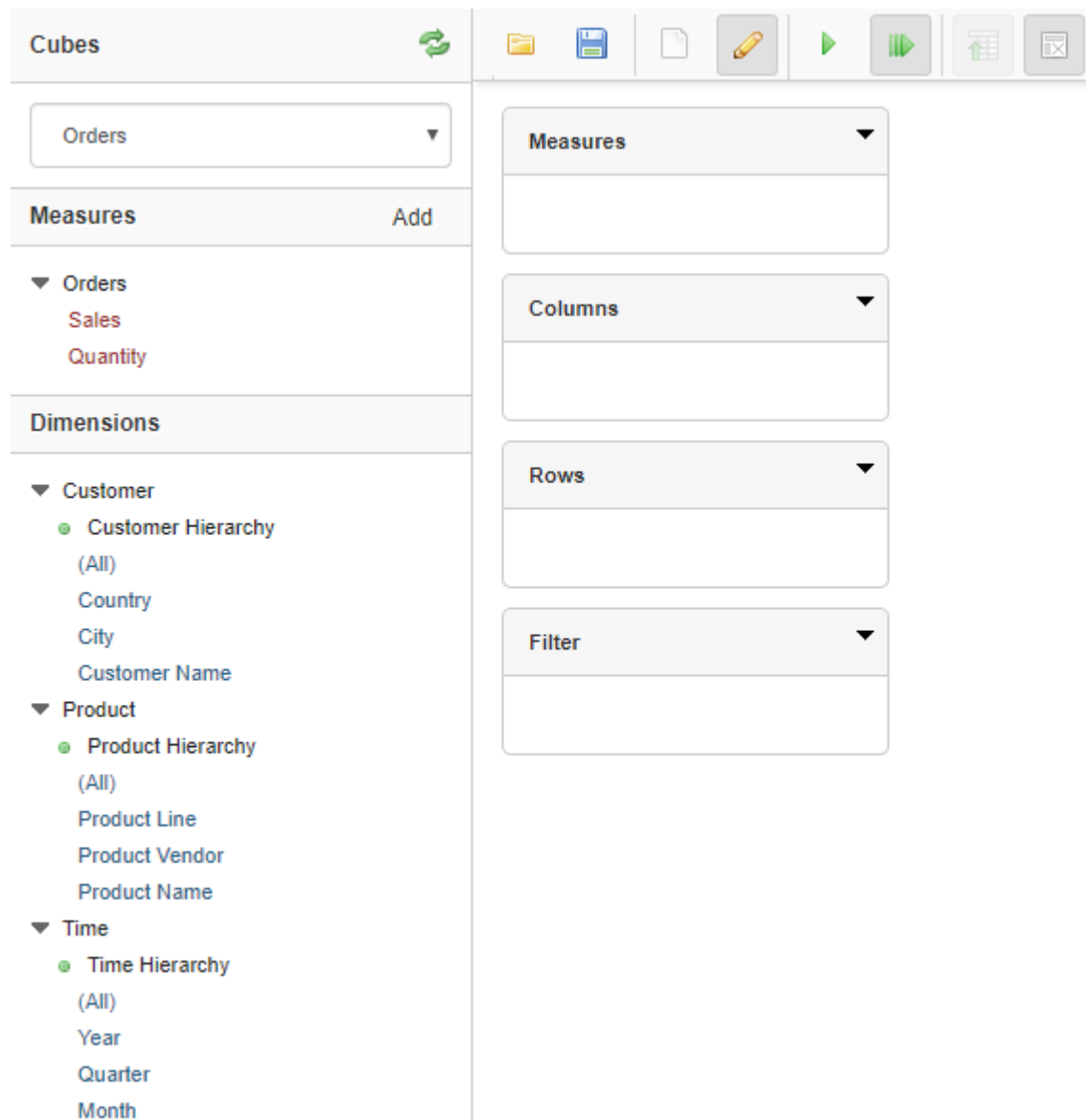
OLAP Front-End

- Cube
 - measures
 - dimensions
 - hierarchies
 - levels

The screenshot displays a web-based OLAP front-end interface. On the left, a sidebar contains three main sections: 'Cubes', 'Measures', and 'Dimensions'. The 'Cubes' section has a dropdown menu currently set to 'Orders'. The 'Measures' section includes an 'Add' button. The 'Dimensions' section is expanded, showing three categories: 'Customer', 'Product', and 'Time'. Each category has a green radio button next to its hierarchy name (e.g., 'Customer Hierarchy') and a list of levels (e.g., '(All)', 'Country', 'City', 'Customer Name' for Customer). On the right side of the interface, there is a toolbar with icons for file operations (folder, save, document, edit) and execution (play, multiple play, refresh, close). Below the toolbar are five large, empty rectangular boxes with dropdown arrows, labeled 'Measures', 'Columns', 'Rows', and 'Filter' from top to bottom.

OLAP Front-End

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



Sales by Country

The screenshot shows a BI tool interface with the following components:

- Cubes:** A dropdown menu showing 'Orders'.
- Measures:** A section with an 'Add' button and a list containing 'Sales' (circled in blue). A blue arrow points from 'Sales' in the Measures list to the 'Sales' measure in the Measures pane.
- Dimensions:** A section with a list of dimensions under various categories:
 - Customer:** Customer Hierarchy (All), **Country** (circled in blue), City, Customer Name. A blue arrow points from 'Country' in the list to the 'Country' dimension in the Rows pane.
 - Product:** Product Hierarchy (All), Product Line, Product Vendor, Product Name.
 - Time:** Time Hierarchy (All), Year, Quarter, Month.
- Rows:** A section with a dropdown menu showing 'Customer Hierarchy' and a list containing 'Country' (circled in blue).
- Filter:** A section with a dropdown menu.
- Table:** A table on the right showing the results of the query, with columns 'Country' and 'Sales'.

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	\$ 210,080.00
Switzerland	\$ 117,745.00
UK	\$ 478,720.00
USA	\$ 4,263,627.00

Sales by country and product line

Cubes

Orders

Measures

▼ 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

Measures

Sales

Columns

Product Line

Rows

Country

Filter

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	\$ 74,665.00	\$ 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

Sales

Columns

Product Hierarchy
Product Line

Rows

Customer Hierarchy
Country
Time Hierarchy
Year

Filter

Product Line		Classic Cars	Motorcycles	Planes	Ships	Trains	Trucks and Buses	Vintage Cars
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

Sales

Columns

Product Hierarchy
Product Line

Time Hierarchy
Year

Rows

Customer Hierarchy
Country

Filter

As column

Product Line	Classic Cars			Motorcycles			Planes	
Year	2003	2004	2005	2003	2004	2005	2003	2004
Country	Sales	Sales	Sales	Sales	Sales	Sales	Sales	Sales
Australia	\$ 85,355.00	\$ 76,198.00	\$ 31,460.00	\$ 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	\$ 15,662.00	\$ 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 BI tool interface with the following configuration:

- Measures:** Quantity
- Columns:** Year
- Rows:** Product Line

The Dimensions pane shows a tree structure with the following items highlighted:

- 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

The resulting data table is as follows:

	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 show up side-by-side

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	-	-
	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	662	\$ 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		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
	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
Motorcycles	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		Q1							
Month		Jan		Feb		Mar		Apr	
Product Line	Country	Quantity	Sales	Quantity	Sales	Quantity	Sales	Quantity	Sales
Classic Cars	Australia	-	-	-	-	-	-	-	-
	Austria	-	-	-	-	-	-	46	\$ 5,014.00
	Belgium	-	-	-	-	-	-	-	-
	Canada	-	-	-	-	-	-	-	-
	Denmark	-	-	120	\$ 20,445.00	-	-	-	-
	Finland	-	-	-	-	-	-	-	-
	France	-	-	-	-	-	-	145	\$ 17,983.00
	Germany	-	-	-	-	-	-	-	-
	Ireland	-	-	-	-	-	-	-	-
	Italy	-	-	-	-	-	-	-	-
	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
Motorcycles	Australia	-	-	-	-	-	-	212	\$ 23,448.00
	Austria	-	-	-	-	-	-	-	-
	Canada	-	-	-	-	-	-	-	-