Administer DI Server

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

In this section, you do some configuration tasks and fine-tuning so you can create ETL solutions that fit your needs.

Prerequisites

Before you begin, you must have *installed* Pentaho Data Integration software. If you chose to install the Pentaho Business Analytics software you must go through *a different configuration process*. You must also have performed some *configuration tasks*.

Expertise

The topics in this section are written for IT administrators who know where data is stored, how to connect to it, details about the computing environment, and how to use the command line to issue commands for Microsoft Windows, Linux, or Microsoft OS.

Tools

We provide a design tool, Spoon, that you can use to perform some tasks. Other tasks must be performed using the command line interface.

Login Credentials

All of the configuration tasks that use Spoon require that you *login to Spoon* using a Pentaho administrator user name and password.

Specify Data Connections for the DI Server

Pentaho Data Integration (PDI) allows you to make connections in each job and transformation through an input step. Although users can create connections themselves, it is best to set up shared connections for your users so that they can simply select the connection they need from a list. We help you download the correct drivers, choose the connection type, and then create the connection.

JDBC Database Connections

To connect to databases, install the driver for your database, as well as define the access protocol and settings now. You can choose from these access protocols.

- **Native (*JDBC*):** This is a commonly used access protocol. Please see details in the *Database Access Protocol Decision Table* to ensure you make an informed choice.
- ***JNDI*:** This also is a commonly used access type. Please see details in the *Database Access Protocol Decistion Table* to ensure you make an informed choice.
- ***ODBC*:** We do not support ODBC, and it is our recommendation that you use the JDBC driver instead the ODBC driver. You should only use ODBC when there is the need to connect to unsupported databases by using the generic database driver or other specific reasons. For more information, see *Why Should You Avoid ODBC?* on the Pentaho public wiki.
- ***OCI*:**If you are connecting to an Oracle database, you must first *install the appropriate OCI driver and add the OCI connection*.

Table 1: Database Access Protocol Decision Table

If You Are Interested In	Choose Options	
	Native (JDBC)	***JNDI***
• Understanding options	Native (JDBC) connections are the easiest way to get going quickly. You specify the connection information in Spoon. The connections are controlled by the DI Server. If the connection information changes, you change it in Spoon for each connection you have defined.	JNDI connections are maintained in the application server, offering more advanced configuration options. One typical use case is you may want to hide security credentials from administrators of the Pentaho system. You specify the connection information by editing the `context.xml` file and selecting JNDI as the access type in Spoon. If the connection information changes, you change the `context.xml` file.
• Expertise needed	Knowledge of the JDBC driver and options for your RDBMS	Knowledge of Tomcat or JBoss JNDI connection procedures and options
• How much time it takes	Approximately 10 minutes	Approximately 30 minutes
• **Recommendation**	**Use for the Pentaho Trial Download, evaluating, and rapid development.**	**Use for production or when the work environment is distributed in a network.**

Define Native (JDBC) Database Connections

Once you have *chosen to use the Native (JDBC) access protocol*, here are configuration and maintenance tasks you can perform.

- *Add Drivers*
- *Create Connections*
- *Add Database-Specific Options*
- *Configure Database Connections*
- *Define Connection Pooling*

- *Connect to Clusters*
- *Modify Connections*

When you are done, please go on to the next stop on the Guide Post graphic.

Add Drivers

The DI Server and workstations need the appropriate driver to connect to the database that stores your data. Your database administrator, Chief Intelligence Officer, or IT manager should be able to provide the appropriate driver. If not, you can download drivers from your database vendor's website. See the *Supported Technologies* to ensure that your database and its driver are supported by Pentaho.

Note: If you are using a Microsoft SQL Server (MSSQL), you might need to use an alternative, non-vendor-supported driver called JTDS. Contact *Pentaho support* to ensure that you are adding the correct driver.

Installing Drivers

Once you have the correct driver, copy it to these directories.

DI Server: `/pentaho/server/data-integration-server/tomcat/webapps/pentaho-di/WEB-INF/lib/` .

Spoon: `data-integration/lib`

You must restart Spoon for the driver to take effect.

There should be only one driver for your database in this directory. Ensure that there are no other versions of the same vendor's driver in this directory. If there are, back up the old driver files and remove them to avoid version conflicts. This is a concern when you are adding a driver for the same database type as your Pentaho solution repository. If you have any concerns about how to proceed, contact *Pentaho support*.

When the driver files are in place *restart* the server.

Connecting to a Microsoft SQL Server Using Integrated or Windows Authentication

If you are using a Microsoft SQL Server (MSSQL), you might need to use an alternative, non-vendor-supported driver called JTDS. Contact *Pentaho support* to ensure that you are adding the correct driver

For Microsoft Windows, most JDBC drivers support Type 2 integrated authentication through the `integratedSecurity` connection string property. To use integrated authentication, copy the `sqljdbc_auth.dll` file to all machines and directories to which you copied the JDBC driver. You can find this file in this location.

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

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

Specify Native (JDBC) Connection Information

Before you can create the connection, you must have *installed the appropriate JDBC driver* for your particular data.

Pentaho Data Integration (PDI) allows you to define connections to multiple databases provided by multiple database vendors (MySQL, Oracle, PostgreSQL, and many more). PDI ships with the most suitable JDBC drivers for PostgreSQL, our default database.

Note:

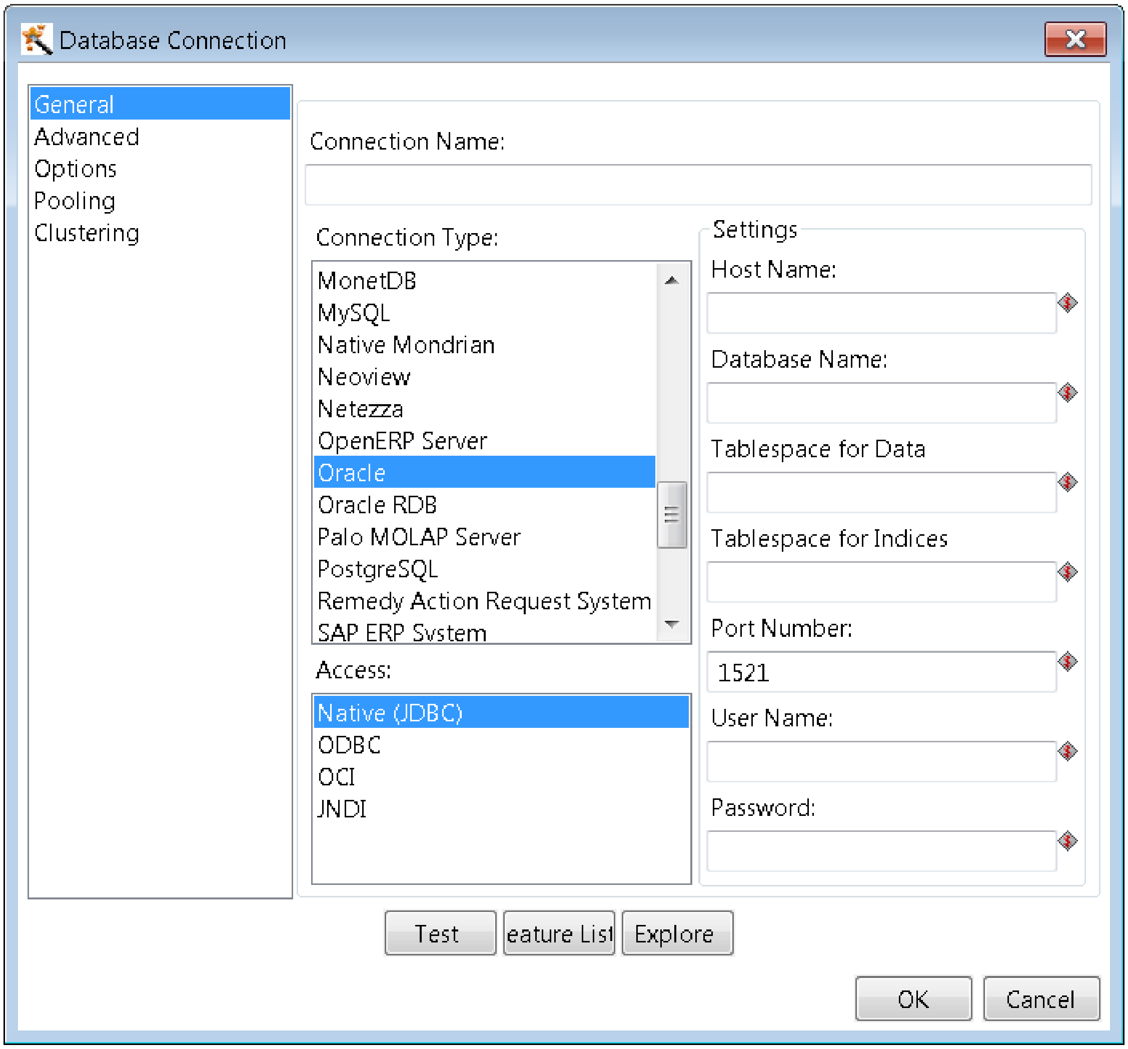
Pentaho recommends that you avoid using ODBC connections. The ODBC to JDBC bridge driver does not always provide an exact match and adds another level of complexity that may affect performance. The only time you may have to use ODBC is if there is no available JDBC driver. For details, this article explains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

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

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

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

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



Connection Type: Oracle

Access: Native (JDBC)

Port Number: 1521

1. From within **Spoon**, navigate to the **View** tab of the **Explorer** pane. Double-click on the **Database connections** folder.
   The **Database Connection** dialog box appears.

Section Name	What to Do
Connection Name	Type name that uniquely identifies your new connection
Connection Type	Select the type of database to which you are connecting
Access	Select your method of access. Available access types depend on the connecting database type.
Host Name	Type the name of the server that hosts the database to which you are connecting. Alternatively, you can specify the host by IP address.

Section Name	What to Do
Database Name	Enter the name of the database to which you are connecting. If you are using a ODBC connection, enter the Data Source Name (DSN) in this field.
Port Number	Enter the TCP/IP port number if it is different from the default.
User name	Optionally, type the user name used to connect to the database.
Password	Optionally, type the password used to connect to the database.

2. Click **Test**.
   A confirmation message displays if Spoon is able to establish a connection with the target database.
3. Click **OK** to save your entries and exit the Database Connection dialog box.
4. From within the ***View** tab*, right-click on the connection and select **Share** from the list that appears.

   This shares the connection with your users. They will be able to select the shared connection.

   From within the ***View** tab*, click **Explore** to open the **Database Explorer** for an existing connection. This shows you the schemas and tables inside the connection.

Add Database-Specific Options

Add database-specific options by adding parameters to the generated URL.

1. From within the **Database Connection** dialog box, select **Options**.
2. Select the first available row in the parameter table.
3. Choose the database type and enter a valid parameter name and its corresponding value.

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

Advanced Configuration of Database Connections

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

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

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

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

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

Define Connection Pooling

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

This table shows descriptions of the pooling options.

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

1. Select **Enable Connection Pooling**.
2. Type the initial pool size in the **Initial:** area and the maximum pool size in the **Maximum:** area.
3. Select the parameters you need from within the **Parameters:** area.
   A Description of the parameter appears in the **Description:** area when you select a check box.
4. Click **OK** to save your selections and close the **Database Connection** dialog box.

Connect to Clusters

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

Modify Connections

This table contains information about other database-related connection tasks you can perform.

Task	Description
Edit a Connection	Right-click on the connection name and select **Edit**.
Duplicate a Connection	Right-click on the connection name and select **Duplicate**.
Copy to a Clipboard	Allows you to copy the XML defining the step to the clipboard. You can then paste this step into another transformation. Double-click on the connection name in the tree or right-click on the connection name and select **Copy to Clipboard**.
Delete a Connection	Double-click on the connection name in the tree or right-click on the connection name and select **Delete**.
SQL Editor	To execute SQL command against an existing connection, right-click on the connection name and select *SQL Editor*.
Clear the Database Cache	To speed up connections Pentaho Data Integration uses a database cache. When the information in the cache no

Task	Description
	longer represents the layout of the database, right-click on the connection in the tree and select **Clear DB Cache...**. This command is commonly used when databases tables have been changed, created or deleted.
Share a Connection	Rather than redefining a connection each time you create a job or transformation on your *local device*, right-click and select **Share** to share the connection information among jobs and transformations.
Exploring the Database	Double-click on the connection name in the tree or right-click on the connection name and select *Explore*.
Show dependencies	Right-click a connection name and select **Show dependencies** to see all of the transformations and jobs that use this database connection.

Define JNDI Connections for the DI Server

Pentaho has supplied a way of configuring a JNDI connection for "local" Pentaho Data Integration use so that you do not have an application server continuously running during the development and testing of transformations. To configure, edit the properties file called **jdbc.properties** located at `...\data-integration-server\pentaho-solutions\system\simple-jndi`.

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

Define OCI Connections for the DI Server

Once you have *chosen to use the OCI access protocol*, here are configuration and maintenance tasks you can perform.

- *Add Drivers*
- *Create OCI Connections*
- *Add Database-Specific Connections*
- *Advanced Configuration of Database Connections*
- *Define Connection Pooling*
- *Connect to Clusters*
- *Modify Connections*

When you are done, please go on to the next stop on the *Guide Post* graphic.

Add Drivers

The DI Server and workstations need the appropriate driver to connect to the database that stores your data. Your database administrator, Chief Intelligence Officer, or IT manager should be able to provide the appropriate driver. If not, you can download drivers from your database vendor's website. See the *Supported Technologies* to ensure that your database and its driver are supported by Pentaho.

Note: If you are using a Microsoft SQL Server (MSSQL), you might need to use an alternative, non-vendor-supported driver called JTDS. Contact *Pentaho support* to ensure that you are adding the correct driver.

Installing Drivers

Once you have the correct driver, copy it to these directories.

DI Server: `/pentaho/server/data-integration-server/tomcat/webapps/pentaho-di/WEB-INF/lib/`.

Spoon: `data-integration/lib`

You must restart Spoon for the driver to take effect.

There should be only one driver for your database in this directory. Ensure that there are no other versions of the same vendor's driver in this directory. If there are, back up the old driver files and remove them to avoid version conflicts. This is a concern when you are adding a driver for the same database type as your Pentaho solution repository. If you have any concerns about how to proceed, contact *Pentaho support*.

When the driver files are in place *restart* the server.

Connecting to a Microsoft SQL Server Using Integrated or Windows Authentication

If you are using a Microsoft SQL Server (MSSQL), you might need to use an alternative, non-vendor-supported driver called JTDS. Contact *Pentaho support* to ensure that you are adding the correct driver

For Microsoft Windows, most JDBC drivers support Type 2 integrated authentication through the `integratedSecurity` connection string property. To use integrated authentication, copy the `sqljdbc_auth.dll` file to all machines and directories to which you copied the JDBC driver. You can find this file in this location.

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

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

Create OCI Connections

1. *Start the web application and DI Servers*, *log into the Spoon*, then click on **Tools** > **Database** > **Explore**.
   The **Data Sources** dialog box appears.
2. Click the plus icon (**+**) on the right and select **JDBC**.
   The **Database Connection** dialog box appears with **General** highlighted in the left navigation pane.
3. In the **Connection Name** field, enter a name that uniquely describes this connection. The name can have spaces, but it cannot have special characters, such as #, $, %, and alike.
4. In the **Database Type** list, select **Oracle**.
5. In the **Access** list, select **OCI**.
6. Enter **Settings** as directed by the *Oracle OCI documentation*.
   a) In the **SID** field, enter the Oracle system ID that uniquely identifies the database on the system.
   b) In the **Tablespace for Data** field, enter the name of the tablespace where the data is stored.
   c) In the **Tablespace for Indicies** field, enter the name of the tablespace where the indicies are stored.
   d) Enter the **User Name** and **Password** required to access the database.
7. Click **Test**.
   A success message appears if the connection is established.
8. To save the connection, click **OK** twice.
   This connection name appears in the list of available data sources in the **Data Sources** dialog box. If you want to use Advanced, Options, or Pooling, refer to the *Oracle OCI documentation* to understand how to specify these settings.

Add Database-Specific Options

Add database-specific options by adding parameters to the generated URL.

1. From within the **Database Connection** dialog box, select **Options**.
2. Select the first available row in the parameter table.
3. Choose the database type and enter a valid parameter name and its corresponding value.

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

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

Advanced Configuration of Database Connections

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

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

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

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

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

Define Connection Pooling

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

This table shows descriptions of the pooling options.

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

1. Select **Enable Connection Pooling**.
2. Type the initial pool size in the **Initial:** area and the maximum pool size in the **Maximum:** area.
3. Select the parameters you need from within the **Parameters:** area.
   A Description of the parameter appears in the **Description:** area when you select a check box.

4. Click **OK** to save your selections and close the **Database Connection** dialog box.

Connect to Clusters

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

Modify Connections

This table contains information about other database-related connection tasks you can perform.

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

Create a Connection to the DI Repository

Users need a place to store and schedule their transformations and jobs. This place is called the DI repository. You must create a connection to this repository, which is part of the DI Server.

1. Click on **Tools** > **Repository** > **Connect Access** to access the **Repository Connection** dialog box.
2. In the **Repository Connection** dialog box, click the add button (+).
3. Select **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. Enter your user name and password for the repository and click **OK**

Implement Advanced Security for the DI Server

There are several different ways to handle security other than with the default Pentaho security.

Configure LDAP for the DI Server

Your directory server must be available in order to perform this procedure.

Follow these instructions to configure your DI Server to authenticate against an LDAP service.

1. Stop the DI Server.
2. Open `/pentaho-solutions/system/security.properties` with a text editor.
3. Change the value of the provider property to `ldap`, then save and close the file.
4. Open `/pentaho-solutions/system/ldap.properties`. Update adminRole and adminUser for your system, replacing adminRole with the administrator role that you have defined in your LDAP server, and replacing adminUser with the user name that has the administrator role assigned to it.

```
adminRole=cn\=Administrator,ou\=roles
adminUser=uid\=admin,ou\=users
```

5. In ldap.properties, replace the localhost address to match your IP address.
6. In ldap.properties, also change the password to your password.
7. Start the Data Integration Server.

You are running the Pentaho Data Integration Server in LDAP mode, though you will need to consult *LDAP Properties* for more information on LDAP and Microsoft Active Directory configuration settings.

LDAP Properties

You can manually configure LDAP values by editing the `/pentaho-solutions/system/applicationContext-security-ldap.properties` file in the DI Server directory.

Connection Information (Context)

These entries define the connection to the LDAP server and the user/password used to perform directory searches against it.

LDAP Property	Purpose	Example
contextSource.providerUrl	LDAP connection URL	contextSource.providerUrl=ldap://holly:389/DC=Valyant,DC=local
contextSource.userDn	Distinguished name of a user with read access to directory	contextSource.userDn=CN=Administrator,CN Valyant,DC=local
contextSource.password	Password for the specified user	contextSource.password=secret

Users

These options control how the LDAP server is searched for usernames that are entered in the Pentaho login dialog box.

The `{0}` token is replaced by the username from the login dialog.

The example above defines `DC=Valyant,DC=local` in `contextSource.providerURL`. Given that definition, you would not need to repeat that in `userSearch.searchBase` below because it is appended automatically to the defined value here.

LDAP Property	Purpose	Example
userSearch.searchBase	Base (by username) for user searches	userSearch.searchBase=CN=Users

LDAP Property	Purpose	Example
userSearch.searchFilter	Filter (by username) for user searches. The attribute you specify here must contain the value that you want your users to log into Pentaho with. Active Directory usernames are represented by `sAMAccountName`; full names are represented by `displayName`.	userSearch.searchFilter=(sAMAccountName={0})

Populator

The populator matches fully distinguished user names from `userSearch` to distinguished role names for roles those users belong to.

The `{0}` token will be replaced with the user DN found during a user search; the `{1}` token is replaced with the username entered in the login screen.

LDAP Property	Purpose	Example
populator.convertToUpperCase	Indicates whether or not retrieved role names are converted to uppercase	populator.convertToUpperCase=false
populator.groupRoleAttribute	The attribute to get role names from	populator.groupRoleAttribute=cn
populator.groupSearchBase	Base (by user DN or username) for role searches.	populator.groupSearchBase=ou=Pentaho
populator.groupSearchFilter	The special nested group filter for Active Directory is shown in the example; this will not work with non-MSAD directory servers.	populator.groupSearchFilter=(memberof:1.2.840.113556.1.4.1941:=({0}))
populator.rolePrefix	A prefix to add to the beginning of the role name found in the group role attribute; the value can be an empty string.	populator.rolePrefix=
populator.searchSubtree	Indicates whether or not the search must include the current object and all children. If set to `false`, the search must include the current object only.	populator.searchSubtree=true

All Authorites Search

These entries populate roles that appear in the **Admin** tab . These should be similar or identical to the Populator entries.

LDAP Property	Purpose	Example
allAuthoritiesSearch.roleAttribute	The attribute used for role values	allAuthoritiesSearch.roleAttribute=cn
allAuthoritiesSearch.searchBase	Base for `all roles` searches	allAuthoritiesSearch.searchBase=ou=Pentaho
allAuthoritiesSearch.searchFilter	Filter for `all roles` searches. Active Directory requires that the `objectClass` value be set to `group`.	allAuthoritiesSearch.searchFilter=(objectClass=group)

All User Name Search

These entries populate the users that appear on the **Admin** tab and can *only* be set manually in the `/pentaho-solutions/system/applicationContext-security-ldap.properties` file. These entities are not made available in the User Console.

LDAP Property	Purpose	Example
allUsernamesSearch.usernameAttribute	The attribute used for user values	allUsernamesSearch. usernameAttribute=sAMAccountName
allUsernamesSearch.searchBase	Base for "all users" searches	allUsernamesSearch.searchBase= CN=users
allUsernamesSearch.searchFilter	Filter for "all users" searches	allUsernamesSearch.searchFilter= objectClass=person

Manual JDBC Connection Configuration

You must have existing security tables in a relational database in order to proceed with this task.

Follow the instructions below to switch from Pentaho default security to JDBC security, which will allow you to use your own security tables.

Note: If you are using the BA Server and choose to switch to a JDBC security shared object, you will no longer be able to use the role and user administration settings in the Administration portion of the User Console.

1. Stop the BA Server by running the **stop-pentaho** script.
2. Open `/pentaho-solutions/system/security.properties` with a text editor.
3. Change the value of the provide property to `jdbc`.
4. Open `/pentaho-solutions/system/applicationContext-pentaho-security-jdbc.xml` with a text editor, find this line:

```
<import resource="applicationContext-spring-security-jdbc.xml" />
<import resource="applicationContext-pentaho-security-jdbc.xml" />
     <entry key="Admin" value="Administrator"/>
</util:map>
```

5. By default, the role `Admin` is mapped to `Administrator`. Change `Admin` to the appropriate administrator role in your JDBC authentication database.
6. Verify that the SQL statements are the correct syntax for your database, and that they reference the correct tables, roles, and actions.
7. Save the file and close the editor.
8. Start the server by running the **start-pentaho** script.

The server is configured to authenticate users against the specified database.

Create LDAP/JDBC Hybrid Configuration for the DI Server

You must have a working directory server with an established configuration, and a database containing your user roles before continuing.

It is possible to use a directory server for user authentication and a JDBC security table for role definitions. This is common in situations where LDAP roles cannot be redefined for DI Server use. Follow the below instructions to switch the BA Server's authentication backend from the Pentaho data access object to an LDAP/JDBC hybrid.

Note: Replace the **pentahoAdmins** and **pentahoUsers** references in the examples below with the appropriate roles from your LDAP configuration.

1. Stop the DI Server and Spoon.
2. Open `/pentaho-solutions/system/security.properties` with a text editor.
3. Change the value of the property provider to `ldap`.
4. Open the `/pentaho-solutions/system/pentahoObjects.spring.xml` with a text editor.
5. Find this code block and change the providerName to `jdbc`.

```
  <pen: bean id="UserDetailsService"
class ="org.springframework.security.userdetails.UserDetailsService">
```

```
    <pen:attributes>
       <pen:attr key="providerName" value="jackrabbit"/>
    </pen:attributes>

   <pen:publish as-type="INTERFACES">
     <pen:attributes>
    <pen:attr key="priority" value="50"/>
      </pen:attributes>
    </pen:publish>

    </pen:bean>
```

6. Edit the `/pentaho-solutions/system/applicationContext-pentaho-security-jdbc.xml` file and add the following two bean definitions, changing the connection and JDBC details to match your security database.

```

<bean id="dataSource"
class="org.springframework.jdbc.datasource.DriverManagerDataSource">
     <property name="driverClassName" value="org.hsqldb:hsql://localhost:9002/
userdb" />
     <property name="url" value="jdbc:hsqldb:hsql://localhost:9002/userdb" />
     <property name="username" value="sa" />
     <property name="password" value="" />
</bean>
<bean id="userDetailsService"
class="org.springframework.security.userdetails.jdbc.JdbcDaoImpl">
     <property name="dataSource">
        <ref local="dataSource" />
     </property>
     <property name="authoritiesByUsernameQuery">
        <value> <![CDATA[SELECT username, authority FROM
        granted_authorities WHERE username = ?}}></value>
     </property>
     <property name="usersByUsernameQuery">
        <value> <![CDATA[SELECT username,
        password, enabled FROM users WHERE username = ?]]>
        </value>
     </property>
</bean>
```

7. Edit the `/pentaho-solutions/system/data-access/settings.xml` file and modify the user and role settings to match your LDAP configuration:

```
<!– roles with data access permissions –>
<data-access-roles>pentahoAdmins</data-access-roles>
<!– users with data access permissions –>
<!–
<data-access-users></data-access-users>
–>
<!– roles with datasource view permissions –>
<data-access-view-roles>pentahoUsers,pentahoAdmins</data-access-view-roles>
<!– users with datasource view permissions –>
<!– <data-access-view-users></data-access-view-users> –>
<!– default view acls for user or role –>
<data-access-default-view-acls>31</data-access-default-view-acls>
```

8. Save and close the file, then open `/pentaho-solutions/system/applicationContext-pentaho-security-jdbc.xml`. Find this code block and change `Admin` to an appropriate administrator role in your JDBC authentication database.

```
<!-- map ldap role to pentaho security role -->
<util:map id="jdbcRoleMap">
   <entry key="Admin" value="Administrator"/>
</util:map>
```

9. Delete the `/tomcat/work/` and `/tomcat/temp/` directories.
10. Start the DI Server and Spoon.
11. Log into Spoon.

12. Configure the Pentaho LDAP connection as explained in *LDAP Properties* on page 16.

The DI Server is configured to authenticate users against your directory server.

Configure Microsoft Active Directory for the DI Server

The server does not recognize any difference among LDAP-based directory servers, including Active Directory. However, the way that you modify certain LDAP-specific files will probably be different for Microsoft Active Directory (MSAD) than for more traditional LDAP implementations. Below are some tips for specific MSAD-specific configurations that you might find helpful.

Binding

MSAD allows you to uniquely specify users in two ways, in addition to the standard DN. If the standard DN is not working, try one of the two below. Each of the following examples is shown in the context of the **userDn** property of the Spring Security **DefaultSpringSecurityContextSource** bean.

Note: The examples in this section use **DefaultSpringSecurityContextSource**. Be aware that you may need to use the same notation (Kerberos or Windows domain) in all of your DN patterns.

Kerberos notation example for pentahoadmin@mycompany.com:

File: **applicationContext-security-ldap.properties**

```
contextSource.providerUrl=ldap\://mycompany\:389
contextSource.userDn=pentahoadmin@mycompany.com
contextSource.password=omitted
```

Windows domain notation example for MYCOMPANY\pentahoadmin:

File: **applicationContext-security-ldap.properties**

```
contextSource.providerUrl=ldap\://mycompany\:389
contextSource.userDn=MYCOMPANY\pentahoadmin
contextSource.password=omitted
```

Referrals

If more than one Active Directory instance is serving directory information, it may be necessary to enable referral following. This is accomplished by modifying the **DefaultSpringSecurityContextSource** bean.

```
<bean id="contextSource"
 class="org.springframework.security.ldap.DefaultSpringSecurityContextSource">
    <constructor-arg value="${contextSource.providerUrl}"/>
    <property name="userDn" value="${contextSource.userDn}"/>
    <property name="password" value="${contextSource.password}"/>
    <property name="referral" value="follow" />
</bean>
```

User DN Patterns vs. User Searches

In the **LdapAuthenticator** implementations provided by Spring Security (**BindAuthenticator** for instance), you must either specify a **userDnPatterns**, or a **userSearch**, or both. If you're using the Kerberos or Windows domain notation, you should use **userDnPatterns** exclusively in your **LdapAuthenticator**.

Note: The reason for suggesting **userDnPatterns** when using Kerberos or Windows domain notation is that the **LdapUserSearch** implementations do not give the control over the DN that **userDnPatterns** does. (The **LdapUserSearch** implementations try to derive the DN in the standard format, which might not work in Active Directory.)

Note, however, that **LdapUserDetailsService** requires an **LdapUserSearch** for its constructor.

User DN Pattern example:

```
<bean id="authenticator"
```

```
class="org.springframework.security.providers.ldap.authenticator.BindAuthenticator">
<constructor-arg>
    <ref local="contextSource"/>
    </constructor-arg>
    <propertyname="userDnPatterns">
    <list>
    <value>{0}@mycompany.com
    </value> <!-- and/or -->
    <value>domain\{0}</value>
    </list>
    </property>
</bean>
```

In user searches, the **sAMAccountName** attribute should be used as the username. The **searchSubtree** property (which influences the **SearchControls**) should most likely be true. Otherwise, it searches the specified base plus one level down.

User Search example:

```
<bean id="userSearch"
class="org.springframework.security.ldap.search.FilterBasedLdapUserSearch">
    <constructor-arg index="0" value="DC=mycompany,DC=com" />
    <constructor-arg index="1">
    <value>(sAMAccountName={0})</value>
    </constructor-arg> <constructor-arg index="2">
    <ref local="contextSource" />
    </constructor-arg>
    <property name="searchSubtree" value="true"/>
</bean>
```

Nested Groups

You can remove nested or transitive groups out of Active Directory. In the LDAP popular group filter, enter the following LDAP filter for MSAD nested groups:

```
(member:1.2.840.113556.1.4.1941:={0})
```

This will search down the whole tree of nested groups.

Import and Export PDI Content

You can import and export PDI content to and from a repository by using PDI's built-in functions, explained in these subsections.

Note: Among other purposes, these procedures are useful for backing up and restoring content in the solution repository. However, users, roles, permissions, and schedules will not be included in import/export operations. If you want to back up these things, you should follow the procedure in How To Backup the Solution Repository instead.

Import Content Into a Repository

You must be logged into the repository in Spoon.

Follow the instructions below to import the repository.

1. In Spoon, go to **Tools** > **Repository** > **Import Repository**.
2. Locate the export (XML) file that contains the solution repository contents.
3. Click **Open**.
   The **Directory Selection** dialog box appears.
4. Select the directory in which you want to import the repository.
5. Click **OK**.
6. Enter a comment, if applicable.
7. Wait for the import process to complete.
8. Click **Close**.

The full contents of the repository are now in the directory you specified.

Use the Import Script From the Command Line

The import script is a command line utility that pulls content into an enterprise or database repository from two kinds of files: Individual KJB or KTR files, or complete repository export XML files.

You must also declare a rules file that defines certain parameters for the data integration content you're importing. We provide a sample file called **import-rules.xml**, included with the standard Data Integration client tool distribution. It contains all of the potential rules with comments that describe what each rule does. You can either modify this file, or copy its contents to another file; regardless, you must declare the rules file as a command line parameter.

Options

The table below defines command line options for the import script. Options are declared with a dash: **-** followed by the option, then the **=** (equals) sign and the value.

Parameter	Definition/value
rep	The name of the enterprise or database repository to import into.
user	The repository username you will use for authentication.
pass	The password for the username you specified with **user**.
dir	The directory in the repository that you want to copy the content to.
limitdir	**Optional.** A list of comma-separated source directories to include (excluding those directories not explicitly declared).
file	The path to the repository export file that you will import from.
rules	The path to the rules file, as explained above.

Parameter	Definition/value
comment	The comment that will be set for the new revisions of the imported transformations and jobs.
replace	Set to **Y** to replace existing transformations and jobs in the repository. Default value is **N**.
coe	Continue on error, ignoring all validation errors.
version	Shows the version, revision, and build date of the PDI instance that the import script interfaces with.

```
sh import.sh -rep=PRODUCTION -user=admin -pass=12345 -dir=/ -
file=import-rules.xml -rules=import-rules.xml -coe=false -replace=true -
comment="New version upload from UAT"
```

Export Content From the Repository

You must be logged into the repository through Spoon.

Follow the instructions below to export the repository.

1. In Spoon, go to **Tools** > **Repository** > **Export Repository**.
2. In the **Save As** dialog box, browse to the location where you want to save the export file.
3. Type a name for your export file in the **File Name** text box..

   Note: The export file will be saved in XML format regardless of the file extension used.

4. Click **Save**.

The export file is created in the location you specified. This XML file is a concatenation of all of the data integration content you selected. It is possible to break it up into individual KTR and KJB files by hand or through a transformation.

Create Clusters

You can set up Carte to operate as a standalone execution engine for a job or transformation. Within Spoon, you can define one or more Carte servers and send jobs and transformations to them on an individual basis. However, in some cases you will want to set up a cluster of Carte servers so that you don't have to manage Carte instance assignments by hand. You may also need to use several servers to improve performance on resource-intensive jobs or transformations. In these scenarios, you will establish a cluster of Carte servers. There are two paradigms for Carte clustering:

A **static cluster** is a Spoon instance managing Carte slave nodes that have been explicitly defined in the user interface.

A **dynamic cluster** is a single master Carte server with a variable number of available Carte slave node registered with it.

Static clusters are a good choice for smaller environments where you don't have a lot of machines (virtual or real) to use for PDI transformations. Dynamic clusters are more appropriate in environments where transformation performance is extremely important, or there can potentially be multiple concurrent transformation executions. Architecturally, the primary difference between a static and dynamic cluster is whether it's Spoon or Carte doing the load balancing.

Configure Carte to Be a Static Slave Instance

Follow the directions below to set up static Carte slave servers.

Note: If you already have Carte installed on the target machines, you can skip the initial installation steps.

1. Retrieve a **pdi-ee-client** archive package from the Pentaho Customer Support Portal.
2. On each machine that will act as a Carte server (slave), create a `/pentaho/design-tools/` directory.
3. Unpack the archive to the `/pentaho/design-tools/` directory on each machine.

   Two directories will be created: **data-integration** and **license-installer**.
4. Use the license utility to install the PDI Enterprise Edition license, if applicable.
5. Copy over any required JDBC drivers and PDI plugins from your development instances of PDI to the Carte instances.
6. Run the Carte script with an IP address, hostname, or domain name of this server, and the port number you want it to be available on.

   ```
   ./carte.sh 127.0.0.1 8081
   ```
7. If you will be executing content stored in a DI Repository, copy the **repositories.xml** file from the `.kettle` directory on your workstation to the same location on your Carte slave.

   Without this file, the Carte slave will be unable to connect to the DI Repository to retrieve content.
8. Ensure that the Carte service is running as intended, accessible from your primary PDI development machines, and that it can run your jobs and transformations.
9. To start this slave server every time the operating system boots, create a startup or init script to run Carte at boot time with the same options you tested with.

You now have one or more Carte slave servers that you can delegate job and transformation work to in the Repository Explorer.

Configure a Dynamic Cluster

Follow the procedures below to set up one or more Carte slave servers and a Carte master server to load-balance them.

Configure Carte as a Master (Load Balancer)

This procedure is only necessary for **dynamic cluster** scenarios in which one Carte server will load-balance multiple slave Carte instances. If you are implementing a static cluster, which is where Carte slaves are individually declared in the PDI user interface, then skip these instructions.

Follow the process below to establish a dynamic Carte load balancer (master server).

Note: You do not have to use Carte as a load balancer; you can use the DI Server instead. If you decide to use the DI Server, you must enable the proxy trusting filter as explained in *Execute Scheduled Jobs on a Remote Carte Server* on page 28, then set up your dynamic Carte slaves and define the DI Server as the master.

Note: If you already have Carte installed on the target machine, you can skip the initial installation steps.

1. Retrieve a **pdi-ee-client** archive package from the Pentaho Customer Support Portal.
2. Create a `/pentaho/design-tools/` directory.
3. Unpack the archive to the `/pentaho/design-tools/` directory on each machine.

   Two directories will be created: **data-integration** and **license-installer**.
4. Copy over any required JDBC drivers from your development instances of PDI to the Carte instances.
5. Create a **carte-master-config.xml** configuration file using the following example as a basis:

```
<slave_config>
<!-- on a master server, the slaveserver node contains information about this Carte
 instance -->
 <slaveserver>
  <name>Master</name>
  <hostname>localhost</hostname>
  <port>9001</port>
  <username>cluster</username>
  <password>cluster</password>
  <master>Y</master>
 </slaveserver>
</slave_config>
```

   Note: The **<name>** must be unique among all Carte instances in the cluster.

6. Run the Carte script with the carte-slave-config.xml parameter.

```
./carte.sh carte-master-config.xml
```

7. Ensure that the Carte service is running as intended.
8. To start this master server every time the operating system boots, create a startup or init script to run Carte at boot time with the same config file option you specified earlier.

You now have a Carte master to use in a dynamic cluster. You must configure one or more Carte slave servers in order for this to be useful.

Configure Carte to Be a Dynamic Slave Instance

Follow the directions below to set up static Carte slave servers.

Note: If you already have Carte installed on the target machines, you can skip the initial installation steps.

1. Retrieve a **pdi-ee-client** archive package from the Pentaho Customer Support Portal.
2. On each machine that will act as a Carte server (slave), create a `/pentaho/design-tools/` directory.
3. Unpack the archive to the `/pentaho/design-tools/` directory on each machine.

   Two directories will be created: **data-integration** and **license-installer**.
4. Copy over any required JDBC drivers and PDI plugins from your development instances of PDI to the Carte instances.
5. Create a **carte-slave-config.xml** configuration file using the following example as a basis:

```
<slave_config>
<!-- the masters node defines one or more load balancing Carte instances that will
 manage this slave -->
 <masters>
  <slaveserver>
   <name>Master</name>
   <hostname>localhost</hostname>
   <port>9000</port>
<!-- uncomment the next line if you want the DI Server to act as the load balancer
 -->
<!--     <webAppName>pentaho-di</webAppName> -->
   <username>cluster</username>
   <password>cluster</password>
   <master>Y</master>
  </slaveserver>
 </masters>

 <report_to_masters>Y</report_to_masters>
<!-- the slaveserver node contains information about this Carte slave instance -->
 <slaveserver>
  <name>SlaveOne</name>
  <hostname>localhost</hostname>
  <port>9001</port>
  <username>cluster</username>
  <password>cluster</password>
  <master>N</master>
 </slaveserver>
</slave_config>
```

Note: The slaveserver **<name>** must be unique among all Carte instances in the cluster.

6. Run the Carte script with the carte-slave-config.xml parameter.

   ```
   ./carte.sh carte-slave-config.xml
   ```

7. If you will be executing content stored in a DI Repository, copy the **repositories.xml** file from the `.kettle` directory on your workstation to the same location on your Carte slave.

   Without this file, the Carte slave will be unable to connect to the DI Repository to retrieve PDI content.
8. Ensure that the Carte service is running as intended.
9. To start this slave server every time the operating system boots, create a startup or init script to run Carte at boot time with the same config file option you specified earlier.

You now have a Carte slave to use in a dynamic cluster. You must configure a Carte master server or use the DI Server as a load balancer.

Create a Cluster Schema in Spoon

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

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

Option	Description
Schema name	The name of the clustering schema
Port	Specify the port from which to start numbering ports for the slave servers. Each additional clustered step executing on a slave server will consume an additional port. **Note:** To avoid networking problems, make sure no other networking protocols are in the same range .
Sockets buffer size	The internal buffer size to use

Option	Description
Sockets flush interval rows	The number of rows after which the internal buffer is sent completely over the network and emptied.
Sockets data compressed?	When enabled, all data is compressed using the Gzip compression algorithm to minimize network traffic
Dynamic cluster	If checked, a master Carte server will perform load-balancing operations, and you must define the master as a slave server in the feild below. If unchecked, Spoon will act as the load balancer, and you must define the available Carte slaves in the field below.
Slave Servers	A list of the servers to be used in the cluster. You must have one master server and any number of slave servers. To add servers to the cluster, click **Select slave servers** to select from the list of available slave servers.

Execute Transformations in a Cluster

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

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

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

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

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

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.

Execute Scheduled Jobs on a Remote Carte Server

Follow the instructions below if you need to schedule a job to run on a remote Carte server. Without making these configuration changes, you will be unable to remotely execute scheduled jobs.

Note: This process is also required for using the DI Server as a load balancer in a dynamic Carte cluster.

1. Stop the DI Server and remote Carte server.
2. Copy the **repositories.xml** file from the `.kettle` directory on your workstation to the same location on your Carte slave.

   Without this file, the Carte slave will be unable to connect to the DI Repository to retrieve PDI content.
3. Open the `/pentaho/server/data-integration-server/tomcat/webapps/pentaho-di/WEB-INF/web.xml` file with a text editor.
4. Find the **Proxy Trusting Filter** filter section, and add your Carte server's IP address to the **param-value** element.

```
<filter>
    <filter-name>Proxy Trusting Filter</filter-name>
    <filter-class>org.pentaho.platform.web.http.filters.ProxyTrustingFilter</filter-
class>
    <init-param>
      <param-name>TrustedIpAddrs</param-name>
      <param-value>127.0.0.1,192.168.0.1</param-value>
      <description>Comma separated list of IP addresses of a trusted hosts.</
description>
    </init-param>
    <init-param>
      <param-name>NewSessionPerRequest</param-name>
      <param-value>true</param-value>
      <description>true to never re-use an existing IPentahoSession in the
 HTTP session; needs to be true to work around code put in for BISERVER-2639</
description>
    </init-param>
</filter>
```

5. Uncomment the proxy trusting filter-mappings between the <!-- begin trust --> and <!-- end trust --> markers.

```
  <!-- begin trust -->
  <filter-mapping>
    <filter-name>Proxy Trusting Filter</filter-name>
    <url-pattern>/webservices/authorizationPolicy</url-pattern>
  </filter-mapping>

  <filter-mapping>
    <filter-name>Proxy Trusting Filter</filter-name>
    <url-pattern>/webservices/roleBindingDao</url-pattern>
  </filter-mapping>

  <filter-mapping>
    <filter-name>Proxy Trusting Filter</filter-name>
    <url-pattern>/webservices/userRoleListService</url-pattern>
  </filter-mapping>

  <filter-mapping>
    <filter-name>Proxy Trusting Filter</filter-name>
    <url-pattern>/webservices/unifiedRepository</url-pattern>
  </filter-mapping>

  <filter-mapping>
    <filter-name>Proxy Trusting Filter</filter-name>
    <url-pattern>/webservices/userRoleService</url-pattern>
  </filter-mapping>

  <filter-mapping>
    <filter-name>Proxy Trusting Filter</filter-name>
    <url-pattern>/webservices/Scheduler</url-pattern>
  </filter-mapping>

  <filter-mapping>
    <filter-name>Proxy Trusting Filter</filter-name>
    <url-pattern>/webservices/repositorySync</url-pattern>
  </filter-mapping>
  <!-- end trust -->
```

6. Save and close the file, then edit the **carte.sh** or **Carte.bat** startup script on the machine that runs your Carte server.
7. Add **-Dpentaho.repository.client.attemptTrust=true** to the **java** line at the bottom of the file.

```
java $OPT -Dpentaho.repository.client.attemptTrust=true org.pentaho.di.www.Carte
 "${1+$@}"
```

8. Save and close the file.
9. Start your Carte and DI Server

You can now schedule a job to run on a remote Carte instance.

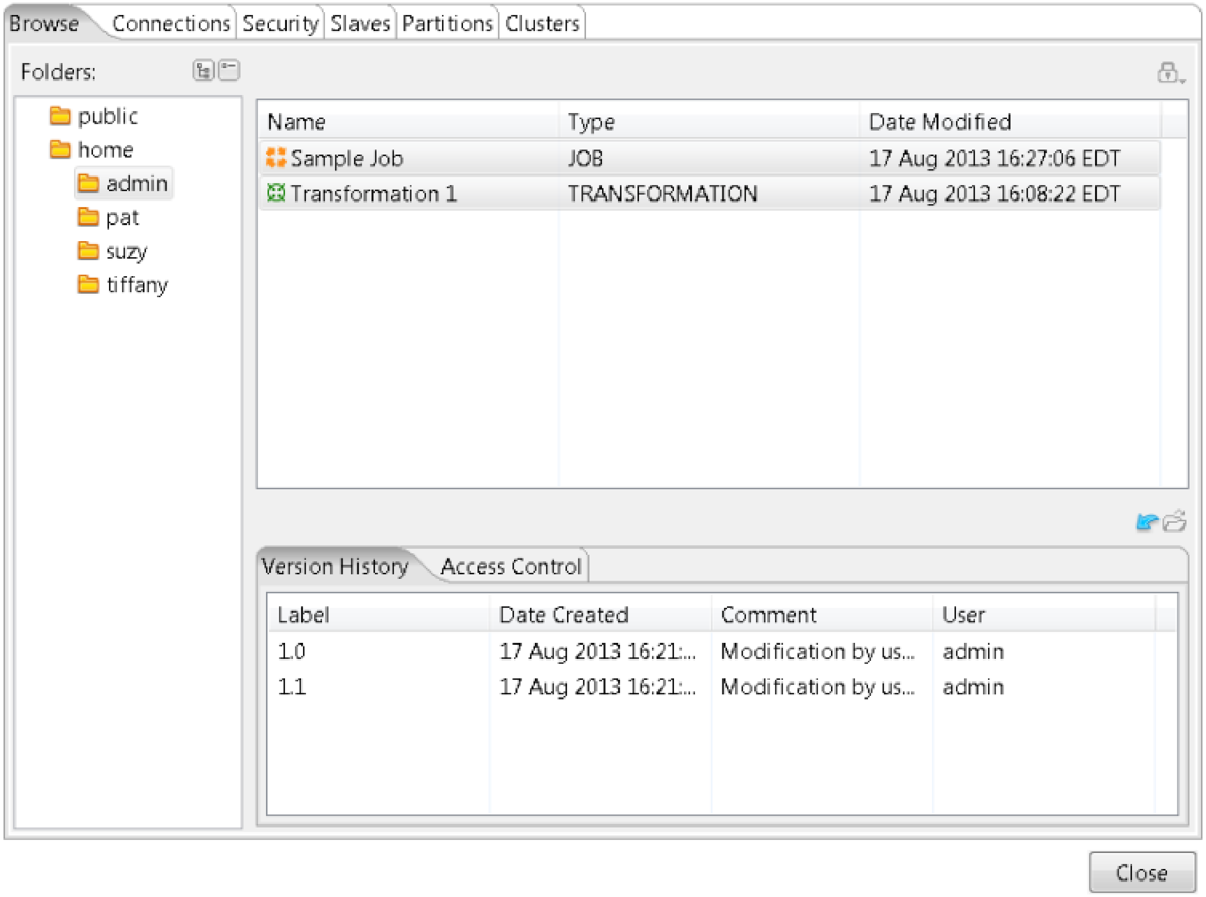
Install License Keys Using the Command Line Interface

1. Download the .lic file you want to install.
2. Copy your .lic files to the DI Server.
3. Navigate to the `licenses` directory.
   pdi/pdi-ee/data-integration/licenses
4. Run the license installation script.
   a) **For Linux:** Run `install_license.sh` with the install switch and the location and name of your .lic file as a parameter. You can specify multiple .lic files separated by spaces. Be sure to use backslashes to escape any spaces in the path or file name.
   ```
   install_license.sh install /home/dvader/downloads/Pentaho/BI/Platform/Enterprise/
   Edition.lic
   ```
   b) **For Windows:** Run `install_license.bat` with the install switch and the location and name of your license file as a parameter.
   ```
   install_license.bat install "C:\Users\dvader\Downloads\Pentaho BA Platform
   Enterprise Edition.lic"
   ```

Assign Permissions to Use or Manage Database Connections

You may have several connections to your data that you do not want to share with all of your users. When connected to the DI Server, Spoon gives you the ability to make your data visible to only the users and roles that you specify. You can assign permission to allow users and roles to read, write, or delete the connection. You can also delegate the ability to assign these permissions to another user or role.

Connection definitions are stored in the DI Repository. The Spoon Repository Explorer enables you to browse the available connections and select the one for which you want to assign permissions.



Name	Type	Date Modified
Sample Job	JOB	17 Aug 2013 16:27:06 EDT
Transformation 1	TRANSFORMATION	17 Aug 2013 16:08:22 EDT

Label	Date Created	Comment	User
1.0	17 Aug 2013 16:21:...	Modification by us...	admin
1.1	17 Aug 2013 16:21:...	Modification by us...	admin

1. From within **Spoon**, click on **Tools** > **Repository** > **Explore**. The **Repository Explorer** on [Your_DI_Repository_Name] dialog box appears.
2. Select the Connections tab.
3. Select the connection for which you want to assign permissions.
4. From the User/Role area, select the user or role for which you want to assign permissions.
5. Check the permissions you want to assign to the selected user or role.

Selection	Selection Result
Read	For this user or role, the connection appears in the connection list and can be selected for use. If users or roles have permission to read a transformation or job but not to a referenced database connection, they cannot open the transformation or job and an error message appears.
Write	This user or role can edit the connection definition.
Delete	This user or role can permanently remove the connection definition from the list..

Selection	Selection Result
Manage Access Control	This user or role can assign read, write, and delete permissions to other users or roles.

6. Click **Apply**.
7. Click **Close** to exit the dialog box.

List of Server Ports Used by PDI

The port numbers below must be available internally on the machine that runs the DI Server. The only exception is SampleData, which is only for evaluation and demonstration purposes and is not necessary for production systems. If you are unable to open these ports, or if you have port collisions with existing services, refer to *Change Service Port Numbers* on page 33 for instructions on how to change them.

Service	Port Number
Data Integration Server	9080
H2 (SampleData)	9092
Embedded BA Server (Jetty)	10000

Change Service Port Numbers

DI Server (Tomcat)

Edit the `/pentaho/server/data-integration-server/tomcat/conf/server.xml` file and change the port numbers in the section shown below.

```
<!-- A "Connector" represents an endpoint by which requests are received
         and responses are returned. Documentation at :
         Java HTTP Connector: /docs/config/http.html (blocking & non-blocking)
         Java AJP  Connector: /docs/config/ajp.html
         APR (HTTP/AJP) Connector: /docs/apr.html
         Define a non-SSL HTTP/1.1 Connector on port 9080
    -->
    <Connector URIEncoding="UTF-8" port="9080" protocol="HTTP/1.1"
               connectionTimeout="20000"
               redirectPort="9443" />
    <!-- A "Connector" using the shared thread pool-->
    <!--
    <Connector URIEncoding="UTF-8" executor="tomcatThreadPool"
               port="9080" protocol="HTTP/1.1"
               connectionTimeout="20000"
               redirectPort="9443" />
```

Note: You may also have to change the SSL and SHUTDOWN ports in this file, depending on your configuration.

Next, follow the directions in *Change the DI Server URL* on page 34 to accommodate for the new port number.

Embedded BA Server (Jetty)

This server port is hard-coded in Pentaho Data Integration and cannot be changed. If port 10000 is unavailable, the system will increment by 1 until an available port is found.

Change the DI Server URL

You can change the DI Server hostname from localhost to a specific IP address, hostname, or domain name by following these instructions. This procedure is also a requirement if you are changing the DI Server port number.

1. Stop the DI Server through your preferred means.
2. Open the `/pentaho/server/data-integration-server/tomcat/webapps/pentaho-di/WEB-INF/web.xml` file with a text editor.
3. Modify the value of the **fully-qualified-server-url** element appropriately.

```
<context-param>
    <param-name>fully-qualified-server-url</param-name>
    <param-value>http://localhost:9080/pentaho-di/</param-value>
</context-param>
```

4. Save and close the file.
5. Start the DI Server.

The DI Server is now configured to reference itself at the specified URL.

Logging and Monitoring

This section contains information on DI Server and client tool logging and status monitoring.

Enable Logging

The logging functionality in Data Integration enables you to more easily troubleshoot complex errors and failures, and measure performance. To turn on logging in Data Integration, follow the below procedure.

1. Create a database or table space called **pdi_logging**.
2. Start Spoon, and open a transformation or job for which you want to enable logging.
3. Go to the **Edit** menu and select **Settings...**

   The **Settings** dialog appears.
4. Select the **Logging** tab.
5. In the list on the left, select the function you want to log.
6. Click the **New** button next to the **Log Connection** field.

   The **Database Connection** dialogue appears.
7. Enter your database connection details, then click **Test** to ensure that they are correct. Click **OK** when you are done.
8. Look through the list of fields to log, and ensure that the correct fields are selected.

   Warning: Monitoring the **LOG_FIELD** field can negatively impact BA Server or DI Server performance. However, if you don't select all fields, including LOG_FIELD, when configuring transformation logging, you will not see information about this transformation in the Operations Mart logging.

Logging is enabled for the job or transformation.

When you run a job or transformation that has logging enabled, you have the option of choosing the log verbosity level in the execution dialogue:

- **Nothing** Do not record any output
- **Error** Only show errors
- **Minimal** Only use minimal logging
- **Basic** This is the default level
- **Detailed** Give detailed logging output
- **Debug** For debugging purposes, very detailed output
- **Row level** Logging at a row level. This will generate a lot of log data

If the **Enable time** option is enabled, all lines in the logging will be preceded by the time of day.

Log Rotation

This procedure assumes that you do not have or do not want to use an operating system-level log rotation service. If you are using such a service on your Pentaho server, connect to the BA Server and Data Integration Server and use that instead of implementing this solution.

The Business Analysis and Data Integration servers use the Apache log4j Java logging framework to store server feedback. The default settings in the log4j.xml configuration file may be too verbose and grow too large for some production environments. Follow these instructions to modify the settings so that Pentaho server log files are rotated and compressed.

1. Stop all relevant Pentaho servers.
2. Download a .zip archive of the Apache Extras Companion for log4j package: *Apache Logging Services*.
3. Unpack the **apache-log4j-extras** JAR file from the zip archive, and copy it to the following locations:
   - **Business Analytics Server:** `/tomcat/webapps/pentaho/WEB-INF/lib/`
   - **Data Integration Server:** `/tomcat/webapps/pentaho-di/WEB-INF/lib/`
4. Edit the **log4j.xml** settings file for each server that you are configuring. The files are in the following locations:
   - **BA Server:** `/tomcat/webapps/pentaho/WEB-INF/classes/`
   - **DI Server:** `/tomcat/webapps/pentaho-di/WEB-INF/classes/`

5. Remove all **PENTAHOCONSOLE** appenders from the configuration.
6. Modify the **PENTAHOFILE** appenders to match the log rotation conditions that you prefer.

   You may need to consult the log4j documentation to learn more about configuration options. Two examples that many Pentaho customers find useful are listed:

   Daily (date-based) log rotation with compression:

   ```
   <appender name="PENTAHOFILE" class="org.apache.log4j.rolling.RollingFileAppender">
       <!-- The active file to log to; this example is for BA/DI Server.-->
       <param name="File" value="../logs/pentaho.log" />
       <param name="Append" value="false" />
       <rollingPolicy class="org.apache.log4j.rolling.TimeBasedRollingPolicy">
           <!-- See javadoc for TimeBasedRollingPolicy -->
           <param name="FileNamePattern" value="../logs/pentaho.%d.log.gz" />
       </rollingPolicy>
       <layout class="org.apache.log4j.PatternLayout">
           <param name="ConversionPattern" value="%d %-5p [%c] %m%n"/>
       </layout>
   </appender>
   ```

   Size-based log rotation with compression:

   ```
   <appender name="PENTAHOFILE" class="org.apache.log4j.rolling.RollingFileAppender">
       <!-- The active file to log to; this example is for BA/DI Server.-->
       <param name="File" value="../logs/pentaho.log" />
       <param name="Append" value="false" />
       <rollingPolicy class="org.apache.log4j.rolling.FixedWindowRollingPolicy">
           <param name="FileNamePattern" value="../logs/pentaho.%i.log.gz" />
           <param name="maxIndex" value="10" />
           <param name="minIndex" value="1" />
       </rollingPolicy>
       <triggeringPolicy class="org.apache.log4j.rolling.SizeBasedTriggeringPolicy">
           <!-- size in bytes -->
           <param name="MaxFileSize" value="10000000" />
       </triggeringPolicy>
       <layout class="org.apache.log4j.PatternLayout">
           <param name="ConversionPattern" value="%d %-5p [%c] %m%n" />
       </layout>
   </appender>
   ```

7. Save and close the file, then start all affected servers to test the configuration.

You have an independent log rotation system in place for all modified Pentaho servers.

Monitor Job and Transformation Results

You can view remotely executed and scheduled job and transformation details, including the date and time that they were run, and their status and results, through the **Kettle Status** page. To view it, navigate to the `/pentaho-di/kettle/status` page on your Data Integration Server (change the host name and port to match your configuration):

```
http://internal-di-server:9080/pentaho-di/kettle/status
```

You must be logged in to ensure you are redirected to the login page.

You can get to a similar page in Spoon by using the **Monitor** function of a slave server.

Notice the **Configuration details** table at the bottom of the screen. This shows the three configurable settings for schedule and remote execution logging. See *slave-server-config.xml* on page 37 for more information on what these settings do and how you can modify them.

Note: This page clears when the server is restarted, or at the interval specified by the **object_timeout_minutes** setting.

slave-server-config.xml

Any action done through the Carte server embedded in the Data Integration Server is controlled through the `/pentaho/server/data-integration-server/pentaho-solutions/system/kettle/slave-server-config.xml` file. These three configurable options are explained here.

Note: To make modifications to slave-server-config.xml, you must stop the Data Integration Server.

Property	Values	Description
max_log_lines	Any value of 0 (zero) or greater. 0 indicates that there is no limit.	Truncates the execution log when it goes beyond this many lines.
max_log_timeout_minutes	Any value of 0 (zero) or greater. 0 indicates that there is no timeout.	Removes lines from each log entry if it is older than this many minutes.
object_timeout_minutes	Any value of 0 (zero) or greater. 0 indicates that there is no timeout.	Removes entries from the list if they are older than this many minutes.

```
<slave_config>
  <max_log_lines>0</max_log_lines>
  <max_log_timeout_minutes>0</max_log_timeout_minutes>
  <object_timeout_minutes>0</object_timeout_minutes>
</slave_config>
```

Data Integration Operations Mart

The DI Operations Mart enables you to collect and query Data Integration log data and then use BA server tools to examine log data in reports, charts, or dashboards.

Description

The DI Operations Mart is a centralized data mart that stores job or transformation log data for easy reporting and analysis. The data mart is a collection of tables organized as a data warehouse using a star schema. Together, dimension tables and a fact table represent the logging data. These tables need to be created in the DI Operations Mart database. Pentaho provides SQL scripts to create these tables for MySQL, Oracle, and PostgresSQL databases. A Data Integration job populates the time and date dimensions.

Note: For optimal performance, be sure to clean the operations mart periodically.

Getting Started

These procedures describe how to install, set up, and configure the DI Operations Mart to collect ETL logging information. These instructions only apply if you do not have the BA Server. If you are a Pentaho Business Analytics customer, these tables and connections are created automatically.

Install the DI Operations Mart

These instructions are for customers who are only using the DI Server and its tools. If you purchased Pentaho Business Analytics, the Data Integration (DI) Operations Mart installs as part of the installation process and you do not need to follow these instructions.

1. Navigate to `data-integration-server/pentaho-solutions`.
2. Unzip `pentaho-operatiuons-mart.zip` to a temporary location.
   The archive folder structure is:
   - `pdi-operations-mart/`

- `DDL/`
- `etl/`
- `models/`
- `samples/`
    - `dashboards/`
    - `datamart/`
    - `jobs_transformations/`
    - `reports/`

3. On the computer that runs the DI repository from PDI/Spoon, create a folder within the repository, such as `public/pdi_operations_mart`. Import the `etl/pdi-operations-mart.xml` to this folder.
   The import creates two database connections:
    - `live_logging_info`: The online database that stores the logging data for the sample jobs and transformations.
    - `PDI_Operations_Mart`: The off-line database that contains the DI Operations Mart database objects.

Set Up Database Connections

In order to fetch logging data from the online database, you must define a database connection and populate the Operations Mart. *Installing the DI Operations Mart* defines two default database connections: `live_logging_info`: connects to the online database used for the sample jobs and transformations, and `PDI_Operations_Mart` connects to the off-line DI Operations Mart database. The connection information needs to match your databases. This procedure explains how to define your database connections.

1. From within Spoon, close any jobs or transformations you might have open.
2. Select **Tools** > **Repository** > **Explore** from the drop-down menu.
   The **Repository Explorer** window opens.
3. Select the **Connections** tab.
4. Select the `live_logging_info entry`. Edit the entry by clicking the pencil icon in the upper-right corner.
   The database connection window opens.
5. Enter the information for the connection that fetches the online logging data.

   If you need to have multiple connections to fetch the online logging information, create new connections and enter the information for each connection.
6. Repeat steps 3 and 4 for the `PDI_Operations_Mart` connection.

The database connections for the DI Operations Mart are defined.

Create the DI Operations Mart

1. From any program that can run scripts against the logging data database, execute the DDL script called `pentaho_mart_<database>.sql`, where `<database>` is the database vendor, such as MySQL, Oracle, PostgreSQL, and alike.
   These tables are created:
    - `dim_batch`
    - `dim_date`
    - `dim_execution`
    - `dim_executor`
    - `dim_log_table`
    - `dim_step`
    - `dim_time`
    - `fact_execution`
    - `fact_jobentry_execution`
    - `fact_perf_execution`
    - `fact_step_execution`
2. From within Spoon, run the job named `Fill in DIM_DATE and DIM_TIME`.
   The DI Operations Mart is created.

Configure Logging Data Collection

For each job or transformation, use this procedure to configure which logging data you would like to collect.

You must set the global logging variables for your database or table in advance. See *Setting Global Logging Variables* for information about how to set global logging variables for transformations and jobs. If you have already set the global logging variables, start at Step 6 to specify an input and output step for each transformation that collects external input or output data.

1. From within Spoon, open a job or transformation.
2. Select the **View** tab, then right-click the job or transformation and select **Settings**.
3. Select the **Logging** tab and choose the appropriate selection from the left pane.
   - For jobs, select **Job**.
   - For transformations, select **Transformation**.
4. In the **Log Connection** field, enter or select the appropriate *database connection*. Using the provided samples, select the connection named `live_logging_info`.
5. In the **Log table name** field
   - For jobs, enter `LOG_JOB`.
   - For transformations, enter `LOG_TRANS`.
6. In order to collect row input or output information for jobs or transformations, for instance for throughput calculations, specify an input and output step for each transformation that collects external input or output data.
   - For `LINES_INPUT`, specify the step collecting external input data.
   - For `LINES_OUPUT`, specify the step collecting output data.
7. Ensure all entries under **Log table** fields are selected.

   If the `LOG_JOB` or `LOG_TRANS` table has not been created for the specified database, click the **SQL** button and then click the **Execute** button in the subsequent dialog box.
8. Click **OK** until you return to the **Job/Transformation properties** dialog box.
9. From the **Monitoring** tab, check the box labeled **Enable step performance monitoring?** Click **OK** to exit the dialog box, then save the job or transformation.

The DI Operations Mart is configured to collect ETL logging data.

Update the Logging for the DI Operations Mart

You can monitor the latest performance of your ETL operations by updating the logging data within the DI Operations Mart. As a prerequisite, the Operations Mart must have previously been *created* and configured with the *logging data* you want to collect.

Your data logs need to be updated if you modified these types of data.

- Logging table
- Database connection
- Transformation step
- Job entry

You must update and then populate the executor and log dimensions table if you want to log the most current data. You also have the option to only update or populate.

1. From within Spoon, select **Tools** > **Repository** > **Explore**.
2. Select **pdi_operations_mart**.
3. Choose the appropriate job or transformation from the table.

If you want to	Choose
Update the executor and log dimension tables.	**Update Executor and Log Table Dimensions.ktr**
Populate the Pentaho Operations Mart with the logging information *without* updating executor and log dimension tables.	**Update_Logging_Datamart.kjb**

If you want to	Choose
Update the executor and log dimension tables with the latest logging data. Then, update the Pentaho Operations Mart with that new data.	**Update_Dimensions_then_Logging_Datamart.kjb**

As a result, the job or transformation runs. The Operations Mart updates and/or populates with the latest logging data.

Load the Sample Data in the DI Operations Mart

For the sake of illustration, this procedure uses the **Fill_datamart_with_sample_data.kjb** job in the `pdi-operations-mart\samples\datamart` folder to load sample data. This job is intended to be run from the file system; *do not* import it into your EE repository.

⚠ **Caution:** If you have loaded your own data to the `PDI_Operations_Mart`, this procedure will corrupt the data.

Transformations use the `PDI_Operations_Mart` database connection. The connection information has been left out. Use this procedure to configure the connection so that all transformations can use it.

1. Open the transformation and edit the `PDI_Operations_Mart`, adding the correct database information.
2. From the transformations **View** pane to the left, right-click the database connection you just edited to bring up its context menu. Then click **Share** and close the transformation. Close the job to ensure the change is saved. Only the **Fill_datamart_with_sample_data.kjb** job should be open now within Spoon.
3. From within Spoon, execute the **Fill_datamart_with_sample_data.kjb** job.

The sample data is loaded into the DI Operations Mart.

Loading the Sample Reports, Charts, and Dashboards

This procedure explains how to load and view sample reports, charts, and dashboards, which were created using the Data Integration Operations Mart under the BA Server.

1. From within the User Console, create a folder under the BA Server at `biserver-ee\pentaho-solutions\`. The internal location under the BA Server is `biserver-ee\pentahosolutions\`. In the Solution pane, name the folder `PDI Operations Mart Sample Reports`.
2. Copy the contents of the `/pdi-operations-mart/samples/reports` directory into the `PDI Operations Mart Sample Reports` folder.
3. Open the Browse view, then select **Tools** > **Refresh** > **Repository cache**. Then select **Tools** > **Refresh** > **Reporting Metadata**.

Sample reports appear in the **Files** area of the **Browse** view.

Repeat this procedure for loading sample charts or dashboards by substituting either for the word *reports* in step 2.

Set Up and Distributethe Data Models

This procedure describes how to set up and distribute the data models for the DI Operations Mart under the BA Server:

1. Place the `models/[MyBusinessModel].xmi` and the `models/PDI_Operations_Mart_<dbname>.mondrian.xml`, where <dbname> is the name of the database containing the DI Operations Mart, under the BA Server directory at the following location: `bi-server/pentaho_solutions/PDI Operations Mart Sample Reports`.

   You may also put the `[MyBusinessModel]` into `bi-server/pentaho_solutions/admin/resources/metadata` or to another solutions directory so it is available independent of the sample solution. In case you already have an existing `[MyBusinessModel]` in this location, you need to rename the file to `PDI_Operations_Mart.xmi`. The same applies accordingly to the Mondrian schema.
2. Rename the `PDI_Operations_Mart_<dbname>.mondrian.xml` file to `PDI_Operations_Mart.mondrian.xml`.
3. *Create a new database connection*. Name it `PDI_Operations_Mart`. Then set the connection information to the Data Integration Operations Mart database location. You can copy the needed URL from the database connecting within Spoon when editing the connection information and pressing the **Feature List** button.
4. Add a category entry to the `datasources.xml` file, which can be found here: `bi-server/pentaho_solutions/system/olap/.`

If you named your data source `PDI_Operations_Mart` and used the solution folder `PDI Operations Mart Sample Reports`, then the addition to the XML file looks like this.

```
<Catalog name="PDI_Operations_Mart">
  <DataSourceInfo>Provider=mondrian;DataSource=PDI_Operations_Mart</DataSourceInfo>
  <Definition>
    solution:PDI Operations Mart Sample Reports/PDI_Operations_Mart.mondrian.xml
  </Definition>
</Catalog>
```

5. Save the file.
6. Restart the BA Server.
7. From the User Console, refresh all caches and settings.

The DI Operations Mart data models are available for Analyzer and Interactive reporting using the `PDI_Operations_Mart` data source.

Give Users Access to the DI Operations Mart

You must have previously mapped user roles, as described in *Mondrian Role Mapping in the BA Server*.

By default, only users who have the **Admin** role can access the Pentaho Operations Mart. The **Admin** role has access to all capabilities within all Pentaho products, including the Pentaho Operations Mart. If you want to allow users to view and run the Pentaho Operations Mart only, you can assign them the **Pentaho Operations** role. For example, a user who has been assigned the **Pentaho Operations** user role is able to open and view a report within the DI Operations mart, but does not have the ability to delete it.

To give users access to view the DI Operations Mart, assign the Pentaho Operations role to those users.

1. From within the Pentaho User Console, select the **Administration** tab.
2. From the left panel, select **Security** > **Users/Roles**.
3. Select the **Roles** tab.
4. Add the new role called **Pentaho Operations** by following the instructions in *Adding Roles*.
5. Assign the appropriate users to the new role, as described in *Adding Users to Roles*.
6. Advise these users to log in to the Pentaho User Console, create a Pentaho Analyzer or Pentaho Interactive Report, and ensure that they can view the Pentaho Operations Mart in the **Select a Data Source** dialog.

Create Charts, Reports, and Dashboards Using PDI Operations Mart Data

Once you have created and populated your Data Integration Operations Mart with log data, the features of the User Console enable you to examine this data and create reports, charts, and dashboards. We provide many samples, reports, charts, and dashboards that you can modify to include your own log data.

For More Information

For more information about creating or modifying reports, charts, or dashboards, see *Create Analysis, Interactive Reports, and Dashboards*.

Create ETL Logging Reports

1. Open a new report in Report Designer.
2. Create two parameters named `Start Date` and `End Date`, both with a **Value Type** of `Date` and a **Prompt Display Type** of `Date Picker`.
3. Create a parameter named `Number of Rows` with a **Value Type** of `Integer` and a default value of `50`.
4. Create a table data set named `PeriodSelection` with an **ID** column of type `Integer` and a **Value** column of type `String`. Enter these ID/Value pairs into the table.
   - `1, "24 Hours"`
   - `7, "7 Days"`
   - `30, "30 Days"`
5. Create a parameter named `Period Selection` with the these settings.
   - `Value Type = Integer`

- `Prompt Display Type = Single Selection Button`
- `Query = PeriodSelection`
- `Prompt Value = ID`
- `Prompt Display Name = Value`

Check the **Validate Values** and **Use first value if default value formula results in NA** boxes.

6. Create a new metadata data set. In the Metadata Data Source editor under **XMI file**, point to the metadata file in the solutions folder under the BA Server at `biserver-ee/pentaho-solutions/PDI Operations Mart Sample Reports/[MyBusinessModel.xmi]`.
7. Create a query against the metadata data set named `Status` and add the following field to the **Selected Columns** list: **Dim execution > Execution status**.
8. Add a parameter named `Status Selection` with the these settings.

   - `Value Type = String`
   - `Default Value = [start,end]`
   - `Prompt Display Type = Multivalue List`
   - `Query = Status`
   - `Prompt Value = Execution Status`
   - `Prompt Display Name = Execution Status`

   Check the **Validate Values** and **Use first value if default value formula results in NA** boxes.
9. Create a query against the metadata data set named `TypeSelection`, add the **Dim executor > Executor type** field to the **Selected Columns** list.
   Add the following condition: `Dim executor > Executor type is not null`.
10. Add a parameter named Kettle Type with these settings.

    - `Value Type = String`
    - `Default Value = [job,transformation]`
    - `Prompt Display Type = Multi Selection Button`
    - `Query = TypeSelection`
    - `Prompt Value = Executor type`
    - `Prompt Display Name = Executor type`

    Check the **Validate Values** and **Use first value if default value formula results in NA** boxes.
11. Create a query against the Metadata data set named `LastRun` and add these fields to the **Selected Columns** list.

    - `Dim executor > Executor name`
    - `Fact execution > Executor timestamp`
    - `Dim execution > Execution status`
    - `Fact execution > Duration`
    - `Dim executor > Executor type`
12. Add these conditions to the query.

    - `Dim execution > Execution status in {Status Selection}, with default value "start|end"`
    - `Dim executor > Executor type in {Kettle Type}, with default value "transformation"`
    - `Fact execution > Execution Timestamp >= {Start Date}`
    - `Fact execution > Execution Timestamp <= {End Date}`
13. Add the following order to the query: `Fact execution > Execution timestamp (Descending - DESC)`.
14. Click **OK** twice to exit the Query Editor and the Metadata Data Source Editor.
15. Drag a **Message** field from the panel on the left onto the report under **Report Header**, enter `Last Run Jobs and Transformations` and format as necessary.
16. Drag 5 **Message** fields onto the **Group Header** band and fill them with the this text.

    - `Date/Time of Execution`
    - `Name of Job or Transformation`
    - `Type`
    - `Execution Status`
    - `Duration (sec)`

Format as necessary.

17. Drag the these fields onto the **Details** band and fill them with the corresponding values.

    - **Date** field: `Execution Timestamp`
    - **String** field: `Executor Name`
    - **String** field: `Executor Type`
    - **String** field: `Execution Status`
    - **Number** field: `Duration`

    Align the field widths to the **Group Header** message field widths, in order to align the headers with the values.
18. Review the report, selecting various parameter values to verify the report is working correctly.

Create ETL Logging Charts

1. Open a new report from within Pentaho Report Designer.
2. Create two parameters: `Start Date` and `End Date`, both with a **Value Type** of Date and a **Prompt Display Type** of `Date Picker`.
    a) From within Pentaho Report Designer, Go to **Data** > **Add Parameter**.
    This brings up the **Add Parameter** dialog box.
    b) For the **Name** field, enter `Start Date`.
    c) Set the **Value Type** to **Date**.
    d) Set the **Display Type** to **Date Picker**.
    e) Repeat steps 2a. through 2d, but name this second parameter `End Date`.
3. Create a new metadata data set. In the Metadata Data Source editor, under **XMI file**, point to the metadata file in the solutions folder under the BA Server at `biserver-ee/pentaho-solutions/PDI Operations Mart Sample Reports/metadata.xmi`.
    a) Go to **Data** > **Add Datasource** > **Metadata**.
    This brings up the Metadata Data Source editor dialog box.
4. Set the **Domain Id / BI-Server Solution Name:** to `PDI Operations Mart Sample Reports/metadata.xmi`
5. Create a new query named `Top 10 Slowest Transformations`, then open the Metadata Query Editor.
6. Add these fields to the **Selected Columns** list.

    - `Dim executor > Executor name`
    - `Fact execution > Minimum Throughput`
7. Add these conditions to the query:.

    - `Dim executor > Executor type = 'transformation'`
    - `Fact execution > Minimum Throughput > 0`
    - `Fact execution > Execution Timestamp >= {Start Date}`
    - `Fact execution > Execution Timestamp <= {End Date}`
8. Add the following order to the query: `Fact execution > Minimum Throughput (Ascending - ASC)`
9. Click **OK** twice to exit the Query Editor and the Metadata Data Source Editor.
10. Create a new Open Formula. Name it `rc` and set the value to: `&amp; (ROWCOUNT([LC_Dim_executor_executor_name])+1) &amp; ": " &amp; [LC_Dim_executor_executor_name]`.
11. Create a new chart by dragging the chart icon on the left to the **Report Header** section of the report. Set the size.
12. Double-click the chart to bring up the **Edit Chart** dialog box. Select **XY Line Chart** as the chart type.
13. Select **CategorySet Collector** as the collector type under **Primary Datasource**.
14. Set the **category-column** value to the **rc** function, and the **value-columns** value to the **Minimum Throughput** field.
15. Under **Bar Chart properties**, set these options.

    - **x-axis-label-rotation** to `45`
    - **show-legend** to `False`
    - **tooltip-formula** to `=["chart::category-key"]`
16. Preview the report, selecting various parameter values to verify the chart is being displayed correctly.

Create ETL Logging Dashboards

This procedure shows how to create a dashboard using the sample log data and report created in the *Loading Sample Reports, Charts, and Dashboards* procedure.

Dashboards and the elements within them are highly configurable and can be modified to fit a variety of complex analytical needs. See *Use Dashboard Designer* for more information about creating and customizing dashboards.

1. From with User Console, click on **New Dashboard** icon.
2. Select the `2 and 1` template.
3. From the **Files** pane on the left, drag these items from the list to the dashboard canvas.
   - Top 10 Failed Jobs and Transformations
   - Top 10 Slowest Transformations
   - Transformation Throughput Overview
4. For each content pane do the following:
   a) Give the content pane an appropriate title.
   b) From the **Objects** pane, select **Prompts**.
   c) Select **Add** to add the first of two new prompts.
   d) Name the first prompt `Start Date` and make it a **Date Picker**. Click **OK**.
   e) Name the next prompt `Period` and make it a button. Set the **Data Type** to **Static List**. Click **OK**.
5. Save the dashboard.
6. Select the **Pencil** icon on the toolbar to place the dashboard in edit mode.

You have a dashboard that displays log data created using the Data Integration Operations Mart.

Logging Tables Status for the Data Integration Operations Mart

Transformation Log Tables

The transformation tables have a **status** column, these are descriptions of the values that can be found in that column.

Status Display	Description
start	Indicates the transformation was started and remains in this status until the transformation ends when no logging interval is set.
end	Transformation ended successfully.
stop	Indicates the user stopped the transformation.
error	Indicates an error occurred when attempting to run the transformation.
running	A transformation is only in this status directly after starting and does not appear without a logging interval.
paused	Indicates the transformation was paused by the user and does not appear without a logging interval.

Jobs Log Tables

The job log tables have a **status** column, these are descriptions of the values that can be found in that column.

Status Display	Description
start	Indicates the job was started and keeps in this status until the job ends, and when no logging interval is set.
end	Job ended successfully.
stop	Indicates the user stopped the job.
error	Indicates an error occurred when attempting to run the job.
running	A job is only in this status directly after starting and does not appear without a logging interval.

Status Display	Description
paused	Indicates the job was paused by the user, and does not appear without a logging interval.

Logging Dimensions and Metrics for the Data Integration Operation Mart

These tables are references that identify the various dimensions and metrics that can be used to create new ETL log charts and reports.

Fact Table

(fact_execution)

Field Name	Description
`execution_date_tk`	A technical key (TK) linking the fact to the date when the transformation/job was executed.
`execution_time_tk`	A technical key (TK) linking the fact to the time-of-day when the transformation/job was executed.
`batch_tk`	A technical key (TK) linking the fact to batch information for the transformation/job.
`execution_tk`	A technical key (TK) linking the fact to execution information about the transformation/job.
`executor_tk`	A technical key (TK) linking the fact to information about the executor (transformation or job).
`parent_executor_tk`	A technical key (TK) linking the fact to information about the parent transformation/job).
`root_executor_tk`	A technical key (TK) linking the fact to information about the root transformation/job.
`execution_timestamp`	The date and time when the transformation/job was executed.
`duration`	The length of time (in seconds) between when the transformation was logged (LOGDATE) and the maximum dependency date (DEPDATE)
`rows_input`	The number of lines read from disk or the network by the specified step. Can be input from files, databases, etc.
`rows_output`	The number of rows output during the execution of the transformation/job.
`rows_read`	The number of rows read in from the input stream of the the specified step.
`rows_written`	The number of rows written during the execution of the transformation/job.
`rows_rejected`	The number of rows rejected during the execution of the transformation/job.
`errors`	The number of errors that occurred during the execution of the transformation/job.

Batch Dimension

(dim_batch)

Field Name	Description
`batch_tk`	A technical key (TK) for linking facts to batch information.
`batch_id`	The ID number for the batch.
`logchannel_id`	A string representing the identifier for the logging channel used by the batch.
`parent_logchannel_id`	A string representing the identifier for the parent logging channel used by the batch.

Date Dimension

(dim_date)

Field Name	Description
date_tk	A technical key (TK) for linking facts to date information.
date_field	A Date object representing a particular day (year, month, day).
ymd	A string representing the date value in year-month-day format.
ym	A string representing the date value in year-month format.
year	An integer representing the year value.
quarter	An integer representing the number of the quarter (1-4) to which this date belongs.
quarter_code	A 2-character string representing the quarter (Q1-Q4) to which this date belongs.
month	An integer representing the number of the month (1-12) to which this date belongs.
month_desc	A string representing the month (“January”..”December”) to which this date belongs.
month_code	A string representing the shortened month code (“JAN”..”DEC”) to which this date belongs.
day	An integer representing the day of the month (1-31) to which this date belongs.
day_of_year	An integer representing the day of the year (1-366) to which this date belongs.
day_of_week	An integer representing the day of the week (1-7) to which this date belongs.
day_of_week_desc	A string representing the day of the week (“Sunday”..”Saturday”) to which this date belongs.
day_of_week_code	A string representing the shortened day-of-week code (“SUN”..”SAT”) to which this date belongs.
week	An integer representing the week of the year (1-53) to which this date belongs.

Execution Dimension

(dim_execution)

Field Name	Description
execution_tk	A technical key (TK) for linking facts to execution information.
execution_id	A unique string identifier for the execution.
server_name	The name of the server associated with the execution.
server_host	The name of the server associated with the execution.
executing_user	The name of the user who initiated the execution.
execution_status	The status of the execution (start, stop, end, error).

Executor Dimesion

This table contains information about an executor that is a job or transformation (dim_executor).

Field Name	Description
`executor_tk`	A technical key (TK) for linking facts to executor information
`version`	An integer corresponding to the version of the executor
`date_from`	A date representing the minimum date for which the executor is valid
`date_to`	A date representing the maximum date for which the executor is valid
`executor_id`	A string identifier for the executor
`executor_source`	The source location (either file- or repository-relative) for the executor
`* executor_environment`	File server, repository name, related to the executor_source. **Reserved for future use.*
`executor_type`	The executor type (“job” or “transformation”)
`executor_name`	The name of the executor (transformation name, e.g.)
`executor_desc`	A string description of the executor (job description, e.g.)
`executor_revision`	A string representing the revision of the executor (“1.3”, e.g.)
`executor_version_label`	A string representing a description of the revision (i.e. change comments)
`exec_enabled_table_logging`	Whether table logging is enabled for this executor. Values are “Y” if enabled, “N” otherwise.
`exec_enabled_detailed_logging`	Whether detailed (step or job entry) logging is enabled for this executor. Values are “Y” if enabled, “N” otherwise.
`exec_enabled_perf_logging`	Whether performance logging is enabled for this executor. Values are “Y” if enabled, “N” otherwise.
`exec_enabled_history_logging`	Whether historical logging is enabled for this executor. Values are “Y” if enabled, “N” otherwise.
`last_updated_date`	The date the executor was last updated
`last_updated_user`	The name of the user who last updated the executor

Log Table Dimension

This is a “junk dimension” containing log table information (dim_log_table).

Field Name	Description
`log_table_tk`	A technical key (TK) for linking.
`object_type`	The type of PDI object being logged (“job”, “transformation”, “step”, e.g.)
`table_connection_name`	The name of the database connection corresponding to the location of the transformation/job logging table
`table_name`	The name of the table containing the transformation/job logging information
`schema_name`	The name of the database schema corresponding to the location of the transformation/job logging table
`step_entry_table_conn_name`	The name of the database connection corresponding to the location of the step/entry logging table
`step_entry_table_name`	The name of the table containing the step/entry logging information
`step_entry_schema_name`	The name of the database schema corresponding to the location of the step/entry logging table
`perf_table_conn_name`	The name of the database connection corresponding to the location of the performance logging table

Field Name	Description
perf_table_name	The name of the table containing the performance logging information
perf_schema_name	The name of the database schema corresponding to the location of the performance logging table

Time-Of-Day-Dimension

This dimension contains entries for every second of a day from midnight to midnight (dim_time).

Field Name	Description
time_tk	A technical key (TK) for linking facts to time-of-day information
hms	A string representing the time of day as hours-minutes-seconds ("00:01:35", e.g.)
hm	A string representing the time of day as hours-minutes ("23:59", e.g.)
ampm	A string representing whether the time-of-day isAM or PM. Values are “am” or “pm”.
hour	The integer number corresponding to the hour of the day (0-23)
hour12	The integer number corresponding to the hour of the day with respect toAM/PM (0-11)
minute	The integer number corresponding to the minute of the hour (0-59)
second	The integer number corresponding to the second of the minute (0-59)

Step Fact Table

This fact table contains facts about individual step executions (fact_step_execution).

Field Name	Description
execution_date_tk	A technical key (TK) linking the fact to the date when the step was executed.
execution_time_tk	A technical key (TK) linking the fact to the time-of-day when the step was executed.
batch_tk	A technical key (TK) linking the fact to batch information for the step.
executor_tk	A technical key (TK) linking the fact to information about the executor (transformation).
parent_executor_tk	A technical key (TK) linking the fact to information about the parent transformation.
root_executor_tk	A technical key (TK) linking the fact to information about the root transformation/job.
execution_timestamp	The date and time when the step was executed.
step_tk	A technical key (TK) linking the fact to information about the step.
step_copy	The step copy number. This is zero if there is only one copy of the step, or (0 to N-1) if N copies of the step are executed.
rows_input	The number of lines read from disk or the network by the step. Can be input from files, databases, etc.
rows_output	The number of lines written to disk or the network by the step. Can be output to files, databases, etc.
rows_read	The number of rows read in from the input stream of the step.
rows_written	The number of rows written to the output stream of the step.

Field Name	Description
rows_rejected	The number of rows rejected during the execution of the step.
errors	The number of errors that occurred during the execution of the step.

Step Dimension

This dimension contains information about individual steps and job entries (dim_step) .

Field Name	Description
step_tk	A technical key (TK) for linking facts to step/entry information
step_id	The string name of the step/entry
* original_step_name	The name of the step/entry template used to create this step/entry (“Table Input”, e.g.). **Reserved for future use.*

Job Entry Fact Table

This fact table contains facts about individual job entry executions (fact_jobentry_execution).

Field Name	Description
execution_date_tk	A technical key (TK) linking the fact to the date when the job entry was executed.
execution_time_tk	A technical key (TK) linking the fact to the time-of-day when the job entry was executed.
batch_tk	A technical key (TK) linking the fact to batch information for the job entry.
executor_tk	A technical key (TK) linking the fact to information about the executor (transformation or job).
parent_executor_tk	A technical key (TK) linking the fact to information about the parent transformation/job.
root_executor_tk	A technical key (TK) linking the fact to information about the root transformation/job.
step_tk	A technical key (TK) linking the fact to information about the job entry.
execution_timestamp	The date and time when the job entry was executed.
rows_input	The number of lines read from disk or the network by the job entry. Can be input from files, databases, etc.
rows_output	The number of lines written to disk or the network by the job entry. Can be output to files, databases, etc.
rows_read	The number of rows read in from the input stream of the job entry.
rows_written	The number of rows written to the output stream of the job entry.
rows_rejected	The number of rows rejected during the execution of the job entry.
errors	The number of errors that occurred during the execution of the job entry.
result	Whether the job entry finished successfully or not. Values are “Y” (successful) or “N” (otherwise).
nr_result_rows	The number of result rows after execution.
nr_result_files	The number of result files after execution.

Execution Performance Fact Table

This fact table contains facts about the performance of steps in transformation executions (fact_perf_execution).

Field Name	Description
`execution_date_tk`	A technical key (TK) linking the fact to the date when the transformation was executed.
`execution_time_tk`	A technical key (TK) linking the fact to the time-of-day when the transformation was executed.
`batch_tk`	A technical key (TK) linking the fact to batch information for the transformation.
`executor_tk`	A technical key (TK) linking the fact to information about the executor (transformation).
`parent_executor_tk`	A technical key (TK) linking the fact to information about the parent transformation/job.
`root_executor_tk`	A technical key (TK) linking the fact to information about the root transformation/job.
`step_tk`	A technical key (TK) linking the fact to information about the transformation/ job.
`seq_nr`	The sequence number. This is an identifier differentiating performance snapshots for a single execution.
`step_copy`	The step copy number. This is zero if there is only one copy of the step, or (0 to N-1) if N copies of the step are executed.
`execution_timestamp`	The date and time when the transformation was executed.
`rows_input`	The number of rows read from input (file, database, network, ...) during the interval
`rows_output`	The number of rows written to output (file, database, network, ...) during the interval
`rows_read`	The number of rows read from previous steps during the interval.
`rows_written`	The number of rows written to following steps during the interval.
`rows_rejected`	The number of rows rejected by the steps error handling during the interval.
`errors`	The number of errors that occurred during the execution of the transformation/ job.
`input_buffer_rows`	The size of the step's input buffer in rows at the time of the snapshot.
`output_buffer_rows`	The size of the output buffer in rows at the time of the snapshot.

Clean Up Operations Mart Tables

Cleaning up the PDI Operation Mart consists of running a job or transformation that deletes data older than the specified maximum age. The transformation and job for cleaning up the PDI Operations Mart can be found in the "`etl`" folder.

1. From within PDI/Spoon, open either `Clean_up_PDI_Operations_Mart.kjb` for jobs or the `Clean_up_PDI_Operations_Mart_fact_table.ktr` for transformations.
2. Set these parameters.
   - **max.age** (required)—the maximum age in days of the data. Job and transformation data older than the maximum age will be deleted from the datamart.
   - **schema.prefix** (optional)—for PostgreSQL databases, enter the schema name followed by a period (.), this will be applied to the SQL statements. For other databases, leave the value blank.

Data that was not within the specified date range is now deleted.

To schedule regular clean up of the PDI Operations Mart, see *Create DI Solutions*.

Contents of the .kettle Directory

File	Purpose
kettle.properties	Main PDI properties file; contains global variables for low-level PDI settings
shared.xml	Shared objects file
db.cache	The database cache for metadata
repositories.xml	Connection details for PDI database or solution repositories
.spoonrc	User interface settings, including the last opened transformation/job
.languageChoice	Default language for the PDI client tool

Change the PDI Home Directory Location (.kettle folder)

The default location for the Pentaho Data Integration home directory is the **.kettle** directory in your system user's home directory.

- **Windows:** `C:\Documents and Settings\example_user\.kettle`
- **Linux:** `~/.kettle`)

There will be a different .kettle directory, and therefore a different set of configuration files, for each system user that runs PDI.

Standalone PDI client tool deployments

You can specify a single, universal .kettle directory for all users by declaring a KETTLE_HOME environment variable in your operating system. When declaring the variable, leave out the **.kettle** portion of it; this is automatically added by PDI.

```
export KETTLE_HOME=/home/pentaho/examplepath/pdi
```

BA Server deployments that run PDI content

If you followed a manual deployment or archive package installation path, you can set a system environment variable as explained above, but it must be declared before the BA Server service starts. You can alternatively change the **CATALINA_OPTS** system variable to include the -D flag for KETTLE_HOME, or you can edit the script that runs the BA Server and set the flag inline, as in this example from the **start-pentaho.sh** script:

```
export CATALINA_OPTS="--Xms2048m -Xmx2048m -XX:MaxPermSize=256m -
Dsun.rmi.dgc.client.gcInterval=3600000 -Dsun.rmi.dgc.server.gcInterval=3600000" -
DKETTLE_HOME=/home/pentaho/examplepath/pdi
```

Windows service modification

If you used the graphical utility to install the DI Server, then you must modify the Java options flag that runs the BA Server Tomcat service. Here is an example command that will change the value of KETTLE_HOME to `C:\<examplepath>\pdi\.kettle`:

```
tomcat6.exe //US//pentahobiserver ++JvmOptions -DKETTLE_HOME=C:\examplepath\pdi
```

Modify the **DI Server** in the same way, changing the service name:

```
tomcat6.exe //US//pentahoDataIntegrationServer ++JvmOptions -DKETTLE_HOME=C:
\<examplepath>\pdi
```

Back Up the DI Repository

Follow the instructions below to create a backup of the DI Repository.

Note: If you've made any changes to the DI Server Web application configuration, such as changing the port number or base URL, you will have to modify this procedure to include the entire `/pentaho/server/` directory.

1. Stop the DI Server.

   ```
   /pentaho/server/data-integration-server/stop-pentaho.sh
   ```

2. Create a backup archive or package of the `/pentaho/server/data-integration-server/pentaho-solutions/` directory.

   ```
   tar -cf pdi_backup.tar /pentaho/server/data-integration-server/pentaho-solutions/
   ```

3. Copy the backup archive to removable media or an online backup server.
4. Start the DI Server.

   ```
   /pentaho/server/data-integration-server/start-pentaho.sh
   ```

Your DI Server's stored content, settings, schedules, and user/role information is now backed up.

To restore from this backup, simply unpack it to the same location, overwriting all files that already exist there.

Troubleshooting

This section contains known problems and solutions relating to the procedures earlier.

Jobs scheduled on the Data Integration Server cannot execute a transformation on a remote Carte server

You may see an error like this one when trying to schedule a job to run on a remote Carte server:

```
ERROR 11-05 09:33:06,031 - !
UserRoleListDelegate.ERROR_0001_UNABLE_TO_INITIALIZE_USER_ROLE_LIST_WEBSVC!
                com.sun.xml.ws.client.ClientTransportException: The server sent HTTP
 status code 401: Unauthorized
```

To fix this, follow the instructions in *Executing Scheduled Jobs on a Remote Carte Server*.

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.