Pentaho Data Integration User Guide

This document supports Pentaho Business Analytics Suite 4.8 GA and Pentaho Data Integration 4.4 GA, documentation revision October 31, 2012.

Help and Support Resources

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Introduction

Pentaho Data Integration is a flexible tool that allows you to collect data from disparate sources such as databases, files, and applications, and turn the data into a unified format that is accessible and relevant to end users. Pentaho Data Integration provides the Extraction, Transformation, and Loading (ETL) engine that facilitates the process of capturing the right data, cleansing the data, and storing the data using a uniform and consistent format.

Pentaho Data Integration provides support for slowly changing dimensions, (see Note below), and surrogate key for data warehousing, allows data migration between databases and application, is flexible enough to load giant datasets, and can take full advantage of cloud, clustered, and massively parallel processing environments. You can cleanse your data using transformation steps that range from very simple to very complex. Finally, you can leverage ETL as the data source for Pentaho Reporting.

Note: Dimension is a data warehousing term that refers to logical groupings of data such as product, customer, or geographical information. **Slowly Changing Dimensions** (SCD) are dimensions that contain data that changes slowly over time. For example, in most instances, employee job titles change slowly over time.

Common Uses of Pentaho Data Integration Include:

- Data migration between different databases and applications
- Loading huge data sets into databases taking full advantage of cloud, clustered and massively parallel processing environments
- Data Cleansing with steps ranging from very simple to very complex transformations
- Data Integration including the ability to leverage real-time ETL as a data source for Pentaho Reporting
- Data warehouse population with built-in support for slowly changing dimensions and surrogate key creation (as described above)

Audience and Assumptions

This guide is written for IT managers, database administrators, and Business Intelligence solution architects who have intermediate to advanced knowledge of ETL and Pentaho Data Integration Enterprise Edition features and functions.

You must have installed Pentaho Data Integration to examine some of the step-related information included in this document.

If you are novice user, Pentaho recommends that you start by following the exercises in *Getting Started with Pentaho Data Integration* available in the Pentaho InfoCenter. You can return to this document when you have mastered some of the basic skills required to work with Pentaho Data Integration.

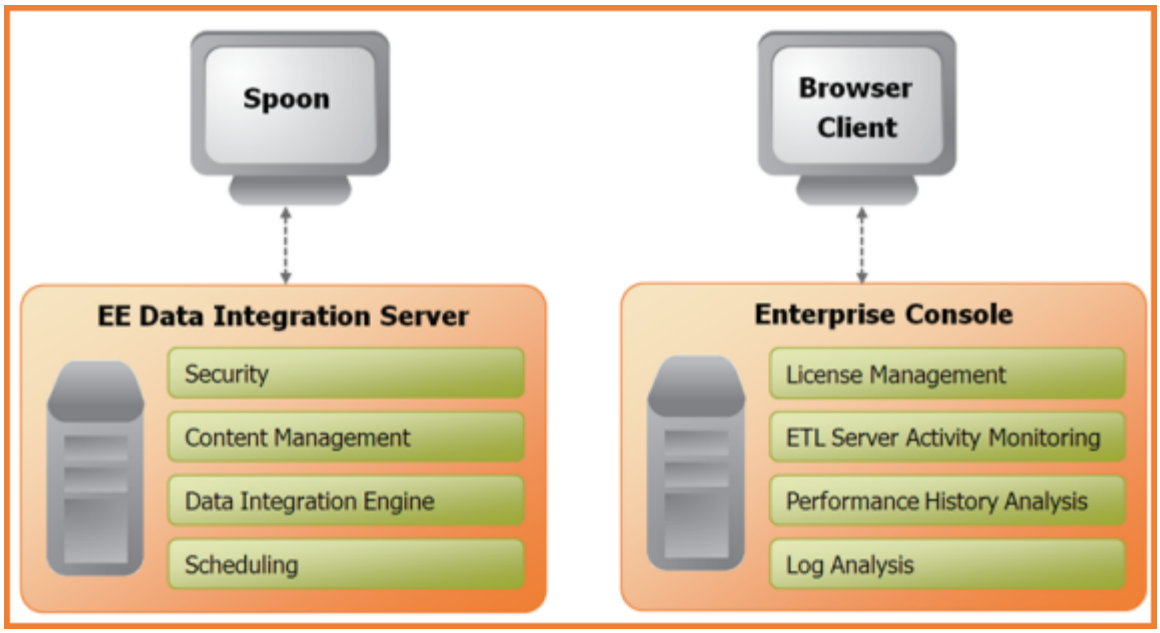
What this Guide Covers

This document provides you with information about the most *commonly used* steps. There are over 140 transformation steps included in Pentaho Data Integration. Future versions of this guide will include more coverage of PDI steps. Also included in this document is information about step performance, PDI architecture, using and managing variables, and more.

Refer to the *Pentaho Data Integration Administrator's Guide* and the *Pentaho Security Guide* for information about administering Pentaho Data Integration and configuring security related to LDAP and MSAD, respectively.

Pentaho Data Integration Architecture

The diagram below depicts the the core components of Pentaho Data Integration Enterprise Edition



Spoon is the design interface for building ETL jobs and transformations. Spoon provides a drag and drop interface allowing you to graphically describe what you want to take place in your transformations which can then be executed locally within Spoon, on a dedicated Data Integration Server, or a cluster of servers.

The **Data Integration Server** is a dedicated ETL server whose primary functions are:

Execution	Executes ETL jobs and transformations using the Pentaho Data Integration engine
Security	Allows you to manage users and roles (default security) or integrate security to your existing security provider such as LDAP or Active Directory
Content Management	Provides a centralized repository that allows you to manage your ETL jobs and transformations. This includes full revision history on content and features such as sharing and locking for collaborative development environments.
Scheduling	Provides the services allowing you to schedule and monitor activities on the Data Integration Server from within the Spoon design environment.

The **Enterprise Console** provides a thin client for managing deployments of Pentaho Data Integration Enterprise Edition including management of Enterprise Edition licenses, monitoring and controlling activity on a remote Pentaho Data Integration server and analyzing performance trends of registered jobs and transformations.

Pentaho Data Integration Components

Pentaho Data Integration is composed of the following primary components:

- **Spoon.** Introduced earlier, Spoon is a desktop application that uses a graphical interface and editor for transformations and jobs. Spoon provides a way for you to create complex ETL jobs without having to read or write code. When you think of Pentaho Data Integration as a product, Spoon is what comes to mind because, as a database developer, this is the application on which you will spend most of your time. Any time you author, edit, run or debug a transformation or job, you will be using Spoon.

- **Pan.** A standalone command line process that can be used to execute transformations and jobs you created in Spoon. The data transformation engine Pan reads data from and writes data to various data sources. Pan also allows you to manipulate data.
- **Kitchen.** A standalone command line process that can be used to execute jobs. The program that executes the jobs designed in the Spoon graphical interface, either in XML or in a database repository. Jobs are usually scheduled to run in batch mode at regular intervals.
- **Carte**. Carte is a lightweight Web container that allows you to set up a dedicated, remote ETL server. This provides similar remote execution capabilities as the Data Integration Server, but does not provide scheduling, security integration, and a content management system.

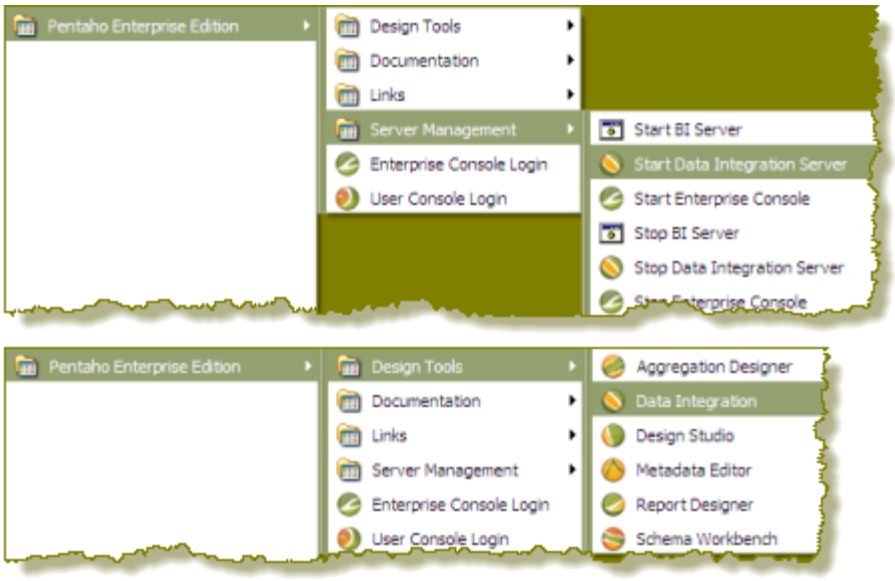
What's with all the Culinary Terms?

If you are new to Pentaho, you may sometimes see or hear Pentaho Data Integration referred to as, "Kettle." To avoid confusion, all you must know is that Pentaho Data Integration began as an open source project called. "Kettle." The term, K.E.T.T.L.E is a recursive that stands for **K**ettle **E**xtraction **T**ransformation **T**ransport **L**oad **E**nvironment. When Pentaho acquired Kettle, the name was changed to **Pentaho Data Integration**. Other PDI components such as Spoon, Pan, and Kitchen, have names that were originally meant to support a "restaurant" metaphor of ETL offerings.

Starting Pentaho Data Integration

The root directory of your Pentaho Data Integration installation, **\pdi-ee**, contains a set of scripts that make it convenient to start or stop all of the core server modules including the **Data Integration Server** and **Enterprise Console**.

If you are using Pentaho Data Integration as part of a BI Server installation in Windows, use **Start** -> **Programs** to launch the BI and Data Integration servers and the design tool (Data Integration/Spoon).



File paths will also be different depending on which method of installation was used. File paths associated with the installer, look like the following examples: ... \pentaho\server\data-integration-server, ...\pentaho\design-tools\data-integration.

File paths associated with a .zip or .tar installation look like the following example: ...\pdi-ee\data-integration.

Starting the Pentaho Data Integration Servers

To start Pentaho Data Integration servers...

1. Navigate to the folder where you have installed Pentaho Data Integration; for example, `...\Program Files\pdi-ee`.
2. Double-click **start-servers.bat** to start the servers.

Note: If you are using Linux or Macintosh, double-click **start-servers.sh**.

Starting Spoon

Follow the directions below to start Spoon, the Pentaho Data Integration graphical client tool.

1. Navigate to the folder where you have installed Pentaho Data Integration.

```
cd /pentaho/design-tools/data-integration/
```

2. Execute the **Spoon.bat** script (Windows) or **spoon.sh** (Linux, OS X) to start Spoon.

The Data Integration client tool will start. If you have not installed an Enterprise Edition license key, you will be prompted to do so.

Installing and Managing Enterprise Edition License Keys

If you do not have a valid PDI Enterprise Edition license key installed, Spoon will display a license management dialog box where you can view or remove existing Pentaho licenses, and install new ones. Expired licenses are displayed with a red mark to the left of the license title; valid licenses display a green checkmark.

To remove a license, select it, then click the red **X** in the upper right corner of the license list.

To add a license, click the round green **+** icon in the upper right corner of the window, then navigate to your Pentaho PDI Enterprise Edition. Only files with a .LIC extension will appear in the file dialogue.

You can also view, install, or remove licenses through the Pentaho Enterprise Console, or via the command line with the **install_license** script in the `/license-installer/` directory.

If you want to go to the PDI license manager in the future, start Spoon and go to the **Help** menu, then select **Register**.

Connecting to the Repository

Each time you launch the designer (Spoon), the Repository Connection dialog box appears requesting you to log into the Pentaho Enterprise Repository. The Pentaho Enterprise Repository provides you a place to centrally store ETL jobs and transformations. Before you begin, you must have a user name and password to access the repository.

Note: In a production environment, user access to Pentaho Data Integration is most likely established using LDAP or a custom authentication server. See the *Pentaho Security Guide* for information regarding LDAP and MSAD setup for Pentaho Data Integration.

If you do not want to see the Repository Connection dialog box every time you open the designer, disable the **Show this dialog at startup** check box.

To create a connection to the Enterprise Repository...

1. In the **Repository Connection** dialog box, click  (Add).
2. Select **Enterprise Repository:Enterprise Repository** and click **OK**.
   The **Repository Configuration** dialog box appears.
3. Enter the URL associated with your repository. Enter and ID and name for your repository.
4. Click **Test** to ensure your connection is properly configured. If you see an error message, make sure you started your *Data Integration Server* and that the **Repository URL** is correct.
5. Click **OK** to exit the **Success** dialog box.
6. Click **OK** to exit the Repository Configuration dialog box.
   Your new connection appears in the list of available repositories.
7. Enter your credentials, user name and password, for the Pentaho Enterprise Repository and click **OK**

Storing Content Alternatives

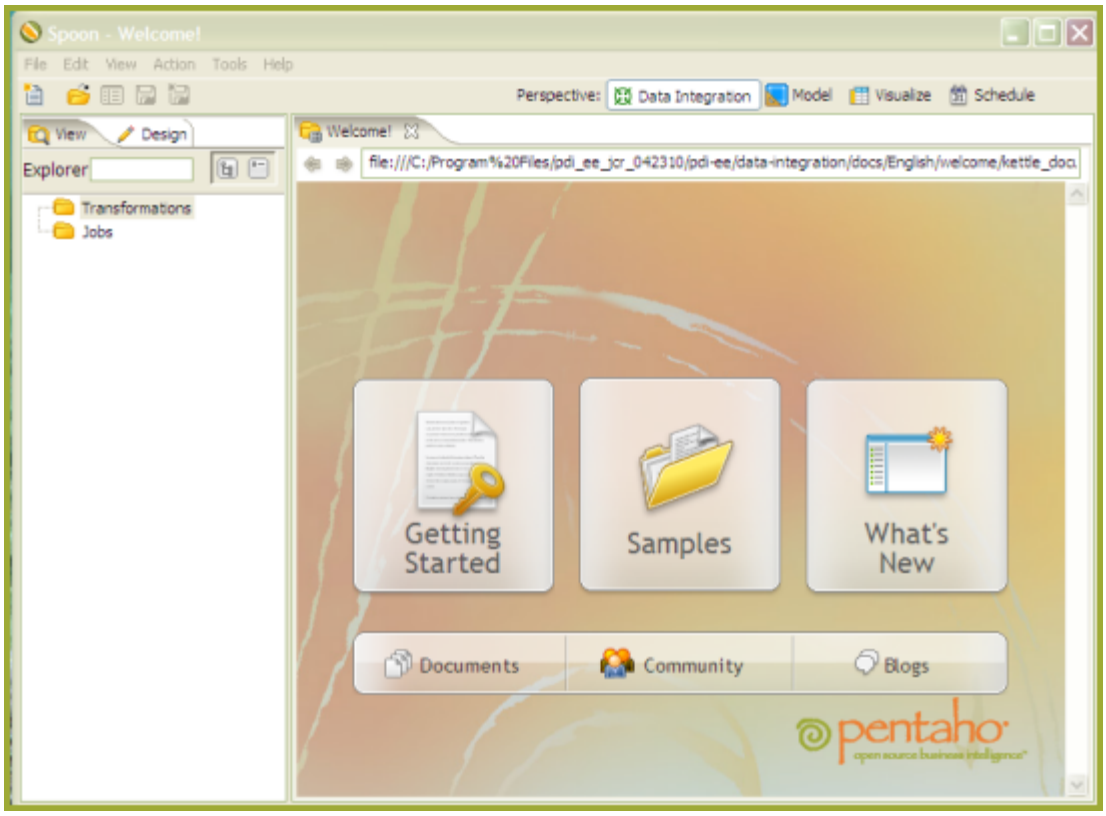
Pentaho Data Integration provides you with two ways of storing your transformations, jobs, and database connections as described below:

- **Pentaho Enterprise Repository** — You can save your jobs, transformations, and database connections in the Pentaho Enterprise Repository which provides you with content management, collaborative development, and enhanced security.
- **File-Based** — If you are not part of a collaborative team and do not want the overhead associated with Pentaho Enterprise Repository, you can save your jobs and transformations as files on your local device. Your database connection information is saved with your job or transformation. If you select this option, your jobs (.kjb) and transformations (.ktr) are saved in XML format.

Note: If you are an existing Pentaho Data Integration customer, see the *Pentaho Data Integration Upgrade Guide* for upgrade instructions.

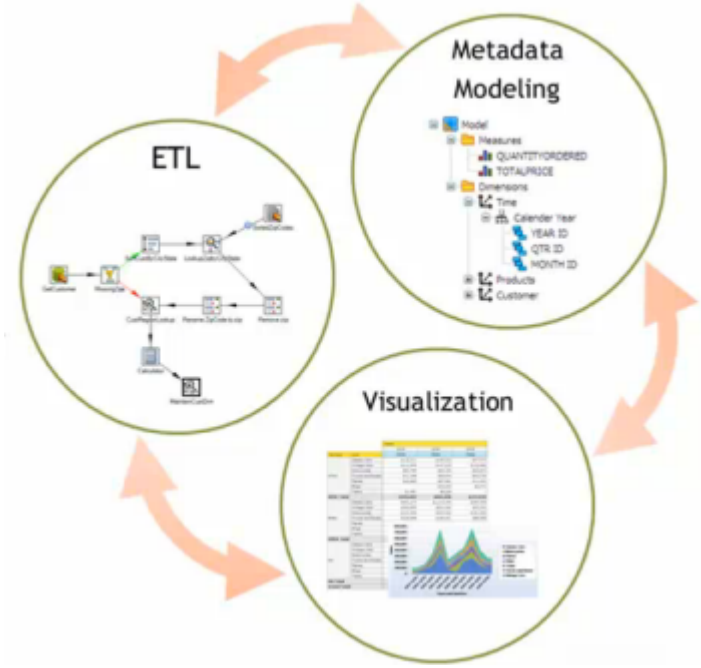
PDI Interface Perspectives

The **Welcome** page contains useful links to documentation, community links for getting involved in the Pentaho Data Integration project, and links to blogs from some of the top contributors to the Pentaho Data Integration project.



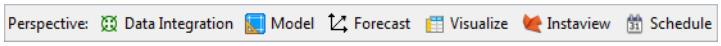
Introducing Perspectives

Pentaho Data Integration provides you with tools that include ETL, modeling, and visualization in one unified environment — the Spoon interface. This integrated environment allows you, as BI developer, to work in close cooperation with business users to build business intelligence solutions more quickly and efficiently.



When you are working in Spoon you can *change perspectives*, or switch from designing ETL jobs and transformations to modeling your data, and visualizing it. As users provide you with feedback about how the data is presented to them, you can quickly make iterative changes to your data directly in Spoon by changing perspectives. The ability to quickly respond to feedback and to collaborate with business users is part of the Pentaho Agile BI initiative. See the *Agile BI Techcast* series to learn more.

From within Spoon you can change perspectives using the **Perspective** toolbar located in the upper-right corner.

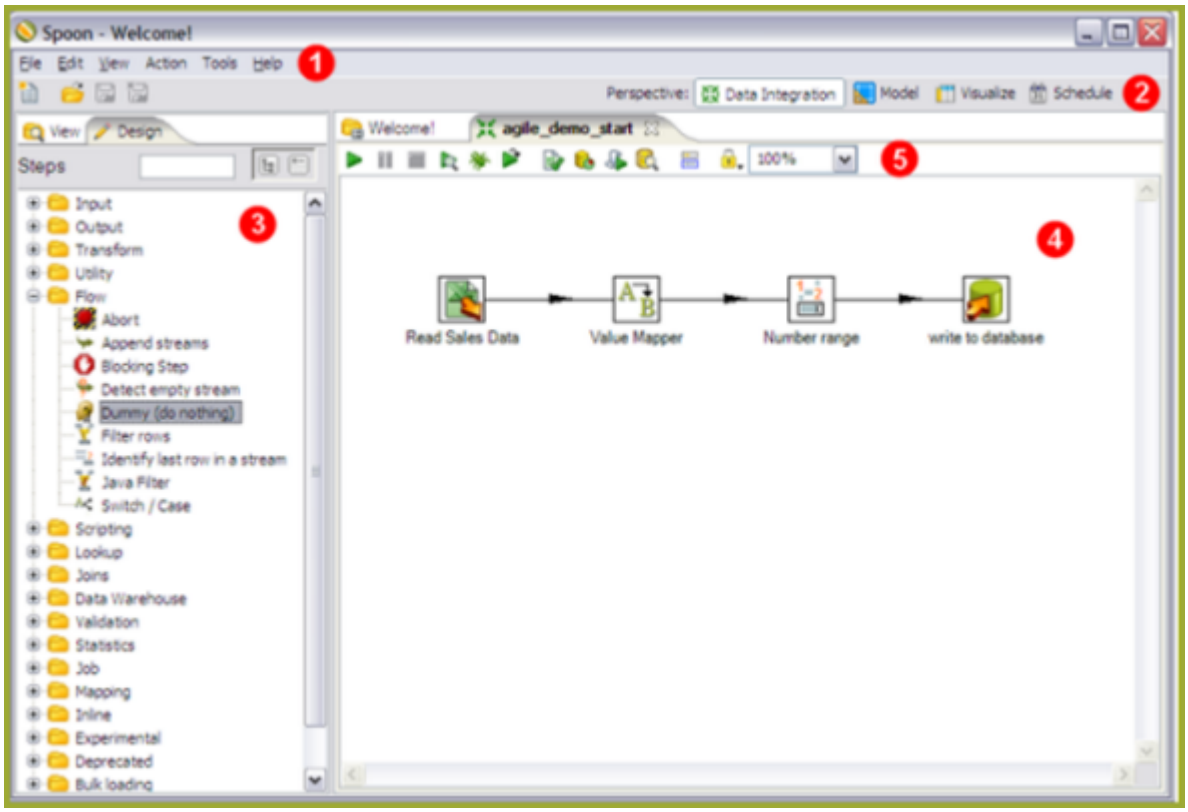


The perspectives in PDI enable you to focus how you work with different aspects of data.

- ***Data Integration** perspective*—Connect to data sources and extract, transform, and load your data
- ***Model** perspective*—Create a metadata model to identify the relationships within your data structure
- ***Forecast** perspective*—Identify trends within facets of your data
- ***Visualize** perspective*—Create charts, maps, and diagrams based on your data
- ***Instaview** perspective*—Create a data connection, a metadata model, and analysis reports all at once with a dialog-guided, template-based reporting tool
- **Schedule** perspective—Plan when to run data integration jobs and set timed intervals to automatically send the output to your preferred destinations
- **ScatterPlot3D** *perspective*—Visualize your data as a Java 3D scatter plot visualization or histogram matrix overview (**separate installation required*)

Data Integration (ETL) Perspective

The **Data Integration** perspective is used to design, preview, and test ETL jobs and transformations.



The Data Integration perspective is organized into the components described in this table.

Component Name	Description
1-Menubar	The Menubar provides access to common features such as properties, actions and tools
2-Main Toolbar	The Main Toolbar provides single-click access to common actions such as create a new file, opening existing

Component Name	Description
	documents, save and save as. The **Data Integration** perspective (shown in the image above), is used to create ETL transformations and jobs. The **Schedule** perspective (not shown) is related to the Data Integration perspective and is used to manage scheduled ETL activities on a Data Integration Server.
3-Design Palette	While in the **Data Integration** perspective, the **Design Palette** provides an organized list of transformation steps or job entries used to build transformations and jobs. Transformations are created by simply dragging transformation steps from the Design Palette onto the Graphical Workspace, or canvas, (4) and connecting them with hops to describe the flow of data.
4-Graphical Workspace	The Graphical Workspace, or canvas, is the main design area for building transformations and jobs describing the ETL activities you want to perform.
5-Sub-toolbar	The Sub-toolbar provides buttons for quick access to common actions specific to the transformation or job such as Run, Preview, and Debug.

Toolbar Icons in the Data Integration Perspective

Icon	Description
	Create a new job or transformation
	Open transformation/job from file if you are not connected to a repository or from the repository if you are connected to one
	Explore the repository
	Save the transformation/job to a file or to the repository
	Save the transformation/job under a different name or file name (Save as)
	Run transformation/job; runs the current transformation from XML file or repository
	Pause transformation
	Stop transformation
	Preview transformation: runs the current transformation from memory. You can preview the rows that are produced by selected steps.
	Run the transformation in debug mode; allows you to troubleshoot execution errors
	Replay the processing of a transformation
	Verify transformation
	Run an impact analysis on the database

Icon	Description
	Generate the SQL that is needed to run the loaded transformation.
	Launch the database explorer allowing you to preview data, run SQL queries, generate DDL and more
	Hide execution results pane
	Lock transformation

VFS File Dialogues in Spoon

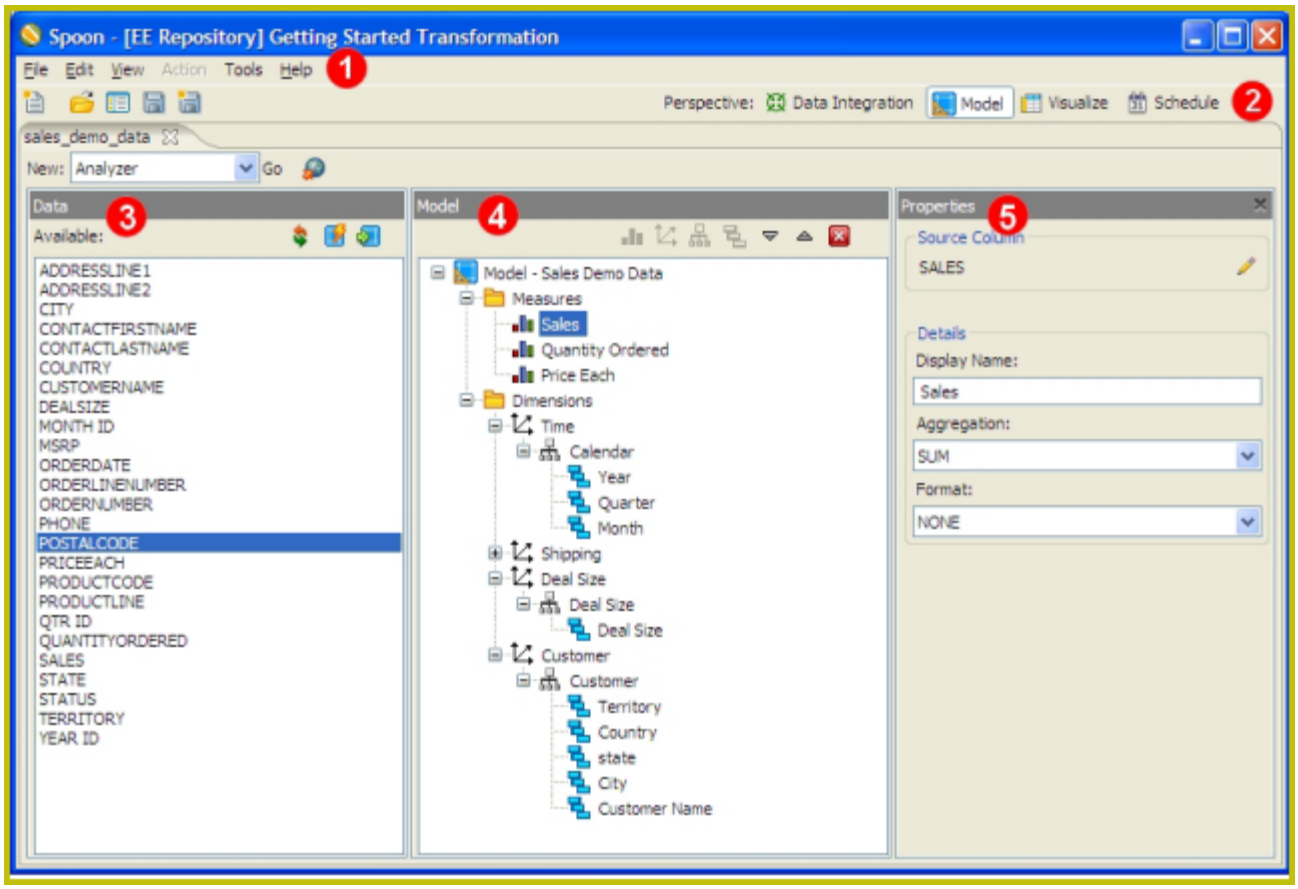
Some job and transformation steps have virtual filesystem (VFS) dialogues in place of the traditional local filesystem windows. VFS file dialogues enable you to specify a VFS URL in lieu of a typical local path. The following PDI and PDI plugin steps have such dialogues:

- File Exists
- Mapping (sub-transformation)
- ETL Meta Injection
- Hadoop Copy Files
- Hadoop File Input
- Hadoop File Output

Note: VFS dialogues are configured through certain transformation parameters. Refer to *Configuring SFTP VFS* on page 52 for more information on configuring options for SFTP.

Model Perspective

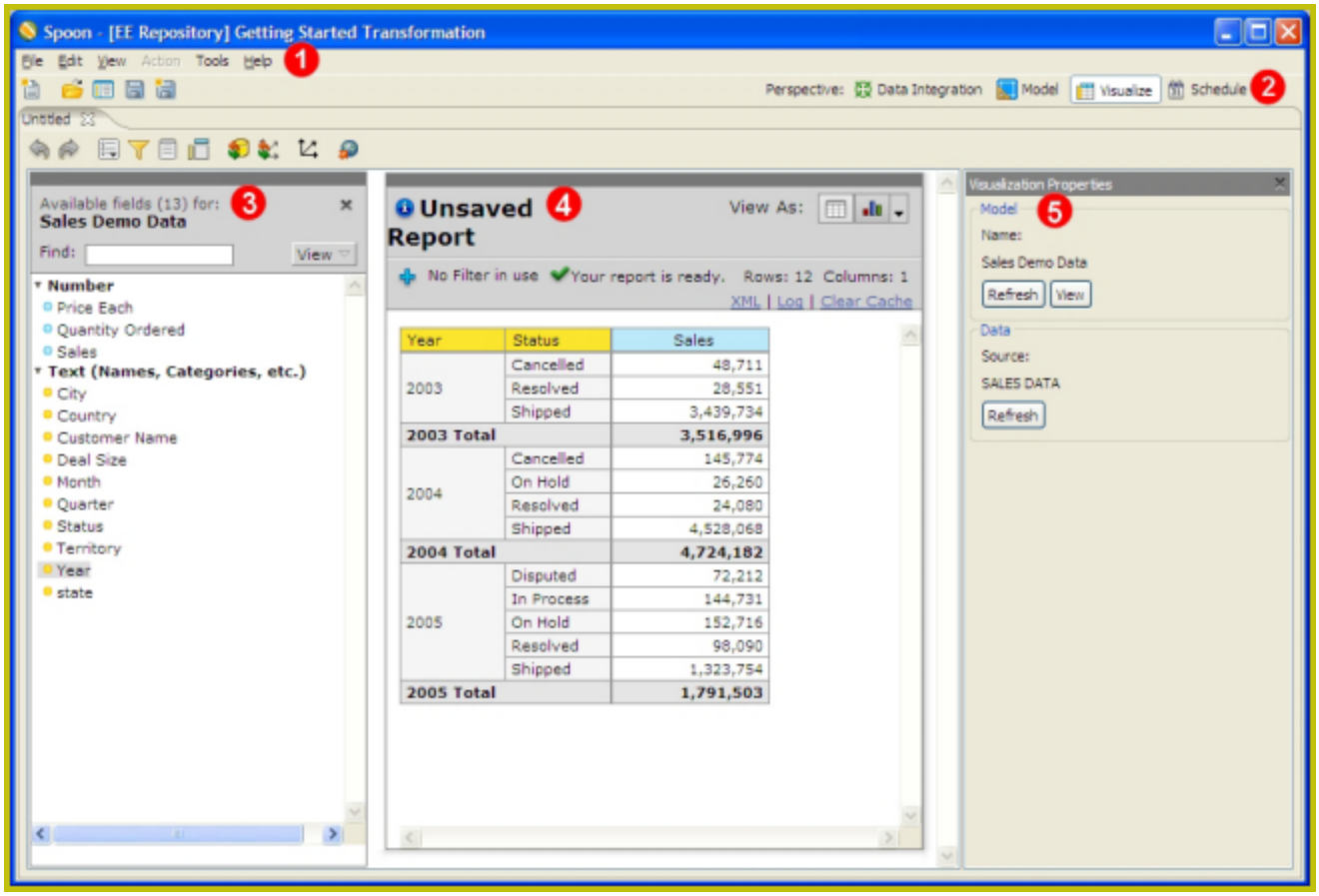
The **Model** perspective is used for designing reporting and OLAP metadata models that can be tested from within the **Visualize** perspective or published to the Pentaho BA Server.



Component Name	Description
1-Menubar	The Menubar provides access to common features such as properties, actions and tools.
2-Main Toolbar	The Main Toolbar provides single-click access to common actions such as create a new file, opening existing documents, save and save as. The right side of the main toolbar is also where you can switch between perspectives.
3-Data Panel	Contains a list of available fields from your data source that can be used either as measure or dimension levels (attributes) within your OLAP dimensional model.
4- Model Panel	Used to create measures and dimensions of your Analysis Cubes from the fields in the data panel. Create a new measure or dimension by dragging a field from the data panel over onto the Measures or Dimension folder in the Model tree.
5-Properties Panel	Used to modify the properties associated with the selection in the Model Panel tree.

Visualization Perspective

The **Visualize** perspective allows you to test reporting and OLAP metadata models created in the **Model** perspective using the Report Design Wizard and Analyzer clients respectively.



Component Name	Description
1-Menubar	The Menubar provides access to common features such as properties, actions, and tools.

Component Name	Description
2-Main Toolbar	The Main Toolbar provides single-click access to common actions such as create a new file, opening existing documents, save and save as. The right side of the main toolbar is also where you can switch between perspectives.
3-Field List	Contains the list of measures and attributes as defined in your model. These fields can be dragged into the Report Area (4) to build your query.
4-Report Area	Drag fields from the field list into the Report Area to build your query. Right click on a measure or level to further customize your report with sub-totals, formatting, and more.
5-Visualization Properties	Used to modify the properties associated with the selection in the Model Panel tree.

Instaview Perspective

Instaview is a data analysis tool that is comprised of a data integration transformation, a metadata model, and a number of visual representations of your data created using Analyzer.

Instaview uses Pentaho Analyzer as the tool for exploring your data. Analyzer's interactive graphical user interface makes it easy to create interactive reports based on your data and enables you to drill down into the data to discover previously hidden details. Use Analyzer to drill, slice, dice, pivot, filter, chart data, and create calculated fields. Instaview presents data multi-dimensionally and enables you to select what dimensions and measures to explore.

Configure mode and View mode

Configure mode enables you to edit an Instaview's configuration details, while **View** mode is where reporting and analysis takes place.

Instaview Configure Mode

Within Configure mode you can access and modify an Instaview's underlying configuration details.

Basic actions

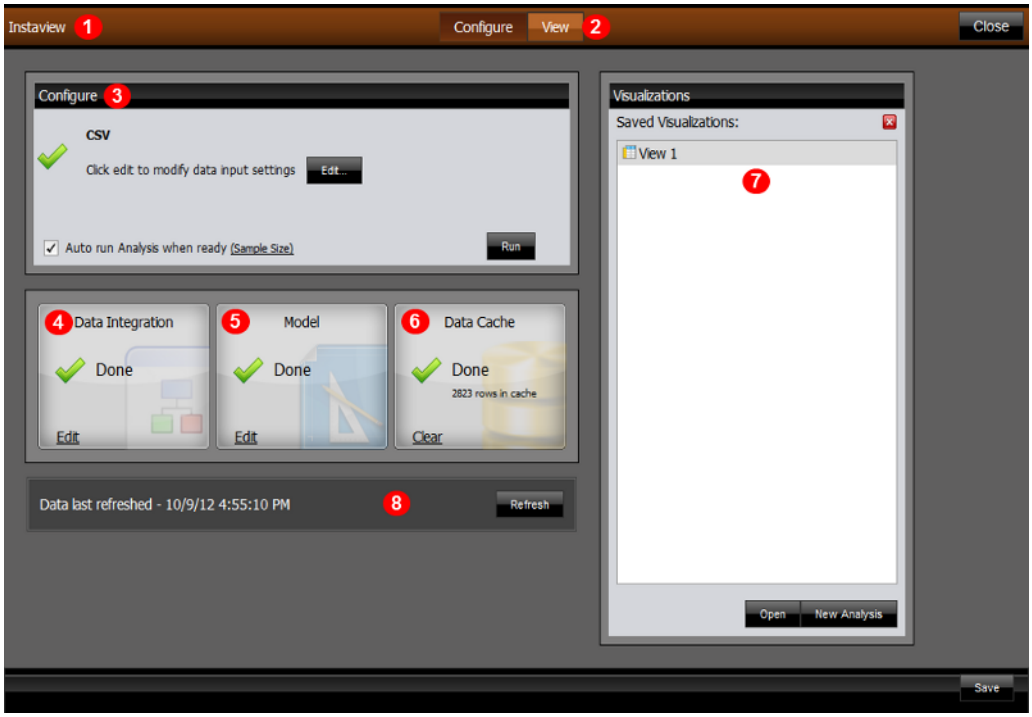
These actions are covered in this guide, and can be completed using the sample data provided in the procedures.

- Configure the data source settings
- Clear the data cache
- Open, delete, or rename existing Views
- Create new Views
- Run or refresh the Instaview data
- Clear the data cache

Advanced actions

The advanced actions allow you to customize your Instaview for more specific use cases, but require a more technical understanding of Pentaho Data Integration, Data Sources and Metadata.

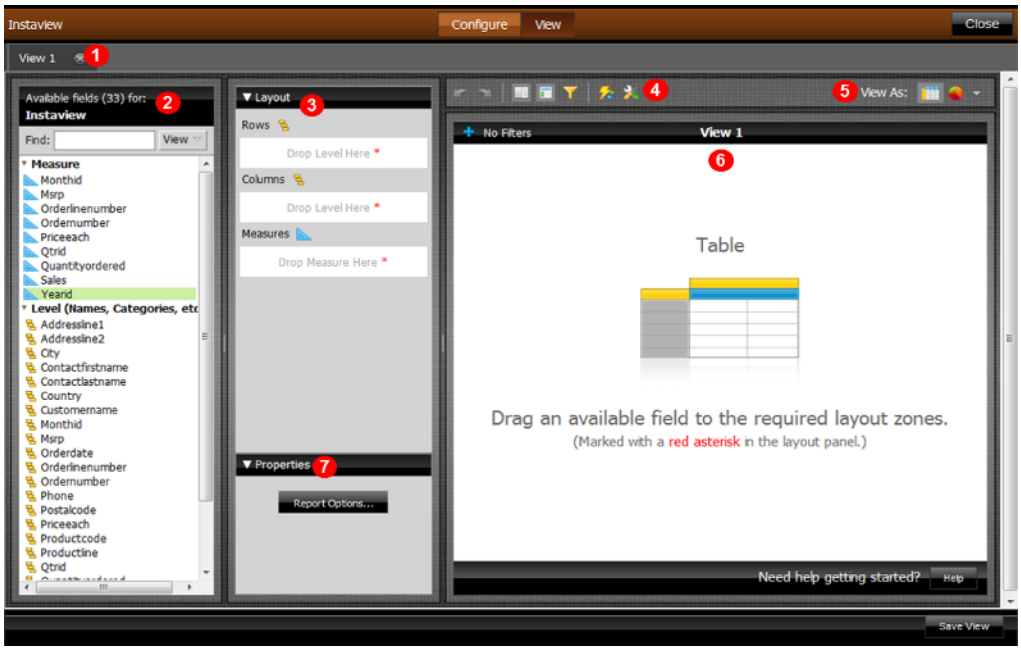
- Switch to the full Pentaho Data Integration transformation perspective
- Launch the model perspective



Component	Description
1 - Instaview	A combination of a valid data connection, a data integration transformation, a metadata data source template, and one or more Analyzer Views. You can only have one Instaview at a time.
2 - Configure View	The Configure/View mode toggle allows you to switch between Cofigure mode and View mode. • Configure mode enables you edit a data connection, data integration transformation, metadata data source template, and Analyzer report. It also provides the means to clear the Data Cache. • View mode enables you to create reports and visualizations from a valid Instaview data source. From within this view you can drag and drop fields from (measurements or dimensions) your data onto the Reporting canvas.
3 - Configure data source panel	• The Edit button takes you to the data connection dialog and allows you to edit the data connection settings for the current Instaview. • The Auto run Analysis when ready option, if checked, will automatically create a new Analyzer view after pressing Run. • The Run button lets you manually start the Instaview data transformation. Pressing Run will modify the data integration transformation or metadata model if changes were made within the Configure panel, if necessary.
4 - Data Integration panel	Provides the means to access and edit the data integration transformation for the current Instaview. Editing will open the Data Integration perspective in PDI.
5 - Model panel	Enables you to edit the metadata model for the current Instaview. Editing will open the Model perspective in PDI.
6 - Data Cache panel	Provides the means to clear the data cache.
7 - Visualizations panel	Displays existing Views and provides the means to open existing, create new, and delete Instaviews. You can also rename an existing visualization by right-clicking an item within this panel.
8 - Refresh display	Displays when the current Instaview was last run. If your data is connected to a live data source this displays the last time the data was accessed by Instaview. The Refresh button provides the means to manually refresh the current Instaview.

Instaview View Mode

Within View mode you are able to drag and drop data onto the Analyzer canvas to interactively explore your data. Instaview offers many ways to visually display data, such as maps, charts, and grids. You may have multiple Views open for editing at a time, but you may only have one Instaview open at a time.



Component	Description
1 - View	A View relies on the data source connection, metadata model, and the Analyzer canvas (Pentaho Analyzer) to enable you to explore and visualize your data. Create tables from transformed data by dragging fields from the Available fields panel to the Analyzer canvas (or Layout panel). Drill, slice, dice, pivot, filter, chart data, and create calculated fields to discover previously hidden details with the tools and menus on the Analyzer toolbar.
2 - Available fields panel	Displays fields within a connected data source. • The thin yellow steps represent levels within the data hierarchy (text fields). Levels are hierarchical groups of dimensions, which are facets of your data that can be measured. For instance, within a time dimension there are different levels of measurement such as year, quarter, month, or day. • The blue carpenter squares represent measurements within the data hierarchy (number fields). Measures are quantitative values about your data and are also referred to as facts.
3 - Layout panel	Enables you to drag levels and measures into the correct areas of a report. Displays which fields are in use within a View.
4 - Analyzer toolbar	Enables you to specify how your data is displayed based on user-defined values. Applying filters changes the way the data is displayed on the Analyzer canvas. You can also drag and drop levels or dimensions onto this toolbar to filter your data.
5 - Switch to table/chart format	Enables you to switch the format of your data as either a report or a chart.
6 - Analyzer canvas	An interactive graphical workspace that serves as the main design area for building Analyzer reports within Instaview.
7 - Properties panel	Enables you to configure report and visualization properties to customize analysis content.

Supported formats and data sources

Instaview comes with pre-configured templates that give you instant connectivity to the most popular data sources.

- **Local Files** - Load existing Excel spreadsheets or CSV files.
- **Relational Databases** - Working with JDBC 3 compliant databases in Instaview enables you to analyze your data even without in-depth knowledge of how your database is structured.
- **Big Data** - Cassandra, Hadoop, Hive, or MongoDB are easily integrated.

Data Mining Perspectives

Pentaho Data Mining is based on the *Waikato Environment for Knowledge Analysis* (Weka) project. This project contains a comprehensive set of algorithms that provide data mining results used for time series analysis and predictive modeling for forecasting, as well as 3D visualizations. These algorithms are integrated into a set of Pentaho Data Integration (PDI) steps used in transformations to create ETL jobs or reports. You can also manipulate the algorithm results in a PDI Weka perspective. You get access the Weka steps and perspective the same way you access any other type of PDI step or perspective through the Spoon interface.

The ***Forecast*** perspective is a time series analysis environment that allows forecasting models to be developed, evaluated and visualized. This time series framework takes a machine learning/data mining approach to modeling time series by transforming the data into a form that standard propositional learning algorithms can process.

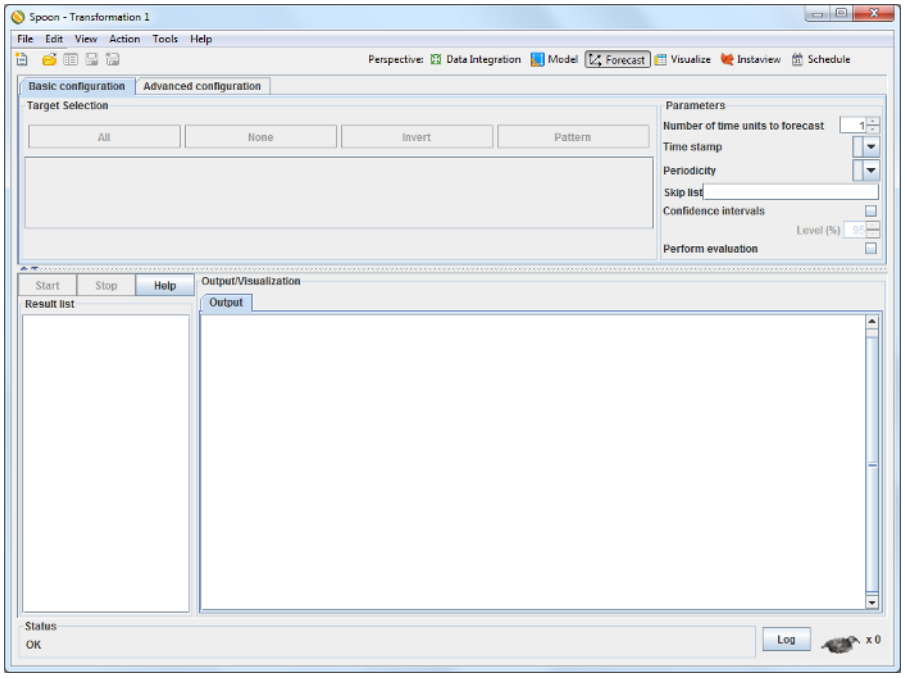
The ***ScatterPlot3D*** perspective provides a Java 3D scatter plot visualization and histogram matrix overview. This perspective is not included in the standard PDI installation and must be installed as a Spoon perspective plugin.

Forecast Perspective

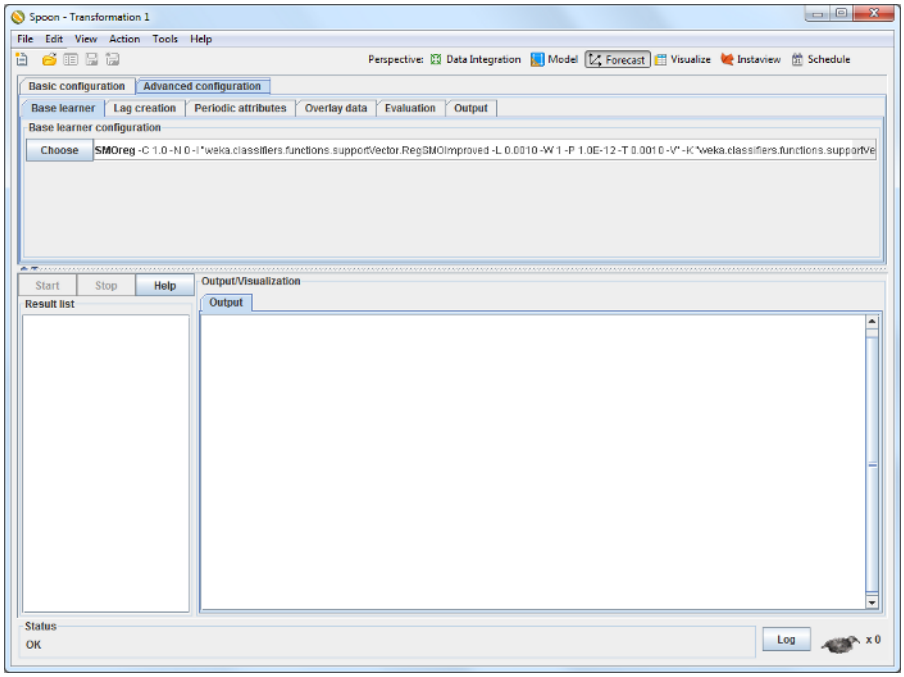
The **Forecast** perspective is a time series analysis environment within Spoon that enables the development, evaluation, and visualization of forecasting models with a graphical user interface.

There are Kettle transformation steps that allow models created and exported from a time series modeling environment to be used to make future forecasts as part of an ETL transformation.

Time series forecasting is the process of using a model to generate predictions, forecasts, for future events based on known past events. This environment takes the form of a perspective in Spoon. This time series framework takes a machine learning/data mining approach to modeling time series by transforming the data into a form that standard propositional learning algorithms can process.



The **Advanced configuration** tab gives you control over a number of additional aspects of the forecasting analysis, each with a dedicated sub-panel.



- **Basic leaner** sub-panel: Choice of underlying model and parameters
- **Lag creation** sub-panel: Creation of lagged variables
- **Periodic attributes** sub-paenl: Creation of variables derived from a date time stamp
- **Overlay data** sub-paenl: Specification of "overlay" data
- **Evaluation** sub-panel: Evaluation options
- **Output** sub-paenl: Control over what output is created

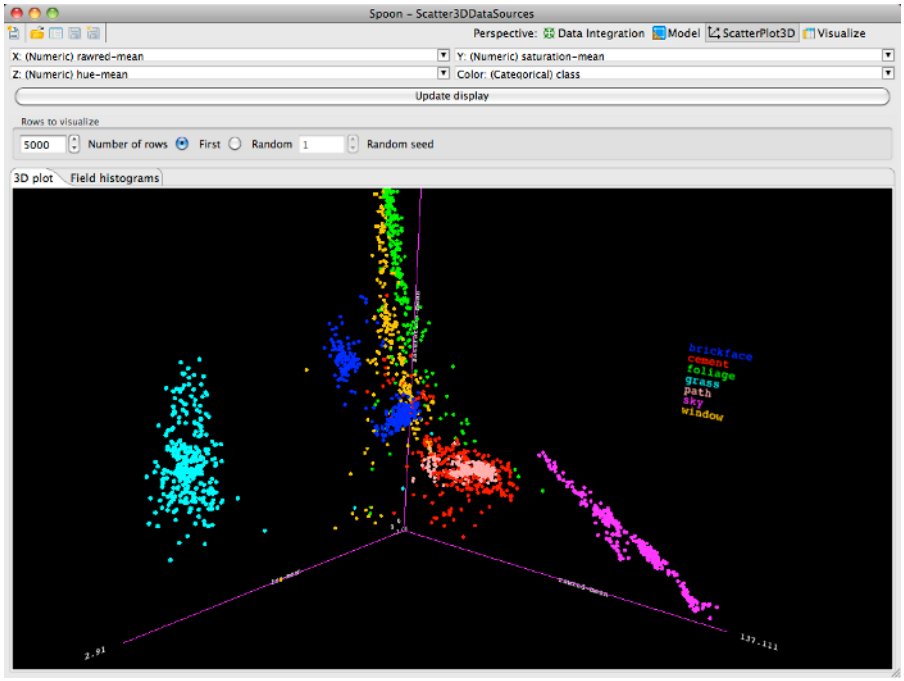
For more information, including procedures on how to use this perspective, see *Using the Weka Forecasting Plugin*.

ScatterPlot3D Perspective

The **ScatterPlot3D** perspective provides a Java 3D scatter plot visualization and histogram matrix overview. You can select which dimensions to assign to each axis of a visualization with drop-down lists populated with fields from your data. You can base coloring on categorical values or numeric variables, in which case a color gradient is used.

The **3D Plot** tab displays a three-dimensional scatter plot visualization. The visualization can be rotated, zoomed, and translated all from within the 3D Plot tab.

This perspective is not included in the standard PDI installation and must be installed as a Spoon perspective plugin. Once installed, it can be accessed from the contextual menu that appears when right-clicking a **Table output**, or **Table input** step in a transformation.



The **Field histograms** tab shows a matrix of histograms, one for each field/column in the data. If the coloring dimension is categorical, each bar in each histogram is colored relative to proportions of a field's values and corresponding range of the value.

For more information, including procedures on how to use this perspective, see *3D Visualization Perspective for PDI*.

Customizing the Spoon Interface

Kettle Options allow you to customize properties associated with the behavior and look and feel of the Spoon interface. Examples include startup options such as whether or not to display tips and the Welcome page, and user interface options such as fonts and colors. To access the options, in the menu bar, go to **Tools** -> **Options**...

The tables below contain descriptions for options under the **General** and **Look & Feel** tabs, respectively. You may want to keep the default options enabled initially. As you become more comfortable using Pentaho Data Integration, you can set the options to better suit your needs.

General

Option	Description
Default number of lines in preview dialog	Sets the default number of lines that are displayed in the preview dialog box in Spoon
Maximum nr of lines in the logging windows	Specifies the maximum limit of rows to display in the logging window
Central log line store timeout in minutes	no def given
Max number of lines in the log history views	Specifies the maximum limit of line to display in the log history views
Show tips at startup?	Sets the display of tips at startup
Show welcome page at startup?	Controls whether or not to display the Welcome page when launching Spoon
Use database cache?	Spoon caches information that is stored on the source and target databases. In some instances, caching causes incorrect results when you are making database changes. To prevent errors you can disable the cache altogether instead of clearing the cache every time.
Open last file at startup?	Loads the last transformation you used (opened or saved) from XML or repository automatically
Auto save changed files?	Automatically saves a changed transformation before running
Only show the active file in the main tree?	Reduces the number of transformation and job items in the main tree on the left by only showing the currently active file
Only save used connections to XML?	Limits the XML export of a transformation to the used connections in that transformation. This is helpful while exchanging sample transformations to avoid having all defined connections to be included.
Ask about replacing existing connections on open/ import?	Requests permission before replacing existing database connections during import
Replace existing connections on open/import?	This is the action that takes place when there is no dialog box shown, (see previous option)
Show Save dialog?	Allows you to turn off the confirmation dialogs you receive when a transformation has been changed
Automatically split hops?	Disables the confirmation messages that launch when you want to split a hop
Show copy or distribute dialog?	Disables the warning message that appears when you link a step to multiple outputs. This warning message describes the two options for handling multiple outputs: 1. Distribute rows - destination steps receive the rows in turns (round robin) 2. Copy rows - all rows are sent to all destinations
Show repository dialog at startup?	Controls whether or not the Repository dialog box appears at startup
Ask user when exiting?	Controls whether or not to display the confirmation dialog when a user chooses to exit the application
Clear custom parameters (steps/plug-ins)	Clears all parameters and flags that were set in the plug-in or step dialog boxes.

Option	Description
Display tool tips?	Controls whether or not to display tool tips for the buttons on the main tool bar.

Look & Feel

Option	Description
Fixed width font	This option customizes the font that is used in the dialog boxes, trees, input fields, and more; click **Edit** to edit the font or **Delete** to return the font to its default value.
Font on workspace	This option customizes font that is used in the Spoon interface; click Edit to edit the font or **Delete** to return the font to its default value.
Font for notes	This option customizes the font used in notes that are displayed in Spoon; click Edit to edit the font or Delete to return the font to its default value.
Background color	This option sets the background color in Spoon and affects all dialog boxes; click **Edit** to edit the color or **Delete** to return the background color to its default value.
Workspace background color	This option sets the background color in the graphical view of Spoon; click **Edit** to edit the background color or **Delete** to return the background color to its default value.
Tab color	This option customizes the color that is being used to indicate tabs that are active/selected; click **Edit** to edit the tab color or **Delete** to return the color to its default value.
Icon size in workspace	Affects the size of the icons in the graph window. The original size of an icon is 32x32 pixels. The best results (graphically) are probably at sizes 16,24,32,48,64 and other multiples of 32.
Line width on workspace	Affects the line width of the hops in the Spoon graphical view and the border around the step.
Shadow size on workspace	If this size is larger then 0, a shadow of the steps, hops, and notes is drawn on the canvas, making it look like the transformation floats above the canvas.
Dialog middle percentage	By default, a parameter is drawn at 35% of the width of the dialog box, counted from the left. You can change using this option in instances where you use unusually large fonts.
Canvas anti-aliasing?	Some platforms like Windows, OSX and Linux support anti-aliasing through GDI, Carbon or Cairo. Enable this option for smoother lines and icons in your graph view. If you enable the option and your environment does not work, change the value for option "EnableAntiAliasing" to "N" in file $HOME/.kettle/.spoonrc (C:\Documents and Settings\<user>\.kettle\.spoonrc on Windows)
Use look of OS?	Enabling this option on Windows allows you to use the default system settings for fonts and colors in Spoon. On other platforms, the default is always enabled.
Show branding graphics	Enabling this option will draw Pentaho Data Integration branding graphics on the canvas and in the left hand side "expand bar."

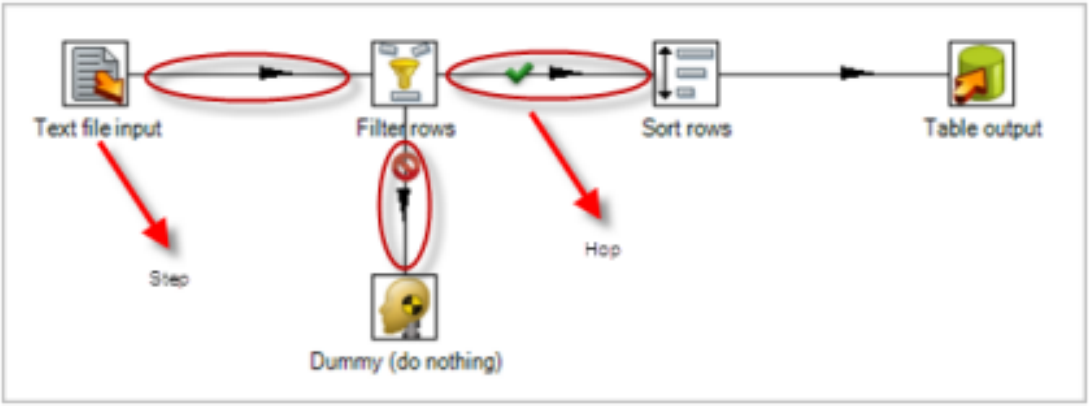
Option	Description
Preferred Language	Specifies the preferred language setting.
Alternative Language	Specifies the alternative language setting. Because the original language in which Pentaho Data Integration was written is English, it is best to set this locale to English.

Terminology and Basic Concepts

Before you can start designing transformations and jobs, you must have a basic understanding of the terminology associated with Pentaho Data Integration.

Transformations, Steps, and Hops

A **transformation** is a network of logical tasks called *steps*. Transformations are essentially *data flows*. In the example below, the database developer has created a transformation that reads a flat file, filters it, sorts it, and loads it to a relational database table. Suppose the database developer detects an error condition and instead of sending the data to a Dummy step, (which does nothing), the data is logged back to a table. The transformation is, in essence, a directed graph of a logical set of data transformation configurations. Transformation file names have a .ktr extension.



The two main components associated with transformations are **steps** and **hops**:

Steps are the building blocks of a transformation, for example a text file input or a table output. There are over 140 steps available in Pentaho Data Integration and they are grouped according to function; for example, input, output, scripting, and so on. Each step in a transformation is designed to perform a specific task, such as reading data from a flat file, filtering rows, and logging to a database as shown in the example above. Steps can be configured to perform the tasks you require.

Hops are data pathways that connect steps together and allow schema metadata to pass from one step to another. In the image above, it seems like there is a sequential execution occurring; however, that is not true. Hops determine the flow of data *through* the steps not necessarily the sequence in which they run. When you run a transformation, each step starts up in its own thread and pushes and passes data.

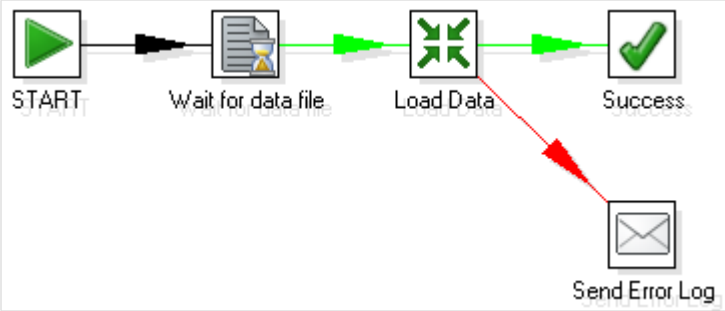
Note: All steps are started and run in parallel so the initialization sequence is not predictable. That is why you cannot, for example, set a variable in a first step and attempt to use that variable in a subsequent step.

You can connect steps together, edit steps, and open the step contextual menu by clicking to edit a step. Click the down arrow to open the contextual menu. For information about connecting steps with hop, see *More About Hops*.

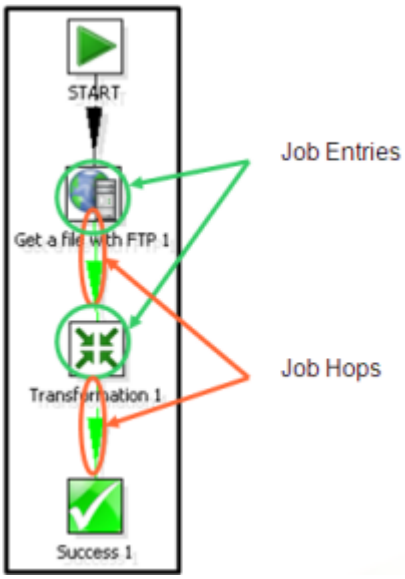
A step can have many connections — some join two steps together, some only serve as an input or output for a step. The data stream flows through steps to the various steps in a transformation. Hops are represented in Spoon as arrows. Hops allow data to be passed from step to step, and also determine the direction and flow of data through the steps. If a step sends outputs to more than one step, the data can either be copied to each step or distributed among them.

Jobs

Jobs are workflow-like models for coordinating resources, execution, and dependencies of ETL activities.



Jobs aggregate up individual pieces of functionality to implement an entire process. Examples of common tasks performed in a job include getting FTP files, checking conditions such as existence of a necessary target database table, running a transformation that populates that table, and e-mailing an error log if a transformation fails. The final job outcome might be a nightly warehouse update, for example.



Jobs are composed of **job hops**, **job entries**, and **job settings**. Hops behave differently when used in a job, see *More About Hops*. Job entries are the individual configured pieces as shown in the example above; they are the primary building blocks of a job. In data transformations these individual pieces are called steps. Job entries can provide you with a wide range of functionality ranging from executing transformations to getting files from a Web server. A single job entry can be placed multiple times on the canvas; for example, you can take a single job entry such as a transformation run and place it on the canvas multiple times using different configurations. Job settings are the options that control the behavior of a job and the method of logging a job's actions. Job file names have a .kjb extension.

More About Hops

A hop connects one transformation step or job entry with another. The direction of the data flow is indicated by an arrow. To create the hop, click the source step, then press the <**SHIFT**> key down and draw a line to the target step. Alternatively, you can draw hops by hovering over a step until the hover menu appears. Drag the hop painter icon from the source step to your target step.

Additional methods for creating hops include:

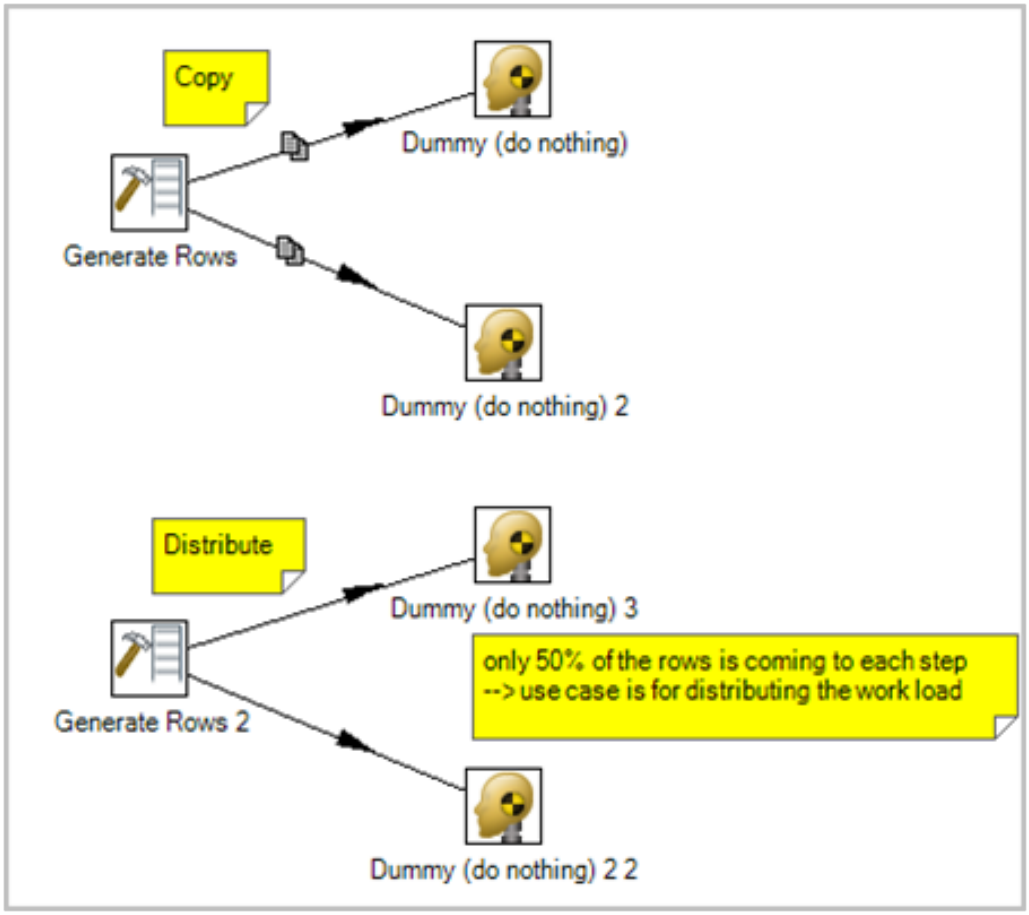
- Click on the source step, hold down the middle mouse button, and drag the hop to the target step.
- Select two steps, then choose New Hop from the right-click menu.
- Use <CTRL + left-click> to select two steps the right-click on the step and choose **New Hop**.

To **split a hop**, insert a new step into the hop between two steps by dragging the step over a hop. Confirm that you want to split the hop. This feature works with steps that have not yet been connected to another step only.

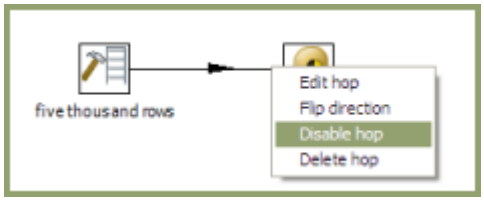
Loops are not allowed in transformations because Spoon depends heavily on the previous steps to determine the field values that are passed from one step to another. Allowing loops in transformations may result in endless loops and other problems. Loops are allowed in jobs because Spoon executes job entries sequentially; however, make sure you do not create endless loops.

Mixing rows that have a different layout is not allowed in a transformation; for example, if you have two table input steps that use a varying number of fields. Mixing row layouts causes steps to fail because fields cannot be found where expected or the data type changes unexpectedly. The trap detector displays warnings at design time if a step is receiving mixed layouts.

You can specify if data can either be **copied** or **distributed** between multiple hops leaving a step. Select the step, right-click and choose **Data Movement**.



A hop can be enabled or disabled (for testing purposes for example). Right-click on the hop to display the options menu.



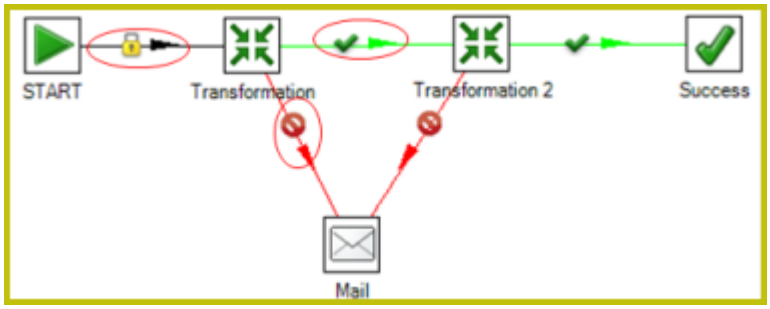
Hop Colors in Transformations

Hops in transformations display in different colors based on the properties and state of the hop. The following table describes the meaning behind hop colors:

Color	Meaning
Green	Distribute rows: if multiple hops are leaving a step, rows of data will be evenly distributed to all target steps
Red	Copies rows: if multiple hops are leaving a step, all rows of data will be copied to all target steps
Yellow	Provides info for step, distributes rows
Gray	The hop is disabled
Black	The hop has a named target step
Blue	Candidate hop using middle button + drag
Red (Bold Dot line)	The hop is used for carrying rows that caused errors in source step(s).

Job Hops

Besides the execution order, a hop also specifies the condition on which the next job entry will be executed. You can specify the **Evaluation** mode by right clicking on the job hop. A job hop is just a flow of control. Hops link to job entries and, based on the results of the previous job entry, determine what happens next.



Option	Description
Unconditional	Specifies that the next job entry will be executed regardless of the result of the originating job entry
Follow when result is true	Specifies that the next job entry will be executed only when the result of the originating job entry is true; this means a successful execution such as, file found, table found, without error, and so on
Follow when result is false	Specifies that the next job entry will only be executed when the result of the originating job entry was false, meaning unsuccessful execution, file not found, table not found, error(s) occurred, and so on

Hop Colors in Jobs

Hops in jobs display in different colors based on the properties and state of the hop. The following table describes the meaning behind hop colors:

Color	Meaning
Black	The target entry executes regardless of the result of the source entry (Unconditional)
Green	The target entry executes only if the result of the source entry is successful (Result is true)
Red	The target entry executes only if the source entry failed (Result is false)

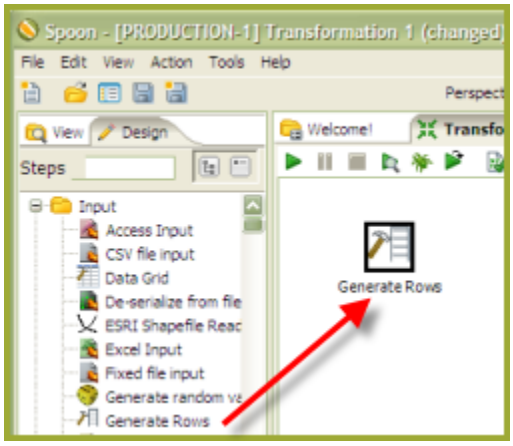
Creating Transformations

This exercise is designed to help you learn basic skills associated with handling steps and hops, running and previewing transformations. See the *Getting Started with Pentaho Data Integration* guide for a comprehensive, "real world" exercise for creating, running, and scheduling transformations.

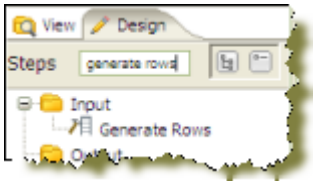
Getting Started

Follow the instructions below to begin creating your transformation.

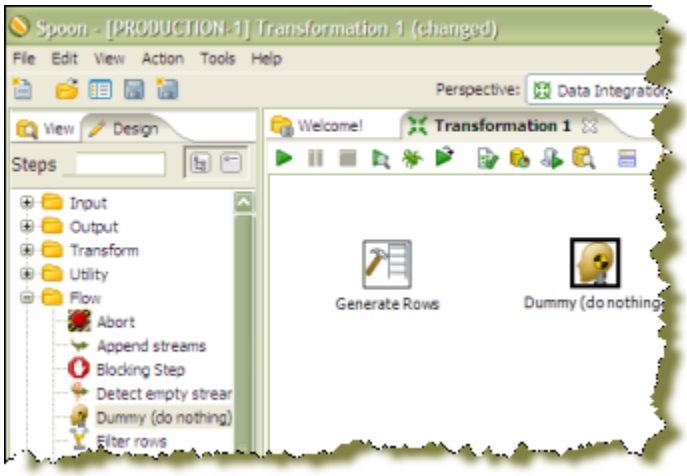
1. Click **New** in the upper left corner of Spoon.
2. Select **Transformation** from the list.
3. Under the **Design** tab, expand the **Input** node; then, select and drag a **Generate Rows** step onto the canvas on the right.



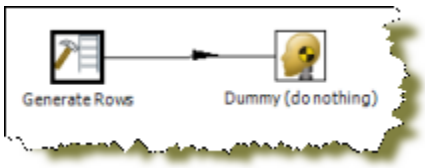
Note: (**Tip**) If you don't know where to find a step, there is a search function in the left corner of Spoon. Type the name of the step in the search box. Possible matches appear under their associated nodes. Clear your search criteria when you are done searching.



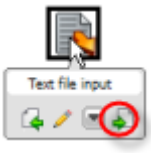
4. Expand the **Flow** node; click and drag a **Dummy (do nothing)** step onto the canvas.



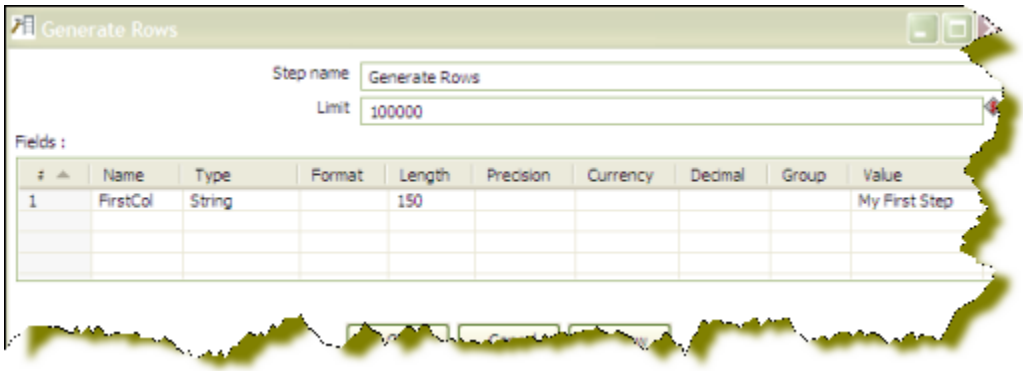
5. To connect the steps to each other, you must add a hop. Hops are used to describe the flow of data between steps in your transformation. To create the hop, click the **Generate Rows** step, then press and hold the <**SHIFT**> key then draw a line to the **Dummy (do nothing)** step.



Note: Alternatively, you can draw hops by hovering over a step until the hover menu appears. Drag the hop painter icon from the source step to your target step.



6. Double click the **Generate Rows** step to open its edit properties dialog box.
7. In the **Limit** field, type 100000.
   This limits the number of generated rows to 100,000.
8. Under **Fields:,** type **FirstCol** in the **Name** field.
9. Under **Type**, enter **String**.
10. Under **Value**, type **My First Step**. Your entries should look like the image below. Click **OK** to exit the Generate Rows edit properties dialog box.

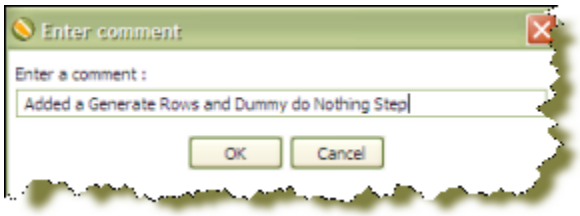


11. Now, save you transformation. See *Saving Your Transformation*.

Saving Your Transformation

Follow the instructions below to save your transformation.

1. In Spoon, click **File** -> **Save As**.
   The **Transformation Properties** dialog box appears.
2. In the **Transformation Name** field, type **First Transformation**.
3. In the **Directory** field, click the **Folder Icon** to select a repository folder where you will save your transformation.
4. Expand the **Home** directory and double-click the **joe** folder.
   Your transformation will be saved in the **joe** folder in the Enterprise Repository.
5. Click **OK** to exit the **Transformation Properties** dialog box.
   The **Enter Comment** dialog box appears.
6. Click in the **Enter Comment** dialog box and press <**Delete**> to remove the default text string. Type a meaningful comment about your transformation.



The comment and your transformation are tracked for version control purposes in the Enterprise Repository.

7. Click **OK** to exit the **Enter Comment** dialog box and save your transformation.

Running Your Transformation Locally

In the exercise, you created a simple transformation. Now, you are going to run your transformation locally (Local Execution). Local execution allows you to execute a transformation or job from within the Spoon design environment (on your local device). This is ideal for designing and testing transformations or lightweight ETL activities.

1. In Spoon, go to **File** -> **Open**.
   The contents of the repository appear.
2. Navigate to the folder that contains your transformation.
   If you are a user with administrative rights, you may see the folders of other users.
3. Double-click on your transformation to open it in the Spoon workspace.

Note: If you followed the exercise instructions, the name of the transformation is **First Transformation**.

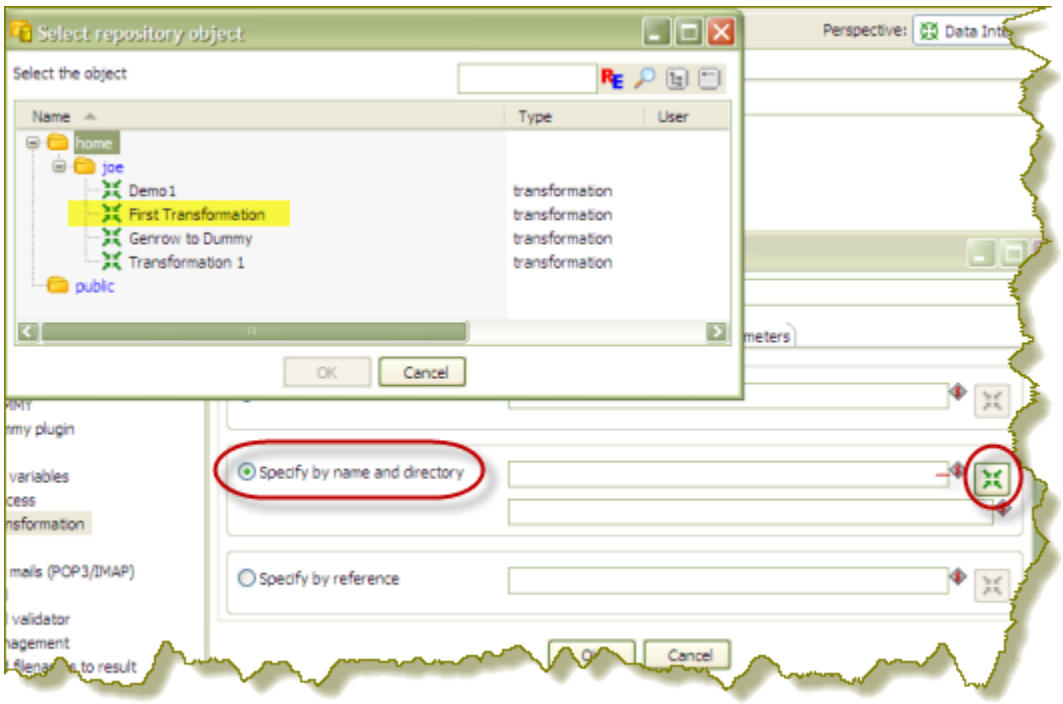
4. In the upper left corner of the workspace, click  (Run).
   The **Execute a Transformation** dialog box appears. Notice that **Local Execution** is enabled by default.
5. Click **Launch**.
   The **Execution Results** appear in the lower pane.
6. Examine the contents under **Step Metrics**. The Step Metrics tab provides statistics for each step in your transformation such as how many records were read, written, caused an error, processing speed (rows per second) and more. If any of the steps caused the transformation to fail, they would be highlighted in red.

Note: Other tabs associated with Execution Results, require additional set up. See *Performance Monitoring and Logging*.

Building a Job

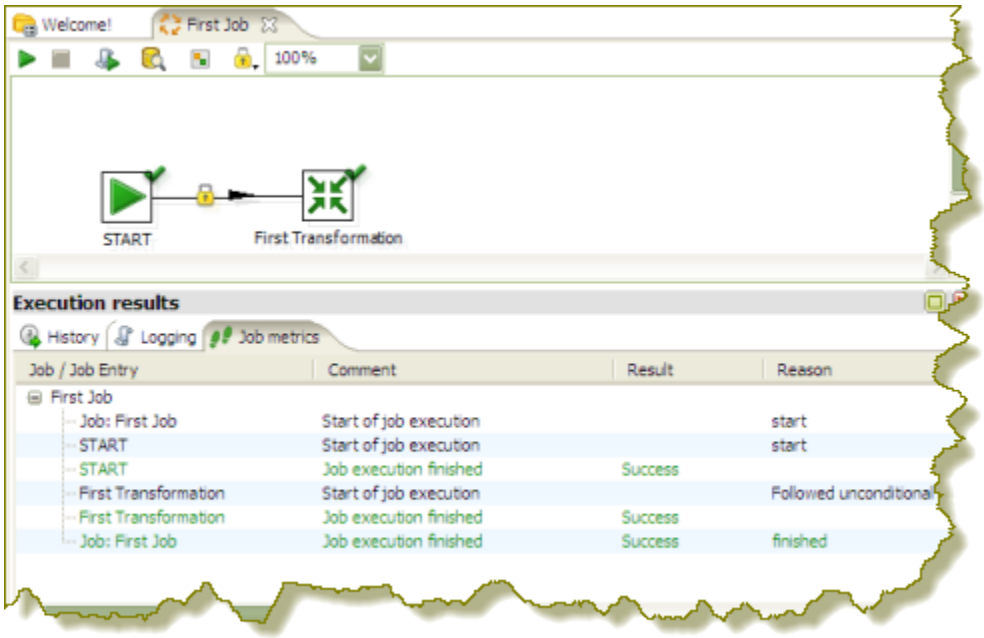
You created, saved, and ran your first transformation. Now, you will build a simple job. Use jobs to execute one or more transformations, retrieve files from a Web server, place files in a target directory, and more. Additionally, you can schedule jobs to run on specified dates and times. The *Getting Started with Pentaho Data Integration Guide* contains a "real world" exercise for building jobs.

1. In the Spoon menubar, go to **File** -> **New** > **Job**. Alternatively click  (New) in the toolbar.
2. Click the **Design** tab.
   The nodes that contain job entries appear.
3. Expand the **General** node and select the **Start** job entry.
4. Drag the Start job entry to the workspace (canvas) on the right.
   The Start job entry defines where the execution will begin.
5. Expand the **General** node, select and drag a **Transformation** job entry on to the workspace.
6. Use a hop to connect the Start job entry to the Transformation job entry.
7. Double-click on the **Transformation** job entry to open its properties dialog box.
8. Under **Transformation specification**, click **Specify by name and directory**.
9. Click  (Browse) to locate your transformation in the Enterprise Repository.
10. In the **Select repository object** view, expand the **Home** and **joe** directories. Locate **First Transformation** and click **OK**.



The name of the transformation and its location appear next to the **Specify by name and directory** option.

11. Under **Transformation specification**, click **OK**.
12. Save your job; call it **First Job**. Steps used to save a job are nearly identical to saving a transformation. Provide a meaningful comment when saving your job. See *Saving Your Transformation*.
13. Click (Run Job) in the toolbar. When the **Execute a Job** dialog box appears, choose **Local Execution** and click **Launch**.

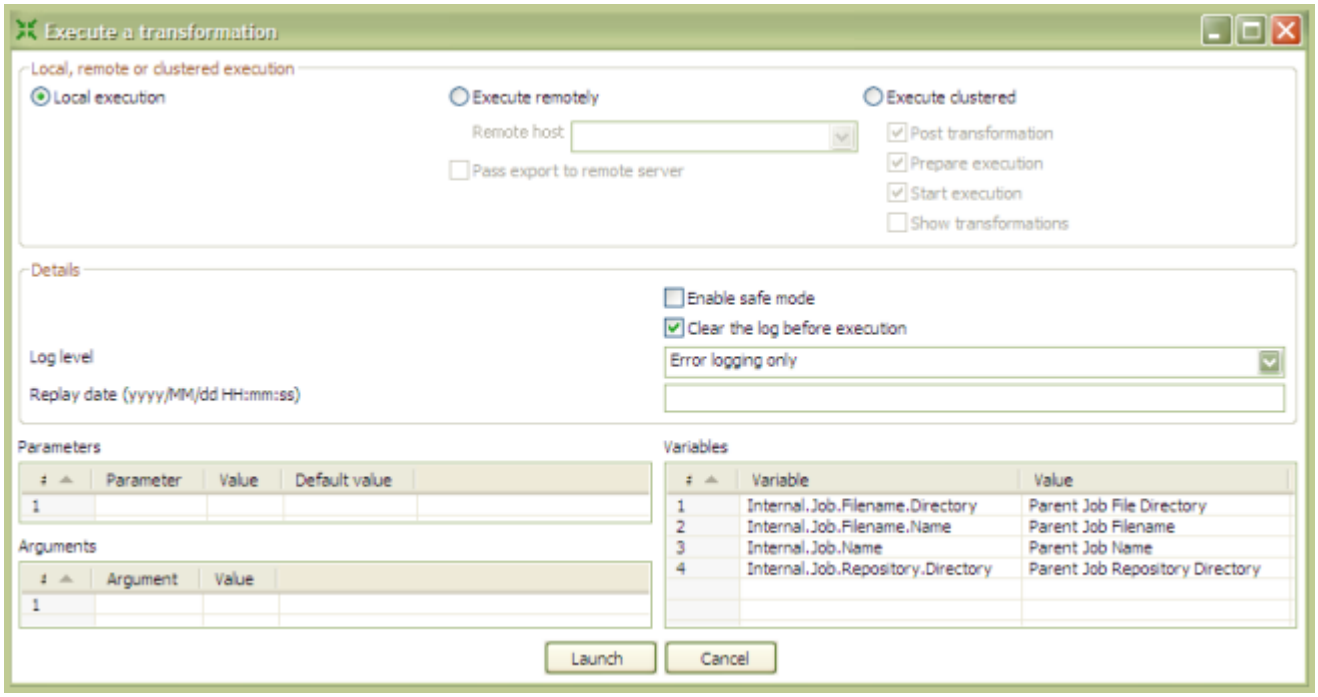


The **Execution Results** panel opens displaying the job metrics and log information for the job execution.

Executing Transformations

When you are done modifying a transformation or job, you can run it by clicking (Run) from the main menu toolbar, or by pressing F9. There are three options that allow you to decide where you want your transformation to be executed:

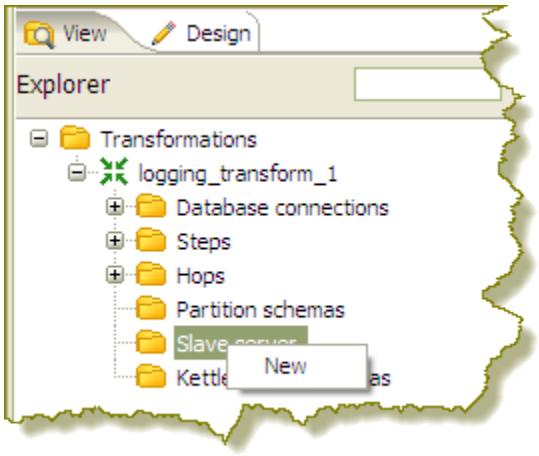
- **Local Execution** — The transformation or job will be executed on the machine you are currently using.
- **Execute remotely** — Allows you to specify a remote server where you want the execution to take place. This feature requires that you have the Data Integration Server running or Pentaho Data Integration installed on a remote machine and running the Carte service. To use remote execution you first must set up a slave server (see *Setting Up a Slave Server* .
- **Execute clustered** — Allows you to execute a transformation in a clustered environment.



Creating a Carte Slave Server in Spoon

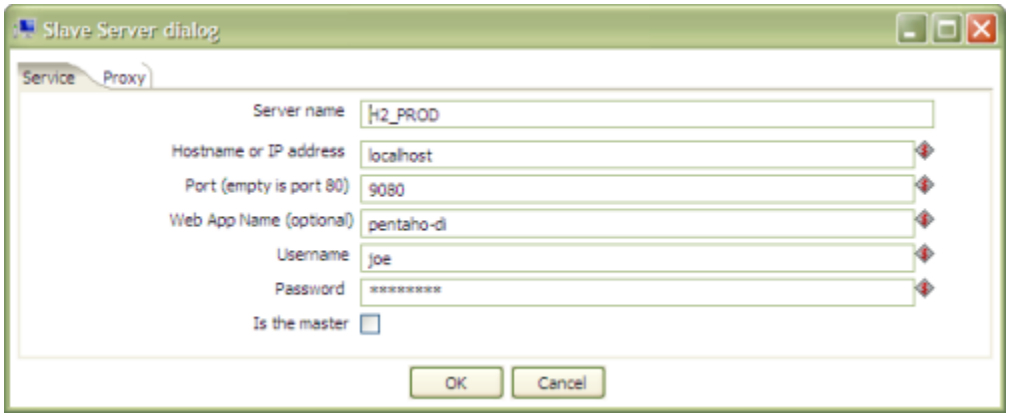
Follow this procedure to establish a cluster schema in PDI. This only creates schemas; clusters are manually assigned to transformations or individual steps on a file or step basis.

1. Open a transformation.
2. In the **Explorer View** in Spoon, select **Slave Server**.
3. Right-click and select **New**.



The **Slave Server** dialog box appears.

4. In the Slave Server dialog box, enter the appropriate connection information for the Data Integration (or Carte) slave server. The image below displays a connection to the Data Integration slave server.



Option	Description
Server name	The name of the slave server
Hostname or IP address	The address of the device to be used as a slave
Port	Defines the port you are for communicating with the remote server
Web App Name	Used for connecting to the DI server and set to pentaho-di by default
User name	Enter the user name for accessing the remote server
Password	Enter the password for accessing the remote server
Is the master	Enables this server as the master server in any clustered executions of the transformation

Note: When executing a transformation or job in a clustered environment, you should have one server set up as the master and all remaining servers in the cluster as slaves.

Below are the proxy tab options:

Option	Description
Proxy server hostname	Sets the host name for the Proxy server you are using
The proxy server port	Sets the port number used for communicating with the proxy
Ignore proxy for hosts: regexp|separated	Specify the server(s) for which the proxy should not be active. This option supports specifying multiple servers using regular expressions. You can also add multiple servers and expressions separated by the ' | ' character.

5. Click **OK** to exit the dialog box. Notice that a plus sign (+) appears next to **Slave Server** in the Explorer View.

Creating a Cluster Schema in Spoon

Clustering allows transformations and transformation steps to be executed in parallel on more than one Carte server. The clustering schema defines which slave servers you want to assign to the cluster and a variety of clustered execution options.

Begin by selecting the **Kettle cluster schemas** node in the Spoon **Explorer View**. Right-click and select **New** to open the **Clustering Schema** dialog box.

Option	Description
Schema name	The name of the clustering schema
Port	Specify the port from which to start numbering ports for the slave servers. Each additional clustered step executing on a slave server will consume an additional port.  **Note:** to avoid networking problems, make sure no other networking protocols are in the same range .
Sockets buffer size	The internal buffer size to use
Sockets flush interval rows	The number of rows after which the internal buffer is sent completely over the network and emptied.
Sockets data compressed?	When enabled, all data is compressed using the Gzip compression algorithm to minimize network traffic
Dynamic cluster	If checked, a master Carte server will perform load-balancing operations, and you must define the master as a slave server in the feild below. If unchecked, Spoon will act as the load balancer, and you must define the available Carte slaves in the field below.
Slave Servers	A list of the servers to be used in the cluster. You must have one master server and any number of slave servers. To add servers to the cluster, click **Select slave servers** to select from the list of available slave servers.

Executing Transformations in a Cluster

To run a transformation on a cluster, access the **Execute a transformation** screen and select **Execute clustered**.

To run a clustered transformation via a job, access the **Transformation** job entry details screen and select the **Advanced** tab, then select **Run this transformation in a clustered mode?**.

To assign a cluster to an individual transformation step, right-click on the step and select **Clusterings** from the context menu. This will bring up the cluster schema list. Select a schema, then click **OK**.

When running transformations in a clustered environment, you have the following options:

- **Post transformation** — Splits the transformation and post it to the different master and slave servers
- **Prepare execution** — Runs the initialization phase of the transformation on the master and slave servers
- **Prepare execution** — Runs the initialization phase of the transformation on the master and slave servers
- **Start execution** — Starts the actual execution of the master and slave transformations.
- **Show transformations** — Displays the generated (converted) transformations that will be executed on the cluster

Executing Jobs and Transformations from the Repository on the Carte Server

To execute a job or transformation remotely on a Carte server, you need to copy the local `repositories.xml` from the user's home directory.

In a Windows environment, the file path would be: `C:\Documents and Settings\{user}\.kettle`

For all other *nix based operating systems, go to the Carte servers user's home directory: `$HOME/.kettle`

For more information locating or changing the Kettle home directory, see the topic **Changing the Pentaho Data Integration Home Directory Location (.kettle folder)**.

Impact Analysis

To see what effect your transformation will have on the data sources it includes, go to the **Action** menu and click on **Impact**. PDI will perform an impact analysis to determine how your data sources will be affected by the transformation if it is completed successfully.

Working with the Enterprise Repository

In addition to storing and managing your jobs and transformations, the Enterprise Repository provides full revision history for documents allowing you to track changes, compare revisions and revert to previous versions when necessary. This, in combination with other feature such as enterprise security and content locking make the Enterprise Repository an ideal platform for providing a collaborative ETL environment.

Note: If you prefer to manage your documents as loose files on the file system, click **Cancel** in the **Repository Connection** dialog box. You can also stop the Repository Connection dialog box from appearing at startup by disabling the **Show this dialog at startup** option.

Adding an Enterprise Repository

To add a new enterprise repository...

1. In the Spoon menu bar, go to **Tools** -> **Repository** -> **Connect**.

   Note: If you are currently connected to a repository you must click **Disconnect Repository** and return to this step to continue.

2. In the Repository Connection dialog box, click (**Add**).
3. Select **Enterprise Repository** and click **OK**. The **Repository Configuration** dialog box appears.
4. In the **Repository Configuration** dialog box, enter the following values and click **OK**:

Field Name	Description
URL	http://localhost:9080/pentaho-di — Click **Test** to make sure your repository URL is correct. In production, this URL may be different than the default URL provided here. **Note:** To find out what port your repository (Data Integration server port) is on, locate the **pentaho** folder on your local device or network drive and open the **installation-summary.text** file.
ID	Enter a unique ID for this repository.
Name	Enter a name for your repository.

5. Click **OK**. Notice that the new repository has been added to the list of available repositories in the **Repository Connection** dialog box.
6. Enter the appropriate credentials (user name and password) to access the repository and click **OK**.

Editing Enterprise Repository Details

To edit Enterprise Repository details...

1. In the **Repository Connection** dialog box, select the repository whose details you want to edit.
2. Click (**Edit**).
   The **Repository Configuration** dialog box appears.
3. Make changes as needed and click **OK** when you are done.

Deleting an Enterprise or Kettle Database Repository

When necessary, you can delete an Enterprise Repository or Kettle Database repository. To delete a repository...

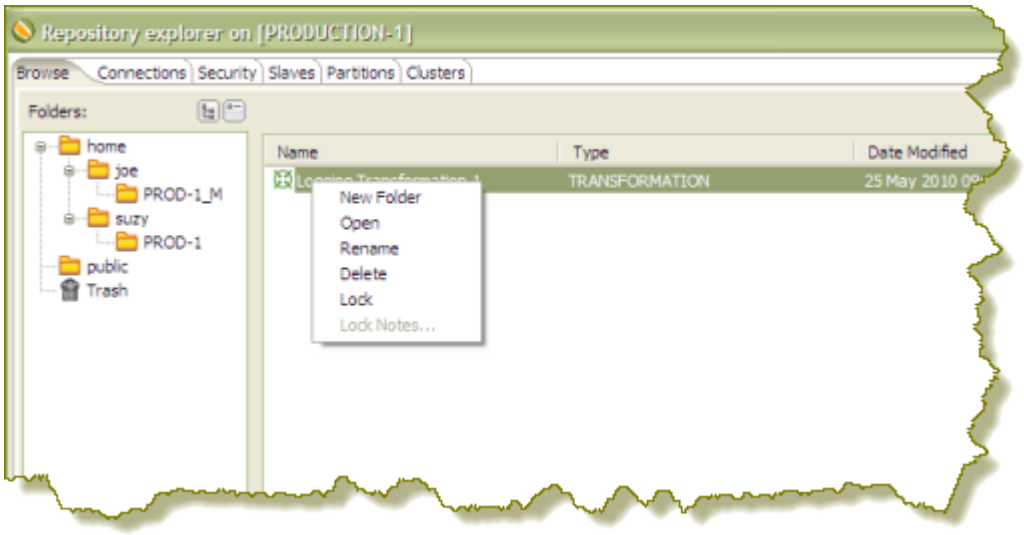
1. In the **Repository Connection** dialog box, select the repository you want to delete from the list of available repositories.
2. Click (**Delete**).
   A confirmation dialog appears.
3. Click **Yes** to delete the repository.

Managing Content in the Enterprise Repository

When you are in the Repository Explorer view (**Tools** -> **Repository** -> **Explore**) use the right-click menu to perform common tasks such as those listed below:

- Exploring repository contents
- Sharing content with other repository users
- Creating a new folder in the repository
- Opening a folder, job, or transformation
- Renaming a folder, job or transformation
- Deleting a folder, job, or transformation
- Locking a job or transformation

Note: Permissions set by your administrator determine what you are able to view and tasks you are able to perform in the repository.

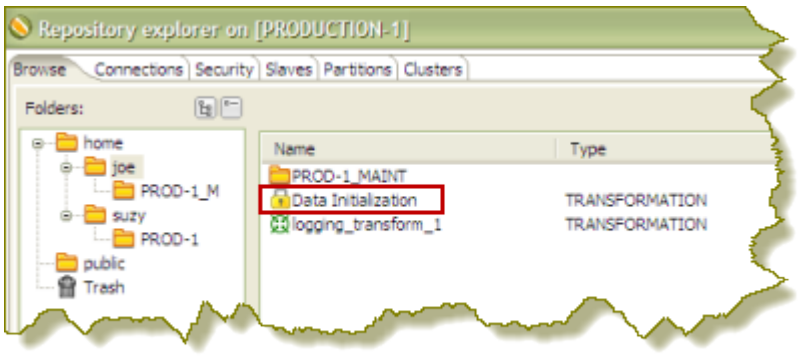


To **move** objects, such as folders, jobs, or transformations, in the repository, select the object, then click-and-drag it to the desired location in the navigation pane on the left. You can move an object in your folder to the folder of another repository user.

To **restore** an object you deleted, double-click (Trash). The object(s) you deleted appear in the right pane. Right-click on the object you want restored, and select **Restore** from the menu.

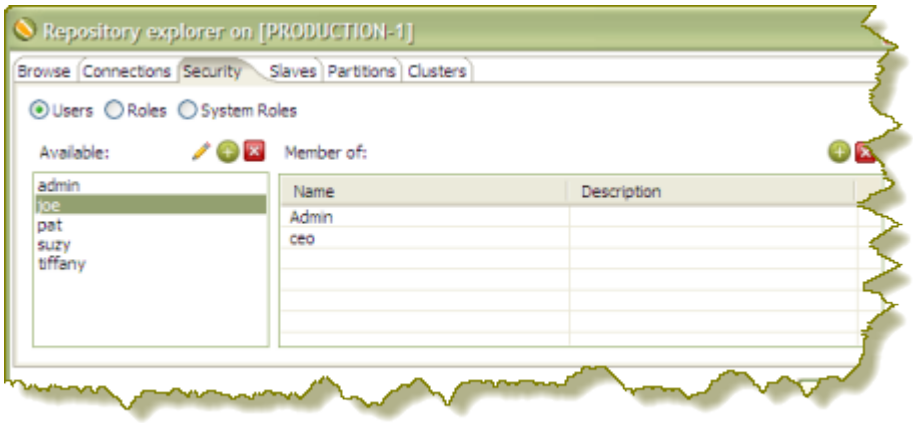
To **lock** a job or transformation from being edited by other users, select the job or transformation, right-click, and choose **Lock**. Enter a meaningful comment in the notes box that appears. A padlock icon appears next to jobs and transformation that have been locked. Locking and unlocking objects in the repository works like a toggle switch. When you release a lock on an object, the checkmark next to the Lock option disappears.

Note: The lock status icons are updated on each PDI client only when the Repository Explorer is launched. If you want to refresh lock status in the Repository Explorer, exit and re-launch it.



In addition to managing content such as jobs and transformations, click the **Connections** tab to manage (create, edit, and delete) your database connections in the Enterprise Repository. See *Managing Connections* for more information about connecting to a database.

Click the **Security** tab to manage users and roles. Pentaho Data Integration comes with a default security provider. If you do not have an existing security such as LDAP or MSAD, you can use Pentaho Security to define users and roles. You must have administrative privileges to manage security. For more information, see the *Pentaho Data Integration Administrator's Guide*.



You can manage your slave servers (Data Integration and Carte instances) by clicking the **Slaves** tab. See *Setting Up a Slave Server* for instructions.

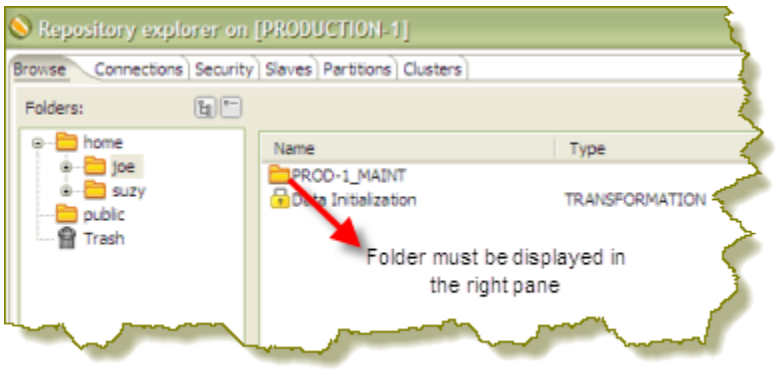
Click the **Partitions** and **Cluster** tabs to manage partitions and clusters. See *Creating a Cluster Schema* for more information.

Setting Folder-Level Permissions

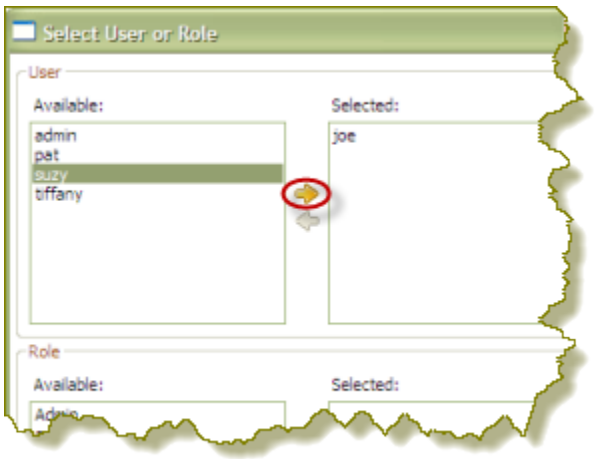
You can assign specific permissions to content files and folders stored in a PDI Enterprise Repository. Setting permissions manually will override inherited permissions if the access control flags allow. Follow the instructions below to set folder-level permissions.

1. Open the Repository Explorer (**Tools** -> **Repository** -> **Explore**).
2. Navigate to the folder to which you want permissions set and click to select it.

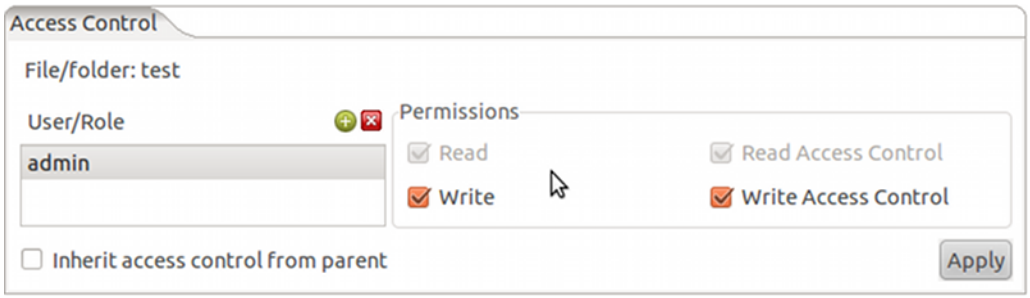
   The folder must appear in the right pane before you can set permissions.



3. In the lower pane, under the **Permissions** tab, disable **Inherit security settings from parent**.
4. Click (**Add**) to open the **Select User or Role** dialog box.
5. Select a user or role to add to the permission list. Use the yellow arrows to move the user or role in or out of the permissions list. Click **OK** when you are done.



6. In the lower pane, under the **Access Control** tab, enable the appropriate **Permissions** granted to your selected user or role.



If you change your mind, use (**Delete**) to remove users or roles from the list.

7. Click **Apply** to apply permissions.

Access Control List (ACL) Permissions

All of the permissions settings for PDI Enterprise Repository content and folders are explained below.

Note: You must assign both **Write** and **Write Access Control** to a directory in order to enable the selected user to create subfolders and save files within the folder.

Read Access Control	If set, access controls will be readable for this object.
Read	If set, the content of the file or contents of the directory will be accessible.

Write Access Control	If set, access controls can be changed for this object.
Write	If set, enables read and write access to the selected content.

Exporting Content from an Enterprise Repositories with Command-Line Tools

To export repository objects into XML format, using command-line tools instead of exporting repository configurations from within Spoon, use named parameters and command-line options when calling Kitchen (or Pan) from a command-line prompt.

The following is an example command-line entry to execute an export job using Kitchen:

```
call kitchen.bat /file:C:\Pentaho_samples\repository\repository_export.kjb
"/param:rep_name=PDI2000" "/param:rep_user=joe" "/param:rep_password=password"
"/param:rep_folder=/public/dev"
"/param:target_filename=C:\Pentaho_samples\repository\export\dev.xml"
```

Parameter	Description
rep_folder	Repository Folder
rep_name	Repository Name
rep_password	Repository Password
rep_user	Repository Username
target_filename	Target Filename

Note: It is also possible to use obfuscated passwords with Encr (Command line tool for encrypting strings for storage / use by PDI).

The following is an example command-line entry to execute a complete command-line call for the export in addition to checking for errors:

```
   @echo off
   ECHO This an example of a batch file calling the repository_export.kjb

   cd C:\Pentaho\pdi-ee-4.4.0-GA\data-integration

   call kitchen.bat /file:C:\Pentaho_samples\repository\repository_export.kjb "/
param:rep_name=PDI2000"
   "/param:rep_user=joe" "/param:rep_password=password" "/param:rep_folder=/public/
dev"
   "/param:target_filename=C:\Pentaho_samples\repository\export\dev.xml"

   if errorlevel 1 goto error
   echo Export finished successfull.
   goto finished

   :error
   echo ERROR: An error occured during repository export.
   :finished
   REM Allow the user to read the message when testing, so having a pause
   pause
```

Working with Version Control

Whenever you save a job or transformation in the Enterprise Repository, you are prompted to provide a comment. Your comments are saved along with your job or transformation so that you can keep track of changes you make. If you have

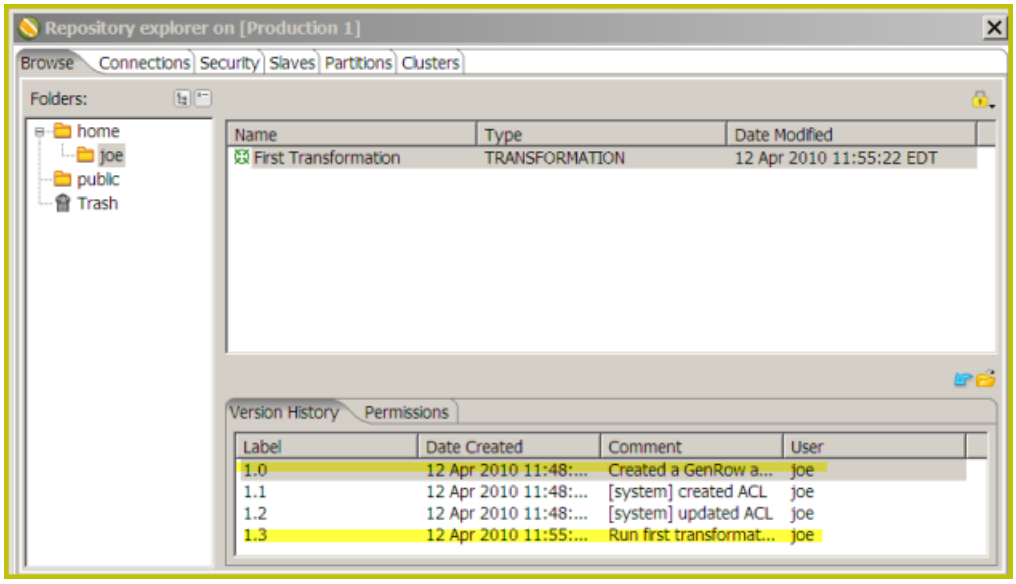
made a change to a transformation or job that you do not like, you can choose to restore a specific version of that job or transformation. It is important to provide descriptive version control comments, so that you can make good decisions when reverting to a version of a job or transformation.

Examining Revision History

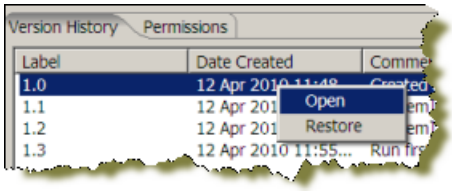
To examine revision history for a job or transformation...

1. In Spoon menubar, go to **Tools** -> **Repository** -> **Explore**. Alternatively click in the Spoon menubar. The **Repository Explorer** window opens.
2. In the navigation pane on the left, locate and double-click the folder that contains your job or transformation. In the example below, there is one transformation listed in the folder called, "joe."
3. Click on a transformation or job from the list to select it. Notice that the **Version History** associated with transformation or job appears in the lower pane.

   Administrative users see the **home** folders of all users on the system. If you are not an administrator you see your **home** and **public** folders. Your **home** folder is where you manage private content, such as transformations and jobs that are "in progress," for example. The **public** folder is where you store content that you want to share with others.



4. Right-click on the line under Version History that contains the transformation or job you want to examine. Choose **Open** to open the transformation or job in Spoon.



Restoring a Previously Saved Version of a Job or Transformation

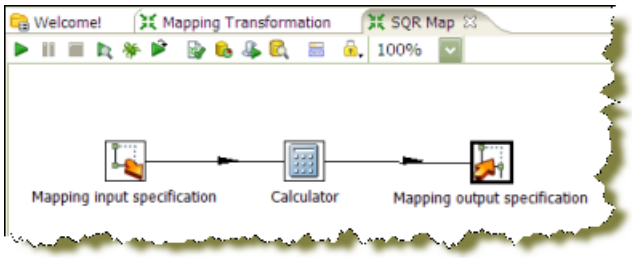
To restore a version of a job or transformation...

1. In Spoon menubar, go to **Tools** -> **Repository** -> **Explore**. The **Repository Explorer** window opens.
2. Browse through the folders to locate the transformation or job that has multiple versions associated with it.
3. Right-click on a transformation or job from the list to select it.
4. Select **Restore**.
5. Write a meaningful comment in the **Commit Comment** dialog box and click **OK**. The version is restored. Next time you open the transformation or job, the restored version is what you will see.

Reusing Transformation Flows with Mapping Steps

When you want to reuse a specific sequence of steps, you can turn the repetitive part into a *mapping*. A mapping is a standard transformation except that you can define mapping input and output steps as placeholders.

- Mapping Input Specification — the placeholder used for input from the parent transformation
- Mapping Output Specification — the placeholder from which the parent transformation reads data



Note: Pentaho Data Integration samples that demonstrate the use of mapping steps are located at `...samples\mapping\Mapping`.

Below is the reference for the **Mapping (sub-transformation)** step:

Option	Description
Step name	Optionally, you can change the name of this step to fit your needs.
Mapping transformation	Specify the name of the mapping transformation file to execute at runtime. You can specify either a filename (XML/.ktr) or a transformation from the repository. The **Edit** button opens the specified transformation under a separate step in the Spoon Designer.
Parameters	Options under the **Parameters** tab allow you to define or pass PDI variables down to the mapping. This provides you with a high degree of customization. **Note:** It is possible to include variable expressions in the string values for the variable names. **Note: Important!** Only those variables/values that are specified are passed down to the sub-transformation.
Input Tabs	Each of the Input tabs (may be missing) correspond to one **Mapping Input Specification** step in the mapping or sub-transformation. This means you can have multiple Input tabs in a single Mapping step. To add an Input tab, click **Add Input**. • **Input source step name**— The name of the step in the parent transformation (not the mapping) from which to read • **Mapping target step name** — The name of the step in the mapping (sub-transformation) to send the rows of data from the input source step • **Is this the main data path?** — Enable if you only have one input mapping ; you can leave the **Mapping source step name** and **Output target step name** fields blank • **Ask these values to be renamed back on output?** — Fields get renamed before they are transferred to the mapping transformation

Option	Description
	 **Note:** Enabling this option renames the values back to their original names once they move to the Mapping output step. This option makes your sub-transformations more transparent and reusable. • **Step mapping description** — Add a description of the mapping step • **Source - mapping transformation mapping** Enter the required field name changes
Output Tabs	Each of the Output tabs (may be missing) correspond to one **Mapping Output Specification** step in the mapping or sub-transformation. This means you can have multiple Output tabs in a single Mapping step. To add an Output tab, click **Add Output**. • **Mapping source step** — the name of the step in the mapping transformation (sub-transformation) where that will be read • **Output target step name** — the name of the step in the current transformation (parent) to send the data from the mapping transformation step to. • **Is this the main data path?** — Enable if you only have one output mapping and you can leave the **Mapping source step** and **Output target step name** fields above blank. • **Step mapping description** — Add a description to the output step mapping • **Mapping transformation - target step field mapping** — Enter the required field name changes
Add input / Add output	Add an input or output mapping for the specified sub-transformation

Arguments, Parameters, and Variables

PDI has three paradigms for storing user input: arguments, parameters, and variables. Each is defined below, along with specific tips and configuration information.

Arguments

A PDI argument is a named, user-supplied, single-value input given as a command line argument (running a transformation or job manually from Pan or Kitchen, or as part of a script). Each transformation or job can have a maximum of 10 arguments. Each argument is declared as space-separated values given after the rest of the Pan or Kitchen line:

```
sh pan.sh -file:/example_transformations/example.ktr argOne argTwo argThree
```

In the above example, the values **argOne**, **argTwo**, and **argThree** are passed into the transformation, where they will be handled according to the way the transformation is designed. If it was not designed to handle arguments, nothing will happen. Typically these values would be numbers, words (strings), or variables (system or script variables, not PDI variables).

In Spoon, you can test argument handling by defining a set of arguments when you run a transformation or job. This is accomplished by typing in values in the **Arguments** fields in the **Execute a Job** or **Execute a Transformation** dialogue.

Parameters

Parameters are like local variables; they are reusable inputs that apply only to the specific transformation that they are defined in. When defining a parameter, you can assign it a default value to use in the event that one is not fetched for it. This feature makes it unique among dynamic input types in PDI.

Note: If there is a name collision between a parameter and a variable, the parameter will take precedence.

To define a parameter, right-click on the transformation workspace and select **Transformation settings** from the context menu (or just press **Ctrl-T**), then click on the **Parameters** tab.

VFS Properties

vfs . *scheme* . *property* . *host*

The **vfs** subpart is required to identify this as a virtual filesystem configuration property. The **scheme** subpart represents the VFS driver's scheme (or VFS type), such as http, sftp, or zip. The **property** subpart is the name of a VFS driver's ConfigBuilder's setter (the specific VFS element that you want to set). The **host** optionally defines a specific IP address or hostname that this setting applies to.

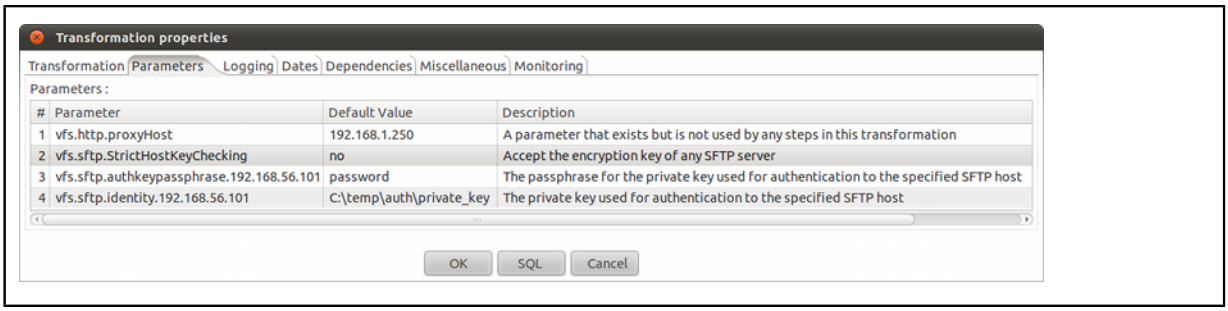
You must consult each scheme's API reference to determine which properties you can create variables for. Apache provides VFS scheme documentation at *http://commons.apache.org/vfs/apidocs/index.html*. The **org.apache.commons.vfs.provider** package lists each of the configurable VFS providers (ftp, http, sftp, etc.). Each provider has a **FileSystemConfigBuilder** class that in turn has **set*(FileSystemOptions, Object)** methods. If a method's second parameter is a **String** or a **number** (Integer, Long, etc.) then you can create a PDI variable to set the value for VFS dialogues.

The table below explains VFS properties for the SFTP scheme. Each property must be declared as a PDI variable and preceded by the **vfs.sftp** prefix as defined above.

Note: All of these properties are optional.

SFTP VFS Property	Purpose
compression	Specifies whether zlib compression is used for the destination files. Possible values are **zlib** and **none**.

SFTP VFS Property	Purpose
identity	The private key file (fully qualified local or remote path and filename) to use for host authentication.
authkeypassphrase	The passphrase for the private key specified by the **identity** property.
StrictHostKeyChecking	If this is set to **no**, the certificate of any remote host will be accepted. If set to **yes**, the remote host must exist in the known hosts file (~/.ssh/known_hosts).



Configuring SFTP VFS

To configure the connection settings for SFTP dialogues in PDI, you must create either variables or parameters for each relevant value. Possible values are determined by the VFS driver you are using.

You can also use parameters to substitute VFS connection details, then use them in the VFS dialogue where appropriate. For instance, these would be relevant credentials, assuming the parameters have been set:

```
sftp://${username}@${host}/${path}
```

This technique enables you to hide sensitive connection details, such as usernames and passwords.

See *VFS Properties* on page 51 for more information on VFS options. You can also see all of these techniques in practice in the **VFS Configuration Sample** sample transformation in the `/data-integration/samples/transformations/` directory.

Variables

A variable in PDI is a piece of user-supplied information that can be used dynamically and programmatically in a variety of different scopes. A variable can be local to a single step, or be available to the entire JVM that PDI is running in.

PDI variables can be used in steps in both jobs and transformations. You define variables with the **Set Variable** step in a transformation, by hand through the **kettle.properties** file, or through the **Set Environment Variables** dialogue in the **Edit** menu.

The**Get Variable** step can explicitly retrieve a value from a variable, or you can use it in any PDI text field that has the diamond dollar sign icon next to it by using a metadata string in either the Unix or Windows formats:

- `${VARIABLE}`
- `%%VARIABLE%%`

Both formats can be used and even mixed. In fact, you can create variable recursion by alternating between the Unix and Windows syntaxes. For example, if you wanted to resolve a variable that depends on another variable, then you could use this example: **${%%inner_var%%}**.

Note: If there is a name collision with a parameter or argument, variables will defer.

You can also use ASCII or hexidecimal character codes in place of variables, using the same format: **$[hex value]**. This makes it possible to escape the variable syntax in instances where you need to put variable-like text into a variable. For instance if you wanted to use **${foobar}** in your data stream, then you can escape it like this: **$[24]{foobar}**. PDI will replace **$[24]** with a **$** without resolving it as a variable.

Variable Scope

The scope of a variable is defined by the location of its definition. There are two types of variables: global environment variables, and Kettle variables. Both are defined below.

Environment Variables

This is the traditional variable type in PDI. You define an environment variable through the **Set Environment Variables** dialogue in the **Edit** menu, or by hand by passing it as an option to the Java Virtual Machine (JVM) with the -D flag.

Environment variables are an easy way to specify the location of temporary files in a platform-independent way; for example, the `${java.io.tmpdir}` variable points to the `/tmp/` directory on Unix/Linux/OS X and to the `C:\Documents and Settings\<username\Local Settings\Temp\` directory on Windows.

The only problem with using environment variables is that they cannot be used dynamically. For example, if you run two or more transformations or jobs at the same time on the same application server, you may get conflicts. Changes to the environment variables are visible to all software running on the virtual machine.

Kettle Variables

Kettle variables provide a way to store small pieces of information dynamically in a narrower scope than environment variables. A Kettle variable is local to Kettle, and can be scoped down to the job or transformation in which it is set, or up to a related job. The **Set Variable** step in a transformation allows you to specify the related job that you want to limit the scope to; for example, the parent job, grandparent job, or the root job.

Internal Variables

The following variables are always defined:

Variable Name	Sample Value
Internal.Kettle.Build.Date	2010/05/22 18:01:39
Internal.Kettle.Build.Version	2045
Internal.Kettle.Version	4.3

These variables are defined in a transformation:

Variable Name	Sample Value
Internal.Transformation.Filename.Directory	D:\Kettle\samples
Internal.Transformation.Filename.Name	Denormaliser - 2 series of key-value pairs.ktr
Internal.Transformation.Name	Denormaliser - 2 series of key-value pairs sample
Internal.Transformation.Repository.Directory	/

These are the internal variables that are defined in a job:

Variable Name	Sample Value
Internal.Job.Filename.Directory	/home/matt/jobs
Internal.Job.Filename.Name	Nested jobs.kjb
Internal.Job.Name	Nested job test case
Internal.Job.Repository.Directory	/

These variables are defined in a transformation running on a slave server, executed in clustered mode:

Variable Name	Sample Value
Internal.Slave.Transformation.Number	0..<cluster size-1> (0,1,2,3 or 4)
Internal.Cluster.Size	<cluster size> (5)

Note: In addition to the above, there are also **System** parameters, including command line arguments. These can be accessed using the *Get System Info* step in a transformation.

Note: Additionally, you can specify values for variables in the **Execute a transformation** dialog box. If you include the variable names in your transformation they will appear in this dialog box.

Prototyping With Pentaho Data Integration

Pentaho Data Integration offers rapid prototyping of analysis schemas through a mix of processes and tools known as **Agile BI**. The Agile BI functions of Pentaho Data Integration are explained in this section, but there is no further instruction here regarding PDI installation, configuration, or use beyond ROLAP schema creation. If you need information related to PDI in general, consult the *Pentaho Data Integration Installation Guide* and/or the *Pentaho Data Integration User Guide* in the Pentaho InfoCenter.

Note: Agile BI is for **prototyping only**. It is extremely useful as an aid in developing ROLAP schemas that meet the needs of BI developers, business users, and database administrators. However, **it should not be used for production**. Once your Agile BI schema has been refined, you will have to either hand-edit it in Schema Workbench to optimize it for performance, or completely re-implement the entire model with Schema Workbench.

Creating a Prototype Schema With a Non-PDI Data Source

Your data sources must be configured, running, and available before you can proceed with this step.

Follow the below procedure to create a ROLAP schema prototype from an existing database, file, or data warehouse.

Note: If you are already using PDI to create your data source, skip these instructions and refer to *Creating a Prototype Schema With a PDI Data Source* on page 55 instead.

1. Start Spoon and connect to your repository, if you are using one.

   ```
   cd ~/pentaho/design-tools/data-integration/ && ./spoon.sh
   ```

2. Go to the **File** menu, then select the **New** sub-menu, then click on **Model**.

   The interface will switch over to the **Model** perspective.

3. In the **Properties** pane on the right, click **Select**.

   A data source selection window will appear.

4. Click the round green **+** icon in the upper right corner of the window.

   The **Database Connection** dialogue will appear.

5. Enter in and select the connection details for your data source, then click **Test** to ensure that everything is correct. Click **OK** when you're done.

6. Select your newly-added data source, then click **OK**.

   The **Database Explorer** will appear.

7. Traverse the database hierarchy until you get to the table you want to create a model for. Right-click the table, then select **Model** from the context menu.

   The Database Explorer will close and bring you back to the Model perspective.

8. Drag items from the **Data** pane on the left and drop them into either the **Measures** or **Dimensions** groups in the **Model** pane in the center.

   The Measures and Dimensions groups will expand to include the items you drag into them.

9. Select each new measure and dimension item, and modify its details accordingly in the **Properties** pane on the right.

10. Save your model through the **File** menu, or publish it to the BA Server using the **Publish** icon above the Model pane.

You now have a basic ROLAP schema. You should test it yourself before putting it into production. To do this, continue on to *Testing With Pentaho Analyzer and Report Wizard* on page 56.

Creating a Prototype Schema With a PDI Data Source

Context for the current task

1. Start Spoon and connect to your repository, if you are using one.

```
cd ~/pentaho/design-tools/data-integration/ && ./spoon.sh
```

2. Open the transformation that produces the data source you want to create a ROLAP schema for.
3. Right-click your output step, then select **Model** from the context menu.
4. Drag items from the **Data** pane on the left and drop them into either the **Measures** or **Dimensions** groups in the **Model** pane in the center.

   The Measures and Dimensions groups will expand to include the items you drag into them.
5. Select each new measure and dimension item, and modify its details accordingly in the **Properties** pane on the right.
6. Save your model through the **File** menu, or publish it to the BA Server using the **Publish** icon above the Model pane.

You now have a basic ROLAP schema. You should test it yourself before putting it into production. To do this, continue on to *Testing With Pentaho Analyzer and Report Wizard* on page 56.

Testing With Pentaho Analyzer and Report Wizard

You must have an analysis schema with at least one measure and one dimension, and it must be currently open and focused on the Model perfective in Spoon.

This section explains how to use the embedded Analyzer and Report Design Wizard to test a prototype analysis schema.

1. While in the Model perspective, select your visualization method from the drop-down box above the Data pane (it has a **New:** to its left), then click **Go**.

   The two possible choices are: **Pentaho Analyzer** and **Report Wizard**. You do not need to have license keys for Pentaho Analysis or Pentaho Reporting in order to use these preview tools.
2. Either the Report Design Wizard will launch in a new sub-window, or Pentaho Analyzer will launch in a new tab. Use it as you would in Report Designer or the Pentaho User Console.
3. When you have explored your new schema, return to the Model perspective by clicking **Model** in the upper right corner of the Spoon toolbar, where all of the perspective buttons are.

   Do not close the tab; this will close the file, and you will have to reopen it in order to adjust your schema.
4. If you continue to refine your schema in the Model perspective, you must click the **Go** button again each time you want to view it in Analyzer or Report Wizard; the Visualize perspective does not automatically update according to the changes you make in the Modeler.

You now have a preview of what your model will look like in production. Continue to refine it through the Model perspective, and test it through the Visualize perspective, until you meet your initial requirements.

Prototypes in Production

Once you're ready to test your ROLAP schema on a wider scale, use the **Publish** button above the Model pane in the Model perspective, and use it to connect to your test or development BA Server.

You can continue to refine your schema if you like, but it must be republished each time you want to redeploy it.

Note: Agile BI is for **prototyping only**. It is extremely useful for developing ROLAP schemas that meet the needs of BI developers, business users, and database administrators. However, **it should not be used for production**. Rather, once your Agile BI schema has been refined, you will have to either hand-edit it in Schema Workbench to optimize it for performance, or completely re-implement the entire model with Schema Workbench.

Managing Connections

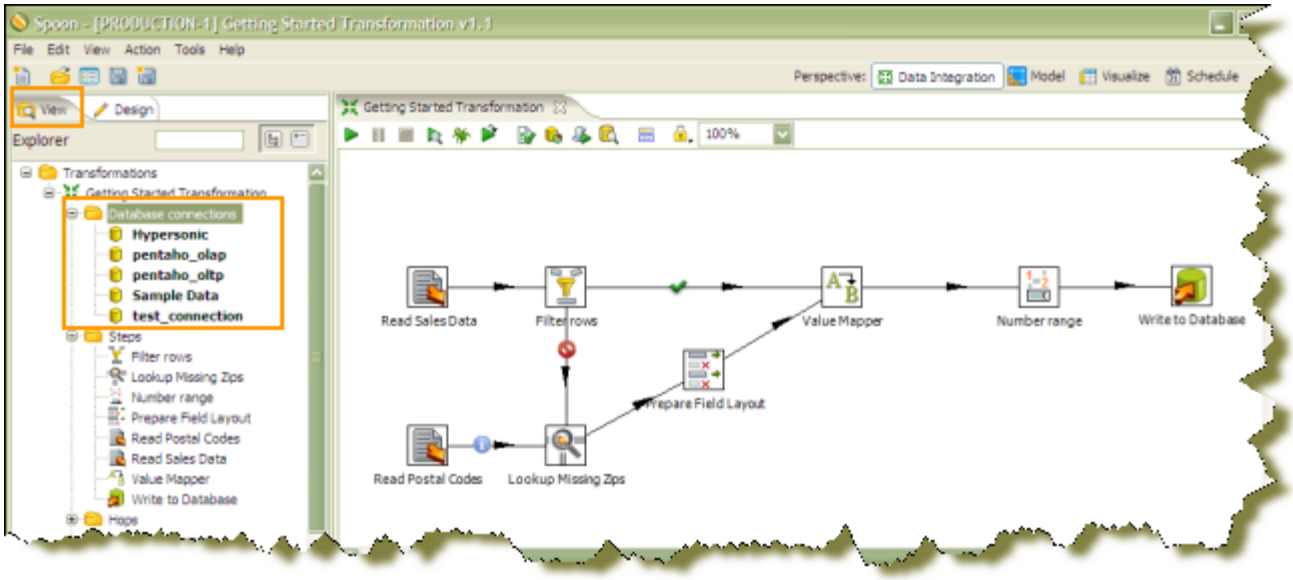
Pentaho Data Integration allows you to define connections to multiple databases provided by multiple database vendors (MySQL, Oracle, Postgres, and many more). Pentaho Data Integration ships with the most suitable JDBC drivers for supported databases and its primary interface to databases is through JDBC. Vendors write a driver that matches the JDBC specification and Pentaho Data Integration uses the driver. Unless you require extensive debugging or have other needs, you won't ever need to write your own database driver.

Note:

Pentaho recommends that you avoid using ODBC connections. The ODBC to JDBC bridge driver does not always provide exact match and adds another level of complexity that may affect performance. The only time you may have to use ODBC is if there is no available JDBC driver. For details, this article explains "Why you should avoid ODBC." *http://wiki.pentaho.com/pages/viewpage.action?pageId=14850644*.

When you define a database connection, the connection information (user name, password, port number, and so on) is stored in the Pentaho Enterprise Repository and is available to other users when they connect to the repository. If you are not using the Pentaho Enterprise Repository, the database connection information is stored in the XML file associated with a transformation or job.

Connections that are available for use with a transformation or job are listed under the **Database Connection** node in the explorer **View** in Spoon.



There are several ways to define a new database connection:

- In Spoon, go to **File** -> **New** -> **Database Connection**.
- In Spoon, under **View**, right-click **Database connections** and choose **New**.
- In Spoon, under **View**, right-click **Database connections** and choose **New Connection Wizard**.

Adding a JDBC Driver

Before you can connect to a data source in any Pentaho server or client tool, you must first install the appropriate database driver. Your database administrator, Chief Intelligence Officer, or IT manager should be able to provide you with the proper driver JAR. If not, you can download a JDBC driver JAR file from your database vendor or driver developer's Web site. Once you have the JAR, follow the instructions below to copy it to the driver directories for all of the Business Analytics components that need to connect to this data source. See the *Compatibility Matrix: Supported Components* in any of the Installation guide for current version numbers.

Note: Microsoft SQL Server users frequently use an alternative, non-vendor-supported driver called JTDS. If you are adding an MSSQL data source, ensure that you are installing the correct driver.

Backing up old drivers

You must also ensure that there are no other versions of the same vendor's JDBC driver installed in these directories. If there are, you may have to back them up and remove them to avoid confusion and potential class loading problems. This is of particular concern when you are installing a driver JAR for a data source that is the same database type as your Pentaho solution repository. If you have any doubts as to how to proceed, contact your Pentaho support representative for guidance.

Installing JDBC drivers

Copy the driver JAR file to the following directories, depending on which servers and client tools you are using (Dashboard Designer, ad hoc reporting, and Analyzer are all part of the BA Server):

Note: For the DI Server: before copying a new JDBC driver, ensure that there is not a different version of the same JAR in the destination directory. If there is, you must remove the old JAR to avoid version conflicts.

- **BA Server:** `/pentaho/server/biserver-ee/tomcat/lib/`
- **Enterprise Console:** `/pentaho/server/enterprise-console/jdbc/`
- **Data Integration Server:** `/pentaho/server/data-integration-server/tomcat/webapps/pentaho-di/WEB-INF/lib/`
- **Data Integration client:** `/pentaho/design-tools/data-integration/libext/JDBC/`
- **Report Designer:** `/pentaho/design-tools/report-designer/lib/jdbc/`
- **Schema Workbench:** `/pentaho/design-tools/schema-workbench/drivers/`
- **Aggregation Designer:** `/pentaho/design-tools/agg-designer/drivers/`
- **Metadata Editor:** `/pentaho/design-tools/metadata-editor/libext/JDBC/`

Note: To establish a data source in the Pentaho Enterprise Console, you must install the driver in both the Enterprise Console and the BA Server or Data Integration Server. If you are just adding a data source through the Pentaho User Console, you do not need to install the driver to Enterprise Console.

Restarting

Once the driver JAR is in place, you must restart the server or client tool that you added it to.

Connecting to a Microsoft SQL Server using Integrated or Windows Authentication

The JDBC driver supports Type 2 integrated authentication on Windows operating systems through the **integratedSecurity** connection string property. To use integrated authentication, copy the **sqljdbc_auth.dll** file to all the directories to which you copied the JDBC files.

The **sqljdbc_auth.dll** files are installed in the following location:

```
<installation directory>\sqljdbc_<version>\<language>\auth\
```

Note: Use the **sqljdbc_auth.dll** file, in the x86 folder, if you are running a 32-bit Java Virtual Machine (JVM) even if the operating system is version x64. Use the **sqljdbc_auth.dll** file in the x64 folder, if you are running a 64-bit JVM on a x64 processor. Use the **sqljdbc_auth.dll** file in the IA64 folder, you are running a 64-bit JVM on an Itanium processor.

Defining Database Connections

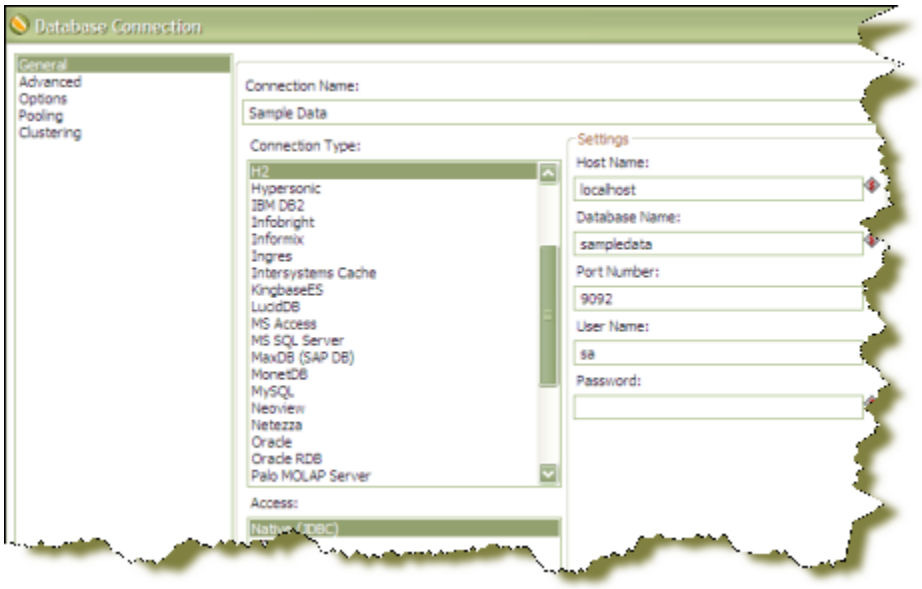
You must have information about your database, such as your database type, port number, user name and password, before you define a database connection. You can also set connection properties using variables. Variables ( ) provide you with the ability to access data from multiple database types using the same transformations and jobs.

Note: Make sure to use clean ANSI SQL that works on all used database types in the latter case.

1. Right-click the **Database connections** in the tree and choose **New** or **New Connection Wizard**.

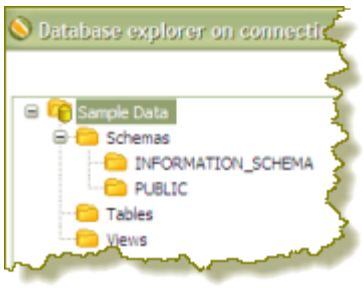
   Note: Alternatively, double-click **Database Connections**, or select **Database Connections** and press <**F3**>. The connection wizard allows you to define a connection quickly. If you require advanced features like pooling and clustering, don't use the connection wizard.

Depending on your choice, the **Database Connection** dialog box (or wizard) appears. The wizard requires that you provide the same type of basic information as required in the Database Connection dialog box shown below:

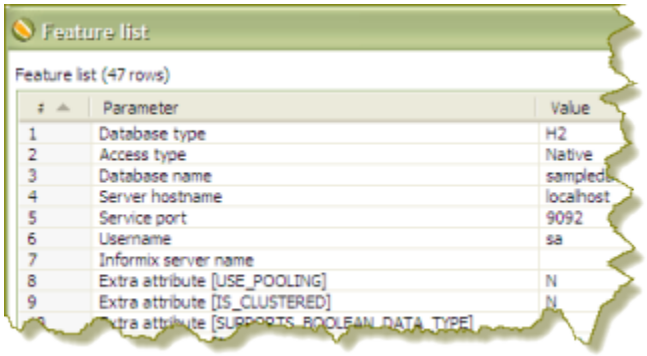


2. In the **Connection Name** field, enter a name that uniquely identifies your new connection.
3. Under **Connection Type**, select the database you are connecting to (for example, MySQL, Oracle, and so on).
4. Under **Access**, select your method of access. This will be **Native (JDBC)**, **ODBC**, or **JNDI**. Available access types depend on the type of database to which you are connecting.
5. Under **Settings**, in the **Host Name** field, enter the name of the server that hosts the database to which you are connecting. Alternatively, you can specify the host by IP address.
6. In the **Database Name** field, enter the name of the database to which you are connecting. If you are using a ODBC connection, enter the Data Source Name (DSN) in this field.
7. In the **Port Number** field, enter the TCP/IP port number if it is different from the default.
8. Optionally, enter the **User name** used to connect to the database.
9. Optionally, enter the **Password** used to connect to the database.
10. Click **Test**.
    A confirmation message displays if Spoon is able to establish a connection with the target database.
11. Click **OK** to save your entries and exit the Database Connection dialog box.

Click **Explore** to open the **Database Explorer** for an existing connection, or right-click on the connection in View mode and select **Explore**.



Click **Feature List** to expose the JDBC URL, class, and various database settings for the connection such as the list of reserved words.



Working with JNDI Connections

If you are developing transformations and jobs that will be deployed on an application server such as the BI platform running on JBoss, you can configure your database connections using JNDI. Pentaho has supplied a way of configuring a JNDI connection for "local" Pentaho Data Integration use so that you do not have an application server continuously running during the development and testing of transformations. To configure, edit the properties file called **jdbc.properties** located at `...\data-integration-server\pentaho-solutions\system\simple-jndi`.

Note: It is important that the information stored in **jdbc.properties** mirrors the content of your application server data sources.

Working with JNDI Connections in Carte and Spoon

The Carte server and Spoon use JNDI in the same way. The information below may be helpful in instances when you have a transformation that uses a JNDI data source connection and that runs on a remote Carte server. There are three ways to set the location of the `Simple-JNDI jdbc.properties` location:

1. Add connections to the `<pdi-install>/simple-jndi/jdbc.properties` file. This is the default location for Carte.
2. Modify the **carte.bat** to execute with the command line option: `org.osjava.sj.root=<simple-jndi-path>`.
3. Modify the carte.bat to execute with the command line option `KETTLE_JNDI_ROOT=<simple-jndi-path>` .

Database-Specific Options

Options in the Database Connection dialog box allow you to set database-specific options for the connection by adding parameters to the generated URL.

Adding Database-Specific Options

Follow the instructions below to add parameters associated with **Options** in the **Database Connections** dialog box:

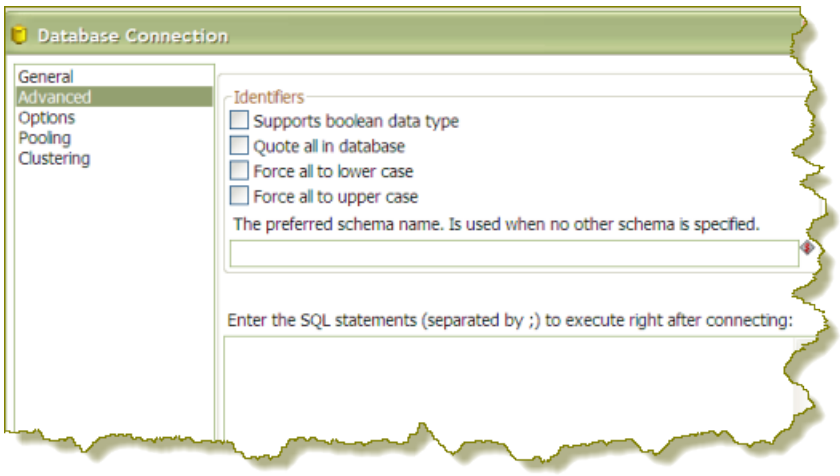
1. Select the next available row in the parameter table.
2. Enter a valid parameter name and its corresponding value.

   Note: For more database-specific configuration help, click **Help**. A new browser opens and displays additional information about configuring the JDBC connection for the currently selected database type.

3. Click **OK** to save your entries.

Database Connections Advanced Configurations

The **Advanced** option in the Database Connection dialog box allows you to configure properties that are, for most part, associated with how SQL is generated. These options allow you to set a standard across all of your SQL tools, ETL tools and design tools. All database table names and column names are always upper case or lower case no matter what users do in the tools.



Feature	Description
Supports boolean data types	Enable to instruct Pentaho Data Integration to use native boolean data types if supported by the database.
Quote all in database	Enable to instruct the databases to use a case-sensitive tablename; (for example MySQL is case-sensitive on Linux but not case sensitive on Windows. If you quote the identifiers, the databases will use a case sensitive tablename.
Force all to lower case	Enable to force all identifiers to lower case.
Force all to upper case	Enable to force all identifiers to upper case.
Preferred schema name...	Enter the preferred schema name to use, (for example, MYSCHEMA).
Enter SQL name...	Enter the SQL statement used to initialize a connection.

More About Quoting

Pentaho has implemented a database-specific quoting system that allows you to use any name or character acceptable to the supported databases' naming conventions.

Pentaho Data Integration contains a list of reserved words for most of the supported databases. To ensure that quoting behaves correctly, Pentaho has implemented a strict separation between the schema (user/owner) of a table and the table name itself. Doing otherwise makes it impossible to quote tables or fields with one or more periods in them correctly. Placing periods in table and field names is common practice in some ERP systems (for example, fields such as "V.A.T.")

To avoid quoting-related errors, a rule stops the Pentaho Data Integration from performing quoting activity when there is a start or end quote in the table name or schema. This allows you to specify the quoting mechanism yourself.

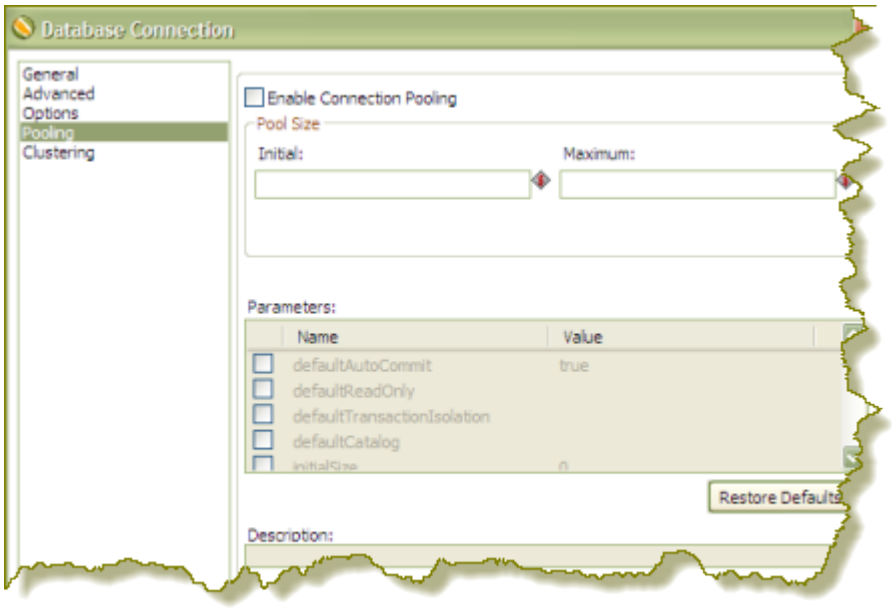
Connection Pooling

Instead of having a connection open for each individual step in a transformation, you can set up a connection *pool* and define options like the initial pool size, maximum pool size, and connection pool parameters. For example, you might start with a pool of ten or fifteen connections, and as you run jobs or transformations, the unused connections drop off. Pooling helps control database access, especially if you have transformations that contain many steps and that require a large number of connections. Pooling can also be implemented when your database licencing restricts the number of active concurrent connections.

The table below provides a more detailed description of the pooling options available:

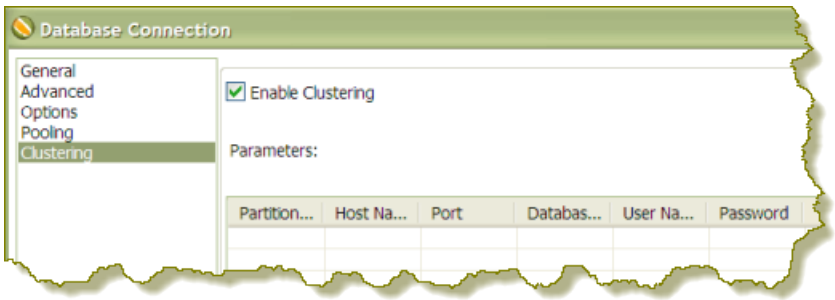
Feature	Description
Enable connection pooling	Enables connection pooling

Feature	Description
Pool Size	Sets the *initial* size of the connection pool; sets the *maximum* number of connections in the connection pool
Parameters	Allows you to define additional custom pool parameters; click **Restore Defaults** when appropriate
Description	Allows you to add a description for your parameters



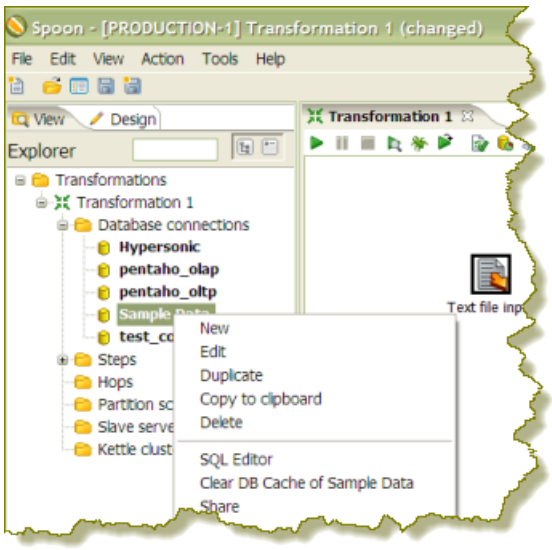
Clustering

This option allows you to enable clustering for the database connection and create connections to the data partitions. To create a new data partition, enter a **Partition ID** and the **Host Name**, **Port**, **Database**, **User Name**, and **Password** for connecting to the partition.



Editing, Duplicating, Copying, and Deleting Connections

The table below contains information about other database-related connection tasks you can perform. Refer to the image as you read the task descriptions.



Task	Description
Edit a Connection	Right-click on the connection name and select **Edit**.
Duplicate a Connection	Right-click on the connection name and select **Duplicate**.
Copy to a Clipboard	Allows you to copy the XML defining the step to the clipboard. You can then paste this step into another transformation. Double-click on the connection name in the tree or right-click on the connection name and select **Copy to Clipboard**.
Delete a Connection	Double-click on the connection name in the tree or right-click on the connection name and select **Delete**.
SQL Editor	To execute SQL command against an existing connection, right-click on the connection name and select ***SQL Editor***.
Clear the Database Cache	To speed up connections Pentaho Data Integration uses a database cache. When the information in the cache no longer represents the layout of the database, right-click on the connection in the tree and select **Clear DB Cache...**. This command is commonly used when databases tables have been changed, created or deleted.
Share a Connection	Rather than redefining a connection each time you create a job or transformation on your *local device*, right-click and select **Share** to share the connection information among jobs and transformations.
Exploring the Database	Double-click on the connection name in the tree or right-click on the connection name and select ***Explore***.
Show dependencies	Right-click a connection name and select **Show dependencies** to see all of the transformations and jobs that use this database connection.

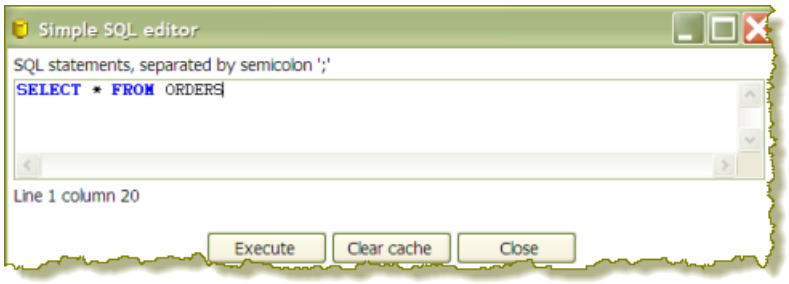
Using the SQL Editor

The **SQL Editor** is good tool to use when you must execute standard SQL commands for tasks such as creating tables, dropping indexes and modifying fields. The SQL Editor is used to preview and execute DDL (Data Definition Language) generated by Spoon such as "create/alter table, "create index," and "create sequence" SQL commands. For example, if you add a Table Output step to a transformation and click the SQL button at the bottom of the Table Input dialog box,

Spoon automatically generates the necessary DDL for the output step to function properly and presents it to the end user through the SQL Editor.

Below are some points to consider:

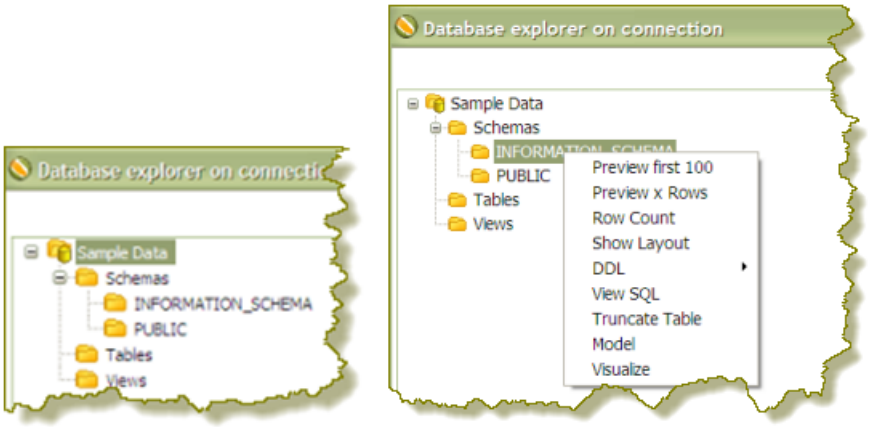
- Multiple SQL Statements must be separated by semi-colons.
- Before SQL Statements are sent to the database to be executed, Spoon removes returns, line-feeds, and separating semi-colons.
- Pentaho Data Integration clears the database cache for the database connection on which you launch DDL statements.



The SQL Editor does not recognize the dialects of all supported databases. That means that creating stored procedures, triggers, and other database-specific objects may pose problems. Consider using the tools that came with the database in these instances.

Using the Database Explorer

The **Database Explorer** allow you to explore configured database connections. The Database Explorer also supports tables, views, and synonyms along with the catalog, schema, or both to which the table belongs.



A right-click on the selected table provides quick access to the following features:

Feature	Description
Preview first 100	Returns the first 100 rows from the selected table
Preview x Rows	Prompts you for the number of rows to return from the selected table
Row Count	Specifies the total number of rows in the selected table
Show Layout	Displays a list of column names, data types, and so on from the selected table
DDL	Generates the DDL to create the selected table based on the current connection type; the drop-down
View SQL	Launches the Simple SQL Editor for the selected table

Feature	Description
Truncate Table	Generates a TRUNCATE table statement for the current table  **Note:** The statement is commented out by default to prevent users from accidentally deleting the table data

Unsupported Databases

Contact Pentaho if you want to access a database type that is not yet supported. A few database types are not supported in this release due to the lack of a sample database, software, or both. It is generally possible to read from unsupported databases by using the generic database driver through an ODBC or JDBC connection.

You can add or replace a database driver files in the **libext** directory located under **...\design-tools\data-integration**.

Performance Monitoring and Logging

Pentaho Data Integration provides you with several methods in which to monitor the performance of jobs and transformations. Logging offers you summarized information regarding a job or transformation such as the number of records inserted and the total elapsed time spent in a transformation. In addition, logging provides detailed information about exceptions, errors, and debugging details.

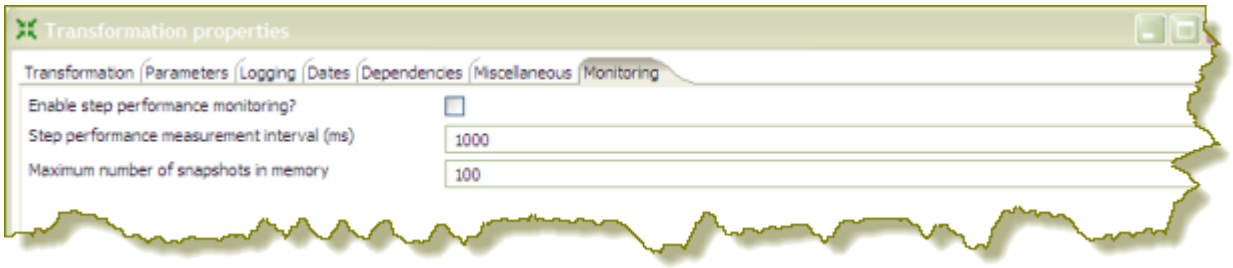
Reasons you may want to enable logging and step performance monitoring include: determining if a job completed with errors or to review errors that were encountered during processing. In headless environments, most ETL in production is not run from the graphical user interface and you need a place to watch initiated job results. Finally, performance monitoring provides you with useful information for both current performance problems and capacity planning.

If you are an administrative user and want to monitor jobs and transformations in the Pentaho Enterprise Console, you must first set up logging and performance monitoring in Spoon. For more information about monitoring jobs and transformation in the Pentaho Enterprise Console, see the *Pentaho Data Integration Administrator's Guide*.

Monitoring Step Performance

Pentaho Data Integration provides you with a tool for tracking the performance of individual steps in a transformation. By helping you identify the slowest step in the transformation, you can fine-tune and enhance the performance of your transformations.

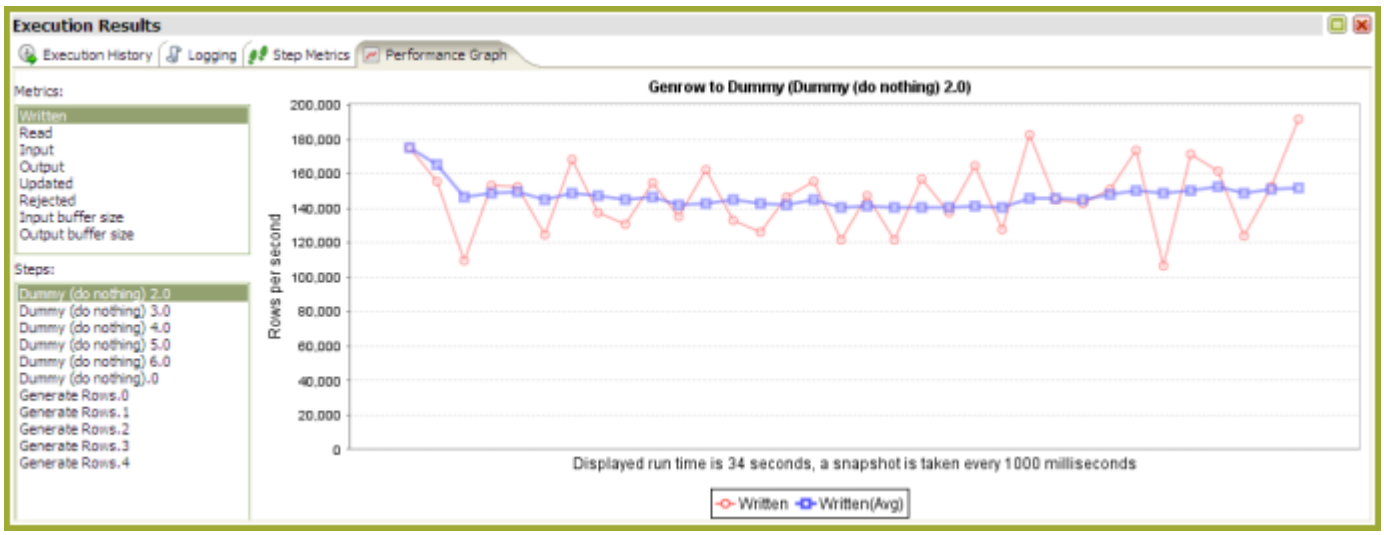
You enable the step performance monitoring in the **Transformation Properties** dialog box. To access the dialog box right-click in the workspace that is displaying your transformation and choose, **Transformation Settings**. You can also access this dialog box, by pressing <**CTRL + T**>.



As shown in the sample screen capture above, the option to track performance (**Enable step performance monitoring?**) is not selected by default. Step performance monitoring may cause memory consumption problems in long-running transformations. By default, a performance snapshot is taken for all the running steps every second. This is not a CPU-intensive operation and, in most instances, does not negatively impact performance unless you have many steps in a transformation or you take a lot of snapshots (several per second, for example). You can control the number of snapshots in memory by changing the default value next to **Maximum number of snapshots in memory**. In addition, if you run in Spoon locally you may consume a fair amount of CPU power when you update the JFreeChart graphics under the Performance tab. Running in "headless" mode (Kitchen, Pan, DI Server (slave server), Carte, Pentaho BI platform, and so on) does not have this drawback and should provide you with accurate performance statistics.

Using Performance Graphs

If you configured step performance monitoring, with database logging (optional), you can view the performance evolution graphs. Performance graphs provide you with a visual interpretation of how your transformation is processing.



Follow the instructions below to set up a performance graph history for your transformation.

1. Right-click in the workspace (canvas) where you have an open transformation. Alternatively, press <CTRL +T>. The **Transformation Properties** dialog box appears.
2. In the Transformation Properties dialog box, click the **Logging** tab. Make sure **Performance** is selected in the navigation pane on the left.
3. Under **Logging** enter the following information:

Option	Description
Log Connection	Specifies the database connection you are using for logging; you can configure a new connection by clicking **New**.
Log Table Schema	Specifies the schema name, if supported by your database
Log Table Name	Specifies the name of the log table (for example L_ETL)
Logging interval (seconds)	Specifies the interval in which logs are written to the table
Log record timeout (in days)	Specifies the number of days old log entries in the table will be kept before they are deleted

4. Enable the fields you want to log or keep the defaults.
5. Click **SQL** to create your log table.
   The Simple SQL Editor appears.
6. Click **Execute** to execute the SQL code for your log table, then click **OK** to exit the **Results** dialog box.

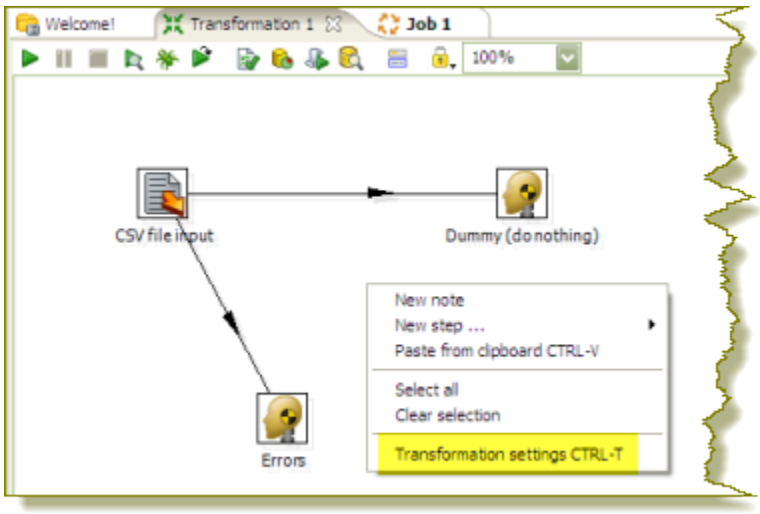
Note: You *must* execute the SQL code to create the log table.

7. Click **Close** to exit the Simple SQL Editor.
8. Click **OK** to exit the Transformation Properties dialog box.

Logging Steps

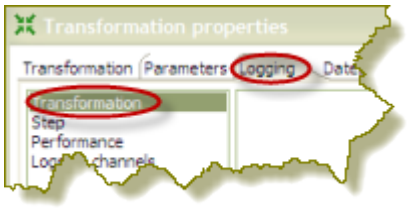
Follow the instructions below to create a log table that keeps history of step-related information associated with your transformation.

1. Right-click in the workspace (canvas) where you have an open transformation. Alternatively, press <**CTRL** +**T**>.



The **Transformation Properties** dialog box appears.

2. In the Transformation Properties dialog box, click the **Logging** tab. Make sure **Step** is selected in the navigation pane on the left.



d

3. Under **Logging** enter the following information:

Option	Description
Log Connection	Specifies the database connection you are using for logging; you can configure a new connection by clicking **New**.
Log Table Schema	Specifies the schema name, if supported by your database
Log Table Name	Specifies the name of the log table (for example L_STEP)
Logging interval (seconds)	Specifies the interval in which logs are written to the table
Log record timeout (in days)	Specifies the number of days old log entries in the table will be kept before they are deleted

4. Enable the fields you want to log or keep the defaults.
5. Click **SQL** to create your log table.
   The Simple SQL Editor appears.
6. Click **Execute** to execute the SQL code for your log table, then click **OK** to exit the **Results** dialog box.

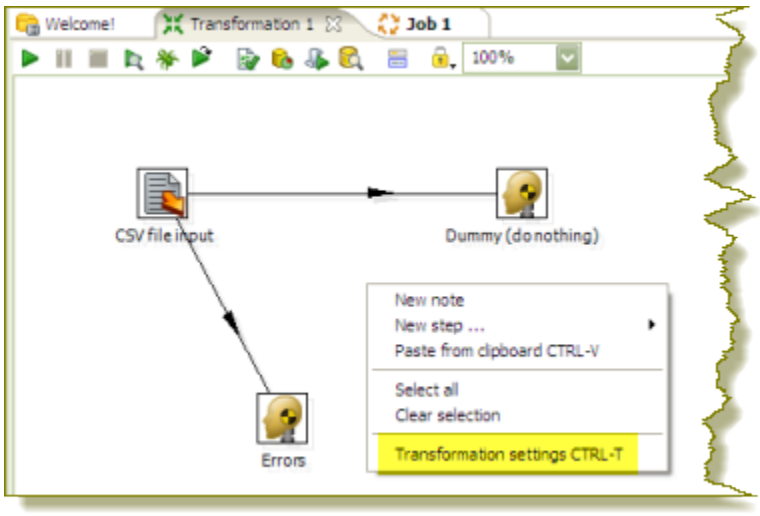
Note: You *must* execute the SQL code to create the log table.

7. Click **Close** to exit the Simple SQL Editor.
8. Click **OK** to exit the Transformation Properties dialog box.

Logging Transformations

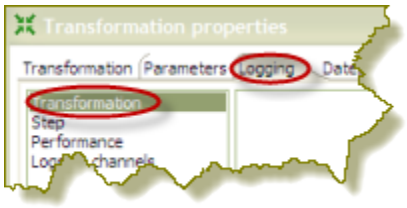
Follow the instructions below to create a log table for transformation-related processes:

1. Right-click in the workspace (canvas) where you have an open transformation. Alternatively, press <CTRL +T>.



   The **Transformation Properties** dialog box appears.

2. In the Transformation Properties dialog box, click the **Logging** tab. Make sure **Transformation** is selected in the navigation pane on the left.



3. Under **Logging** enter the following information:

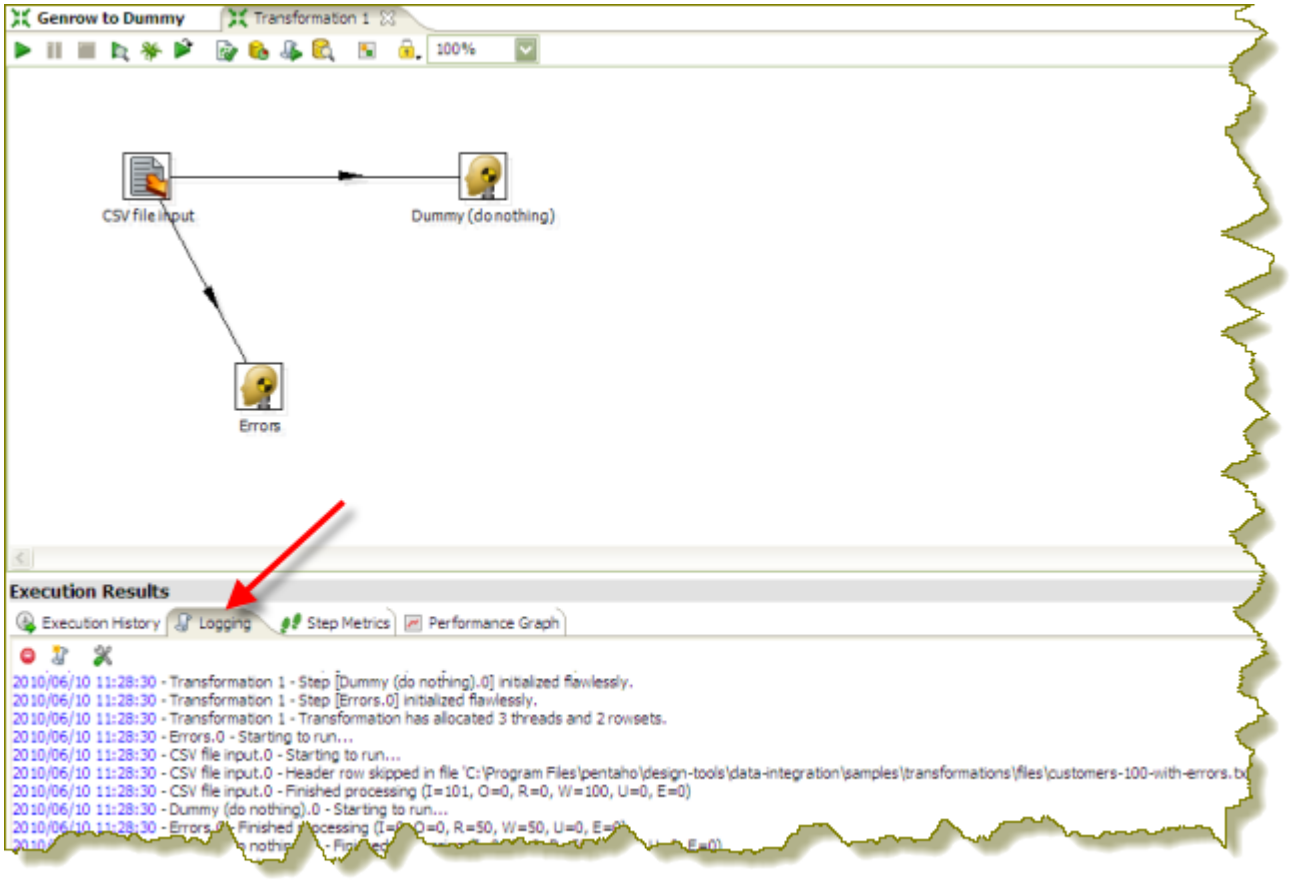
Option	Description
Log Connection	Specifies the database connection you are using for logging; you can configure a new connection by clicking **New**.
Log Table Schema	Specifies the schema name, if supported by your database
Log Table Name	Specifies the name of the log table (for example L_ETL)
Logging interval (seconds)	Specifies the interval in which logs are written to the table
Log record timeout (in days)	Specifies the number of days old log entries in the table will be kept before they are deleted
Log size limit in lines	Limits the number of lines that are stored in the LOG_FIELD (when selected under Fields to Log); when the LOG_FIELD is enabled Pentaho Data Integration will store logging associated with the transformation in a long text field (CLOB)

4. Enable the fields you want to log or keep the defaults.
5. Click **SQL** to create your log table.
   The Simple SQL Editor appears.
6. Click **Execute** to execute the SQL code for your log table, then click **OK** to exit the **Results** dialog box.

   Note: You *must* execute the SQL code to create the log table.

7. Click **Close** to exit the Simple SQL Editor.
8. Click **OK** to exit the Transformation Properties dialog box.

The next time you run your transformation, logging information will be displayed under the **Logging** tab. If you run your transformation on a slave server, and are an administrative user, you can view log information on the Pentaho Enterprise Console. See the *Pentaho Data Integration Administrator's Guide* for details.



Note: If the log does not appear, click (Log Settings) to adjust your logging parameters.

Pentaho Data Integration Performance Tuning Tips

The tips described here may help you to identify and correct performance-related issues associated with PDI transformations.

Step	Tip	Description
JS	Turn off compatibility mode	Rewriting JavaScript to use a format that is not compatible with previous versions is, in most instances, easy to do and makes scripts easier to work with and to read. By default, old JavaScript programs run in compatibility mode. That means that the step will process like it did in a previous version. You may see a small performance drop because of the overload associated with forcing compatibility. If you want make use of the new architecture, disable compatibility mode and change the code as shown below: • `intField.getInteger() --> intField` • `numberField.getNumber() --> numberField` • `dateField.getDate() --> dateField` • `bigNumberField.getBigNumber() --> bigNumberField` • and so on... Instead of Java methods, use the built-in library. Notice that the resulting program code is more intuitive. For example : • checking for null is now: `field.isNull() --> field==null`

Step	Tip	Description
		• Converting string to date: `field.Clone().str2dat() --> str2date(field)` • and so on... If you convert your code as shown above, you may get significant performance benefits. **Note:** It is no longer possible to modify data in-place using the value methods. This was a design decision to ensure that no data with the wrong type would end up in the output rows of the step. Instead of modifying fields in-place, create new fields using the table at the bottom of the Modified JavaScript transformation.
JS	Combine steps	One large JavaScript step runs faster than three consecutive smaller steps. Combining processes in one larger step helps to reduce overhead.
JS	Avoid the JavaScript step or write a custom plug in	Remember that while JavaScript is the fastest scripting language for Java, it is still a scripting language. If you do the same amount of work in a native step or plugin, you avoid the overhead of the JS scripting engine. This has been known to result in significant performance gains. It is also the primary reason why the Calculator step was created — to avoid the use of JavaScript for simple calculations.
JS	Create a copy of a field	No JavaScript is required for this; a "Select Values" step does the trick. You can specify the same field twice. Once without a rename, once (or more) with a rename. Another trick is to use B=NVL(A,A) in a Calculator step where B is forced to be a copy of A. In version 3.1, an explicit "create copy of field A" function was added to the Calculator.
JS	Data conversion	Consider performing conversions between data types (dates, numeric data, and so on) in a "Select Values" step (version 3.0.2 or higher). You can do this in the Metadata tab of the step.
JS	Variable creation	If you have variables that can be declared once at the beginning of the transformation, make sure you put them in a separate script and mark that script as a startup script (right click on the script name in the tab). JavaScript object creation is time consuming so if you can avoid creating a new object for every row you are transforming, this will translate to a performance boost for the step.
N/A	Launch several copies of a step	There are two important reasons why launching multiple copies of a step may result in better performance: **1.** The step uses a lot of CPU resources and you have multiple processor cores in your computer. Example: a JavaScript step **2.** Network latencies and launching multiple copies of a step can reduce average latency. If you have a low network latency of say 5ms and you need to do a round trip to the database, the maximum performance you get is 200 (x5) rows per second, even if the database is running smoothly. You can try to reduce the round trips with caching, but if not, you can try to run multiple copies. Example: a database lookup or table output
N/A	Manage thread priorities	In versions 3.0.2 and higher, this feature that is found in the "Transformation Settings" dialog box under the (Misc tab) improves performance by reducing the locking overhead in certain situations. This feature is enabled by default for new transformations that are created in recent versions, but for older transformations this can be different.
Select Value	If possible, don't remove fields in Select Value	Don't remove fields in Select Value unless you must. It's a CPU-intensive task as the engine needs to reconstruct the complete row. It is almost always faster to add fields to a row rather than delete fields from a row.

Step	Tip	Description
Get Variables	Watch your use of Get Variables	May cause bottlenecks if you use it in a high-volume stream (accepting input). To solve the problem, take the "Get Variables" step out of the transformation (right click, detach)then insert it in with a "Join Rows (cart prod)" step. Make sure to specify the main step from which to read in the "Join Rows" step. Set it to the step that originally provided the "Get Variables" step with data.
N/A	Use new text file input	The new "CSV Input" or "Fixed Input" steps provide optimal performance. If you have a fixed width (field/row) input file, you can even read data in parallel. (multiple copies) These new steps have been rewritten using Non-blocking I/O (NIO) features. Typically, the larger the NIO buffer you specify in the step, the better your read performance will be.
N/A	When appropriate, use lazy conversion	In instances in which you are reading data from a text file and you write the data back to a text file, use Lazy conversion to speed up the process. The principle behind lazy conversion that it delays data conversion in hopes that it isn't necessary (reading from a file and writing it back comes to mind). Beyond helping with data conversion, lazy conversion also helps to keep the data in "binary" storage form. This, in turn, helps the internal Kettle engine to perform faster data serialization (sort, clustering, and so on). The Lazy Conversion option is available in the "CSV Input" and "Fixed input" text file reading steps.
Join Rows	Use Join Rows	You need to specify the main step from which to read. This prevents the step from performing any unnecessary spooling to disk. If you are joining with a set of data that can fit into memory, make sure that the cache size (in rows of data) is large enough. This prevents (slow) spooling to disk.
N/A	Review the big picture: database, commit size, row set size and other factors	Consider how the whole environment influences performance. There can be limiting factors in the transformation itself and limiting factors that result from other applications and PDI. Performance depends on your database, your tables, indexes, the JDBC driver, your hardware, speed of the LAN connection to the database, the row size of data and your transformation itself. Test performance using different commit sizes and changing the number of rows in row sets in your transformation settings. Change buffer sizes in your JDBC drivers or database.
N/A	Step Performance Monitoring	Step Performance Monitoring is an important tool that allows you identify the slowest step in your transformation.

Working with Big Data and Hadoop in PDI

If you are familiar with Pentaho Data Integration (PDI) ETL steps, transformations, job entries, and jobs you can apply these same concepts to working with PDI and big data and Hadoop. Here are some of the typical functions you might perform using PDI Hadoop.

- Load data into a Hadoop cluster
- Transform data within a Hadoop cluster
- Extract data from a Hadoop cluster
- Report on data within a Hadoop cluster
- Access other big data-related technology and databases, such as MongoDB, Cassandra, Hive, HBase, Sqoop, and Oozie using PDI transformations or jobs

PDI steps, transformations, job entries, and jobs are described in the *Pentaho Data Integration User Guide.*

PDI's Big Data Plugin—No Additional Installation Required

By default PDI is pre-configured to work with Apache Hadoop 0.20.X. But PDI can be configured to communicate with most popular Hadoop distributions. Instructions for changing Hadoop configurations are covered in the *PDI Administrators Guide*.

For a list of supported big data technology, including which configurations of Hadoop are currently supported, see the *PDI Installation Guide, Compatibility Matrix*.

Hadoop and PDI Workflows

There are two different ways to use PDI/Spoon jobs to connect to and extract Hadoop data, transform it, execute MapReduce operations, and if you want to, return the data to Hadoop.

- Use *Pentaho MapReduce* to interactively design the data flow for a MapReduce job without writing scripts or code. Here is a 12 minute video that provides an overview of the process:

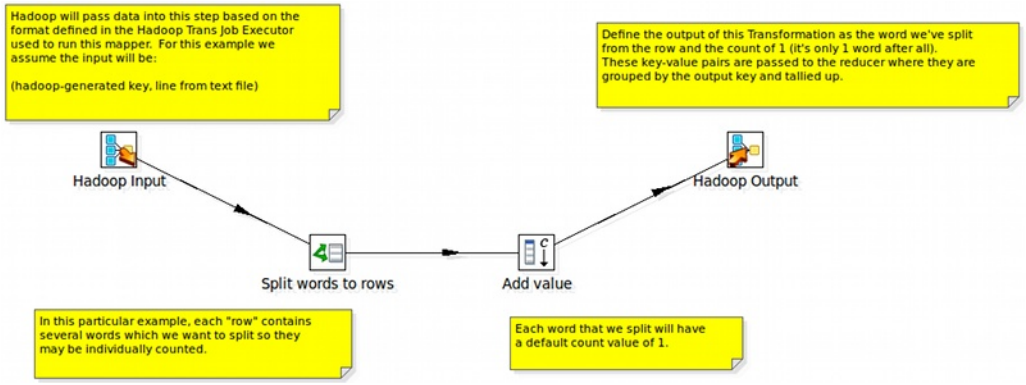
  http://www.youtube.com/watch?v=KZe1UugxXcs.
- Use *PDI Hadoop Job Executor* to schedule and execute your existing MapReduce applications. Here is a 31 minute video that provides an overview of the process. *http://www.youtube.com/watch?v=cfFq1XB4kww*.
- This 6 minute video highlights the differences between Pentaho MapReduce and PDI Hadoop Job Executor: *http://www.youtube.com/watch?v=ZnyuTICOrhk*.

Pentaho MapReduce Workflow

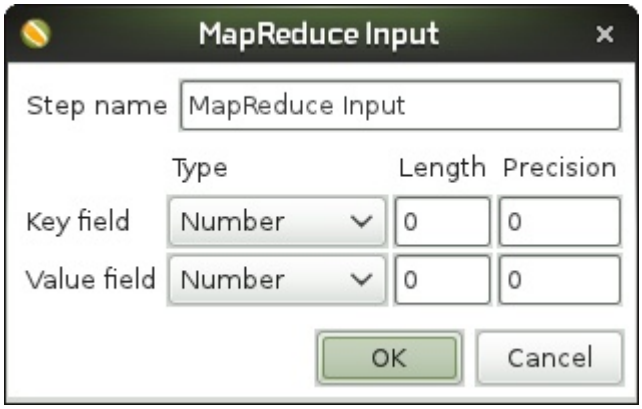
PDI and Pentaho MapReduce enables you to pull data from a Hadoop cluster, transform it, and pass it back to the cluster. Here is how you would approach doing this.

PDI Transformation

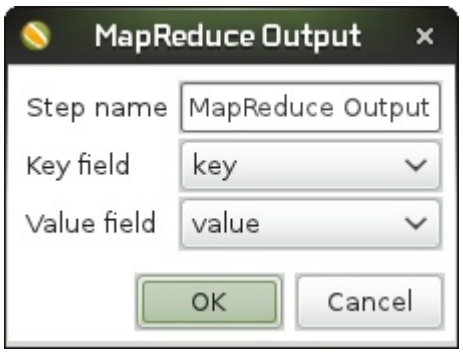
Start by deciding what you want to do with your data, open a PDI transformation, and drag the appropriate steps onto the canvas, configuring the steps to meeet your data requirements. Drag the specifically-designed Hadoop **MapReduce Input** and Hadoop **MapReduce Output** steps onto the canvas. PDI provides these steps to completely avoid the need to write Java classes for this functionality. Configure both of these steps as needed. Once you have configured all the the steps, add hops to sequence the steps as a transformation. Follow the workflow as shown in this sample transformation in order to properly communicate with Hadoop. Name this transformation Mapper.



Hadoop communicates in key/value pairs. PDI uses the **MapReduce Input** step to define how key/value pairs from Hadoop are interpreted by PDI. The **MapReduce Input** dialog box enables you to configure the **MapReduce Input** step.



PDI uses a **MapReduce Output** step to pass the output back to Hadoop. The **MapReduce Output** dialog box enables you to configure the **MapReduce Output** step.



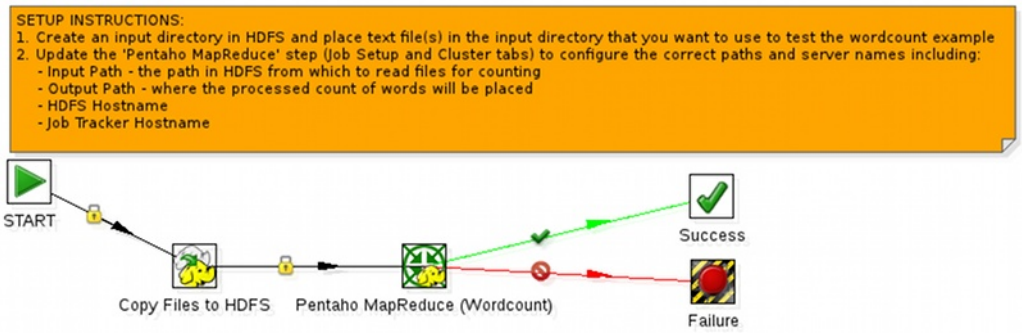
What happens in the middle is entirely up to you. Pentaho provides many sample steps you can alter to create the functionality you need.

PDI Job

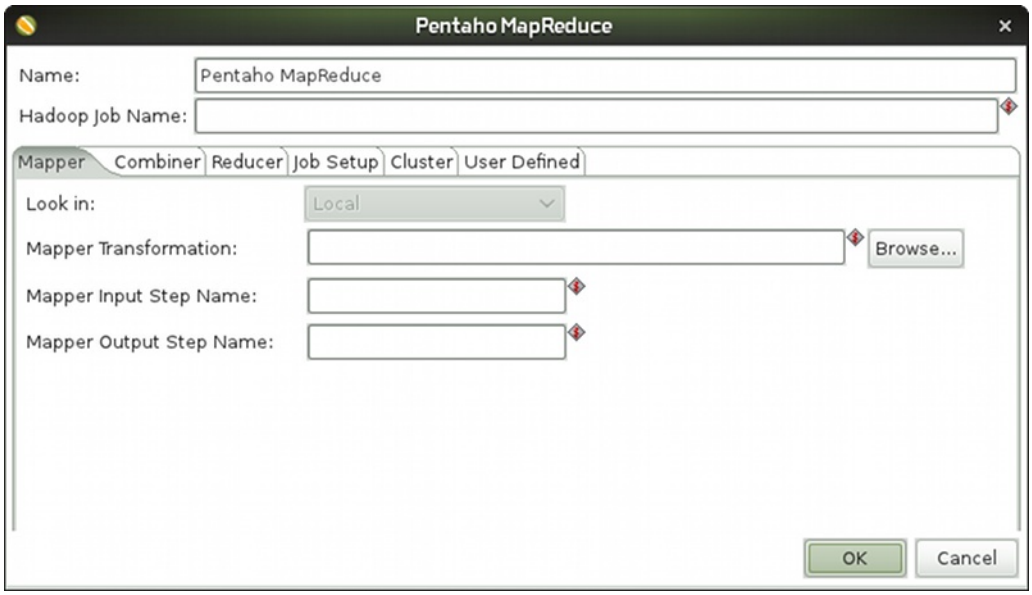
Once you have created the Mapper transformation, you are ready to include it in a **Pentaho MapReduce** job entry and build a MapReduce job. Open a PDI job and drag the specifically-designed **Pentaho MapReduce** job entry onto the canvas. In addition to ordinary transformation work, this entry is designed to execute mapper/reducer functions within PDI. Again, no need to provide a Java class to achieve this.

Configure the **Pentaho MapReduce** entry to use the transformation as a mapper. Drag and drop a Start job entry, other job entries as needed, and result jobentries to handle the output onto the canvas. Add hops to sequence the entries into a job that you execute in PDI.

The workflow for the job should look something like this.

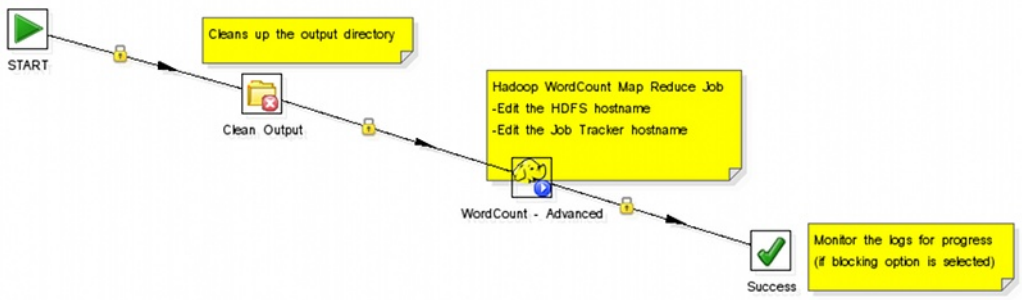


The Pentaho **MapReduce** dialog box enables you to configure the Pentaho MapReduce entry.

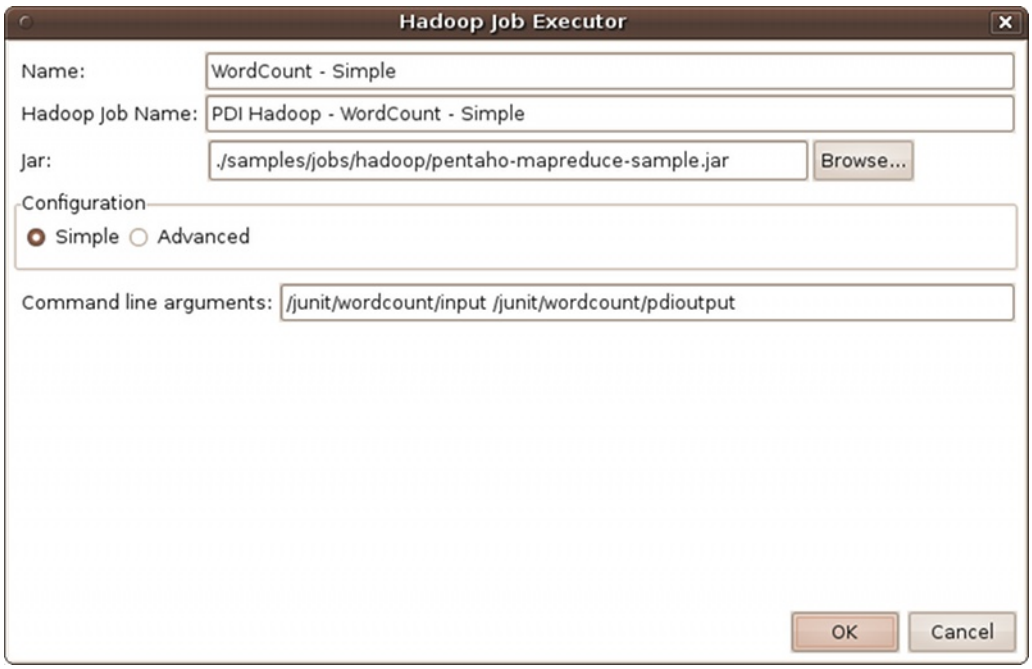


PDI Hadoop Job Workflow

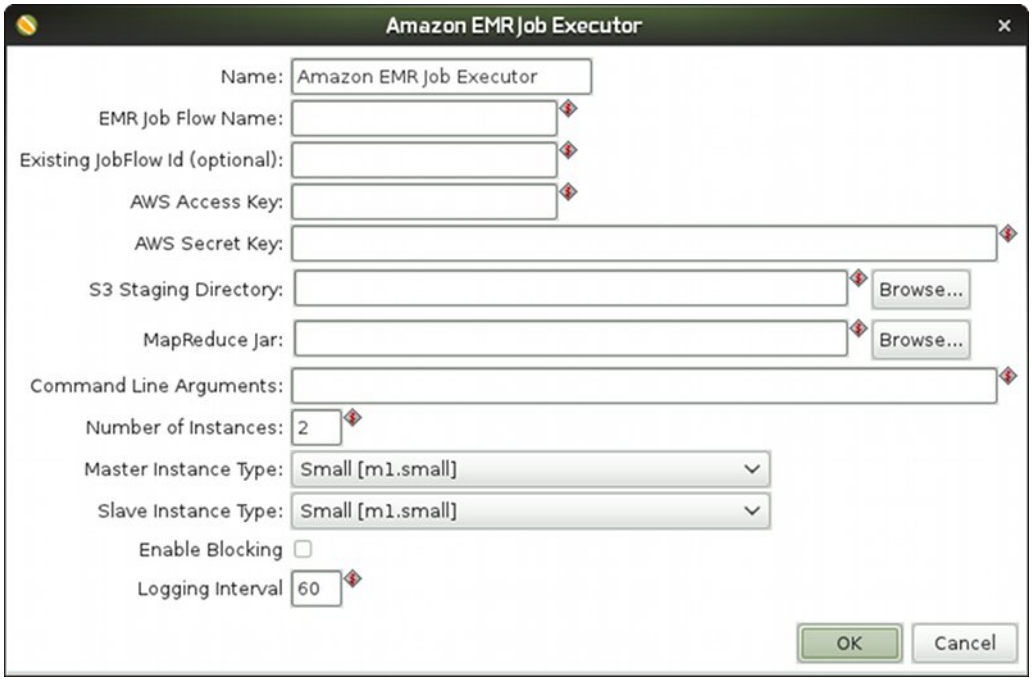
PDI enables you to execute a Java class from within a PDI/Spoon job to perform operations on Hadoop data. The way you approach doing this is similar to the way would for any other PDI job. The specifically-designed job entry that handles the Java class is **Hadoop Job Executor**. In this illustration it is used in the **WordCount - Advanced** entry.



The **Hadoop Job Executor** dialog box enables you to configure the entry with a `jar` file that contains the Java class.



If you are using the Amazon Elastic MapReduce (EMR) service, you can **Amazon EMR Job Executor**. job entry to execute the Java class This differs from the standard Hadoop Job Executor in that it contains connection information for Amazon S3 and configuration options for EMR.



Hadoop to PDI Data Type Conversion

The **Hadoop Job Executo**r and **Pentaho MapReduce** steps have an advanced configuration mode that enables you to specify data types for the job's input and output. PDI is unable to detect foreign data types on its own; therefore you must specify the input and output data types in the **Job Setup** tab. This table explains the relationship between Hadoop data types and their PDI equivalents.

PDI (Kettle) Data Type	Apache Hadoop Data Type
`java.lang.Integer`	`org.apache.hadoop.io.IntWritable`
`java.lang.Long`	`org.apache.hadoop.io.IntWritable`

PDI (Kettle) Data Type	Apache Hadoop Data Type
java.lang.Long	org.apache.hadoop.io.LongWritable
org.apache.hadoop.io.IntWritable	java.lang.Long
java.lang.String	org.apache.hadoop.io.Text
java.lang.String	org.apache.hadoop.io.IntWritable
org.apache.hadoop.io.LongWritable	org.apache.hadoop.io.Text
org.apache.hadoop.io.LongWritable	java.lang.Long

For more information on configuring **Pentaho MapReduce** to convert to additional data types, see *http://wiki.pentaho.com/display/BAD/Pentaho+MapReduce*.

Hadoop Hive-Specific SQL Limitations

There are a few key limitations in Hive that prevent some regular Metadata Editor features from working as intended, and limit the structure of your SQL queries in Report Designer:

- **Outer joins are not supported**.
- **Each column can only be used once in a SELECT clause**. Duplicate columns in SELECT statements cause errors.
- **Conditional joins can only use the = conditional unless you use a WHERE clause**. Any non-equal conditional in a FROM statement forces the Metadata Editor to use a cartesian join and a WHERE clause conditional to limit it. This is not much of a limitation, but it may seem unusual to experienced Metadata Editor users who are accustomed to working with SQL databases.

Big Data Tutorials

These sections contain guidance and instructions about using Pentaho technology as part of your overall big data strategy. Each section is a series of scenario-based tutorials that demonstrate the integration between Pentaho and Hadoop using a sample data set.

Hadoop Tutorials

These tutorials are organized by topic and each set explains various techniques for loading, transforming, extracting and reporting on data within a Hadoop cluster. You are encouraged to perform the tutorials in order as the output of one is sometimes used as the input of another. However, if you would like to jump to a tutorial in the middle of the flow, instructions for preparing input data are provided.

Loading Data into a Hadoop Cluster

These scenario-based tutorials contain guidance and instructions on loading data into HDFS (Hadoop's Distributed File System), Hive and HBase using Pentaho Data Integration (PDI)

Prerequisites

To perform the tutorials in this section you must have these components installed.

PDI—The primary development environment for the tutorials. See the *Pentaho Data Integration Installation Guide* if you have not already installed PDI.

Apache Hadoop 0.20.X—A single-node local cluster is sufficient for these exercises, but a larger and/or remote configuration also works. If you are using a different distribution of Hadoop see the *Configuring Your Big Data Environment* section. You need to know the addresses and ports for your Hadoop installation.

***Hive**—A supported version of Hive. Hive is a Map/Reduce abstraction layer that provides SQL-like access to Hadoop data. For instructions on installing or using Hive, see the *Hive Getting Started Guide*.

***HBase**—A supported version of HBase. HBase is an open source, non-relational, distributed database that runs on top of HDFS. For instructions on installing or using HBase, see the *Getting Started section of the Apache HBase Reference Guide*.

Component only required for corresponding tutorial.

Sample Data

The tutorials in this section were created with this sample weblog data.

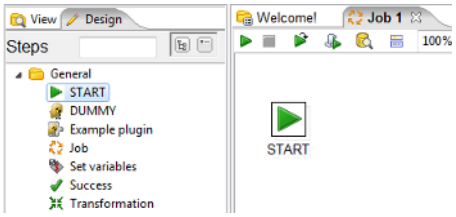
Tutorial	File Name	Content
Using a Job Entry to Load Data into Hadoop's Distributed File System (HDFS)	*weblogs_rebuild.txt.zip*	Unparsed, raw weblog data
Using a Job Entry to Load Data into Hive	*weblogs_parse.txt.zip*	Tab-delimited, parsed weblog data
Using a Transformation Step to Load Data into HBase	*weblogs_hbase.txt.zip*	Prepared data for HBase load

Using a Job Entry to Load Data into Hadoop's Distributed File System (HDFS)

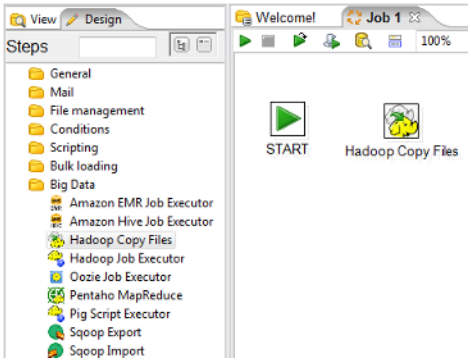
You can use PDI jobs to put files into HDFS from many different sources. This tutorial describes how to create a PDI job to move a sample file into HDFS.

If not already running, start Hadoop and PDI. Unzip the sample data files and put them in a convenient location: *weblogs_rebuild.txt.zip*.

1. Create a new Job by selecting **File** > **New** > **Job**.
2. Add a Start job entry to the canvas. From the **Design** palette on the left, under the **General** folder, drag a **Start** job entry onto the canvas.

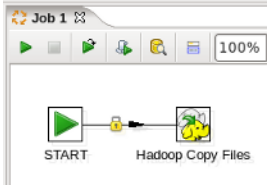


3. Add a Hadoop Copy Files job entry to the canvas. From the **Design** palette, under the **Big Data** folder, drag a **Hadoop Copy Files** job entry onto the canvas.



4. Connect the two job entries by hovering over the **Start** entry and selecting the output connector 

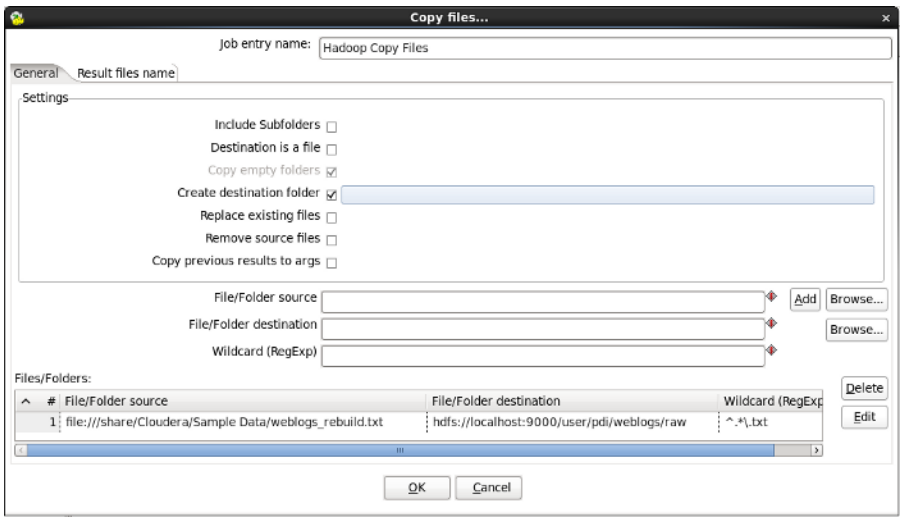
, then drag the connector arrow to the **Hadoop Copy Files** entry.



5. Enter the source and destination information within the properties of the **Hadoop Copy Files** entry by double-clicking it.

a) For **File/Folder source(s)**, click **Browse** and navigate to the folder containing the downloaded sample file `weblogs_rebuild.txt`.
b) For **File/Folder destination(s)**, enter `hdfs://<NAMENODE>:<PORT>/user/pdi/weblogs/raw`, where NAMENODE and PORT reflect your Hadoop destination.
c) For **Wildcard (RegExp)**, enter `^.*\.txt`.
d) Click **Add** to include the entries to the list of files to copy.
e) Check the **Create destination folder** option to ensure that the `weblogs` folder is created in HDFS the first time this job is executed.

When you are done your window should look like this (your file paths may be different).

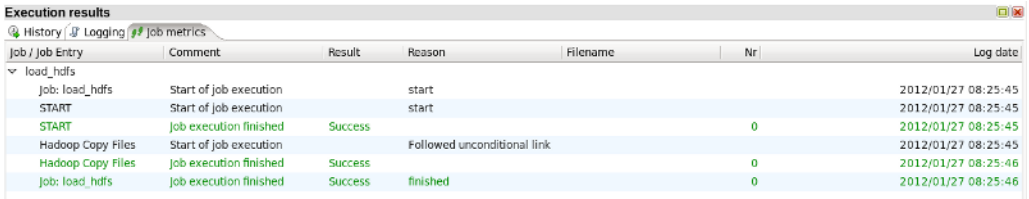


Click **OK** to close the window.

6. Save the job by selecting **Save as** from the **File** menu. Enter `load_hdfs.kjb` as the file name within a folder of your choice.
7. Run the job by clicking the green Run button on the job toolbar 

, or by selecting **Action** > **Run** from the menu. The **Execute a job** window opens. Click **Launch**.

   An **Execution Results** panel opens at the bottom of the Spoon interface and displays the progress of the job as it runs. After a few seconds the job finishes successfully.



   If any errors occurred the job entry that failed will be highlighted in red and you can use the **Logging** tab to view error messages.
8. Verify the data was loaded by querying Hadoop.
   a) From the command line, query Hadoop by entering this command.

```
hadoop fs -ls /user/pdi/weblogs/raw
```

This statement is returned

```
-rwxrwxrwx 3 demo demo 77908174 2011-12-28 07:16 /user/pdi/weblogs/raw/weblog_raw.txt
```

Using a Job Entry to Load Data into Hive

PDI jobs can be used to put files into Hive from many different sources. This tutorial instructs you how to use a PDI job to load a sample data file into a Hive table.

Note: Hive could be defined with external data. Using the external option, you could define a Hive table that uses the HDFS directory that contains the parsed file. For this tutorial, we chose not to use the external option to demonstrate the ease with which files can be added to non-external Hive tables.

If not already running, start Hadoop, PDI, and the Hive server. Unzip the sample data files and put them in a convenient location: *weblogs_parse.txt.zip*.

This file should be placed in the `/user/pdi/weblogs/parse` directory of HDFS using these three commands.

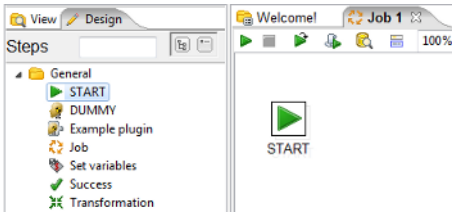
```
hadoop fs -mkdir /user/pdi/weblogs
hadoop fs -mkdir /user/pdi/weblogs/parse
hadoop fs -put weblogs_parse.txt /user/pdi/weblogs/parse/part-00000
```

If you previously completed the *Using Pentaho MapReduce to Parse Weblog Data*tutorial, the necessary files will already be in the proper directory.

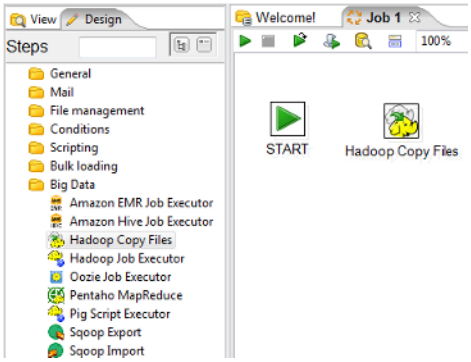
1. Create a Hive Table.
   a) Open the Hive shell by entering `'hive'` at the command line.
   b) Create a table in Hive for the sample data by entering

```
create table weblogs (
client_ip    string,
full_request_date string,
day    string,
month    string,
month_num int,
year    string,
hour    string,
minute    string,
second    string,
timezone    string,
http_verb    string,
uri    string,
http_status_code    string,
bytes_returned        string,
referrer        string,
user_agent    string)
row format delimited
fields terminated by '\t';
```

   c) Close the Hive shell by entering `'quit'`.
2. Create a new Job to load the sample data into a Hive table by selecting **File** > **New** > **Job**.
3. Add a Start job entry to the canvas. From the **Design** palette on the left, under the **General** folder, drag a **Start** job entry onto the canvas.

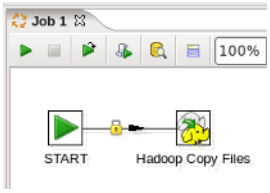


4. Add a Hadoop Copy Files job entry to the canvas. From the **Design** palette, under the **Big Data** folder, drag a **Hadoop Copy Files** job entry onto the canvas.



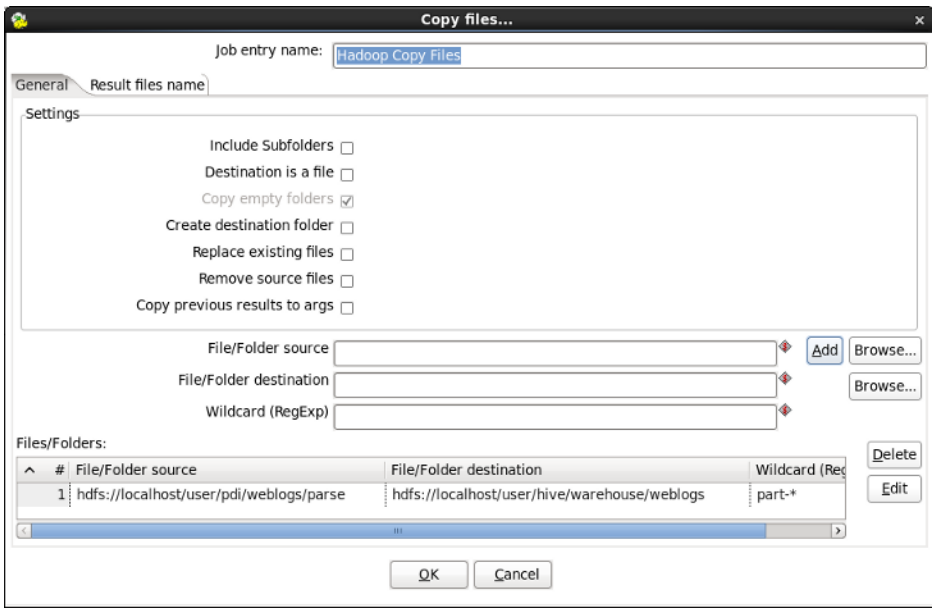
5. Connect the two job entries by hovering over the **Start** entry and selecting the output connector 

, then drag the connector arrow to the **Hadoop Copy Files** entry.



6. Enter the source and destination information within the properties of the **Hadoop Copy Files** entry by double-clicking it.
   a) For **File/Folder source(s)**, enter `hdfs://<NAMENODE>:<PORT>/user/pdi/weblogs/parse`, where NAMENODE and PORT reflect your Hadoop destination.
   b) For **File/Folder destination(s)**, enter `hdfs://<NAMENODE>:<PORT>/user/hive/warehouse/weblogs`.
   c) For **Wildcard (RegExp)**, enter `part-.*`.
   d) Click the **Add** button to add the entries to the list of files to copy.

   When you are done your window should look like this (your file paths may be different)



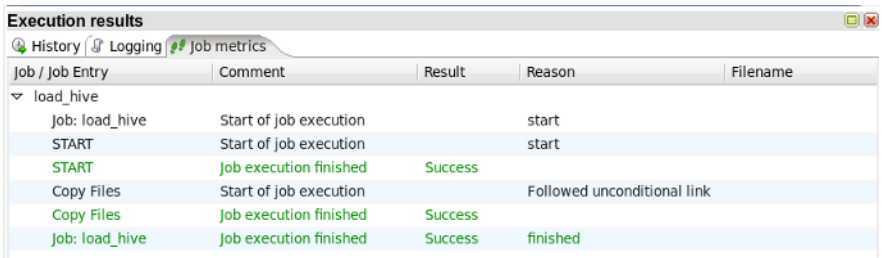
   Click **OK** to close the window.

7. Save the job by selecting **Save as** from the **File** menu. Enter `load_hive.kjb` as the file name within a folder of your choice.

8. Run the job by clicking the green Run button on the job toolbar 

, or by selecting **Action** > **Run** from the menu. The **Execute a job** window opens. Click **Launch**.

   An **Execution Results** panel opens at the bottom of the Spoon interface and displays the progress of the job as it runs. After a few seconds the job finishes successfully.



   If any errors occurred the job entry that failed will be highlighted in red and you can use the **Logging** tab to view error messages.

9. Verify the data was loaded by querying Hive.
   a) Open the Hive shell from the command line by entering `hive`.
   b) Enter this query to very the data was loaded correctly into Hive.

```
select * from weblogs limit 10;
```

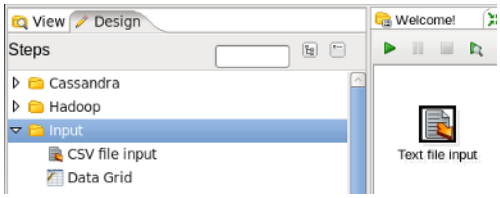
Ten rows of data are returned.

Using a Transformation Step to Load Data into HBase

This tutorial describes how to use data from a sample flat file to create a HBase table using a PDI transformation. For the sake of brevity, you will use a prepared sample dataset and a simple transformation to prepare and transform your data for HBase loads.

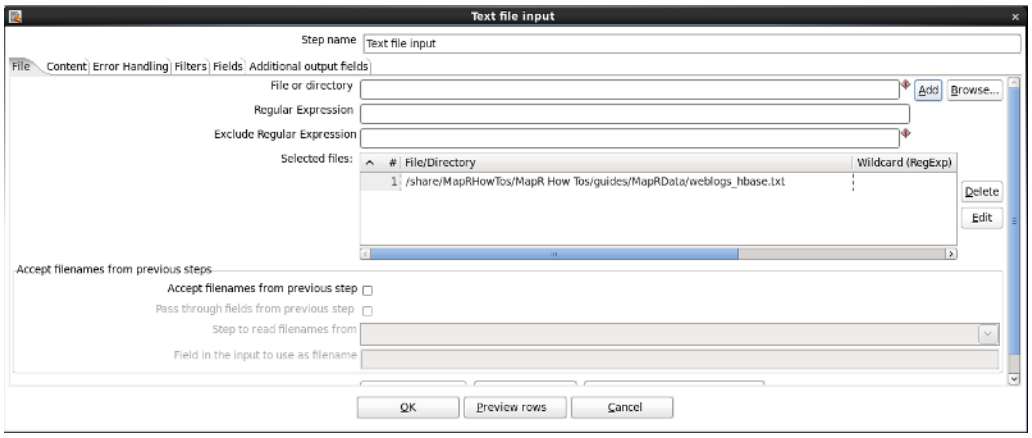
If not already running, start Hadoop, PDI, and HBase. Unzip the sample data files and put them in a convenient location: *weblogs_hbase.txt.zip*

1. Create a HBase Table.
   a) Open the HBase shell by entering `hbase shell` at the command line.
   b) Create the table in HBase by entering `create 'weblogs', 'pageviews'` in the HBase shell.
   This creates a table named `weblogs` with a single column family named `pageviews`.
   c) Close the HBase shell by entering `quit`.
2. From within the Spoon, create a new transformation by selecting **File** > **New** > **Transformation**.
3. Identify the source where the transformation will get data from.
   For this tutorial your source is a text file (`.txt`). From the **Input** folder of the **Design** palette on the left, add a **Text File Input** step to the transformation by dragging it onto the canvas.

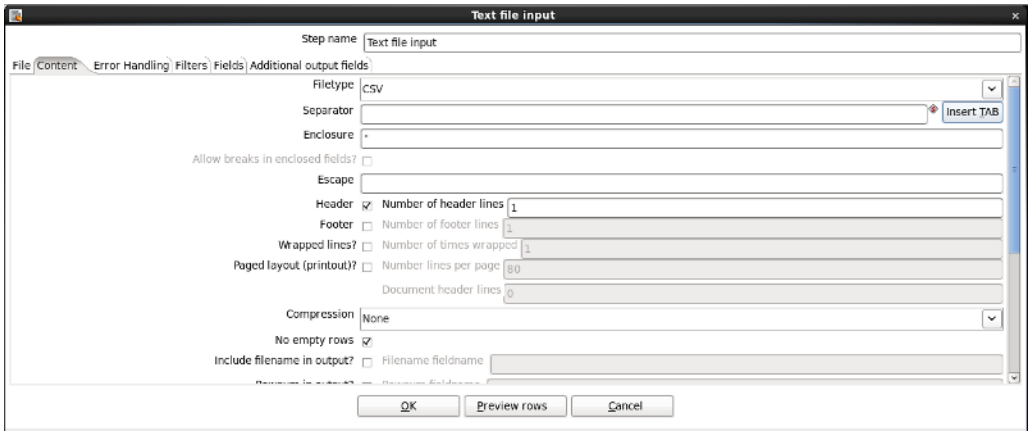


4. Edit the properties of the **Text file input** step by double-clicking the icon.
   The **Text file input** dialog box appears.
5. From the **File** tab, in the **File or Directory** field, click **Browse** and navigate to the `weblog_hbase.txt` file. Click **Add**.

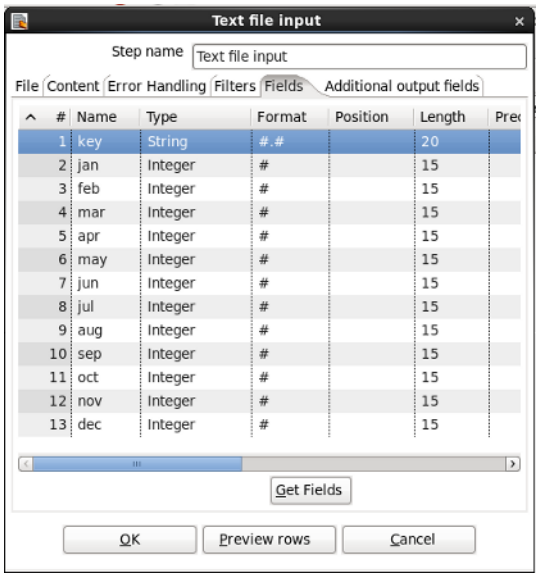
   The file appears in the **Selected files** pane.



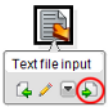
6. Configure the contents of the file by switching to the **Content** tab.
   a) For **Separator**, clear the contents and click **Insert TAB**.
   b) Check the **Header** checkbox.
   c) For **Format**, Select **Unix** from the drop-down menu.



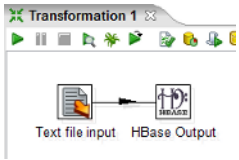
7. Configure the input fields.
   a) From the **Fields** tab, select **Get Fields** to populate the list the available fields.
   b) A dialog box appears asking for **Number of sample lines**. Enter **100** and click **OK**.
   c) Change the **Type** of the field named **key** to **String** and set the **Length** to **20**.



   Click **OK** to close the window.

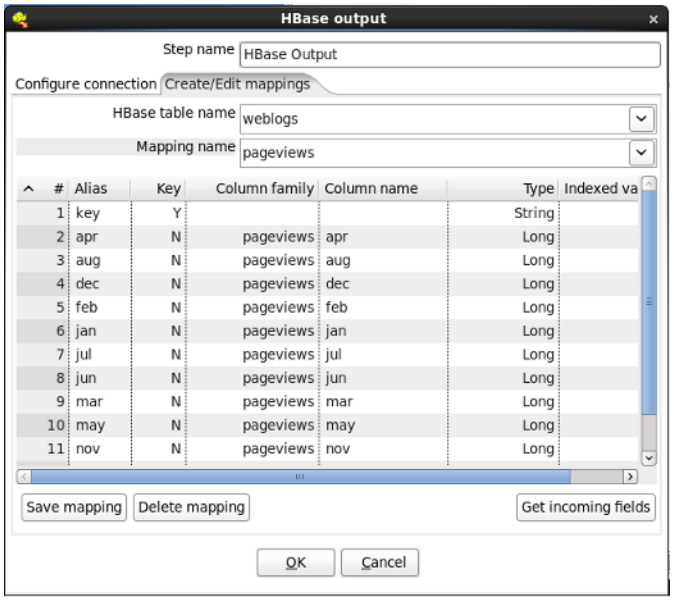
8. On the **Design** palette, under **Big Data**, drag the **HBase Output** to the canvas. Create a hop to connect your input and **HBase Output** step by hovering over the input step and clicking the output connector 

, then drag the connector arrow to the **HBase Output** step.



9. Edit the **HBase Output** step by double-clicking it. You must now enter your Zookeeper host(s) and port number.
   a) For the **Zookeeper hosts(s)** field, enter a comma separated list of your HBase Zookeeper Hosts. For local single node clusters use `localhost`.
   b) For **Zookeeper port**, enter the port for your Zookeeper hosts. By default this is `2181`.
10. Create a HBase mapping to tell Pentaho how to store the data in HBase by switching to the **Create/Edit mappings** tab and changing these options.
   a) For **HBase table name**, select **weblogs**.
   b) For **Mapping name**, enter `pageviews`.
   c) Click **Get incoming fields**.

d) For the alias **key** change the **Key** column to **Y**, clear the **Column family** and **Column name** fields, and set the **Type** field to **String**. Click **Save mapping**.



11. Configure the HBase out to use the mapping you just created.

a) Go back to the **Configure connection** tab and click **Get table names**.

b) For **HBase table name**, enter `weblogs`.

c) Click **Get mappings for the specified table**.

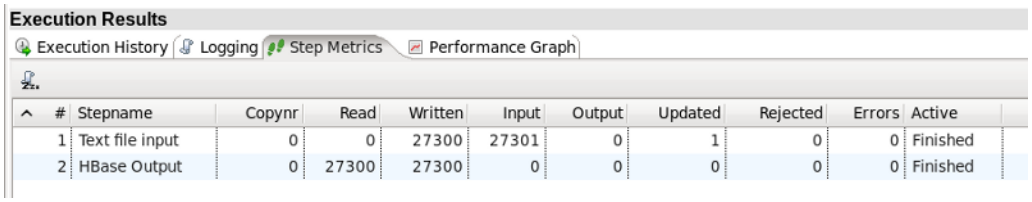
d) For **Mapping name**, select **pageviews**. Click **OK** to close the window.

Save the transformation by selecting **Save as** from the **File** menu. Enter **load_hbase.ktr** as the file name within a folder of your choice.

12. Run the transformation by clicking the green **Run** button on the transformation toolbar 

, or by choosing **Action** > **Run** from the menu. The **Execute a transformation** window opens. Click **Launch**.

An **Execution Results** panel opens at the bottom of the Spoon interface and displays the progress of the transformation as it runs. After a few seconds the transformation finishes successfully.



If any errors occurred the transformation step that failed will be highlighted in red and you can use the **Logging** tab to view error messages.

13. Verify the data was loaded by querying HBase.

a) From the command line, open the HBase shell by entering this command.

```
hbase shell
```

b) Query HBase by entering this command.

```
scan 'weblogs', {LIMIT => 10}
```

Ten rows of data are returned.

Transforming Data within a Hadoop Cluster

These tutorials contain guidance and instructions on transforming data within the Hadoop cluster using Pentaho MapReduce, Hive, and Pig.

- *Using Pentaho MapReduce to Parse Weblog Data*—How to use Pentaho MapReduce to convert raw weblog data into parsed, delimited records.

- *Using Pentaho MapReduce to Generate an Aggregate Dataset*—How to use Pentaho MapReduce to transform and summarize detailed data into an aggregate dataset.
- *Transforming Data within Hive*—How to read data from a Hive table, transform it, and write it to a Hive table within the workflow of a PDI job.
- *Transforming Data with Pig*—How to invoke a Pig script from a PDI job.

Extracting Data from a Hadoop Cluster

These tutorials contain guidance and instructions on extracting data from Hadoop using HDFS, Hive, and HBase.

- *Extracting Data from HDFS to Load an RDBMS*—How to use a PDI transformation to extract data from HDFS and load it into a RDBMS table.
- *Extracting Data from Hive to Load an RDBMS*—How to use a PDI transformation to extract data from Hive and load it into a RDBMS table.
- *Extracting Data from HBase to Load an RDBMS*—How to use a PDI transformation to extract data from HBase and load it into a RDBMS table.
- *Extracting Data from Snappy Compressed Files*—How to configure client-side PDI so that files compressed using the Snappy codec can be decompressed using the Hadoop file input or Text file input step.

Reporting on Data within a Hadoop Cluster

These tutorials contain guidance and instructions about reporting on data within a Hadoop cluster.

- *Reporting on HDFS File Data*—How to create a report that sources data from a HDFS file.
- *Reporting on HBase Data*—How to create a report that sources data from HBase.
- *Reporting on Hive Data*—How to create a report that sources data from Hive.

MapR Tutorials

These tutorials are organized by topic and each set explains various techniques for loading, transforming, extracting and reporting on data within a MapR cluster. You are encouraged to perform the tutorials in order as the output of one is sometimes used as the input of another. However, if you would like to jump to a tutorial in the middle of the flow, instructions for preparing input data are provided.

Loading Data into a MapR Cluster

These tutorials contain guidance and instructions on loading data into CLDB (MapR's distributed file system), Hive, and HBase.

- *Loading Data into CLDB*—How to use a PDI job to move a file into CLDB.
- *Loading Data into MapR Hive*—How to use a PDI job to load a data file into a Hive table.
- *Loading Data into MapR HBase*—How to use a PDI transformation that sources data from a flat file and writes to an HBase table.

Transforming Data within a MapR Cluster

These tutorials contain guidance and instructions on leveraging the massively parallel, fault tolerant MapR processing engine to transform resident cluster data.

- *Using Pentaho MapReduce to Parse Weblog Data in MapR*—How to use Pentaho MapReduce to convert raw weblog data into parsed, delimited records.
- *Using Pentaho MapReduce to Generate an Aggregate Dataset in MapR*—How to use Pentaho MapReduce to transform and summarize detailed data into an aggregate dataset.
- *Transforming Data within Hive in MapR*—How to read data from a Hive table, transform it, and write it to a Hive table within the workflow of a PDI job.
- *Transforming Data with Pig in MapR*—How to invoke a Pig script from a PDI job.

Extracting Data from a MapR Cluster

These tutorials contain guidance and instructions on extracting data from a MapR cluster and loading it into an RDBMS table.

- *Extracting Data from CLDB to Load an RDBMS*—How to use a PDI transformation to extract data from MapR CLDB and load it into a RDBMS table.

- *Extracting Data from Hive to Load an RDBMS in MapR*—How to use a PDI transformation to extract data from Hive and load it into a RDBMS table.
- *Extracting Data from HBase to Load an RDBMS in MapR*—How to use a PDI transformation to extract data from HBase and load it into a RDBMS table.

Reporting on Data within a MapR Cluster

These tutorials contain guidance and instructions about reporting on data within a MapR cluster.

- *Reporting on CLDB File Data* —How to create a report that sources data from a MapR CLDB file.
- *Reporting on HBase Data in MapR*—How to create a report that sources data from HBase.
- *Reporting on Hive Data in MapR*—How to create a report that sources data from Hive.

Cassandra Tutorials

These tutorials demonstrate the integration between Pentaho and the Cassandra NoSQL Database, specifically techniques about writing data to and reading data from Cassandra using graphical tools. These tutorials also include instructions on how to sort and group data, create reports, and combine data from Cassandra with data from other sources.

- *Write Data To Cassandra*—How to read data from a data source (flat file) and write it to a column family in Cassandra using a graphic tool.
- *How To Read Data From Cassandra*—How to read data from a column family in Cassandra using a graphic tool.
- *How To Create a Report with Cassandra*—How to create a report that uses data from a column family in Cassandra using graphic tools.

MongoDB Tutorials

These tutorials demonstrate the integration between Pentaho and the MongoDB NoSQL Database, specifically how to write data to, read data from, MongoDB using graphical tools. These tutorials also include instructions on sorting and grouping data, creating reports, and combining data from Mongo with data from other sources.

- *Write Data To MongoDB*—How to read data from a data source (flat file) and write it to a collection in MongoDB
- *Read Data From MongoDB*—How to read data from a collection in MongoDB.
- *Create a Report with MongoDB*—How to create a report that uses data from a collection in MongoDB.
- *Create a Parameterized Report with MongoDB*—How to create a parameterize report that uses data from a collection in MongoDB.

Interacting With Web Services

PDI jobs and transformations can interact with a variety of Web services through specialized steps. How you use these steps, and which ones you use, is largely determined by your definition of "Web services." The most commonly used Web services steps are:

- *Web Service Lookup*
- *Modified Java Script Value*
- *RSS Input*
- *HTTP Post*

The Web Service Lookup Step is useful for selecting and setting input and output parameters via WSDL, but only if you do not need to modify the SOAP request. You can see this step in action in the **Web Services - NOAA Latitude and Longitude.ktr** sample transformation included with PDI in the `/data-integration/samples/transformations/` directory.

There are times when the SOAP message generated by the Web Services Lookup step is insufficient. Many Web services require the security credentials be placed in the SOAP request headers. There may also be a need to parse the response XML to get more information than the response values provide (such as namespaces). In cases like these, you can use the Modified Java Script Value step to create whatever SOAP envelope you need. You would then hop to an HTTP Post step to accept the SOAP request through the input stream and post it to the Web service, then hop to another Modified Java Script Value to parse the response. The **General - Annotated SOAP Web Service call.ktr** sample in the `/data-integration/samples/transformations/` directory shows this theory in practice.

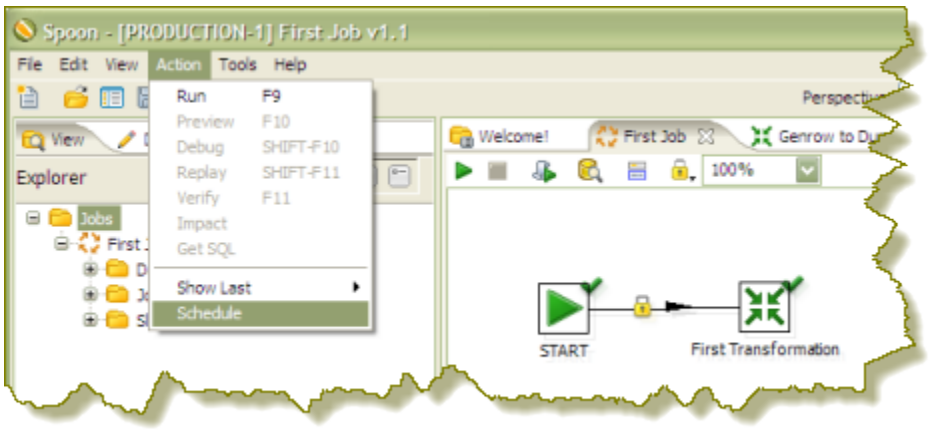
Scheduling and Scripting PDI Content

Once you're finished designing your PDI jobs and transformations, you can arrange to run them at certain time intervals through the DI Server, or through your own scheduling mechanism (such as **cron** on Linux, and the **Task Scheduler** or the **at** command on Windows). The methods of operation for scheduling and scripting are different; scheduling through the DI Server is done through the Spoon graphical interface, whereas scripting using your own scheduler or executor is done by calling the **pan** or **kitchen** commands. This section explains all of the details for scripting and scheduling PDI content.

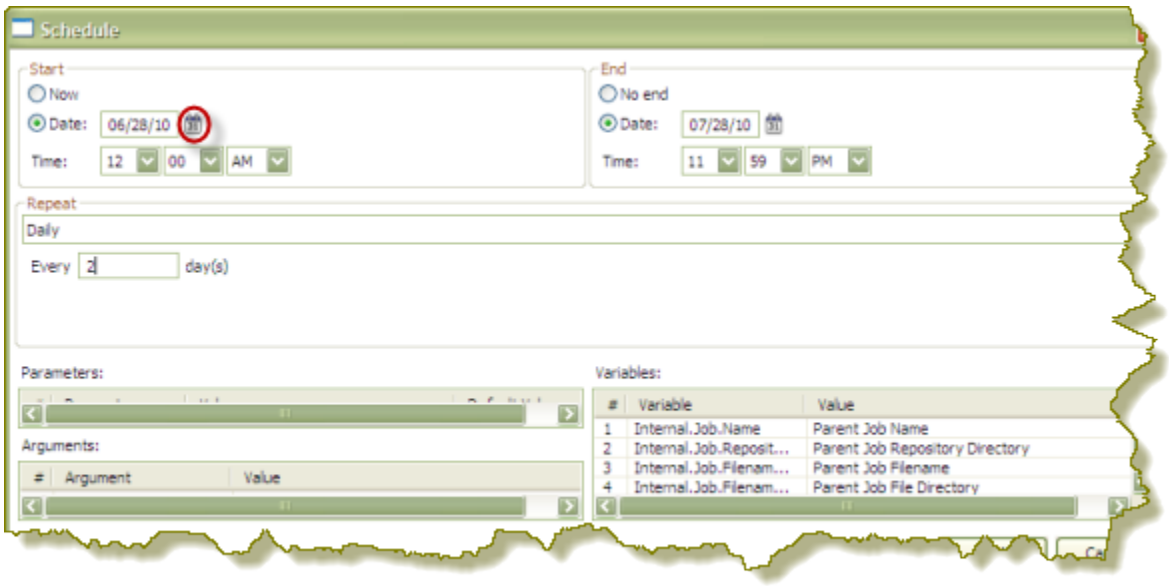
Scheduling Transformations and Jobs From Spoon

You can schedule jobs and transformations to execute automatically on a recurring basis by following the directions below.

1. Open a job or transformation, then go to the **Action** menu and select **Schedule**.



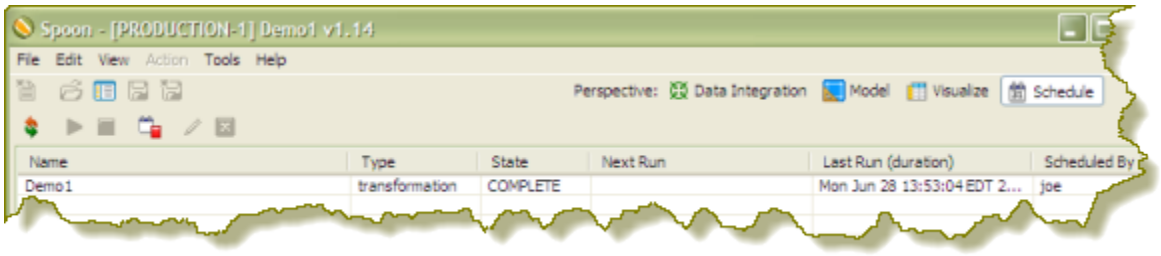
2. In the **Schedule a Transformation** dialog box, enter the date and time that you want the schedule to begin in the **Start** area, or click the calendar icon (circled in red) to display the calendar. To run the transformation immediately, enable the **Now** radio button.



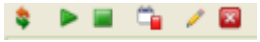
3. Set up the **End** date and time. If applicable, enable the **No end** radio button or click on the calendar and input the date and time to end the transformation.
4. If applicable, set up a recurrence under **Repeat**.

   End date and time are disabled unless you select a recurrence. From the list of schedule options select the choice that is most appropriate: **Run Once**, **Seconds**, **Minutes**, **Hourly**, **Daily**, **Weekly**, **Monthly**, **Yearly**.
5. Make sure you set parameters, arguments and variables, if available. Click **OK**.

6. In the Spoon button bar, click the **Schedule** perspective.



From the Schedule perspective, you can refresh, start, pause, stop and delete a transformation or job using the buttons on the upper left corner of the page.



Command-Line Scripting Through Pan and Kitchen

You can use PDI's command line tools to execute PDI content from outside of Spoon. Typically you would use these tools in the context of creating a script or a cron job to run the job or transformation based on some condition outside of the realm of Pentaho software.

Pan is the PDI command line tool for executing transformations.

Kitchen is the PDI command line tool for executing jobs.

Both of these programs are explained in detail below.

Pan Options and Syntax

Pan runs transformations, either from a PDI repository (database or enterprise), or from a local file. The syntax for the batch file and shell script are shown below. All Pan options are the same for both.

pan.sh `-option=value arg1 arg2`

pan.bat `/option:value arg1 arg2`

Switch	Purpose
rep	Enterprise or database repository name, if you are using one
user	Repository username
pass	Repository password
trans	The name of the transformation (as it appears in the repository) to launch
dir	The repository directory that contains the transformation, including the leading slash
file	If you are calling a local KTR file, this is the filename, including the path if it is not in the local directory
level	The logging level (Basic, Detailed, Debug, Rowlevel, Error, Nothing)
logfile	A local filename to write log output to
listdir	Lists the directories in the specified repository
listtrans	Lists the transformations in the specified repository directory
listrep	Lists the available repositories
exprep	Exports all repository objects to one XML file
norep	Prevents Pan from logging into a repository. If you have set the KETTLE_REPOSITORY, KETTLE_USER, and KETTLE_PASSWORD environment variables, then this option will enable you to prevent Pan from logging into the specified repository, assuming you would like to execute a local KTR file instead.

Switch	Purpose
safemode	Runs in safe mode, which enables extra checking
version	Shows the version, revision, and build date
param	Set a named parameter in a **name=value** format. For example: **-param:FOO=bar**
listparam	List information about the defined named parameters in the specified transformation.
maxloglines	The maximum number of log lines that are kept internally by PDI. Set to **0** to keep all rows (default)
maxlogtimeout	The maximum age (in minutes) of a log line while being kept internally by PDI. Set to **0** to keep all rows indefinitely (default)

```
sh pan.sh -rep=initech_pdi_repo -user=pgibbons -pass=lumburghsux -
trans=TPS_reports_2011
```

```
pan.bat /rep:initech_pdi_repo /user:pgibbons /pass:lumburghsux /
trans:TPS_reports_2011
```

Pan Status Codes

When you run Pan, there are seven possible return codes that indicate the result of the operation. All of them are defined below.

Status code	Definition
0	The transformation ran without a problem.
1	Errors occurred during processing
2	An unexpected error occurred during loading / running of the transformation
3	Unable to prepare and initialize this transformation
7	The transformation couldn't be loaded from XML or the Repository
8	Error loading steps or plugins (error in loading one of the plugins mostly)
9	Command line usage printing

Kitchen Options and Syntax

Kitchen runs jobs, either from a PDI repository (database or enterprise), or from a local file. The syntax for the batch file and shell script are shown below. All Kitchen options are the same for both.

kitchen.sh `-option=value arg1 arg2`

kitchen.bat `/option:value arg1 arg2`

Switch	Purpose
rep	Enterprise or database repository name, if you are using one
user	Repository username
pass	Repository password

Switch	Purpose
job	The name of the job (as it appears in the repository) to launch
dir	The repository directory that contains the job, including the leading slash
file	If you are calling a local KJB file, this is the filename, including the path if it is not in the local directory
level	The logging level (Basic, Detailed, Debug, Rowlevel, Error, Nothing)
logfile	A local filename to write log output to
listdir	Lists the directories in the specified repository
listjob	Lists the jobs in the specified repository directory
listrep	Lists the available repositories
export	Exports all linked resources of the specified job. The argument is the name of a ZIP file.
norep	Prevents Kitchen from logging into a repository. If you have set the KETTLE_REPOSITORY, KETTLE_USER, and KETTLE_PASSWORD environment variables, then this option will enable you to prevent Kitchen from logging into the specified repository, assuming you would like to execute a local KTR file instead.
version	Shows the version, revision, and build date
param	Set a named parameter in a **name=value** format. For example: **-param:FOO=bar**
listparam	List information about the defined named parameters in the specified job.
maxloglines	The maximum number of log lines that are kept internally by PDI. Set to **0** to keep all rows (default)
maxlogtimeout	The maximum age (in minutes) of a log line while being kept internally by PDI. Set to **0** to keep all rows indefinitely (default)

```
sh kitchen.sh -rep=initech_pdi_repo -user=pgibbons -pass=lumburghsux -
job=TPS_reports_2011
```

```
kitchen.bat /rep:initech_pdi_repo /user:pgibbons /pass:lumburghsux /
job:TPS_reports_2011
```

Kitchen Status Codes

When you run Kitchen, there are seven possible return codes that indicate the result of the operation. All of them are defined below.

Status code	Definition
0	The job ran without a problem.
1	Errors occurred during processing

Status code	Definition
2	An unexpected error occurred during loading or running of the job
7	The job couldn't be loaded from XML or the Repository
8	Error loading steps or plugins (error in loading one of the plugins mostly)
9	Command line usage printing

Importing KJB or KTR Files From a Zip Archive

Both Pan and Kitchen can pull PDI content files from out of Zip files. To do this, use the **!** switch, as in this example:

```
Kitchen.bat /file:"zip:file:///C:/Pentaho/PDI Examples/Sandbox/
linked_executable_job_and_transform.zip!Hourly_Stats_Job_Unix.kjb"
```

If you are using Linux or Solaris, the ! must be escaped:

```
./kitchen.sh -file:"zip:file:////home/user/pentaho/pdi-ee/my_package/
linked_executable_job_and_transform.zip\!Hourly_Stats_Job_Unix.kjb"
```

Connecting to Enterprise Repositories with Command-Line Tools

To export repository objects into XML format using command-line tools instead of exporting repository configurations from within Spoon, use named parameters and command-line options when calling Kitchen or Pan from a command-line prompt.

The following is an example command-line entry to execute an export job using Kitchen:

```
    call kitchen.bat /file:C:\Pentaho_samples\repository\repository_export.kjb
    "/param:rep_name=PDI2000" "/param:rep_user=joe" "/param:rep_password=password"
    "/param:rep_folder=/public/dev"
    "/param:target_filename=C:\Pentaho_samples\repository\export\dev.xml"
```

Parameter	Description
`rep_folder`	Repository Folder
`rep_name`	Repository Name
`rep_password`	Repository Password
`rep_user`	Repository Username
`target_filename`	Target Filename

Note: It is also possible to use obfuscated passwords with Encr a command line tool for encrypting strings for storage or use by PDI.

The following is an example command-line entry to execute a complete command-line call for the export in addition to checking for errors:

```
   @echo off
   ECHO This an example of a batch file calling the repository_export.kjb

   cd C:\Pentaho\pdi-ee-4.4.0-GA\data-integration

   call kitchen.bat /file:C:\Pentaho_samples\repository\repository_export.kjb "/
param:rep_name=PDI2000"
```

```
   "/param:rep_user=joe" "/param:rep_password=password" "/param:rep_folder=/public/
dev"
   "/param:target_filename=C:\Pentaho_samples\repository\export\dev.xml"

   if errorlevel 1 goto error
   echo Export finished successfull.
   goto finished

   :error
   echo ERROR: An error occured during repository export.
   :finished
   REM Allow the user to read the message when testing, so having a pause
   pause
```

Exporting Content from an Enterprise Repositories with Command-Line Tools

To export repository objects into XML format, using command-line tools instead of exporting repository configurations from within Spoon, use named parameters and command-line options when calling Kitchen (or Pan) from a command-line prompt.

The following is an example command-line entry to execute an export job using Kitchen:

```
    call kitchen.bat /file:C:\Pentaho_samples\repository\repository_export.kjb
    "/param:rep_name=PDI2000" "/param:rep_user=joe" "/param:rep_password=password"
    "/param:rep_folder=/public/dev"
    "/param:target_filename=C:\Pentaho_samples\repository\export\dev.xml"
```

Parameter	Description
rep_folder	Repository Folder
rep_name	Repository Name
rep_password	Repository Password
rep_user	Repository Username
target_filename	Target Filename

Note: It is also possible to use obfuscated passwords with Encr (Command line tool for encrypting strings for storage / use by PDI).

The following is an example command-line entry to execute a complete command-line call for the export in addition to checking for errors:

```
   @echo off
   ECHO This an example of a batch file calling the repository_export.kjb

   cd C:\Pentaho\pdi-ee-4.4.0-GA\data-integration

   call kitchen.bat /file:C:\Pentaho_samples\repository\repository_export.kjb "/
param:rep_name=PDI2000"
   "/param:rep_user=joe" "/param:rep_password=password" "/param:rep_folder=/public/
dev"
   "/param:target_filename=C:\Pentaho_samples\repository\export\dev.xml"

   if errorlevel 1 goto error
   echo Export finished successfull.
   goto finished

   :error
   echo ERROR: An error occured during repository export.
   :finished
   REM Allow the user to read the message when testing, so having a pause
```

```
pause
```

Transformation Step Reference

This section contains reference documentation for transformation steps.

Note: Many steps are not completely documented in this guide, but have rough definitions in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Big Data

The PDI transformation steps in this section pertain to Big Data operations.

Note: PDI is configured by default to use the Apache Hadoop distribution. If you are working with a Cloudera or MapR distribution instead, you must install the appropriate patch before using any Hadoop functions in PDI. Patch installation is covered in the *PDI Installation Guide* and the *Pentaho Hadoop Guide*.

Avro Input

The Avro Input step decodes binary or JSON Avro data and extracts fields from the structure it defines, either from flat files or incoming fields.

Source tab

Option	Definition
Avro source is in file	Indicates the source data comes from a file.
Avro source is defined in a field	Indicates the source data comes from a field, and you can select an incoming field to decode from the **Avro field to decode from** drop-down box. In this mode of operation, a schema file must be specified in the **Schema file** field.
Avro file	Specifies the file to decode.
Avro field to decode from	Specifies the incoming field containing Avro data to decode.
JSON encoded	Indicates the Avro data has been encoded in JSON.

Schema tab

Option	Definition
Schema file	Indicates an Avro schema file.
Schema is defined in a field	Indicates the schema specified to use for decoding an incoming Avro object is found within a field. When checked, this option enables the **Schema in field is a path** and **Cache schemas** options. This also changes the **Schema file** label to **Default schema file**, which the user can specify if an incoming schema is missing.
Schema in field is a path	Indicates that the incoming schema specifies a path to a schema file. If left unchecked, the step assumes the incoming schema is the actual schema definition in JSON format.
Cache schemas in memory	Enables the step to retain all schemas seen in memory and uses this before loading or parsing an incoming schema.
Field containing schema	Indicates which field contains the Avro schema.

Avro fields tab

Option	Definition
Do not complain about fields not present in the schema	Disables issuing an exception when specified paths or fields are not present in the active Avro schema. Instead a `null` value is returned. OR Instead the system returns a `null` value.
Preview	Displays a review of the fields or data from the designated source file.
Get fields	Populates the fields available from the designated source file or schema and gives each extracted field a name that reflects the path used to extract it.

Lookup fields tab

Option	Definition
Get incoming fields	Populates the **Name** column of the table with the names of incoming Kettle fields. The **Variable** column of the table allows you to assign the values of these incoming fields to variable. A default value (to use in case the incoming field value is `null`) can be supplied in the **Default** value column. These variables can then be used anywhere in the Avro paths defined in the **Avro fields** tab.

Cassandra Input

Configure Cassandra Input

Cassandra Input is an input step that enables data to be read from a Cassandra column family (table) as part of an ETL transformation.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Cassandra host	Connection host name input field.
Cassandra port	Connection host port number input field.
Username	Input field for target keyspace and/or family (table) authentication details.
Password	Input field for target keyspace and/or family (table) authentication details.
Keyspace	Input field for the keyspace (database) name.
Use query compression	If checked, tells the step whether or not to compress the text of the CQL query before sending it to the server.
Show schema	Opens a dialog that shows metadata for the column family named in the CQL SELECT query.

CQL SELECT Query

The large text box at the bottom of the dialog enables you to enter a CQL SELECT statement to be executed. Only a single SELECT query is accepted by the step.

```
SELECT [FIRST N] [REVERSED] <SELECT EXPR>
FROM <COLUMN FAMILY> [USING <CONSISTENCY>] [WHERE <CLAUSE>] [LIMIT N];
```

Important: Cassandra Input does not support the CQL range notation, for instance name1..nameN, for specifying columns in a SELECT query.

Select queries may name columns explicitly (in a comma separated list) or use the * wildcard. If the wildcard is used then only those columns defined in the metadata for the column family in question are returned. If columns are selected explicitly, then the name of each column must be enclosed in single quotation marks. Because Cassandra is a sparse column oriented database, as is the case with HBase, it is possible for rows to contain varying numbers of columns which might or might not be defined in the metadata for the column family. The Cassandra Input step can emit columns that are not defined in the metadata for the column family in question if they are explicitly named in the SELECT clause. Cassandra Input uses type information present in the metadata for a column family. This, at a minimum, includes a default type (column validator) for the column family. If there is explicit metadata for individual columns available, then this is used for type information, otherwise the default validator is used.

Option	Definition
LIMIT	If omitted, Cassandra assumes a default limit of 10,000 rows to be returned by the query. If the query is expected to return more than 10,000 rows an explicit LIMIT clause must be added to the query.
FIRST N	Returns the first N [where N is determined by the column sorting strategy used for the column family in question] column values from each row, if the column family in question is sparse then this may result in a different N (or less) column values appearing from one row to the next. Because PDI deals with a constant number of fields between steps in a transformation, Cassandra rows that do not contain particular columns are output as rows with `null` field values for non-existent columns. Cassandra's default for FIRST (if omitted from the query) is 10,000 columns. If a query is expected to return more than 10,000 columns, then an explicit FIRST must be added to the query.
REVERSED	Option causes the sort order of the columns returned by Cassandra for each row to be reversed. This may affect which values result from a FIRST N option, but does not affect the order of the columns output by Cassandra Input.
WHERE clause	Clause provides for filtering the rows that appear in results. The clause can filter on a key name, or range of keys, and in the case of indexed columns, on column values. Key filters are specified using the KEY keyword, a relational operator (one of =, >, >=, <, and <=) and a term value.

Cassandra Output

Configure Cassandra Output

Cassandra Output is an output step that enables data to be written to a Cassandra column family (table) as part of an ETL transformation.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Cassandra host	Connection host name input field.
Cassandra port	Connection host port number input field.
Username	Target keyspace and/or family (table) authentication details input field.

Option	Definition
Password	Target keyspace and/or family (table) authentication details input field.
Keyspace	Input field for the keyspace (database) name.
Show schema	Opens a dialog box that shows metadata for the specified column family.

Configure Column Family and Consistency Level

This tab contains connection details and basic query information, in particular, how to connect to Cassandra and execute a CQL (Cassandra query language) query to retrieve rows from a column family (table).

Important: Note that Cassandra Output does not check the types of incoming columns against matching columns in the Cassandra metadata. Incoming values are formatted into appropriate string values for use in a textual CQL INSERT statement according to PDI's field metadata. If resulting values cannot be parsed by the Cassandra column validator for a particular column then an error results.

Note: Cassandra Output converts PDI's dense row format into sparse data by ignoring incoming field values that are `null`.

Option	Definition
Column family (table)	Input field to specify the column family, to which the incoming rows should be written.
Get column family names button	Populates the drop-down box with names of all the column families that exist in the specified keyspace.
Consistency level	Input field enables an explicit write consistency to be specified. Valid values are: ZERO, ONE, ANY, QUORUM and ALL. The Cassandra default is ONE.
Create column family	If checked, enables the step to create the named column family if it does not already exist.
Truncate column family	If checked, specifies whether any existing data should be deleted from the named column family before inserting incoming rows.
Update column family metadata	If checked, updates the column family metadata with information on incoming fields not already present, when option is selected. If this option is not selected, then any unknown incoming fields are ignored unless the Insert fields not in column metadata option is enabled.
Insert fields not in column metadata	If checked, inserts the column family metadata in any incoming fields not present, with respect to the default column family validator. This option has no effect if **Update column family metadata** is selected.
Commit batch size	Allows you to specify how many rows to buffer before executing a BATCH INSERT CQL statement.
Use compression	Option compresses (gzip) the text of each BATCH INSERT statement before transmitting it to the node.

Pre-insert CQL

Cassandra Output gives you the option of executing an arbitrary set of CQL statements prior to inserting the first incoming PDI row. This is useful for creating or dropping secondary indexes on columns.

Note: Pre-insert CQL statements are executed *after* any column family metadata updates for new incoming fields, and before the first row is inserted. This enables indexes to be created for columns corresponding new to incoming fields.

Option	Definition
CQL to execute before inserting first row	Opens the CQL editor, where you can enter one or more semicolon-separated CQL statements to execute before data is inserted into the first row.

CouchDB Input

The CouchDB Input step retrieves all documents from a given view in a given design document from a given database. The resulting output is a single String field named **JSON**, one row for each received document. For information about CouchDB, design documents, or views, see *http://guide.couchdb.org*.

Option	Definition
Step Name	The name of this step as it appears in the transformation workspace.
Host name or IP	Connection host name input field.
Port	Connection host port number input field.
Database	Name of the incoming database.
Design document	Identify the source design document. Design documents are a special type of CouchDB document that contains application code. See *http://guide.couchdb.org* for more information about design documents in CouchDB.
View name	Identify the source CouchDB view. For more on views in CouchDB, see *http://guide.couchdb.org/editions/1/en/views.html#views*.
Authentication user	The username required to access the database.
Authentication password	The password required to access the database.

Hadoop File Input

The Hadoop File Input step is used to read data from a variety of different text-file types stored on a Hadoop cluster. The most commonly used formats include comma separated values (CSV files) generated by spreadsheets and fixed width flat files.

This step enables you to specify a list of files to read, or a list of directories with wild cards in the form of regular expressions. In addition, you can accept file names from a previous step.

These tables describe all available Hadoop File Input options.

File Tab Options

Option	Description
Step Name	Optionally, you can change the name of this step to fit your needs. Every step in a transformation must have a unique name.
File or Directory	Specifies the location and/or name of the text file to read. Click **Browse** to navigate to the file, select **Hadoop** in the file dialog to enter in your Hadoop credentials, and click **Add** to add the file/directory/wildcard combination to the list of selected files (grid).
Regular expression	Specify the regular expression you want to use to select the files in the directory specified in the previous option. For example, you want to process all files that have a `.txt` output.

Option	Description
Selected Files	Contains a list of selected files (or wild card selections) along with a property specifying if a file is required or not. If a file is required and it isn't found, an error is generated. Otherwise, the file name is skipped.
Show filenames(s)...	Displays a list of all files that are loaded based on the current selected file definitions.
Show file content	Displays the raw content of the selected file.
Show content from first data line	Displays the content from the first data line for the selected file.

Selecting file using Regular Expressions... The Text File Input step can search for files by wildcard in the form of a regular expression. Regular expressions are more sophisticated than using '*' and '?' wildcards. This table describes a few examples of regular expressions.

File Name	Regular Expression	Files selected
`/dirA/`	`.userdata.\.txt`	Find all files in `/dirA/` with names containing user data and ending with .txt
`/dirB/`	AAA.*	Find all files in `/dirB/` with names that start with AAA
`/dirC/`	[ENG:A-Z][ENG:0-9].*	Find all files in `/dirC/` with names that start with a capital and followed by a digit (A0-Z9)

Accepting file names from a previous step... This option allows even more flexibility in combination with other steps, such as Get File Names. You can specify your file name and pass it to this step. This way the file name can come from any source; a text file, database table, and so on.

Option	Description
Accept file names from previous steps	Enables the option to get file names from previous steps
Step to read file names from	Step from which to read the file names
Field in the input to use as file name	Text File Input looks in this step to determine which filenames to use

Content Tab

Options under the **Content** tab allow you to specify the format of the text files that are being read. This table is a list of the options associated with this tab.

Option	Description
File type	Can be either CSV or Fixed length. Based on this selection, Spoon launches a different helper GUI when you click **Get Fields** in the **Fields** tab.
Separator	One or more characters that separate the fields in a single line of text. Typically this is a semicolon (;) or a tab.
Enclosure	Some fields can be enclosed by a pair of strings to allow separator characters in fields. The enclosure string is optional. If you use repeat an enclosures allow text line 'Not the nine o''clock news.'. With ' the enclosure string, this gets parsed as Not the nine o'clock news.
Allow breaks in enclosed fields?	Not implemented

Option	Description
Escape	Specify an escape character (or characters) if you have these types of characters in your data. If you have a backslash (/) as an escape character, the text 'Not the nine o\'clock news' (with a single quote ['] as the enclosure) gets parsed as Not the nine o'clock news.
Header & number of header lines	Enable if your text file has a header row (first lines in the file). You can specify the number of times the header lines appears.
Footer & number of footer lines	Enable if your text file has a footer row (last lines in the file). You can specify the number of times the footer row appears.
Wrapped lines and number of wraps	Use if you deal with data lines that have wrapped beyond a specific page limit. Headers and footers are never considered wrapped.
Paged layout and page size and doc header	Use these options as a last resort when dealing with texts meant for printing on a line printer. Use the number of document header lines to skip introductory texts and the number of lines per page to position the data lines
Compression	Enable if your text file is in a Zip or GZip archive. Only the first file in the archive is read.
No empty rows	Do not send empty rows to the next steps.
Include file name in output	Enable if you want the file name to be part of the output
File name field name	Name of the field that contains the file name
Rownum in output?	Enable if you want the row number to be part of the output
Row number field name	Name of the field that contains the row number
Format	Can be either DOS, UNIX, or mixed. UNIX files have lines that are terminated by line feeds. DOS files have lines separated by carriage returns and line feeds. If you specify mixed, no verification is done.
Encoding	Specify the text file encoding to use. Leave blank to use the default encoding on your system. To use Unicode, specify UTF-8 or UTF-16. On first use, Spoon searches your system for available encodings.
Be lenient when parsing dates?	Disable if you want strict parsing of data fields. If case-lenient parsing is enabled dates like Jan 32nd become Feb 1st.
The date format Locale	This locale is used to parse dates that have been written in full such as "February 2nd, 2006." Parsing this date on a system running in the French (fr_FR) locale would not work because February is called Février in that locale.
Add filenames to result	Adds filenames to result filenames list.

Error Handling Tab

Options under the **Error Handling** tab allow you to specify how the step reacts when errors occur, such as, malformed records, bad enclosure strings, wrong number of fields, premature line ends. This describes the options available for Error handling.

Option	Description
Ignore errors?	Enable if you want to ignore errors during parsing
Skip error lines	Enable if you want to skip those lines that contain errors. You can generate an extra file that contains the line numbers on which the errors occur. Lines with errors are not skipped. The fields that have parsing errors are empty (`null`).
Error count field name	Add a field to the output stream rows. This field contains the number of errors on the line.
Error fields field name	Add a field to the output stream rows; this field contains the field names on which an error occurred.
Error text field name	Add a field to the output stream rows; this field contains the descriptions of the parsing errors that have occurred.
Warnings file directory	When warnings are generated, they are placed in this directory. The name of that file is `<warning dir>/filename.<date_time>.<warning extension>`
Error files directory	When errors occur, they are placed in this directory. The name of the file is `<errorfile_dir>/filename.<date_time>.<errorfile_extension>`
Failing line numbers files directory	When a parsing error occurs on a line, the line number is placed in this directory. The name of that file is `<errorline dir>/filename.<date_time>.<errorline extension>`

Filters Tab

Options under the **Filters** tab enables you to specify the lines you want to skip in the text file. This table describes the available options for defining filters.

Option	Description
Filter string	The string for which to search.
Filter position	The position where the filter string must be placed in the line. Zero (0) is the first position in the line. If you specify a value below zero (0), the filter string is searched for in the entire string.
Stop on filter	Specify Y here if you want to stop processing the current text file when the filter string is encountered.
Positive match	Turns filters into positive mode when turned on. Only lines that match this filter will be passed. Negative filters take precedence and are immediately discarded.

Fields Tab

The options under the **Fields** tab allow you to specify the information about the name and format of the fields being read from the text file. Available options include:

Option	Description
Name	Name of the field.
Type	Type of the field can be either String, Date or Number.
Format	See Number Formats for a complete description of format symbols.
Length	For Number: Total number of significant figures in a number. For String: total length of string. For Date: length of printed output of the string, for instance, 4 only gives back the year.
Precision	For Number: Number of floating point digits. For String, Date, Boolean: unused.

Option	Description
Currency	Used to interpret numbers like $10,000.00 or E5.000,00.
Decimal	A decimal point can be a "." (10;000.00) or "," (5.000,00).
Grouping	A grouping can be a dot "," (10;000.00) or "." (5.000,00).
Null if	Treat this value as `null`.
Default	Default value in case the field in the text file was not specified (empty).
Trim	Type trim this field, left, right, both, before processing.
Repeat	If the corresponding value in this row is empty, repeat the one from the last time it was not empty (Y/N).

Number formats... The information about number formats was taken from the Sun Java API documentation, *Decimal Formats*.

Symbol	Location	Localized	Meaning
0	Number	Yes	Digit
#	Number	Yes	Digit, zero shows as absent
.	Number	Yes	Decimal separator or monetary decimal separator
-	Number	Yes	Minus sign
,	Number	Yes	Grouping separator
E	Number	Yes	Separates mantissa and exponent in scientific notation. Need not be quoted in prefix or suffix.
;	Sub pattern boundary	Yes	Separates positive and negative sub patterns
%	Prefix or suffix	Yes	Multiply by 100 and show as percentage
\u2030	Prefix or suffix	Yes	Multiply by 1000 and show as per mille
(\u00A4)	Prefix or suffix	No	Currency sign, replaced by currency symbol. If doubled, replaced by international currency symbol. If present in a pattern, the monetary decimal separator is used instead of the decimal separator.
'	Prefix or suffix	No	Used to quote special characters in a prefix or suffix, for example, "'#'#" formats 123 to "#123". To create a single quote itself, use two in a row: "# o''clock".

Scientific Notation... In a pattern, the exponent character immediately followed by one or more digit characters indicates scientific notation, for example "0.###E0" formats the number 1234 as "1.234E3".

Date formats... The information about Date formats was taken from the Sun Java API documentation, *Date Formats*.

Letter	Date or Time Component	Presentation	Examples
G	Era designator	Text	AD
y	Year	Year	1996 or 96
M	Month in year	Month	July, Jul, or 07
w	Week in year	Number	27
W	Week in month	Number	2
D	Day in year	Number	189
d	Day in month	Number	10
F	Day of week in month	Number	2
E	Day in week	Text	Tuesday or Tue
a	Am/pm marker	Text	PM
H	Hour in day (0-23)	Number 0	n/a
k	Hour in day (1-24)	Number 24	n/a
K	Hour in am/pm (0-11)	Number 0	n/a
h	Hour in am/pm (1-12)	Number 12	n/a
m	Minute in hour	Number 30	n/a
s	Second in minute	Number 55	n/a
S	Millisecond	Number 978	n/a
z	Time zone	General time zone	Pacific Standard Time, PST, or GMT-08:00
Z	Time zone	RFC 822 time zone	-0800

Hadoop File Output

The Hadoop File Output step is used to export data to text files stored on a Hadoop cluster. This is commonly used to generate comma separated values (CSV files) that can be read by spreadsheet applications. It is also possible to generate fixed width files by setting lengths on the fields in the fields tab.

These tables describe all available Hadoop File Output options.

File Tab

The options under the **File** tab is where you define basic properties about the file being created.

Option	Description
Step name	Optionally, you can change the name of this step to fit your needs. Every step in a transformation must have a unique name.
Filename	Specifies the location and/or name of the text file to which to write. Click **Browse** to navigate to the file. Select **Hadoop** in the file dialogue to enter in your Hadoop credentials.
Extension	Adds a point and the extension to the end of the file name (`.txt`).
Accept file name from field?	Enables you to specify the file name(s) in a field in the input stream.

Option	Description
File name field	When the previous option is enabled, you can specify the field that contains the filename(s) at runtime.
Include stepnr in filename	If you run the step in multiple copies (Launching several copies of a step), the copy number is included in the file name before the extension. (_0).
Include partition nr in file name?	Includes the data partition number in the file name.
Include date in file name	Includes the system date in the filename (_20101231)
Include time in file name	Includes the system time in the filename (_235959)
Specify Date time format	Allows you to specify the date time format from the list within the **Date time format** dropdown list..
Date time format	Dropdown list of date format options.
Show file name(s)	Displays a list of the files that are generated. This is a simulation and depends on the number of rows that go into each file.

Content tab

The **Content** tab contains these options for describing the content being read.

Option	Description
Append	Enables to append lines to the end of the specified file.
Separator	Specifies the character that separates the fields in a single line of text. Typically this is semicolon (;) or a tab.
Enclosure	A pair of strings can enclose some fields. This allows separator characters in fields. The enclosure string is optional. Enable if you want the text file to have a header row (first line in the file).
Force the enclosure around fields?	Forces all field names to be enclosed with the character specified in the **Enclosure** property above
Header	Enable this option if you want the text file to have a header row (first line in the file)
Footer	Enable this option if you want the text file to have a footer row (last line in the file)
Format	Can be either DOS or UNIX; UNIX files have lines are separated by line feeds, DOS files have lines separated by carriage returns and line feeds
Encoding	Specify the text file encoding to use. Leave blank to use the default encoding on your system. To use Unicode, specify UTF-8 or UTF-16. On first use, Spoon searches your system for available encodings.
Compression	Specify the type of compression, .zip or .gzip to use when compressing the output.  **Note:** Only one file is placed in a single archive.
Fast data dump (no formatting)	Improves the performance when dumping large amounts of data to a text file by not including any formatting information.

Option	Description
Split every ... rows	If the number N is larger than zero, split the resulting text-file into multiple parts of N rows.
Add Ending line of file	Allows you to specify an alternate ending row to the output file.

Fields tab

The fields tab is where you define properties for the fields being exported. The table below describes each of the options for configuring the field properties:

Option	Description
Name	The name of the field
Type	Type of the field can be either String, Date or Number.
Format	The format mask to convert with. See Number Formats for a complete description of format symbols.
Length	The length option depends on the field type follows: • Number - Total number of significant figures in a number • String - total length of string • Date - length of printed output of the string (for exampl, 4 returns year)
Precision	The precision option depends on the field type as follows: • Number - Number of floating point digits • String - unused • Date - unused
Currency	Symbol used to represent currencies like $10,000.00 or E5.000,00
Decimal	A decimal point can be a "." (10,000.00) or "," (5.000,00)
Group	A grouping can be a "," (10,000.00) or "." (5.000,00)
Trim type	The trimming method to apply on the string **Note:** Trimming works when there is no field length given only.
Null	If the value of the field is null, insert this string into the text file
Get	Click to retrieve the list of fields from the input fields stream(s)
Minimal width	Change the options in the Fields tab in such a way that the resulting width of lines in the text file is minimal. So instead of save 0000001, you write 1, and so on. String fields will no longer be padded to their specified length.

HBase Input

This step reads data from an HBase table according to user-defined column metadata.

Configure Query

This tab contains connection details and basic query information. You can configure a connection in one of two ways: either via a comma-separated list of hostnames where the zookeeper quorum reside, or via an **hbase-site.xml** (and,

optionally, **hbase-default.xml**) configuration file. If both zookeeper and HBase XML configuration options are supplied, then the zookeeper takes precedence.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Zookeeper host(s)	Comma-separated list of hostnames for the zookeeper quorum.
URL to hbase-site.xml	Address of the hbase-site.xml file.
URL to hbase-default.xml	Address of the hbase-default.xml file.
HBase table name	The source HBase table to read from. Click **Get Mapped Table Names** to populate the drop-down list of possible table names.
Mapping name	A mapping to decode and interpret column values. Click **Get Mappings For the Specified Table** to populate the drop-down list of available mappings.
Start key value (inclusive) for table scan	A starting key value to retrieve rows from. This is inclusive of the value entered.
Stop key value (exclusive) for table scan	A stopping key value for the scan. This is exclusive of the value entered. Both fields or the stop key field may be left blank. If the stop key field is left blank, then all rows from (and including) the start key will be returned.
Scanner row cache size	The number of rows that should be cached each time a fetch request is made to HBase. Leaving this blank uses the default, which is to perform no caching; one row would be returned per fetch request. Setting a value in this field will increase performance (faster scans) at the expense of memory consumption.
#	The order of query limitation fields.
Alias	The name that the field will be given in the output stream.
Key	Indicates whether the field is the table's key field or not.
Column family	The column family in the HBase source table that the field belongs to.
Column name	The name of the column in the HBase table (family + column name uniquely identifies a column in the HBase table).
Type	The PDI data type for the field.
Format	A formatting mask to apply to the field.
Indexed values	Indicates whether the field has a predefined set of values that it can assume.
Get Key/Fields Info	Assuming the connection information is complete and valid, this button will populate the field list and display the name of the key.

Create/Edit Mappings

This tab creates or edits a mapping for a given HBase table. A mapping simply defines metadata about the values that are stored in the table. Since most information is stored as raw bytes in HBase, this enables PDI to decode values and execute meaningful comparisons for column-based result set filtering.

Option	Definition
HBase table name	Displays a list of table names. Connection information in the previous tab must be valid and complete in order for this drop-down list to populate.
Mapping name	Names of any mappings that exist for the table. This box will be empty if there are no mappings defined for the selected table, in which case you can enter the name of a new mapping.
#	The order of the mapping operation.
Alias	The name you want to assign to the HBase table key. This is required for the table key column, but optional for non-key columns.
Key	Indicates whether or not the field is the table's key.
Column family	The column family in the HBase source table that the field belongs to. Non-key columns must specify a column family and column name.
Column name	The name of the column in the HBase table.
Type	Data type of the column. Key columns can be of type: String Integer Unsigned integer (positive only) Long Unsigned long (positive only) Date Unsigned date. Non-key columns can be of type: String, Integer, Long, Float, Double, Boolean, Date, BigNumber, Serializable, Binary.
Indexed values	String columns may optionally have a set of legal values defined for them by entering comma-separated data into this field.

Filter Result Set

This tab provides two fields that limit the range of key values returned by a table scan. Leaving both fields blank will result in all rows being retrieved from the source table.

Option	Definition
Match all / Match any	When multiple column filters have been defined, you have the option returning only those rows that match all filters, or any single filter. Bounded ranges on a single numeric column can be defined by defining two filters (upper and lower bounds) and selecting **Match all**; similarly, open-ended ranges can be defined by selecting **Match any**.
#	The order of the filter operation.
Alias	A drop-down box of column alias names from the mapping.
Type	Data type of the column. This is automatically populated when you select a field after choosing the alias.
Operator	A drop-down box that contains either equality/inequality operators for numeric, date, and boolean fields; or substring and regular expression operators for string fields.
Comparison value	A comparison constant to use in conjunction with the operator.
Format	A formatting mask to apply to the field.

Option	Definition
Signed comparison	Specifies whether or not the comparison constant and/or field values involve negative numbers (for non-string fields only). If field values and comparison constants are only positive for a given filter, then HBase's native lexicographical byte-based comparisons are sufficient. If this is not the case, then it is necessary for column values to be deserialized from bytes to actual numbers before performing the comparison.

Performance Considerations

Specifying fields in the Configure query tab will result in scans that return just those columns. Since HBase is a sparse column-oriented database, this requires that HBase check to see whether each row contains a specific column. More lookups equate to reduced speed, although the use of Bloom filters (if enabled on the table in question) mitigates this to a certain extent. If, on the other hand, the fields table in the Configure query tab is left blank, it results in a scan that returns rows that contain all columns that exist in each row (not only those that have been defined in the mapping). However, the HBase Input step will only emit those columns that are defined in the mapping being used. Because all columns are returned, HBase does not have to do any lookups. However, if the table in question contains many columns and is dense, then this will result in more data being transferred over the network.

HBase Output

This step writes data to an HBase table according to user-defined column metadata.

Configure Connection

This tab contains HBase connection information. You can configure a connection in one of two ways: either via a comma-separated list of hostnames where the zookeeper quorum reside, or via an **hbase-site.xml** (and, optionally, **hbase-default.xml**) configuration file. If both zookeeper and HBase XML configuration options are supplied, then the zookeeper takes precedence.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Zookeeper host(s)	Comma-separated list of hostnames for the zookeeper quorum.
URL to hbase-site.xml	Address of the hbase-site.xml file.
URL to hbase-default.xml	Address of the hbase-default.xml file.
HBase table name	The HBase table to write to. Click **Get Mapped Table Names** to populate the drop-down list of possible table names.
Mapping name	A mapping to decode and interpret column values. Click **Get Mappings For the Specified Table** to populate the drop-down list of available mappings.
Disable write to WAL	Disables writing to the Write Ahead Log (WAL). The WAL is used as a lifeline to restore the status quo if the server goes down while data is being inserted. Disabling WAL will increase performance.
Size of write buffer (bytes)	The size of the write buffer used to transfer data to HBase. A larger buffer consumes more memory (on both the client and server), but results in fewer remote procedure calls. The default (in the hbase-default.xml) is 2MB (2097152 bytes), which is the value that will be used if the field is left blank.

Create/Edit Mappings

This tab creates or edits a mapping for a given HBase table. A mapping simply defines metadata about the values that are stored in the table. Since just about all information is stored as raw bytes in HBase, this allows PDI to decode values and execute meaningful comparisons for column-based result set filtering.

Note: The names of fields entering the step are expected to match the aliases of fields defined in the mapping. All incoming fields must have a matching counterpart in the mapping. There may be fewer incoming fields than defined in the mapping, but if there are more incoming fields then an error will occur. Furthermore, one of the incoming fields must match the key defined in the mapping.

Option	Definition
HBase table name	Displays a list of table names. Connection information in the previous tab must be valid and complete in order for this drop-down list to populate.
Mapping name	Names of any mappings that exist for the table. This box will be empty if there are no mappings defined for the selected table, in which case you can enter the name of a new mapping.
#	The order of the mapping operation.
Alias	The name you want to assign to the HBase table key. This is required for the table key column, but optional for non-key columns.
Key	Indicates whether or not the field is the table's key.
Column family	The column family in the HBase source table that the field belongs to. Non-key columns must specify a column family and column name.
Column name	The name of the column in the HBase table.
Type	Data type of the column. Key columns can be of type: String Integer Unsigned integer (positive only) Long Unsigned long (positive only) Date Unsigned date. Non-key columns can be of type: String, Integer, Long, Float, Double, Boolean, Date, BigNumber, Serializable, Binary.
Indexed values	String columns may optionally have a set of legal values defined for them by entering comma-separated data into this field.
Get incoming fields	Retrieves a field list using the given HBase table and mapping names.

Performance Considerations

The **Configure connection** tab provides a field for setting the size of the write buffer used to transfer data to HBase. A larger buffer consumes more memory (on both the client and server), but results in fewer remote procedure calls. The default (defined in the hbase-default.xml file) is 2MB. When left blank, the buffer is 2MB, **auto flush** is enabled, and **Put** operations are executed immediately. This means that each row will be transmitted to HBase as soon as it arrives at the step. Entering a number (even if it is the same as the default) for the size of the write buffer will disable auto flush and will result in incoming rows only being transferred once the buffer is full.

There is also a checkbox for disabling writing to the **Write Ahead Log** (WAL). The WAL is used as a lifeline to restore the status quo if the server goes down while data is being inserted. However, the tradeoff for error-recovery is speed.

The **Create/edit mappings** tab has options for creating new tables. In the **HBase table name** field, you can suffix the name of the new table with parameters for specifying what kind of compression to use, and whether or not to use Bloom filters to speed up lookups. The options for compression are: NONE, GZ and LZO; the options for Bloom filters are: NONE, ROW, ROWCOL. If nothing is selected (or only the name of the new table is defined), then the default of NONE

is used for both compression and Bloom filters. For example, the following string entered in the HBase table name field specifies that a new table called "NewTable" should be created with GZ compression and ROWCOL Bloom filters:

```
NewTable@GZ@ROWCOL
```

Note: Due to licensing constraints, HBase does not ship with LZO compression libraries. These must be manually installed on each node if you want to use LZO compression.

HBase Row Decoder

The HBase Row Decoder step decodes an incoming key and HBase result object according to a mapping.

Option	Definition
Step Name	The name the step as it appears in the transformation workspace.

Configure fields tab

Option	Definition
Key field	Input key field.
HBase result field	Field containing the serialized HBase result.

Create/Edit mappings tab

Option	Definition
Zookeeper host	Hostname for the zookeeper quorum.
Zookeeper port	Database entry port for the zookeeper quorum.
HBase table name	Displays a list of table names which have mappings defined for them.
Mapping name	Names of any mappings that exist for the table. This box will be empty if there are no mappings defined for the selected table. You can define a mapping from scratch or use the connection fields to access any mappings already saved into HBase.
Save mapping	Saves the mapping in HBase as long as valid connection details were provided and the mapping was named. If the mapping was only needed locally then connection details and mapping name are not needed, the mapping will be serialized into the transformation metadata automatically.
Delete mapping	Deletes the mapping.
Create a tuple template	Partially populates the table with special fields that define a tuple mapping for use in the tuple output mode. Tuple output mode allows the step to output all the data in wide HBase rows where the number of columns may vary from row to row. It assumes that all column values are of the same type. A tuple mapping consists of the following output fields: KEY, Family, Column, Value and Timestamp. The type for “Family” and “Timestamp” is preconfigured to “String” and “Long” respectively. You must provide the types for “KEY”, “Column” (column name) and “Value” (column value). The default behavior is to output all column values in all column families.

MapReduce Input

This step defines the key/value pairs for Hadoop input. The output of this step is appropriate for whatever data integration transformation tasks you need to perform.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Key field	The Hadoop input field and data type that represents the **key** in MapReduce terms.
Value field	The Hadoop input field and data type that represents the **value** in MapReduce terms.

MapReduce Output

This step defines the key/value pairs for Hadoop output. The output of this step will become the output to Hadoop, which changes depending on what the transformation is used for.

If this step is included in a transformation used a as **mapper** and there is a combiner and/or reducer configured, the output will become the input pairs for the combiner and/or reducer. If there are no combiner or reducers configured the output is passed to the format configured for the job it was executed with.

If this step is included in a transformation used as a **combiner** and there is a reducer configured, the output will become the input pairs for the reducer. If no reducer configured, the output is passed to the format configured for the job it was executed with.

If this step is included in a transformation used as a **reducer**, then the output is passed to the format configured for the job it was executed with.

Note: You are not able to define the data type for the key or value here; it is defined earlier in your transformation. However, a reducer or combiner that takes this output as its input will have to know what the key and value data types are, so you may need to make note of them somehow.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Key field	The Hadoop output field that represents the **key** in MapReduce terms.
Value field	The Hadoop output field that represents the **value** in MapReduce terms.

MongoDb Input

Options

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Host name or IP address	The location of the MongoDB server. Check mongodb.log to see which IP address was used to run.
Port	The TCP/IP port to connect to, the default is 27017 (also check mongodb.log for the actual value).
Database	The name of the database to retrieve data from. Use the "show dbs" command when connected using the "mongodb" utility to list all databases on the server.

Option	Definition
Collection	The name of the collection to retrieve data from. Use the "show collections" command when connected using the "mongodb" utility to list all collections in the database.
Name of the JSON output field	The name of the field that will contain the JSON output from the server. You can parse this JSON then using the "JSON Input" step, eval("{"+jsonString+"}"), in JavaScript or using a *User Defined Java Class step*.
Query expression (JSON)	The query expression in JSON that will limit the output (see examples below).
Authentication user	The user to use for the connection with MongoDB.
Authentication password	The password to use.

Query Examples

The *Advanced Queries* page in the MongoDB wiki space details how to use queries. What is not mentioned is that in order for us to pass these queries to MongoDB using the Java API (on which PDI is built) we need to add appropriate quoting. Below are some translated examples:

Query expression	Description
{ 'name' : "MongoDB" }	Query all values where the name field equals to "MongoDB".
{ 'name' : { '$regex' : 'm.*', '$options' : "i" } }	Uses a regular expression to find names starting with m, case insensitive.
{ 'name' : { '$gt' : "M" } }	Searches all strings greater than M.
{ 'name' : { '$lte' : "T" } }	Searches all strings less than or equal to "T".
{ 'name' : { '$in' : \["MongoDB", "MySQL"] } }	Finds all names that are either MongoDB or MySQL.
{ 'name' : { '$nin' : ["MongoDB", "MySQL"] } }	Finds all names that are either MongoDB or MySQL.
{ '$where' : "this.count == 1" }	Uses JavaScript to evaluate a condition.

MongoDb Output

MongoDb Output writes to a MongoDB collection.

Configure connection

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Host name or IP address	The network name or address of the MongoDB instance
Port	Port number of the MongoDB instance
Username	If the database requires authentication, this is the user credential
Password	The password for the given username
Database	The name of the database to use. If you entered the correct connection and authentication information, you can click **Get DBs** to show a list of databases.
Collection	The collection you want to write to in the specified database. If you entered the correct connection and

Option	Definition
	authentication information, you can click **Get collections** to show a list of collections. By default, data is inserted into the target collection. If the specified collection doesn't exist, it will be created before data is inserted.
Batch insert size	Mongo DB allows for fast bulk insert operations. This option sets the batch size. If left blank, the default size will be 100 rows.
Truncate collection	Deletes any existing data in the target collection before inserting begins. MongoDB will allow duplicate records to be inserted unless you are using unique indexes.
Upsert	Changes the write mode from insert to upsert, which updates if a match is found, and inserts a new record if there is no match.
Multi-update	Updates all matching documents, rather than just the first.
Modifier update	Enables modifier ($) operators to be used to mutate individual fields within matching documents. This type of update is fast and involves minimal network traffic.

Mongo document fields

Option	Definition
#	The order of this field in the list
Name	The name of this field, descriptive of its content
Mongo document path	The hierarchical path to each field
Use field name	Specifies whether the incoming field name will be used as the final entry in the path. When this is set to **Y** for a field, a preceding **.** (dot) is assumed.
Match field for upsert	Specifies which of the fields should be used for matching when performing an upsert operation. The first document in the collection that matches all fields tagged as "Y" in this column is replaced with the new document constructed with incoming values for all of the defined field paths. If no matching document is found, then a new document is inserted into the collection.
Modifier operation	In-place modifications of existing document fields. These are much faster than replacing a document with a new one. It is also possible to update more than one matching document in this way. Selecting the **Modifier update** checkbox in conjunction with **Upsert** enables this mode of updating. Selecting the **Multi-update** checkbox as well enables each update to apply to all matching documents (rather than just the first). Valid modifier operations are: **$set**, **$inc**, and **$push**. It also supports the positional operator ($) for matching inside of arrays.
Get fields	Populates the left-hand column of the table with the names of the incoming fields
Preview document structure	Shows the structure that will be written to MongoDB in JSON format

Create/drop indexes

Option	Definition
#	The order of this field in the list
Index fields	Specifies a single index (using one field) or a compound index (using multiple fields). The **.** (dot) notation is used to specify a path to a field to use in the index. This path can be optionally postfixed by a direction indicator. Compound indexes are specified by a comma-separated list of paths.
Index opp	Specifies whether this index will be created or dropped
Unique	Makes the index unique
Sparse	Makes the index sparse
Show indexes	Shows the index information available

SSTable Output

The SSTable Output step writes to a filesystem directory as a Cassandra SSTable.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Cassandra yaml file	Location of yaml file. A cassandra.yaml file is the main configuration file for Cassandra and defines node and cluster configuration details.
Directory	Location to write the output to. This directory points to the target table to load to and must match the **Keyspace** field.
Keyspace	Name of the keyspace of the target table to load to. This name must match the **Directory** field.
Column family (table)	Name of the table to upload to. This assumes the metadata for this table was previously defined in Cassandra.
Incoming field to use as the row key	Allows you to select which incoming row to use as the row key. This drop-down box will be populated with the names of incoming transformation fields.
Buffer (MB)	The buffer size to use. A new table file is written every time the buffer is full.

Input

The PDI transformation steps in this section pertain to various methods of data input.

Cassandra Input

Configure Cassandra Input

Cassandra Input is an input step that enables data to be read from a Cassandra column family (table) as part of an ETL transformation.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Option	Definition
Cassandra host	Connection host name input field.
Cassandra port	Connection host port number input field.
Username	Input field for target keyspace and/or family (table) authentication details.
Password	Input field for target keyspace and/or family (table) authentication details.
Keyspace	Input field for the keyspace (database) name.
Use query compression	If checked, tells the step whether or not to compress the text of the CQL query before sending it to the server.
Show schema	Opens a dialog that shows metadata for the column family named in the CQL SELECT query.

CQL SELECT Query

The large text box at the bottom of the dialog enables you to enter a CQL SELECT statement to be executed. Only a single SELECT query is accepted by the step.

```
SELECT [FIRST N] [REVERSED] <SELECT EXPR>
FROM <COLUMN FAMILY> [USING <CONSISTENCY>] [WHERE <CLAUSE>] [LIMIT N];
```

Important: Cassandra Input does not support the CQL range notation, for instance name1..nameN, for specifying columns in a SELECT query.

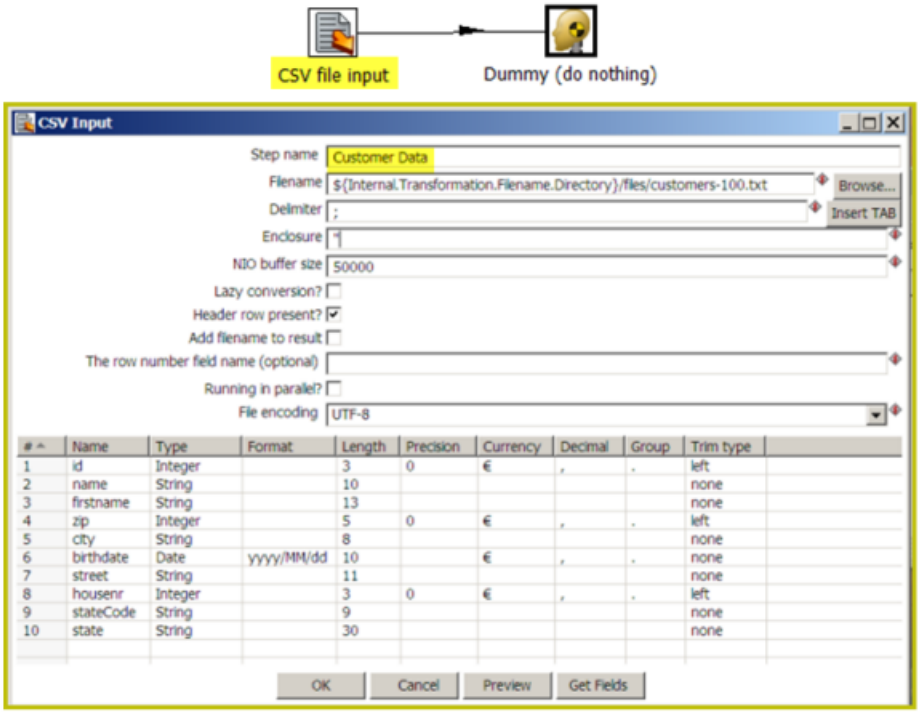
Select queries may name columns explicitly (in a comma separated list) or use the * wildcard. If the wildcard is used then only those columns defined in the metadata for the column family in question are returned. If columns are selected explicitly, then the name of each column must be enclosed in single quotation marks. Because Cassandra is a sparse column oriented database, as is the case with HBase, it is possible for rows to contain varying numbers of columns which might or might not be defined in the metadata for the column family. The Cassandra Input step can emit columns that are not defined in the metadata for the column family in question if they are explicitly named in the SELECT clause. Cassandra Input uses type information present in the metadata for a column family. This, at a minimum, includes a default type (column validator) for the column family. If there is explicit metadata for individual columns available, then this is used for type information, otherwise the default validator is used.

Option	Definition
LIMIT	If omitted, Cassandra assumes a default limit of 10,000 rows to be returned by the query. If the query is expected to return more than 10,000 rows an explicit LIMIT clause must be added to the query.
FIRST N	Returns the first N [where N is determined by the column sorting strategy used for the column family in question] column values from each row, if the column family in question is sparse then this may result in a different N (or less) column values appearing from one row to the next. Because PDI deals with a constant number of fields between steps in a transformation, Cassandra rows that do not contain particular columns are output as rows with `null` field values for non-existent columns. Cassandra's default for FIRST (if omitted from the query) is 10,000 columns. If a query is expected to return more than 10,000 columns, then an explicit FIRST must be added to the query.
REVERSED	Option causes the sort order of the columns returned by Cassandra for each row to be reversed. This may affect

Option	Definition
	which values result from a FIRST N option, but does not affect the order of the columns output by Cassandra Input.
WHERE clause	Clause provides for filtering the rows that appear in results. The clause can filter on a key name, or range of keys, and in the case of indexed columns, on column values. Key filters are specified using the KEY keyword, a relational operator (one of =, >, >=, <, and <=) and a term value.

CSV File Input

The CSV File Input step reads a *delimited* file format. The CSV label for this step is a misnomer because you can define whatever separator you want to use, such as pipes, tabs, and semicolons; you are not constrained to using commas. Internal processing allows this step to process data quickly. Options for this step are a subset of the Text File Input step. An example of a simple CSV Input transformation can be found under `...\samples\transformations\CSV Input - Reading customer data.ktr`.



CSV File Input Options

The table below describes the options available for the CSV Input step:

Option	Description
Step name	Optionally, you can change the name of this step to fit your needs.
File Name	Specify the name of the CSV file from which to read or select the field name that will contain the file name(s) from which to read. If your CSV Input step receives data from a previous step, this option is enabled as well as the option to include the file name in the output.
Delimiter	Specify the file delimiter or separator used in the target file. This includes pipes, tabs, semicolons and so on. In the sample image, the delimiter is a semicolon.

Option	Description
Enclosure	Specify the enclosure character used in the target file. It's possible that your strings contain semicolons or commas as delimiters, so the enclosures specify that a textual string inside an enclosure, such as a "quotation mark" is not to be parsed until the "end" enclosure. In the sample image, the enclosure is a quotation mark.
NIO buffer size	The size of the read buffer. It represents the number of bytes that is read at one time from disk.
Lazy conversion	Lazy conversion delays conversion of data as long as possible. In some instances, data conversion is prevented altogether. This can result in significant performance improvements when possible. The typical example that comes to mind is reading from a text file and writing back to a text file.
Header row present?	Enable this option if the target file contains a header row containing column names. Header rows are skipped.
Add file name to result	Adds the CSV filename(s) read to the result of this transformation. A unique list is being kept in memory that can be used in the next job entry in a job, for example in another transformation.
The row number field name (optional)	The name of the Integer field that will contain the row number in the output of this step.
Running in parallel?	Enable if you will have multiple instances of this step running (step copies) and if you want each instance to read a separate part of the CSV file(s). When reading multiple files, the total size of all files is taken into consideration to split the workload. In that specific case, make sure that ALL step copies receive all files that need to be read, otherwise, the parallel algorithm will not work correctly (for obvious reasons).  **Note:** For technical reasons, parallel reading of CSV files is supported only for files that do not include fields with line breaks or carriage returns.
File Encoding	Specify the encoding of the file being read.
Fields Table	This table contains an ordered list of fields to be read from the target file.
Preview	Click to preview the data coming from the target file.
Get Fields	Click to return a list of fields from the target file based on the current settings (for example, Delimiter, Enclosure, and so on.). All fields identified will be added to the Fields Table.

Data Grid

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

De-serialize From File

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Email Messages Input

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

ESRI Shapefile Reader

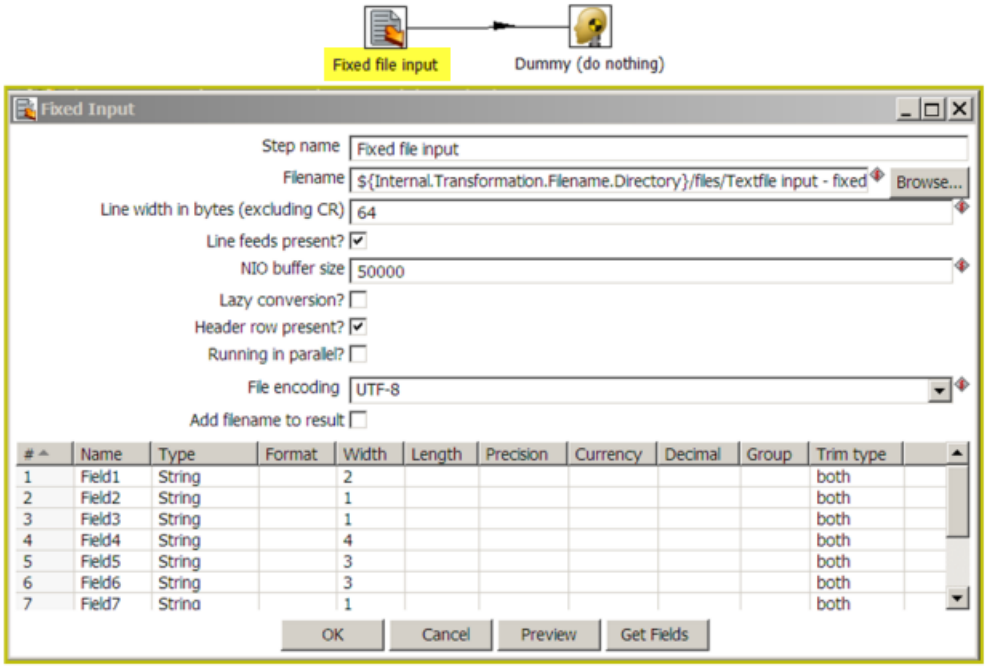
This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Fixed File Input Step

This step is used to read data from a fixed-width text file, exclusively. In fixed-width files, the format is specified by column widths, padding, and alignment. Column widths are measured in units of characters. For example, the data in the file contains a first column that has exactly 12 characters, and the second column has exactly 10, the third has exactly 7, and so on. Each row contains one record of information; each record can contain multiple pieces of data (fields), each data field (column) has a specific number of characters. When the data does not use all the characters alloted to it, the data is padded with spaces (or other character). In addition, each data element may be left or right justified, which means that characters can be padded on either side.

A sample Fixed File Input transformation is located at `...\samples\transformations\Fixed Input - fixed length reading .ktr`



The table below describes the options available for the Fixed File Input step:

Fixed File Options

Option	Description
Step name	Optionally, you can change the name of this step to fit your needs.
File name	Specify the CSV file from which to read.
Line feeds present?	Enable if the target file contains line feed characters; line width in bytes (excluding carriage returns) — defines the width of each line in the input file
NIO buffer size	The size of the read buffer — represents the number of bytes that is read at one time from disk
Lazy conversion	The lazy conversion algorithm will try to avoid unnecessary data type conversions and can result in a significant performance improvements if this is possible. The typical example that comes to mind is reading from a text file and writing back to a text file.
Header row present?	Enable if the target file contains a header row containing column names.
Running in parallel?	Enable if you will have multiple instances of this step running (step copies) and if you want each instance to read a separate part of the file.
File Encoding	Specify the encoding of the file being read.
Add file name to result	Adds the file name(s) read to the result of this transformation. A unique list is kept in memory so that it can be used in the next job entry in a job, for example in another transformation.
Fields Table	Contains an ordered list of fields to be read from the target file.
Preview	Click to preview the data coming from the target file.
Get Fields	Click to return a list of fields from the target file based on the current settings;for example, Delimiter, Enclosure, and so on. All fields identified will be added to the Fields Table.

Generate Random Credit Card Numbers

This step generates random credit card numbers with a valid LUHN checksum.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Card number	Credit card number.
Card type	Specify the type of credit card.
Card length	Specify the length of the credit card numbers.
Generate numbers for cards: Card type	Specify the card type, for example "VISA."
Generate numbers for cards: Length	Specify the desired length of the number.
Generate numbers for cards: How many?	Specify how many random numbers per card type.

Generate Random Value

This step creates a large random compilation of letters and numbers.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Name	Specify the name of the new field that will contain the random value.
Type	Specify the type of data to generate.

Generate Rows

Generate rows outputs a specified number of rows. By default, the rows are empty; however they can contain a number of static fields. This step is used primarily for testing purposes. It may be useful for generating a fixed number of rows, for example, you want exactly 12 rows for 12 months. Sometimes you may use Generate Rows to generate one row that is an initiating point for your transformation. For example, you might generate one row that contains two or three field values that you might use to parameterize your SQL and then generate the real rows.

Generate Rows Options

Option	Description
Step Name	Optionally, you can change the name of this step to fit your needs
Limit	Specifies the number of rows to output
Fields	This table is where you configure the structure and values of the rows you are generating (optional). This may be used to generate constants.

Get Data From XML

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Get File Names

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Get Files Rows Count

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Note: This step can only work with plain text files.

File

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Get filename from field	
Filename from field	
File or directory	
Regular expression	
Exclude regular expression	
Selected files	

Content

Option	Definition
Rows count fieldname	
Rows separator type	
Row separator	
Include files count in output?	
Files count field name	
Add filename to result	

Get Repository Names

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Get Subfolder Names

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Get System Info

This step retrieves information from the Kettle environment. It generates a single row with the fields containing the requested information.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Name	Specify the name for the information to retrieve.
Type	Select the information type to retrieve. A menu appears with a list of available information to retrieve.

Get Table Names

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Google Analytics Input Step

The Google Analytics step allow you to access your Google analytics data to generate reports or populate your BI data warehouse.

Note: To make querying easier, a link provides you with quick access to the Google Analytics API documentation.

Authorization

Option	Description
Username	Google Analytics account user name
Password	Google Analytics account password

Query

Option	Description
Domain Table ID	Specifies the domain associated with Google Analytics that must be queried. Click **Lookup** to display the list of available domains.
Start Date	Specifies the start date associated with the query - date must be entered in the following format: year, month, and date (for example, 2010-03-01)
End Date	Specifies the end date associated with the query - date must be entered in the following format: year, month, and date (for example, 2010-03-31)
Dimensions	Specifies the dimension fields for which you want to query - the Google Analytics API documentation provides you with a list of valid inputs and metrics that can be combined

Option	Description
Metrics	Specifies the metrics fields you want returned
Filters	Specifies the filter (described in the Google Analytics API documentation) for example, 'ga:country==Algeria'
Sort	Specifies a field on which to sort, for example, 'ga:city'

Fields

Click **Get Fields** to retrieve a list of possible fields based on the query you defined on the Query tab.

Click **Preview Rows** to preview data based on the defined query.

Setting Up Google Analytics API

The Google Analytics API requires an API key. The upgraded Pentaho Google Analytics EE plugin provides a field in the step dialog for entering this key.

To set up your Google project:

1. Navigate to *http://developers.google.com* and click on `API Console` under `Developer Tools`.
2. Sign in with your credentials.
3. From the `Services` page, turn on `Analytics API`. Here you find the API key. This is the key that is to be entered in the new field within the `Google Analytics EE` step.

Google Analytics Plugin Installation

This procedure describes how to install the Google Analytics plugin for Google 2.4 APIs:

1. From within the `data-integration/plugins/steps` folder, delete the plugin folder named `google-analytics-input-step`.
2. Copy the `gdata-analytics-2.3.0.jar` file from `data-integration/plugins/steps/google-analytics-input-step/gdata-analytics` to two locations:
   - `data-integration/libext/google`
   - `data-integration-server/tomcat/webapps/pentaho-di/WEB-INF/lib`
3. Delete the `gdata-analytics-2.1.jar` from the following two locations:
   - `data-integration/libext/google`.
   - `data-integration-server/tomcat/webapps/pentaho-di/WEB-INF/lib`.

Google Analytics is now configured for input into Kettle and will work with Google 2.4 APIs.

Google Docs Input

The Google Docs Input step provides you with the ability to read data from one or more Google Docs spreadsheets. The following sections describe each of the available features for configuring the Google Docs Input step. If necessary, you refer to the Google *Dimensions and Metrics Reference*.

Files

The Files tab is where you define the location of the Google Docs files that you want read. The table below contains options associated with the Files tab:

Option	Description
Step Name	Optionally, you can change the name of this step to fit your needs.
Username	Google Docs account user name
Password	Google Docs account password
Google Docs Object ID	Key to the Google document from which you want to read data - Note: The key is included in the URL associated with the document; your entry must be in the following

Option	Description
	format spreadsheet%pBb5yoxtYzKEyXDB9eqsNVG. Click **Lookup** to display the list of available keys.

Sheets

The options in the Sheets tab allow you to specify the names of the sheets in the Google Docs workbook to read. For each of the sheet names, you can specify the row and column to start at. The row and column numbers are zero (0) based; start number is 0.

Content

The content tab allows you to configure the following properties:

Option	Description
Header	Enable if the sheets specified contain a header row to skip
No empty rows	Enable if you don't want empty rows in the output of this step
Stop on empty row	Makes the step stop reading the current sheet of a file when a empty line is encountered
Filename field	Specifies a field name to include the file name in the output of this step
Sheetname field	Specifies a field name to include the sheet name in the output of this step
Sheet row nr field	Specifies a field name to include the sheet row number in the output of the step; the sheet row number is the actual row number in the Google Docs sheet
Row nrwritten field	Specifies a field name to include the row number in the output of the step; "Row number written" is the number of rows processed, starting at 1 and counting indefinitely
Limit	Limits the number of rows to this number (zero (0) means all rows).
Encoding	Specifies the character encoding (such as UTF-8, ASCII)

Error Handling

The Error handling tab allows you to configure the following properties:

Option	Description
Strict types?	Certain columns in the Google Docs input step can be flagged as numbers, strings, dates, and so on. Once flagged, if a column does not contain the right data type; for example, the column was flagged as numeric but contains a string input, an error occurs.
Ignore errors?	Enable if you want to ignore errors during parsing
Skip error lines?	Enable if you want to skip the lines that contain errors. Note: you can generate an extra file that will contain the line numbers on which the errors occurred. If lines with errors are not skipped, the fields that did have parsing errors, will be empty (null).
Warnings file directory	When warnings are generated, they are placed in this directory. The name of that file is `<warning dir>/ filename. <date_time>.<warning extension>`

Option	Description
Error files directory	When errors occur, they are placed in this directory. The name of that file is `<errorfile_dir>/filename .<date_time>.<errorfile_extension>`
Failing line numbers files directory	When a parsing error occurs on a line, the line number is placed in this directory. The name of that file is `<errorline dir> / filename.<date_time>.<errorline extension>`

Fields

The fields tab is for specifying the fields that must be read from the Google Docs files. Use **Get fields** from header row to fill in the available fields if the sheets have a header row automatically. The Type column performs type conversions for a given field. For example, if you want to read a date and you have a String value in the Google Docs file, specify the conversion mask.

Note: In the case of Number to Date conversion (for example, 20101028--> October 28th, 2010) specify the conversion mask yyyyMMdd because there will be an implicit Number to String conversion taking place before doing the String to Date conversion.

GZIP CSV Input

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

HBase Input

This step reads data from an HBase table according to user-defined column metadata.

Configure Query

This tab contains connection details and basic query information. You can configure a connection in one of two ways: either via a comma-separated list of hostnames where the zookeeper quorum reside, or via an **hbase-site.xml** (and, optionally, **hbase-default.xml**) configuration file. If both zookeeper and HBase XML configuration options are supplied, then the zookeeper takes precedence.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Zookeeper host(s)	Comma-separated list of hostnames for the zookeeper quorum.
URL to hbase-site.xml	Address of the hbase-site.xml file.
URL to hbase-default.xml	Address of the hbase-default.xml file.
HBase table name	The source HBase table to read from. Click **Get Mapped Table Names** to populate the drop-down list of possible table names.
Mapping name	A mapping to decode and interpret column values. Click **Get Mappings For the Specified Table** to populate the drop-down list of available mappings.
Start key value (inclusive) for table scan	A starting key value to retrieve rows from. This is inclusive of the value entered.

Option	Definition
Stop key value (exclusive) for table scan	A stopping key value for the scan. This is exclusive of the value entered. Both fields or the stop key field may be left blank. If the stop key field is left blank, then all rows from (and including) the start key will be returned.
Scanner row cache size	The number of rows that should be cached each time a fetch request is made to HBase. Leaving this blank uses the default, which is to perform no caching; one row would be returned per fetch request. Setting a value in this field will increase performance (faster scans) at the expense of memory consumption.
#	The order of query limitation fields.
Alias	The name that the field will be given in the output stream.
Key	Indicates whether the field is the table's key field or not.
Column family	The column family in the HBase source table that the field belongs to.
Column name	The name of the column in the HBase table (family + column name uniquely identifies a column in the HBase table).
Type	The PDI data type for the field.
Format	A formatting mask to apply to the field.
Indexed values	Indicates whether the field has a predefined set of values that it can assume.
Get Key/Fields Info	Assuming the connection information is complete and valid, this button will populate the field list and display the name of the key.

Create/Edit Mappings

This tab creates or edits a mapping for a given HBase table. A mapping simply defines metadata about the values that are stored in the table. Since most information is stored as raw bytes in HBase, this enables PDI to decode values and execute meaningful comparisons for column-based result set filtering.

Option	Definition
HBase table name	Displays a list of table names. Connection information in the previous tab must be valid and complete in order for this drop-down list to populate.
Mapping name	Names of any mappings that exist for the table. This box will be empty if there are no mappings defined for the selected table, in which case you can enter the name of a new mapping.
#	The order of the mapping operation.
Alias	The name you want to assign to the HBase table key. This is required for the table key column, but optional for non-key columns.
Key	Indicates whether or not the field is the table's key.
Column family	The column family in the HBase source table that the field belongs to. Non-key columns must specify a column family and column name.
Column name	The name of the column in the HBase table.

Option	Definition
Type	Data type of the column. Key columns can be of type: String Integer Unsigned integer (positive only) Long Unsigned long (positive only) Date Unsigned date. Non-key columns can be of type: String, Integer, Long, Float, Double, Boolean, Date, BigNumber, Serializable, Binary.
Indexed values	String columns may optionally have a set of legal values defined for them by entering comma-separated data into this field.

Filter Result Set

This tab provides two fields that limit the range of key values returned by a table scan. Leaving both fields blank will result in all rows being retrieved from the source table.

Option	Definition
Match all / Match any	When multiple column filters have been defined, you have the option returning only those rows that match all filters, or any single filter. Bounded ranges on a single numeric column can be defined by defining two filters (upper and lower bounds) and selecting **Match all**; similarly, open-ended ranges can be defined by selecting **Match any**.
#	The order of the filter operation.
Alias	A drop-down box of column alias names from the mapping.
Type	Data type of the column. This is automatically populated when you select a field after choosing the alias.
Operator	A drop-down box that contains either equality/inequality operators for numeric, date, and boolean fields; or substring and regular expression operators for string fields.
Comparison value	A comparison constant to use in conjunction with the operator.
Format	A formatting mask to apply to the field.
Signed comparison	Specifies whether or not the comparison constant and/or field values involve negative numbers (for non-string fields only). If field values and comparison constants are only positive for a given filter, then HBase's native lexicographical byte-based comparisons are sufficient. If this is not the case, then it is necessary for column values to be deserialized from bytes to actual numbers before performing the comparison.

Performance Considerations

Specifying fields in the Configure query tab will result in scans that return just those columns. Since HBase is a sparse column-oriented database, this requires that HBase check to see whether each row contains a specific column. More lookups equate to reduced speed, although the use of Bloom filters (if enabled on the table in question) mitigates this to a certain extent. If, on the other hand, the fields table in the Configure query tab is left blank, it results in a scan that returns rows that contain all columns that exist in each row (not only those that have been defined in the mapping). However, the HBase Input step will only emit those columns that are defined in the mapping being used. Because all columns are returned, HBase does not have to do any lookups. However, if the table in question contains many columns and is dense, then this will result in more data being transferred over the network.

HL7 Input

This step provides the ability to read data from HL7 data streams within a transformation. Combined with the job entry *HL7 MLLP Input* on page 242, messages can be read from a remote server, processed by a transformation and then acknowledged by the *HL7 MLLP Acknowledge* on page 242 job entry.

Options

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Message field	Specifies the field name in the data stream that gets parsed.

Output Fields

All output fields have fixed names and are String value types.

Fieldname	Description
ParentGroup	This is the name of the root group.
Group	Name of the Group.
HL7Version	HL7 version of the data stream.
StructureName	Name of the HL7 structure.
StructureNumber	Child number within structure (level)
FieldName	Field Description according to HL7
Coordinates	Level within each Segment: Segment.Terser.Component.SubComponent
HL7DataType	Data Types according to the HL7 specification. Note: These data types do not get mapped to Kettle data types.
FieldDescription	Field Description according to HL.
Value	The value of the field. Note: All values are of String type.

JMS Consumer

The Java Messaging Service (JMS) Consumer step allows Pentaho Data Integration to receive text messages from any JMS server. For example, you could use JMS Consumer step to define a long running transformation that updates a data warehouse every time a JMS message is received.

You must be familiar with JMS messaging to use this step. Additionally, you must have a message broker like *Apache ActiveMQ* available before you configure this step. If you are using the Java Naming and Directory Interface (JNDI) to connect to JMS, you must have the appropriate connection information.

JMS Consumer Options

Option	Description
Step Name	Optionally, you can change the name of this step to fit your needs.
ActiveMQ Connection	Enable ActiveMQ Connection you are using ActiveMQ as your message broker.
JMS URL	Enter the appropriate broker URL.
Username	Enter the ActiveMQ user name.

Option	Description
Password	Enter the ActiveMQ password.
Jndi Connection	Enable JNDI Connection if you are using the Java Naming and Directory Interface (JNDI) to connect to JMS
Jndi URL	The URL for the JNDI connection
Topic/Queue	Select Topic or Queue from the drop down list to specify whether you want to use a Topic or Queue delivery model. **Topic** uses a publish/subscribe delivery model meaning that a one message can be delivered to multiple consumers. Messages are delivered to the topic destination, and ultimately to all active consumers who are subscribers of the topic. Also, any number of producers can send messages to a topic destination; each message can be delivered to any number of subscribers. If there are no registered consumers, the topic destination does not hold messages unless it has durable subscription for inactive consumers. A durable subscription represents a consumer registered with the topic destination that can be inactive at the time the messages are sent to the topic. **Queue** uses a point-to-point delivery model. In this model, a message is delivered from a single producer to a single consumer. The messages are delivered to the destination, which is a queue, and then delivered to one of the consumers registered for the queue. While any number of producers can send messages to the queue, each message is guaranteed to be delivered, and consumed by one consumer. If no consumers are registered to consume the messages, the queue holds them until a consumer registers to consume them.
Destination	Specify the queue or topic name.
Receive Timeout	Specify the time to wait for incoming messages in milliseconds. **Note:** A timeout setting of zero never expires.
Field Name	Specify the field name that contains the contents of the message.

JSON Input

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

LDAP Input

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

LDIF Input

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Load File Content In Memory

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Microsoft Access Input

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Microsoft Excel Input

This step imports data from a Microsoft Excel (2003 or 2007) or OpenOffice.org Calc spreadsheet file.

Note: The **Files**, **Sheets**, and **Fields** tabs are required for proper step configuration.

Files Tab

The Files tab defines basic file properties for this step's output.

Option	Description
Step name	The name of this step in the transformation workspace.
File or directory	The name of the spreadsheet file or directory of files that you are reading from.
Regular Expression	Includes all files (in a given location) that meet the criteria specified by this regular expression.
Exclude Regular Expression	Excludes all files (in a given location) that meet the criteria specified by this regular expression.
Selected files	A list of files that will be used in this step, according to the criteria specified in the previous fields.
Accept filenames from previous step	If checked, will retrieve a list of filenames from the previous step in this transformation. You must also specify which step you are importing from, and the input field in that step from which you will retrieve the filename data. If you choose this option, the **Show filename(s)** option will show a preview of the list of filenames.

Sheets Tab

The Sheets tab specifies which worksheets you want to use in the specified files. A spreadsheet document can contain several worksheets.

Option	Description
List of sheets to read	A list of worksheets that you want to use. If this remains empty, all worksheets in all specified files will be selected. Rows and columns are numbered, starting with 0.
Get sheetname(s)	This button will retrieve a list of worksheets from all of the specified files and give you the option to select some or all of them for this step.

Content Tab

The content tab contains options for describing the file's content.

Option	Description
Header	Enable this option if there is a header row to skip in the selected worksheets.
No empty rows	If checked, removes empty rows from the output.
Stop on empty row	If checked, stops reading from the current worksheet when an empty row is read.
Limit	Sets a static number of rows to read. If set to 0, there is no set limit.
Encoding	Specifies the text file encoding to use. Leave blank to use the default encoding on your system. To use Unicode, specify UTF-8 or UTF-16. On first use, Spoon searches your system for available encodings.
Spreadsheet type (engine)	Specifies which spreadsheet format to expect from the file, regardless of its extension.
Add filenames to result	If checked, passes the input filenames to the output.

Error Handling tab

This tab sets options for recording and reporting various error conditions.

Option	Description
Strict types?	If checked, PDI will report data type errors in the input.
Ignore errors?	If checked, no errors will be reported during input parsing.
Skip error lines?	If checked, PDI will skip lines that contain errors. These lines can be dumped to a separate file by specifying a path in the **Failing line numbers files directory** field below. If this is not checked, lines with errors will appear as NULL values in the output.
Warning files directory	Directory in which to create files that contain warning messages regarding input values for each spreadsheet file read. These files will have the extension you specify here.
Error files directory	Directory in which to create files that contain error messages regarding input values for each spreadsheet file read. These files will have the extension you specify here.
Failing line numbers files directory	Directory in which to create files that contain the lines that failed error checks during input validation. These files will have the extension you specify here.

Fields tab

The Fields tab defines properties for the exported fields.

Option	Description
Name	The name of the field.
Type	The field's data type; String, Date or Number.
Length	The length option depends on the field type. **Number:** total number of significant figures in a number; **String:** total length of a string; **Date:** determines how much of the date string is printed or recorded.
Precision	The precision option depends on the field type, but only **Number** is supported; it returns the number of floating point digits.
Trim type	Truncates the field (left, right, both) before processing. Useful for fields that have no static length.
Repeat	If set to **Y**, will repeat this value if the next field is empty.
Format	The format mask (number type).
Currency	Symbol used to represent currencies.
Decimal	A decimal point; this is either a dot or a comma.
Grouping	A method of separating units of thousands in numbers of four digits or larger. This is either a dot or a comma.

Additional output fields tab

This tab retrieves custom metadata fields to add to the step's output. The purpose of each field is defined in its name, but you can use these fields for whatever you want. Each item defines an output field that will contain the following information. Some of these are missing.

Option	Description
Full filename field	The full file name plus the extension.
Sheetname field	The worksheet name you're using.
Sheet row nr field	The current sheet row number.
Row nr written field	Number of rows written
Short filename field	
Extension field	The three- or four-letter file type extension.
Path field	
Size field	
Is hidden field	
Last modification field	
URI field	
Root URI field	

Mondrian Input

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

MongoDb Input

Options

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Host name or IP address	The location of the MongoDB server. Check mongodb.log to see which IP address was used to run.
Port	The TCP/IP port to connect to, the default is 27017 (also check mongodb.log for the actual value).
Database	The name of the database to retrieve data from. Use the "show dbs" command when connected using the "mongodb" utility to list all databases on the server.
Collection	The name of the collection to retrieve data from. Use the "show collections" command when connected using the "mongodb" utility to list all collections in the database.
Name of the JSON output field	The name of the field that will contain the JSON output from the server. You can parse this JSON then using the "JSON Input" step, eval("{"+jsonString+"}"), in JavaScript or using a *User Defined Java Class step*.
Query expression (JSON)	The query expression in JSON that will limit the output (see examples below).
Authentication user	The user to use for the connection with MongoDB.
Authentication password	The password to use.

Query Examples

The *Advanced Queries* page in the MongoDB wiki space details how to use queries. What is not mentioned is that in order for us to pass these queries to MongoDB using the Java API (on which PDI is built) we need to add appropriate quoting. Below are some translated examples:

Query expression	Description
{ 'name' : "MongoDB" }	Query all values where the name field equals to "MongoDB".
{ 'name' : { '$regex' : 'm.*', '$options' : "i" } }	Uses a regular expression to find names starting with m, case insensitive.
{ 'name' : { '$gt' : "M" } }	Searches all strings greater than M.
{ 'name' : { '$lte' : "T" } }	Searches all strings less than or equal to "T".
{ 'name' : { '$in' : \["MongoDB", "MySQL"] } }	Finds all names that are either MongoDB or MySQL.
{ 'name' : { '$nin' : ["MongoDB", "MySQL"] } }	Finds all names that are either MongoDB or MySQL.
{ '$where' : "this.count == 1" }	Uses JavaScript to evaluate a condition.

OLAP Input

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

OpenERP Object Input

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/OpenERP+Object+Input*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Palo Cell Input

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Palo Dim Input

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Property Input

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

RSS Input

This step imports data from an RSS or Atom feed. RSS versions 0.91, 0.92, 1.0, 2.0, and Atom versions 0.3 and 1.0 are supported.

General Tab

The General tab defines which RSS/Atom URLs you want to use, and optionally which fields contain the URLs.

Option	Description
Step name	The name of this step in the transformation workspace.

Option	Description
URL is defined in a field	If checked, you must specify which field to retrieve the URL from.
URL Field	If the previous option is checked, this is where you specify the URL field.
URL list	A list of RSS/Atom URLs you want to pull article data from.

Content tab

The content tab contains options for limiting input and changing output.

Option	Description
Read articles from	Specifies a date in yyyy-MM-dd HH:mm:ss format. Only articles published after this date will be read.
Max number of articles	Specifies a static number of articles to retrieve, starting at the oldest.
Include URL in output?	If checked, specify a field name to pass the URL to.
Include rownum in output?	If checked, specify a field name to pass the row number to.

Fields tab

The Fields tab defines properties for the exported fields.

Option	Description
Name	The name of the field.
Type	The field's data type; String, Date or Number.
Length	The length option depends on the field type. **Number:** total number of significant figures in a number; **String:** total length of a string; **Date:** determines how much of the date string is printed or recorded.
Precision	The precision option depends on the field type, but only **Number** is supported; it returns the number of floating point digits.
Trim type	Truncates the field (left, right, both) before processing. Useful for fields that have no static length.
Repeat	If set to **Y**, will repeat this value if the next field is empty.
Format	The format mask (number type).
Currency	Symbol used to represent currencies.
Decimal	A decimal point; this is either a dot or a comma.
Grouping	A method of separating units of thousands in numbers of four digits or larger. This is either a dot or a comma.

Notes on Error Handling

When error handling is turned on for the transformation that includes this step, the full exception message, the field number on which the error occurred, and one or more of the following codes will be sent in an error row to the error stream:

- **UnknownError:** an unexpected error. Check the "Error description" field for more details.

- **XMLError:** typically this means that the specified file is not XML.
- **FileNotFound:** an HTTP 404 error.
- **UnknownHost:** means that the domain name cannot be resolved; may be caused by network outage.
- **TransferError:** any non-404 HTTP server error code (401, 403, 500, 502, etc.) can cause this.
- **BadURL:** means that the URL cannot be understood. It may be missing a protocol or use an unrecognized protocol.
- **BadRSSFormat:** typically means that the file is valid XML, but is not a supported RSS or Atom doc type.

Note: To see the full stack trace from a handled error, turn on detailed logging.

S3 CSV Input

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Salesforce Input

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

SAP Input

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

SAS Input

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/SAS+Input*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Table Input

This step is used to read information from a database, using a connection and SQL. Basic SQL statements can be generated automatically by clicking **Get SQL select statement**.

Table Input Options

Option	Description
Step name	Optionally, you can change the name of this step to fit your needs.

Option	Description
Connection	The database connection from which to read data (see *Managing Connections*)
SQL	The SQL statement used to read information from the database connection. You can also click Get SQL select statement... to browse tables and automatically generate a basic select statement.
Enable lazy conversion	When enables, lazy conversion avoids unnecessary data type conversions and can result in a significant performance improvements.
Replace variables in script?	Enable to replace variables in the script; this feature was provided to allow you to test with or without performing variable substitutions.
Insert data from step	Specify the input step name where Pentaho? an expect information to come from. This information can then be inserted into the SQL statement. The locators where Pentaho? inserts information is indicated by ? (question marks).
Execute for each row?	Enable to perform the data insert for each individual row.
Limit size	Sets the number of lines that is read from the database; zero (0) means read all lines.

Example... Below is a sample SQL statement::

```
SELECT * FROM customers WHERE changed_date BETWEEN ? AND ?
```

This statement requires two dates that are read on the Insert data from the step.

Note: The dates can be provided using the **Get System Info** step. For example, if you want to read all customers that have had their data changed yesterday, you may get the range for yesterday and read the customer data

Preview... Preview allows you to preview the step. This is accomplished by preview of a new transformation with two steps: this one and a Dummy step. To see a detailed log of the execution, click **Logs** in the Preview window.

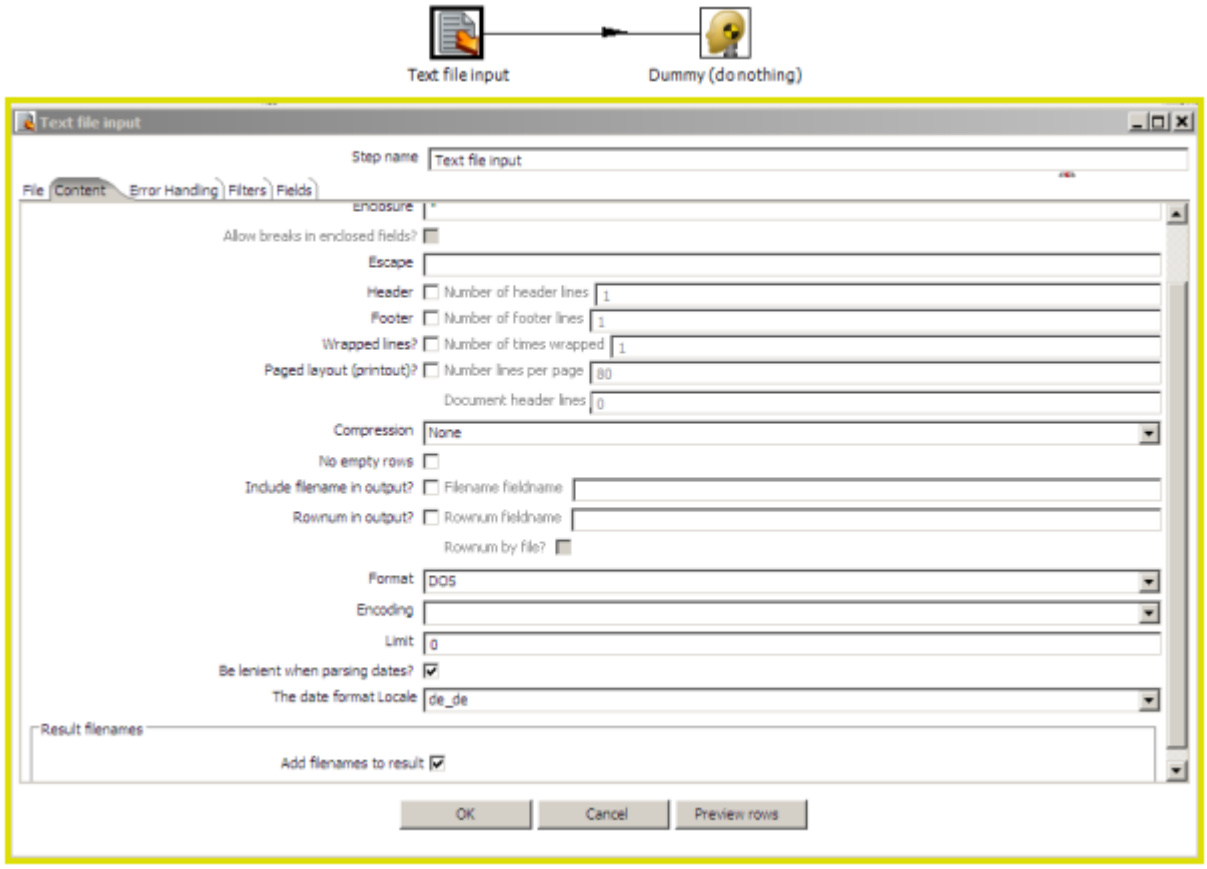
For additional information, see *Table Input*

Text File Input

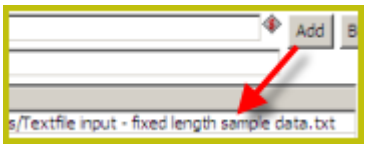
The **Text File Input** step is used to read data from a variety of different text-file types. The most commonly used formats include Comma Separated Values (CSV files) generated by spreadsheets and fixed width flat files.

The Text File Input step provides you with the ability to specify a list of files to read, or a list of directories with wild cards in the form of regular expressions. In addition, you can accept file names from a previous step making file name handling more even more generic.

The following sections describe the available options for configuring the Text file input step. You can find an example of a simple Text File Input transformation at `...\samples\transformations\Text File Output - Number formatting.ktr`.



File Tab Options

Option	Description
Step Name	Optionally, you can change the name of this step to fit your needs.
File or Directory	Specifies the location and/or name of the input text file (s) to be read. . **Note:** Click Add (Add) to add the file/directory/ wildcard combination to the list of selected files (grid) below. 
Regular expression	Specify the regular expression you want to use to select the files in the directory specified in the previous option. For example, you want to process all files that have a .txt extension. (See below)
Selected Files	This table contains a list of selected files (or wild card selections) along with a property specifying if file is required or not. If a file is required and it isn't found, an error is generated. Otherwise, the file name is skipped.
Show filenames(s)...	Displays a list of all files that will be loaded based on the current selected file definitions.
Show file content	Displays the raw content of the selected file.

Option	Description
Show content from first data line	Displays the content from the first data line only for the selected file.

Note:

Selecting file using Regular Expressions The Text File Input step can search for files by wildcard in the form of a regular expression. Regular expressions are more sophisticated than using '*' and '?' wildcards. Below are a few examples of regular expressions:

File Name	Regular Expression	Files selected
/dirA/	.**userdata**.\.txt	Find all files in /dirA/ with names containing userdata and ending with .txt
/dirB/	AAA.*	Find all files in /dirB/ with names that start with AAA
/dirC/	[ENG:A-Z][ENG:0-9].*	Find all files in /dirC/ with names that start with a capital and followed by a digit (A0-Z9)

Note: Accepting file names from a previous step This option allows even more flexibility in combination with other steps such as "Get File Names". You can create your file name and pass it to this step. This way the file name can come from any source; a text file, database table, and so on.

Option	Description
Accept file names from previous steps	Enables the option to get file names from previous steps
Step to read file names from	Step from which to read the file names
Field in the input to use as file name	Text File Input looks in this step to determine which filenames to use

Content Tab

Options under the Content tab allow you to specify the format of the text files that are being read. Below is a list of the options associated with this tab:

Option	Description
File type	Can be either CSV or Fixed length. Based on this selection, Spoon will launch a different helper GUI when you click **Get Fields** in the **Fields** tab.
Separator	One or more characters that separate the fields in a single line of text. Typically this is ; or a tab.
Enclosure	Some fields can be enclosed by a pair of strings to allow separator characters in fields. The enclosure string is optional. If you use repeat an enclosures allow text line 'Not the nine o''clock news.'. With ' the enclosure string, this gets parsed as Not the nine o'clock news.
Allow breaks in enclosed fields?	Not implemented
Escape	Specify an escape character (or characters) if you have these types of characters in your data. If you have \ as an escape character, the text 'Not the nine o\'clock news' (with ' the enclosure) gets parsed as Not the nine o'clock news.

Option	Description
Header & number of header lines	Enable if your text file has a header row (first lines in the file); you can specify the number of times the header lines appears.
Footer & number of footer lines	Enable if your text file has a footer row (last lines in the file); you can specify the number of times the footer row appears.
Wrapped lines and number of wraps	Use if you deal with data lines that have wrapped beyond a specific page limit; note that headers and footers are never considered wrapped
Paged layout and page size and doc header	Use these options as a last resort when dealing with texts meant for printing on a line printer; use the number of document header lines to skip introductory texts and the number of lines per page to position the data lines
Compression	Enable if your text file is in a Zip or GZip archive.
No empty rows	Do not send empty rows to the next steps.
Include file name in output	Enable if you want the file name to be part of the output
File name field name	Name of the field that contains the file name
Rownum in output?	Enable if you want the row number to be part of the output
Row number field name	Name of the field that contains the row number
Format	Can be either DOS, UNIX, or mixed. UNIX files have lines that are terminated by line feeds. DOS files have lines separated by carriage returns and line feeds. If you specify mixed, no verification is done.
Encoding	Specify the text file encoding to use; leave blank to use the default encoding on your system. To use Unicode, specify UTF-8 or UTF-16. On first use, Spoon searches your system for available encodings.
Limit	The maximum number of rows that will be read from the file
Be lenient when parsing dates?	Disable if you want strict parsing of data fields; if case-lenient parsing is enabled, dates like Jan 32nd will become Feb 1st.
The date format Locale	This locale is used to parse dates that have been written in full such as "February 2nd, 2010;" parsing this date on a system running in the French (fr_FR) locale would not work because February is called Février in that locale.
Add filenames to result	Enable so that output file names are added as a field in the results

Error Handling Tab

Options under the Error Handling tab allow you to specify how the step reacts when errors (such as, malformed records, bad enclosure strings, wrong number of fields, premature line ends), occur. The table below describes the options available for Error handling:

Option	Description
Ignore errors?	Enable if you want to ignore errors during parsing

Option	Description
Skip error lines	Enable if you want to skip those lines that contain errors. You can generate an extra file that contains the line numbers on which the errors occurred. When lines with errors are not skipped, the fields that have parsing errors, will be empty (null)
Error count field name	Add a field to the output stream rows; this field contains the number of errors on the line
Error fields field name	Add a field to the output stream rows; this field contains the field names on which an error occurred
Error text field name	Add a field to the output stream rows; this field contains the descriptions of the parsing errors that have occurred
Warnings file directory	When warnings are generated, they are placed in this directory. The name of that file is <warning dir>/filename.<date_time>.<warning extension>
Error files directory	When errors occur, they are placed in this directory. The name of the file is <errorfile_dir>/filename.<date_time>.<errorfile_extension>
Failing line numbers files directory	When a parsing error occurs on a line, the line number is placed in this directory. The name of that file is <errorline dir>/filename.<date_time>.<errorline extension>

Filters Tab

Options under the Filters tab allow you to specify the lines you want to skip in the text file. The table below describes the available options for defining filters:

Option	Description
Filter string	The string for which to search
Filter position	The position where the filter string has to be at in the line. Zero (0) is the first position in the line. If you specify a value below zero (0) here, the filter string is searched for in the entire string.
Stop on filter	Specify Y here to stop processing the current text file when the filter string is encountered.
Positive Match	Includes the rows where the filter condition is found (include). The alternative is that those rows are avoided (exclude).

Fields Tab

The options under the Fields tab allow you to specify the information about the name and format of the fields being read from the text file. Available options include:

Option	Description
Name	Name of the field
Type	Type of the field can be either String, Date or Number
Format	See Number Formats below for a complete description of format symbols.
Length	For Number: Total number of significant figures in a number; For String: total length of string; For Date: length of printed output of the string (e.g. 4 only gives back the year).
Precision	For Number: Number of floating point digits; For String, Date, Boolean: unused;
Currency	Used to interpret numbers like $10,000.00 or E5.000,00

Option	Description
Decimal	A decimal point can be a "." (10,000.00) or "," (5.000,00)
Grouping	A grouping can be a dot "," (10;000.00) or "." (5.000,00)
Null if	Treat this value as NULL
Default	Default value in case the field in the text file was not specified (empty)
Trim Type	Type trim this field (left, right, both) before processing
Repeat	If the corresponding value in this row is empty, repeat the one from the last time it was not empty (Y/N)

Note: Number formats The information about Number formats was taken from the Sun Java API documentation, *Decimal Formats*.

Symbol	Location	Localized	Meaning
0	Number	Yes	Digit
#	Number	Yes	Digit, zero shows as absent
.	Number	Yes	Decimal separator or monetary decimal separator
-	Number	Yes	Minus sign
,	Number	Yes	Grouping separator
E	Number	Yes	Separates mantissa and exponent in scientific notation; need not be quoted in prefix or suffix
;	Sub pattern boundary	Yes	Separates positive and negative sub patterns
%	Prefix or suffix	Yes	Multiply by 100 and show as percentage
\u2030	Prefix or suffix	Yes	Multiply by 1000 and show as per mille
(\u00A4)	Prefix or suffix	No	Currency sign, replaced by currency symbol. If doubled, replaced by international currency symbol. If present in a pattern, the monetary decimal separator is used instead of the decimal separator.
'	Prefix or suffix	No	Used to quote special characters in a prefix or suffix, for example, "'#'#" formats 123 to "#123". To create a single quote itself, use two in a row: "# o''clock".

Note: Scientific Notation In a pattern, the exponent character immediately followed by one or more digit characters indicates scientific notation (for example, "0.###E0" formats the number 1234 as "1.234E3".

Note: Date formats The information about Date formats was taken from the Sun Java API documentation, *Date Formats*.

Letter	Date or Time Component	Presentation	Examples
G	Era designator	Text	AD
y	Year	Year	1996; 96
M	Month in year	Month	July; Jul; 07
w	Week in year	Number	27
W	Week in month	Number	2
D	Day in year	Number	189
d	Day in month	Number	10
F	Day of week in month	Number	2
E	Day in week	Text	Tuesday; Tue
a	Am/pm marker	Text	PM
H	Hour in day (0-23)	Number 0	n/a
k	Hour in day (1-24)	Number 24	n/a
K	Hour in am/pm (0-11)	Number 0	n/a
h	Hour in am/pm (1-12)	Number 12	n/a
m	Minute in hour	Number 30	n/a
s	Second in minute	Number 55	n/a
S	Millisecond	Number 978	n/a
z	Time zone	General time zone	Pacific Standard Time; PST; GMT-08:00
Z	Time zone	RFC 822 time zone	-0800

XBase Input

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

XML Input Stream (StAX)

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

YAML Input

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Output

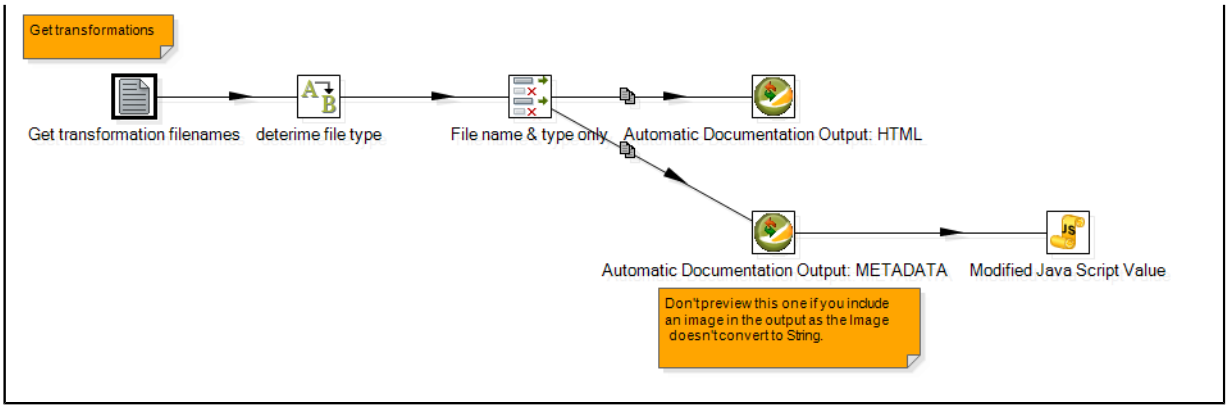
The PDI transformation steps in this section pertain to various methods of data output.

Automatic Documentation Output

This step is used to generate descriptive documentation for one or more transformations or jobs. This can be used as a way to automatically generate documentation about the purpose of jobs and transformations or as a way to archive their behavior as they change over time. It takes as input a list of file names types (transformation or job) and generates a corresponding set of documentation files containing various details about them.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
File name field	The input field containing the name of the file you are generating documentation for.
File type field	The input field containing the type of file (transformation or job).
Target filename	The target location and filename for the generated documentation.
Output type	The output type for the generated documentation (PDF, HTML, DOC, Excel, CSV, or METADATA).
Include the name?	If checked, the filename will be included in the generated documentation.
Include the description?	If checked, includes the description in the generated documentation (the description is configured in the transformation settings).
Include the extended description?	If checked, includes the extended description in the generated documentation (the extended description is configured in the transformation settings).
Include the creation date and user?	If checked, includes the creation date and username for the creator in the generated documentation.
Include the modification date and user?	If checked, includes the date of the last modification made to the file and user who modified it.
Include the image?	If checked, includes the job or transformation graph in the generated documentation.
Include logging configuration details?	If checked, includes a summary of the connections used for logging in the transformation or job.
Include the last execution result?	If checked, includes a summary of the last execution results, such as whether it completed successfully or ended in failure.

There is a sample distributed with PDI that shows this step in action. It's called **Automatic Documentation Output - Generate Kettle HTML Documentation**, and it is included in the `/data-integration/samples/transformations/` directory.



Cassandra Output

Configure Cassandra Output

Cassandra Output is an output step that enables data to be written to a Cassandra column family (table) as part of an ETL transformation.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Cassandra host	Connection host name input field.
Cassandra port	Connection host port number input field.
Username	Target keyspace and/or family (table) authentication details input field.
Password	Target keyspace and/or family (table) authentication details input field.
Keyspace	Input field for the keyspace (database) name.
Show schema	Opens a dialog box that shows metadata for the specified column family.

Configure Column Family and Consistency Level

This tab contains connection details and basic query information, in particular, how to connect to Cassandra and execute a CQL (Cassandra query language) query to retrieve rows from a column family (table).

Important: Note that Cassandra Output does not check the types of incoming columns against matching columns in the Cassandra metadata. Incoming values are formatted into appropriate string values for use in a textual CQL INSERT statement according to PDI's field metadata. If resulting values cannot be parsed by the Cassandra column validator for a particular column then an error results.

Note: Cassandra Output converts PDI's dense row format into sparse data by ignoring incoming field values that are `null`.

Option	Definition
Column family (table)	Input field to specify the column family, to which the incoming rows should be written.
Get column family names button	Populates the drop-down box with names of all the column families that exist in the specified keyspace.
Consistency level	Input field enables an explicit write consistency to be specified. Valid values are: ZERO, ONE, ANY, QUORUM and ALL. The Cassandra default is ONE.

Option	Definition
Create column family	If checked, enables the step to create the named column family if it does not already exist.
Truncate column family	If checked, specifies whether any existing data should be deleted from the named column family before inserting incoming rows.
Update column family metadata	If checked, updates the column family metadata with information on incoming fields not already present, when option is selected. If this option is not selected, then any unknown incoming fields are ignored unless the Insert fields not in column metadata option is enabled.
Insert fields not in column metadata	If checked, inserts the column family metadata in any incoming fields not present, with respect to the default column family validator. This option has no effect if **Update column family metadata** is selected.
Commit batch size	Allows you to specify how many rows to buffer before executing a BATCH INSERT CQL statement.
Use compression	Option compresses (gzip) the text of each BATCH INSERT statement before transmitting it to the node.

Pre-insert CQL

Cassandra Output gives you the option of executing an arbitrary set of CQL statements prior to inserting the first incoming PDI row. This is useful for creating or dropping secondary indexes on columns.

Note: Pre-insert CQL statements are executed *after* any column family metadata updates for new incoming fields, and before the first row is inserted. This enables indexes to be created for columns corresponding new to incoming fields.

Option	Definition
CQL to execute before inserting first row	Opens the CQL editor, where you can enter one or more semicolon-separated CQL statements to execute before data is inserted into the first row.

Delete

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

HBase Output

This step writes data to an HBase table according to user-defined column metadata.

Configure Connection

This tab contains HBase connection information. You can configure a connection in one of two ways: either via a comma-separated list of hostnames where the zookeeper quorum reside, or via an **hbase-site.xml** (and, optionally, **hbase-default.xml**) configuration file. If both zookeeper and HBase XML configuration options are supplied, then the zookeeper takes precedence.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Zookeeper host(s)	Comma-separated list of hostnames for the zookeeper quorum.
URL to hbase-site.xml	Address of the hbase-site.xml file.
URL to hbase-default.xml	Address of the hbase-default.xml file.
HBase table name	The HBase table to write to. Click **Get Mapped Table Names** to populate the drop-down list of possible table names.
Mapping name	A mapping to decode and interpret column values. Click **Get Mappings For the Specified Table** to populate the drop-down list of available mappings.
Disable write to WAL	Disables writing to the Write Ahead Log (WAL). The WAL is used as a lifeline to restore the status quo if the server goes down while data is being inserted. Disabling WAL will increase performance.
Size of write buffer (bytes)	The size of the write buffer used to transfer data to HBase. A larger buffer consumes more memory (on both the client and server), but results in fewer remote procedure calls. The default (in the hbase-default.xml) is 2MB (2097152 bytes), which is the value that will be used if the field is left blank.

Create/Edit Mappings

This tab creates or edits a mapping for a given HBase table. A mapping simply defines metadata about the values that are stored in the table. Since just about all information is stored as raw bytes in HBase, this allows PDI to decode values and execute meaningful comparisons for column-based result set filtering.

Note: The names of fields entering the step are expected to match the aliases of fields defined in the mapping. All incoming fields must have a matching counterpart in the mapping. There may be fewer incoming fields than defined in the mapping, but if there are more incoming fields then an error will occur. Furthermore, one of the incoming fields must match the key defined in the mapping.

Option	Definition
HBase table name	Displays a list of table names. Connection information in the previous tab must be valid and complete in order for this drop-down list to populate.
Mapping name	Names of any mappings that exist for the table. This box will be empty if there are no mappings defined for the selected table, in which case you can enter the name of a new mapping.
#	The order of the mapping operation.
Alias	The name you want to assign to the HBase table key. This is required for the table key column, but optional for non-key columns.
Key	Indicates whether or not the field is the table's key.
Column family	The column family in the HBase source table that the field belongs to. Non-key columns must specify a column family and column name.
Column name	The name of the column in the HBase table.

Option	Definition
Type	Data type of the column. Key columns can be of type: String Integer Unsigned integer (positive only) Long Unsigned long (positive only) Date Unsigned date. Non-key columns can be of type: String, Integer, Long, Float, Double, Boolean, Date, BigNumber, Serializable, Binary.
Indexed values	String columns may optionally have a set of legal values defined for them by entering comma-separated data into this field.
Get incoming fields	Retrieves a field list using the given HBase table and mapping names.

Performance Considerations

The **Configure connection** tab provides a field for setting the size of the write buffer used to transfer data to HBase. A larger buffer consumes more memory (on both the client and server), but results in fewer remote procedure calls. The default (defined in the hbase-default.xml file) is 2MB. When left blank, the buffer is 2MB, **auto flush** is enabled, and **Put** operations are executed immediately. This means that each row will be transmitted to HBase as soon as it arrives at the step. Entering a number (even if it is the same as the default) for the size of the write buffer will disable auto flush and will result in incoming rows only being transferred once the buffer is full.

There is also a checkbox for disabling writing to the **Write Ahead Log** (WAL). The WAL is used as a lifeline to restore the status quo if the server goes down while data is being inserted. However, the tradeoff for error-recovery is speed.

The **Create/edit mappings** tab has options for creating new tables. In the **HBase table name** field, you can suffix the name of the new table with parameters for specifying what kind of compression to use, and whether or not to use Bloom filters to speed up lookups. The options for compression are: NONE, GZ and LZO; the options for Bloom filters are: NONE, ROW, ROWCOL. If nothing is selected (or only the name of the new table is defined), then the default of NONE is used for both compression and Bloom filters. For example, the following string entered in the HBase table name field specifies that a new table called "NewTable" should be created with GZ compression and ROWCOL Bloom filters:

```
NewTable@GZ@ROWCOL
```

Note: Due to licensing constraints, HBase does not ship with LZO compression libraries. These must be manually installed on each node if you want to use LZO compression.

Insert/Update

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

JMS Producer

The Java Messaging Service (JMS) Producer step allows Pentaho Data Integration to send text messages to any JMS server. For example, you could use the JMS Producer step to define a transformation that for every update of a warehouse, posts to a JMS queue that could launch another job that flushes an application cache.

You must be familiar with JMS messaging to use this step. Additionally, you must have a message broker like *Apache ActiveMQ* available before you configure this step. If you are using the Java Naming and Directory Interface (JNDI) to connect to JMS, you must have the appropriate connection information.

Note: Place JMS Library jars for the ConnectionFactory and other supporting classes in the **.../data-integration/plugins/pdi-jms-plugin/lib** directory.

JMS Producer Options

Option	Description
Step Name	Optionally, you can change the name of this step to fit your needs.
ActiveMQ Connection	Enable ActiveMQ Connection you are using the message broker.
JMS URL	Enter the appropriate broker URL.
Username	Enter the ActiveMQ user name
Password	Enter the ActiveMQ password
JNDI Connection	Enable JNDI Connection if you are using the Java Naming and Directory Interface (JNDI) to connect to JMS
Jndi URL	The URL for the JNDI connection
Topic/Queue	Select Topic or Queue from the drop down list to specify whether you want to use a Topic or Queue delivery model. **Topic** uses a publish/subscribe delivery model meaning that a one message can be delivered to multiple consumers. Messages are delivered to the topic destination, and ultimately to all active consumers who are subscribers of the topic. Also, any number of producers can send messages to a topic destination; each message can be delivered to any number of subscribers. If there are no registered consumers, the topic destination does not hold messages unless it has durable subscription for inactive consumers. A durable subscription represents a consumer registered with the topic destination that can be inactive at the time the messages are sent to the topic. **Queue** uses a point-to-point delivery model. In this model, a message is delivered from a single producer to a single consumer. The messages are delivered to the destination, which is a queue, and then delivered to one of the consumers registered for the queue. While any number of producers can send messages to the queue, each message is guaranteed to be delivered, and consumed by a single consumer. If there are no consumers registered to consume the messages, the messages are held in the queue until a consumer registers to consume them.
Destination	Specify the queue or topic name.
Header Properties	If the header properties file is specified, then the name/value pairs are submitted with the message text as JMS string properties.
Is field a filename?	Enable if the message is based on a field name. In this instance, the contents of the file, (not the field name), are sent.
Field Name	If applicable, select the name of the field from the list.

JSON Output

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

LDAP Output

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Microsoft Access Output

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Microsoft Excel Output

This step exports data to a Microsoft Excel 2003 spreadsheet file.

File Tab

The File tab defines basic file properties for this step's output.

Option	Description
Step name	The name of this step in the transformation workspace.
Filename	The name of the spreadsheet file you are reading from.
Do not create file at start	If checked, does not create the file until the end of the step.
Extension	The three-letter file extension to append to the file name.
Include stepnr in filename	If you run the step in multiple copies (launching several copies of a step), the copy number is included in the file name, before the extension. (_0).
Include date in file name	Includes the system date in the filename (_20101231).
Include time in file name	Includes the system time (24-hour format) in the filename (_235959).
Specify Date time format	If checked, the filename will include a date and time stamp that follows the selection you choose from the drop-down box. Selecting this option disables the previous two options.
Show file name(s)	Displays a list of the files that will be generated. This is a simulation and depends on the number of rows that will go into each file.
Add filenames to result	Uses the Filename field in constructing the result filename. If un-checked, the Filename field is ignored.

Content Tab

The content tab contains options for describing the file's content.

Option	Description
Append	When checked, appends lines to the end of the specified file. If the file does not exist, a new one will be created.
Header	Enable this option if you want a header to appear before the spreadsheet grid data.
Footer	Enable this option if you want a footer to appear after the spreadsheet grid data.
Encoding	Specifies the text file encoding to use. Leave blank to use the default encoding on your system. To use Unicode, specify UTF-8 or UTF-16. On first use, Spoon searches your system for available encodings and populates this list accordingly.
Split every ... rows	After this many rows, start a new spreadsheet file to continue data output.
Sheet name	Specifies the name of the worksheet within the spreadsheet file.
Protect sheet?	If checked, enables password protection on the worksheet. You must also specify a password in the Password field.
Auto size columns	If checked, automatically sizes the worksheet columns to the largest value.
Retain NULL values	If checked, NULL values are preserved in the output. If un-checked, NULLs are replaced with empty strings.
Use Template	If checked, PDI will use the specified Excel template to create the output file. The template must be specified in the Excel template field.
Append to Excel Template	Appends output to the specified Excel template.

Fields tab

The Fields tab defines properties for the exported fields. The **Get Fields** button will automatically retrieve a list of fields from the inputstream and populate the list. The **Minimal width** button removes any padding from the output.

Option	Description
Name	The name of the field.
Type	The field's data type; String, Date or Number.
Format	The format mask (number type).

Microsoft Excel Writer

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

OpenERP Object Input

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/OpenERP+Object+Output*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Palo Cell Output

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Palo Dim Output

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Pentaho Reporting Output

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Properties Output

This step outputs a set of rows of data to a Java properties files. For more information on this file format, read this: *http://en.wikipedia.org/wiki/.properties*.

The data needs to be structured in a key/value format to be usable for a properties file.

See also: *Property Input* and the *Row Normalizer* steps.

General tab

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Key field	The input field name that will contain the key part to be written to the properties file.
Value field	The input field name that will contain the value part to be written to the properties file.
Comment	Short comment that is going to be copied into the properties file (at the top).NOTE: Only the first line is

Option	Definition
	commented out. The next ones need to be commented by the user.

Content

Option	Definition
Filename	The filename without the file extension.
Append	Check this option to update an existing property file. Properties in the file that are not processed by the step will remain unchanged.
Create parent folder	Check this option if you want to automatically create the parent folder.
Accept file name from field?	Check this option if the file name is specified in an input stream field.
File name field	Specifies the field that contains the name of the file to write to.
Extension	Specify the file extension. Usually this is "properties".
Include stepnr in filename	Includes the step number (when running in multiple copies) in the output filename.
Include date in filename	Includes the date in the output filename with format yyyyMMdd (20081231).
Include time in filename	Includes the date in the output filename with format HHmmss (235959).
Show filenames(s)...	Displays the path of the file to be written to.
Result filename	Add files to result filename : Adds the generated filenames read to the result of this transformation. A unique list is being kept in memory that can be used in the next job entry in a job, for example in another transformation.

RSS Output

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

S3 File Output

This step exports data to a text file on an Amazon Simple Storage Service (S3) account.

File Tab

The File tab defines basic file properties for this step's output.

Option	Description
Step name	The name of this step in the transformation workspace.
Filename	The name of the output text file.

Option	Description
Accept file name from field?	When checked, enables you to specify file names in a field in the input stream.
File name field	When the **Accept file name from field** option is checked, specify the field that will contain the filenames.
Extension	The three-letter file extension to append to the file name.
Include stepnr in filename	If you run the step in multiple copies (launching several copies of a step), the copy number is included in the file name, before the extension. (_0).
Include partition nr in file name?	Includes the data partition number in the file name.
Include date in file name	Includes the system date in the filename (_20101231).
Include time in file name	Includes the system time (24-hour format) in the filename (_235959).
Show file name(s)	Displays a list of the files that will be generated. This is a simulation and depends on the number of rows that will go into each file.

Content tab

The content tab contains options for describing the file's content.

Option	Description
Append	When checked, appends lines to the end of the file.
Separator	Specifies the character that separates the fields in a single line of text; typically this is semicolon or a tab.
Enclosure	Optionally specifies the character that defines a block of text that is allowed to have separator characters without causing separation. Typically a single or double quote.
Force the enclosure around fields?	Forces all field names to be enclosed with the character specified in the **Enclosure** property above.
Header	Enable this option if you want the text file to have a header row (first line in the file).
Footer	Enable this option if you want the text file to have a footer row (last line in the file).
Format	Specifies either DOS or UNIX file formats. UNIX files have lines that are separated by line feeds, DOS files have lines that are separated by carriage returns and line feeds.
Compression	Specifies the type of compression to use on the output file -- either zip or gzip. Only one file is placed in a single archive.
Encoding	Specifies the text file encoding to use. Leave blank to use the default encoding on your system. To use Unicode, specify UTF-8 or UTF-16. On first use, Spoon searches your system for available encodings.
Fast data dump (no formatting)	Improves the performance when dumping large amounts of data to a text file by not including any formatting information.
Right pad fields	When checked, fields will be right-padded to their defined width.

Option	Description
Split every ... rows	If the number N is larger than zero, splits the resulting text file into multiple parts of N rows.
Add Ending line of file	Enables you to specify an alternate ending row to the output file.

Fields tab

The Fields tab defines properties for the exported fields.

Option	Description
Name	The name of the field.
Type	The field's data type; String, Date or Number.
Format	The format mask (number type).
Length	The length option depends on the field type. **Number:** total number of significant figures in a number; **String:** total length of a string; **Date:** determines how much of the date string is printed or recorded.
Precision	The precision option depends on the field type, but only **Number** is supported; it returns the number of floating point digits.
Currency	Symbol used to represent currencies.
Decimal	A decimal point; this is either a dot or a comma.
Group	A method of separating units of thousands in numbers of four digits or larger. This is either a dot or a comma.
Trim type	Truncates the field (left, right, both) before processing. Useful for fields that have no static length.
Null	Inserts the specified string into the text file if the field value is null.
Get	Retrieves a list of fields from the input stream.
Minimal width	Minimizes field width by removing unnecessary characters (such as superfluous zeros and spaces). If set, string fields will no longer be padded to their specified length.

Salesforce Delete

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Salesforce Insert

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Salesforce Update

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Salesforce Upsert

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Serialize to File

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

SQL File Output

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Synchronize After Merge

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Table Output

The Table Output step allows you to load data into a database table. Table Output is equivalent to the DML operator, **INSERT**. This step provides configuration options for target table and a lot of housekeeping and/or performance-related options such as Commit Size and Use batch update for inserts.

If you have a Postgres or MySQL database that has identity columns and you are inserting a record, as part of the insert, the JDBC driver will typically return the auto-generated key it used when performing the insert.

Table Output Options

Option	Description
Step name	Optionally, you can change the name of this step to fit your needs.
Connection	The database connection to which data is written (see *Managing Connections*)
Target Schema	The name of the Schema for the table to write data to. This is important for data sources that allow for table names with periods in them.
Target table	The name of the table to which data is written.
Commit size	Use transactions to insert rows in the database table. Commit the connection every N rows if N is larger than zero (0); otherwise, don't use transactions. (Slower) **Note:** Transactions are not supported on all database platforms.
Truncate table	Select if you want the table to be truncated before the first row is inserted into the table
Ignore insert errors	Makes PDI ignore all insert errors such as violated primary keys. A maximum of 20 warnings will be logged however. This option is not available for batch inserts.
Partition data over tables	Used to split the data over multiple tables. For example instead of inserting all data into table SALES, put the data into tables SALES_200510, SALES_200511, SALES_200512, ... Use this on systems that don't have partitioned tables and/or don't allow inserts into UNION ALL views or the master of inherited tables. The view SALES allows you to report on the complete sales: `CREATE OR REPLACE VIEW SALES AS SELECT * FROM SALES_200501 NION ALL SELECT * FROM SALES_200502 UNION ALL SELECT * FROM SALES_200503 UNION ALL SELECT * FROM SALES_200504`
Use batch update for inserts	Enable if you want to use batch inserts. This feature groups inserts statements to limit round trips to the database. This is the fastest option and is enabled by default. **This feature is not available under these conditions:** If the transformation database is transactional, if you are using Greenplum or PostgreSQL with error handling turned on, if you are using auto-generated keys.
Is the name of the table defined in a field?	Use these options to split the data over one or more tables; the name of the target table is defined in the field you specify. For example if you store customer data in the field gender, the data might end up in tables M and F (Male and Female). There is an option to exclude the field containing the tablename from being inserted into the tables.

Option	Description
Return auto-generated key	Enable if you want to get back the key that was generated by inserting a row into the table
Name of auto-generated key field	Specifies the name of the new field in the output rows that contains the auto-generated key
SQL	Generates the SQL to create the output table automatically

Text File Output

The Text File Output step is used to export data to text file format. This is commonly used to generate Comma Separated Values (CSV files) that can be read by spreadsheet applications. It is also possible to generate fixed width files by setting lengths on the fields in the fields tab.

File Tab

The options under the File tab is where you define basic properties about the file being created, such as:

Option	Description
Step name	Optionally, you can change the name of this step to fit your needs.
Filename	Specify the CSV file from which to write
Run this as a command instead?	Enable to "pipe" the results into the command or script you specify
Accept file name from field?	Enable to specify the file name(s) in a field in the input stream
File name field	When the previous option is enabled, you can specify the field that will contain the filename(s) at runtime.
Extension	Adds a point and the extension to the end of the file name. (.txt)
Include stepnr in filename	If you run the step in multiple copies (Launching several copies of a step), the copy number is included in the file name, before the extension. (_0).
Include partition nr in file name?	Includes the data partition number in the file name
Include date in file name	Includes the system date in the filename (_20101231)
Include time in file name	Includes the system time in the filename (_235959)
Show file name(s)	Displays a list of the files that will be generated  **Note:** This is a simulation and depends on the number of rows that will go into each file.

Content tab

The content tab contains the following options for describing the content being read:

Option	Description
Append	Enable to append lines to the end of the specified file
Separator	Specify the character that separates the fields in a single line of text; typically this is semicolon (;) or a tab

Option	Description
Enclosure	A pair of strings can enclose some fields. This allows separator characters in fields. The enclosure string is optional.
Force the enclosure around fields?	Forces all field names to be enclosed with the character specified in the **Enclosure** property above
Header	Enable this option if you want the text file to have a header row (first line in the file)
Footer	Enable this option if you want the text file to have a footer row (last line in the file)
Format	Can be either DOS or UNIX; UNIX files have lines are separated by line feeds, DOS files have lines separated by carriage returns and line feeds
Compression	Specify the type of compression, .zip or .gzip to use when compressing the output.  **Note:** Only one file is placed in a single archive.
Encoding	Specify the text file encoding to use. Leave blank to use the default encoding on your system. To use Unicode, specify UTF-8 or UTF-16. On first use, Spoon searches your system for available encodings.
Fast data dump (no formatting)	Improves the performance when dumping large amounts of data to a text file by not including any formatting information
Right pad fields	Enable so that fields are padded to their defined width on the right
Split every ... rows	If the number N is larger than zero, split the resulting text-file into multiple parts of N rows
Add Ending line of file	Allows you to specify an alternate ending row to the output file

Fields tab

The fields tab is where you define properties for the fields being exported. The table below describes each of the options for configuring the field properties:

Option	Description
Name	The name of the field
Type	Type of the field can be either String, Date or Number.
Format	The format mask to convert with. See Number Formats for a complete description of format symbols.
Length	The length option depends on the field type follows: • Number - Total number of significant figures in a number • String - total length of string • Date - length of printed output of the string (for exampl, 4 returns year)
Precision	The precision option depends on the field type as follows: • Number - Number of floating point digits

Option	Description
	• String - unused • Date - unused
Currency	Symbol used to represent currencies like $10,000.00 or E5.000,00
Decimal	A decimal point can be a "." (10,000.00) or "," (5.000,00)
Group	A grouping can be a "," (10,000.00) or "." (5.000,00)
Trim type	Type trim this field (left, right, both) before processing  **Note:** Trimming works when there is no field length given only.
Null	If the value of the field is null, insert this string into the text file
Get	Click to retrieve the list of fields from the input fields stream(s)
Minimal width	Change the options in the Fields tab in such a way that the resulting width of lines in the text file is minimal. So instead of save 0000001, you write 1, and so on. String fields will no longer be padded to their specified length.

Update

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

XML Output

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Transform

The PDI transformation steps in this section pertain to various data modification tasks.

Add a Checksum

This step calculates checksums for one or more fields in the input stream and adds this to the output as a new field.

Option	Description
Step name	The name of this step as it appears in the transformation workspace. **Note**: This name must be unique within a single transformation.
Type	The type of checksum that needs to be calculated. These are the types that are available: CRC32: 32-bit Cyclic

Option	Description
	Redundancy Check ADLER 32: Checksum algorithm by Mark Adler MD5: Message Digest algorithm 5 SHA-1 : Secure Hash Algorithm 1
Result field	The name of the result field containing the checksum.
Fields used in the checksum	The names of the fields to include in the checksum calculation. **Note**: *You can use the `Get Fields` button to insert all input fields from previous steps.*

Add Constants

The Add constant values step is a simple and high performance way to add constant values to the stream.

Option	Description
Step name	The name of this step as it appears in the transformation workspace. **Note**: This name must be unique within a single transformation.
Fields	Specify the name, type, and value in the form of a string. Then, specify the formats to convert the value into the chosen data type.

Add Sequence

The Add sequence step adds a sequence to the stream. A sequence is an ever-changing integer value with a specific start and increment value. You can either use a database (Oracle) sequence to determine the value of the sequence, or have it generated by Kettle.

Option	Description
Step name	The name of this step as it appears in the transformation workspace. **Note**: This name must be unique within a single transformation.
Name of value	Name of the new sequence value that is added to the stream.
Use DB to generate the sequence	Enable if you want the sequence to be driven by a database sequence, then set the following parameters: Connection name, Schema name (optional), Sequence name.
Use a transformation counter to generate the sequence	Enable if you want the sequence to be generated by Kettle, then set the following parameters: Use counter to calculate sequence, Counter name (optional), Start at, Increment by, Maximum value

Examples

```
Start at = 1, increment by = 1, max value = 3
```

This will produce: 1, 2, 3, 1, 2, 3, 1, 2...

```
Start at = 0, increment by = \-1, max value = \-2
```

This will produce: 0, -1, -2, 0, -1, -2, 0...

Add Value Fields Changing Sequence

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Add XML

The XML column step allows you to encode the content of a number of fields in a row in XML. This XML is added to the row in the form of a String field.

Content Tab

Option	Description
Step name	The name of this step as it appears in the transformation workspace. **Note**: This name must be unique within a single transformation.
Encoding	The encoding to use; this encoding is specified in the header of the XML file.
Output Value	The name of the new field that contains the XML.
Root XML element	The name of the root element in the generated element.
Omit XML header	Enable to not include the XML header in the output.

Fields tab

The Fields tab is where you configure the output fields and their formats. The table below describes each of the available properties for a field:

Option	Description
Fieldname	Name of the field
Element name	The name of the element in the XML file to use
Type	Type of the field can be either String, Date, or Number.
Format	Format mask with which to convert data; see Number Formats for a complete description of format specifiers.
Length	Output string is padded to this length if it is specified.
Precision	The precision to use.
Currency	Symbol used to represent currencies like $10,000.00 or E5.000,00.
Decimal	A decimal point can be a "." (10,000.00) or "," (5.000,00).
Grouping	A grouping can be a "," (10,000.00) or "." (5.000,00).
Null	The string to use in case the field value is null.
Attribute	Make this an attribute (N means : element).
Attribute parent name	You can specify the name of the parent element to add the attribute to if previous parameter attribute is set to Y. If no parent name is specified, the attribute is set in the parent element.

Calculator

This step provides you with predefined functions that can be executed on input field values.

Besides the arguments (Field A, Field B and Field C) you must also specify the return type of the function. You can also choose to remove the field from the result (output) after all values are calculated.

The table below contains descriptions of the fields associated with the calculator step:

Function	Description	Required fields
Set field to constant A	Create a field with a constant value.	A
A + B	A plus B.	A and B
A - B	A minus B.	A and B
A * B	A multiplied by B.	A and B
A / B	A divided by B.	A and B
A * A	The square of A.	A
SQRT(A)	The square root of A.	A
100 * A / B	Percentage of A in B.	A and B
A - (A * B / 100)	Subtract B% of A.	A and B
A + (A * B / 100)	Add B% to A.	A and B
A + B *C	Add A and B times C.	A, B and C
SQRT(A*A + B*B)	Calculate ?(A2+B2).	A and B
ROUND(A)	Round A to the nearest integer.	A
ROUND(A, B)	Round A to B decimal positions.	A and B
NVL(A, B)	If A is not NULL, return A, else B. Note that sometimes your variable won't be null but an empty string.	A and B
Date A + B days	Add B days to Date field A.	A and B
Year of date A	Calculate the year of date A.	A
Month of date A	Calculate number the month of date A.	A
Day of year of date	A Calculate the day of year (1-365).	A
Day of month of date A	Calculate the day of month (1-31).	A
Day of week of date A	Calculate the day of week (1-7).	A
Week of year of date A	Calculate the week of year (1-54).	A
ISO8601 Week of year of date A	Calculate the week of the year ISO8601 style (1-53).	A
ISO8601 Year of date A	Calculate the year ISO8601 style.	A
Byte to hex encode of string A	Encode bytes in a string to a hexadecimal representation.	A
Hex encode of string A	Encode a string in its own hexadecimal representation.	A
Char to hex encode of string A	Encode characters in a string to a hexadecimal representation.	A

Function	Description	Required fields
Hex decode of string A	Decode a string from its hexadecimal representation (add a leading 0 when A is of odd length).	A
Checksum of a file A using CRC-32	Calculate the checksum of a file using CRC-32.	A
Checksum of a file A using Adler-32	Calculate the checksum of a file using Adler-32.	A
Checksum of a file A using MD5	Calculate the checksum of a file using MD5.	A
Checksum of a file A using SHA-1	Calculate the checksum of a file using SHA-1.	A
Levenshtein Distance (Source A and Target B)	Calculates the Levenshtein Distance.	A and B
Metaphone of A (Phonetics)	Calculates the metaphone of A.	A
Double metaphone of A	Calculates the double metaphone of A.	A
Absolute value ABS(A)	Calculates the Absolute value of A.	A
Remove time from a date A	Removes time value of A.	A
Date A - Date B (in days)	Calculates difference, in days, between A date field and B date field.	A and B
A + B + C	A plus B plus C.	A, B, and C
First letter of each word of a string A in capital	Transforms the first letter of each word within a string.	A
UpperCase of a string A	Transforms a string to uppercase.	A
LowerCase of a string A	Transforms a string to lowercase.	A
Mask XML content from string A	Escape XML content; replace characters with &values.	A
Protect (CDATA) XML content from string A	Indicates an XML string is general character data, rather than non-character data or character data with a more specific, limited structure. The given string will be enclosed into <![CDATA[String]]>.	A
Remove CR from a string A	Removes carriage returns from a string.	A
Remove LF from a string A	Removes linefeeds from a string.	A
Remove CRLF from a string A	Removes carriage returns/linefeeds from a string.	A
Remove TAB from a string A	Removes tab characters from a string.	A
Return only digits from string A	Outputs only Outputs only digits (0-9) from a string from a string.	A
Remove digits from string A	Removes all digits (0-9) from a string.	A
Return the length of a string A	Returns the length of the string.	A

Function	Description	Required fields
Load file content in binary	Loads the content of the given file (in field A) to a binary data type (e.g. pictures).	A
Add time B to date A	Add the time to a date, returns date and time as one value.	A and B
Quarter of date A	Returns the quarter (1 to 4) of the date.	A
variable substitution in string A	Substitute variables within a string.	A
Unescape XML content	Unescape XML content from the string.	A
Escape HTML content	Escape HTML within the string.	A
Unescape HTML content	Unescape HTML within the string.	A
Escape SQL content	Escapes the characters in a String to be suitable to pass to an SQL query.	A
Date A - Date B (working days)	Calculates the difference between Date field A and Date field B (only working days Mon-Fri).	A and B
Date A + B Months	Add B months to Date field A.	A
Check if an XML file A is well formed	Validates XML file input.	A
Check if an XML string A is well formed	Validates XML string input.	A
Get encoding of file A	Guess the best encoding (UTF-8) for the given file.	A
Dameraulevenshtein distance between String A and String B	Calculates Dameraulevenshtein distance between strings.	A and B
NeedlemanWunsch distance between String A and String B	Calculates NeedlemanWunsch distance between strings.	A and B
Jaro similitude between String A and String B	Returns the Jaro similarity coefficient between two strings.	A and B
JaroWinkler similitude between String A and String B	Returns the Jaro similarity coefficient between two strings.	A and B
SoundEx of String A	Encodes a string into a Soundex value.	A
RefinedSoundEx of String A	Retrieves the Refined Soundex code for a given string object	A
Date A + B Hours	Add B hours to Date field A	A and B
Date A + B Minutes	Add B minutes to Date field A	A and B
Date A - Date B (milliseconds)	Subtract B milliseconds from Date field A	A and B
Date A - Date B (seconds)	Subtract B seconds from Date field A	A and B
Date A - Date B (minutes)	Subtract B minutes from Date field A	A and B
Date A - Date B (hours)	Subtract B hours from Date field A	A and B

Closure Generator

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Example Plugin

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Get ID From Slave Server

When processing large amounts of data on multiple distinct systems (for example when running a clustered transformation) you sometimes still need to generate a unique numeric ID for each one. Since a GUID is not guaranteed to be unique and consumes a lot more memory and space compared to a numeric integer (long) ID, you may prefer to use numerical IDs.

A unique ID identifies a piece of information, which is useful for: looking up data, support cases, incremental processing, error handling (recovering from where you left off by looking up the last inserted ID) and so on. Typically you would use a database to generate such an ID, for example using an Oracle sequence. However, there are cases where you don't have a database available (such as when you add a unique ID to a text/log file), when the database doesn't support sequences (column databases, typically), or when retrieving the ID from a database is slow (going back and forth to the database for each row severely limits performance). In all these situations, you need a high-performance way of providing unique IDs to a PDI transformation. The Get ID From Slave Server step is designed to fit this need.

Note: The "old way" of generating a unique ID locally was with the Add Sequence step. This is fast, but not unique across multiple systems. Getting a unique ID from a remote database sequence (also possible with the Add Sequence step) will work, but it will be slow and won't scale. Get ID From Slave Server uses a hybrid approach by getting value ranges from a central server which keeps track of the ranges for the various slave sequences, with the ability to use them locally.

Assuming you have (or are now configuring) Carte slave servers set up in PDI, this step retrieves a unique ID from the Carte slave server of your choice. It works by asking a slave server for a range of values. In other words, the step reserves a range of IDs for a certain given central slave server sequence. It then increments by one until there are no more values in the range, asks another range, and so forth. This means that the returned IDs can be sequential, however this is not guaranteed. The only thing you know is that after each execution for each input row you get a unique ID that has a higher value than the last one returned. The last value returned plus the size of the range (increment) are stored in a database table to persist the value over several runs of a transformation.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Name of value	The name of the (Integer type) output field (sequence or ID)
Slave server	The slave server to get the unique ID range from. This can be specified using a variable
Sequence name	The name of the sequence as defined on the slave server (see below). The sequence name can be specified using a variable

Option	Definition
Increment or batch name	The number of IDs to generate before a new value (range) is obtained from the slave server. The higher you make the increment size, the faster the step can run. However, it will deplete the available IDs (1x10^15) faster. For example, if you take 1,000,000,000 as the increment, you can reserve 1,000,000 times a range of IDs. If you only use up a few of those ID each time a transformation runs, you will run out of IDs anyway after 1M executions. Don't make this value too high; keep it in the 1000-10000 range to achieve speeds of over 100,000 rows/sec with this step. This parameter can be specified using a variable

XML Configuration

You need to start your slave server with extra connection and sequence information configured in an XML file. The extra connection and sequences blocks are what make the sequences work in the following example:

```
<slave_config>

  <slaveserver>
    <name>master1</name>
    <hostname>localhost</hostname>
    <port>8282</port>
    <master>Y</master>
  </slaveserver>

  <connection>
    <name>MySQL</name>
    <server>localhost</server>
    <type>MYSQL</type>
    <access>Native</access>
    <database>test</database>
    <port>3306</port>
    <username>matt</username>
    <password>Encrypted 2be98afc86aa7f2e4cb79ce10df90acde</password>
  </connection>

  <sequences>

   <sequence>
    <name>test</name>
    <start>0</start>
    <connection>MySQL</connection>
    <schema/>
    <table>SEQ_TABLE</table>
    <sequence_field>SEQ_NAME</sequence_field>
    <value_field>SEQ_VALUE</value_field>
   </sequence>

  </sequences>
```

The **start** tag is optional and will default to **0** if you leave it out of the definition. You can define as many sequences as you like.

Servlet Information

Once the configuration files are changed as shown above, slave servers receive a new servlet that can be called as follows (authentication required):

```
http://hostname:port/kettle/nextSequence/?
name=SequenceName&increment=NumberOfIDsToReserve
```

In case no increment is specified, 10000 IDs are reserved, for example:

```
http://localhost:8282/kettle/nextSequence/?name=test
```

The servlet will return a simple piece of XML containing both the start of the range as well as the number of IDs reserved, or the increment:

```
<seq><value>570000</value><increment>10000</increment></seq>
```

Continuing with this example, the following row will be present in the SEQ_TABLE table:

```
mysql> select * from SEQ_TABLE where SEQ_NAME='test';
+----------+-----------+
| SEQ_NAME | SEQ_VALUE |
+----------+-----------+
| test     |    580000 |
+----------+-----------+
```

Note: You must create the sequence table with the sequence field (<sequence_field>) as a primary key. This will guarantee uniqueness and allow for fast lookup of the sequence value (<value_field>).

Automatic Loading and Creation

It can be a burden to maintain all your sequences in an XML file. Because of this, it is also possible to automatically load all the sequences from a database table. You can use the following construct to do it:

```
<autosequence>
    <connection>MySQL</connection>
    <schema/>
    <start>1234</start>
    <table>SEQ_TABLE</table>
    <sequence_field>SEQ_NAME</sequence_field>
    <value_field>SEQ_VALUE</value_field>

    <autocreate>N</autocreate>
</autosequence>
```

The <autocreate> tag allows any sequence name to be specified in the step without error. In that case, the sequence with the name specified will be created automatically with the start value from the <autosequence> specification.

Note: You should disable auto-creation of slave sequences in a production environment.

Number Range

Create ranges based on numeric fields.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Input field	Designate the field to create ranges for.
Output field	Designate the name of the field of ranges to be created.
Default value	Value to return if there are no matches within the ranges specified.
Ranges	Designated the upper and lower bound of a range.
Lower Bound	Designated the minimum value of a range.
Upper Bound	Designate the upper value of a range.
Value	Designated a name for the value.

Replace in String

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Row Denormalizer

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Row Flattener

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Row Normalizer

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Select Values

The Select Values step is useful for selecting, removing, renaming, changing data types and configuring the length and precision of the fields on the stream. These operations are organized into different categories:

- **Select and Alter** — Specify the exact order and name in which the fields have to be placed in the output rows
- **Remove** — Specify the fields that have to be removed from the output rows
- **Meta-data** - Change the name, type, length and precision (the metadata) of one or more fields

An example of a transformation that includes this step is located at `samples/transformations/Select values - some variants.ktr` and `samples/transformations/Select Values - copy field values to new fields.ktr`

Select & Alter Options

This tab contains options for selecting and changing data types and fields. The **Get Fields to Select** button will retrieve available fields based on the existing input steps and populate the entries in this tab. Click **Edit Mapping** to open a mapping dialog to easily define multiple mappings between source and target fields.

Note: Edit Mapping will only work if there is only one target output step.

Option	Description
Step name	Optionally, you can change the name of this step to fit your needs.
Fieldname	Click to insert fields from all input steams to the step
Rename to	Click to insert fields from all input steams to the step
Length	Enable if you want to implicitly select all other fields from the input stream(s) that are not explicitly selected in the Fields section.
Precision	The precision option depends on the field type, but only **Number** is supported; it returns the number of floating point digits.
Include unspecified fields, ordered by name	Enable if you want to implicitly select all other fields from the input stream(s) that are not explicitly selected in the Fields section

Remove

Simply name the fields from the inputstream that you want to remove.

Note: Field removals are slow because of the nature of the queries that they generate.

Meta-data

Options under this tab allow you to rename, change data types, and change the length and precision of fields coming into the Select Values step. Click **Get fields to change** to import fields from previous steps. A lot of data type conversions are also possible with this tab.

Option	Description
Fieldname	The name of the imported field.
Rename to	If you want to rename this field, this is where you put the new name.
Type	The data type for this field.
Length	The field length.
Precision	The precision option depends on the field type, but only **Number** is supported; it returns the number of floating point digits.
Binary to Normal?	Converts a string to a numeric data type, when appropriate.
Format	The format mask (number type or date format).
Encoding	Specifies the text file encoding to use. Leave blank to use the default encoding on your system. To use Unicode, specify UTF-8 or UTF-16. On first use, Spoon searches your system for available encodings and populates this list accordingly.
Decimal	A decimal point; this is either a dot or a comma.
Grouping	A method of separating units of thousands in numbers of four digits or larger. This is either a dot or a comma.
Currency	Symbol used to represent currencies.

Option	Description
Date Format Lenient?	Determines whether the date parser is strict or lenient. Leniency means that invalid date values are processed. If set to **N**, only strictly valid date values will be accepted; if set to **Y**, the parser will attempt to determine the intention of an incorrect date, if possible, and correct it.

Set Field Value

Set the value of a field with the value of another field.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Field name	Displays the fields with values that can be replaced.
Replace by value from field	Specify the field value to replace the values in the Field name column.

Set Field Value to a Constant

This step allows you to set the value of a field with a user-defined constant.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Use variable in constant	Selecting this option allows you to use variable replacement within a constant.
Field	Displays the fields with values that can be replaced.
Replace by value	The value that will replace existing values within the specified field.
Conversion mask (Date)	Allows you to specify a date format to convert to.

Sort Rows

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Split Field to Rows

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Split Fields

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

String Operations

Apply operations, such as trimming, padding, and others to the string value.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
In stream field	Designate the field to transform.
Out stream field	Designate the name of the field to be created.
Trim type	Designate the trim type: none, left, right, or both.
Lower/Upper	Designate upper or lowercase.
Padding	Designate left or right padding.
Pad char	Designate the padding character.
Pad Length	Designate how long the padding will be.
InitCap	Transform to initial capitalization.
Escape	
Digits	Designate whether to return remove, or do nothing to digits.
Remove Special character	Designate a special character to remove.

Strings Cut

This step allows you to cut a portion of a substring. If the designated field is out of range, it returns blank.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
In stream field	Name of the field whose substring to cut.
Out stream field	Rename the field upon output.
Cut from	Designate where to begin cutting the substring.
Cut to	Designate where to end cutting the substring.

Unique Rows

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Unique Rows (HashSet)

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Value Mapper

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

XSL Transformation

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Utility

The PDI transformation steps in this section pertain to various conditional and data processing tasks.

Change File Encoding

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Clone Row

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Delay Row

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Edit to XML

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Edi+to+XML*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Execute a Process

You can use the Execute a process step to execute a shell script on the host where a job will run. This is similar to the Shell job entry, in that it executes a shell script on the host where the job is running, but performs this for every row.

Option	Description
Step name	The name of this step as it appears in the transformation workspace.
Process field	The field name in the data stream that defines the process to start (shell script / batch file to start). Arguments can also be used.
Fail if not success	Checking this option means if the exit status is different than zero the step fails. You can use error handling to get these rows.
Result fieldname	Specify here the name of the result fieldname (STRING) added to the output stream of the transformation. This field is populated by the output stream (stdout) of the process.
Error fieldname	Specify here the name of the error fieldname (STRING) added to the output stream of the transformation. This field is filled by the error stream (stderr) of the process.
Exit value	Specify here the name of the exit fieldname (INTEGER) added to the output stream of the transformation. This field is filled by the exit output of the process.

If Field Value is Null

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Mail

This step uses an SMTP server to send an email containing data from the previous step.

Note: The Mail transformation step is similar to the Mail job entry, except the step receives all data from the stream fields.

Addresses

This tab defines the sender, contact person, and recipients of a PDI-generated email.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Destination address	The destination for the email. This can be a single address, a comma-separated list of addresses, or an email alias for a distribution list.
Cc	An email address, comma-separate list of email addresses, or a distribution list to send a carbon copy of the email to.
Bcc	An email address, comma-separate list of email addresses, or a distribution list to send a blind carbon copy of the email to.
Sender name	The name of the person you want the email to be from.
Sender Address	The email address of the person or account you want the email to be from.
Reply to	The email address that recipients will use if they reply to the email.
Contact	The name of the person to contact regarding the email's contents.
Contact phone	The phone number of the contact person defined in the previous field.

Server

This tab contains details for your SMTP server, including authentication and encryption.

Option	Definition
SMTP server	URL, hostname, or IP address of your SMTP server.
Port	Port number for your SMTP service.
Use authentication	If checked, you will be able to enter an SMTP username and password in the next few fields.
Authentication user	The SMTP username to use for server authentication.
Authentication password	The password for the previously defined SMTP username.
Use secure authentication	If checked you will be able to specify SSL or TLS encryption in the next field.
Secure connection type	Determines whether the server will use SSL or TLS encryption protocols.

Email Message

This tab determines the text content of the email.

Option	Definition
Include date in message?	If checked, the date will be printed in the email body.
Only send comment in mail body?	If checked, information about the transformation will not be included -- only the content from the Comment field will be sent in the message body.
Use HTML format in mail body?	If checked, this email will be in HTML format instead of plain text.

Option	Definition
Encoding	Character encoding for the text of an HTML email.
Manage priority	If checked, enables the following two fields to set email priority and importance levels.
Priority	The priority level to assign in the email metadata.
Importance	The importance level to assign in the email metadata.
Subject	The email subject line.
Comment	The email body.

Attached Files

This tab contains options for file attachments.

Option	Definition
Dynamic filenames?	If checked, you will use the next two fields to define which streams you want to use to create dynamic filenames for your attachments.
Filename field	The stream field you want to use for dynamic filenames of attachments. This can also be a folder name, in which case you would use the Wildcard field to determine filenames.
Wildcard field	A regular expression that creates dynamic filenames for attachments.
Filename/foldername	A static name and location of a file to attach.
Include subfolders	If checked, will attach files in subfolders of the specified folder.
Wildcard	A regular expression that identifies a file to attach.
Zip files	If checked, multiple file attachments will be zipped into a single archive before attaching to the email.
Is zip filename dynamic?	If checked, the name of the zip archive will be determined by a data stream.
Zipfilename field	The data field to use for the name of the zip archive.
Zip filename	A static name for the zip archive.
Zip files if size greater than	Only archives file attachments if their combined size is above this number (in bytes).

Embedded Images

This tab contains options for embedded images in HTML emails.

Option	Definition
Filename	The name and location of the file you want to embed in the email.
Content ID	A unique identifier for this file. PDI will generate one if you don't specify one yourself.
#	The order that the attachment will be processed.
Image	The name of as added image.

Option	Definition
Content ID (field)	The content ID of an added image.

Metadata Structure of Stream

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Null if...

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Process Files

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Run SSH Commands

This step conveniently allows you to execute commands over the secure shell (ssh) TCP/IP protocol.

You can pass text to stdout or stderr in the commands. This information can then be picked up by the step and passed in a field to subsequent steps.

Note: This step accepts no input from other steps and is executed only once unless_ _the "Get commands from field" option is enabled.

General tab

Option	Description
Step name	The name of this step as it appears in the transformation workspace.
Server name / IP address	You can specify the server or IP address of the machine on which you want to execute a command.
Server port	The TCP/IP port on which the ssh protocol lives on the server. The default is 22.
Timeout	The timeout in seconds. If set to a number larger than zero you can specify a non-default connection timeout.
Username	The username to log in with.
Password	The password to use.
Use key	Enable this option if you want to log in using a private key.

Option	Description
Private key	The private key file. The private part of a private/public RSA key-pair (see: ssh-keygen).
Passphrase	The optional pass-phrase used when the key-pair was generated.
Proxy host	The proxy server host to use (name or IP address).
Proxy port	The proxy server port to use.
Proxy username	The proxy username.
Proxy password	The proxy password.
Test connection	Button that allows you to test if the supplied credentials are sufficient for logging in to the SSH server.

Settings tab

Option	Description
Response fieldname	The name of the String output field that will contain the text passed to the standard output channel (stdout) by the specified commands.
error response fieldname	The name of the String output field that will contain the text passed to the standard error channel (stderr) by the specified commands.
Get commands from field	Enable this option if you want to execute commands specified in an input field.
Commands fieldname	Select the input field that will contain the commands to execute.
Commands	Field allows you to specify the commands to execute.

Send Message to Syslog

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Write to Log

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Flow

The PDI transformation steps in this section pertain to various process control tasks.

Abort

This step type allows you abort a transformation upon seeing input. Its main use is in error handling. For example, you can use this step so that a transformation can be aborted after x number of rows flow to over an error hop.

Option	Description
Step name	The name of this step as it appears in the transformation workspace. **Note**: This name must be unique within a single transformation.
Abort threshold	The threshold of number of rows after which to abort the transformations. E.g. If threshold is 0, the abort step will abort after seeing the first row. If threshold is 5, the abort step will abort after seeing the sixth row.
Abort message	The message to put in the log upon aborting. If not filled in a default message will be used.
Always log	Always log the rows processed by the Abort step. This allows the rows to be logged although the log level of the transformation would normally not do it. This way you can always see in the log which rows caused the transformation to abort.

Append Streams

The Append streams step reads the data from two steps, only processing the second stream after the first is finished. As always, the row layout for the input data coming from both steps has to be identical: the same row lengths, the same data types, the same fields at the same field indexes in the row.

Important: If you don't care about the order in which the output rows occur, you can use any step to create a union of 2 or more data streams.

Option	Description
Step name	The name of this step as it appears in the transformation workspace. **Note**: This name must be unique within a single transformation.
Head hop	The name of the step from which will be read from first.
Tail hop	The name of the step from which will be read from last.

Block This Step Until Steps Finish

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Blocking Step

This step blocks until all incoming rows have been processed. Subsequent steps only receive the last input row of this step.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Option	Definition
Pass all rows?	Determines whether to pass one row or all rows.
Spool directory	The directory in which the temporary files are stored if needed; the default is the standard temporary directory for the system.
Spool-file prefix	Choose a recognizable prefix to identify the files when they appear in the temp directory.
Cache size	The more rows you can store in memory, the faster the step works.
Compress spool files?	Compresses temporary files when they are needed.

Detect Empty Stream

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Dummy (do nothing)

The Dummy step does not do anything. Its primary function is to be a placeholder for testing purposes. For example, to have a transformation, you must have at least two steps connected to each other. If you want to test a file input step, you can connect it to a dummy step.

ETL Metadata Injection

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

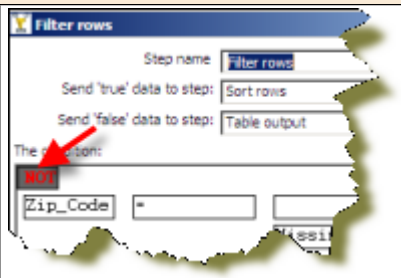
Filter Rows

The Filter Rows step allows you to filter rows based on conditions and comparisons. Once this step is connected to a previous step (one or more and receiving input), you can click on the "<field>", "=" and "<value>" areas to construct a condition.

Note: To enter an IN LIST operator, use a string value separated by semicolons. This also works on numeric values like integers. The list of values must be entered with a string type, e.g.: 2;3;7;8

Filter Row Options

Option	Description
Step name	Optionally, you can change the name of this step to fit your needs.
Send 'true' data to step	The rows for which the condition specified is true are sent to this step
Send 'false' data to step	The rows for which the condition specified are false are sent to this step
The Condition	Click the **NOT** to negate the condition.

Option	Description
	 Click **<Field>** to select from a list of fields from the input stream(s) to build your condition(s). Click **<value>** to enter a specific value into your condition(s). To delete a condition, right-click and select **Delete Condition**.
Add Condition	Click (Add condition) to add conditions. Add condition converts the original condition into a sub-level condition. Click a sub-condition to edit it by going down one level in the condition tree.

Filtering Rows Based on Values from Variables

The filter rows step detects only fields in the input stream. If you want to filter rows based in a variable value, you must modify the previous step (a table input for example) and include the variable as another field, such as:

```
${myvar}=5
```

A query:

```
SELECT field1,
field2,
${myvar} AS field3
FROM table
WHERE field1=xxxx
```

Then in the filter row condition, you can have the following...

```
field1 = field3
```

Alternatively, you can use the simple **Get Variables** step to set parameters in fields.

Identify Last Row in a Stream

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Java Filter

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Prioritize Streams

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Single Threader

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Switch / Case

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Scripting

The PDI transformation steps in this section pertain to formula and script execution.

Execute Row SQL Script

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Execute SQL Script

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Formula

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Modified JavaScript Value

The Modified JavaScript Value step provides a user interface for building JavaScript expressions. This step also allows you to create multiple scripts for each step. For more information about this step see *Modified JavaScript Value* in the Pentaho Wiki.

JavaScript Functions

Function	Description
Transformation Scripts	Displays a list of scripts you have created in this step
Transformation Constants	A list of pre-defined, static constants including SKIP_TRANSFORMATION, ERROR_TRANSFORMATION, and CONTINUE_TRANSFORMATION
Transform Functions	Contains a variety of String, Numeric, Date, Logic and specialized functions you can use to create your script. To add a function to your script, simply double-click on the function or drag it to the location in your script that you wish to insert it.
Input Fields	A list of inputs coming into the step. Double-click or use drag and drop to insert the field into your script.
Output Fields	A list of outputs for the step.

JavaScript

This section is where you edit the script for this step. You can insert functions, constants, input fields, etc. from the tree control on the left by double-clicking on the node you want to insert or by dragging the object onto the Java Script panel.

Fields

The Fields table contains a list of variables from your script including the ability to add metadata like a descriptive name.

Buttons

Get Variables

Retrieves a list of variables from your script.

Test script

Use to test the syntax of your script.

JavaScript Internal API Objects

You can use the following internal API objects (for reference see the classes in the source):

Object	Description
TransformationName	A string with the actual transformation name

Object	Description
step	The actual step instance of org.pentaho.di.trans.steps.scriptvalues_mod.ScriptValuesMod
rowMeta	The actual instance of org.pentaho.di.core.row.RowMeta
row	The actual instance of the actual data Object[]

Advanced Web Services – Modified Java Script Value and HTTP Post Steps

There are times when the SOAP message generated by the **Web Services Lookup** step is insufficient. Many Web Services require security credentials that must be placed in the SOAP request headers. There may also be a need to parse the response XML to get more information than the response values such as namespaces.

This approach uses a **Modified Java Script Value** step. You can create the SOAP envelope as needed. The step is then hopped to an **HTTP Post** step that accepts the SOAP request through the input stream and posts it to the Web Services. This is then hopped to another **Modified Java Script Value** step that is used to parse the response from the Web service.

The *General - Annotated SOAP Web Service call.ktr* in the PDI samples folder (`...\data-integration\samples\transformations`) illustrates the use of this approach.

Regex Evaluation

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

User Defined Java Class

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

User Defined Java Expression

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Lookup

The PDI transformation steps in this section pertain to status checking and remote service interaction.

Call DB Procedure

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Check if a Column Exists

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Check if File is Locked

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Check if Webservice is Available

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Database Join

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Database Lookup

The Database Lookup step allows you to look up values in a database table. Lookup values are added as new fields onto the stream.

Database Lookup Options

Option	Description
Step name	Optionally, you can change the name of this step to fit your needs.
Connection	Select the database connection for the lookup
Lookup schema	Specify the target schema to use for the lookup
Lookup table	Specifies the name of the table used in the lookup process

Option	Description
Enable cache?	This option caches database lookups. This means that the database is expected to return the same value all the time for a certain lookup value.
Cache size in rows	Specify the size of the cache to use in rows.
Load all data from table	Pre-loads the cache with all the data in the lookup table. This can improve performance by lowering lookup latency; however, if you have a large table you may run out of memory.
Keys to look up table	Specify the keys necessary to perform the lookup.
Do not pass the row if the lookup fails	Enable to avoid passing a row when lookup fails
Fail on multiple results?	Enable to force the step to fail if the lookup returns multiple results.
Order by	If the lookup query returns multiple results, the ORDER BY clause helps you to select the record to take. For example, ORDER BY would allow you to pick the customer with the highest sales volume in a specified state.
Get Fields	Click to return a list of available fields from the input stream(s) of the step
Get lookup fields	Click to return a list of available fields from the lookup table that can be added to the step's output stream

Important: ! If other processes are changing values in the table where you perform a lookup, do not cache values. In all other instances, caching values increases the performance substantially because database lookups are relatively slow. If you can't use cache, consider launching several copies of the simultaneously. A simultaneous launch keeps the database busy using different connections.

Dynamic SQL Row

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

File Exists

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Fuzzy Match

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

HTTP Client

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

HTTP Post

This step uses an HTTP POST command to submit form data via a URL.

General Tab

The General tab defines which RSS/Atom URLs you want to use, and optionally which fields contain the URLs.

Option	Description
Step name	The name of this step in the transformation workspace.
URL	The Web service URL to submit to.
Accept URL from field?	If checked, you must specify which field to retrieve the URL from.
URL field name	If the previous option is checked, this is where you specify the URL field.
Encoding	The encoding standard for the files being accessed.
Request entity field	The name of the field that will contain the POST request. When enabled, the **Post a file** option will retrieve the file named in this field, and post the contents of that file.
Post a file	If a file is defined in the **Request entity field**, its contents will be posted if this option is checked.
Result fieldname	The field that you want to post the result output to.
HTTP status code fieldname	The field that you want to post the status code output to.
Response time (milliseconds) fieldname	The field that you want to post the response time, in milliseconds, to.
HTTP login	If this form requires authentication, this field should contain the username.
HTTP password	If this form requires authentication, this field should contain the password that corresponds with the username.
Proxy host	Hostname or IP address of the proxy server, if you use one.
Proxy port	Port number of the proxy server, if you use one.

Fields tab: Body (Header) Parameters

The Fields tab defines parameters for the HTTP request header and body. If you've filled in the URL and other necessary details in the General tab, you can use the **Get values** buttons to pre-populate the fields here. Body parameters are used in POST and PUT operations.

Option	Description
#	The order that this parameter will be passed to the Web application.
Name	The name of the field that contains the value to map to the parameter.
Parameter	The parameter to map the value of **Name** to.
Put in Header?	If set to Y, the parameter will be put into the request header.

Fields tab: Query Parameters

The Fields tab defines parameters for the HTTP request header and body. If you've filled in the URL and other necessary details in the General tab, you can use the **Get values** buttons to pre-populate the fields here. Query parameters are specified in the URL and can be used in any HTTP method.

Option	Description
#	The order that this parameter will be passed to the Web application.
Name	The name of the field that contains the value to map to the parameter.
Value	The value to map to the parameter.

MaxMind GeoIP Lookup

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/MaxMind+GeoIP+Lookup*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

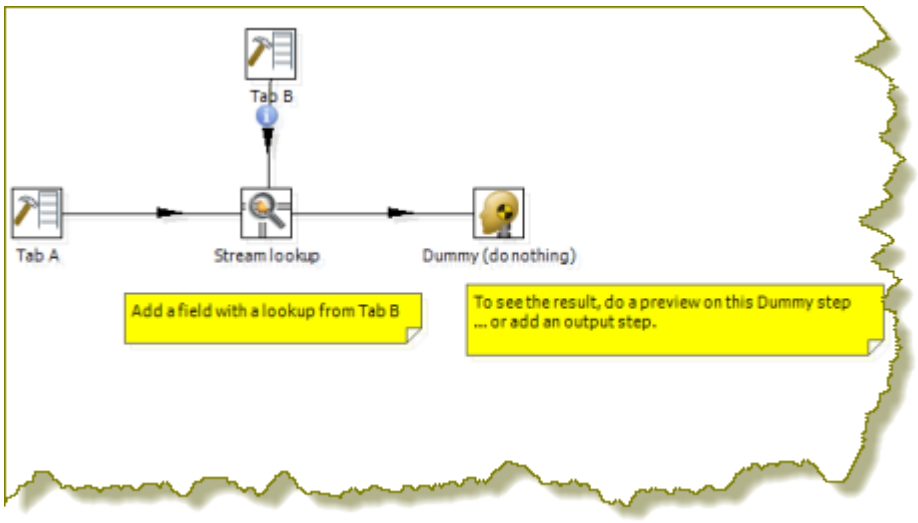
REST Client

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Stream Lookup

The Stream Lookup step type allows you to look up data using information coming from other steps in the transformation. The data coming from the Source step is first read into memory and is then used to look up data from the main stream.



Stream Lookup Options

Option	Description
Step name	Optionally, you can change the name of this step to fit your needs.
Lookup step	The step name where the lookup data is coming from
The keys to lookup...	Allows you to specify the names of the fields that are used to look up values. Values are always searched using the "equal" comparison
Preserve memory	Encodes rows of data to preserve memory while sorting
Specify the fields to retrieve	Specifies the fields to retrieve on a successful lookup
Key and value are exactly one integer field	Preserves memory while executing a sort
Use sorted list	Enable to store values using a sorted list; this provides better memory usage when working with data sets containing wide rows
Get fields	Automatically fills in the names of all the available fields on the source side; you can then delete all the fields you don't want to use for lookup.
Get lookup fields	Automatically inserts the names of all the available fields on the lookup side. You can then delete the fields you don't want to retrieve

Table Exists

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Web Services Lookup

Use the Web Services Lookup step to perform a Web Services lookup using the Web Services Description Language (WSDL). This step has limitations as described below:

- Only SOAP WSDL requests / responses are understood. The other variations of the WSDL standard are not yet implemented.
- Not all WSDL XML dialects and formats are as easily read as we would like. In those cases, you need to specify (manually) what the input and output fields look like.
- Data conversion is performed within the step. In instance where you have dates and numbers you may encounter errors. If you encounter conversion errors return Strings and convert them in a **Select Values** step. See *Select Values*.

Option	Description
Step Name	Optionally, you can change the name of this step to fit your needs.
URL	The base URL pointing to the WSDL document that will be retrieved
Load	Loads the WSDL at the specified URL and tries to populate the input and output tabs and fields automatically  **Note:** If this does not work, you can still try to manually specify the input and output fields using the **Add Input** and **Add Output** buttons.
The number of rows per call	The number of rows to send with each WSDL call
Pass input data to output	If disabled, the input will be discarded and only the WSDL output will be passed along to the next steps
v2.x/3.x compatibility mode	Version 2.0 engine was kept to make sure older steps would still work correctly
Repeating element name	The name of the repeating element in the output XML (if any).
HTTP authentication	The user name and password if these are required for the Web service.
Proxy to use	The proxy host and port information
Add Input / Add Output	The input and output specifications of the WSDL service

Basic Web Services - Web Services Lookup Step

In this scenario the Web service that is accessed is described with a WSDL 1.1 specification. The step can load this specification in one operation allowing the you to select and set input and output parameters. Output parameters are added to the step's output steam and passed to another step for processing. There is no need to modify the SOAP request in this scenario as the Web service does not need any information other that the parameter that is sent.

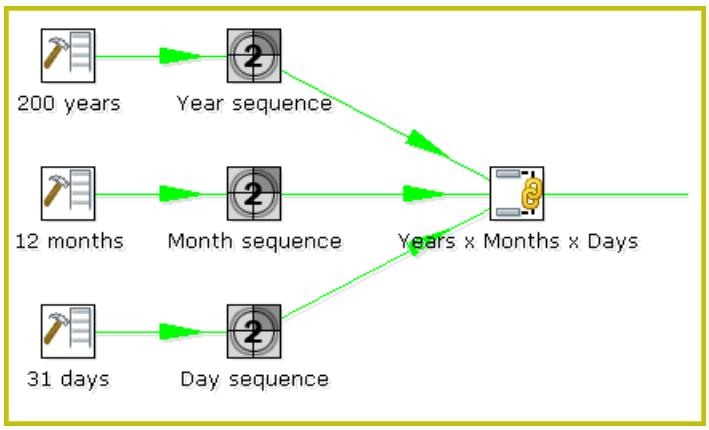
The *Web Services - NOAA Latitude and Longitude.ktr* located in the samples folder (`...\data-integration\samples\transformations`) is an example of this scenario.

Joins

The PDI transformation steps in this section pertain to database and file join operations.

Join Rows (Cartesian Product)

The Join Rows step allows combinations of all rows on the input streams (Cartesian product) as shown below:



The Years x Months x Days step outputs all combinations of Year, Month and Day (for example, 1900, 1, 1 2100, 12, 31) and can be used to create a date dimension.

The *Merge Join* step provides you with better performance in most cases.

Join Rows Options

Option	Description
Step name	Optionally, you can change the name of this step to fit your needs.
Temp directory	Specify the name of the directory where the system stores temporary files in case you want to combine more then the cached number of rows
TMP-file prefix	This is the prefix of the temporary files that will be generated
Max. cache size	The number of rows to cache before the system reads data from temporary files; required when you want to combine large row sets that do not fit into memory
The Condition(s)	You can enter a complex condition to limit the number of output row. **Note:** The fields in the condition must have unique names in each of the streams.

Merge Join

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Merge Rows (diff)

Merge rows allows you to compare two streams of rows. This is useful for comparing data from two different times. It is often used in situations where the source system of a data warehouse does not contain a date of last update.

The two streams of rows, a reference stream (the old data) and a compare stream (the new data), are merged. Only the last version of a row is passed to the next steps each time. The row is marked as follows:

- **identical** — the key was found in both streams and the values to compare are identical
- **changed** — The key was found in both streams but one or more values is different;
- **new** — The key was not found in the reference stream

- **deleted** — The key was not found in the compare stream

The row coming from the compare stream is passed on to the next steps, except when it is "deleted."

Note: IMPORTANT! Both streams must be sorted on the specified key(s).

Merge Rows Options

Option	Description
Step Name	Optionally, you can change the name of this step to fit your needs.
Reference rows origin	Specify the step origin for the reference rows
Compare rows origin	Specify the step origin for the compare rows
Flag fieldname	Specify the name of the flag field on the output stream
Keys to match	Specify fields containing the keys on which to match; click **Get Key Fields** to insert all of the fields originating from the reference rows step
Values to compare	Specify fields contaning the values to compare; click Get value fields to insert all of the fields from the originating value rows step

Sorted Merge

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

XML Join

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Data Warehouse

The PDI transformation steps in this section pertain to data warehouse functions.

Combination Lookup/Update

The Combination Lookup-Update step allows you to store information in a junk-dimension table. It can sometimes be used to maintain Kimball pure Type 1 dimensions.

This step will...

- Look up combination of business key field1... fieldn from the input stream in a dimension table
- If this combination of business key fields exists, return its technical key (surrogate id)
- If this combination of business key doesn't exist yet, insert a row with the new key fields and return its (new) technical key

- Put all input fields on the output stream including the returned technical key, but remove all business key fields if "remove lookup fields" is true

This step creates/maintains a technical key out of data with business keys. After passing through this step all of the remaining data changes for the dimension table can be made as updates, as either a row for the business key already existed or was created.

This step will maintain the key information only. You must update the non-key information in the dimension table; for example, by putting an update step (based on technical key) after the combination update/lookup step.

Pentaho Data Integration will store the information in a table where the primary key is the combination of the business key fields in the table. This process can be slow if you have a large number of fields, Pentaho Data Integration also supports a "hash code" field representing all fields in the dimension. This can speed up lookup performance dramatically while limiting the fields to index to 1.

Combination Lookup/Update Options

Option	Description
Step Name	Optionally, you can change the name of this step to fit your needs.
Connection	Name of the database connection on which the dimension table resides.
Target schema	Allows you to specify a schema name to improve precision in the quoting and allow for table names with dots '.' in them.
Target table	Name of the dimension table.
Commit size	Setting this to 10 will generate a commit every 10 inserts or updates.
Cache size in rows	This is the cache size in number of rows that will be held in memory to speed up lookups by reducing the number of round trips to the database.  **Note:** Only the last version of a dimension entry is kept in memory. If there are more entries passing than what can be kept in memory, the technical keys with the highest values are kept in memory in the hope that these are the most relevant. A cache size of 0 caches as many rows as possible and until your JVM runs out of memory. Use this option wisely with dimensions that can't grow too large. A cache size of -1 means that caching is disabled.
Key fields	Specify the names of the keys in the stream and in the dimension table. This will enable the step to do the lookup.
Technical key field	This indicates the primary key of the dimension. It is also referred to as Surrogate Key.
Creation of technical key	Specify how the technical key is generated, options that are not available for your connection are disabled: • Use table maximum + 1 — A new technical key will be created from the maximum key in the table. Note that the new maximum is always cached, so that the maximum does not need to be calculated for each new row. • Use sequence — Specify the sequence name if you want to use a database sequence on the table

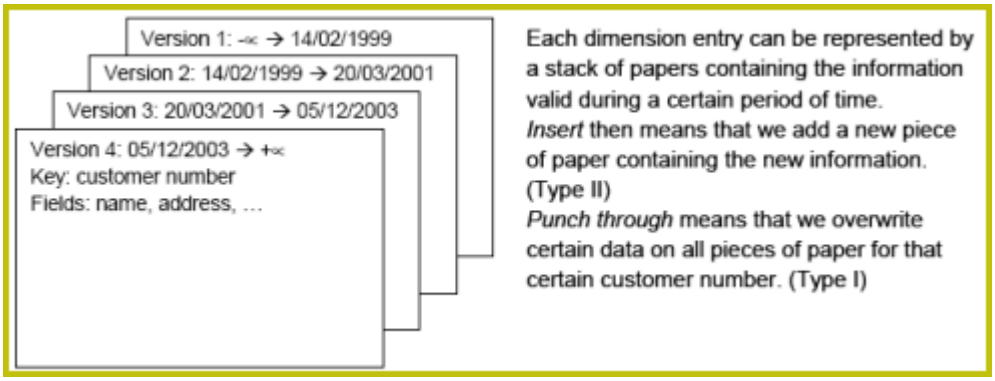
Option	Description
	connection to generate the technical key (typical for Oracle, for example) • Use auto increment field — Use an auto increment field in the database table to generate the technical key (typical for DB2, for example.).
Remove lookup fields?	Enable to remove all the lookup fields from the input stream in the output. The only extra field added is then the technical key.
Use hashcode	Enable to use a hash code.
Hashcode field in table	Allows you to generate a hash code, representing all values in the key fields in a numerical form (a signed 64-bit integer). This hash code has to be stored in the table.  **Important:** This hash code is NOT unique. As such it makes no sense to place a unique index on it.
Date of last update field	When required, specify the date of last update field (timestamp) from the source system to be copied to the data warehouse. For example, when you have an address without a primary key. The field will not be part of the lookup fields (nor be part in the hash code calculation). The value is written once only because any change results in a new record being written.
Get Fields	Fills in all the available fields on the input stream, except for the keys you specified.
SQL	Generates the SQL to build the dimension and allows you to execute this SQL.

 **Note:** The Combination Lookup/Update step assumes that the dimension table it maintains is not updated concurrently by other transformations/applications. For example, when you use the **Table Max + 1** method to create the technical keys, the step will not always go to the database to retrieve the next highest technical key. The technical keys will be cached locally, so if multiple transformations update the dimension table simultaneously you will most likely get errors on duplicate technical keys. Pentaho recommends that you do not concurrently update a dimension table, even if you are using a database sequence or auto increment technical key, because of possible conflicts between transformations.

 **Note:** It is assumed that the technical key is the primary key of the dimension table or at least has a unique index on it. It's not 100% required but if a technical key exists multiple times in the dimension table the result for the Combination Lookup/Update step is unreliable.

Dimension Lookup/Update

The Dimension Lookup/Update step allows you to implement Ralph Kimball's slowly changing dimension for both types: Type I (update) and Type II (insert). Not only can you use this step to update a dimension table, it may also be used to look up values in a dimension.



In this dimension implementation each entry in the dimension table has the following properties:

Option	Description
Technical key	This is the primary key of the dimension.
Version field	Shows the version of the dimension entry (a revision number).
Start of date range	This is the field name containing the validity starting date.
End of date range	This is the field name containing the validity ending date.
Keys	These are the keys used in your source systems. For example: customer numbers, product id, etc.
Fields	These fields contain the actual information of a dimension.

As a result of the lookup or update operation of this step type, a field is added to the stream containing the technical key of the dimension. In case the field is not found, the value of the dimension entry for not found (0 or 1, based on the type of database) is returned.

Note: This dimension entry is added automatically to the dimension table when the update is first run. If you have "NOT NULL" fields in your table, adding an empty row causes the entire step to fail! Make sure that you have a record with the ID field = 0 or 1 in your table if you do not want PDI to insert a potentially invalid empty record.

A number of optional fields (in the "Fields" tab) are automatically managed by the step. You can specify the table field name in the "Dimension Field" column. These are the optional fields:

- Date of last insert or update (without stream field as source): Adds and manages a Date field
- Date of last insert (without stream field as source): Adds and manages a Date field
- Date of last update (without stream field as source): Adds and manages a Date field
- Last version (without stream field as source): Adds and manages a Boolean field. (converted into Char(1) or boolean database data type depending on your database connection settings and availability of such data type). This acts as a current valid dimension entry indicator for the last version:. So when a type II attribute changes and a new version is created (to keep track of the history) the 'Last version' attribute in the previous version is set to 'False/N' and the new record with the latest version is set to 'True/Y'.

Lookup

In read-only mode (update option is disabled), the step only performs lookups in a slowly changing dimension. The step will perform a lookup in the dimension table on the specified database connection and in the specified schema. To perform the lookup it uses not only the specified natural keys (with an "equals" condition) but also the specified "Stream datefield" (see below). The condition that is applied is: `"Start or table date range" >= "Stream datefield" AND "End or table date range" < "Stream datefield"`

In the event no "Stream datefield" is specified the step uses the current system date to find the correct dimension version record.

Note: If you use an "alternative start date" the SQL clause described above will differ slightly.

In the event that no row is found, the "unknown" key is returned. This will be 0 or 1 depending on whether you selected an auto-increment field for the technical key field). Please note that we don't make a difference between "Unknown", "Not found", "Empty", "Illegal format", etc. These nuances can be added manually however. Nothing prevents you from flushing out these types before the data hits this step with a Filter, regular expression, etc. We suggest you manually add values -1, -2, -3, etc for these special dimension entry cases, just like you would add the specific details of the "Unknown" row prior to population of the dimension table.

Important: Because SQL is used to look up the technical key in the dimension table, take the following precautions:

- Do *not* use NULL values for your natural key(s). Null values cannot be compared and are not indexed by most databases.
- Be aware of data conversion issues that occur if you have data types in your input streams that are different from the data types in your natural key(s). If you are have Strings in the steps input and in the database you use an Integer for example, make sure you are capable of converting the String to number. See it as a best practice to do this before this step to make sure it works as planned. Another typical example of problems is with floating point number comparisons. Pentaho recommends you use data types such as Integer or Long Integers. Do not use Double, Decimal or catch-all data types such as Oracle's Number (without length or precision; it implicitly uses precision 38 causing the use of the slower BigNumber data type)

Update

In update mode (update option is enabled) the step first performs a lookup of the dimension entry as described in the "Lookup" section above. The result of the lookup is different though. Not only the technical key is retrieved from the query, but also the dimension attribute fields. A field-by-field comparison then follows. Results are as follows:

- The record was not found, new record is inserted into the table.
- The record was found and any of the following is true:
- One or more attributes were different and had an "Insert" (Kimball Type II) setting: A new dimension record version is inserted
- One or more attributes were different and had a "Punch through" (Kimball Type I) setting: These attributes in all the dimension record versions are updated
- One or more attributes were different and had a "Punch through" (Kimbal lType I) setting: These attributes are updated in all the dimension record versions
- One or more attributes were different and had an "Update" setting: These attributes in the last dimension record version are updated
- All the attributes (fields) were identical : No updates or insertions are performed

Note: If you mix Insert, Punch Through and Update options in this step, this algorithm acts like a Hybrid Slowly Changing Dimension. (it is no longer just Type I or II, it is a combination)

The following table provides a more detailed description of the options for the Dimension Lookup/Update step:

Option	Description
Step name	Optionally, you can change the name of this step to fit your needs
Update the dimension?	Enable to update the dimension based on the information in the input stream; if not enabled, the dimension only performs lookups and adds the technical key field to the streams
Connection	Name of the database connection on which the dimension table resides
Target schema	Schema name to improve precision in the quoting and allow for table names that contain dots '.'
Target table	Name of the dimension table
Commit size	Setting commit size to 10 generates a commit every 10 inserts or updates

Option	Description
Caching	• **Enable the cache?** Enable data caching in this step; set a cache size of >=0 in previous versions or -1 to disable caching • **Pre-load cache?** You can enhance performance by reading the complete contents of a dimension table prior to performing lookups. Performance is increased by the elimination of the round trips to the database and by the sorted list lookup algorithm. • **Cache size in rows** The cache size in number of rows that will be held in memory to speed up lookups by reducing the number of round trips to the database. **Note:** Only the last version of a dimension entry is kept in memory (unless pre-load is enabled). If there are more entries passing than what can be kept in memory, the technical keys with the highest values are kept in memory in the hope that these are the most relevant. **Important:** A cache size of 0 caches as many rows as possible and until your JVM runs out of memory. Use this option wisely with dimensions that can't grow too large. A cache size of -1 means that caching is disabled.
Keys tab	The names of the keys in the stream and in the dimension table; enables the step to perform the lookup
Fields tab	For each of the fields you must have in the dimension, you can specify whether you want the values to be updated (for all versions, this is a Type I operation) or you want to have the values inserted into the dimension as a new version. In the example we used in the screenshot the birth date is something that's not variable in time, so if the birth date changes, it means that it was wrong in previous versions. It's only logical then, that the previous values are corrected in all versions of the dimension entry.
Technical key field	The primary key of the dimension; also referred to as Surrogate Key. Use the new name option to rename the technical key after a lookup. For example, if you need to lookup different types of products like ORIGINAL_PRODUCT_TK, REPLACEMENT_PRODUCT_TK, ... **Note:** Renaming technical keys is only possible during lookup mode, not when running in update.
Creation of technical key	Indicates how the technical key is generated; options that are not available for your connection are grayed out • **Use table maximum + 1** A new technical key will be created from the maximum key in the table. Note that the new maximum is always cached, so that the maximum does not need to be calculated for each new row. • **Use sequence** Specify the sequence name if you want to use a database sequence on the table connection to generate the technical key (typical for Oracle e.g.).

Option	Description
	• **Use auto increment field** Use an auto increment field in the database table to generate the technical key (typical for DB2 e.g.).
Version field	The name of the field in which to store the version (revision number)
Stream Datefield	If you have the date at which the dimension entry was last changed, you can specify the name of that field here. It allows the dimension entry to be accurately described for what the date range concerns. If you do not have such a date, the system date is used. When the dimension entries are looked up (Update the dimension is not selected) the date field entered into the stream datefield is used to select the appropriate dimension version based on the date from and date to dates in the dimension record.
Date range start field	Specify the names of the dimension entries start range.
Use an alternative start date?	When enabled, you can choose an alternative to the "Min. Year"/01/01 00:00:00 date that is used. You can use any of the following: • **System date** Use the system date as a variable date/time • **Start date of transformation** Use the system date, taken at start of the transformation for the start date • **Empty (null) value** • **Column value** Select a column from which to take the value  **Important:** It is possible to create a non-conformed dimension with these options; use them wisely, however. Not all possibilities make sense!
Table daterange end	The names of the dimension entries end range
Get Fields	Fills in all the available fields on the input stream, except for the keys you specified
SQL	Generates the SQL to build the dimension and allows you to execute this SQL.

Validation

The PDI transformation steps in this section pertain to data validation.

Credit Card Validator

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Data Validator

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Mail Validator

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

XSD Validator

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Statistics

The PDI transformation steps in this section pertain to statistics and analysis.

Analytic Query

This step allows you to execute analytic queries over a sorted dataset. Examples of common use cases are:

- Calculate the "time between orders" by ordering rows by order date, and LAGing 1 row back to get previous order time.
- Calculate the "duration" of a web page view by LEADing 1 row ahead and determining how many seconds the user was on this page.

Option	Description
Step name	The name of this step as it appears in the transformation workspace. **Note**: This name *must* be unique within a single transformation.
Group fields table	Specify the fields you want to group. Click `Get Fields` to add all fields from the input stream(s). The step will do no additional sorting, so in addition to the grouping identified (ie, CUSTOMER_ID) here you *must* also have the data sorted (ORDER_DATE).
Analytic Functions table	Specify the analytic functions to be solved.
New Field Name	the name you want this new field to be named on the stream (PREV_ORDER_DATE)
Subject	The existing field to grab (ORDER_DATE)

Option	Description
Type	Set the type of analytic function; Lead - Go forward N rows and get the value of Subject. Lag - Go backward N rows and get the value of Subject
N	The number of rows to offset (backwards or forwards)

Examples

There are two examples available in the samples folder within Pentaho's distribution of PDI:

```
samples/transformations/Analytic Query - Lead One Example.ktr
samples/transformations/Analytic Query - Random Value Example.ktr
```

Group By

This step allows you to calculate values over a defined group of fields. Examples of common use cases are: calculate the average sales per product or get the number of yellow shirts that we have in stock. Sample transformations that include this step are located at:

- `.../samples/transformations/Group By - Calculate standard deviation.ktr`
- `.../samples/transformations/Group by - include all rows and calculations .ktr`
- `.../samples/transformations/Group By - include all rows without a grouping.ktr`

Group By Options

Option	Description
Step name	Optionally, you can change the name of this step to fit your needs.
Include all rows?	Enable if you want all rows in the output, not just the aggregation; to differentiate between the two types of rows in the output, a flag is required in the output. You must specify the name of the flag field in that case (the type is boolean).
Temporary files directory	The directory in which the temporary files are stored if needed; the default is the standard temporary directory for the system
TMP-file prefix	Specify the file prefix used when naming temporary files
Add line number, restart in each group	Enable to add a line number that restarts at 1 in each group
Line number field name	Enable to add a line number that restarts at 1 in each group
Always give back a row	If you enable this option, the Group By step will always give back a result row, even if there is no input row. This can be useful if you want to count the number of rows. Without this option you would never get a count of zero (0).
Group fields table	Specify the fields over which you want to group. Click Get Fields to add all fields from the input stream(s).
Aggregates table	Specify the fields that must be aggregated, the method and the name of the resulting new field. Here are the available aggregation methods: • Sum • Average (Mean) • Minimum

Option	Description
	• Maximum • Number of values (N) • Concatenate strings separated by , (comma) • First non-null value • Last non-null value • First value (including null) • Last value (including null) • Cumulative sum (all rows option only!) • Cumulative average (all rows option only!) • Standard deviation • Concatenate strings separated by <Value>: specify the separator in the Value column

Memory Group By

This step builds aggregates in a group by fashion and does not require a sorted input.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Always give back a result row	Option to provide a results summary.
The field that make up the group	After retrieving fields using the `Get Fields` button, designate the fields to include in the group.
Aggregates	After retrieving fields using the `Get looup fields` button, designate the fields to include in the group.

Output Steps Metrics

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Reservoir Sampling

The reservoir sampling step allows you to sample a fixed number of rows from an incoming data stream when the total number of incoming rows is not known in advance. The step uses uniform sampling; all incoming rows have an equal chance of being selected. This step is particularly useful when used in conjunction with the ARFF output step in order to generate a suitable sized data set to be used by WEKA. The reservoir sampling step uses *Algorithm R by Jeffery Vitter*.

Option	Description
Step name	The name of this step as it appears in the transformation workspace.
Sample size	Select how many rows to sample from an incoming stream. Setting a value of 0 will cause all rows to be sampled; setting a negative value will block all rows.
Random seed	Choose a seed for the random number generator. Repeating a transformation with a different value for the seed will result in a different random sample being chosen.

Sample Rows

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Univariate Statistics

This step allows simple, univariate statistics to be computed from incoming data in a Kettle transform.

For more information, including procedures on how to use this step, see *Using the Weka Statistics Plugin* on our wiki page.

Palo

The PDI transformation steps in this section pertain to interactivity with Palo business intelligence software.

Palo Cell Input

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Palo Cell Output

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Palo Dim Input

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Palo Dim Output

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Job

The PDI transformation steps in this section pertain to interactivity with a PDI job that is calling this transformation (a parent job).

Copy Rows to Result

This step allows you to transfer rows of data (in memory) to the next transformation (job entry) in a job.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Get Files From Result

This step allows you to read filenames used or generate in a previous entry in a job.

Every time a file gets processed, used or created in a transformation or a job, the details of the file, the job entry, the step, etc. is captured and added to the result. You can access this file information using this step.

Below is a list of the output fields generated by this step including an example of each:

- Type (string): Normal, Log, Error, Error-line, etc.
- Filename (string): somefile.txt
- Path (string): C:\Foo\Bar\somefile.txt
- Parentorigin (string): Process files transformation
- Origin (string): Text File Input
- Comment (string): Read by text file input
- Timestamp (date): 2006-06-23 12:34:56

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Get Rows From Result

This step returns rows that were previously generated by another transformation in a job. The rows were passed on to this step using the `Copy rows to result` step. You can enter the meta-data of the fields you're expecting from the previous transformation in a job.

Important: There is no validation performed on this metadata; it is intended as an aid during design.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Fieldname	Name of the field that contains the rows from the previous result.
Type	Type of data.
Length	For Number: Total number of significant figures in a number; For String: total length of string; For Date: length of printed output of the string.
Precision	For Number: Number of floating point digits; For String, Date, Boolean: unused.

Get Variables

This step allows you to get the value of a variable. This step can return rows or add values to input rows.

Note: You must specify the complete variable specification in the format `${variable}` or `%%variable%%`. That means you can also enter complete strings in the variable column, not just a variable.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Name	Name of the field.
Variable	Allows you to enter variables as complete strings to return rows or add values to input rows. For example, you can specify: `${java.io.tmpdir}/kettle/tempfile.txt` and it will be expanded to `/tmp/kettle/tempfile.txt` on Unix-like systems.
Type	Specifies the field type: String, Date, Number, Boolean, Integer, BigNumber, Serializable, or Binary..
Format	Allows you to specify the format of the field after the type has been determined.
Length	For Number: Total number of significant figures in a number; For String: total length of string; For Date: length of printed output of the string (for example, entering 4 would only return the year).
Precision	For Number: Number of floating point digits. Not used for String, Date, or Boolean.
Currency	Used to interpret numbers with currency symbols. For example, $10,000.00 or E5.000,00.
Decimal	Used to indicate whether to use a period (".") or comma (",") for number values.
Group	Used to indicate whether to use a period (".") or comma (",") for number values.
Trim type	Type trim this field before processing: select either none, left, right, or both (left and right).

Set Files in Result

This step allows you to set filenames in the result of a transformation. Subsequent job entries can then use this information as it routes the list of files to the results stream.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Filename field	Field that contains the filenames of the files to copy.
Type of file to	Select the type of file to set in results.

Set Variables

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Mapping

The PDI transformation steps in this section pertain to value mapping.

Mapping (sub-transformation)

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Mapping Input Specification

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Mapping Output Specification

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Bulk Loading

The PDI transformation steps in this section pertain to bulk loading of data.

ElasticSearch Bulk Insert

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Greenplum Bulk Loader

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Greenplum Load

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Infobright Loader

This step allows you to load data into an Infobright database table.

Important: If you want to use the InfoBright bulk loader step within Windows copy either one of the files listed below to your Windows system path (for example `%WINDIR%/System32/`):

```
libswt/win32/infobright_jni_64bit.dll (Windows 64-bit)
```

or

```
libswt/win32/infobright_jni.dll (Windows 32-bit)
```

Then rename the file to:

```
infobright_jni.dll
```

Option	Description
Step name	The name of this step as it appears in the transformation workspace.
Database	Drop-down menu allows you to select the appropriate Infobright database connection. Note: List is populated only once a database connection has already been established; if no database connection has been established, this list will be blank.
Infobright product	Select which version of the Infobright product you are using; Enterprise (EE) or Community (CE) edition.
Target schema	The name of the schema for the table to write data to. This is vital for data sources which allow for table names with dots ("..").
Target table	Name of the target table.
Character set	The used character set.
Agent port	Specify the port of the database.
Debug file	This step generates a `.txt` file, this option allows you to specify the file name of the debug file.

Ingres VectorWise Bulk Loader

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

LucidDB Streaming Loader

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

MonetDB Bulk Loader

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

MySQL Bulk Loader

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Oracle Bulk Loader

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

PostgreSQL Bulk Loader

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Teradata Fastload Bulk Loader

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Inline

The PDI transformation steps in this section pertain to inline data modification.

Injector

This step allows you to insert rows into the transformation using the Kettle API and Java.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.
Fieldname	Specify the field name of the rows to inject.
Type	Specify the type of data.
Length	For Number: Total number of significant figures in a number; For String: total length of string; For Date: length of printed output of the string.
Precision	For Number: Number of floating point digits; For String, Date, Boolean: unused.

Socket Reader

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Socket Writer

This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

Data Mining Steps

The PDI transformation steps in this section pertain to using Data Mining (Weka) plugins.

Weka Scoring

This step allows you to use the Weka scoring plugin in PDI. The Weka scoring plugin is a tool that allows classification and clustering models created with Weka to be used to score (attach a prediction to incoming rows of data) new data as part of a Kettle transform.

For more information, including procedures on how to use this step, see *Using the Weka Scoring Plugin* on our wiki page.

Reservoir Sampling

The reservoir sampling step allows you to sample a fixed number of rows from an incoming data stream when the total number of incoming rows is not known in advance. The step uses uniform sampling; all incoming rows have an equal chance of being selected. This step is particularly useful when used in conjunction with the ARFF output step in order to generate a suitable sized data set to be used by WEKA. The reservoir sampling step uses *Algorithm R by Jeffery Vitter*.

Option	Description
Step name	The name of this step as it appears in the transformation workspace.
Sample size	Select how many rows to sample from an incoming stream. Setting a value of 0 will cause all rows to be sampled; setting a negative value will block all rows.
Random seed	Choose a seed for the random number generator. Repeating a transformation with a different value for the seed will result in a different random sample being chosen.

ARFF Output

This step allows you to output data from PDI to a file in Weka's Attribute Relation File Format (ARFF). ARFF format is essentially the same as comma separated values (CSV) format, except with the addition of metadata on the attributes (fields) in the form of a header.

For more information, including procedures on how to use this step, see *Using the ARFF Output Plugin* on our wiki page.

Univariate Statistics

This step allows simple, univariate statistics to be computed from incoming data in a Kettle transform.

For more information, including procedures on how to use this step, see *Using the Weka Statistics Plugin* on our wiki page.

Knowledge Flow

This step allows entire data mining processes to be run as part of a transformation.

For more information, including procedures on how to use this step, see *Using the Knowledge Flow Plugin* on our wiki page.

Univariate Statistics

This step allows simple, univariate statistics to be computed from incoming data in a Kettle transform.

For more information, including procedures on how to use this step, see *Using the Weka Statistics Plugin* on our wiki page.

Weka Forecasting

This step can load or import a time series forecasting model created in Weka's time series analysis and forecasting environment and use it to generate a forecast for future time steps beyond the end of incoming historical data. This differs from the standard classification or regression scenario covered by the Weka Scoring plugin, where each incoming row receives a prediction (score) from the model, in that incoming rows provide a "window" over the recent history of the time series that the forecasting model then uses to initiate a closed-loop forecasting process to generate predictions for future time steps.

For more information, including procedures on how to use this step, see *Using the Weka Forecasting Plugin* on our wiki page.

Job Entry Reference

This section contains reference documentation for job entries.

Note: Many entries are not completely documented in this guide, but have rough definitions in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

File Encryption

The PDI job entries in this section pertain to file encryption operations.

Decrypt Files With PGP

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Encrypt Files With PGP

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Verify File Signature With PGP

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Big Data

The PDI job entries in this section pertain to Hadoop functions.

Note: PDI is configured by default to use the Apache Hadoop distribution. If you are working with a Cloudera or MapR distribution instead, you must install the appropriate patch before using any Hadoop functions in PDI. Patch installation is covered in the *PDI Installation Guide* and the *Pentaho Hadoop Guide*.

Amazon EMR Job Executor

This job entry executes Hadoop jobs on an Amazon Elastic MapReduce (EMR) account. In order to use this step, you must have an Amazon Web Services (AWS) account configured for EMR, and a premade Java JAR to control the remote job.

Option	Definition
Name	The name of this Amazon EMR Job Executer step instance.

Option	Definition
EMR Job Flow Name	The name of the Amazon EMR job flow (series of steps) you are executing.
AWS Access Key	Your Amazon Web Services access key.
AWS Secret Key	Your Amazon Web Services secret key.
S3 Staging Directory	The Amazon Simple Storage Service (S3) address of the working directory for this Hadoop job. This directory will contain the MapReduce JAR, and log files will be placed here as they are created.
MapReduce JAR	The Java JAR that contains your Hadoop mapper and reducer classes. The job must be configured and submitted using a static main method in any class in the JAR.
Command line arguments	Any command line arguments that must be passed to the static main method in the specified JAR.
Number of Instances	The number of Amazon Elastic Compute Cloud (EC2) instances you want to assign to this job.
Master Instance Type	The Amazon EC2 instance type that will act as the Hadoop "master" in the cluster, which handles MapReduce task distribution.
Slave Instance Type	The Amazon EC2 instance type that will act as one or more Hadoop "slaves" in the cluster. Slaves are assigned tasks from the master. This is only valid if the number of instances is greater than 1.
Enable Blocking	Forces the job to wait until each step completes before continuing to the next step. This is the only way for PDI to be aware of a Hadoop job's status. If left unchecked, the Hadoop job is blindly executed, and PDI moves on to the next step. Error handling/routing will not work unless this option is checked.
Logging Interval	Number of seconds between log messages.

Amazon Hive Job Executor

This job executes Hive jobs on an Amazon Elastic MapReduce (EMR) account. In order to use this step, you must have an Amazon Web Services (AWS) account configured for EMR, and a premade Java JAR to control the remote job.

Option	Definition
Name	The name of this job as it appears in the transformation workspace.
Hive Job Flow Name	The name of the Hive job flow to execute.
Existing JobFlow Id (optional)	The name of a Hive Script on an existing EMR job flow.
AWS Access Key	Your Amazon Web Services access key.
AWS Secret Key	Your Amazon Web Services secret key.
Bootstrap Actions	References to scripts to invoke before the node begins processing data. See *http://docs.amazonwebservices.com/ElasticMapReduce/latest/DeveloperGuide/Bootstrap.html* for more information.
S3 Log Directory	The URL of the Amazon S3 bucket in which your job flow logs will be stored. Artifacts required for execution (e.g.

Option	Definition
	Hive Script) will also be stored here before execution. (Optional)
Hive Script	The URL of the Hive script to execute within Amazon S3.
Command Line Arguments	A list of arguments (space-separated strings) to pass to Hive.
Number of Instances	The number of Amazon EC2 instances used to execute the job flow.
Master Instance Type	The Amazon EC2 instance type that will act as the Hadoop "master" in the cluster, which handles MapReduce task distribution.
Slave Instance Type	The Amazon EC2 instance type that will act as one or more Hadoop "slaves" in the cluster. Slaves are assigned tasks from the master. This is only valid if the number of instances is greater than 1.
Keep Job Flow Alive	Specifies whether the job flow should terminate after completing all steps.

Hadoop Copy Files

This job entry copies files in a Hadoop cluster from one location to another.

General

Option	Definition
Include Subfolders	If selected, all subdirectories within the chosen directory will be copied as well
Destination is a file	Determines whether the destination is a file or a directory
Copy empty folders	If selected, will copy all directories, even if they are empty the **Include Subfolders** option must be selected for this option to be valid
Create destination folder	If selected, will create the specified destination directory if it does not currently exist
Replace existing files	If selected, duplicate files in the destination directory will be overwritten
Remove source files	If selected, removes the source files after copy (a **move** procedure)
Copy previous results to args	If selected, will use previous step results as your sources and destinations
File/folder source	The file or directory to copy from; click **Browse** and select **Hadoop** to enter your Hadoop cluster connection details
File/folder destination	The file or directory to copy to; click **Browse** and select **Hadoop** to enter your Hadoop cluster connection details
Wildcard (RegExp)	Defines the files that are copied in regular expression terms (instead of static file names), for instance: .*\.txt would be any file with a .txt extension
Files/folders	A list of selected sources and destinations

Result files name

Option	Definition
Add files to result files name	Any files that are copied will appear as a result from this step; shows a list of files that were copied in this step

Hadoop Job Executor

This job entry executes Hadoop jobs on a Hadoop node. There are two option modes: **Simple** (the default condition), in which you only pass a premade Java JAR to control the job; and **Advanced**, in which you are able to specify static main method parameters. Most of the options explained below are only available in Advanced mode. The **User Defined** tab in Advanced mode is for Hadoop option name/value pairs that are not defined in the **Job Setup** and **Cluster** tabs.

General

Option	Definition
Name	The name of this Hadoop Job Executer step instance.
Hadoop Job Name	The name of the Hadoop job you are executing.
Jar	The Java JAR that contains your Hadoop mapper and reducer job instructions in a static main method.
Command line arguments	Any command line arguments that must be passed to the static main method in the specified JAR.

Job Setup

Option	Definition
Output Key Class	The Apache Hadoop class name that represents the output key's data type.
Output Value Class	The Apache Hadoop class name that represents the output value's data type.
Mapper Class	The Java class that will perform the map operation. Pentaho's default mapper class should be sufficient for most needs. Only change this value if you are supplying your own Java class to handle mapping.
Combiner Class	The Java class that will perform the combine operation. Pentaho's default combiner class should be sufficient for most needs. Only change this value if you are supplying your own Java class to handle combining.
Reducer Class	The Java class that will perform the reduce operation. Pentaho's default reducer class should be sufficient for most needs. Only change this value if you are supplying your own Java class to handle reducing. **If you do not define a reducer class**, then no reduce operation will be performed and the mapper or combiner output will be returned.
Input Path	The path to your input file on the Hadoop cluster.
Output Path	The path to your output file on the Hadoop cluster.
Input Format	The Apache Hadoop class name that represents the input file's data type.
Output Format	The Apache Hadoop class name that represents the output file's data type.

Cluster

Option	Definition
HDFS Hostname	Hostname for your Hadoop cluster.
HDFS Port	Port number for your Hadoop cluster.
Job Tracker Hostname	If you have a separate job tracker node, type in the hostname here. Otherwise use the HDFS hostname.
Job Tracker Port	Job tracker port number; this cannot be the same as the HDFS port number.
Number of Mapper Tasks	The number of mapper tasks you want to assign to this job. The size of the inputs should determine the number of mapper tasks. Typically there should be between 10-100 maps per node, though you can specify a higher number for mapper tasks that are not CPU-intensive.
Number of Reducer Tasks	The number of reducer tasks you want to assign to this job. Lower numbers mean that the reduce operations can launch immediately and start transferring map outputs as the maps finish. The higher the number, the quicker the nodes will finish their first round of reduces and launch a second round. Increasing the number of reduce operations increases the Hadoop framework overhead, but improves load balancing. **If this is set to 0**, then no reduce operation is performed, and the output of the mapper will be returned; also, combiner operations will also not be performed.
Enable Blocking	Forces the job to wait until each step completes before continuing to the next step. This is the only way for PDI to be aware of a Hadoop job's status. If left unchecked, the Hadoop job is blindly executed, and PDI moves on to the next step. Error handling/routing will not work unless this option is checked.
Logging Interval	Number of seconds between log messages.

Oozie Job Executor

This job entry executes Oozie Workflows. It is a front end on top of the OozieClient Java API that submits jobs to an Oozie server using web service calls.

Oozie is a workflow/coordination system to manage Hadoop jobs. Oozie Workflow jobs are Directed Acyclical Graphs (DAGs) of actions. Oozie Coordinator jobs are recurrent Oozie Workflow jobs and can be configured so a job is triggered by time (frequency) and data availability.

Oozie is integrated with the rest of the Hadoop stack supporting several types of Hadoop jobs out of the box (Java map-reduce, Streaming map-reduce, Pig, Distcp, etc.). To learn more about Oozie and Oozie Workflows, visit Oozie's website: *http://incubator.apache.org/oozie/index.html*.

Oozie Job Executor (Quick Setup Mode)

Option	Definition
Name	The name of this job instance.
Oozie URL	Field to enter an Oozie URL. *This must be a valid Oozie location.*
Enable Blocking	Option blocks the rest of a transformation from executing until the Oozie job finishes when checked.

Option	Definition
Polling Interval (ms)	Field allows you to set the interval rate to check for Oozie workflows.
Workflow Properties	Field to enter the Workfile Properties file. This path is required and must be a valid job properties file. In the properties file, the `oozie.wf.application.path` path must be set.

Oozie Job Executor (Advanced Setup Mode)

If you have not set the Oozie path within your workflow properties file, you can add the needed path with Advanced Setup Mode within the Oozie Job Executor. To access Advanced Setup Mode, from within the Oozie Job Executor dialog, click `Advanced Options`.

Advanced Setup Mode allows you to add the needed Oozie path to your workflow properties file. It does not add the path directly to the properties file, instead the path is added by the Oozie Job Executor, not directly changing your workflow properties file.

Option	Definition
Workflow Properties	Displays the arguments, and their values, that are set within the workflow properties file found at the Oozie URL specified within the `Oozie URL` field.
Add Argument (green plus button)	Allows you to add a workflow property argument. Use this button to add the required Oozie path if it is not already set. This does not add the path to the properties file, instead it adds it to the PDI job, which adds it to the workflow configuration upon execution of the job.
Delete Argument (red "x" button)	Allows you to delete an argument. To delete an argument from the Oozie Executor job, select the desired argument from Workflow Properties, then click the `Delete Argument` button.

Pentaho MapReduce

Note: This entry was formerly known as **Hadoop Transformation Job Executor**.

This job entry executes transformations as part of a Hadoop MapReduce job. This is frequently used to execute transformations that act as mappers and reducers in lieu of a traditional Hadoop Java class. The **User Defined** tab is for Hadoop option name/value pairs that are not defined in the **Job Setup** and **Cluster** tabs. Any properties defined here will be set in the MapReduce job configuration.

General

Option	Definition
Name	The name of this Hadoop Job Executer step instance
Hadoop Job Name	The name of the Hadoop job you are executing

Mapper

Option	Definition
Look in	Sets the context for the Browse button. Options are: **Local** (the local filesystem), **Repository by Name** (a PDI database or enterprise repository), or **Repository**

Option	Definition
	by Reference (a link to a transformation no matter which repository it is in).
Mapper Transformation	The KTR that will perform the mapping functions for this job.
Mapper Input Step Name	The name of the step that receives mapping data from Hadoop. This must be a MapReduce Input step.
Mapper Output Step Name	The name of the step that passes mapping output back to Hadoop. This must be a MapReduce Output step.

Combiner

Option	Definition
Look in	Sets the context for the Browse button. Options are: **Local** (the local filesystem), **Repository by Name** (a PDI database or enterprise repository), or **Repository by Reference** (a link to a transformation no matter which repository it is in).
Combiner Transformation	The KTR that will perform the combiner functions for this job.
Combiner Input Step Name	The name of the step that receives combiner data from Hadoop. This must be a MapReduce Input step.
Combiner Output Step Name	The name of the step that passes combiner output back to Hadoop. This must be a MapReduce Output step.
Combine single threaded	Indicates if the Single Threaded transformation execution engine should be used to execute the combiner transformation. If false, the normal multi-threaded transformation engine will be used. The Single Threaded transformation execution engine reduces overhead when processing many small groups of output.

Reducer

Option	Definition
Look in	Sets the context for the Browse button. Options are: **Local** (the local filesystem), **Repository by Name** (a PDI database or enterprise repository), or **Repository by Reference** (a link to a transformation no matter which repository it is in).
Reducer Transformation	The KTR that will perform the reducer functions for this job.
Reducer Input Step Name	The name of the step that receives reducing data from Hadoop. This must be a MapReduce Input step.
Reducer Output Step Name	The name of the step that passes reducing output back to Hadoop. This must be a MapReduce Output step.
Reduce single threaded	Indicates if the Single Threaded transformation execution engine should be used to execute the reducer transformation. If false, the normal multi-threaded transformation engine will be used. The Single Threaded transformation execution engine reduces overhead when processing many small groups of output.

Job Setup

Option	Definition
Suppress Output of Map Key	If selected the key output from the Mapper transformation will be ignored and replaced with NullWritable.
Suppress Output of Map Value	If selected the value output from the Mapper transformation will be ignored and replaced with NullWritable.
Suppress Output of Reduce Key	If selected the key output from the Combiner and/or Reducer transformations will be ignored and replaced with NullWritable.
Suppress Output of Reduce Value	If selected the key output from the Combiner and/or Reducer transformations will be ignored and replaced with NullWritable.
Input Path	A comma-separated list of input directories from your Hadoop cluster that will be used when using a file-based input format derived from *FileInputFormat*.
Output Path	The directory output from the MapReduce should be written to when using a file-based output format derived from *FileOutputFormat*.
Input Format	The Apache Hadoop class name that describes the input specification for the MapReduce job. See *InputFormat* for more information.
Output Format	The Apache Hadoop class name that describes the output specification for the MapReduce job. See *OutputFormat* for more information.
Clean output path before execution	If enabled the output path specified will be removed before the MapReduce job is scheduled.

Cluster

Option	Definition
Hadoop Distribution	The Hadoop Distribution to connect to. Only Cloudera has a different option; all others are **generic**.
HDFS Hostname	Hostname for your Hadoop cluster.
HDFS Port	Port number for your Hadoop cluster.
Job Tracker Hostname	If you have a separate job tracker node, type in the hostname here. Otherwise use the HDFS hostname.
Job Tracker Port	Job tracker port number; this cannot be the same as the HDFS port number.
Number of Mapper Tasks	The number of mapper tasks you want to assign to this job. The size of the inputs should determine the number of mapper tasks. Typically there should be between 10-100 maps per node, though you can specify a higher number for mapper tasks that are not CPU-intensive.
Number of Reducer Tasks	The number of reducer tasks you want to assign to this job. Lower numbers mean that the reduce operations can launch immediately and start transferring map outputs as the maps finish. The higher the number, the quicker the nodes will finish their first round of reduces and launch a second round. Increasing the number of reduce

Option	Definition
	operations increases the Hadoop framework overhead, but improves load balancing. **If this is set to 0**, then no reduce operation is performed, and the output of the mapper becomes the output of the entire job; also, combiner operations will also not be performed.
Enable Blocking	Forces the job to wait until each step completes before continuing to the next step. This is the only way for PDI to be aware of a Hadoop job's status. If left unchecked, the Hadoop job is blindly executed, and PDI moves on to the next job entry. Error handling/routing will not work unless this option is checked.
Logging Interval	Number of seconds between log messages.

Pig Script Executor

Executes a script written in Apache Pig's "Pig Latin" language on a Hadoop cluster. All log entries pertaining to this script execution that are generated by Apache Pig will show in the PDI log.

General

Option	Definition
Job Entry Name	The name of this Pig Script Executor instance.
HDFS hostname	The hostname of the machine that operates a Hadoop distributed filesystem.
HDFS port	The port number of the machine that operates a Hadoop distributed filesystem.
Job tracker hostname	The hostname of the machine that operates a Hadoop job tracker.
Job tracker port	The port number of the machine that operates a Hadoop job tracker.
Pig script	The path (remote or local) to the Pig Latin script you want to execute.
Enable blocking	If checked, the Pig Script Executor job entry will prevent downstream entries from executing until the script has finished processing.
Local execution	Executes the script within the same Java virtual machine that PDI is running in. This option is useful for testing and debugging because it does not require access to a Hadoop cluster. When this option is selected, the HDFS and job tracker connection details are not required and their corresponding fields will be disabled.

Script Parameters

Option	Definition
#	The order of execution of the script parameters.
Parameter name	The name of the parameter you want to use.
Value	The value you're substituting whenever the previously defined parameter is used.

Sqoop Export

The Sqoop Export job allows you to export data from Hadoop into an RDBMS using Apache Sqoop. This job has two setup modes:

- **Quick Mode** provides the minimum options necessary to perform a successful Sqoop export.
- **Advanced Mode**'s default view provides options for to better control your Sqoop export. **Advance Mode** also has a command line view which allows you to reuse an existing Sqoop command from the command line.

For additional information about Apache Sqoop, visit *http://sqoop.apache.org/*.

Quick Setup

Option	Definition
Name	The name of this job as it appears in the transformation workspace.
Namenode Host	Host name or IP address of the Hadoop NameNode.
Namenode Port	Port number of the Hadoop NameNode.
Jobtracker Host	Host name of the Hadoop JobTracker.
Job Tracker Port	Port number of the Hadoop JobTracker
Export Directory	Path of the directory within HDFS to export from.
Database Connection	Select the database connection to export to. Clicking **Edit...** allows you to edit an existing connection or you can create a new connection from this dialog by clicking **New...**.
Table	Destination table to export into. If the source database requires it a schema may be supplied in the format: SCHEMA.TABLE_NAME. This table must exist and its structure must match the input data's format.

Advanced Setup

Option	Definition
Default/List view	List of property and value pair settings which can be modified to suit your needs including options to configure an export from Hive or HBase.
Command line view	Field which accepts command line arguments, typically used to allow you to paste an existing Sqoop command line argument.

Sqoop Import

The Sqoop Import job allows you to import data from a relational database into the Hadoop Distributed File System (HDFS) using Apache Sqoop. This job has two setup modes:

- **Quick Mode** provides the minimum options necessary to perform a successful Sqoop import.
- **Advanced Mode**'s default view provides options for to better control your Sqoop import. **Advance Mode** also has a command line view which allows you to paste an existing Sqoop command line argument into.

For additional information about Apache Sqoop, visit *http://sqoop.apache.org/*.

Quick Setup

Option	Definition
Name	The name of this job as it appears in the transformation workspace.
Database Connection	Select the database connection to import from. Clicking **Edit...** allows you to edit an existing connection or you can create a new connection from this dialog by clicking **New...**.
Table	Source table to import from. If the source database requires it a schema may be supplied in the format: `SCHEMA.YOUR_TABLE_NAME`.
Namenode Host	Host name of the target Hadoop NameNode.
Namenode Port	Port number of the target Hadoop NameNode.
Jobtracker Host	Host name of the target Hadoop JobTracker.
Job Tracker Port	Port number of the target Hadoop JobTracker.
Target Directory	Path of the directory to import into.

Advanced Setup

Option	Definition
Default/List view	List of property and value pair settings which can be modified to suit your needs including options to configure an import to Hive or HBase.
Command line view	Field which accepts command line arguments, typically used to allow you to paste an existing Sqoop command line argument.

General

The PDI job entries in this section pertain to general data integration functions.

Start

Start defines the starting point for job execution. Every job must have one (and only one) Start. Unconditional job hops only are available from a Start job entry. The start job entry settings contain basic scheduling functionality; however, scheduling is not persistent and is only available while the device is running.

The Data Integration Server provides a more robust option for scheduling execution of jobs and transformations and is the preferred alternative to scheduling using the Start step. If you want the job to run like a daemon process, however, enable **Repeat** in the job settings dialog box.

Dummy

The **Dummy** job entry does nothing. It is just an entry point on the canvas; however, suppose you have a transformation that processes one row at a time. You have set the transformation so that it gets the initial five records and processes the additional records five at a time. The Job script must determine whether or not processing is complete. It may need to loop back over a few times. The job workflow drawing could be tough to read in this type of scenario. The Dummy job entry makes the job workflow drawing clearer for looping. Dummy performs no evaluation.

Example Plugin

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Job

Use the **Job** job entry to execute a previously defined job. Job entry jobs allow you to perform "functional decomposition." That is, you use them to break out jobs into more manageable units. For example, you would not write a data warehouse load using one job that contains 500 entries. It is better to create smaller jobs and aggregate them.

Below are the job options listed by tab name. The name of the job entry appears above every tab.

Transformation Specification

Option	Description
Name of the Job Entry	The unique name of the job entry on the canvas. A job entry can be placed on the canvas several times; however it will be the same job entry
Job Filename	If you are not working in a repository, specify the XML file name of the transformation to start. Click  to browse through your local files.
Specify by Name and Directory	If you are working in the Enterprise Repository, (or database repository) specify the name of the transformation to start. Click the **Browse In Jobs** button to browse through the repository.
Specify by Reference	If you specify a transformation or job by reference, you can rename or move it around in the repository. The reference (identifier) is stored, not the name and directory.

Advanced

Option	Description
Copy previous results to args?	The results from a previous transformation can be sent to this one using the **Copy rows to result** step
Copy previous results to parameters?	If **Execute for every input row** is enabled then each row is a set of command line arguments to be passed into the transformation, otherwise only the first row is used to generate the command line arguments.
Execute for every input row?	Implements looping; if the previous job entry returns a set of result rows, the job executes once for every row found. One row is passed to the job at every execution. For example, you can execute a job for each file found in a directory.
Remote slave server	The slave server on which to execute the job
Wait for the remote transformation to finish?	Enable to block until the job on the slave server has finished executing
Follow local abort to remote transformation	Enable to send the abort signal to the remote job if it is called locally

Logging Settings

Option	Description
Specify logfile?	Enable to specify a separate logging file for the execution of this transformation
Append logfile?	Enable to append to the logfile as opposed to creating a new one
Name of logfile	The directory and base name of the log file; for example **C:\logs**
Create parent folder	Create the parent folder for the log file if it does not exist
Extension of logfile	The file name extension; for example, **log** or **txt**
Include date in logfile?	Adds the system date to the log file
Include time in logfile?	Adds the system time to the log file
Loglevel	The logging level to use

Arguments

You can pass job command line arguments to a transformation.

Parameters

You can pass parameters to a transformation.

Set Variables

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Success

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Transformation

The **Transformation** job entry is used to execute a previously defined transformation.

Below are the transformation options listed by tab name. The name of the job entry appears above every tab.

Transformation Specification

Option	Description
Name of the Job Entry	The unique name of the job entry on the canvas. A job entry can be placed on the canvas several times; however it will be the same job entry

Option	Description
Transformation Filename	If you are not working in a repository, specify the XML file name of the transformation to start. Click to browse through your local files.
Specify by Name and Directory	If you are working in the Enterprise Repository, (or database repository) specify the name of the transformation to start. Click the **Browse In Jobs** button to browse through the repository.
Specify by Reference	If you specify a transformation or job by reference, you can rename or move it around in the repository. The reference (identifier) is stored, not the name and directory.

Advanced

Option	Description
Copy previous results to args?	The results from a previous transformation can be sent to this one using the **Copy rows to result** step
Copy previous results to parameters?	If **Execute for every input row** is enabled then each row is a set of command line arguments to be passed into the transformation, otherwise only the first row is used to generate the command line arguments.
Execute for every input row?	Allows a transformation to be executed once for every input row (looping)
Clear list of result files before execution?	Ensures that the list or result files is cleared before the transformation is started
Run this transformation in a clustered mode?	As described
Remote slave server	The slave server on which to execute the job
Wait for the remote transformation to finish?	Enable to block until the job on the slave server has finished executing
Follow local abort to remote transformation	Enable to send the abort signal to the remote job if it is called locally

Logging Settings

By default, if you do not set logging, Pentaho Data Integration will take log entries that are being generated and create a log record inside the job. For example, suppose a job has three transformations to run and you have not set logging. The transformations will not output logging information to other files, locations, or special configuration. In this instance, the job executes and puts logging information into its master job log.

In most instances, it is acceptable for logging information to be available in the job log. For example, if you have load dimensions, you want logs for your load dimension runs to display in the job logs. If there are errors in the transformations, they will be displayed in the job logs. If, however, you want all your log information kept in one place, you must set up logging.

Option	Description
Specify logfile?	Enable to specify a separate logging file for the execution of this transformation
Append logfile?	Enable to append to the logfile as opposed to creating a new one
Name of logfile	The directory and base name of the log file; for example **C:\logs**

Option	Description
Create parent folder	Enable to create a parent folder for the log file it it does not exist
Extension of logfile	The file name extension; for example, **log** or **txt**
Include date in logfile?	Adds the system date to the log file
Include time in logfile?	Adds the system time to the log file
Loglevel	The logging level to use

Arguments

You can pass job command line arguments to a transformation.

Parameters

You can pass parameters to a transformation.

Mail

The PDI job entries in this section pertain to email operations.

Get Mails (POP3/IMAP)

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Mail

Use the **Mail** job entry to send a text or HTML email with optional file attachments. This job entry is used at the end of a job run in most instances. It can be used to announce both a job failure or success. For example, it is not uncommon at the end of a successful load, to send an email to a distribution list announcing that the load was successful and include a log file. If there are errors, an email can be sent to alert individuals on a distribution list.

Important: No email messages are sent when a job crashes during a run. If you are bound by service level agreements or quality of service agreements you may not want to use this job entry as a notification method.

The Mail job entry requires an SMTP server. You can use authentication and security as part of the connection but you must have the SMTP credentials.

You can attach files to your email messages such as error logs and regular logs. In addition, logs can be zipped into a single archive for convenience.

Addresses

Option	Description
Job entry name	The unique name of the job entry on the canvas. A job entry can be placed on the canvas several times; however it will be the same job entry
Destination Address	The destination for the email; you can specify multiple addresses if you separate them with a space or comma.  **Note:** Do not maintain your distribution list within a job. Rather, have your email administrators set up a list so that you can send to a specified

Option	Description
	list each time you create the job. Operational functions such as Email contents, routing, people, and so on should be managed outside of Pentaho Data Integration.
Cc:	An identical copy of the message is also sent to all the addresses listed in the Cc: field. To enter more than one address in the Cc: field, separate them with commas.
BCc:	Send to a recipient whose email address does not appear in the message
Sender name	Name of the person sending the email
Sender address	Email address of the person sending the email
Reply to	Email address of the person to which to send a reply
Contact person	The name of the contact person to be placed in the email
Contact phone	The contact telephone number to be placed in the email

Server

Option	Description
SMTP Server	The SMTP server address
Port	The port on which the SMTP Server is running
Authentication	Enable to set authentication to the SMTP Server
Authentication user	SMTP user account name
Authentication password	SMTP user account password
Use Secure Authentication?	Enable to use secure authentication
Secure Connection Type	Select authentication type

Email Message

Option	Description
Include date in message?	Enable to include date in message
Only send comment in mail body?	If not enabled the email will contain information about the job and its execution in addition to the comment
Use HTML in mail body	As described
Encoding	Select encoding type
Manage Priority	Enable to manage priority
Subject	As described
Comment	As described

Attached Files

Option	Description
Attach files to message?	Enable to attach a file to your email message
Select file type	As described
Zip files to single archive?	Enable to have attachments achived in a zip file

Option	Description
Name of the zip archive	As described
Filename	Name of a *single* image file
Content ID	Automatically entered
Image	The full path to image (used when embedding multiple images) Click **Edit** to edit the path; click **Delete** to delete the path to the image
Content ID	The image content ID (used when embedding multiple images) Click **Edit** to edit the content ID; click **Delete** to delete the Content ID

Mail Validator

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

File Management

The PDI job entries in this section pertain to file input/output operations.

Add Filenames to Result

This job entry allows you to add a set of files or folders to the result list of the job entry. That list of filenames can then be used in the various job entries all around.

Option	Description
Job entry name	The name of the job entry. This name must be unique within a single job. A job entry can be placed several times on the canvas, however it will be the same job entry.
Include subfolders	Include subfolders of the selected folders
Copy previous results to?	Passes the results of the previous entry to the arguments of this entry.
Clear result filenames?	This option clears the list of result files (from previous job entries) before creating a new list.
File/Folder	Specify the list of files or folders with wildcards (regular expressions) in this grid. You can add a different source/destination on each line. **Note**: You can use the Add button to add a line to the Files/Folders list.

Compare Folders

This job entry compares two folders to determine if the content is identical; the result will either be true or false.

Option	Description
Job entry name	The name of the job entry. This name must be unique within a single job. A job entry can be placed several times on the canvas, however it will be the same job entry.
Include Subfolders	Also compare the content of sub-folders.

Option	Description
Compare	Specify what to compare: `All`, `Only files`, `Only folders`, or `Let me specify...`
Wildcard	If you chose `Let me specify` in the previous option, you can specify the regular expression of files to compare.
Compare file size	Check this to compare file size, in opposed to just comparing folder names.
Compare file content	Checks if files have the same content. **Note**: this may cause slower processing speeds.
File/Folder name 1	This is the first file or folder to compare
File/Folder name 2	This is the second file or folder to compare

Convert File Between DOS and Unix

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Copy Files

You can copy one of more files or folders with this job entry.

General tab

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.
Include subfolders	Check this option if you want to include subfolders. Note: This option will only work when the source is a folder.
Destination is a file	PDI will consider destination a file.
Copy empty folders	Check this option to also copy empty folders.
Create destination folder	This option will create a folder; if destination is a file, parent folder will be created as necessary.
Replace existing files	If the destination file or folder exists, this option will replace it, otherwise PDI will ignore it.
Remove source files	Remove the source files after copying. Only files will be removed.
Copy previous results to args	Check this option to pass the results of the previous entry to the arguments of this entry. Note: Arguments must be in the following order: 1) source folder/file, 2) destination folder/file, 3) wildcard.
File/Folder source	Enter the file or folder to be copied. Note: If destination is a folder, PDI will only fetch the files within the folder if the `Include Subfolders` option is checked. Note: You can use the Add button to add a line to the Files/Folders list.
File/Folder destination	Enter the destination file or folder.

Option	Definition
Wildcard (RegExp)	Allows you to use wildcard expressions to specify source or destination files or folders.
Files/Folders:	Table displays copying parameters set in the fields above after pressing the Add button.

Result files name tab

Option	Definition
Add files to result files name	Add destination files to result files name.

Copy or Remove Result Filenames

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Create a Folder

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Create File

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Delete File

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Delete Filenames From Result

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Delete Files

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Delete Folders

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

File Compare

The File Compare job entry allows you to compare the contents of two files and the flow of the job will depend on the results. When the contents of the files are the same the success outgoing hop will be followed. When the content of the files is not the same, the failure hop will be followed.

Option	Description
Job entry name	The name of the job entry. This name must be unique within a single job.
File name 1	The name and path of the file of the first file to compare.
File name 2	The name and path of the file of the second file to compare.

HTTP

Use the HTTP job entry to retrieve a file from a Web server using the HTTP protocol. This job entry could be used to access data on partner Web sites. For example, the daily data export or daily list of customers is located at a specified Web site. Also, SaaS providers may give you a URL to locate a report. You can call that URL to retrieve an Excel file or zip file that contains the data. Salesforce requires that you use SOAP APIs to retrieve data.

If HTTP traffic is too heavy in your corporate environment, you may choose to use a proxy server with HTTP authentication.

General

Option	Definition
Name of job entry	The name of the job entry. This name has to be unique in a single job. A job entry can be placed several times on the canvas, however it will be the same job entry.
URL	The HTTP URL of the file to retrieve, or the directory name to store an uploaded file to
Run for every result row?	If selected, an HTTP request will be made for each result. Otherwise, the file is only retrieved once
Input field which contains URL	If the previous option is selected, the field specified here will determine the file URL for each row

Option	Definition
Username	If the site requires authentication, use this username to log in
Password	If a username is defined, this is the password for it
Proxy server for upload	The URL of a proxy server that you want to connect to the HTTP URL through
Proxy port	If a proxy server is defined, this is the port number it listens on
Ignore proxy for hosts	A regular expression list of exceptions for proxy redirection. This may be useful when working on an intranet or VPN
Upload file	If you are uploading a file, this will be its name on the remote server
Target file	If you are downloading a file, this its name on your local filesystem
Append to specified target file?	If selected, and if the target file already exists, PDI will append all new data to the end of the file
Add date and time to file name?	If selected, the date and time of the HTTP request (in yyyMMdd_HHmmss format) will be added to the target filename
Target file extension	If the previous option is selected, this field specifies the extension (letters after the dot) of the target filename
Add filename to result filename	Any files that are copied will appear as a result from this step; shows a list of files that were copied in this step

Headers

Option	Definition
#	Order that the header should be processed
Name	The name of this HTTP header
Value	The actual header value to pass

Move Files

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Unzip File

This entry allows you to unzip one or more files and pass the contents to a transformation.

General tab

Option	Description
Job entry name	The name of this entry as it appears in the transformation workspace.

Option	Description
Get args from previous	Check this option if you want to use the list of result files (from a previous job entry) as the list of files to unzip.
Zip file name	The name of the zip file or a folder if you want to use a wildcard.
Source wildcard	If the previous option is a folder, you can enter a regular expression wildcard here. Note: The regex is compared against the absolute path of the file and a complete match MUST be made. For example, to match `/folder/test.zip`, a regex of `te.*\.zip` will come up empty. Use `.*te.*\.zip` instead to account for the folders ahead of it.
Use zipfile name as root directory	Check this if you want to create a separate directory for each zip filename (same name as file).
Target directory	Allows you to specify the target directory to unzip content in.
Create folder	Check this if you want to create a new folder for the target folder.
Include wildcard	Use this regular expression to select the files in the zip archives to extract.
Exclude wildcard	Use this regular expression to select the files in the zip archives not to extract.
Include date in filename	Include the current date in the unzipped filenames (format yyyyMMdd).
Include time in filename	Include the time in the unzipped filenames (format HHmmss).
Specify date time format	Allows you to specify the date time format.
Date time format	Allows you to specify the date time format from a predefined list of formats.
Add original timestamp	Check this option to extract the files with the original timestamp instead of the current timestamp.
Set modification date to original	Set last modification date to the original timestamp.
If files exists	Select the action to take if the target (unzipped) file exists.
After extraction	Select the action to take after zip file extraction.
Move files to	If the previous option is set to `Move files`, you can select the target directory here.
Create folder	Check this if you want to create a new folder for the target folder.

Advanced tab

Option	Description
Add extracted file to result	Add the extracted file names to the list of result files of this job entry for use in the next job entries.
Success condition:	Allows you to specify the success factor of this job entry.
Limit files	Allows you to limit the number of files returned.

Wait For File

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Write to File

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Zip File

This step creates a standard ZIP archive using options specified in the dialog.

General Tab

Option	Description
Job entry name	The name of this entry as it appears in the transformation workspace.
Get arguments from	If this option is selected, you must give four arguments: 1) Source folder (or file) name. 2) Wildcard to include (turn it to null if you select file in 1-). 3) Wildcard to exclude (turn it to null if you select file in 1-). 4) Destination zip filename (full path).
Source directory	The source directory of the files to be zipped.
Include wildcard	The wildcard (regular expression) of the files to include in the zip archive.
Exclude wildcard	The wildcard (regular expression) of the files to exclude from the zip archive.
Include subfolders?	Option enables searching of all subfolders within the selected folder.
Zip File name	The full name of the destination archive.
Create Parent folder	Check this option if you want to create a parent folder. Otherwise, PDI will throw an exception when parent folder doesn't exist.
Include date in filename	Check this option if you want to add the date in the zip filename.
Include time in filename	Check this option if you want to add the time in the zip filename.
Specify Date time format	Specify the date or time format to include in the zip filename.

Advanced Tab

Option	Description
Compression	The compression level to be used (Default, Best Compression, Best speed).
If zip file exists:	The action to take when there already is a file at the target destination.
After zipping	Specify the action to take after zipping.
Move files to	The target directory to move the source files to after zipping.
Create folder	Create folder if needed.
Add zip file to result	Check this option if you want to add the zip file to result's filename and then attached in an email.

Conditions

The PDI job entries in this section pertain to conditional functions.

Check DB Connections

This job entry allows you to verify connectivity with one or several databases.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.
Connection	List of connections.
Wait	After the connection was opened, wait x (s, min, hrs).
Units of Time	Specify the unit of measurement for the length of time to remain connected.
Get connections	Get available connects.

Check Files Locked

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Check If a Folder is Empty

This job entry verifies if a folder is empty; that there are no files in the folder.

Option	Description
Job entry name	The name of the job entry. This name must be unique within a single job. A job entry can be placed several times on the canvas, however it will be the same job entry.
Folder name	The name of the folder to verify for emptiness.
Limit search to	Limits the search for files to those with a certain wildcard (regular expression)

Option	Description
Wildcard	The wildcard (regular expression) to limit the files to look for with, for example: .*\.txt$

Check Webservice Availability

This step checks if a given URL is valid, can be connected and data can be read from.

If it connects within the given timeout and data can be read, it returns 'true', otherwise 'false'.

Further information of the failing reason can be found in the log as an error log entry.

Option	Description
Job entry name	The name of the job entry. This name must be unique within a single job. A job entry can be placed several times on the canvas, however it will be the same job entry.
URL field	Specifies the URL fieldname in the data stream. The URL is checked for every row that is coming into this step.
Connect timeout (ms)	The connect timeout in ms. The value is depending on the quality of service of this URL and experiences.
Read timeout (ms)	After connection, the step tries to read data. This value gives the read timeout in ms. The value is depending on the quality of service of this URL and experiences.

Checks If Files Exist

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Columns Exist in a Table

This job entry verifies that one or more columns exist in a database table.

Option	Description
Job entry name	The name of the job entry. This name must be unique within a single job. A job entry can be placed several times on the canvas, however it will be the same job entry.
Connection	The database connection to use
Schema name	The schema of the table to use
Table name	The name of the table to use
Columns	The list of column names to verify (one or more)

Evaluate Files Metrics

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Evaluate Rows Number in a Table

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

File Exists

Use the **File exists** job entry to verify that a specified file exists on the server on which Pentaho Data Integration is running. You must provide the file name. Pentaho Data Integration returns a True or False value depending on whether or not the file exists.

The File Exists job entry can be an easy integration point with other systems. For example, suppose you have a three-part data warehouse load process. The first part runs in PERL. You have batch scripts that accesses data from a remote location, performs first-level row processing, and outputs the data to a specified directory. You do not want to start the job until this is done, so you put the job on a scheduler. As soon as the task is complete, the file is placed in a well-known location so that the "file exists." That is the signal that launches the job for final processing.

Note: This job entry performs one check and then moves on. If you want to poll until the files appear, use the **Wait for File** or **Wait for SQL** job entries which have a polling interval parameter.

Option	Description
Job entry name	The name of this entry as it appears in the transformation workspace.
File name	The name and path of the file to check for.

Simple Evaluation

With this step, you can evaluate contents of a variable or a field in the result stream.

Connect two steps with the output of the Simple Evaluation. The green connection will be called on success, the red one on failure.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.
Evaluate	Select this to evaluate a variable set before.
Field name	Enter the variable name using the usual syntax.
Type	The type of your variable.
Success condition	Select the condition to be met for a successful result.
Value	Value to compare the variable to.

Table Exists

Use the **Table exists** job entry to verify that a specified table exists on a database. You must provide a connection and the table name. Pentaho Data Integration returns a True or False value depending on whether or not the table exists.

Suppose you have an external system that creates a summary table or yesterday's data extract. The external system may not have performed the action yet, so you set up a polling piece that waits for the staged data to arrive in the database. There is no point in processing the job until the data is available, so you can use this job entry as a semaphore that polls the database to determine whether or not the table exists.

Note: This job entry performs one check and then moves on. If you want to poll until the tables appear, use the **Wait for File** or **Wait for SQL** job entries which have a polling interval parameter.

Option	Description
Job entry name	The unique name of the job entry on the canvas. A job entry can be placed on the canvas several times; however it will be the same job entry
Connection	The connection to use
Schema name	The schema name if applicable to your database
Table name	The name of the database table to check

Wait For

You can use the Wait for to wait a delay before running the next job entry.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.
Wait for	The delay to wait.
Unit time	Specify the unit time (second, minute and hour)

Scripting

The PDI job entries in this section pertain to script execution.

JavaScript

Use the **JavaScript** job entry to calculate a boolean expression. The result can be used to determine which step will be executed next. You can use functions, procedure calls, ANDs, ampersands, ORs, EQUALs, etc. The Javascript job entry evaluates (returns?) a true or false.

The following variables are available for the expression:

Variable	Description
errors	Number of errors in the previous job entry (long)
lines_input	Number of rows read from database or file (long)
lines_output	Number of rows written to database or file (long)
lines_updated	Number of rows updated in a database table (long)
lines_read	number of rows read from a previous transformation step (long)
lines_written	Number of rows written to a next transformation step (long)
files_retrieved	Number of files retrieved from an FTP server (long)
exit_status	The exit status of a shell script (integer)
nr (integer)	The job entry number; increments at every next job entry
is_windows	use if Pentaho Data Integration runs on Windows (boolean)

Shell

Use the **Shell** job entry to execute a shell script on the host where the job is running. For example, suppose you have a program that reads five data tables and creates a file in a specified format. You know the program works. Shell allows you to do portions of your work in Pentaho Data Integration but reuse the program that reads the data tables as needed.

The Shell job entry is platform agnostic; you can use a batch file, UNIX, and so on. When you use a Shell job entry, Pentaho Data Integration makes a Java call to execute a program in a specified location. The return status is provided by the operating system call. For example, in batch scripting a return value of 1 indicates that the script was successful; a return value of 0 (zero) indicates that it was unsuccessful. You can pass command line arguments and set up logging for the Shell job entry.

General

Option	Description
Job entry name	The unique name of the job entry on the canvas. A job entry can be placed on the canvas several times; however it will be the same job entry
Insert script	Enable to insert the shell script; click on the Script tab to manually enter your script
Script file name	The file name of the shell script to execute
Working directory	The working directory for the command or script
Specify logfile?	Enable to specify a separate logging file for the execution of this transformation
Append logfile?	Enable to append to the logfile as opposed to creating a new one
Name of logfile	The directory and base name of the log file; for example **C:\logs**
Extension of logfile	The file name extension; for example, **log** or **txt**
Include date in logfile?	Adds the system date to the log file
Include time in logfile?	Adds the system time to the log file
Loglevel	Specifies the logging level for the execution of the shell
Copy previous results to args?	The results from a previous transformation can be sent to the shell script using **Copy rows to result** step
Execute for every input row?	Implements looping; if the previous job entry returns a set of result rows, the shell script executes once for every row found. One row is passed to this script at every execution in combination with the copy previous result to arguments. The values of the corresponding result row can then be found on command line argument $1, $2, ... (%1, %2, %3, ... on Windows).
Fields	Values to be passed into the command/script as command line arguments. (Not used if **Copy previous results to args** is used)

Script

An arbitrary script that can be used as the files contents if **Insert script** is enabled

SQL

Use the **SQL** job entry to execute an SQL script. You can execute more than one SQL statement, as long as they are separated by semi-colons. The SQL job entry is flexible; you can perform procedure calls, create and analyze tables, and more. Common uses associated with the SQL job entry include truncating tables, drop index, partition loading, refreshing materialized views, disabling constraints, disabling statistics, and so on.

Option	Description
Job entry name	The unique name of the job entry on the canvas. A job entry can be placed on the canvas several times; however it will be the same job entry.
Connection	The database connection to use
SQL from file	Enable to use SQL script from file
SQL filename	Specify SQL file name
Send SQL as single	If enabled the entire block is sent as a single statement on the database. If not enabled, each statement (as terminated by ';') is executed individually.
Use variable substitution	Resolve the SQL block against Pentaho Data Integration variables
SQL Script	The SQL script to execute

Bulk Loading

The PDI job entries in this section pertain to bulk loading of data.

Bulkload From MySQL Into File

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Bulkload Into MSSQL

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Bulkload Into MySQL

This step loads data from a text file into a MySQL table.

Option	Description
Job entry name	The name of the job entry. This name must be unique within a single job. A job entry can be placed several times on the canvas, however it will be the same job entry.
Connection	The connection to the MySQL database to use.
Target schema	The schema of the table to load
Target table name	The name of the table to load into
Source file name	The name of the file to load
Local	Check this if the file is local
Priority	The priority to load the file with

Option	Description
Fields terminated by	The field terminator to use
Fields enclosed by	The field enclosure to use
Fields escaped by	The escape character to use
Lines started by	The line start string to use
Lines terminated by	The line termination string to use
Fields	The fields to load, separated by comma (,)
Replace data	Check this option if you want to replace the data in the target data
Ignore the first ... lines	Ignores the first ... lines in the text file
Add files to result	Check this option if you want to re-use the filename of the text file in a next job entry.

MS Access Bulk Load

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

XML

The PDI job entries in this section pertain to XML validation and XSL execution.

Check if XML FIle is Well-Formed

This job entry verifies if one or more files contain well formed (allowed) XML content.

General tab

Option	Description
Job entry name	The name of the job entry. This name must be unique within a single job.
Include Subfolders	Option to move the content of sub-folders.
Copy previous results to args	Check this to pass the results of the previous entry into the arguments of this entry.
Files/Folders	Specify the list of files or folders with wildcards (regular expressions) in this grid. You can add a different source/destination on each line. **Note**: You can use the Add button to add a line to the Files/Folders list.

Advanced tab

In this tab you can specify the files and/or folders to move.

Option	Description
Job entry name	The name of the job entry. This name must be unique within a single job. A job entry can be placed several times on the canvas, however it will be the same job entry.
Success on	Allows you to set specific success conditions: Success if all files are well formed, Success if at least x files are well formed, or Success when number of bad formed files less than.
Result files name	Specify which kind of filenames to add: all filenames, only well formed filenames, or only bad filenames.

DTD Validator

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

XSD Validator

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

XSL Transformation

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Utility

The PDI job entries in this section pertain to a variety of special-case job operations.

Abort Job

Use this job entry if you want to abort a job.

Option	Description
Name of the job entry	The name of this step as it appears in the transformation workspace. **Note**: This name must be unique within a single transformation.
Message	Message to add in log when aborting.

Display Msgbox Info

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

HL7 MLLP Acknowledge

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

HL7 MLLP Input

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Ping a Host

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Send Information Using Syslog

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Send SNMP Trap

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Talend Job Execution

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Truncate Tables

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Wait for SQL

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Write to Log

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Repository

The PDI job entries in this section pertain to PDI database or enterprise repository functions.

Check if Connected to Repository

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Export Repository to XML File

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

File Transfer

The PDI job entries in this section pertain to file transfer operations.

FTP Delete

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Get a File with FTP

Use the **Get a File with FTP** job entry to retrieve one or more files from an FTP server. This job entry does not "crawl" systems. It will not, for example, access a remote directory and go to other directories to find files that match a wildcard. This job retrieves files from one directory exclusively.

General

Option	Description
Job entry name	The unique name of the job entry on the canvas. A job entry can be placed on the canvas several times; however it will be the same job entry
FTP server name/IP address	The name of the server or the IP address
Server Port	Port number of the FTP server
Username	The user name associated with FTP server account
Password	The password associated the FTP server account
Proxy host	Proxy server host name
Proxy port	Proxy server port number
Proxy username	Proxy server account user name
Proxy password	Proxy server account password
Binary mode	Enable if files must be transferred in binary mode
Timeout	The FTP server timeout in seconds
Use Active FTP connection	Enable if you are connecting to the FTP server using Active mode; you must set your firewall to accept connections to the port that your FTP client will open. The default is Passive mode.
Control Encoding	Encoding matters when retrieving file names that contain special characters. For Western Europe and the USA, **ISO-8859-1** usually suffices. Select encoding that is valid for your server.

Files

Option	Description
Remote directory	The remote directory on FTP server from which files are taken
Wildcard (regular expression)	Regular expression when you want to select multiple files. For example: `.*txt$ : get all text files A.*[ENG:0-9].txt : files starting with A, ending with a number and .txt`
Remove files after retrieval	Remove the files on the FTP server, but only after all selected files have been successfully transferred
Move to Folder	Moves files to specified folder
Create Folder	Creates folder that will contain files
Target Directory	The directory where you want to place the retrieved files
Include date in filename	Adds the system date to the filename (_20101231)
Include time in filename	Adds the system time to the filename (_235959)
Specify date time format	Enable to provide your own date/time format; the default is **yyyyMMdd'_'HHmmss**
Date time format	Select date time format
Add date before extension	Adds date to the file name before the extension
Don't overwrite files	Enable to skip, rename, or fail if a file with an identical name already exists in the target directory
If file exists	Action to take if a file with an identical name already exists in the target directory
Add filenames to result	Enable to add the file name(s) read to the result of this job

Advanced

Option	Description
Success on	Sets conditions of success
Limit files	Sets number of files associated with a condition of success

Socks Proxy

Option	Description
Host	Socks Proxy host name
Port	Socks Proxy port number
Username	User name associated with the Socks Proxy account
Password	Password associated with the Socks Proxy account

Get a File With FTPS

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Get a file with SFTP

Use the **Get a file with SFTP** job entry to retrieve one or more files from an FTP server using the Secure FTP protocol.

Option	Description
Job entry name	The unique name of the job entry on the canvas. A job entry can be placed on the canvas several times; however it will be the same job entry
SFTP server name /IP	The name of the SFTP server or the IP address
Port	The TCP port to use; usually 22
User name	The user name to log onto the SFTP server
Password	The password to log onto the SFTP server
Copy previous results to args	Enable to use the list of result files from the previous job entry (entries) instead of the static file list below
Remote directory	The remote directory on the SFTP server from which we retrieve the files
Wildcard (regular expression)	Specify a regular expression here if you want to select multiple files. For example: `*txt$ : get all text files A.*[ENG:0-9].txt : get all files starting with A ending with a number and .txt`
Remove files after retrieval?	Enable to remove the files after they have been successfully transferred
Target directory	The directory where you want to place the transferred files
Add filename to result	Enable to add the file name(s) read to the result of this job

Put a File With FTP

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Put a File With SFTP

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

SSH2 Get

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

SSH2 Put

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Upload Files to FTPS

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Job+Entries*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Palo

The PDI job entries in this section pertain to Palo databases.

Palo Cube Create

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Palo+Cube+Create*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Palo Cube Delete

This entry is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Palo+Cube+Create*.

Option	Definition
Job entry name	The name of this entry as it appears in the transformation workspace.

Troubleshooting

This section contains information about changing the Kettle Home directory. More troubleshooting tips will be added to this document in the future.

Changing the Pentaho Data Integration Home Directory Location (.kettle folder)

The default Pentaho Data Integration (PDI) `HOME` directory is the user's home directory (for example, in Windows `C:\Documents and Settings\{user}\.kettle` or for all other *nix based operating systems (`$HOME/.kettle`). The directory may change depending on the user who is logged on. As a result, the configuration files that control the behavior of PDI jobs and transformations are different from user to user. This also applies when running PDI from the Pentaho BI Platform.

When you set the KETTLE_HOME variable, the PDI jobs and transformations can be run without being affected by the user who is logged on. KETTLE_HOME is used to change the location of the files normally in [user home].kettle.

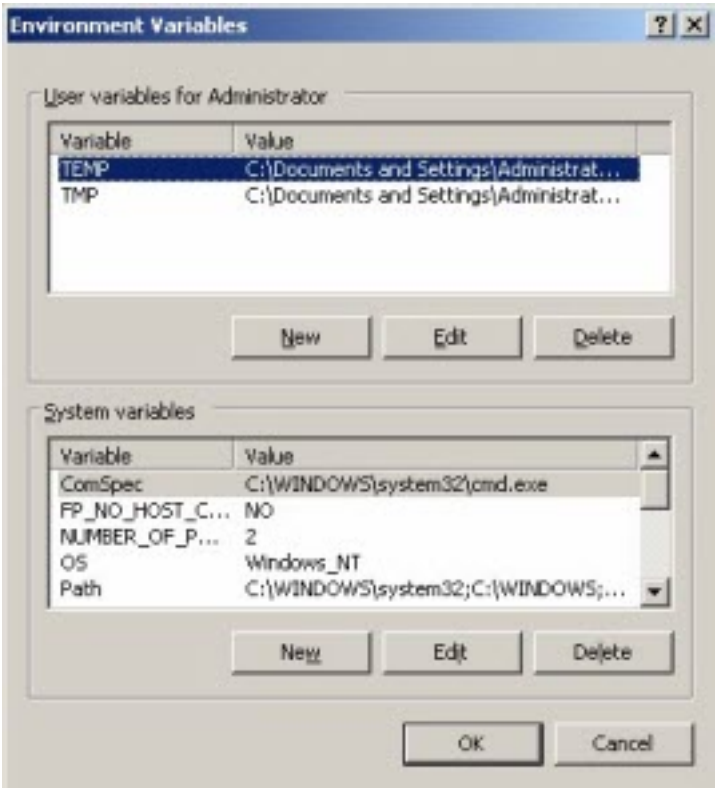
Note: The PDI home directory is independent of the PDI application directory.

Below is a short description of each item in the HOME directory:

Item	Description
kettle.properties	Default properties file for variables
shared.xml	Default shared objects file
db.cache	The database cache for metadata
repositories.xml	The local repositories file
.spoonrc	User interface settings, last opened transformation/job
.languageChoice	User language (delete to revert language)

To change set the KETTLE_HOME variable...

Step	Description
Step 1	Set the KETTLE_HOME variable according to your needs. This can be performed system wide by the operating system or just before the start of PDI using a shell script or batch (for example, use the SET command). The KETTLE_HOME variable can be set system wide on Windows systems using the environment variables settings (see below):



Step 2	Point the KETTLE_HOME to the directory that contains the .kettle directory. The .kettle gets appended by PDI. For example, when you have stored the common files in `C:\Pentaho\Kettle\common\.kettle` you need to set the KETTLE_HOME variable to `C:\Pentaho\Kettle\common`).

The method above can also be used for configuration management and deployment to switch between the test, development, and production environments when other variables like the database server of the connection is defined in `kettle.properties`.

For testing purposes set a variable in the `kettle.properties` file of your defined .kettle home directory. Set the KETTLE_HOME directory accordingly by using the operating system SET command. Start Spoon and go to **Edit** -> **Show Environment Variables**. You should see the variables defined in `kettle.properties`.

Changing the Kettle Home Directory within the Pentaho BI Platform

You can set the KETTLE_HOME directory in the BI Server:

1. When started as a service, edit the registry: `HKEY_LOCAL_MACHINE\SOFTWARE\Apache Software Foundation\Procrun 2.0\pentahobiserver\Parameters\Java`

   Note: On 64-bit systems, the Apache Software Foundation is under **Wow6432Node**.

2. Add a new line (**not a space!**) to the **Options** associated with the KETTLE_HOME variable, for example, `-Dcatalina.base=C:\Pentaho\3.0.1-GA\Installed/server/biserver-ee/tomcat`

```
[...]
-XX:MaxPermSize=256m
-DKETTLE_HOME=C:\Pentaho\Kettle\KETTLE_HOME
```

3. Reboot the server.
4. When you start the BI Server from the command line, you must edit the `...server\biserver-ee\start-pentaho.bat` (see below):

```
[...]
set CATALINA_HOME=%PENTAHO_PATH%tomcat
set CATALINA_OPTS=-Xms256m -Xmx768m -XX:MaxPermSize=256m -
Dsun.rmi.dgc.client.gcInterval=3600000 -Dsun.rmi.dgc.server.gcInterval=3600000 -
DKETTLE_HOME=C:\Pentaho\Kettle\KETTLE_HOME
```

```
call startup
endlocal
:quit
```

Kitchen can't read KJBs from a Zip export

Note: This also applies to Pan and KTR files in Zip archives.

If you are trying to read a KJB file from a Zip export but are getting errors, you may have a syntax error in your Kitchen command. Zip files must be prefaced by a **!** (exclamation mark) character. On Linux and other Unix-like operating systems, you must escape the exclamation mark with a backslash: **\!**

Windows:

```
Kitchen.bat /file:"zip:file:///C:/Pentaho/PDI Examples/Sandbox/
linked_executable_job_and_transform.zip!Hourly_Stats_Job_Unix.kjb"
```

Linux:

```
./kitchen.sh -file:"zip:file:////home/user/pentaho/pdi-ee/my_package/
linked_executable_job_and_transform.zip\!Hourly_Stats_Job_Unix.kjb"
```

Generating a PDI Enterprise Repository Configuration Without Running Spoon

It is not always convenient to launch a repository export from Spoon in some types of environments, so Kettle jobs and transformations can be launched using the command-line tools Kitchen and Pan.

To deploy a job from Kitchen (or transformation from Pan) that will export a `repositories.xml` file, follow the instructions below.

Connecting to Enterprise Repositories with Command-Line Tools

To export repository objects into XML format using command-line tools instead of exporting repository configurations from within Spoon, use named parameters and command-line options when calling Kitchen or Pan from a command-line prompt.

The following is an example command-line entry to execute an export job using Kitchen:

```
call kitchen.bat /file:C:\Pentaho_samples\repository\repository_export.kjb
"/param:rep_name=PDI2000" "/param:rep_user=joe" "/param:rep_password=password"
"/param:rep_folder=/public/dev"
"/param:target_filename=C:\Pentaho_samples\repository\export\dev.xml"
```

Parameter	Description
`rep_folder`	Repository Folder
`rep_name`	Repository Name
`rep_password`	Repository Password
`rep_user`	Repository Username
`target_filename`	Target Filename

Note: It is also possible to use obfuscated passwords with Encr a command line tool for encrypting strings for storage or use by PDI.

The following is an example command-line entry to execute a complete command-line call for the export in addition to checking for errors:

```
   @echo off
   ECHO This an example of a batch file calling the repository_export.kjb

   cd C:\Pentaho\pdi-ee-4.4.0-GA\data-integration

   call kitchen.bat /file:C:\Pentaho_samples\repository\repository_export.kjb "/
param:rep_name=PDI2000"
   "/param:rep_user=joe" "/param:rep_password=password" "/param:rep_folder=/public/
dev"
   "/param:target_filename=C:\Pentaho_samples\repository\export\dev.xml"

   if errorlevel 1 goto error
   echo Export finished successfull.
   goto finished

   :error
   echo ERROR: An error occured during repository export.
   :finished
   REM Allow the user to read the message when testing, so having a pause
   pause
```

Unable to Get List of Repositories Exception

When you are working with a repository and trying to execute a job or transformation remotely on a Carte server, the following error message often appears:

```
There was an error posting the transformation on the remote server:
   org.pentaho.di.core.exception.KettleException:
   Unable to get a list of repositories to locate repository 'repo'
```

Executing Jobs and Transformations from the Repository on the Carte Server

To execute a job or transformation remotely on a Carte server, you need to copy the local `repositories.xml` from the user's home directory.

In a Windows environment, the file path would be: `C:\Documents and Settings\{user}\.kettle`

For all other *nix based operating systems, go to the Carte servers user's home directory: `$HOME/.kettle`

For more information locating or changing the Kettle home directory, see the topic **Changing the Pentaho Data Integration Home Directory Location (.kettle folder)**.

Database Locks When Reading and Updating From A Single Table

If you create read and updated steps to or from a single table within a transformation you will likely experience database locking or slowed processing speeds.

For example, if you have a step which reads from a row within a table--a *Table Input* step--and need to update the step (with the *Update* step) this could cause locking issues.

Note: This is known to often cause difficulty with MS SQL databases in particular.

Reading and Updating Table Rows Within a Transformation

Reading rows and updating rows on a table, within a single transformation, can cause the database to stop updating, referred to as locking, or slow down processing speeds.

Reading rows and updating rows in the same transformation on the same table should be avoided when possible as it is often causes these issues.

A general solution compatible with all databases is to duplicate the table to be read/updated, then create separate read/update steps. Arrange the steps to be executed sequentially within the transformation, each on a different, yet identical, version of the same table.

Adjusting database row locking parameters or mechanisms will also address this issue.

Force PDI to use DATE instead of TIMESTAMP in Parameterized SQL Queries

If your query optimizer is incorrectly using the predicate TIMESTAMP, it is likely because the JDBC driver/database normally converts the data type from a TIMESTAMP to a DATE. In special circumstances this casting prevents the query optimizer of the database not to use the correct index.

Use a `Select Values` step and set the `Precision` to 1 and `Value` to DATE. This forces the parameter to set as a DATE instead of a TIMESTAMP.

For example, if Oracle says it cannot use the index, and generates an error message that states:

```
The predicate DATE used at line ID 1 of the execution plan contains an implicit
   data type conversion on indexed column DATE. This implicit data type conversion
 prevents
   the optimizer from selecting indices on table A.
```

After changing the `Precision` to 1, setting the Value as a DATE, the index can be used correctly.

PDI Does Not Recognize Changes Made To a Table

If PDI does not recognize changes you made to a table, you need to clear the cache of database-related meta information (field names and their types in each used database table). PDI has this cache to increase processing speed.

If you edit the table layout outside of Spoon, field changes, deletions or additions are not known to PDI. Clearing the cache addresses this issue.

To clear the database-related meta information cache from within Spoon:

Select the connection and then `Tools` > `Database` > `Clear Cache`. Or, `Database connections` > `Clear complete DB cache`.

Using ODBC

Although ODBC can be used to connect to a JDBC compliant database, Pentaho does not recommend using it and it is not supported. For details, this article explains "Why you should avoid ODBC." *http://wiki.pentaho.com/pages/viewpage.action?pageId=14850644*.

Sqoop Import into Hive Fails

If executing a Sqoop import into Hive fails to execute on a remote installation, the local Hive installation configuration does not match the Hadoop cluster connection information used to perform the Sqoop job.

Verify the Hadoop connection information used by the local Hive installation is configured the same as the Sqoop job entry.

FAQ: Pentaho Data Integration

Pentaho customers have frequently asked the following questions about Pentaho Data Integration:

Are DI Server schedules persistent? That is, if the machine or just the DI Server is restarted, then will it pick up the schedule for any jobs that need to be run? For example, I have 10 jobs set to run daily at midnight. If the DI Server is restarted at 2PM, will it pick up the scheduled jobs for midnight?

Yes; schedules are stored in the DI Server quartz database.

Can I auto-register the DI Server server in Pentaho Enterprise Console?

Yes. You can add a SQL statement like the one shown below to the `/pentaho/server/enterprise-console/resource/config/hsqldb/pentaho-mgmt-svcs.script` script.

```
INSERT INTO PAC_PROPERTIES VALUES('PDI','pdi.carte.username','joe')
INSERT INTO PAC_PROPERTIES VALUES('PDI','pdi.carte.password','password')
INSERT INTO PAC_PROPERTIES VALUES('PDI','pdi.carte.service','http://localhost:9080/
pentaho-di/kettle/')
```

Is Enterprise Console connected to Carte, or to the DI Server? It asks to register for Carte, but with PDI I would prefer to connect it to the DI Server instead so that my jobs are monitored in Enterprise Console.

When you register a remote execution server in Enterprise Console, it can be a Carte server or a Data Integration Server. The registration dialog says "Carte," but it will accept a DI Server server registration as well. Only one remote execution server can be registered at a time through Enterprise Console.

When jobs are started in Spoon via the Schedule function in the Action menu, are they stored on the DI Server? Will they be visible through Enterprise Console?

Yes, they go by default to your DI Server as defined by the enterprise repository connection. Executions are visible through Enterprise Console as long as the DI Server server that executes the schedule is the same DI Server server that is registered in Enterprise Console.

I do not want to register jobs in Enterprise Console, but Enterprise Console should show all running and idle jobs in the repository. Is there a way to configure this?

Enterprise Console will show step statistics and Carte logging for all jobs and transformations executed on the registered remote execution server. Registering a transformation or a job in Enterprise Console allows you to see additional logged information, like execution history and performance trends. You cannot currently see the entire list of idle or available jobs without using the registration dialogs.

Enterprise Console is our main job management and monitoring tool. Can I schedule jobs directly from Enterprise Console?

Only by wrapping the transformation in an action sequence, and using the BI Server's scheduling feature. DI Server scheduling is only available through Spoon.

Does the enterprise repository always use the local H2 database, or can the database be remote and of a different type, like SQL Server, etc.? My old Kettle database repository was able to reside on any DB type and on a remote machine.

The enterprise repository persistence today is delegated to the JackRabbit CMS. You can read about the options for persistence here: *http://wiki.apache.org/jackrabbit/PersistenceManagerFAQ#ObjectPersistenceManager*.

Any changes you may make to the enterprise repository implementation or configuration are not supported by Pentaho. This is a "black box" offering that does not allow for extra configuration support.