Create DI Solutions

Help and Support Resources

If you do not find answers to your quesions here, please contact your Pentaho technical support representative.

Support-related questions should be submitted through the Pentaho Customer Support Portal at http://support.pentaho.com.

For information about how to purchase support or enable an additional named support contact, please contact your sales representative, or send an email to sales@pentaho.com.

For information about instructor-led training, visit http://www.pentaho.com/training.

Liability Limits and Warranty Disclaimer

The author(s) of this document have used their best efforts in preparing the content and the programs contained in it. These efforts include the development, research, and testing of the theories and programs to determine their effectiveness. The author and publisher make no warranty of any kind, express or implied, with regard to these programs or the documentation contained in this book.

The author(s) and Pentaho shall not be liable in the event of incidental or consequential damages in connection with, or arising out of, the furnishing, performance, or use of the programs, associated instructions, and/or claims.

Trademarks

Pentaho (TM) and the Pentaho logo are registered trademarks of Pentaho Corporation. All other trademarks are the property of their respective owners. Trademarked names may appear throughout this document. Rather than list the names and entities that own the trademarks or insert a trademark symbol with each mention of the trademarked name, Pentaho states that it is using the names for editorial purposes only and to the benefit of the trademark owner, with no intention of infringing upon that trademark.

Third-Party Open Source Software

For a listing of open source software used by each Pentaho component, navigate to the folder that contains the Pentaho component. Within that folder, locate a folder named licenses. The licenses folder contains HTML.files that list the names of open source software, their licenses, and required attributions.

Contact Us

Global Headquarters Pentaho Corporation
Citadel International, Suite 340
5950 Hazeltine National Drive
Orlando, FL 32822
Phone: +1 407 812-OPEN (6736)
Fax: +1 407 517-4575
http://www.pentaho.com

Sales Inquiries: sales@pentaho.com

Contents

Introduction

Pentaho Data Integration (PDI) 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. PDI 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.

PDI provides support for slowly changing *dimensions*, 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 section 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 Section Covers

This document provides you with information about the most *commonly used* steps. For more information about steps, see *Matt Caster's blog* and the *Pentaho Data Integration wiki*.

Refer to *Administer DI Server* for information about administering PDI and configuring security.

Pentaho Data Integration Architecture

Spoon is the design interface for building ETL jobs and transformations. Spoon provides a drag-and-drop interface that allows you to graphically describe what you want to take place in your transformations. Transformations 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.

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.

Use Pentaho Data Integration

There are several tasks that must be done first before following these tutorials. These are the tasks that must be done first.

- Your administrator must have *installed Pentaho Data Integration* and configured the DI server and its client tools as described in *Configure the DI Server* and *Configure the PDI Tools and Utilities*.
- You must also *start the DI server* and *login to Spoon*.

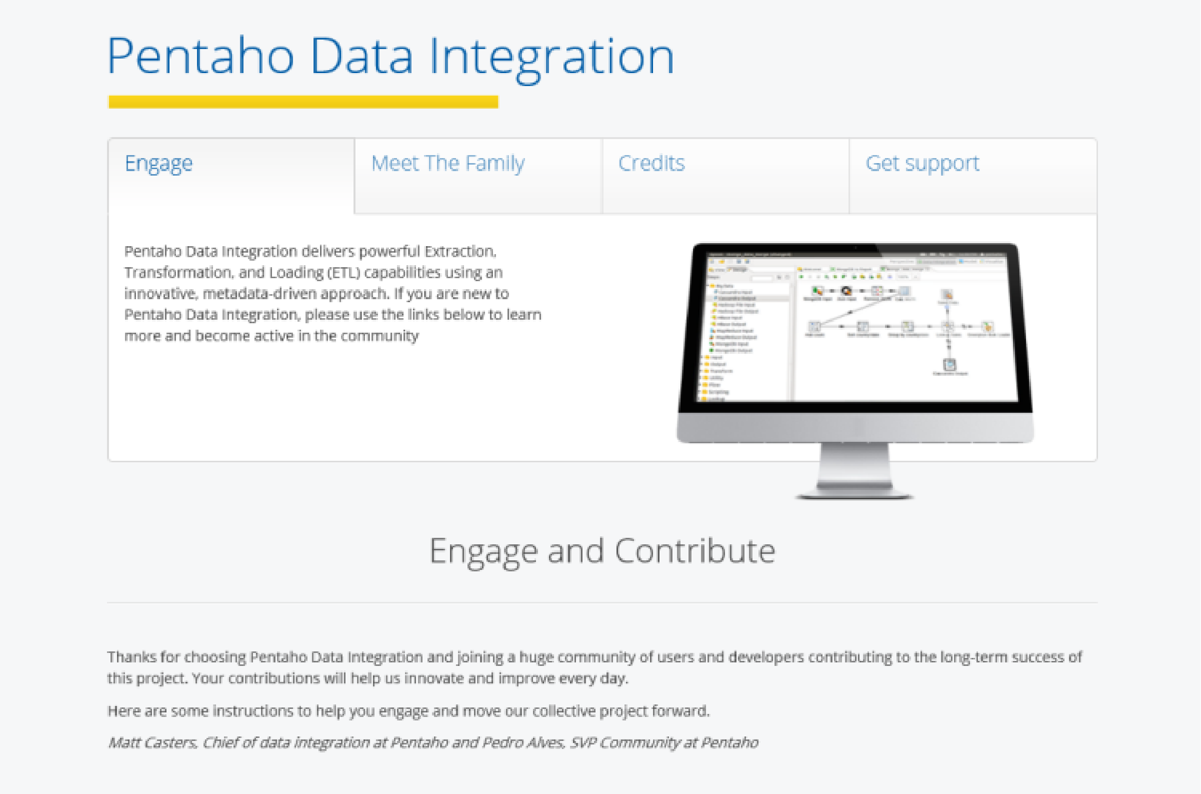
Create a Connection to the DI Repository

You need a place to store your work. We call this place the DI Repository. Your administrator may have created a connection to the DI repository during the configuration process. If you need to make another repository connection or if your administrator did not create a connection to the DI repository, you can create the connection.

1. Click on **Tools** > **Repository** > **Connect**.
   The **Repository Connection** dialog box appears.
2. In the **Repository Connection** dialog box, click the add button (+).
3. Select **DI Repository:DI Repository** and click **OK**.
   The **Repository Configuration** dialog box appears.
4. Enter the URL associated with your repository. Enter an ID and name for your repository.
5. Click **Test** to ensure your connection is properly configured. If you see an error message, make sure you started your *DI server is started* and that the **Repository URL** is correct.
6. Click **OK** to exit the **Success** dialog box.
7. Click **OK** to exit the Repository Configuration dialog box.
   Your new connection appears in the list of available repositories.
8. Select the repository, type your user name and password, and click **OK**.

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.



Pentaho Data Integration

Pentaho Data Integration delivers powerful Extraction, Transformation, and Loading (ETL) capabilities using an innovative, metadata-driven approach. If you are new to Pentaho Data Integration, please use the links below to learn more and become active in the community

Engage and Contribute

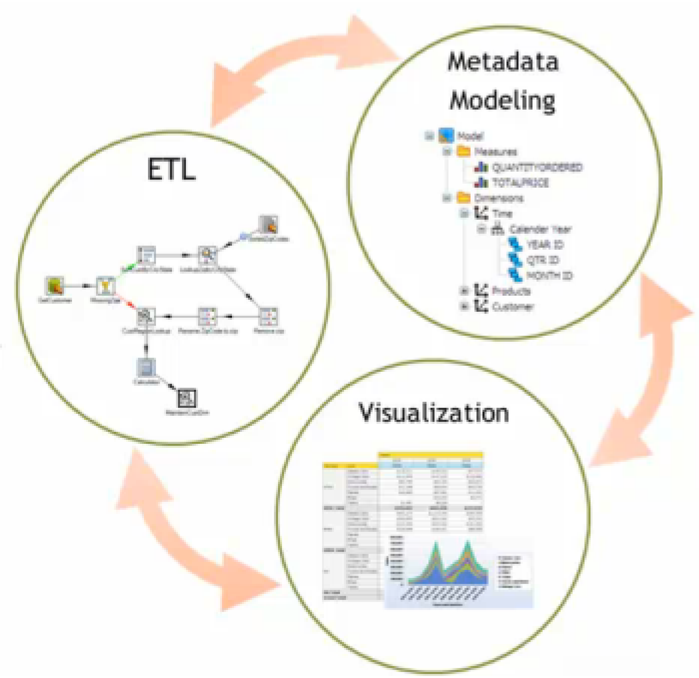
Thanks for choosing Pentaho Data Integration and joining a huge community of users and developers contributing to the long-term success of this project. Your contributions will help us innovate and improve every day.

Here are some instructions to help you engage and move our collective project forward.

Matt Casters, Chief of data integration at Pentaho and Pedro Alves, SVP Community at Pentaho

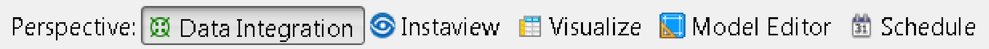
Use Perspectives Within Spoon

Pentaho Data Integration (PDI) provides you with tools that include ETL, modeling, and visualization in one unified environment — the Spoon interface. This integrated environment allows you 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.

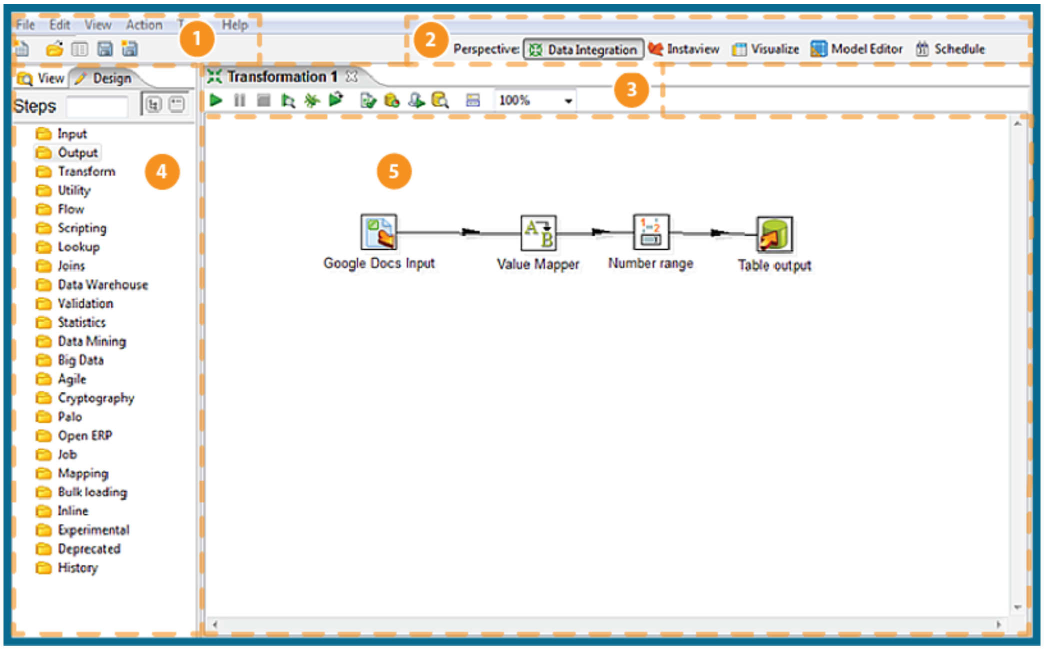
From within Spoon you can change perspectives using the **Perspective** toolbar located in the upper-right corner.



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*)

Tour Spoon



Component Name	Name	Function
1	Toolbar	Single-click access to common actions such as create a new file, opening existing documents, save and save as.
2	Perspectives Toolbar	Switch between the different perspectives. • **Data Integration** — Create ETL transformations and jobs • **Instaview** — Use pre-made templates to create visualizations from PDI transformations

Component Name	Name	Function
		• **Visualize** — Test reporting and OLAP metadata models created in the Model perspective using the Report Design Wizard and Analyzer clients • **Model Editor** — Design reporting and OLAP metadata models which can be tested right from within the Visualization perspective or published to the Pentaho BA Server • **Schedule** — Manage scheduled ETL activities on the Data Integration Server
3	Sub-toolbar	Provides buttons for quick access to common actions specific to the transformation or job such as **Run**, **Preview**, and **Debug**.
4	**Design and View Tabs**	The **Design** tab of the **Explore** pane 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** tab onto the canvas and connecting them with hops to describe the flow of data. The **View** tab of the **Explore** pane shows information for each job or transformation. This includes information such as available database connections and which steps and hops are used. In the image, the **Design** tab is selected.
5	Canvas	Main design area for building transformations and jobs describing the ETL activities you want to perform

Table 1: Spoon Icon Descriptions

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)

Icon	Description
▶	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
▶	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

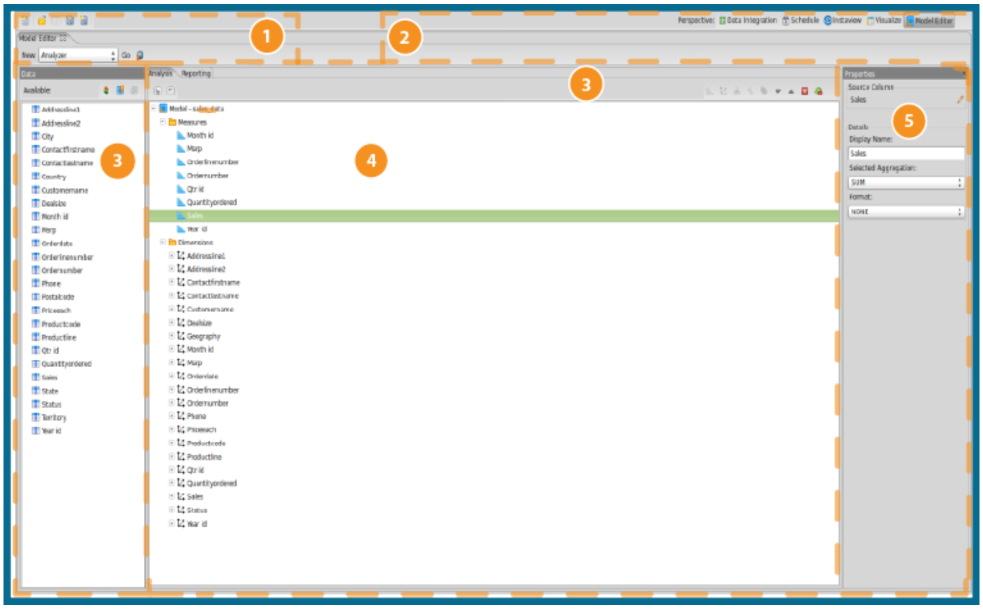
Some job and transformation steps have virtual filesystem (VFS) dialogues in place of the traditional local filesystem windows. VFS file dialogues enable you to specify a VFS URL in lieu of a typical local path. The following PDI and PDI plugin steps have such dialogues:

- 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 *Configure SFTP VFS* on page 41 for more information on configuring options for SFTP.

Model Perspective

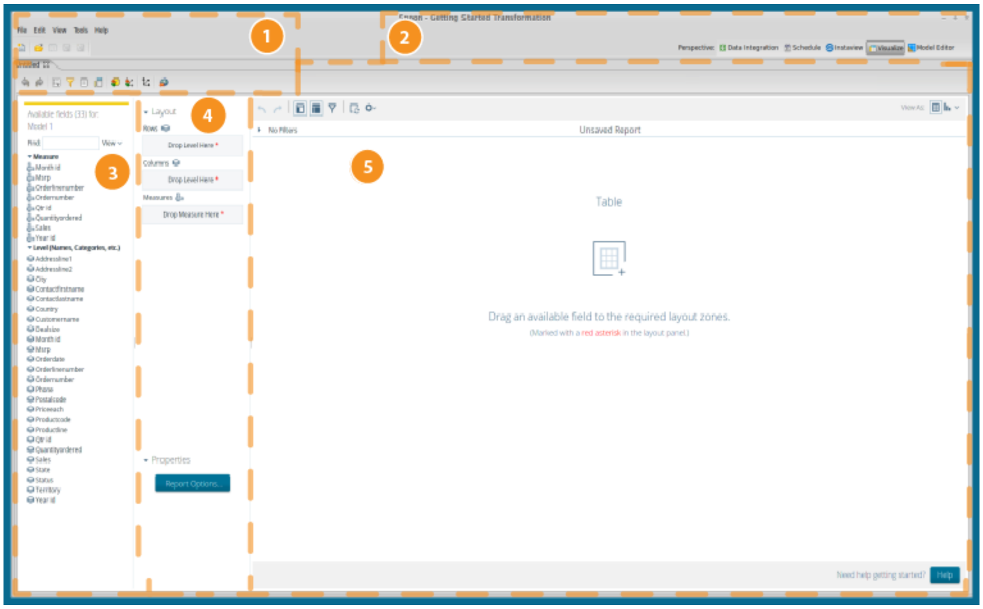
The **Model** perspective is used for designing reporting and OLAP metadata models that can be tested from within the **Visualize** perspective or published to the Pentaho BA Server.



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.



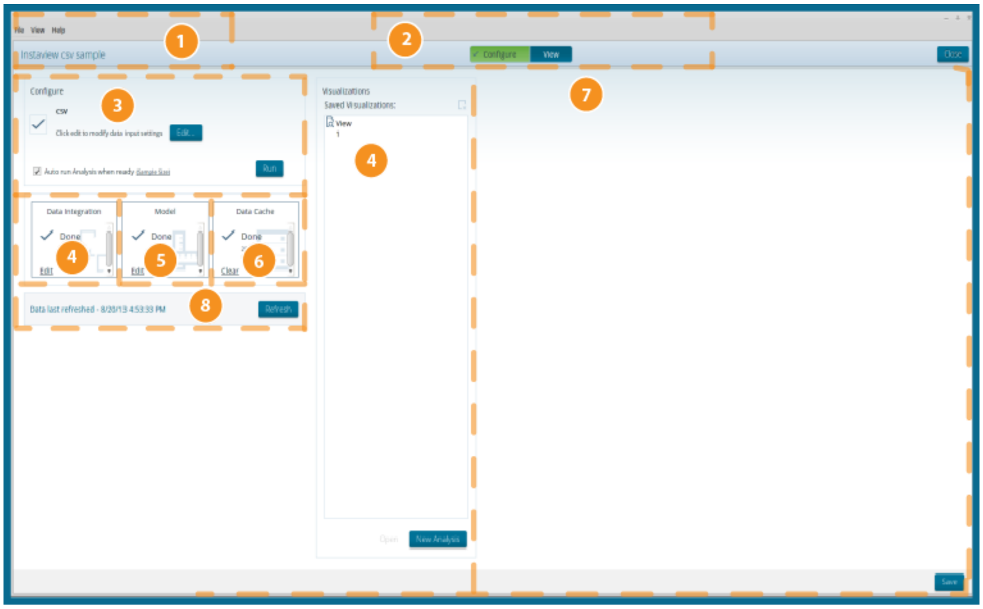
Component Name	Description
1-Menubar	The Menubar provides access to common features such as properties, actions, and tools.
2-Main Toolbar	The Main Toolbar provides single-click access to common actions such as create a new file, opening existing documents, save and save as. The right side of the main 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 to build your query.
4-Layout	Allows you to drag **Measures** and **Levels** into the **Row**, **Column**, and **Measures** area so you can control how it appears in the workspace.
5-Canvas	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.

Instaview Perspective

With Instaview, you can access, transform, analyze, and visualize data without having extensive experience designing business analytics solutions or staging databases. Instaview gives you immediate access to your data so you can quickly explore different ways to structure and present your data as a complete business analytics solution. In addition to extracting and loading the data, Instaview gives you the ability to manipulate the data to make it fit your specific needs from within one simple tool.

When you create an Instaview you

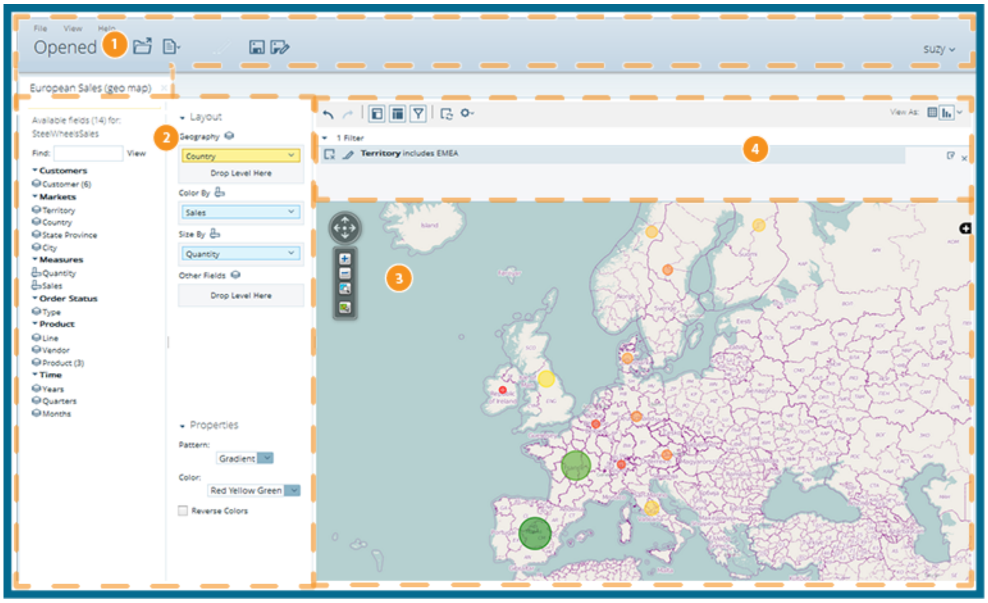
- Create a new data source from which to extract and transform your data.
- Create a data model to define how columns and fields relate to one-another.
- Create an Analyzer Report with tables and charts from your transformed data.



Click edit to modify data input settings

Data last refreshed - 8/20/13 4:53:33 PM

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 reports. 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 report 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.



Item	Name	Function
1	**Opened** view	Displays quick access buttons across the top to create and save new Analysis reports, Interactive reports, and Dashboards. Opened reports and files show as a series of tabs across the page.
2	**Available Fields** and **Layout** panels	Use the **Available Fields** and **Layout** panels to drag levels and measures into a report. Your report displays changes in the **Report Canvas** as you drag items onto the **Layout** panel. Delete a level or measure from your report by dragging it from the Layout panel to the trashcan that appears in the lower right corner of the **Report Canvas**.
3	**Report Canvas**	Shows a dynamic view of your report as you work to build it. The look of your report changes constantly as you work with **Available Fields** and **Layout** panels to refine it. The **Report Canvas** shows different fields based on the chart type selected.
4	**Analyzer Toolbar** and **Filters**	Use the **Analyzer Toolbar** functions to undo or redo actions, hide lists of fields, add or hide filters, disable the auto-refresh function, adjust settings, and change the view of your report. Use the **Filters** panel to display a list of filters applied to the active report, or edit or delete filters.

Customize 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."

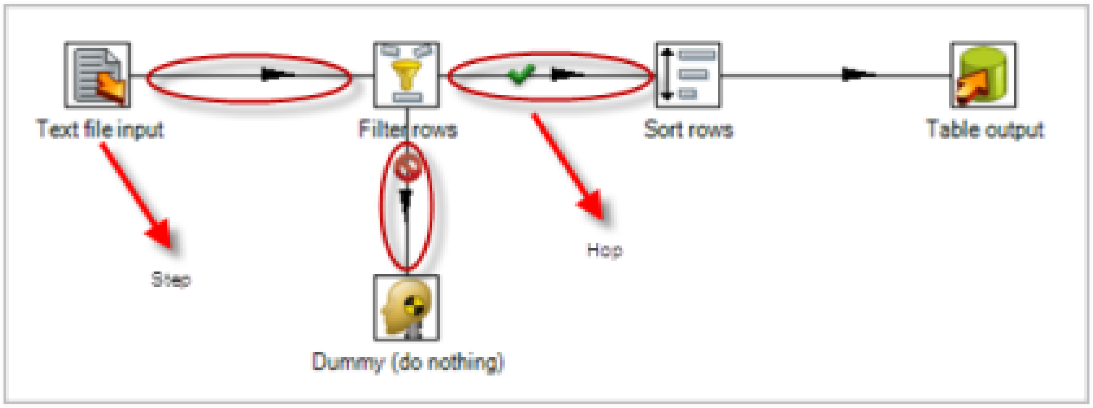
Option	Description
Preferred Language	Specifies the preferred language setting.
Alternative Language	Specifies the alternative language setting. Because the original language in which Pentaho Data Integration was written is English, it is best to set this locale to English.

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.



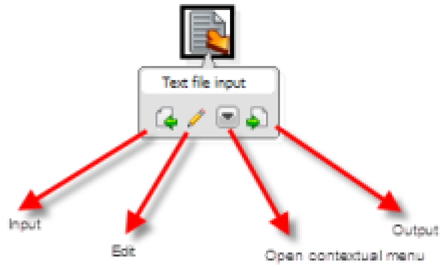
The two main components associated with transformations are **steps** and **hops**:

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.

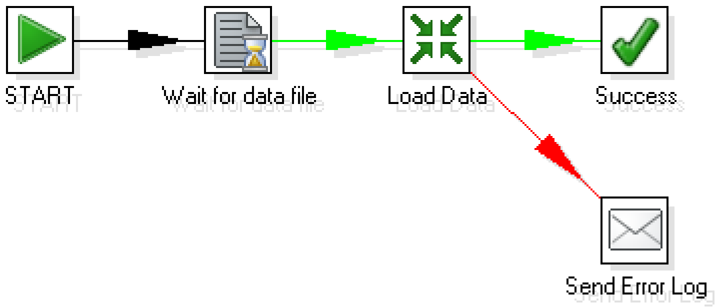
You can connect steps together, edit steps, and open the step contextual menu by clicking ✏ to edit a step. Click the down arrow to open the contextual menu. For information about connecting steps with hop, see *More About Hops*.



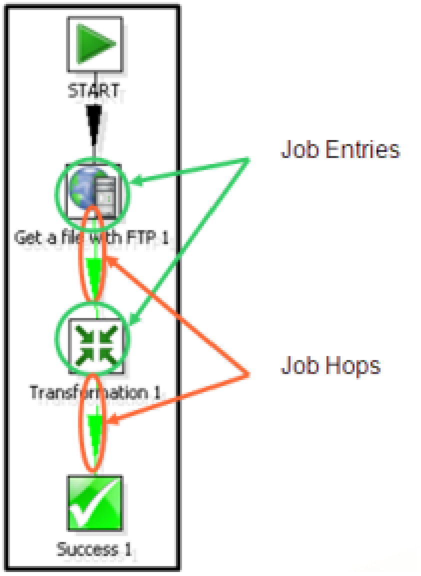
A step can have many connections — some join two steps together, some only serve as an input or output for a step. The data stream flows through steps to the various steps in a transformation. Hops are represented in Spoon as arrows. Hops allow data to be passed from step to step, and also determine 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.



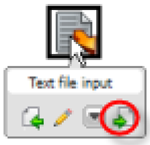
Jobs aggregate up individual pieces of functionality to implement an entire process. Examples of common tasks performed in a job include getting FTP files, checking conditions such as existence of a necessary target database table, running a transformation that populates that table, and e-mailing an 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:

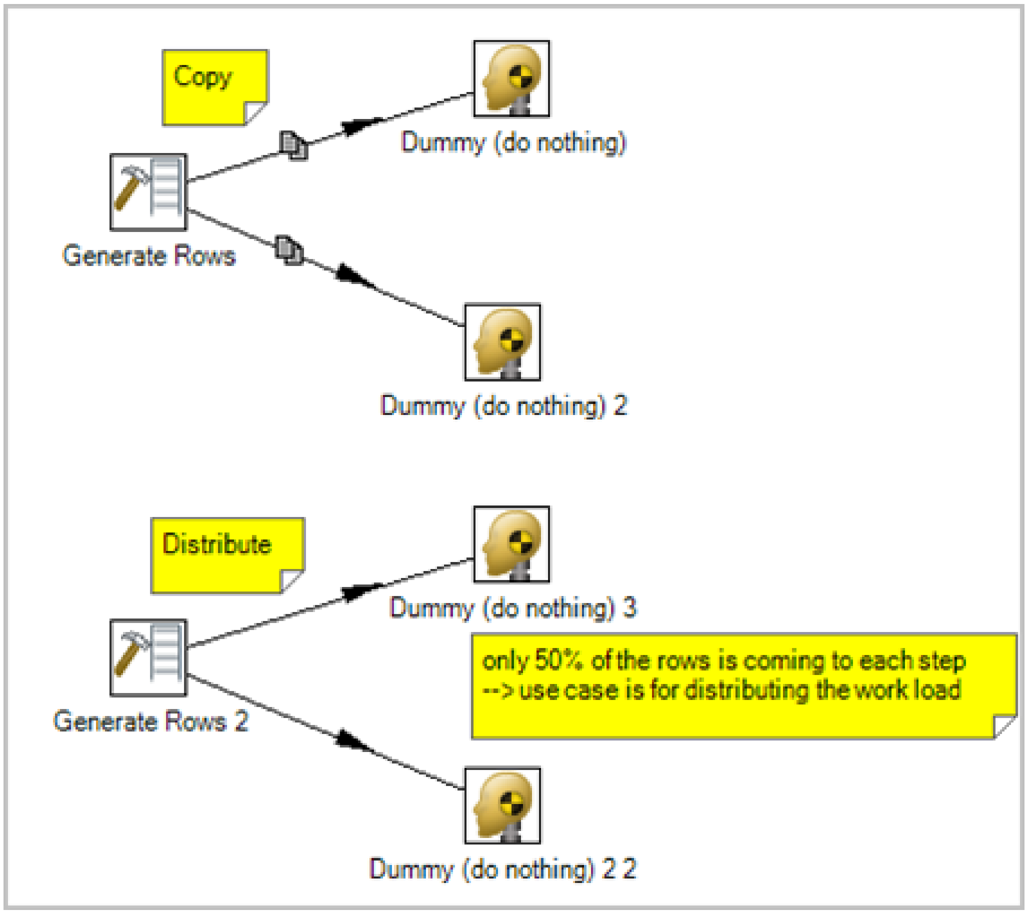
- Click on the source step, hold down the middle mouse button, and drag the hop to the target step.
- Select two steps, then choose New Hop from the right-click menu.
- Use <CTRL + left-click> to select two steps the right-click on the step and choose **New Hop**.

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.

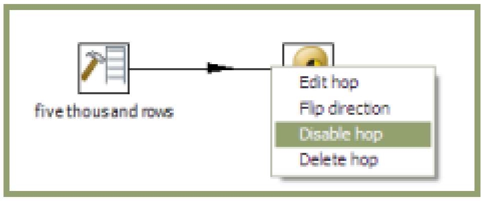
Loops are not allowed in transformations because Spoon depends heavily on the previous steps to determine the field values that are passed from one step to another. Allowing loops in transformations may result in endless loops and other problems. Loops are allowed in jobs because Spoon executes job entries 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**, **distributed**, or **load balanced** between multiple hops leaving a step. Select the step, right-click and choose **Data Movement**.

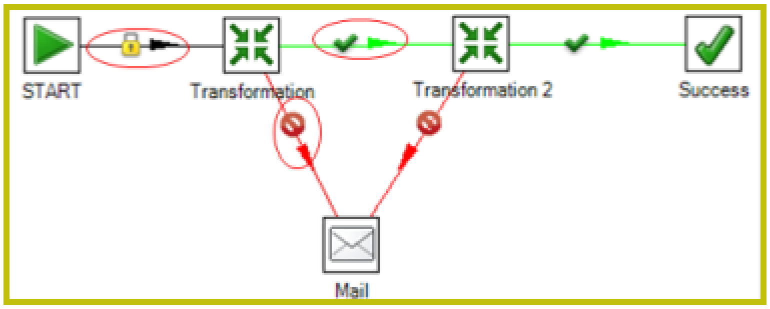


A hop can be enabled or disabled (for testing purposes for example). Right-click on the hop to display the options menu.



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

Create Transformations

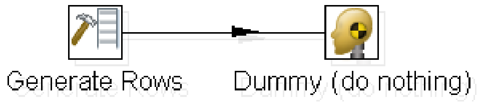
This exercise is designed to help you learn basic skills associated with handling steps and hops, running and previewing transformations. See *Get Started with DI* for a comprehensive, "real world" exercise for creating, running, and scheduling transformations.

Get Started

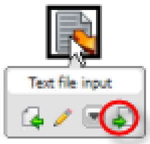
Follow these instructions to begin creating your transformation.

1. Click **File** > **New** > **Transformation**.
2. Under *the **Design** tab*, expand the **Input** node, then select and drag a **Generate Rows** step onto the canvas.

   Note: 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.
3. Expand the **Flow** node; click and drag a **Dummy (do nothing)** step onto the canvas.
4. To connect the steps to each other, you must add a hop. Hops 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 and draw a line to the **Dummy (do nothing)** step.

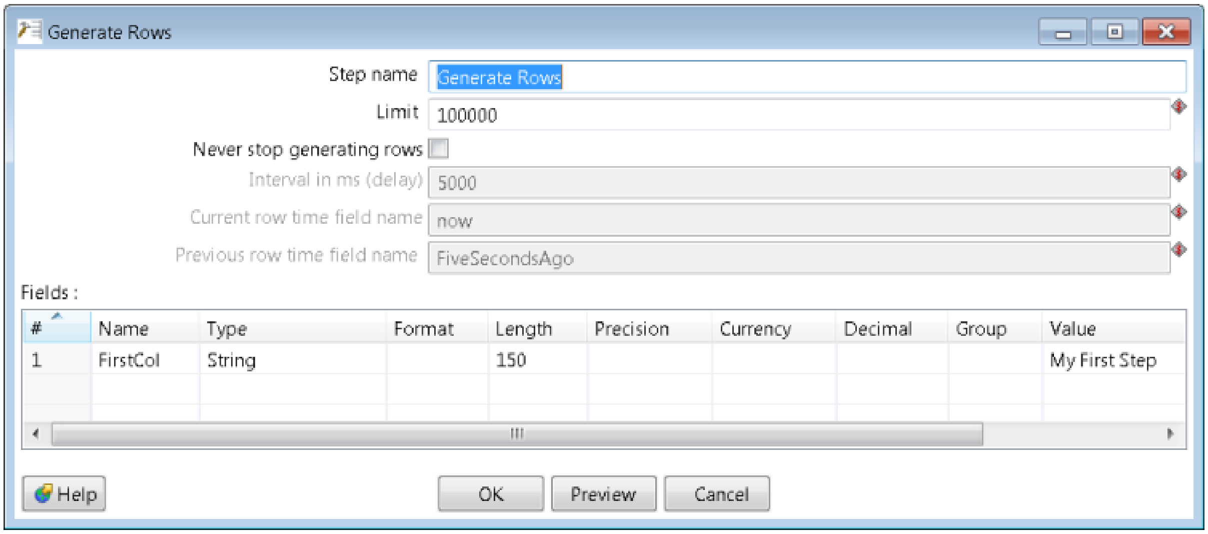
   

   Note: Alternatively, you can draw hops by hovering over a step until the hover menu appears. Drag the hop painter icon from the source step to your target step.

5. Double click the **Generate Rows** step to open its edit properties dialog box.
6. In the **Limit** field, type 100000.

   This limits the number of generated rows to 100,000.
7. Under **Name**, type **FirstCol** in the **Name** field.
8. Under **Type**, type **String**.
9. Under **Length**, type **150**.
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.



Step name: Generate Rows

Limit: 100000

Never stop generating rows ☐

Interval in ms (delay): 5000

Current row time field name: now

Previous row time field name: FiveSecondsAgo

Fields :

#	Name	Type	Format	Length	Precision	Currency	Decimal	Group	Value
1	FirstCol	String		150					My First Step

11. Now, save your transformation. See *Save Your Transformation*.

Save 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 **admin** folder.
   Your transformation will be saved in the **admin** folder in the DI 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 DI Repository.
7. Click **OK** to exit the **Enter Comment** dialog box and save your transformation.

Run Your Transformation Locally

In *Get Started*, you created a simple transformation. Now, you are going to run your transformation locally, which is a local execution. Local execution allows you to execute a transformation or job from within the Spoon 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 are highlighted in red.

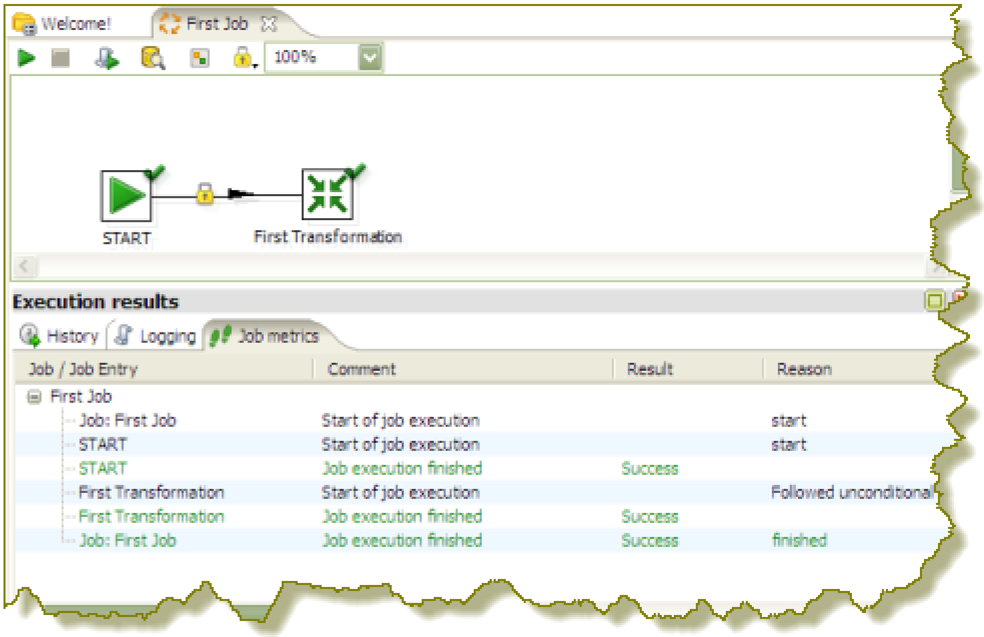
Note: Other tabs associated with Execution Results require additional set up. See *Performance Monitoring and Logging*.

Build 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 section called *Get Started with DI* 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 solution repository.
10. In the **Select repository object** view, expand the 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**.



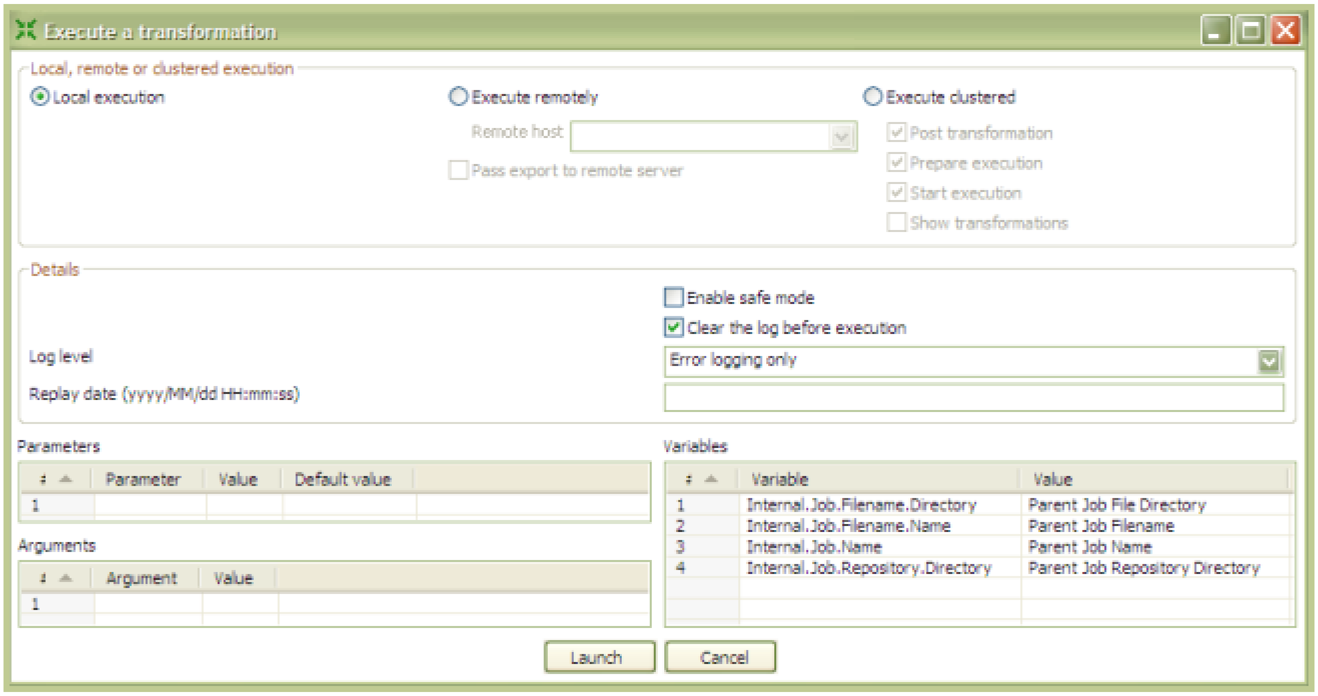
Job / Job Entry	Comment	Result	Reason
First Job			
Job: First Job	Start of job execution		start
START	Start of job execution		start
START	Job execution finished	Success	
First Transformation	Start of job execution		Followed unconditional
First Transformation	Job execution finished	Success	
Job: First Job	Job execution finished	Success	finished

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 executes 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 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.



Execute a transformation

Local, remote or clustered execution

● Local execution

○ Execute remotely

Remote host

□ Pass export to remote server

○ Execute clustered

☑ Post transformation

☑ Prepare execution

☑ Start execution

□ Show transformations

Details

□ Enable safe mode

☑ Clear the log before execution

Log level: Error logging only

Replay date (yyyy/MM/dd HH:mm:ss)

Parameters

#	Parameter	Value	Default value
1			

Arguments

#	Argument	Value
1		

Variables

#	Variable	Value
1	Internal.Job.Filename.Directory	Parent Job File Directory
2	Internal.Job.Filename.Name	Parent Job Filename
3	Internal.Job.Name	Parent Job Name
4	Internal.Job.Repository.Directory	Parent Job Repository Directory

Initialize Slave Servers in Spoon

Follow the instructions below to configure PDI to work with Carte slave servers.

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

Option	Description
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.

Executing Jobs and Transformations from the Repository on the Carte Server

To execute a job or transformation remotely on a Carte server, you first need to copy the local `repositories.xml` from the user's `.kettle` directory to the Carte server's `$HOME/.kettle` directory. The Carte service also looks for the `repositories.xml` file in the directory from which Carte was started.

For more information about locating or changing the `.kettle` home directory, see *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 DI Repository

In addition to storing and managing your jobs and transformations, the DI 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 DI 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.

Deleting a Repository

When necessary, you can delete a DI repository or Kettle Database repository. Follow these instructions

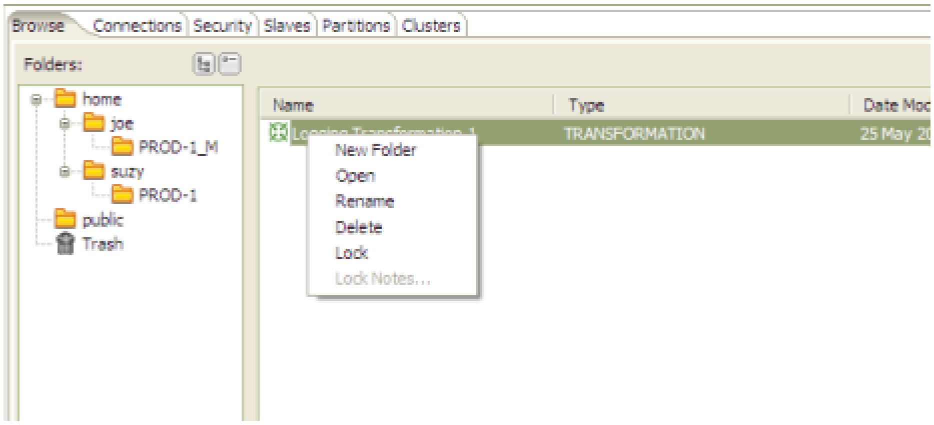
1. In the **Repository Connection** dialog box, select the repository you want to delete from the list of available repositories.
2. Click **Delete**.
   A confirmation dialog appears.
3. Click **Yes** to delete the repository.

Managing Content in the DI 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.

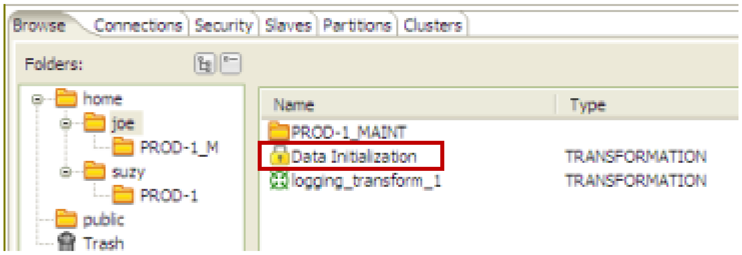


To **move** objects, such as folders, jobs, or transformations, in the repository, select the object, then click-and-drag it to the desired location in the navigation pane on the left. You can move an object in your folder to the folder of another repository user.

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 check-mark next to the Lock option disappears.

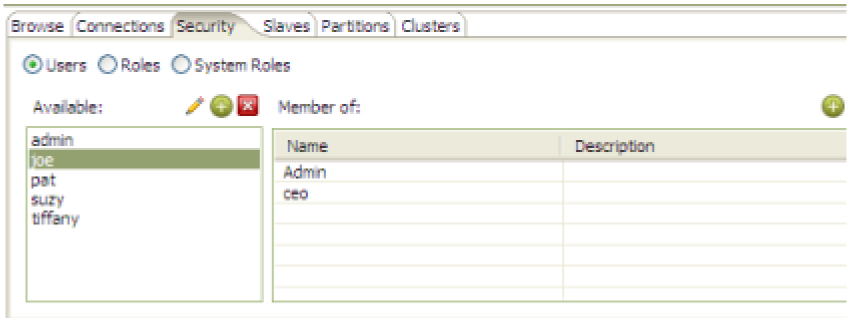
Note: The lock status icons are updated on each PDI client only when the Repository Explorer is launched. If you want to refresh lock status in the Repository Explorer, exit and re-launch it.



Name	Type
PROD-1_MAINT	
Data Initialization	TRANSFORMATION
logging_transform_1	TRANSFORMATION

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 DI 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 section called *Administer the DI Server*.



Name	Description
Admin	
ceo	

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

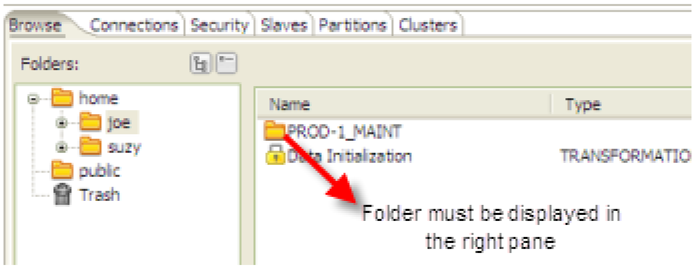
Click the **Partitions** and **Cluster** tabs to manage partitions and clusters. See *Creating a Cluster Schema*for more information.

Setting Folder-Level Permissions

You can assign specific permissions to content files and folders stored in the DI 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.

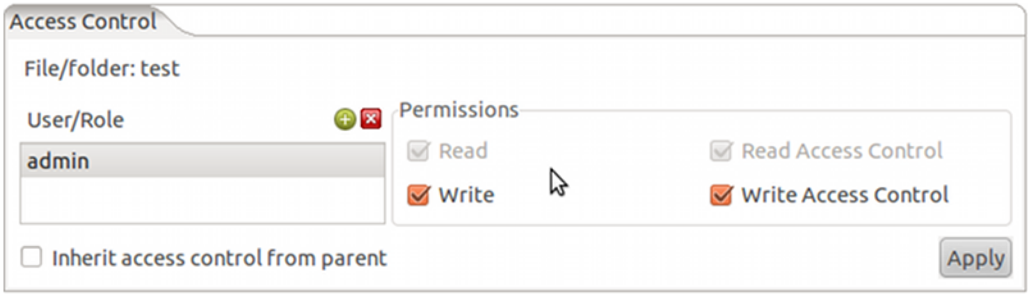
   The folder must appear in the right pane before you can set permissions.

Name	Type
PROD-1_MAINT	
Data Initialization	TRANSFORMATIO

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.



Access Control

File/folder: test

User/Role

admin

Permissions

☑ Read

☑ Write

☑ Read Access Control

☑ Write Access Control

☐ Inherit access control from parent

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

These are the permissions settings for DI Repository content and folders.

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

Read	If set, the content of the file or contents of the directory will be accessible. Allows execution.
Manage Access Control	If set, access controls can be changed for this object.
Write	If set, enables read and write access to the selected content.
Delete	If set, the content of the file or directory can be deleted.

Exporting Content from Solutions 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=admin" "/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

It is also possible to use obfuscated passwords with Encr, the 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-<ph conref="../reuse_files/
reference_reusable.xml#reference_instaview_view_panel/PDIvernum3"/>\data-integration

   call kitchen.bat /file:C:\Pentaho_samples\repository\repository_export.kjb "/
param:rep_name=PDI2000"
   "/param:rep_user=admin" "/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 successful.
   goto finished

   :error
   echo ERROR: An error occurred 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 DI 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**.
   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.
3. Click on a transformation or job from the list to select it. 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 logged in as 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. The **public** folder is where you store content that you want to share with others.

   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 **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

Option	Description
	• **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.

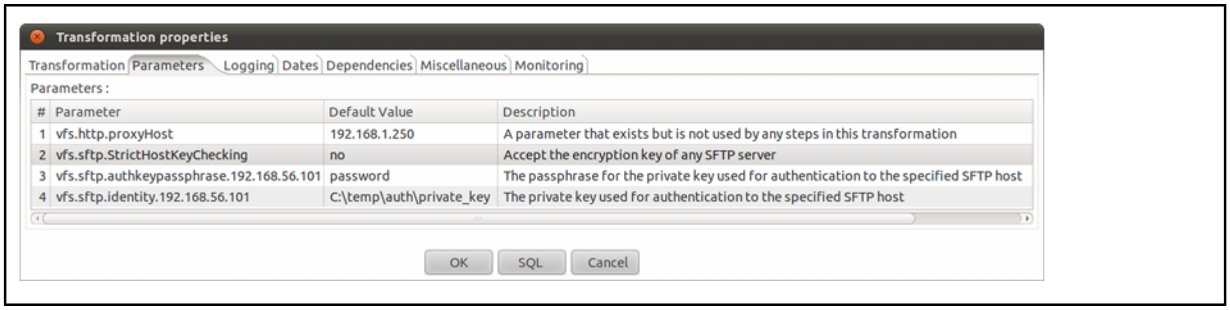
You must consult each scheme's API reference to determine which properties you can create variables for. Apache provides VFS scheme documentation at *http://commons.apache.org/vfs/apidocs/index.html*. The **org.apache.commons.vfs.provider** package lists each of the configurable VFS providers (ftp, http, 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).



Parameters :

#	Parameter	Default Value	Description
1	vfs.http.proxyHost	192.168.1.250	A parameter that exists but is not used by any steps in this transformation
2	vfs.sftp.StrictHostKeyChecking	no	Accept the encryption key of any SFTP server
3	vfs.sftp.authkeypassphrase.192.168.56.101	password	The passphrase for the private key used for authentication to the specified SFTP host
4	vfs.sftp.identity.192.168.56.101	C:\temp\auth\private_key	The private key used for authentication to the specified SFTP host

Configure 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 40 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 OLAP schema creation. If you need information related to PDI in general, consult the section on *installing PDI* and/or the section on *working with PDI* in the Pentaho InfoCenter.

Note: Agile BI is for **prototyping only**. It is extremely useful as an aid in developing OLAP 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 OLAP 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 44 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 OLAP 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 45.

Creating a Prototype Schema With a PDI Data Source

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 OLAP 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 OLAP 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 45.

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 within the Model perspective.

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 OLAP 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 OLAP schemas that meet the needs of business analytics 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.

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
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
Model	Switches to the Model perspective for the selected table
Visualize	Switches to the Visualize perspective for the selected table

Unsupported Databases

It may be possible to read from unsupported databases by using the generic database driver through an ODBC or JDBC connection. Contact Pentaho if you want to access a database type that is not yet in our list of *supported components*.

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.

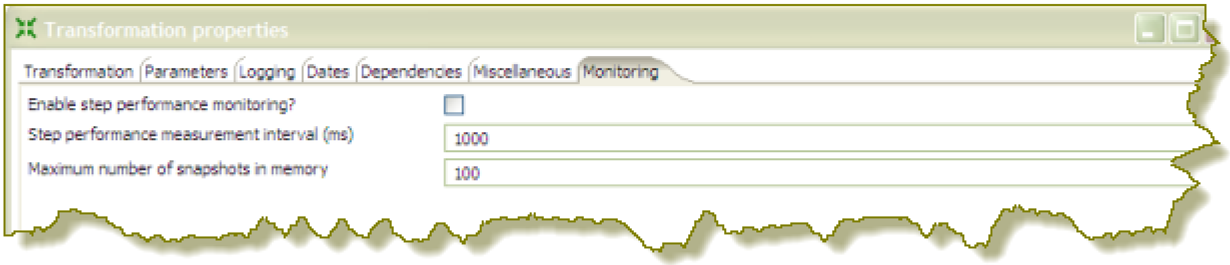
Reasons you may want to enable logging and step performance monitoring include: determining if a job completed with errors or to review errors that were encountered during processing. In headless environments, most ETL in production is not run from the graphical user interface and you need a place to 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, you must first set up logging and performance monitoring in Spoon. For more information about monitoring jobs and transformations, see the section *Administer the DI Server*.

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**>.



Enable step performance monitoring? □

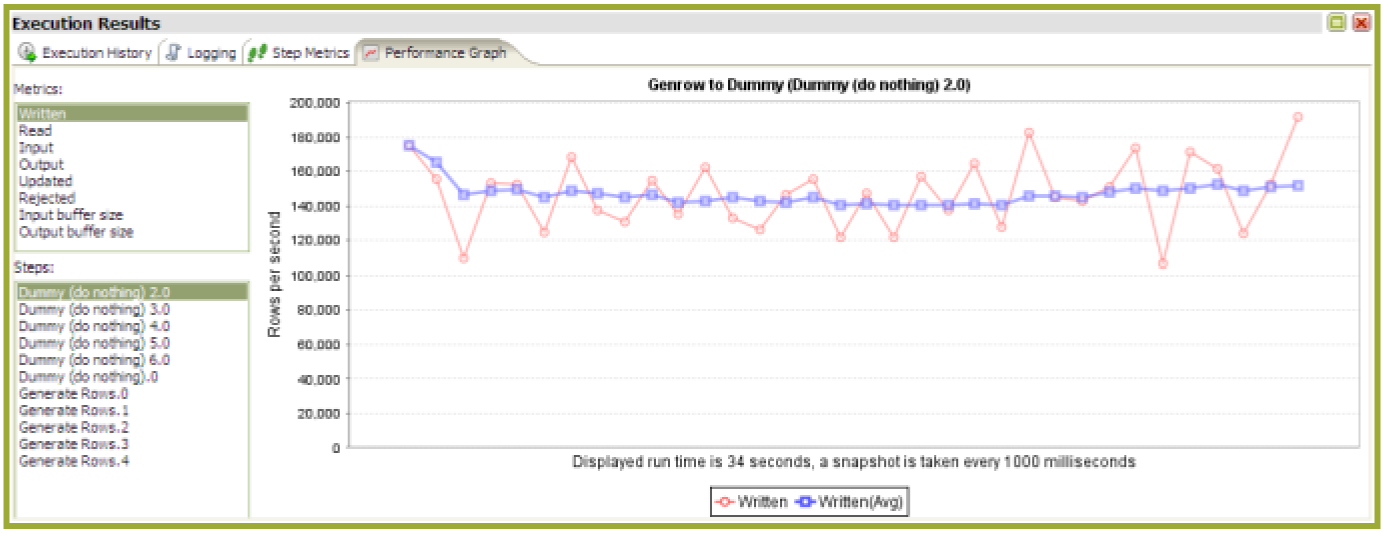
Step performance measurement interval (ms) 1000

Maximum number of snapshots in memory 100

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. To enable database logging, enable the option **Enable step performance monitoring** within the **Transformation Properties / Monitoring** dialog box.



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>. To enable the logging, you also need to enable the option **Enable step performance monitoring in the Transformation Properties/Monitoring** in the dialog.
   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.

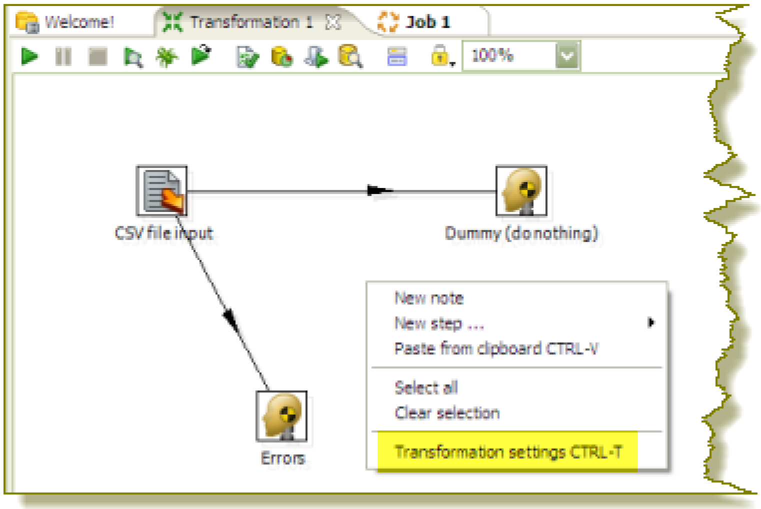
   Note: You *must* execute the SQL code to create the log table.

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

Logging Steps

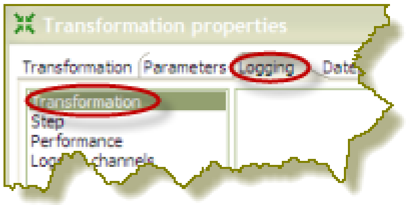
Follow the instructions below to create a log table that keeps history of step-related information associated with your transformation.

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.



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.

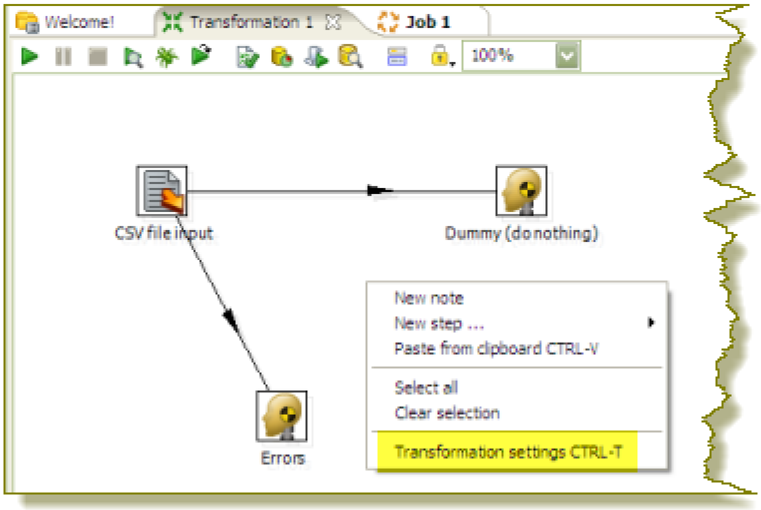
   Note: You *must* execute the SQL code to create the log table.

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

Logging Transformations

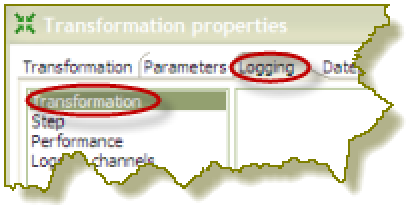
Follow the instructions below to create a log table for transformation-related processes:

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 **Execution History** tab.

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` • 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

Step	Tip	Description
		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.
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

Pentaho Data Integration (PDI) can operate in two distinct modes, job orchestration and data transformation. Within PDI they are referred to as jobs and transformations.

PDI jobs sequence a set of entries that encapsulate actions. An example of a PDI big data job would be to check for existence of new log files, copy the new files to HDFS, execute a MapReduce task to aggregate the weblog into a click stream and stage that clickstream data in an analytic database.

PDI transformations consist of a set of steps that execute in parallel and operate on a stream of data columns. The columns usually flow from one system, through the PDI engine, where new columns can be calculated or values can be looked up and added to the stream. The data stream is then sent to a receiving system like a Hadoop cluster, a database, or even the Pentaho Reporting Engine.

The tutorials within this section illustrate how to use PDI jobs and transforms in typical big data scenarios. PDI job entries and transformation steps are described in the *Transformation Step Reference* and *Job Entry Reference* sections of Administer the DI Server.

PDI's Big Data Plugin

The Pentaho Big Data plugin contains all of the job entries and transformation steps required for working with Hadoop, Cassandra, and MongoDB.

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 *Configure Your Big Data Environment* section.

For a list of supported big data technology, including which configurations of Hadoop are currently supported, see the section on *Supported Components*.

Using PDI Outside and Inside the Hadoop Cluster

PDI is unique in that it can execute both outside of a Hadoop cluster and within the nodes of a hadoop cluster. From outside a Hadoop cluster, PDI can extract data from or load data into Hadoop HDFS, Hive and HBase. When executed within the Hadoop cluster, PDI transformations can be used as Mapper and/or Reducer tasks, allowing PDI with Pentaho MapReduce to be used as visual programming tool for MapReduce.

These videos demonstrate using PDI to work with Hadoop from both inside and outside a Hadoop cluster.

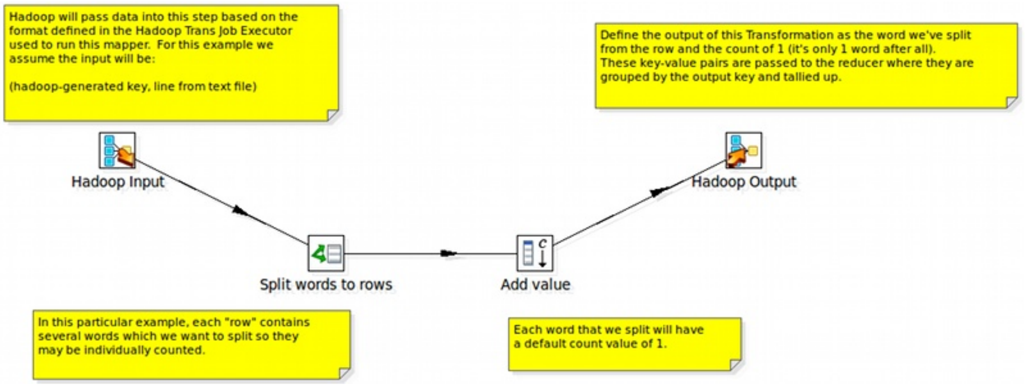
- Loading Data into Hadoop from outside the Hadoop cluster is a 5-minute video that demonstrates moving data using a PDI job and transformation: *http://www.youtube.com/watch?v=Ylekzmd6TAc*
- Use *Pentaho MapReduce* to interactively design a data flow for a MapReduce job without writing scripts or code. Here is a 12 minute video that provides an overview of the process: *http://www.youtube.com/watch?v=KZe1UugxXcs*.

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 will pass data into this step based on the format defined in the Hadoop Trans Job Executor used to run this mapper. For this example we assume the input will be:

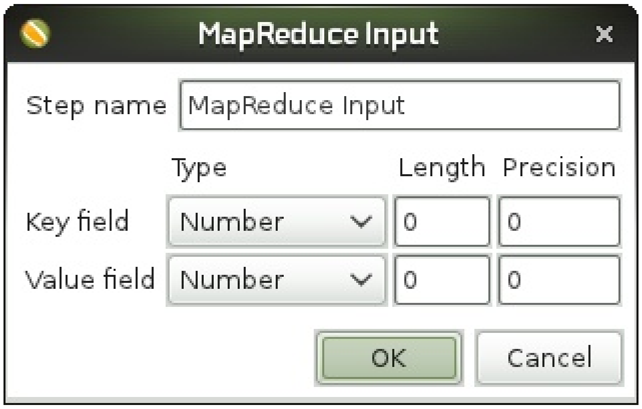
(hadoop-generated key, line from text file)

Define the output of this Transformation as the word we've split from the row and the count of 1 (it's only 1 word after all). These key-value pairs are passed to the reducer where they are grouped by the output key and tallied up.

In this particular example, each "row" contains several words which we want to split so they may be individually counted.

Each word that we split will have a default count value of 1.

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.

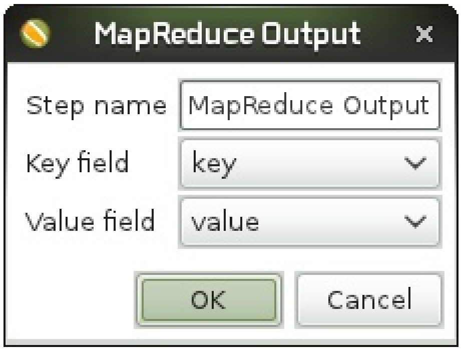


MapReduce Input

Step name: MapReduce Input

	Type	Length	Precision
Key field	Number	0	0
Value field	Number	0	0

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.



MapReduce Output

Step name: MapReduce Output

Key field: key

Value field: value

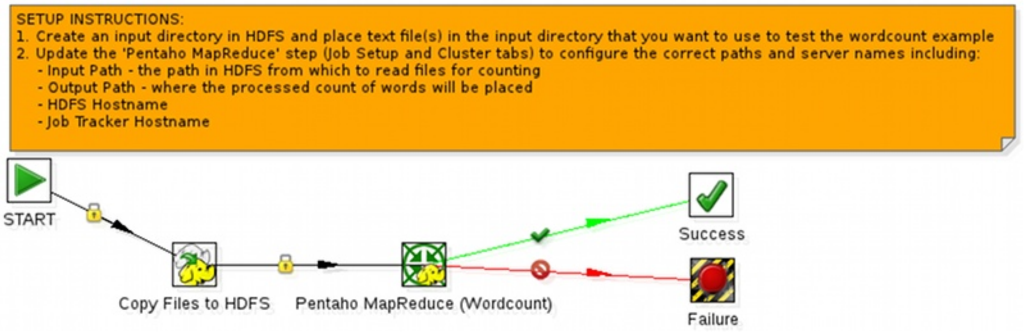
What happens in the middle is entirely up to you. Pentaho provides many sample steps you can alter to create the functionality you need.

PDI Job

Once you have created the Mapper transformation, you are ready to include it in a **Pentaho MapReduc**e 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.

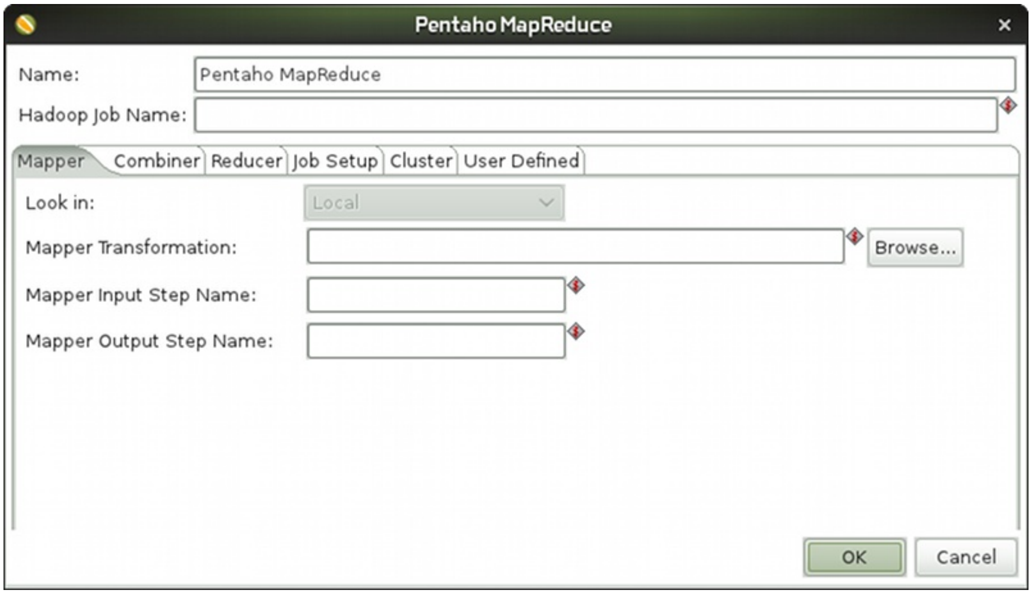
Configure the **Pentaho MapReduce** entry to use the transformation as a mapper. Drag and drop a Start job entry, other job entries as needed, and result jobentries to handle the output onto the canvas. Add hops to sequence the entries into a job that you execute in PDI.

The workflow for the job should look something like this.



SETUP INSTRUCTIONS:
1. Create an input directory in HDFS and place text file(s) in the input directory that you want to use to test the wordcount example
2. Update the 'Pentaho MapReduce' step (Job Setup and Cluster tabs) to configure the correct paths and server names including:
- Input Path - the path in HDFS from which to read files for counting
- Output Path - where the processed count of words will be placed
- HDFS Hostname
- Job Tracker Hostname

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



Pentaho MapReduce

Name: Pentaho MapReduce

Hadoop Job Name:

Look in: Local

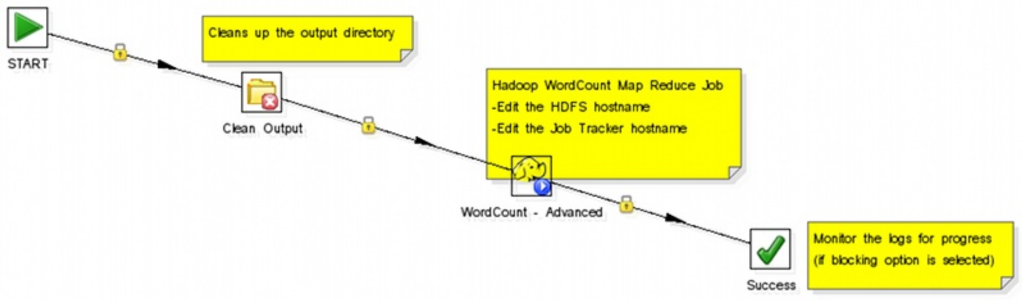
Mapper Transformation:

Mapper Input Step Name:

Mapper Output Step Name:

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.

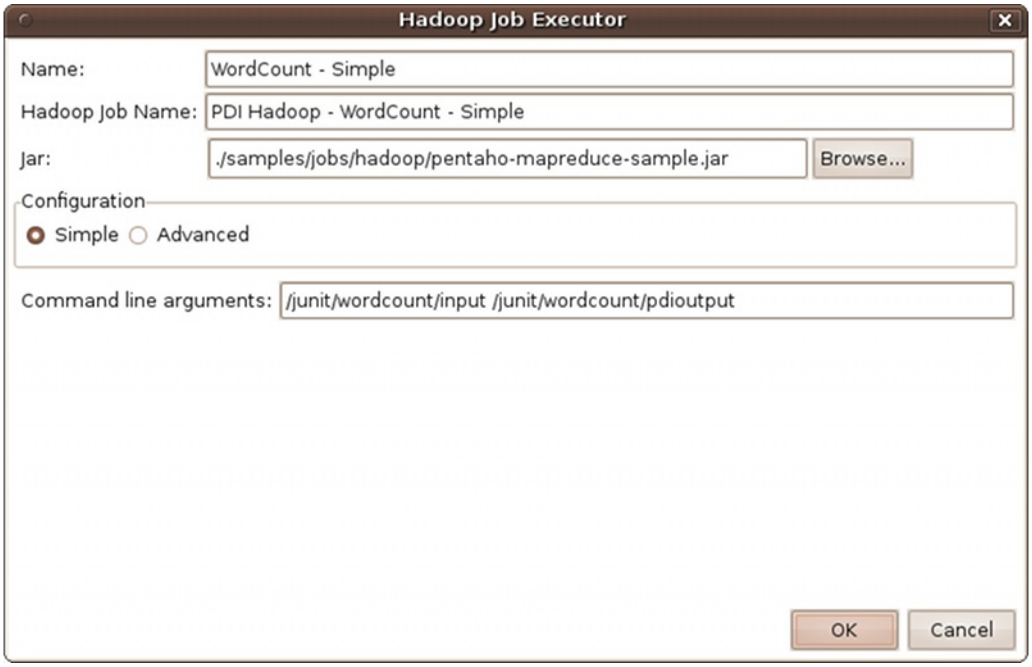


Cleans up the output directory

Hadoop WordCount Map Reduce Job
-Edit the HDFS hostname
-Edit the Job Tracker hostname

Monitor the logs for progress (if blocking option is selected)

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



Name: WordCount - Simple

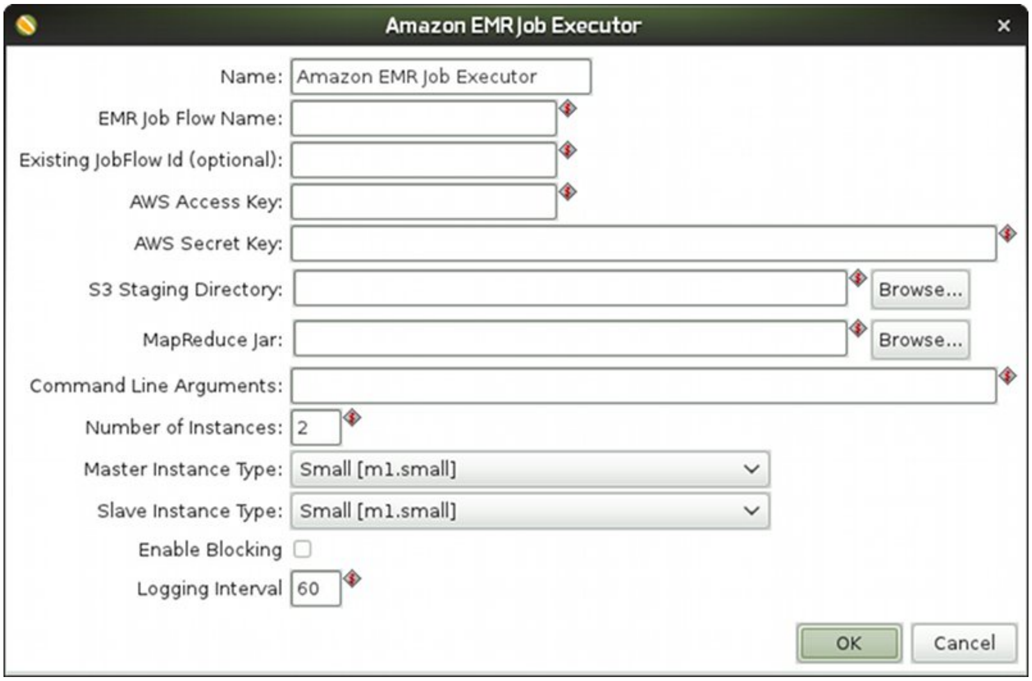
Hadoop Job Name: PDI Hadoop - WordCount - Simple

Jar: ./samples/jobs/hadoop/pentaho-mapreduce-sample.jar

Configuration: ● Simple ○ Advanced

Command line arguments: /junit/wordcount/input /junit/wordcount/pdioutput

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.



Name: Amazon EMR Job Executor

EMR Job Flow Name:

Existing JobFlow Id (optional):

AWS Access Key:

AWS Secret Key:

S3 Staging Directory:

MapReduce Jar:

Command Line Arguments:

Number of Instances: 2

Master Instance Type: Small [m1.small]

Slave Instance Type: Small [m1.small]

Enable Blocking □

Logging Interval 60

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 *Data Integration Installation Options* 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 *Configure Your Big Data Environment*. 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)

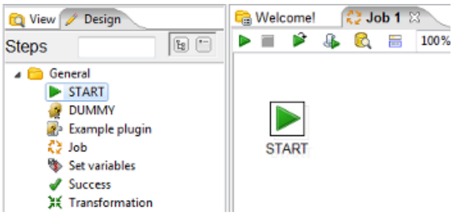
In order to follow along with this tutorial, you will need

- Hadoop
- Pentaho Data Integration

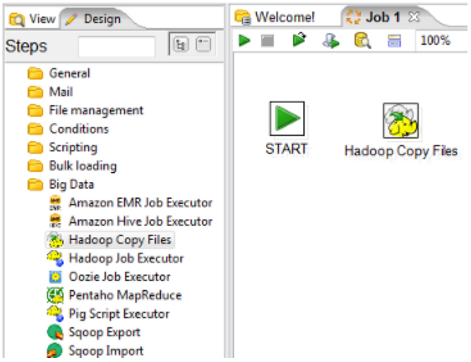
You can use PDI jobs to put files into HDFS from many different sources. This tutorial describes how to create a PDI job to move a sample file into HDFS.

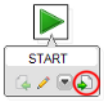
If not already running, start Hadoop and PDI. Unzip the sample data files and put them in a convenient location: *weblogs_rebuild.txt.zip*.

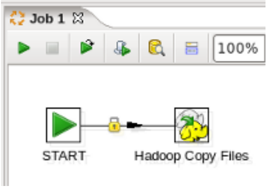
1. Create a new Job by selecting **File** > **New** > **Job**.
2. Add a Start job entry to the canvas. From the **Design** palette on the left, under the **General** folder, drag a **Start** job entry onto the canvas.



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.

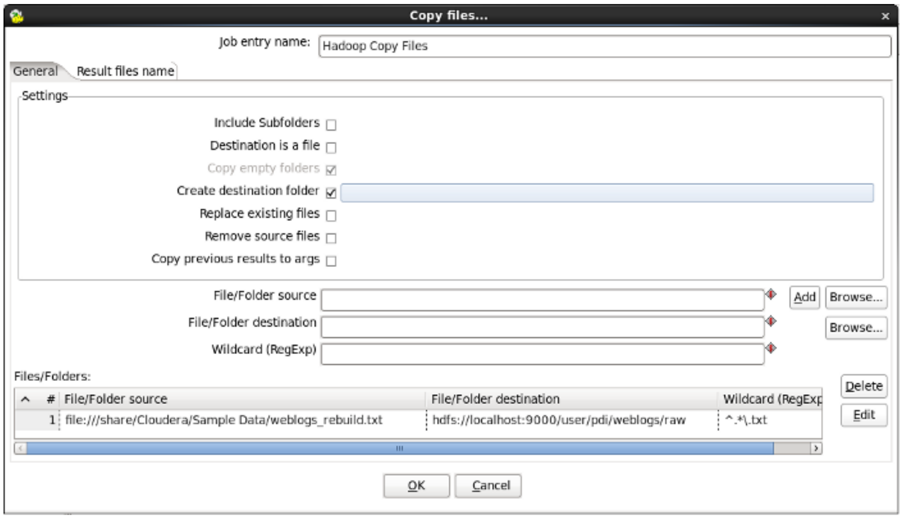


4. Connect the two job entries by hovering over the **Start** entry and selecting the output connector , then drag the connector arrow to the **Hadoop Copy Files** entry.



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).



Copy files...

Job entry name: Hadoop Copy Files

General | Result files name

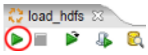
Settings

Include Subfolders □
Destination is a file □
Copy empty folders ☑
Create destination folder ☑
Replace existing files □
Remove source files □
Copy previous results to args □

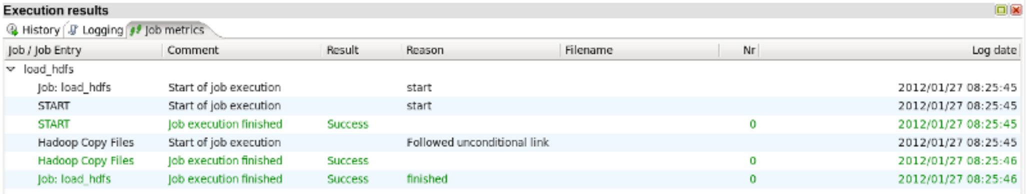
File/Folder source
File/Folder destination
Wildcard (RegExp)

Files/Folders:

#	File/Folder source	File/Folder destination	Wildcard (RegExp
1	file:///share/Cloudera/Sample Data/weblogs_rebuild.txt	hdfs://localhost:9000/user/pdi/weblogs/raw	^.*\.txt

   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.



Execution results

History | Logging | Job metrics

Job / Job Entry	Comment	Result	Reason	Filename	Nr	Log date
load_hdfs						
Job: load_hdfs	Start of job execution		start			2012/01/27 08:25:45
START	Start of job execution		start			2012/01/27 08:25:45
START	Job execution finished	Success			0	2012/01/27 08:25:45
Hadoop Copy Files	Start of job execution		Followed unconditional link			2012/01/27 08:25:45
Hadoop Copy Files	Job execution finished	Success			0	2012/01/27 08:25:46
Job: load_hdfs	Job execution finished	Success	finished		0	2012/01/27 08:25:46

   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

In order to follow along with this tutorial, you will need

- Hadoop
- Pentaho Data Integration
- 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.

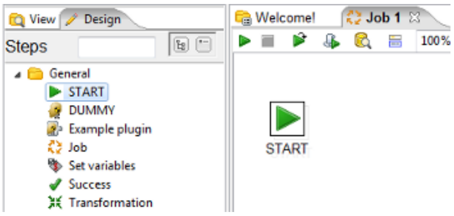
b) Create a table in Hive for the sample data by entering

```
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';
```

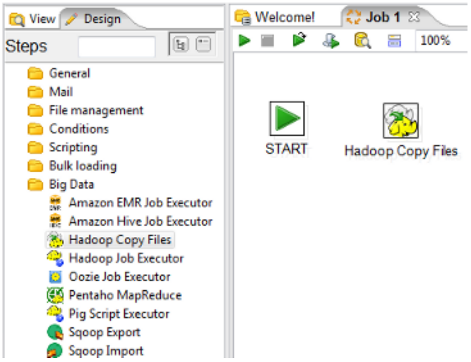
c) Close the Hive shell by entering `'quit'`.

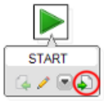
2. Create a new Job to load the sample data into a Hive table by selecting **File** > **New** > **Job**.

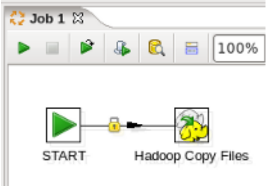
3. Add a Start job entry to the canvas. From the **Design** palette on the left, under the **General** folder, drag a **Start** job entry onto the canvas.



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.

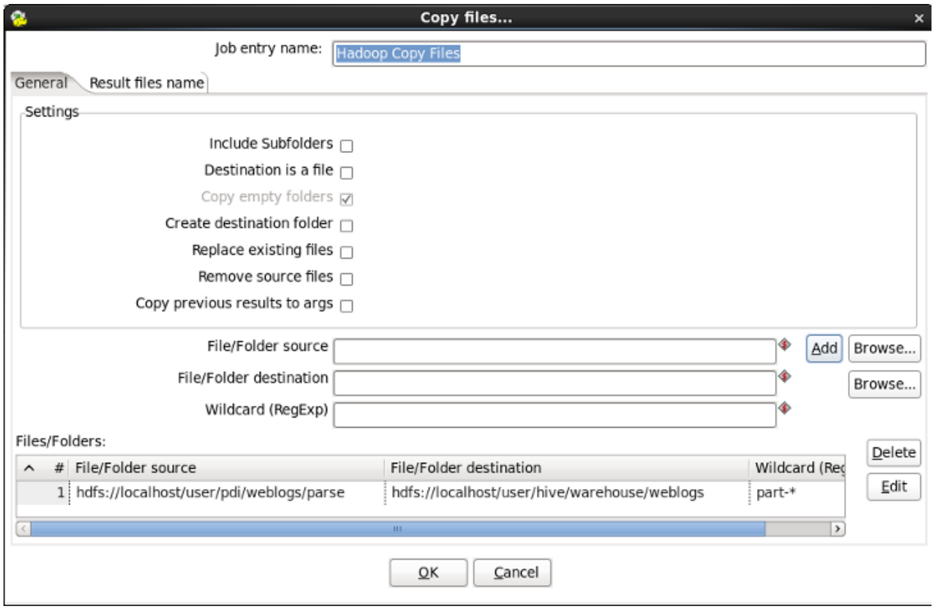


5. Connect the two job entries by hovering over the **Start** entry and selecting the output connector  , then drag the connector arrow to the **Hadoop Copy Files** entry.



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)



Copy files...

Job entry name: Hadoop Copy Files

General | Result files name

Settings

Include Subfolders □
Destination is a file □
Copy empty folders ☑
Create destination folder □
Replace existing files □
Remove source files □
Copy previous results to args □

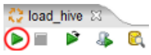
File/Folder source
File/Folder destination
Wildcard (RegExp)

Files/Folders:

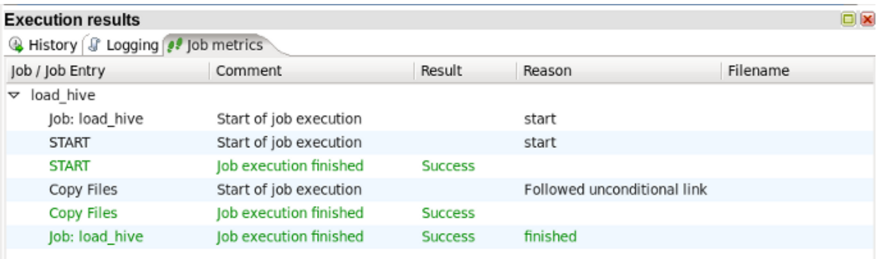
#	File/Folder source	File/Folder destination	Wildcard (Reg
1	hdfs://localhost/user/pdi/weblogs/parse	hdfs://localhost/user/hive/warehouse/weblogs	part-*

   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.



Execution results

Job / Job Entry	Comment	Result	Reason	Filename
load_hive				
Job: load_hive	Start of job execution		start	
START	Start of job execution		start	
START	Job execution finished	Success		
Copy Files	Start of job execution		Followed unconditional link	
Copy Files	Job execution finished	Success		
Job: load_hive	Job execution finished	Success	finished	

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

In order to follow along with this tutorial, you will need

- Hadoop
- Pentaho Data Integration
- 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.

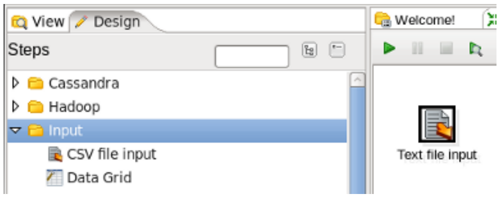
b) Create the table in HBase by entering `create 'weblogs', 'pageviews'` in the HBase shell. This creates a table named `weblogs` with a single column family named `pageviews`.

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.

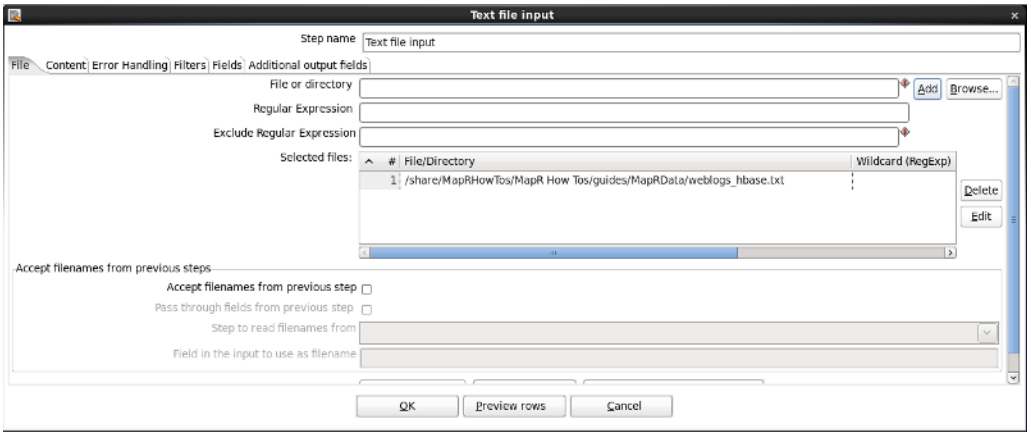


4. Edit the properties of the **Text file input** step by double-clicking the icon.

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.



Step name: Text file input

File or directory:

Regular Expression:

Exclude Regular Expression:

Selected files:

#	File/Directory	Wildcard (RegExp)
1	/share/MapRHowTos/MapR How Tos/guides/MapRData/weblogs_hbase.txt	

Accept filenames from previous steps

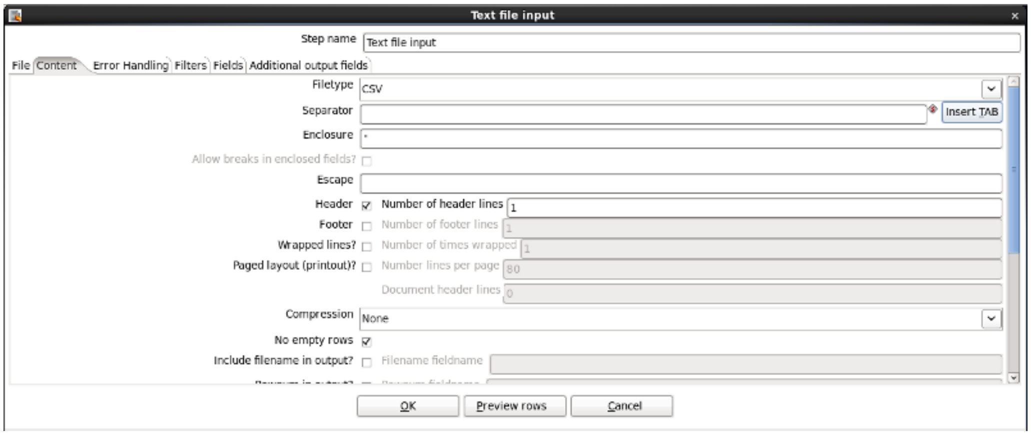
Accept filenames from previous step □

Pass through fields from previous step □

Step to read filenames from

Field in the input to use as filename

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.



Step name: Text file input

Filetype: CSV

Separator:

Enclosure: "

Allow breaks in enclosed fields? □

Escape:

Header ☑ Number of header lines: 1

Footer □ Number of footer lines: 1

Wrapped lines? □ Number of times wrapped: 1

Paged layout (printout)? □ Number lines per page: 80

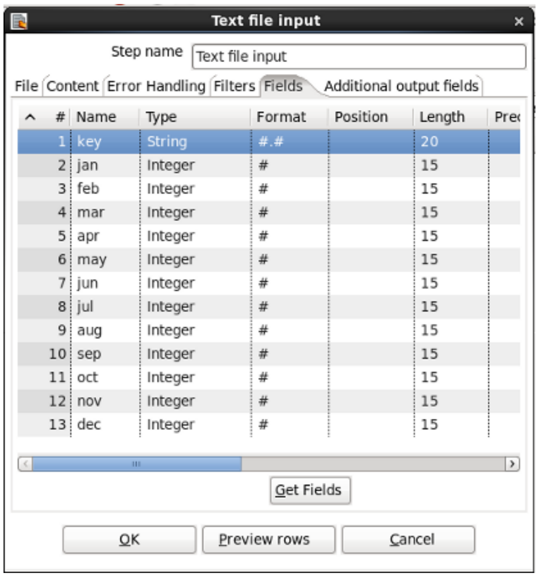
Document header lines: 0

Compression: None

No empty rows ☑

Include filename in output? □ Filename fieldname

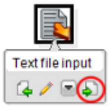
7. Configure the input fields.
   a) From the **Fields** tab, select **Get Fields** to populate the list the available fields.
   b) A dialog box appears asking for **Number of sample lines**. Enter **100** and click **OK**.
   c) Change the **Type** of the field named **key** to **String** and set the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

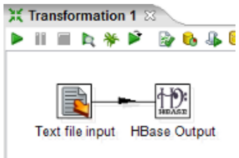


Step name: Text file input

#	Name	Type	Format	Position	Length	Prec
1	key	String	#.#		20	
2	jan	Integer	#		15	
3	feb	Integer	#		15	
4	mar	Integer	#		15	
5	apr	Integer	#		15	
6	may	Integer	#		15	
7	jun	Integer	#		15	
8	jul	Integer	#		15	
9	aug	Integer	#		15	
10	sep	Integer	#		15	
11	oct	Integer	#		15	
12	nov	Integer	#		15	
13	dec	Integer	#		15	

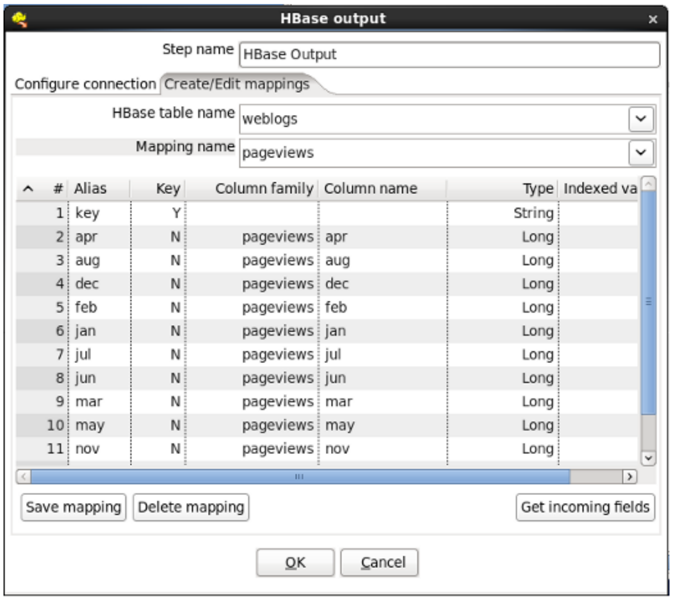
Click **OK** to close the window.

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**.



HBase output

Step name: HBase Output

Configure connection | Create/Edit mappings

HBase table name: weblogs

Mapping name: pageviews

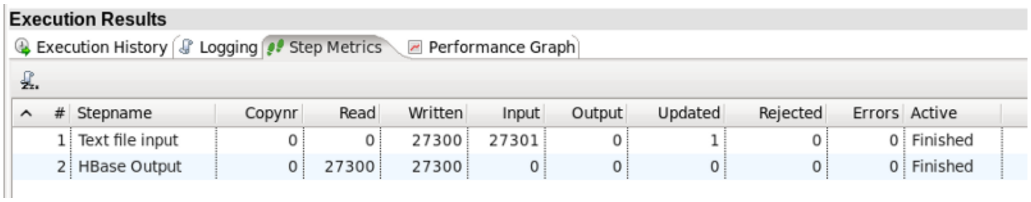
#	Alias	Key	Column family	Column name	Type	Indexed va
1	key	Y			String	
2	apr	N	pageviews	apr	Long	
3	aug	N	pageviews	aug	Long	
4	dec	N	pageviews	dec	Long	
5	feb	N	pageviews	feb	Long	
6	jan	N	pageviews	jan	Long	
7	jul	N	pageviews	jul	Long	
8	jun	N	pageviews	jun	Long	
9	mar	N	pageviews	mar	Long	
10	may	N	pageviews	may	Long	
11	nov	N	pageviews	nov	Long	

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.



#	Stepname	Copynr	Read	Written	Input	Output	Updated	Rejected	Errors	Active
1	Text file input	0	0	27300	27301	0	1	0	0	Finished
2	HBase Output	0	27300	27300	0	0	0	0	0	Finished

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.

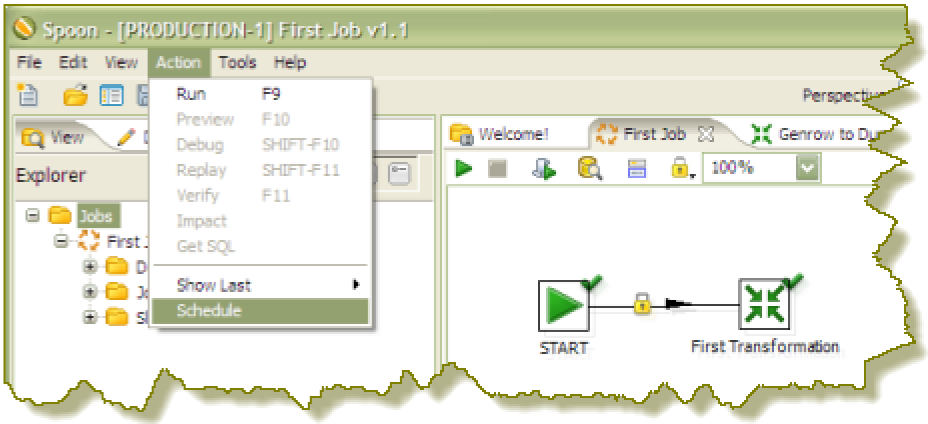
Scheduling and Scripting PDI Content

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.

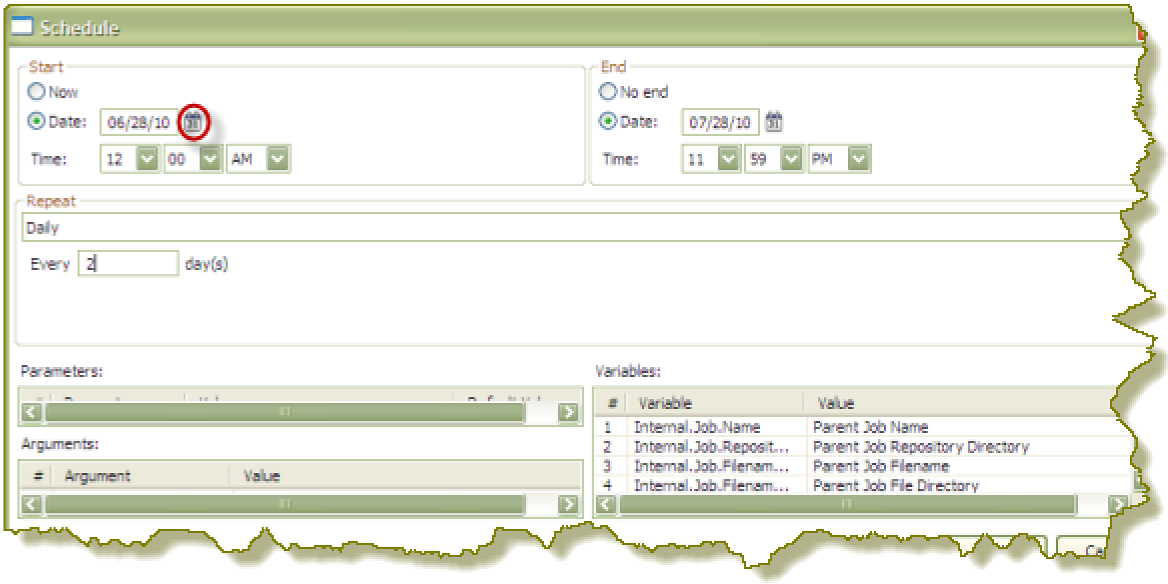
Scheduling Transformations and Jobs From Spoon

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.


Schedule

Start
○ Now
● Date: 06/28/10
Time: 12 00 AM

End
○ No end
● Date: 07/28/10
Time: 11 59 PM

Repeat
Daily
Every 2 day(s)

Parameters:

Arguments:

#	Argument	Value

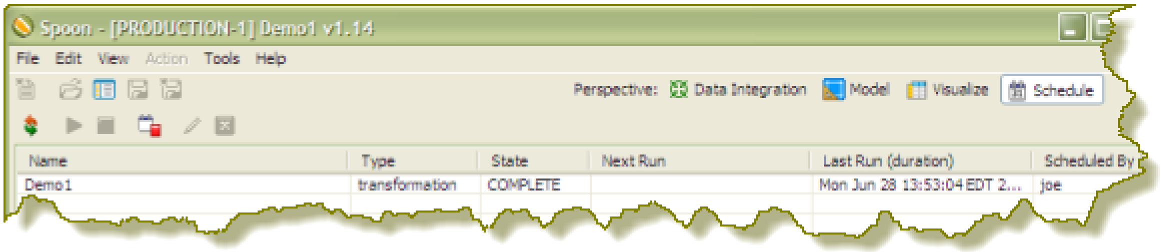
Variables:

#	Variable	Value
1	Internal.Job.Name	Parent Job Name
2	Internal.Job.Reposit...	Parent Job Repository Directory
3	Internal.Job.Filenam...	Parent Job Filename
4	Internal.Job.Filenam...	Parent Job File Directory

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**.

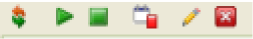
   End date and time are disabled unless you select a recurrence. From the list of schedule options select the choice that is most appropriate: **Run Once**, **Seconds**, **Minutes**, **Hourly**, **Daily**, **Weekly**, **Monthly**, **Yearly**.
5. Make sure you set parameters, arguments and variables, if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

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



Name	Type	State	Next Run	Last Run (duration)	Scheduled By
Demo1	transformation	COMPLETE		Mon Jun 28 13:53:04 EDT 2...	joe

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 a DI Solution 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=admin" "/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-<ph conref="../reuse_files/
reference_reusable.xml#reference_instaview_view_panel/PDIvernum3"/>\data-integration

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

```
   "/param:rep_user=admin" "/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 Solutions 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=admin" "/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

It is also possible to use obfuscated passwords with Encr, the 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-<ph conref="../reuse_files/
reference_reusable.xml#reference_instaview_view_panel/PDIvernum3"/>\data-integration

   call kitchen.bat /file:C:\Pentaho_samples\repository\repository_export.kjb "/
param:rep_name=PDI2000"
   "/param:rep_user=admin" "/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 successful.
   goto finished

   :error
   echo ERROR: An error occurred 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 section, 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 *Select DI Installation Options* and *Getting Started with PDI and Hadoop*.

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

The **MongoDB Input** transformation step enables you to retrieve *documents* or records from a *collection* within MongoDB. For additional information about MongoDB, see the *MongoDB documentation*.

Configure connection tab

The **Configure connection** tab enables you to specify the database and collection to query.

Option	Definition
Step name	Name of the step as it appears in the transformation workspace.
Host name(s) or IP address(es)	Indicates the network name or address of the MongoDB instance or instances. You can input multiple host names or IP addresses, separated by a comma. You can also specify a different port number for each host name by separating the host name and port

Option	Definition
	number with a colon, and separating each combination of host name and port number with a comma. For example, to include the host name and port number for two different MongoDB instances, you would input `localhost1:27017,localhost2:27018` and leave the **Port** field empty.
Use all replica set members/mongos	Differentiates between a replica set containing one node and a stand-alone single Mongo host. If there is a replica set, and it contains more than one host, then the Java driver discovers all hosts automatically. It is good practice to list more than one replica set host in the hosts field so that the driver has a better chance of connecting successfully if one is down.
Port	Indicates the port number of the MongoDB instance or instances. Specify a default port to use if no port numbers are specified in the **Host name(s) or IP address(es)** field.
Username	Indicates the username required to access the database.
Password	Indicates the password associated with the provided **Username**.
Authenticate using Kerberos	Indicates whether to use the Kerberos service to manage the authentication process.
Connection timeout	Designates how long to wait for a connection to a database (in milliseconds) before terminating the connection attempt. Leave blank to never terminate the connection.
Socket timeout	Designates how long to wait for a write operation (in milliseconds) before terminating the operation. Leave blank to never terminate the operation.
Preview	Displays a first look of the data. Clicking **Preview** causes the **Enter preview size** window to appear. Enter the maximum number of records that you want to preview, then click **OK**. The preview data appears in the **Examine preview data** window.

Input Options tab

The **Input Options** tab enables you to specify which database and collection you want to retrieve information from. You can also indicate the read preferences and tag sets in this tab. See *Tag Sets* for more information.

Option	Definition
Database	Name of the database to retrieve data from. Click **Get DBs** to populate the drop-down menu with a list of databases on the server.
Collection	Name of the collection to retrieve data from. Click **Get collections** to populate the drop-down menu with a list of collections within the database.
Read preference	Indicates which node to read first—**Primary**, **Primary preferred**, **Secondary**, **Secondary preferred**, or **Nearest**.
Tag set specification/#/Tag Set	Tags allow you to customize write concerns and read preferences for a replica set. The **Tag set specification** section of the window allows you to specify criteria for

Option	Definition
	selecting replica set members. When you click **Get tags**, the **Tag set specification** populates with the tag sets that are available on the database, in order of execution. You can join, delete, copy, or paste tag sets, then click **Test tag set** to see which replica set members match the **Tag set specification** criteria you specified. The **#** field indicates the number of the tag set. The **Tag set** field displays the tag set criteria.
Get Tags	Retrieves a list of the tag sets that are in the database indicated in the **Database** field.
Join tags	Appends selected tag sets so that nodes that match the criteria are queried or written to simultaneously. If you select individual tag sets, then click **Join tags**, the tag sets are combined to create one tag set. Note that this change only occurs in the **MongoDB Input** window, not on the database.
Test tag set	Displays the set members that match the tags indicated in the tag set specification. Clicking **Test tag set** displays the id, host name, priority, and tags for each replica set member that matches the tag set specification criteria.

Query tab

The **Query** tab enables you to refine your read request. This tab operates in two different modes. You can create a query using JSON Query expression or using the Aggregation Framework. By default, the **Query** tab is in JSON Query expression mode. You can enter a JSON Query expression when the **Query is aggregation pipeline** checkbox is deselected. MongoDB queries use a *JSON*-like query language that includes a variety of *query operators*. To place the Aggregation Framework mode **Query is aggregation pipeline** checkbox. You can then enter a query, using the Aggregation Framework, in the **Aggregation pipeline specification** field that appears. See *MongoDB's Aggregation Framework* for additional information, including code examples.

Option	Definition
Query expression (JSON)*(Field is visible if **Query is aggregation pipeline** checkbox is not selected.)*	JSON expression to limit the output. See the sub-section *Query Examples (JSON Query Expressions)* for additional details.
Aggregation pipeline specification (JSON)*(Field is visible if **Query is aggregation pipeline** checkbox is selected.)*	Use this field if you want to use the MongoDB Aggregation Framework to perform a simple or complex aggregations or selections such as totalling or averaging field values. Note that the method name (which includes the collection name of the database you selected in the **Input Options** tab), appears after the **Aggregation pipeline specification (JSON)** label for this field. See the sub-section *Query Examples (JSON Aggregate Pipeline)* for additional details.
Query is aggregation pipeline	Pipes multiple JSON expressions together to execute at once. An aggregation pipeline strings several JSON expressions together, with the output of the previous expression becoming the input for the next. When selected, the **Aggregation pipeline specification (JSON)** field appears. When deselected, the **Query expression (JSON)** field appears.
Execute for each row	Perform the query on each row of data.
Fields expression (JSON)*(Field is visible if **Query is aggregation pipeline** check box is not selected.)*	This field becomes active only if **Query is aggregation pipeline** *is not* selected. Controls the fields to return,

Option	Definition
	or in MongoDB terms, the projection. If empty, all fields are returned. Enter `true` or `false` after the fields to indicate selected or not, respectively. See the MongoDB documentation [*http://docs.mongodb.org/manual/reference/method/db.collection.find/*] for more information about projections.

Fields Tab

The **Fields** tab enables you to define properties for the exported fields. The **Fields** tab operates in two different modes that impact how query results are formatted. You can indicate that you want the query result to be stored in a single JSON field. To do this, click the **Output single JSON field** check box. If you decide to do this and you want to parse the results of the field, you can apply a transformation step later in the process. Or, you can uncheck the **Output single JSON field** check box and instead, click the **Get Fields** button to apply Pentaho's Schema on Read functionality. This functionality parses fields, paths, and data types and displays them. You can then review and adjust this information, as needed.

Option	Definition
Output single JSON field	Indicates whether the JSON result of the query should be outputted to a single field that has the String data type. You can parse this JSON using the **JSON Input** transformation step, `eval("{"+jsonString+"}")` in JavaScript, or using a *User Defined Java Class step*.
Name of JSON output field*(Field is active if* ***Output single JSON field*** *check box is selected.)*	Designates the name of the field that contains the JSON output from the server.
Get fields*(Field is active if* ***Output single JSON field*** *check box is not selected.)*	Creates a sample set of documents, then displays the name and field for each record. Pentaho's Schema on Read functionality determines the field names, paths, and the data type for each field in the sample.
# (Field is active if ***Output single JSON field*** *check box is not selected.)*	The order of this entry in the list.
Name*(Field is active if* ***Output single JSON field*** *check box is not selected.)*	Displays a user-friendly name of the field that is based on the value in the Path field. The name that appears here maps the name of the field as it appears in the PDI transformation with the field that appears in the MongoDB database. You can edit the name as desired.
Path*(Field is active if* ***Output single JSON field*** *check box is not selected.)*	Indicates the JSON path of the field in MongoDB. If the path shown is an array, you can specify a specific element in the array by passing it the key value, which is contained in the bracketed part of the array. For example `$.emails[0]` indicates that you want the result to display the first value in the array. `$.emails[1]` indicates that you want the result to display the second value in the array and so forth. If you want to display all array values, use the asterisk as the key, like this `$.email[*]`. If the array contains records, and not just strings, you can specify that you want to display the record like this: `$.emails[*].sender`.
Type*(Field is active if* ***Output single JSON field*** *check box is not selected.)*	Indicates the data type.
Indexed Values*(Field is active if* ***Output single JSON field*** *check box is not selected.)*	Allows you to enter a comma-separated list of legal values for String fields. If you specify values in this field, the Kettle indexed data type is applied to the data. If not, the String data type is applied. Usually, you will only need

Option	Definition
	to modify this field if you are using Weka metadata for nominal fields.
Sample: array min: max index*(Field is active if **Output single JSON field** check box is not selected.)*	Indicates minimum and maximum values for the index seen in the sampled documents.
Sample: #occur/#docs*(Field is active if **Output single JSON field** check box is not selected.)*	Indicates how often the field occurs as well as the number of documents processed.
Sample: disparate types*(Field is active if **Output single JSON field** check box is not selected.)*	If several documents are sampled, but the same field contain different data types, the **Sample: disparate types** field is populated with a "Y." The **Type** field displays the String data type. In this instance, the Kettle type for the field in question is set to the String data type, so it is able to output values of differing types.

Query Examples (JSON Query Expressions)

MongoDB has a rich query system that allows you to select and filter documents in a collection along specific fields and values. The *MogoDB Extended JASON* page in the MongoDB wiki space details how to use queries. Pentaho supports only the features discussed on this page. This table displays some examples of the syntax and structure of the queries you can use to request data from MongoDB.

Query expression	Description
`{ name : "MongoDB" }`	Queries all values where the `name` field has a value equal to `MongoDB`
`{ name : { '$regex' : "m.*", '$options' : "i" } }`	Uses a regular expression to find `name` fields 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
`{ $query: {}, $orderby: { age : -1 } }`	Returns all documents in the collection named collection sorted by the age field in descending order.

Query Examples (JSON Aggregate Pipeline)

MongoDB has a rich query system that allows you to select and filter documents using the aggregation pipeline framework. The *Aggregation Framework Examples* page in the MongoDB wiki provides additional examples of function calls. This table displays some examples of the syntax and structure of the queries you can use to request data from MongoDB.

Query expression	Description
`{ $match : {state : "FL", city : "ORLANDO" } }, {$sort : {pop : -1 } }`	Returns all fields from all documents where the `state` field has a value of `FL` and the city field has a value of `ORLANDO`. The documents will be returned sorted by the `pop` field in descending order.
`{ $group : { _id: "$state"} }, { $sort : { _id : 1 } }`	Returns one field named _id containing the distinct values for state in ascending order. Similar to the `SQL: SELECT DISTINCT state AS _id FROM collection ORDER BY state ASC`.

Query expression	Description
`{ $match : {state : "FL" } }, { $group: {_id: "$city" , pop: { $sum: "$pop" }  } }, { $sort: { pop: -1 } }, { $project: {_id : 0, city : "$_id" }  }`	Gets all documents where the`state` field has a value of `FL`, aggregates all values of `pop` for each city, sorts by population descending and returns one field named `city`.
`{ $unwind : "$result" }</p>`	Peels off the elements of an array individually, and returns one document for each element of the array.

MongoDB Output

The MongoDB Output step enables you to insert data to a MongoDB collection and specify a number of options that control what and how data is written. These tables describe the available options within the **MongoDB Output** step.

Configure connection tab

The **Configure connection tab** is where you enter basic connection details. Click **Get DBs** and **Get collections** to retrieve the names of existing databases and collections within the connected database.

Option	Definition
Step name	Name of this step as it appears in the transformation workspace
Host name(s) or IP address(es)	Indicates the network name or address of the MongoDB instance or instances. You can input multiple host names or IP addresses, separated by a comma. You can also specify a different port number for each host name by separating the host name and port number with a colon, and separating each combination of host name and port number with a comma. For example, to include the host name and port number for two different MongoDB instances, you would input `localhost1:27017,localhost2:27018` and leave the **Port** field empty.
Port	Indicates the port number of the MongoDB instance or instances. Use this to specify a default port if no ports are given as part of the **Host name(s) or IP address(es)** field.
Use all replica set members/mongos	Differentiates between a replica set containing one node and a stand-alone single Mongo host. If there is a replica set, and it contains more than one host, then the Java driver discovers all hosts automatically. It is good practice to list more than one replica set host in the hosts field so that the driver has a better chance of connecting successfully if one is down.
Username	Indicates the user name required to access the database
Password	Indicates the password associated with the provided **Username**.
Authenticate using Kerberos	Indicates whether to use the Kerberos service to manage the authentication process.
Connection timeout	Designates how long to wait for a connection to a database (in milliseconds) before terminating the connection attempt. Leave blank to never terminate the connection.

Option	Definition
Socket timeout	Designates how long to wait for a write operation (in milliseconds) before terminating the operation. Leave blank to never terminate the operation.

Output options tab

The **Output options** tab provides additional controls for inserting data into a MongoDB collection. If the specified collection does not exist, it is created before a document is inserted.

Option	Definition
Database	Name of the database to write data to. Click **Get DBs** to populate the drop-down menu with a list of databases on the server.
Collection	Name of the collection to write data to. Click **Get collections** to populate the drop-down menu with a list of collections within the database.
Batch insert size	Sets the batch size for fast bulk insert operations. If left blank, the default size is 100 rows.
Truncate collection	Deletes any existing data in the target collection before inserting begins.
Upsert	Changes the write mode from insert to upsert, which either updates the first document matched in the target collection or, if no document matches, inserts a new document into the target collection according to the incoming fields specified in the *Mongo document fields tab*.
Multi-update	Updates all matching documents, rather than just the first.
Modifier update	Enables modifier operators to be used to modify individual fields within matching documents. To set the *Modifier operation* see the *Mongo document fields tab*.
Write concern (w option)	*http://docs.mongodb.org/manual/reference/glossary/#term-write-concern* specifies the minimum number of servers that must succeed for a write operation. A value of `-1` disables all acknowledgement of write operation errors. `Zero (0)` disables basic acknowledgment of write operations, but returns information about socket excepts and networking errors. `1` provides acknowledgment of write operations on the primary node. `>1` waits for successful write operations to the specified number of slaves, including the primary.
w Time out	Designates how long to wait for a response to write operations (in milliseconds) before terminating the operation. Leave blank to never terminate.
Journaled writes	Writes the operation to the journal first, and after to the core data files. This confirms the write operation can survive a shutdown and ensures the write operation is durable.
Read preference	Indicates which node to read first—**Primary**, **Primary preferred**, **Secondary**, **Secondary preferred**, or **Nearest**
Number of retries for write operations	Indicates the number of times that a write operation is attempted.

Option	Definition
Delay, in seconds, between retry attempts	Indicates the number of seconds between write operation retry attempts.

Mongo document fields tab

The **Mongo document fields** tab enables you to define how field values which are coming into the step get written to a Mongo document. Configure the **Modifier policy** column in the **Mongo document fields tab** for control over when execution of a modifier operation affects a particular field. This can be particularly useful when the data for one Mongo document is split over several incoming PDI rows and in situations where it is not possible to execute different modifier operations that affect the same field simultaneously. The **Modifier policy** can be set to these values: `Insert&Update`, `Insert`, and `Update`. Only these modifier operations are supported: `$set`, `$inc`, and `$push`. You can set the **Modifier policy** to these values.

Option	Definition
#	The order of this entry in the list.
Name	The name of this field, descriptive of its content.
Mongo document path	Defines the hierarchical path to each field
Use field name	Specifies whether the incoming field name is used as the final entry in the path. When this is set to Y for a field, a preceding **.** (dot) is assumed.
JSON	Indicates if a field is in JSON format
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 a matching document does not exist, then a new document is inserted into the collection. `Insert&Update`: The operation gets executed whether or not a match exists in the collection according to the match conditions. `Insert`: The operation is executed on an insert only, for instance if a matching document does not exist. `Update`: Update only, for instance if the record exists.
Modifier operation	In-place modifications of existing document fields. Update more than one matching document by selecting the **Modifier update** option in conjunction with the **Upsert** option. Selecting the **Multi-update** option also enables each update to apply to all matching documents, rather than just the first. `$set`—Sets the value of a field. Used to create the bulk of initial document structure for a new document.`$inc`—If the field does not exist, sets the value of a field. If the field exists, increases (or decreases, with a negative value) the value of a field.`$push`—If the field does not exist, sets the value of a field. If the field exists, appends the value of a field. Used for appending to existing arrays in documents.
Modifier policy	Controls when execution of a modifier operation affects a particular field
Get fields	Populates the left-hand column of the table with the names of the incoming fields
Preview document structure	Displays the structure to be written to MongoDB in JSON format

Create/drop indexes tab

The **Create/drop indexes tab** enables you to specify which indexes to create or remove. An index is a data structure that allows you to quickly locate documents based on the values stored in the specified fields. Fundamentally, indexes in MongoDB are similar to indexes in other database systems. MongoDB supports indexes on any field or sub-field contained in documents within a MongoDB collection.

Each row in the table can be used to create 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.

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, `:1` for ascending or `:-1` for descending. Compound indexes are specified by a comma-separated list of paths.
Index opp	Specifies whether the index is created or dropped.
Unique	Indicates whether to display entries for documents that have a duplicate value for the indexed field.
Sparse	Indicates whether the index should contain only entries fro those documents that have a value in the indexed field.
Show indexes	Displays the index information available.

Further reading

See the *Big Data MongoDB Tutorials*, or *MongoDB Output* section of the Pentaho Wiki for scenario-based examples of working with MongoDB and Pentaho.

Splunk Input

The **Splunk Input** transformation step enables you to connect to a Splunk server, enter a Splunk query, and get results back for use within a PDI Transformation. Once you have completed those steps, you can stream data from Splunk into your transformation. Make sure that you have read access to a Splunk server before you use the **Splunk Input** step. To learn more about Splunk see their *online documentation*.

Configure connection tab

The **Configure connection** tab enables you to specify the database and collection to query.

Option	Definition
Step name	Name of the step as it appears in the transformation workspace.
Host name(s) or IP address(es)	Indicates the network name or address of the Splunk instance or instances.
Port	Indicates the port number of the Splunk (splunkd) server. The default value is 8089.
Username	Indicates the username required to access the Splunk server.
Password	Indicates the password associated with the provided **Username**.
Execute for each row	If checked, a new query is issued for each row of data coming into the step. You can reference incoming fields of

Option	Definition
	data using the `?{<Field>}` syntax. For instance, if you want to use the incoming field `Size` to drive the limit of results coming in, type this: `search *head ?{Size}`.
Splunk Query Expression	This is the definition of the splunk query. Note that unlike the queries defined in the Splunk user interface, you must start the query with the term `search`. Here is an example: `search * | head 100`. One capability of Splunk search is field selection. This allows you to get access to Splunk-parsed fields within the `_raw` column. To select specific fields, use this syntax at the end of your defined search query: `... | field index source OpCode`.
Preview	Provides a first look at the data. Clicking **Preview** causes the **Enter preview size** window to appear. Enter the maximum number of records that you want to preview, then click **OK**. The preview data appears in the **Examine preview data** window.

Fields Tab

The **Fields** tab enables you to define properties for the exported fields.

Option	Definition
#	Number of the record returned.
Name	Name of the field.
Splunk name	Indicates the Splunk name for the field.
Type	Specifies the data type of the field.
Length	Indicates the length of the field.
Format	Specifies the format of the field.
Get Fields	Displays the field metadata and displays it in the Fields tab. After you have detected the field metadata using the **Get Fields** button on the **Fields** tab, you may choose to delete metadata fields that are not relevant to your specific query. Since each field must be translated to its mapped data type, removing unused fields should increase performance.

Raw Field Parsing

The input step automatically attempts to parse the raw field into a number of child fields denoted by `_raw.<Field Name>`. It parses the raw field assuming that the field if formatted with name value pairs separated by a newline character, like this: `<Name1>=<Value1>\n <Name2>=<Value2>\n` . If raw field data is not formatted like this, you must post-process those fields with other steps in the transformation flow. Note that your secondary steps may include String variables.

Date Handling

Kettle does not support the parsing of ISO-8601 date formats, which is Splunk's format for passing date objects through web services. However, you can edit the date string returned from Splunk using the Modified Java Script Value step. Use this script to parse the date.

```
var dateobj = str2date((substr(_time, 0, 23) + "GMT" + substr(_time, 23)).trim(),
 "yyyy-MM-dd'T'HH:mm:ss.SSSz");
```

Splunk Output

The **Splunk Output** transformation step enables you to connect to a Splunk server and write events to a Splunk index. By default, the step writes events as name value pairs separated by newline characters, but can also write arbitrary formats by customizing event data. You must have write access to a Splunk server before you use the **Splunk Output** step. To learn more about Splunk see their *online documentation*.

Option	Definition
Step name	Name of the step as it appears in the transformation workspace.
Host name(s) or IP address(es)	Specifies the network name or address of the Splunk instance or instances.
Port	Indicates the port number of the Splunk (splunkd) server. The default value is 8089, but your administrator may have changed the port number.
Username	Specifies the username required to access the Splunk server.
Password	Indicates the password associated with the **Username**.
Index to write to	Specifies the Splunk index where the events are stored. Usually, this is the main index. Check your Splunk server for a list of available indices. This field can be parameterized with incoming fields `(?{<Field>})` or transformation parameters `(${Parameter})`.
Event host	Indicates the hostname of the original event host. If you want to gather data from a router and write it to Splunk, use the router's host name. This field can be parameterized with incoming fields `(?{<Field>})` or transformation parameters `(${Parameter})`.
Event source type	Indicates the format type of the event data. The list of known source types appears *here*. To define a new format, follow *these instructions*.
Event source	Indicates the source of the event data. See *Splunk documentation* for more details.
Customize Splunk event	If checked, enables the Splunk Event Data option and allows you to customize the data coming into Splunk. This is useful if you want to write a different format than the default, which is name value pairs separated by newline characters.
Splunk event data	Allows you to specify customized event text. This field can be parameterized with incoming fields `(?{<Field>})` or transformation parameters `(${Parameter})`.

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.

Option	Definition
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.
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];
```

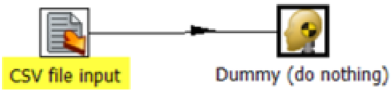
Important: Cassandra Input does not support the CQL range notation, for instance name1..nameN, for specifying columns in a SELECT query.

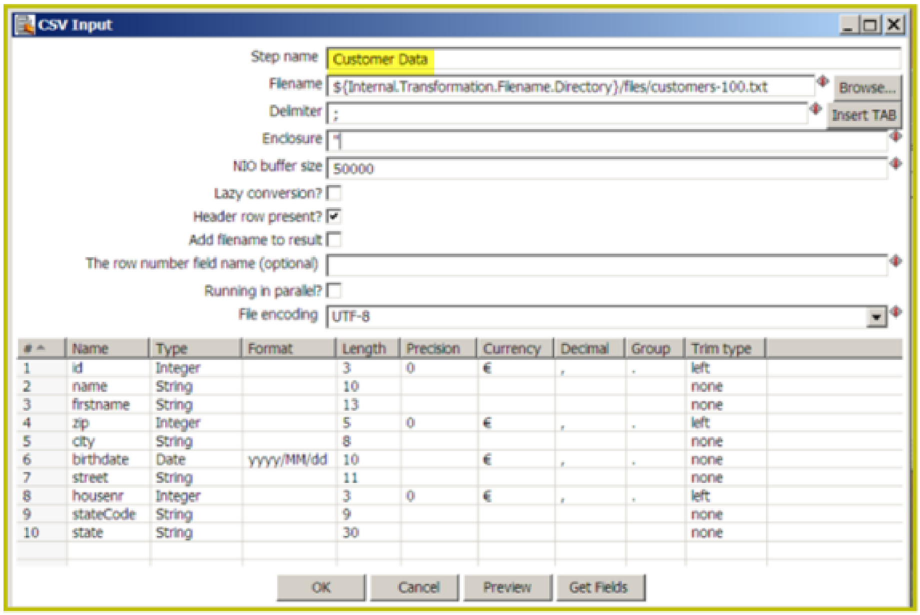
Select queries may name columns explicitly (in a comma separated list) or use the * wildcard. If the wildcard is used then only those columns defined in the metadata for the column family in question are returned. If columns are selected explicitly, then the name of each column must be enclosed in single 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.

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.`





Step name: Customer Data

Filename: ${Internal.Transformation.Filename.Directory}/files/customers-100.txt

Delimiter: ;

Enclosure: "

NIO buffer size: 50000

Lazy conversion? □

Header row present? ☑

Add filename to result □

The row number field name (optional):

Running in parallel? □

File encoding: UTF-8

# ^	Name	Type	Format	Length	Precision	Currency	Decimal	Group	Trim type
1	id	Integer		3	0	€	,	.	left
2	name	String		10					none
3	firstname	String		13					none
4	zip	Integer		5	0	€	,	.	left
5	city	String		8					none
6	birthdate	Date	yyyy/MM/dd	10		€	,	.	none
7	street	String		11					none
8	housenr	Integer		3	0	€	,	.	left
9	stateCode	String		9					none
10	state	String		30					none

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.
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

Option	Description
	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

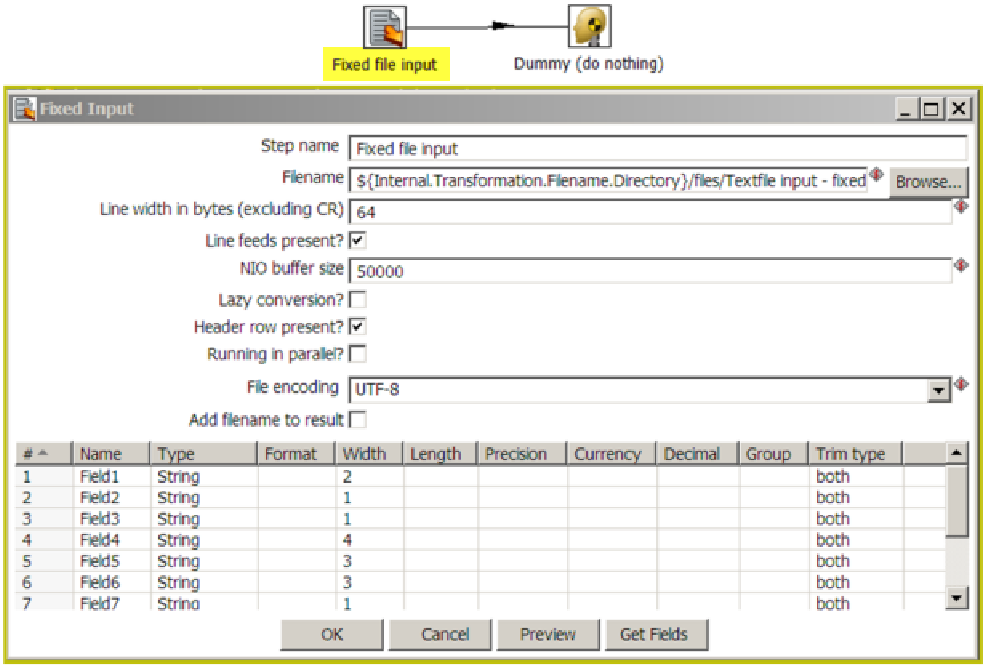
This step is not yet documented here. However, there may be a rough definition available in the Pentaho Wiki: *http://wiki.pentaho.com/display/EAI/Pentaho+Data+Integration+Steps*.

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`



Step name: Fixed file input
Filename: ${Internal.Transformation.Filename.Directory}/files/Textfile input - fixed
Line width in bytes (excluding CR): 64
Line feeds present? ☑
NIO buffer size: 50000
Lazy conversion? □
Header row present? ☑
Running in parallel? □
File encoding: UTF-8
Add filename to result □

#	Name	Type	Format	Width	Length	Precision	Currency	Decimal	Group	Trim type
1	Field1	String		2						both
2	Field2	String		1						both
3	Field3	String		1						both
4	Field4	String		4						both
5	Field5	String		3						both
6	Field6	String		3						both
7	Field7	String		1						both

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

Option	Description
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	

Option	Definition
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 reads a parent folder and returns all subfolders.

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

Note: This step was deprecated in favor of the *Google Analytics step*.

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
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 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>`
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.
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.

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 246, messages can be read from a remote server, processed by a transformation and then acknowledged by the *HL7 MLLP Acknowledge* on page 246 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.
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

The **JSON Input** step extracts relevant portions out of JSON structures, files or incoming fields, and outputs rows.

File Tab

The **File** tab is where you enter basic connection information for accessing a resource.

Option	Definition
Step name	Name of this step as it appears in the transformation workspace
Source is defined in a field	Retrieves the source from a previously defined field
Source is a filename	Indicates source is a filename
Read source as URL	Indicates a source should be accessed as a URL
Get source from field	Indicates the field to retrieve a source from
File or directory	Indicates the location of the source if the source is not defined in a field
Regular expression	All filenames that match this regular expression are selected if a directory is specified
Exclude regular expression	All filenames that match this regular expression are excluded if a directory is specified
Show filename	Displays the file names of the connected source

Content Tab

The **Content** tab enables you to configure which data to collect.

Option	Definition
Ignore empty file	When checked, indicates to skip empty files—when unchecked, instances of empty files causes the process fail and stop
Do not raise an error if no files	When unchecked, causes the transformation to fail when there is no file to process—then checked, avoids failure when there is no file to process
Ignore missing path	When unchecked, causes the transformation to fail when the JSON path is missing—then checked, avoids failure when there is no JSON path
Limit	Sets a limit on the number of records generated from the step when set greater than zero
Include filename in output	Adds a string field with the filename in the result
Rownum in output	Adds an integer field with the row number in the result
Add files to result filesname	If checked, adds processed files to the result file list

Fields Tab

The **Fields** tab displays field definitions to extract values from the JSON structure. This step uses *JSONPath* to extract fields from JSON structures.

Additional Output Fields Tab

The **Additional output fields** tab enables you to provide additional information about the file to process.

Sample Transformations

Pentaho Data Integration ships with sample transformations you can run to demonstrate step functionality. To open a sample transformation, from within the Spoon interface, go to the **File** menu and select **Open**. Browse to `pentaho\design-tools\data-integration\samples\transformations`, then select the sample transformation you want to run. Within this directory are several sample transformations to demonstrate the functionality of this step.

- `JsonInput - read a dynamic file.ktr`

- `JsonInput - read a file.ktr`
- `JsonInput - read incoming stream.ktr`

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.

Option	Description
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.

Option	Description
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.

Option	Description
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

The **MongoDB Input** transformation step enables you to retrieve *documents* or records from a *collection* within MongoDB. For additional information about MongoDB, see the *MongoDB documentation*.

Configure connection tab

The **Configure connection** tab enables you to specify the database and collection to query.

Option	Definition
Step name	Name of the step as it appears in the transformation workspace.
Host name(s) or IP address(es)	Indicates the network name or address of the MongoDB instance or instances. You can input multiple host names or IP addresses, separated by a comma. You can also specify a different port number for each host name by separating the host name and port number with a colon, and separating each combination of host name and port number with a comma. For example, to include the host name and port number for two different MongoDB instances, you would input `localhost1:27017,localhost2:27018` and leave the **Port** field empty.
Use all replica set members/mongos	Differentiates between a replica set containing one node and a stand-alone single Mongo host. If there is a replica set, and it contains more than one host, then the Java driver discovers all hosts automatically. It is good practice to list more than one replica set host in the hosts field so that the driver has a better chance of connecting successfully if one is down.

Option	Definition
Port	Indicates the port number of the MongoDB instance or instances. Specify a default port to use if no port numbers are specified in the **Host name(s) or IP address(es)** field.
Username	Indicates the username required to access the database.
Password	Indicates the password associated with the provided **Username**.
Authenticate using Kerberos	Indicates whether to use the Kerberos service to manage the authentication process.
Connection timeout	Designates how long to wait for a connection to a database (in milliseconds) before terminating the connection attempt. Leave blank to never terminate the connection.
Socket timeout	Designates how long to wait for a write operation (in milliseconds) before terminating the operation. Leave blank to never terminate the operation.
Preview	Displays a first look of the data. Clicking **Preview** causes the **Enter preview size** window to appear. Enter the maximum number of records that you want to preview, then click **OK**. The preview data appears in the **Examine preview data** window.

Input Options tab

The **Input Options** tab enables you to specify which database and collection you want to retrieve information from. You can also indicate the read preferences and tag sets in this tab. See *Tag Sets* for more information.

Option	Definition
Database	Name of the database to retrieve data from. Click **Get DBs** to populate the drop-down menu with a list of databases on the server.
Collection	Name of the collection to retrieve data from. Click **Get collections** to populate the drop-down menu with a list of collections within the database.
Read preference	Indicates which node to read first—**Primary**, **Primary preferred**, **Secondary**, **Secondary preferred**, or **Nearest**.
Tag set specification/#/Tag Set	Tags allow you to customize write concerns and read preferences for a replica set. The **Tag set specification** section of the window allows you to specify criteria for selecting replica set members. When you click **Get tags**, the **Tag set specification** populates with the tag sets that are available on the database, in order of execution. You can join, delete, copy, or paste tag sets, then click **Test tag set** to see which replica set members match the **Tag set specification** criteria you specified. The **#** field indicates the number of the tag set. The **Tag set** field displays the tag set criteria.
Get Tags	Retrieves a list of the tag sets that are in the database indicated in the **Database** field.
Join tags	Appends selected tag sets so that nodes that match the criteria are queried or written to simultaneously. If you

Option	Definition
	select individual tag sets, then click **Join tags**, the tag sets are combined to create one tag set. Note that this change only occurs in the **MongoDB Input** window, not on the database.
Test tag set	Displays the set members that match the tags indicated in the tag set specification. Clicking **Test tag set** displays the id, host name, priority, and tags for each replica set member that matches the tag set specification criteria.

Query tab

The **Query** tab enables you to refine your read request. This tab operates in two different modes. You can create a query using JSON Query expression or using the Aggregation Framework. By default, the **Query** tab is in JSON Query expression mode. You can enter a JSON Query expression when the **Query is aggregation pipeline** checkbox is deselected. MongoDB queries use a *JSON*-like query language that includes a variety of *query operators*. To place the Aggregation Framework mode **Query is aggregation pipeline** checkbox. You can then enter a query, using the Aggregation Framework, in the **Aggregation pipeline specification** field that appears. See *MongoDB's Aggregation Framework* for additional information, including code examples.

Option	Definition
Query expression (JSON)*(Field is visible if **Query is aggregation pipeline** checkbox is not selected.)*	JSON expression to limit the output. See the sub-section *Query Examples (JSON Query Expressions)* for additional details.
Aggregation pipeline specification (JSON)*(Field is visible if **Query is aggregation pipeline** checkbox is selected.)*	Use this field if you want to use the MongoDB Aggregation Framework to perform a simple or complex aggregations or selections such as totalling or averaging field values. Note that the method name (which includes the collection name of the database you selected in the **Input Options** tab), appears after the **Aggregation pipeline specification (JSON)** label for this field. See the sub-section *Query Examples (JSON Aggregate Pipeline)* for additional details.
Query is aggregation pipeline	Pipes multiple JSON expressions together to execute at once. An aggregation pipeline strings several JSON expressions together, with the output of the previous expression becoming the input for the next. When selected, the **Aggregation pipeline specification (JSON)** field appears. When deselected, the **Query expression (JSON)** field appears.
Execute for each row	Perform the query on each row of data.
Fields expression (JSON)*(Field is visible if **Query is aggregation pipeline** check box is not selected.)*	This field becomes active only if **Query is aggregation pipeline** *is not* selected. Controls the fields to return, or in MongoDB terms, the projection. If empty, all fields are returned. Enter `true` or `false` after the fields to indicate selected or not, respectively. See the MongoDB documentation [*http://docs.mongodb.org/manual/reference/method/db.collection.find/*] for more information about projections.

Fields Tab

The **Fields** tab enables you to define properties for the exported fields. The **Fields** tab operates in two different modes that impact how query results are formatted. You can indicate that you want the query result to be stored in a single JSON field. To do this, click the **Output single JSON field** check box. If you decide to do this and you want to parse the results of the field, you can apply a transformation step later in the process. Or, you can uncheck the **Output single JSON field** check box and instead, click the **Get Fields** button to apply Pentaho's Schema on Read functionality. This functionality parses fields, paths, and data types and displays them. You can then review and adjust this information, as needed.

Option	Definition
Output single JSON field	Indicates whether the JSON result of the query should be outputted to a single field that has the String data type. You can parse this JSON using the **JSON Input** transformation step, `eval("{"+jsonString+"}")` in JavaScript, or using a *User Defined Java Class step*.
Name of JSON output field*(Field is active if **Output single JSON field** check box is selected.)*	Designates the name of the field that contains the JSON output from the server.
Get fields*(Field is active if **Output single JSON field** check box is not selected.)*	Creates a sample set of documents, then displays the name and field for each record. Pentaho's Schema on Read functionality determines the field names, paths, and the data type for each field in the sample.
*# (Field is active if **Output single JSON field** check box is not selected.)*	The order of this entry in the list.
Name*(Field is active if **Output single JSON field** check box is not selected.)*	Displays a user-friendly name of the field that is based on the value in the Path field. The name that appears here maps the name of the field as it appears in the PDI transformation with the field that appears in the MongoDB database. You can edit the name as desired.
Path*(Field is active if **Output single JSON field** check box is not selected.)*	Indicates the JSON path of the field in MongoDB. If the path shown is an array, you can specify a specific element in the array by passing it the key value, which is contained in the bracketed part of the array. For example `$.emails[0]` indicates that you want the result to display the first value in the array. `$.emails[1]` indicates that you want the result to display the second value in the array and so forth. If you want to display all array values, use the asterisk as the key, like this `$.email[*]`. If the array contains records, and not just strings, you can specify that you want to display the record like this: `$.emails[*].sender`.
Type*(Field is active if **Output single JSON field** check box is not selected.)*	Indicates the data type.
Indexed Values*(Field is active if **Output single JSON field** check box is not selected.)*	Allows you to enter a comma-separated list of legal values for String fields. If you specify values in this field, the Kettle indexed data type is applied to the data. If not, the String data type is applied. Usually, you will only need to modify this field if you are using Weka metadata for nominal fields.
Sample: array min: max index*(Field is active if **Output single JSON field** check box is not selected.)*	Indicates minimum and maximum values for the index seen in the sampled documents.
Sample: #occur/#docs*(Field is active if **Output single JSON field** check box is not selected.)*	Indicates how often the field occurs as well as the number of documents processed.
Sample: disparate types*(Field is active if **Output single JSON field** check box is not selected.)*	If several documents are sampled, but the same field contain different data types, the **Sample: disparate types** field is populated with a "Y." The **Type** field displays the String data type. In this instance, the Kettle type for the field in question is set to the String data type, so it is able to output values of differing types.

Query Examples (JSON Query Expressions)

MongoDB has a rich query system that allows you to select and filter documents in a collection along specific fields and values. The *MogoDB Extended JASON* page in the MongoDB wiki space details how to use queries. Pentaho supports only the features discussed on this page. This table displays some examples of the syntax and structure of the queries you can use to request data from MongoDB.

Query expression	Description
`{ name : "MongoDB" }`	Queries all values where the `name` field has a value equal to `MongoDB`
`{ name : { '$regex' : "m.*", '$options' : "i" } }`	Uses a regular expression to find `name` fields 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
`{ $query: {}, $orderby: { age : -1 } }`	Returns all documents in the collection named collection sorted by the age field in descending order.

Query Examples (JSON Aggregate Pipeline)

MongoDB has a rich query system that allows you to select and filter documents using the aggregation pipeline framework. The *Aggregation Framework Examples* page in the MongoDB wiki provides additional examples of function calls. This table displays some examples of the syntax and structure of the queries you can use to request data from MongoDB.

Query expression	Description
`{ $match : {state : "FL", city : "ORLANDO" } }, {$sort : {pop : -1 } }`	Returns all fields from all documents where the `state` field has a value of `FL` and the city field has a value of `ORLANDO`. The documents will be returned sorted by the `pop` field in descending order.
`{ $group : { _id: "$state"} }, { $sort : { _id : 1 } }`	Returns one field named _id containing the distinct values for state in ascending order. Similar to the `SQL: SELECT DISTINCT state AS _id FROM collection ORDER BY state ASC`.
`{ $match : {state : "FL" } }, { $group: {_id: "$city" , pop: { $sum: "$pop" } } }, { $sort: { pop: -1 } }, { $project: {_id : 0, city : "$_id" } }`	Gets all documents where the`state` field has a value of `FL`, aggregates all values of `pop` for each city, sorts by population descending and returns one field named `city`.
`{ $unwind : "$result" }</p>`	Peels off the elements of an array individually, and returns one document for each element of the array.

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.

Splunk Input

The **Splunk Input** transformation step enables you to connect to a Splunk server, enter a Splunk query, and get results back for use within a PDI Transformation. Once you have completed those steps, you can stream data from Splunk into your transformation. Make sure that you have read access to a Splunk server before you use the **Splunk Input** step. To learn more about Splunk see their *online documentation*.

Configure connection tab

The **Configure connection** tab enables you to specify the database and collection to query.

Option	Definition
Step name	Name of the step as it appears in the transformation workspace.
Host name(s) or IP address(es)	Indicates the network name or address of the Splunk instance or instances.
Port	Indicates the port number of the Splunk (splunkd) server. The default value is 8089.
Username	Indicates the username required to access the Splunk server.

Option	Definition
Password	Indicates the password associated with the provided **Username**.
Execute for each row	If checked, a new query is issued for each row of data coming into the step. You can reference incoming fields of data using the `?{<Field>}` syntax. For instance, if you want to use the incoming field `Size` to drive the limit of results coming in, type this: `search *head ?{Size}`.
Splunk Query Expression	This is the definition of the splunk query. Note that unlike the queries defined in the Splunk user interface, you must start the query with the term `search`. Here is an example: `search * | head 100`. One capability of Splunk search is field selection. This allows you to get access to Splunk-parsed fields within the `_raw` column. To select specific fields, use this syntax at the end of your defined search query: `... | field index source OpCode`.
Preview	Provides a first look at the data. Clicking **Preview** causes the **Enter preview size** window to appear. Enter the maximum number of records that you want to preview, then click **OK**. The preview data appears in the **Examine preview data** window.

Fields Tab

The **Fields** tab enables you to define properties for the exported fields.

Option	Definition
#	Number of the record returned.
Name	Name of the field.
Splunk name	Indicates the Splunk name for the field.
Type	Specifies the data type of the field.
Length	Indicates the length of the field.
Format	Specifies the format of the field.
Get Fields	Displays the field metadata and displays it in the Fields tab. After you have detected the field metadata using the **Get Fields** button on the **Fields** tab, you may choose to delete metadata fields that are not relevant to your specific query. Since each field must be translated to its mapped data type, removing unused fields should increase performance.

Raw Field Parsing

The input step automatically attempts to parse the raw field into a number of child fields denoted by `_raw.<Field Name>`. It parses the raw field assuming that the field if formatted with name value pairs separated by a newline character, like this: `<Name1>=<Value1>\n <Name2>=<Value2>\n` . If raw field data is not formatted like this, you must post-process those fields with other steps in the transformation flow. Note that your secondary steps may include String variables.

Date Handling

Kettle does not support the parsing of ISO-8601 date formats, which is Splunk's format for passing date objects through web services. However, you can edit the date string returned from Splunk using the Modified Java Script Value step. Use this script to parse the date.

```
var dateobj = str2date((substr(_time, 0, 23) + "GMT" + substr(_time, 23)).trim(),
 "yyyy-MM-dd'T'HH:mm:ss.SSSz");
```

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.
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.

Option	Description
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.
Connection	The database connection from which to read data; see Managing Connections for more information.
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.

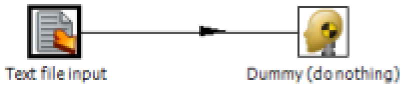
For additional information, see *Table Input*

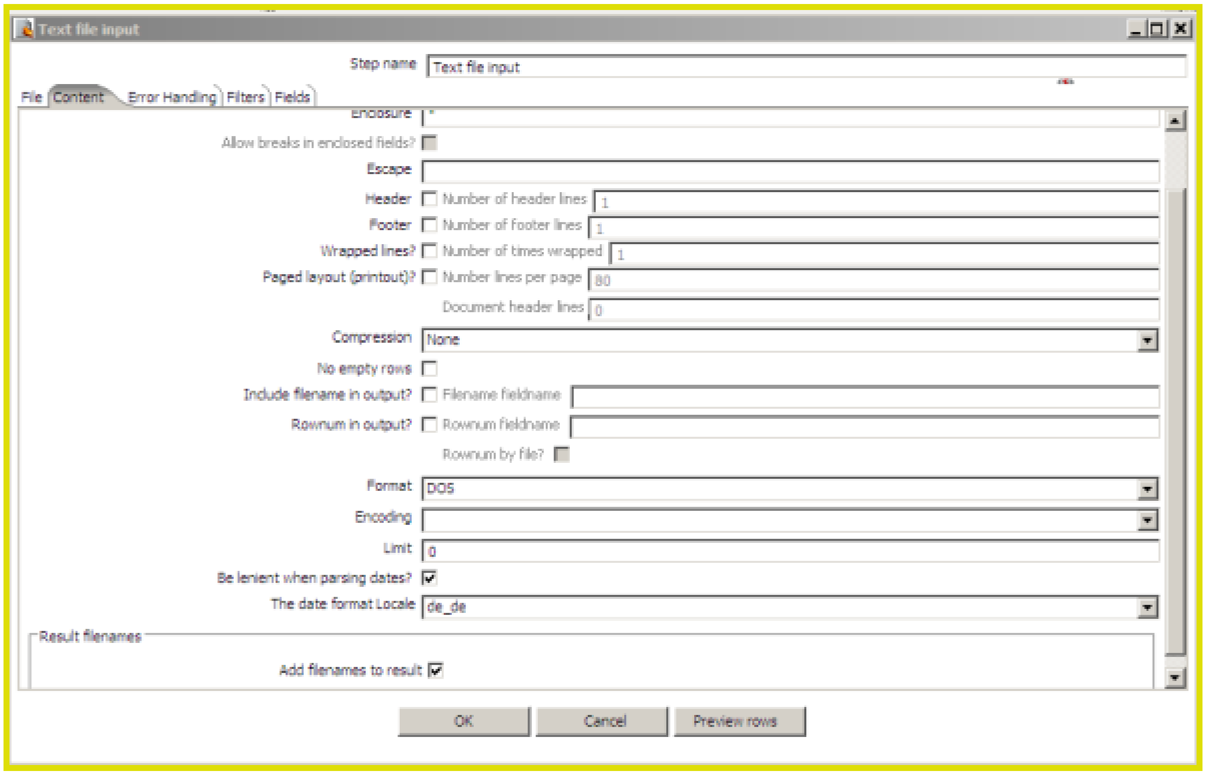
Text File Input

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`.





Step name: Text file input

Enclosure: "

Allow breaks in enclosed fields? ☐

Escape:

Header ☐ Number of header lines: 1

Footer ☐ Number of footer lines: 1

Wrapped lines? ☐ Number of times wrapped: 1

Paged layout (printout)? ☐ Number lines per page: 80

Document header lines: 0

Compression: None

No empty rows ☐

Include filename in output? ☐ Filename fieldname:

Rownum in output? ☐ Rownum fieldname:

Rownum by file? ☐

Format: DOS

Encoding:

Limit: 0

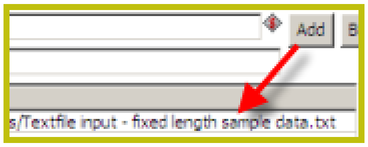
Be lenient when parsing dates? ☑

The date format Locale: de_de

Result filenames

Add filenames to result ☑

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.  s/Textfile input - fixed length sample data.txt
Regular expression	Specify the regular expression you want to use to select the files in the directory specified in the previous option.

Option	Description
	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.
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

Option	Description
	'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.
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
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

Option	Description
	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
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

Symbol	Location	Localized	Meaning
			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.

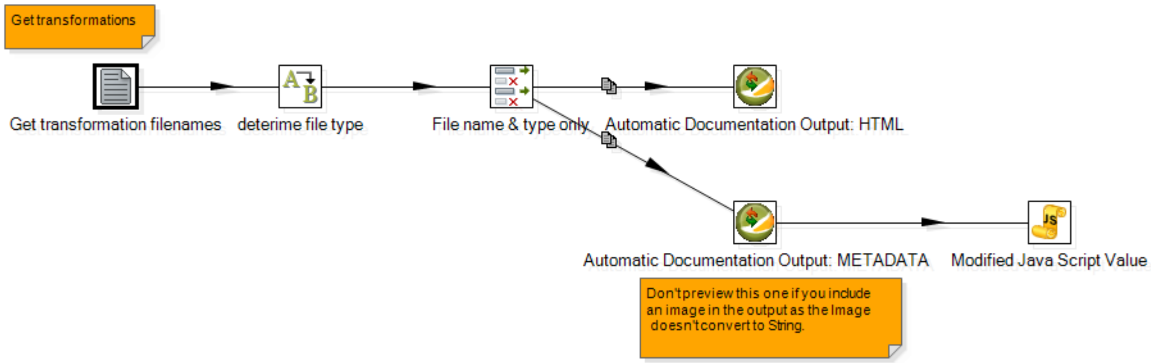
Automatic Documentation Output

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.

Option	Definition
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.


Get transformations
Get transformation filenames
deterime file type
File name & type only
Automatic Documentation Output: HTML
Automatic Documentation Output: METADATA
Modified Java Script Value
Don't preview this one if you include an image in the output as the Image doesn't convert to String.

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.
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.

Option	Definition
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.

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.

Option	Description
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.

Option	Description
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.

MongoDB Output

The MongoDB Output step enables you to insert data to a MongoDB collection and specify a number of options that control what and how data is written. These tables describe the available options within the **MongoDB Output** step.

Configure connection tab

The **Configure connection tab** is where you enter basic connection details. Click **Get DBs** and **Get collections** to retrieve the names of existing databases and collections within the connected database.

Option	Definition
Step name	Name of this step as it appears in the transformation workspace
Host name(s) or IP address(es)	Indicates the network name or address of the MongoDB instance or instances. You can input multiple host names or IP addresses, separated by a comma. You can also specify a different port number for each host name by separating the host name and port number with a colon, and separating each combination of host name and port number with a comma. For example, to include the host name and port number for two different MongoDB instances, you would input `localhost1:27017,localhost2:27018` and leave the **Port** field empty.
Port	Indicates the port number of the MongoDB instance or instances. Use this to specify a default port if no ports are given as part of the **Host name(s) or IP address(es)** field.
Use all replica set members/mongos	Differentiates between a replica set containing one node and a stand-alone single Mongo host. If there is a replica set, and it contains more than one host, then the Java driver discovers all hosts automatically. It is good practice to list more than one replica set host in the hosts field so that the driver has a better chance of connecting successfully if one is down.
Username	Indicates the user name required to access the database
Password	Indicates the password associated with the provided **Username**.
Authenticate using Kerberos	Indicates whether to use the Kerberos service to manage the authentication process.
Connection timeout	Designates how long to wait for a connection to a database (in milliseconds) before terminating the connection attempt. Leave blank to never terminate the connection.

Option	Definition
Socket timeout	Designates how long to wait for a write operation (in milliseconds) before terminating the operation. Leave blank to never terminate the operation.

Output options tab

The **Output options** tab provides additional controls for inserting data into a MongoDB collection. If the specified collection does not exist, it is created before a document is inserted.

Option	Definition
Database	Name of the database to write data to. Click **Get DBs** to populate the drop-down menu with a list of databases on the server.
Collection	Name of the collection to write data to. Click **Get collections** to populate the drop-down menu with a list of collections within the database.
Batch insert size	Sets the batch size for fast bulk insert operations. If left blank, the default size is 100 rows.
Truncate collection	Deletes any existing data in the target collection before inserting begins.
Upsert	Changes the write mode from insert to upsert, which either updates the first document matched in the target collection or, if no document matches, inserts a new document into the target collection according to the incoming fields specified in the *Mongo document fields tab*.
Multi-update	Updates all matching documents, rather than just the first.
Modifier update	Enables modifier operators to be used to modify individual fields within matching documents. To set the *Modifier operation* see the *Mongo document fields tab*.
Write concern (w option)	*http://docs.mongodb.org/manual/reference/glossary/#term-write-concern* specifies the minimum number of servers that must succeed for a write operation. A value of `-1` disables all acknowledgement of write operation errors. `Zero (0)` disables basic acknowledgment of write operations, but returns information about socket excepts and networking errors. `1` provides acknowledgment of write operations on the primary node. `>1` waits for successful write operations to the specified number of slaves, including the primary.
w Time out	Designates how long to wait for a response to write operations (in milliseconds) before terminating the operation. Leave blank to never terminate.
Journaled writes	Writes the operation to the journal first, and after to the core data files. This confirms the write operation can survive a shutdown and ensures the write operation is durable.
Read preference	Indicates which node to read first—**Primary**, **Primary preferred**, **Secondary**, **Secondary preferred**, or **Nearest**
Number of retries for write operations	Indicates the number of times that a write operation is attempted.

Option	Definition
Delay, in seconds, between retry attempts	Indicates the number of seconds between write operation retry attempts.

Mongo document fields tab

The **Mongo document fields** tab enables you to define how field values which are coming into the step get written to a Mongo document. Configure the **Modifier policy** column in the **Mongo document fields tab** for control over when execution of a modifier operation affects a particular field. This can be particularly useful when the data for one Mongo document is split over several incoming PDI rows and in situations where it is not possible to execute different modifier operations that affect the same field simultaneously. The **Modifier policy** can be set to these values: `Insert&Update`, `Insert`, and `Update`. Only these modifier operations are supported: `$set`, `$inc`, and `$push`. You can set the **Modifier policy** to these values.

Option	Definition
#	The order of this entry in the list.
Name	The name of this field, descriptive of its content.
Mongo document path	Defines the hierarchical path to each field
Use field name	Specifies whether the incoming field name is used as the final entry in the path. When this is set to Y for a field, a preceding **.** (dot) is assumed.
JSON	Indicates if a field is in JSON format
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 a matching document does not exist, then a new document is inserted into the collection. `Insert&Update`: The operation gets executed whether or not a match exists in the collection according to the match conditions. `Insert`: The operation is executed on an insert only, for instance if a matching document does not exist. `Update`: Update only, for instance if the record exists.
Modifier operation	In-place modifications of existing document fields. Update more than one matching document by selecting the **Modifier update** option in conjunction with the **Upsert** option. Selecting the **Multi-update** option also enables each update to apply to all matching documents, rather than just the first. `$set`—Sets the value of a field. Used to create the bulk of initial document structure for a new document.`$inc`—If the field does not exist, sets the value of a field. If the field exists, increases (or decreases, with a negative value) the value of a field.`$push`—If the field does not exist, sets the value of a field. If the field exists, appends the value of a field. Used for appending to existing arrays in documents.
Modifier policy	Controls when execution of a modifier operation affects a particular field
Get fields	Populates the left-hand column of the table with the names of the incoming fields
Preview document structure	Displays the structure to be written to MongoDB in JSON format

Create/drop indexes tab

The **Create/drop indexes tab** enables you to specify which indexes to create or remove. An index is a data structure that allows you to quickly locate documents based on the values stored in the specified fields. Fundamentally, indexes in MongoDB are similar to indexes in other database systems. MongoDB supports indexes on any field or sub-field contained in documents within a MongoDB collection.

Each row in the table can be used to create 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.

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, `:1` for ascending or `:-1` for descending. Compound indexes are specified by a comma-separated list of paths.
Index opp	Specifies whether the index is created or dropped.
Unique	Indicates whether to display entries for documents that have a duplicate value for the indexed field.
Sparse	Indicates whether the index should contain only entries fro those documents that have a value in the indexed field.
Show indexes	Displays the index information available.

Further reading

See the *Big Data MongoDB Tutorials*, or *MongoDB Output* section of the Pentaho Wiki for scenario-based examples of working with MongoDB and Pentaho.

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 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).

Option	Definition
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.
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.

Option	Description
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.
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.

Option	Description
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.

Splunk Output

The **Splunk Output** transformation step enables you to connect to a Splunk server and write events to a Splunk index. By default, the step writes events as name value pairs separated by newline characters, but can also write arbitrary formats by customizing event data. You must have write access to a Splunk server before you use the **Splunk Output** step. To learn more about Splunk see their *online documentation*.

Option	Definition
Step name	Name of the step as it appears in the transformation workspace.
Host name(s) or IP address(es)	Specifies the network name or address of the Splunk instance or instances.
Port	Indicates the port number of the Splunk (splunkd) server. The default value is 8089, but your administrator may have changed the port number.
Username	Specifies the username required to access the Splunk server.
Password	Indicates the password associated with the **Username**.
Index to write to	Specifies the Splunk index where the events are stored. Usually, this is the main index. Check your Splunk server for a list of available indices. This field can be parameterized with incoming fields `(?{<Field>})` or transformation parameters `(${Parameter})`.
Event host	Indicates the hostname of the original event host. If you want to gather data from a router and write it to Splunk, use the router's host name. This field can be parameterized with incoming fields `(?{<Field>})` or transformation parameters `(${Parameter})`.
Event source type	Indicates the format type of the event data. The list of known source types appears *here*. To define a new format, follow *these instructions*.
Event source	Indicates the source of the event data. See *Splunk documentation* for more details.
Customize Splunk event	If checked, enables the Splunk Event Data option and allows you to customize the data coming into Splunk. This is useful if you want to write a different format than the default, which is name value pairs separated by newline characters.
Splunk event data	Allows you to specify customized event text. This field can be parameterized with incoming fields `(?{<Field>})` or transformation parameters `(${Parameter})`.

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 for more information.
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`

Option	Description

	`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.
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)

Option	Description
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
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 • 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 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

Use the **Add sequence** step to add a sequence to a stream. A sequence is a distinct integer value with a specific start and increment value. You can either use a database sequence to generate the value of the sequence, or you can generate the sequence using Kettle.

Caution: Kettle-generated sequences should not be used as unique identifiers when the step runs in a clustered environment.

Sequences generated using Kettle are intended for use within the transformation from which they were created. The values are regenerated each time the transformation is launched. See the Related Reading section for more information about creating unique identifiers or sequencing with other transformation steps.

Option	Description
Step name	The name of this step as it appears in the transformation workspace. 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 these parameters:

Option	Description
	Connection name, **Schema name** (optional), **Sequence name**.
Connection name	The name of the connection on which the database sequence resides.
Schema name (optional)	The table's schema name.
Sequence name	The name of the database sequence.
Use a transformation counter to generate the sequence	Enable if you want the sequence to be generated by Kettle, then set these parameters: **Counter name** (optional), **Start at**, **Increment by**, **Maximum value**.
Counter name (optional)	If multiple steps in a transformation generate the same value name, this option enables you to specify the name of the counter to associate with. Avoids forcing unique sequencing across multiple steps.
Start at	The value to begin the sequence with.
Increment by	The amount by which the sequence increases or decreases.
Maximum value	The value after which the sequence returns to the **Start At** 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...

Related Reading

These PDI transformation steps are related to sequencing and unique IDs.

- *Get ID from slave server* - Retrieves unique identifiers from a slave server. The referenced sequence needs to be configured on the slave server in the XML configuration file.
- *Add value fields changing sequence* - Adds a sequence depending on if fields value change; each time value of at least one field change, PDI will reset sequence.
- *Group by step* - Builds aggregates in a group by fashion.

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

Function	Description	Required fields
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
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

Function	Description	Required fields
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
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

Function	Description	Required fields
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
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)
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.
Date Locale	Specifies the date locale to use for date conversions and calculations. Leave blank to use the default encoding on your system or chose from the populated this list accordingly.
Date Time Zone	Specifies the date time zone to use for date conversions and calculations. Leave blank to use the default encoding on your system or chose from the populated list accordingly.
Lenient number conversion	When this option is set to **Y**, numbers get parsed until it finds a non-numeric value (e.g. a dash or slash) and stops parsing without reporting an error. When set to **N**, numbers get parsed strictly throwing an error in case invalid numbers are in the input. The default behavior is set to **N** and can be changed by setting the **KETTLE_LENIENT_STRING_TO_NUMBER_CONVERSION** variable to **Y**.
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

Option	Description
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

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)

The **Unique Rows (HashSet)** transformation step tracks exact duplicate rows. The step can also remove duplicate rows and leave only unique occurrences. Unlike the **Unique Rows** transformation step, which only correctly evaluates consecutive duplicate rows unless used with a sorted input, the **Unique Rows (HashSet)** step does not require a sorted input to process duplicate rows, instead it tracks duplicates in memory.

Option	Definition
Step name	Name of this step as it appears in the transformation workspace
Compare using stored row values	Stores values for the selected fields in memory for every record. Storing row values requires more memory, but it prevents possible false positives if there are hash collisions.
Redirect duplicate row	Processes duplicate rows as an error and redirect rows to the error stream of the step. Requires you to set error handling for this step.
Error description	Sets the error handling description to display when duplicate rows are detected. Only available when **Redirect duplicate row** is checked.
Fields to compare table	Lists the fields to compare—no entries means the step compares an entire row

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.
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.
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.

Option	Description
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.
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.
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*.

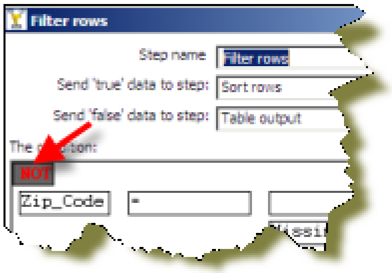
Option	Definition
Step name	The name of this step as it appears in the transformation workspace.

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.  Step name: Filter rows Send 'true' data to step: Sort rows Send 'false' data to step: Table output Zip_Code = 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

The **Identify last row in a stream** transformation step generates a Boolean field filled with `true` for the last row, and `false` otherwise.

Option	Definition
Step name	Name of this step as it appears in the transformation workspace
Result fieldname	Defines the field to use to mark the last row of a stream

Java Filter

The **Java Filter** step filters rows with user-defined Java expressions.

Option	Definition
Step name	Name of this step as it appears in the transformation workspace
Destination step for matching rows (optional)	Identifies the where to send rows that match the user-defined Java expression
Destination step for non-matching rows	Identifies the where to send rows that do not match the user-defined Java expression
Condition (Java expression)	Defines the conditions on which to filter the data

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
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
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

The **Fuzzy Match** step finds strings that potentially match using duplicate-detecting algorithms that calculate the similarity of two streams of data. This step returns matching values as a separated list as specified by user-defined minimal or maximal values.

General Tab

The **General** tab enables you to define the source transformation step, field, and which algorithm to use to match similar strings of data.

Option	Definition
Step name	Name of this step as it appears in the transformation workspace
Lookup step	Identifies the step that contains the fields to match
Lookup field	Identifies the field to match
Main stream field	Identifies the primary stream to match the Lookup field with
Algorithm	Identifies which string-matching algorithm to use—options include Levenshtein, Damerau-Levenshtein, Needleman Wunsch, Jaro, Jaro Winkler, Pair letters similarity, Metaphone, Double Metaphone, SoundEx, or Refined SoundEx
Case sensitive	Identifies if streams can or cannot differ based on the use of uppercase and lowercase letters—only for use with the Levenshtein algorithms
Get closer value	When checked, returns a single result with the highest similarity score—when unchecked, returns all matches that satisfy the minimal and maximal value setting as a separated list
Minimum value	Identifies the lowest possible similarity score
Maximal value	Identifies the highest possible similarity score
Values separator	Identifies how the source data is separated

Algorithm Definitions

Within the **Algorithm** field, there are several options available to compare and match strings.

- ***Levenshtein*** and ***Damerau-Levenshtein***—calculate the distance between two strings by looking at how many edit steps are needed to get from one string to another. The former only looks at inserts, deletes, and replacements. The latter adds transposition. The score indicates the minimum number of changes needed. For instance, the difference between John and Jan would be two; to turn the name John into Jan you need one step to replace the *O* with an *A*, and another step to delete the *H*.
- ***Needleman Wunsch***—calculates the similarity of two sequences and is mainly used in bioinformatics. The algorithm calculates a gap penalty. The aforementioned example would have a score of negative two.

- **Jaro** and ***Jaro Winkler***—calculate a similarity index between two strings. The result is a fraction between zero, indicating no similarity, and one, indicating an identical match.
- **Pair letters similarity**—dissects the two strings in pairs and calculates the similarity of the two strings by dividing the number of common pairs by the sum of the pairs from both strings.
- ***Metaphone***, ***Double Metaphone***, ***SoundEx***, and **Refined SoundEx**—are phonetic algorithms, which try to match strings based on how they would sound. Each is based on the English language and would not be useful to compare other languages.

  - The Metaphone algorithm returns an encoded value based on the English pronunciation of a given word. The encoded value of the names John and Jan would return the value *JN* for both names.
  - The Double Metaphone algorithm has fundamental design improvements over its predecessor and uses a more complex ruleset for coding. It can return a primary and a secondary encoded value for a string. The names John and Jan each return metaphone key values of *JN* and *AN*.
  - The Soundex algorthim returns a single encoded value for a name that consists of a letter followed by three numerical digits. The letter is the first letter of the name, and the digits encode the remaining consonants.
  - The Refined SoundEx algorithm is an improvement over its predecessor. Encoded values for this algorithm are six digits long, the initial character is encoded, and multiple possible encodings can be returned for a single name. Using this algorithm, the name John returns the values 160000 and 460000, as does the name Jan.

Fields Tab

The **Fields** tab enables you to define how to return the results of a comparison.

Option	Definition
Match field	Defines the name of the column that contains the comparison value
Value field	Defines the similarity score for which to return a value

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.

Option	Description
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.

RESTClient

The **REST Client** transformation step enables you to consume RESTfull services. Representational State Transfer (REST) is a key design idiom that embraces a stateless client-server architecture in which the web services are viewed as resources and can be identified by their URLs.

General Tab

The **General** tab is where you enter basic connection information for accessing a resource.

Option	Definition
Step name	Name of this step as it appears in the transformation workspace
URL	Indicates the path to a resource
Accept URL from field	Designates the path to a resource is defined from a field
URL field name	Indicates the field from which the path to a resource is defined
HTTP method	Indicates how the step interacts with a resource—options are either GET, PUT, DELETE, POST, HEAD, or OPTIONS
Get Method from field	Designates the GET method is defined from a field
Method fieldname	Indicates the field from which the GET method is defined
Body field	Contains the request body for POST, PUT, and DELETE methods
Application type	Designates what type of application a resource is—options are either TEXT PLAIN, XML, JSON, OCTET STREAM, XHTML, FORM URLENCODED, ATOM XML, SVG XML, or TEXT XML
Result fieldname	Designates the name of the result output field
HTTP status code fieldname	Designates the name of the HTTP status code field
Response time (milliseconds) fieldname	Designates the name of the response time field

Authentication Tab

If necessary, enter authentication details for a resource in the **Authentication** tab.

Option	Definition
HTTP Login	Indicates the username required to access a resource
HTTP Password	Indicates the password associated with the provided **HTTP Login** user name
Preemptive	Option to send the authentication credentials before a server gives an unauthorized response
Proxy Host	Indicates the name of a proxy host, if proxy authentication is required
Proxy Port	Indicates the port number of a proxy host, if proxy authentication is required

SSL Tab

The **SSL** tab is where you provide authentication details for accessing a resource that requires SSL certificate authentication.

Option	Definition
Truststore file	Indicates the location of a truststore file
Truststore password	Indicates the password associated with the provided truststore file

Headers Tab

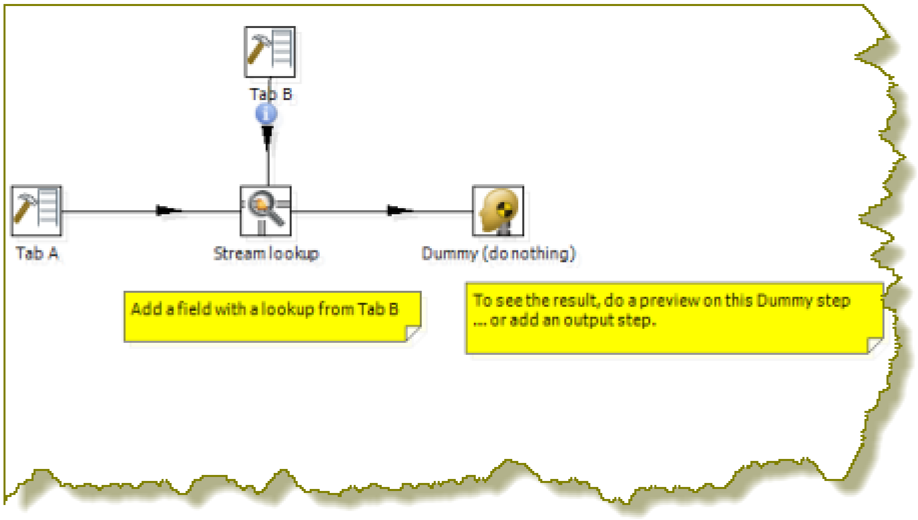
The **Headers** tab enables you to define the content of any HTTP headers using an existing field. Populate the list of fields by clicking the **Get fields** button.

Parameters Tab

The **Parameters** tab enables you to define parameter values for POST, PUT, and DELETE requests. GET parameters should be part of the URL directly.

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.



Add a field with a lookup from Tab B

To see the result, do a preview on this Dummy step
.... or add an output step.

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

Option	Description
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.

Option	Description
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.

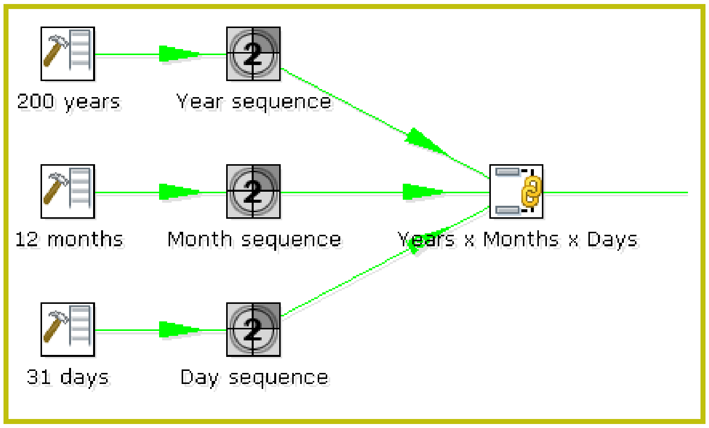
The *Web Services - NOAA Latitude and Longitude.ktr* located in the samples folder (`...\data-integration\samples\transformations`) is an example of this scenario.

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.

Option	Description
	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.

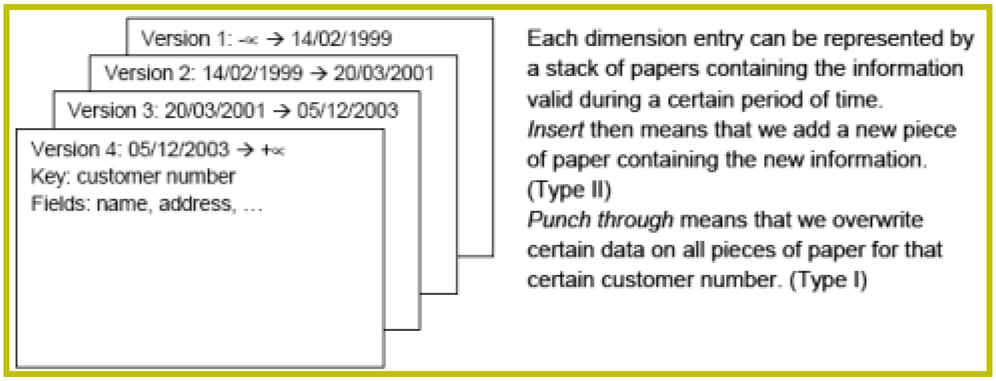
Option	Description
	Note: Only the last version of a dimension entry is kept in memory. If there are more entries passing than what can be kept in memory, the technical keys with the highest values are kept in memory in the hope that these are the most relevant. A cache size of 0 caches as many rows 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 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.


Version 1: -∞ → 14/02/1999
Version 2: 14/02/1999 → 20/03/2001
Version 3: 20/03/2001 → 05/12/2003
Version 4: 05/12/2003 → +∞
Key: customer number
Fields: name, address, ...

Each dimension entry can be represented by a stack of papers containing the information valid during a certain period of time. *Insert* then means that we add a new piece of paper containing the new information. (Type II) *Punch through* means that we overwrite certain data on all pieces of paper for that certain customer number. (Type I)

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
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, ...

Option	Description
	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.). • **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 date range 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)
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

Option	Description
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 • 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.

Option	Description
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 section, 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 *Data Integration Installation* and *Work with Big Data*.

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://oozie.apache.org/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 solution repository), or **Repository by**

Option	Definition
	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 solution 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 solution 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 , such as `/wordcount/input`, from your Hadoop cluster where the source data for the MapReduce job is stored.
Output Path	The directory on your Hadoop cluster where you want the output from the MapReduce job to be stored., such as `//wordcount/output`. The output directory cannot exist prior to running the MapReduce job.
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
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

Option	Definition
	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 DI Repository or database repository, specify the name of the transformation to start. Click the **Browse In Jobs** button to browse through the DI Repository.
Specify by Reference	If you specify a transformation or job by reference, you can rename or move it around in the DI 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
Expand child jobs and transformations on the server	When the remote job starts child jobs and transformations, they are exposed on the slave server and can be monitored.

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 DI 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

The **Check files locked** job entry enables you to determine if a file or folder, or several files or folders, were locked by another process.

Option	Definition
Job entry name	Name of this entry as it appears in the transformation workspace
Include Subfolders	Searches the folders within the primary directory
Copy previous results to args	Passes the results of the previous entry to the arguments of this entry
File/Folder	Specifies files to check
Wildcard	Defines the files to check in regular expression terms instead of static file names—for instance `^.*\.txt` would check any file with a `.txt` extension
Files/Folders	Displays the list of files or folders to check

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)
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

Option	Description
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.

Option	Definition
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)

Variable	Description
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

Option	Description
	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
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.

Option	Description
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

The **Wait for SQL** job entry scans a database and checks if the database meets user-defined conditions.

Option	Definition
Job entry name	Name of this entry as it appears in the transformation workspace
Connection	Identifies the database connection to use
Target schema	Name of the table schema to evaluate
Target table name	Name of the table to evaluate
Success when rows count	Defines the evaluation method used to compare the number of rows with the given value
Value	Defines the value used for the evaluation
Maximum timeout	After this timeout period, the job entry continues with a fail, by default, or success, if the **Success on timeout** option is checked
Check cycle time	Sets the amount time between evaluations
Success on timeout	Defines job entry success behavior when timeout is reached—when checked, reaching the maximum timeout limit causes the job entry to succeed. When left unchecked, reaching the maximum timeout limit causes the job entry to fail.
Custom SQL	Enables the use of custom SQL queries
Use variable substitution	Replaces environment variables in the SQL script with their actual value

Option	Definition
Clear list of result rows before execution	Clears the list of result rows before running this job entry
Add rows to result	Includes returned rows to the result set

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 solution 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

Option	Description
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`

Option	Description
	`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.

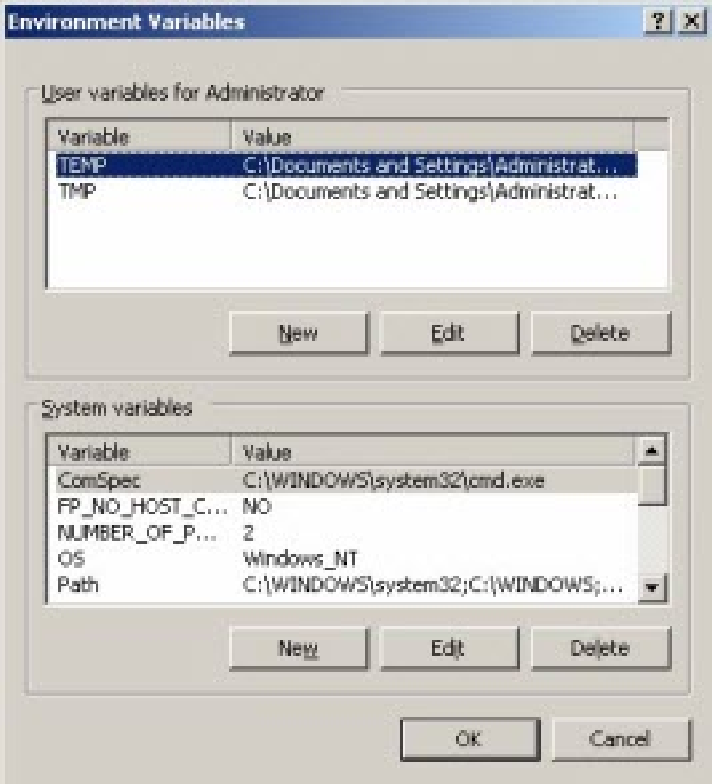
👉 **Note:** The PDI home directory is independent of the PDI application directory.

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):

	 Environment Variables User variables for Administrator New Edit Delete System variables New Edit Delete OK Cancel Variable Value TEMP C:\Documents and Settings\Administrat... TMP C:\Documents and Settings\Administrat... Variable Value ComSpec C:\WINDOWS\system32\cmd.exe FP_NO_HOST_C... NO NUMBER_OF_P... 2 OS Windows_NT Path C:\WINDOWS\system32;C:\WINDOWS;...
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 BA 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\Installed/server/biserver-ee/tomcat`

   ```
   [...]
   -XX:MaxPermSize=256m
   -DKETTLE_HOME=C:\Pentaho\Kettle\KETTLE_HOME
   ```

3. Reboot the server.
4. When you start the BA 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 DI Repository Configuration Without Running Spoon

Because it is not always convenient to launch a repository export from Spoon, jobs and transformations can be launched using the command-line tools Kitchen and Pan.

To deploy a job from Kitchen or a transformation from Pan that will export a `repositories.xml` file, follow these instructions.

Connecting to a DI Solution 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=admin" "/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-<ph conref="../reuse_files/
reference_reusable.xml#reference_instaview_view_panel/PDIvernum3"/>\data-integration

   call kitchen.bat /file:C:\Pentaho_samples\repository\repository_export.kjb "/
param:rep_name=PDI2000"
   "/param:rep_user=admin" "/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 first need to copy the local `repositories.xml` from the user's `.kettle` directory to the Carte server's `$HOME/.kettle` directory. The Carte service also looks for the `repositories.xml` file in the directory from which Carte was started.

For more information about locating or changing the `.kettle` home directory, see *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.