TIBCO ActiveMatrix BusinessWorks™ Plug-in for Change Data Capture

User Guide

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Overview

With TIBCO ActiveMatrix BusinessWorks™ Plug-in for Change Data Capture, allows TIBCO ActiveMatrix BusinessWorks™ users to have a seamless experience to capture changes in their desired data source or streams with an option to update multiple targets at once in real-time directly or via commonly used Message brokers such as Kafka or Apache Pulsar using TIBCO ActiveMatrix BusinessWorks™ Plug-in for Kafka or TIBCO ActiveMatrix BusinessWorks™ Plug-in for Apache Pulsar respectively.

TIBCO ActiveMatrix BusinessWorks™ is a scalable, extensible, and easy to use integration platform that you can use to develop integration projects. TIBCO ActiveMatrix BusinessWorks uses TIBCO Business Studio™ for BusinessWorks™ to define business processes and the TIBCO ActiveMatrix BusinessWorks process engine to run the business processes. For detailed discussion, see *TIBCO ActiveMatrix BusinessWorks™ Concepts*.

With this plug-in, you can perform operations using the services supported by Apache Cassandra, IBM DB2, MongoDB, MSSQL, MySQL, Oracle Database, and PostgreSQL. The plug-in supports the following features:

JDBC Connection Resource
ActiveMatrix BusinessWorks™ Plug-in for Change Data Capture plug-in uses a JDBC Connection shared resource to connect to a database at design time.

CDC-DB Listener Activity
With the Change Data Capture (CDC) DB Listener activity, you can capture change of events from supported databases to be processed in TIBCO BusinessWorks™ either using Kafka, Apache Pulsar, or any required activity.
Supported change events are insert, update, delete, and snapshot. The CDC DB Listener activity supports output formats in XML, JSON, or Avro.

CDC-NoSqlDB Listener Activity
With the Change Data Capture (CDC) NoSqlDB Listener activity, you can capture change of events from supported databases to be processed in TIBCO BusinessWorks™ either using Kafka, Apache Pulsar, or any required activity. Supported change events are insert, update, delete, and snapshot. The CDC NoSqlDB Listener activity supports output formats in XML and JSON.

CDC-SAP Listener Activity
The CDC-SAP Listener activity allows you to receive full and delta data from SAP data sources or extractors using the SAP ODP 2.0 Framework. The data can either be processed

using one or more BW jobs in parallel. The output data can be in XML, JSON, or Avro format. The receipt of data is triggered either using scheduling in BusinessWorks or an event from the SAP system.

CDC Connection Resource for SAP Listener Activity
This plug-in now supports the CDC Connection Resource for CDC-SAP Listener activity that helps to establish client connection and server connection (if enabled). It allows the user to download the schema based on the ODP source.

CDC NoSQL Database Connection Resource

The NoSQL Connection Resource is used to maintain additional configuration required by the plug-in for supported NoSQL sources. Each NoSQL source is maintained in its own tab and section. This resource is used for establishing connections with NoSQL databases, which are utilized by the Debezium engine.

The NoSQL connection resource has two sections:

- Cassandra
- MongoDB

Support for OpenTelemetry (Open Tracing)
ActiveMatrix BusinessWorks™ Plug-in for Change Data Capture now supports OpenTelemetry (Open Tracing). You can use custom tags to get more information about the current job being run by any activity in the palette.

Getting Started

This tutorial is designed for beginners who want to use the ActiveMatrix BusinessWorks™ Plug-in for Change Data Capture in TIBCO Business Studio for BusinessWorks.

A typical workflow for the plug-in (to achieve different goals) includes creating a process, testing it in the debugger, and deploying the application.

ActiveMatrix BusinessWorks uses the Eclipse GUI provided by TIBCO Business Studio™ for BusinessWorks™ - Container Edition (hereinafter referred to as "TIBCO Business Studio") to define business processes and generate Enterprise Archives (EAR files) and push the application to cloud.

Most procedures in a typical workflow are performed in TIBCO Business Studio for BusinessWorks. See Overview of TIBCO Business Studio for BusinessWorks for more information.

The following list contains a sequence of topics that can help you get started with ActiveMatrix BusinessWorks Plug-in for Change Data Capture:

1. Creating a Project
2. Creating a JDBC Connection Resource
3. Configuring a Process
4. Testing a Process

Overview of TIBCO Business Studio for BusinessWorks

TIBCO Business Studio™ for BusinessWorks™ is an Eclipse-based integration development environment that is used to design, develop, and test ActiveMatrix BusinessWorks applications. The studio provides a workbench in which you can create, manage, and navigate resources in your workspace. A *workspace* is the central location on your computer where all data files are stored.

The following table introduces the workbench UI elements:

UI Element	Description
Menu	Contains menu items such as File, Edit, Navigate, Search, Project, Run, Window, and Help.
Toolbar	Contains the following buttons for frequently used commands: • **New**  • **Save**  • **Enable/Disable Business Studio capabilities**  • **Create a new BusinessWorks Application Module**  • **Debug As**  • **Run As** 
Perspectives	Contains an initial set and layout of views that are required to perform a certain task. TIBCO Business Studio for BusinessWorks launches the Design perspective by default. Use the Design perspective when designing a process and the Debug perspective when testing and debugging a process. To change the perspective, select **Window > Open Perspective > *perspective_name*** from the main menu. Alternatively, click the **Open Perspective**  button from the top upper right of the workbench and select the perspective.
Views	Lists the resources and helps you navigate within the workbench. For example, the Project Explorer view displays the ActiveMatrix BusinessWorks applications, modules, and other resources in your workspace, and the Properties view displays the properties for the selected resource. To open a view, select **Window > Show View > *view_nameview_name*** from the main menu.
Editors	Provides a canvas to configure, edit, or browse a resource. Double-click a resource in a view to open the appropriate editor for the selected resource. For example, double-click on a process (`MortgageAppConsumer.bwp`) in the Project Explorer view to open the process in the editor.

UI Element	Description
Palette	Contains a set of widgets and a palette library. A *palette* groups activities that perform similar tasks, and provides quick access to activities when configuring a process.

Creating a Project

The first task for using the plug-in is creating a project. After creating a project, you can add resources and processes.

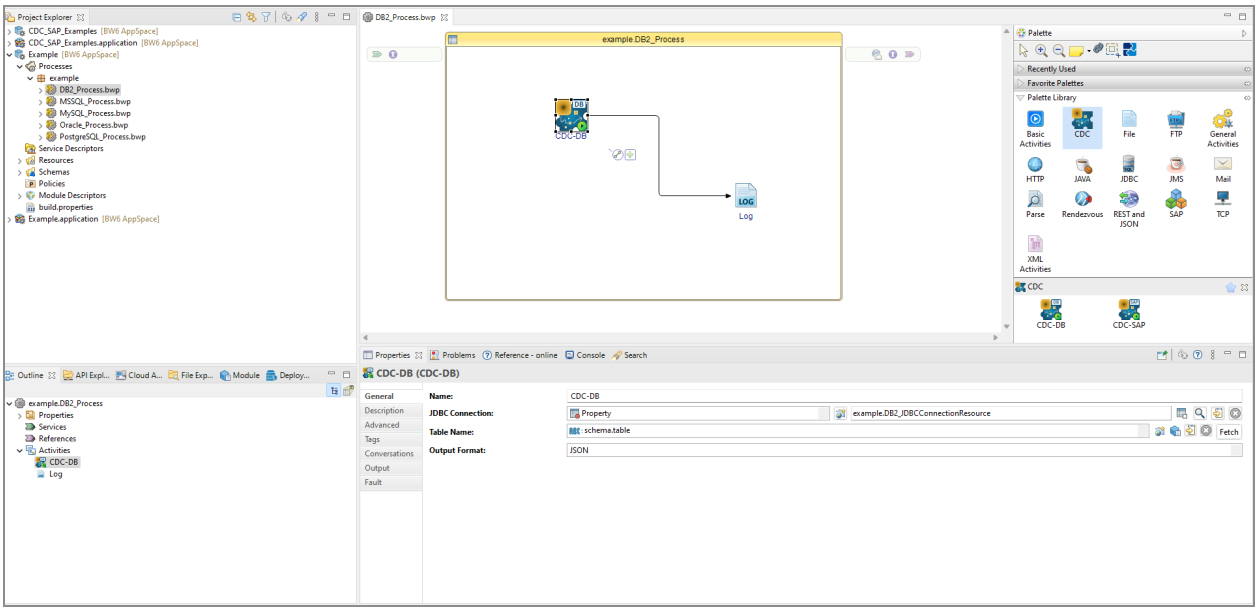
An Eclipse project is an application module configured for TIBCO ActiveMatrix BusinessWorks™. An application module is the smallest unit of resources that is named, versioned, and packaged as part of an application.

Procedure

1. From the menu, click **File > New > BusinessWorks Resources** to open the BusinessWorks Resource Wizard.
2. In the Select a wizard dialog, click **BusinessWorks Application Module** and click **Next** to open the New BusinessWorks Application Module wizard.
3. In the Project dialog, configure the project that you want to create:
4. In the **Project name** field, enter a project name.
5. If you do not want to use the default location (current workspace) for the project, clear the **Use default location** checkbox and click **Browse** to select a new location.
6. Use the default version of the application module, or enter a new version in the **Version** field.
7. Keep the **Create empty process** and **Create Application** checkboxes selected to automatically create an empty process and an application when creating the project.
8. Optional: Select the **Use Java configuration** checkbox if you want to create a Java module. A Java module provides the Java tool capabilities.
9. Click **Finish** to create the project.

Result

The project with the specified settings is displayed in the Project Explorer view.



Creating a JDBC Connection

Create a JDBC Connection shared resource to retrieve connection details and establish the CDC connection with the Change Data Capture instance.

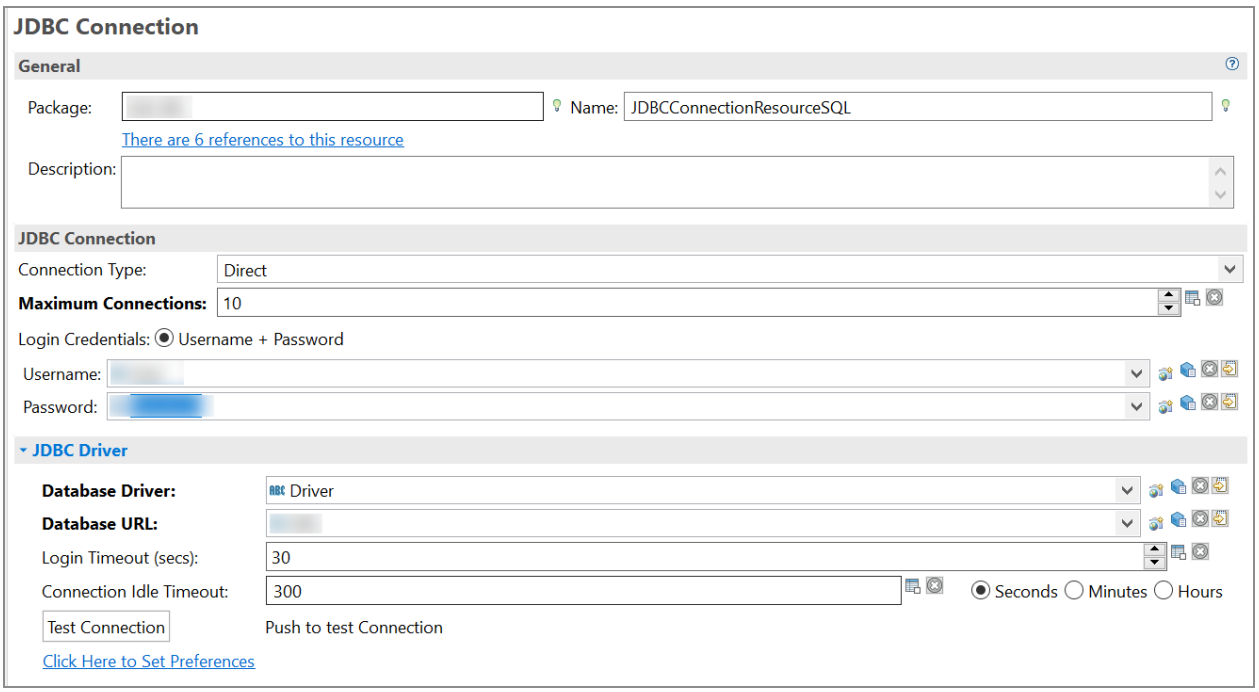
Before you begin

The JDBC Connection resource is available at the **Resources** level. Ensure that you have created a project, as described in Creating a Project.

Procedure

1. Expand the created project in the Project Explorer view.
2. Right-click the **Resources** folder and click **New > JDBC Connection** to open the JDBC Connection wizard.
3. The resource folder, the package name, and resource name of the JDBC connection are provided by default. If you do not want to use the default configurations, change them accordingly. Click **Finish** to open the JDBC connection editor.

4. Configure the JDBC Connection resource in the JDBC connection editor. For information about the configuration fields, see JDBC Connection Resource.
5. Click **Test Connection** to validate the connection.



Configuring a Process

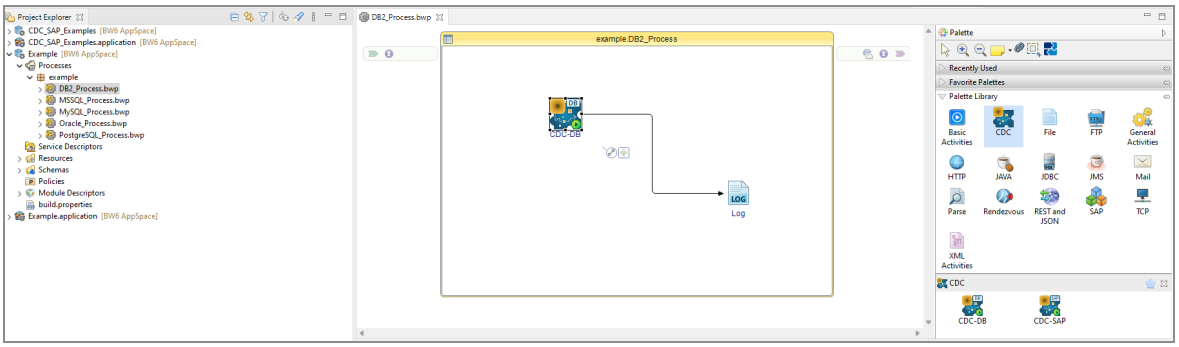
A newly created project contains an empty process. Configure the process by adding activities, conditions, and services to complete a task.

Before you begin

Ensure that you have created an empty process when creating a project. For more details, see Creating a Project.

Procedure

1. In the Project Explorer view, double-click the created project and open the empty process from the **Processes** folder.
2. Select the activity from the Palette view and drop it in the Process editor. For example, select the CDC-DB listener activity from the CDC palette.



3. Click and drag icon to create a transition between the added activities.
4. Configure the added CDC-DB activity, as described in Palette topic.

> **Note:** A JDBC connection is required when configuring the plug-in activities. For more information about creating a JDBC connection, see Creating a JDBC Connection.

5. Click **File > Save** to save the process.

Testing the Process

After configuring a process, you can test the process to check whether it completes your task. Debug the application you have configured to ensure that the application is configured correctly.

Before you begin

You must configure a process as described in Configuring a Process.

Procedure

1. In TIBCO Business Studio for BusinessWorks, open the process you have configured.
2. On the toolbar, click **Debug > Debug Configurations**.
3. In the left panel, click **BusinessWorks Application > BWApplication**.
4. Ensure that only the application you want to debug and run is selected in the **Applications** tab in the right panel.
5. Click the **Advanced** tab and click **Browse** to locate the logback file. By default, the

log file resides in the <TIBCO_HOME>/bw/<*version_number*>/config/design/logback directory and error logs are captured. For more information, see Log Management.

6. Click **Debug**.

   TIBCO Business Studio for BusinessWorks changes to the Debug perspective. Logs are displayed in the Console view.

7. On the **Debug** tab, expand the running process and click an activity.
8. From the upper-right corner, click the **Job Data** tab, and then click the **Output** tab to check the activity output.

What to do next

After you have tested a process, you can check the output of the activities. See Checking Output of an Activity. The final task is to deploy an application. See the Getting Started tutorial.

Checking Output of an Activity

After debugging the application, you can check the output of activities.

Procedure

1. In the left panel, expand **BusinessWorks Application > BWApplication** and click the activity in the upper left panel.
2. In the upper right panel, click the **Job Data** view and click **Output**.

Result

The output of the activity is displayed.

What to do next

Check the activity output in the plug-in logs. For more information, see Log Management.

Pushing an Application In TIBCO Platform

This section describes how to push an application containing TIBCO ActiveMatrix BusinessWorks™ Plug-in for Change Data Capture in TIBCO® Platform.

To ensure the functionality of the TIBCO ActiveMatrix BusinessWorks™ Plug-in for Change Data Capture in the TIBCO® Platform, generate and upload the plug-in supplements into the TIBCO® Control Plane before deploying any application that uses the plug-in.

Generating Plug-in Supplements

Procedure

1. Navigate to the directory `TIBCO_HOME/bw/palettes/cdc/<version>/runtime/plugins`.
2. Do one of the following:
    - For IBM DB2 - Select the CDC tpshell folder `com.tibco.tpshell.cdcdb2_6.1.0.xxx` and create a `.zip` file named `cdc.zip`.
    - For SAP - Select the CDC tpshell folder `com.tibco.tpshell.cdcsap_3.1.8.xxx` and create a `.zip` file named `cdc.zip`.
3. Copy the `cdc.zip` file into a temporary (supplement) directory on your local machine. Do not add any other files to this directory.

> **Note:**
> - The temporary directory must contain *only* the `cdc.zip` file.
> - Supplementing is mandatory to push any Change Data Capture application.

Uploading Plug-in Supplements In TIBCO Platform

Procedure

1. Log in to TIBCO® Control Plane.
2. Click **Data Planes** from the left navigation.
3. On the Data Plane card of your choice, click **Go to Data Plane**.
4. In the Capabilities section, click the **BWCE** capability card.
5. In the **Available Supplements** section, click **Upload Supplements**.
6. In the Upload Supplements dialog, select a plug-in or driver from the dropdown list.
7. Drag your supplement `cdc.zip` archive onto the window. You can also click **browse to upload** to find the files on your system and click **Open** to upload the selected file.

Note: Adding the plug-in supplement is necessary only once for a Data plane. Subsequent application pushes in that Data Plane automatically use the supplemented plug-in.

Uploading Plug-in Supplements via API

For details about uploading supplements using the API, see the API for Uploading Supplements section in the TIBCO® Control Plane documentation.

Deploying an Application

You can deploy applications and then manage them by using TIBCO Enterprise Administrator.

Before deploying an application, complete the following tasks:

- Creating a Project
- Generating an EAR File

Important: Before you run the NoSQL Cassandra Database activity, add the following VM arguments. These arguments are mandatory for the Debezium engine to work with Cassandra. To ensure that the activity runs smoothly, append these arguments to your existing VM arguments:

```
--add-exports="java.base/jdk.internal.misc=ALL-UNNAMED"
--add-exports="java.base/jdk.internal.ref=ALL-UNNAMED"
--add-exports="java.base/sun.nio.ch=ALL-UNNAMED"
--add-
exports="java.management.rmi/com.sun.jmx.remote.internal.rmi=AL
L-UNNAMED"
--add-exports="java.rmi/sun.rmi.registry=ALL-UNNAMED"
--add-exports="java.rmi/sun.rmi.server=ALL-UNNAMED"
--add-exports="java.sql/java.sql=ALL-UNNAMED"
--add-opens="java.base/java.lang.module=ALL-UNNAMED"
--add-opens="java.base/jdk.internal.loader=ALL-UNNAMED"
--add-opens="java.base/jdk.internal.ref=ALL-UNNAMED"
--add-opens="java.base/jdk.internal.reflect=ALL-UNNAMED"
--add-opens="java.base/jdk.internal.math=ALL-UNNAMED"
--add-opens="java.base/jdk.internal.module=ALL-UNNAMED"
--add-opens="java.base/jdk.internal.util.jar=ALL-UNNAMED"
--add-opens="jdk.management/com.sun.management.internal=ALL-
UNNAMED"
--add-opens="java.base/java.io=ALL-UNNAMED"
--add-opens="java.base/sun.nio.ch=ALL-UNNAMED"
--add-opens="java.base/java.lang=ALL-UNNAMED"
--add-opens="java.base/java.lang.reflect=ALL-UNNAMED"
```

If you rerun the same activity, you must:

- Use a new configuration
- Append the VM arguments again

Deploying an application typically includes the following tasks:

1. Upload an EAR file.

   Note: You can deploy an application EAR file by using the command-line mode with the `bwadmin` utility. For more information, see *TIBCO ActiveMatrix BusinessWorks™ Administration*.

2. Deploy the application.

3. Configure the application.
4. Start the application.

Generating an EAR File

Application archives are enterprise archive (EAR) files that are created in TIBCO Business Studio for BusinessWorks. An EAR file is required when deploying an application.

There are many ways to generate an EAR file, the following is one method. For more information, see *TIBCO ActiveMatrix BusinessWorks™ Administration*.

Before you begin

Create an application project as described in Creating a Project.

Procedure

1. From the File Explorer view, click the **Open Directory to Browse** icon.
2. Select the folder where you want to generate the EAR file and click **OK**.

   The new folder is displayed in the File Explorer view.
3. Drag the application from the Project Explorer view to the new folder in the File Explorer view.

   The EAR file is generated with the following name: `<name>.<application>_<version>.ear`.

JDBC Connection Resource

During the design time, the JDBC connection resource creates a connection between the plug-in and supported databases.
During the runtime, the JDBC connection resource details is used to create a connection between the plug-in and supported databases.

The JDBC connection resource has two tabs; General and JDBC Connection.

General

The **General** panel contains the following fields.

Property	Module Property?	Description
Package	No	The name of the package where the JDBC connection resource is added.
Name	No	The name to be displayed as the label for the JDBC shared resource in the process.
Description	No	The name to be displayed as the label for the JDBC connection resource.

JDBC Connection

In the JDBC Connection panel, you can specify the connection details to establish a connection with Change Data Capture. The following fields are included in the JDBC Connection panel.

Property	Module Property?	Description
Connection Type	Yes	The Connection Type used is **Direct**
Maximum Connections	Yes	The maximum number of connections that can be established
Login Credentials	Yes	The database credentials used for creating a connection
Username	Yes	Enter the username of the database to be used for authentication
Password	Yes	Enter the password of the database to be used for authentication
Database Driver	Yes	Select the class for the database driver
Database URL	Yes	It is a connection string representing host port and database name
Login Timeout (secs)	Yes	The time (in seconds) to wait before timing out when establishing a connection. The default login timeout is 30 seconds.
Connection Idle Timeout	Yes	The maximum length of time (in seconds) that a connection is idle until any activity is performed. The default connection idle timeout is 300 seconds.

CDC Connection Resource

The CDC Connection Resource is used to maintain additional configuration required by the plug-in for supported CDC source such as SAP. Each CDC source is maintained in its own tab and section.

The CDC connection resource has two sections; General and SAP Connection.

General

The **General** tab is applicable to all CDC sources. The **General** panel contains the following fields.

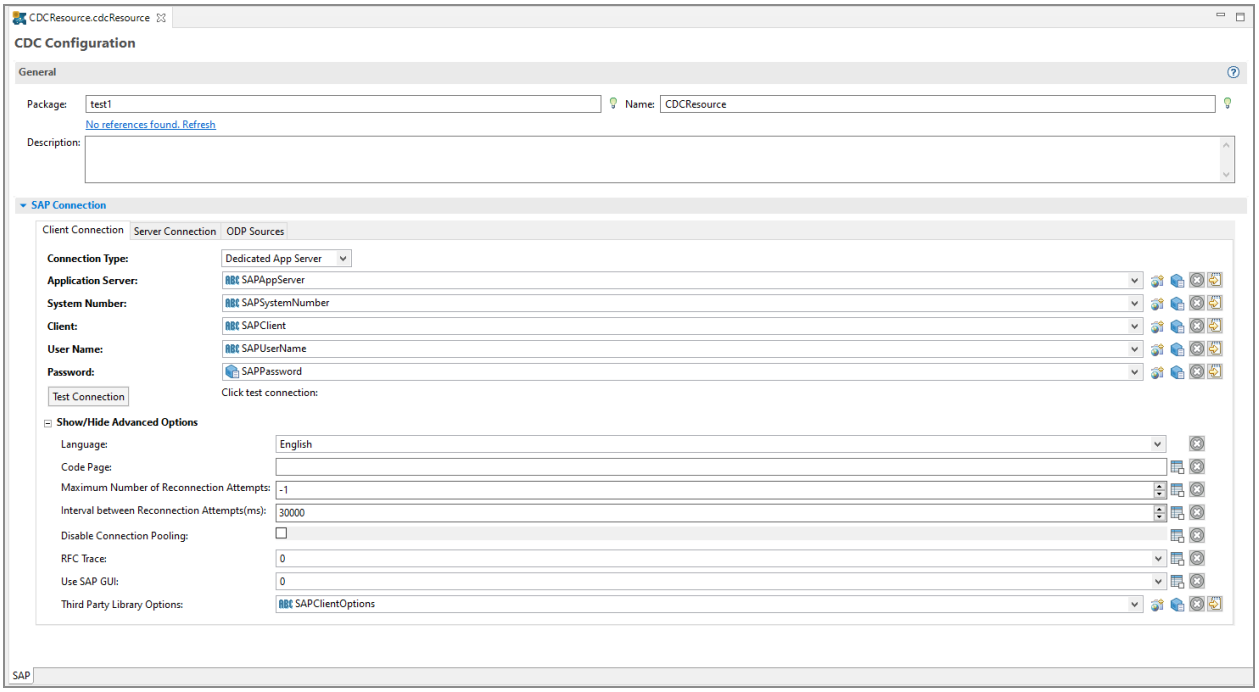
Property	Module Property?	Description
Package	No	The name of the package where the CDC connection resource is added.
Name	No	The name to be displayed as the label for the CDC shared resource in the process.
Description	No	The name to be displayed as the label for the CDC connection resource.

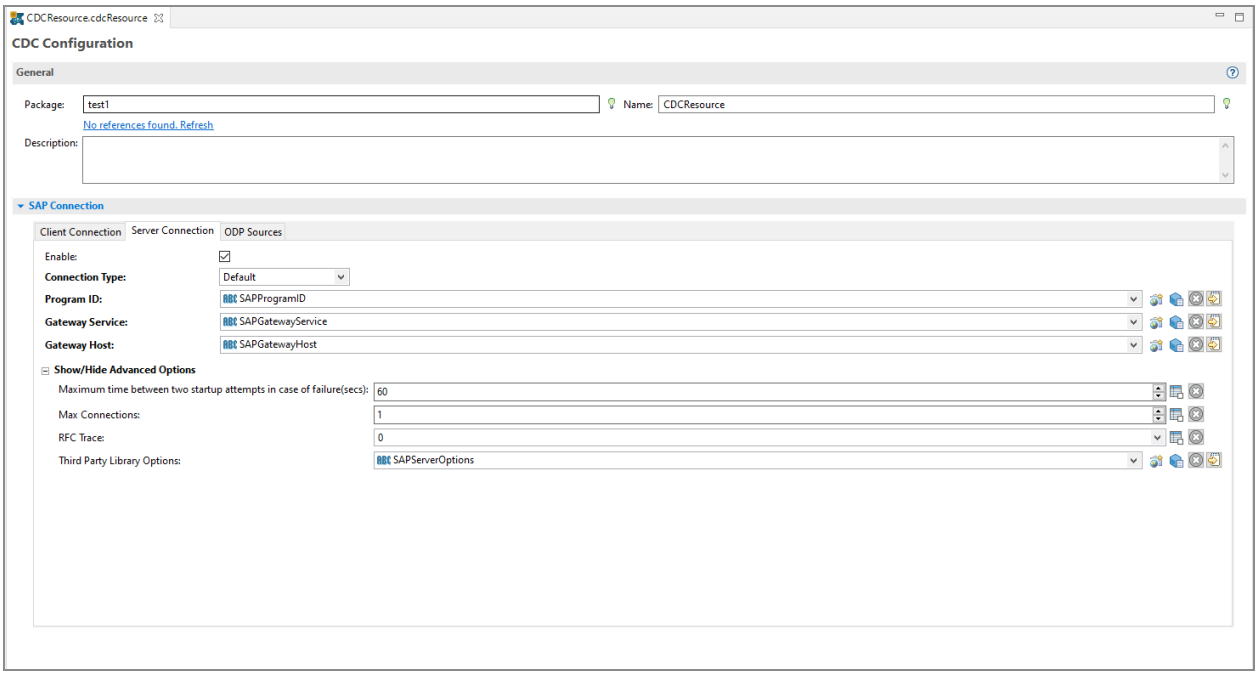
SAP Connection

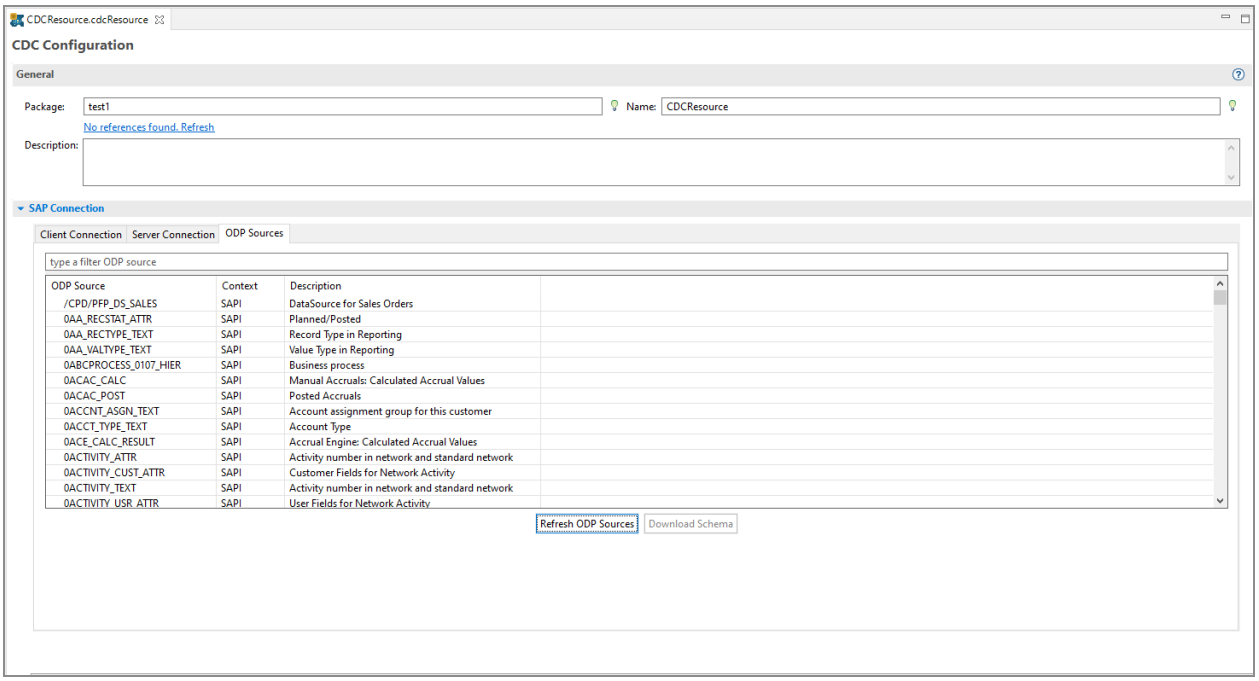
The SAP Connection panel allows you to configure the client connection and server connection (if enabled) between the plug-in and SAP server.

Important: When creating a new CDC Connection resource for first time in a project, predefined module properties would be automatically created in the project. These modules properties have the same naming conventions as the module properties created by the TIBCO ActiveMatrix BusinessWorks Plug-in for SAP Solutions.

In the SAP Connection panel, you can specify the connection details required to capture and process Change Data Capture data from the SAP server. The SAP Connection includes three tabs: Client Connection, Server Connection, and ODP Sources.







Client Connection

At design-time, the client connection is used to get list of SAP ODP sources and download the metadata of a SAP ODP source.

At runtime, the client connection is used to retrieve CDC data from the SAP server.

The **Client Connection** tab contains the following fields.

Property	Module Property?	Description
Connection Type	No	The client connection type. The plug-in provides the following client connection types: Dedicated App Server Load Balancing. The default type is Dedicated App Server.
Message Server	Yes	An SAP message server can be used for load distribution and communication between individual application servers in an SAP BW system.
Application Server	Yes	The network name of the machine where the SAP system exists. **Note:** This field is displayed only when you select **Dedicated App Server** from the Connection Type list.
System Number	Yes	The SAP system number. **Note:** This field is displayed only when you select **Dedicated App Server** from the Connection Type list.
System Name	Yes	The SAP system ID or the SAP message server tcp/ip port number. **Note:** This field is displayed only when you select Load Balancing from the Connection Type list.
Client	Yes	The SAP client number.
User Name	Yes	Enter the username of the database to be used for authentication on to SAP client.
Password	Yes	Enter the password of the database to be used for authentication.
Logon Group	Yes	The SAP logon group server to be used with the load

Property	Module Property?	Description
Name		balancing connection. The default value is PUBLIC. Note: This field is displayed only when you select Load Balancing from the Connection Type list.
The following advanced options are displayed when you click Show/Hide **Advanced Options**		
Language	No	Select the language used to connect to the SAP system. The default language is English.
Code Page	Yes	The character set used by the SAP system. The default value is blank. **Note:** This field can only be specified in the special cases.
Maximum Number of Reconnection Attempts	Yes	The maximum number of times that the plug-in can retry to establish a connection before sending a request to the SAP system. The default value is `-1`, which indicates that the plug-in can retry indefinitely.
Interval between Reconnection Attempts (ms)	Yes	The time interval in milliseconds between two successive attempts to establish a connection before sending a request to the SAP system. The default value is `30000`.
Disable Connection Pooling	Yes	Whether to disable connection pooling. If you want to close the connection automatically after the request to SAP is completed, select this checkbox. This checkbox is cleared by default.
RFC Trace	Yes	Whether to enable the RFC trace. The value of `1` indicates that the RFC trace is enabled. The value of `0` indicates that the RFC trace is disabled. The default value is `0`.
Use SAP GUI	Yes	To enable the SAP GUI.

Property	Module Property?	Description
		The following values indicate different RFC operations: • When the value is `1`: The SAP GUI is enabled to carry out debugging of RFCs. • When the value is `2`: The SAP GUI is enabled to carry out debugging of RFCs until it is used by the invocation of an RFC. • When the value is `0`: The SAP GUI is disabled to carry out debugging of RFCs. The default value is `0`.
Third-Party Library Options	Yes	Specifies SAP JCo properties, which are used by the CDC Connection shared resource. **Note:** It is a semicolon separated list of SAP JCo properties. While specifying an SAP JCo property, which is available as a property in the CDC Connection shared resource then the value specified with the SAP JCo property is used. If an SAP JCo property is specified more than once then the last value is used.

Server Connection

If enabled, the server connection is only used during runtime and in scenario where proessing in BusinessWorks should be executed following an event from SAP server. The **Server Connection** tab contains the following fields.

Property	Module Property?	Description
Enable	Yes	If the **Enabled** checkbox is selected then the Change Data Capture data would be processed by a SAP event sent from SAP server as a RFC call. To support the RFC call, the

Property	Module Property?	Description
		properties maintained in the Server Connection tab need to be maintained accordingly. The event must be sent from SAP using function module `BAPI_XBP_EVENT_RAISE`. No export parameters are required on the RFC call. Default value is unselected.
Connection Type	No	The client connection type. The plug-in provides the following client connection types: Dedicated App Server Load Balancing. The default type is Dedicated App Server.
Program ID	Yes	The program ID that identifies the RFC server program for the SAP system. The Program ID is required by the plug-in but it is up to you to define the Program ID based on the requirements. The program ID is case sensitive. **Note:** RFC destination corresponding to the program ID must exist in the SAP system. If a server connection is not used by an activity, the program ID is ignored and not registered in the SAP system. **Important:** If configuring the Trigger Event in the CDC SAP listener activity as SAP then ensure that the program ID is unique across all CDC SAP listener activities.
Gateway Service	Yes	The SAP gateway service or SAP Gateway tcp/ip port number. The default service is `sapgw00`. **Note:** When specifying a value as a service name, the service name must exist in the services file maintained at the operating system level. To avoid having to maintain the services file, the TCP/IP port number such as `33xx`, where *xx* is the range from `00` to `99`, depending on the instance number of the SAP server, can be specified as a value instead.
Gateway Host	Yes	The Gateway host name, IP address, or router string. If no

Property	Module Property?	Description
		machine exists as a gateway host, this field is specified as the application server.
The following advanced options are displayed when you click Show/Hide **Advanced** Options:		
Maximum time between two startup attempts in case of failure (secs)	Yes	The maximum time interval in seconds between two successive attempts to establish a connection with the gateway host. If the connection cannot be established after the maximum time interval, the server connection is suspended. The default value is `60`.
Max Connections		The number of SAP connections in the server connection. The default value is `1`.
RFC Trace	Yes	Whether to enable the RFC trace. The value of `1` indicates that the RFC trace is enabled. The value of `0` indicates that the RFC trace is disabled. The default value is `0`.
Third-Party Library Options	Yes	Specifies SAP JCo properties, which are used by the CDC Connection shared resource. **Note:** It is a semicolon separated list of SAP JCo properties. While specifying an SAP JCo property, which is available as a property in the CDC Connection shared resource then the value specified with the SAP JCo property is used. If an SAP JCo property is specified more than once then the last value is used.

NoSQL Connection Resource

The NoSQL Connection Resource is used to maintain additional configuration required by the plug-in for supported NoSQL sources. Each NoSQL source is maintained in its own tab and section.

The NoSQL connection resource has two sections: Cassandra and MongoDB.

General

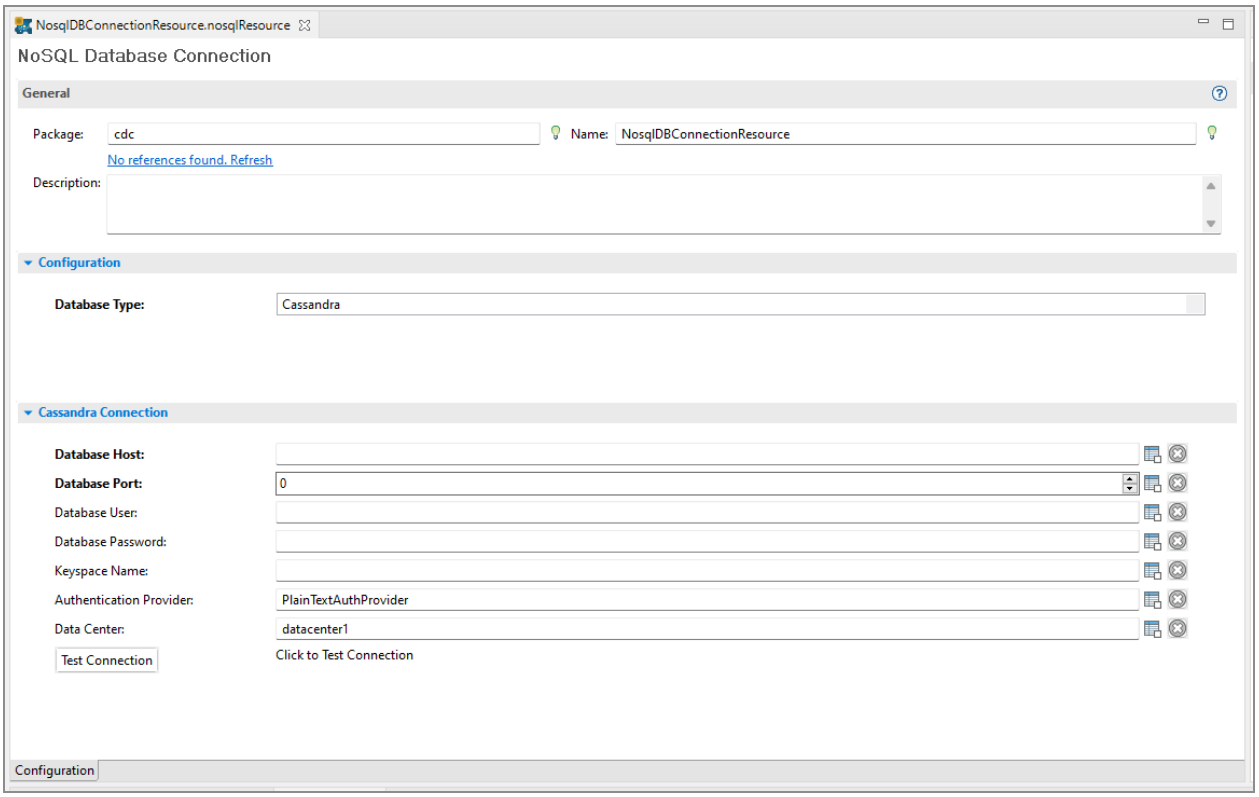
The **General** tab is applicable to all CDC sources. The **General** panel contains the following fields:

Property	Module Property?	Description
Package	No	The name of the package where the CDC connection resource is added.
Name	No	The name to be displayed as the label for the CDC shared resource in the process.
Description	No	The name to be displayed as the label for the CDC connection resource.

Cassandra Connection

The Cassandra Connection panel allows you to configure the client connection between the plug-in and Cassandra server.

In the Cassandra Connection panel, you can specify the connection details required to capture and process NoSql data from the Cassandra server.



Cassandra Connection

The **Client Connection** tab contains the following fields:

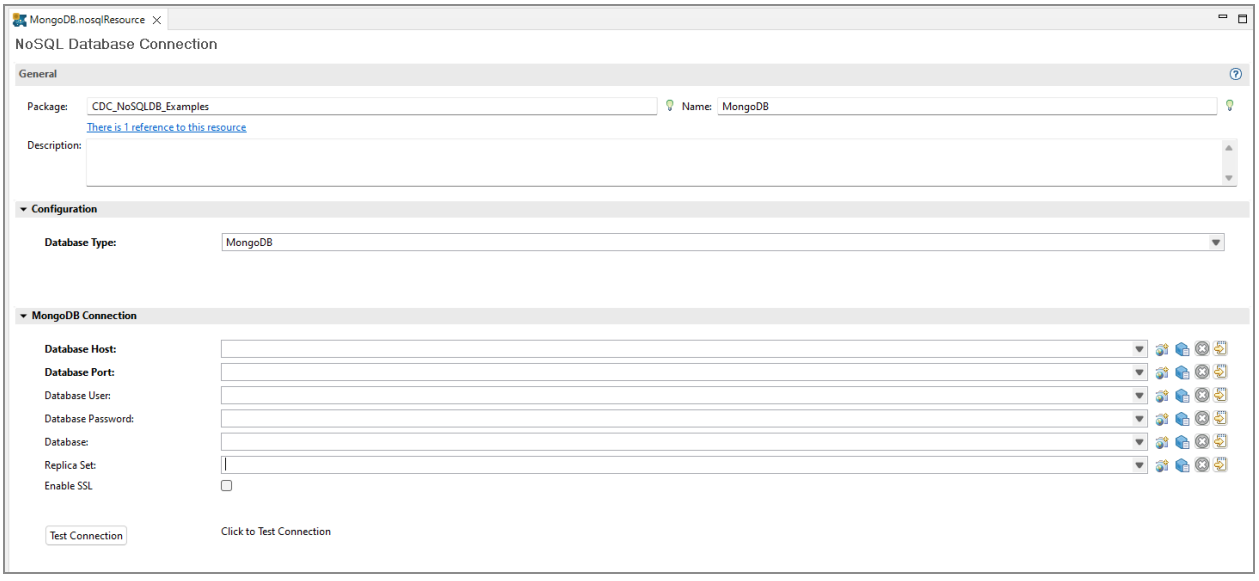
Property	Module Property?	Description
Database Host	Yes	Specify the hostname or network address of the Cassandra server.
Database Port	Yes	Specify the port of the Cassandra server.
Database User	Yes	Specify the username that you created in a Cassandra database.
Database Password	Yes	Specify the password that is used to access the database.
Database	Yes	Enter the name for the database that you want to connect

Property	Module Property?	Description
		to.
Keyspace Name	Yes	The name of the keyspace to be used for the session created.
Authentication Provider	Yes	Specify the authentication service provider used by the database for verifying user credentials. **Default**: `PlainTextAuthProvider`
Data Center	Yes	Specify the data center associated with the Cassandra. **Default**: `datacenter1`

MongoDB Connection

The MongoDB Connection panel allows you to configure the client connection between the plug-in and MongoDB server.

In the MongoDB Connection panel, you can specify the connection details required to capture and process Change Data Capture data from the MongoDB database.



MongoDB Connection

The **Client Connection** tab contains the following fields:

Property	Module Property?	Description
Database Host	Yes	Specify the hostname or network address of the MongoDB server.
Database Port	Yes	Specify the port of the MongoDB server.
Database User	Yes	Specify the username that you created in a MongoDB database.
Database Password	Yes	Specify the password that is used to access the database.
Database	Yes	Specify the name for the database that you want to connect to.
Replica Set	Yes	Specify the name of the MongoDB replica set.
Enable SSL	No	Select to enable the SSL for MongoDB database.
SSL Config File Path	Yes	Provide the path to a file containing keystore and truststore file.

Palette

A palette groups the activities that connect to the same external applications together. The TIBCO ActiveMatrix BusinessWorks™ Plug-in for Change Data Capture palette is added to TIBCO Business Studio for BusinessWorks after installing TIBCO ActiveMatrix BusinessWorks™ Plug-in for Change Data Capture.

The TIBCO ActiveMatrix BusinessWorks™ Plug-in for Change Data Capture palette contains the following activities for supported CDC sources.

- CDC DB Listener Activity
- CDC SAP Listener Activity
- CDC NoSql DB Listener Activity

CDC DB Listener Activity

The CDC-DB Listener activity is a BusinessWorks EventSource and listens to the operations performed on database tables. When CDC is enabled for a table the data change events for the respective table are logged. The plug-in collects these data change event logs and returns the details of the data change.

By default, the plug-in captures change data events for Insert (c), Update (u), Delete (d), and Snapshot operations.

However, you can pass the appropriate Operation Options value so that the data changes specific to these activities performed on a table are captured.

Note:

- The CDC-DB listener activity does not support concurrency, as the events are read sequentially.
- The **Flowlimit** is not supported in the CDC-DB listener activity.

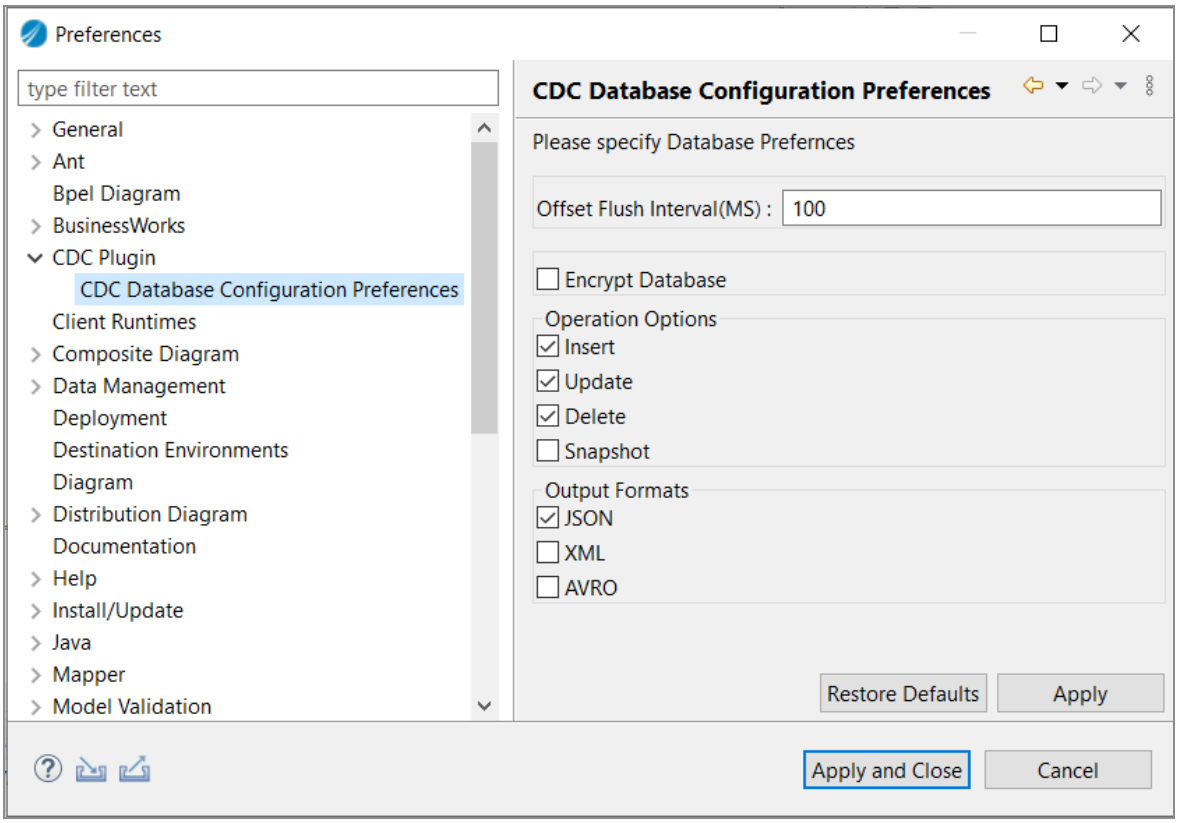
CDC Database Configuration Preferences

You can specify the Database preferences by setting the default values for the **Operation Options** and **Output Formats**.

The **Operation Options** and **Output Formats** fields are also available on the CDC-DB Listener's **Advanced** tab. The default values listed in the CDC Database Configuration Preferences window are preferred until you add the CDC-DB activity to the Palette.

Procedure

1. From the menu, click **Window > Preferences** to open the Preferences Wizard.
2. In the Preferences wizard, click **CDC Plugin** and then click **CDC Database Configuration Preferences** to open the **CDC Database Configuration Preferences** wizard.
3. By default the **Offset Flush Interval** is set to 100 milliseconds. Choose the desired **Operation Options** and **Output Formats**, click **Apply** to set these values as default.



> **Note:** Encrypt Database is supported only for MSSQL database server in configuration preferences setting.

4. Now, click **Apply and Close**.

> **Note:** In the CDC Database Configuration Preferences Wizard, the **Database Encrypt** checkbox can trust server-signed certificates or use a trust store for the server's signer certificates. In the latter case, the path to trust store and the trust store password should be provided as configuration properties ("`database.ssl.truststore`", and "`database.ssl.truststore.password`") using the `com.tibco.bw.palette.cdc.additionalDbProperties` module property.

General

The **General** tab contains the following fields.

Property	Module Property?	Visual Diff?	Description
Name	Yes	Yes	Name of the palette activity.
JDBC Connection	Yes	Yes	The name to be displayed as the label for the JDBC connection resource.
Table Name	Yes	Yes	The table name displayed as the label. Multiple tables can be specified in a comma-separated list. **Note:** If listening table is deleted inside DB, the plug-in does not throw any exception.
Output Format	No	Yes	The following are the output formats: • JSON • XML

Property	Module Property?	Visual Diff?	Description
			• Avro **Note:** For MSSQL, Oracle, MySQL, PostgreSQL, and IBM DB2 for Output Format **JSON** and **XML**, if data is "null" as literal string, then it is treated as database null instead of "null" as literal string.
Database Server ID	Yes	Yes	When MySQL DB connection resource is selected, **Database Server Id** field is displayed. **Note:** The **Database Server Id** value must be a non-zero positive integer.

Description

Provide a short description for the activity.

Advanced

The **Advanced** tab contains the following fields.

Property	Module Property?	Visual Diff?	Description
Sequence Key	No	Yes	This field contains an XPath expression that specifies which processes should run in sequence. Process instances with sequencing keys evaluating to the same value, are executed sequentially in the sequence the process instance was created.
Custom Job	No	Yes	This field contains an XPath expression that

Property	Module Property?	Visual Diff?	Description
Id			specifies a custom ID for the process instance.
Operation Options	Yes	Yes	Facilitate the selection of the appropriate operation. • Insert: When the **Insert** checkbox is selected and insert operation is performed on DB, we receive the event with Opcode value `c`. • Update: When the **Update** checkbox is selected and update operation is performed on DB, we receive the event with Opcode value `u`. • Delete: When the **Delete** checkbox is selected and delete operation is performed on DB, we receive the event with Opcode value `d`. • Snapshot: Scans database tables or objects and creates reference point to capture change data information and we receive the event with Opcode value `r`. **Note:** This Snapshot option performs read operation when app is running for the first time. • Process Nullable Columns For Avro: When **Process Nullable Columns For Avro** checkbox is selected for Output Format Avro, it handles the Null values or datatype mismatch. **Note:** The **Process Nullable Columns For Avro** does not support Visual Diff.

Module Property

Any additional database properties can be specified using the `com.tibco.bw.palette.cdc.additionalDbProperties` module property.

Note:

- If you specify an include column list in the module property and exclude the primary key column, the primary key is not shown in the activity output.
- When the `provide.transaction.metadata` property is set to `true`, transaction metadata is not returned in the response.
- You can provide multiple `additionalDbProperties` by separating them with a semicolon (For example, `prop_name1=prop_value1;prop_name2=prop_value2`).
- For Oracle, to ensure all field values are visible in source and target data during updates, run:
  `ALTER TABLE <TABLE NAME> ADD SUPPLEMENTAL LOG DATA (ALL) COLUMNS;`
- For PostgreSQL, if the offset file is deleted and the application restarts, the connector retrieves the last committed change event from the database and returns the previous record, so the last record before the restart is returned again.

Tags

Conversations

You can use the Conversations tab to initiate or join a conversation.

Conversations receive a message after the creation of the process instance, which is initiated or joined by an activity. This activity can be used to initiate a conversation. Click the **Add New Conversation** icon to initiate a conversation. For more information about conversations, see *TIBCO ActiveMatrix BusinessWorks™ Application Design*.

Output

The following is the output for the activity.

Output Item	Data Type	Description
Global Scope	String	The Global scope checkbox makes output variable of the activity from current scope to global level which is at the process level.
item?	String	`Header`: Based on the output formats, the output item differs • `dbName?`: The database name with which the activity is performed • `schema?`: The schema with which the activity is performed • `table?`: The table on which operations are performed • `opcode?`: The opcode value that is set to perform a specific operation • `timestamp?`: The time at which an event occurs • `date?`: The date when an event is performed • `time?`: The time required to perform the specific activity • `messageID?` It is an Unique ID for an event `Body`: Data of records that undergo change based on the output formats that are chosen. • For JSON: `data?`: Depending on the insert, update, and delete operations performed, we obtain respective source and target values. ◦ For Insert operation the source is null, target consists of values which are inserted.

Output Item	Data Type	Description
		◦ For Update operation the source consists of old values and target consists of new updated values. ◦ For Delete operation the source consists of deleted values and target is null. • For XML: `Source Column` and `Target Column`: Depending on the insert, update, and delete operations performed, we obtain respective Source Column and Target Column values. ◦ For Insert operation the Source Column is null, whereas the Target Column consists of values which are inserted. ◦ For Update operation the Source Column consists of old values and the Target Column consists of new updated values. ◦ For Delete operation the Source Column consists of deleted values and the Target Column is null. • For Avro: `sourceData?` and `targetData?`: Depending on the insert, update, and delete operations performed, we obtain respective sourceData? and targetData? values ◦ For Insert operation there is no sourceData? obtained, whereas the targetData? consists of newly created values ◦ For Update operation the sourceData? consists of old values and the targetData? consists of new updated values ◦ For Delete operation the sourceData? consists of deleted values and there is no targetData? obtained

Fault

The **Fault** tab lists exceptions that are generated by this activity.

Error Schema Element	Data Type	Description
msg	string	The error message returned by the plug-in.
msgCode	string	The error code returned by the plug-in

- **CDCPluginException:** The exception is generated when the plug-in cannot send the request or parse the response.
- **CDCDBException:** The exception is generated when any database related error occurs.

Support of Database Reconnection

In the event the connection between the database and plug-in is interrupted, the plug-in tries to reconnect to the database by using a heartbeat table which is configurable using module properties.

If the heartbeat table is enabled and the plug-in does not receive a change event from that table then the plug-in generates an exception to notify loss of connection to the database.

Following are the module properties with datatypes.

Module Property	Default value	Datatype	Description
com.tibco.bw.palette.cdc.HBENABLE	`False`	Boolean	Enables the heartbeat table for reconnection. By default, it is not enabled.
com.tibco.bw.palette.cdc.HBPOLLINGINTERVAL	`30000`	Long	Specifies the interval in

Module Property	Default value	Datatype	Description
			milliseconds for checking the change event from the heartbeat table.
com.tibco.bw.palette.cdc.HBPOLLINGATTEMPTS	5	Integer	Specifies the number of iterations for checking the change event from the heartbeat table.

Supported Datatypes

The following datatypes are supported for ActiveMatrix BusinessWorks™ Plug-in for Change Data Capture:

Database Type	Database Server
BIT	MSSQL
DECIMAL(10, 2)	MSSQL
FLOAT	MSSQL
INT	MSSQL
SMALLINT	MSSQL
TINYINT	MSSQL

Database Type	Database Server
Money	MSSQL
NUMERIC(8, 4)	MSSQL
REAL	MSSQL
SMALLMONEY	MSSQL
DATE	MSSQL
DATETIME	MSSQL
DATETIME2(3)	MSSQL
SMALLDATETIME	MSSQL
TIME(2)	MSSQL
CHAR(10)	MSSQL
VARCHAR(50)	MSSQL
TEXT	MSSQL
NCHAR(10)	MSSQL
NVARCHAR(50)	MSSQL
NTEXT	MSSQL
BINARY(10)	MSSQL
VARBINARY(50)	MSSQL
IMAGE	MSSQL
UNIQUEIDENTIFIER	MSSQL

Database Type	Database Server
XML	MSSQL
Number	Oracle
Varchar	Oracle
Date	Oracle
Timestamp	Oracle
CHAR	Oracle
FLOAT	Oracle
DOUBLE PRECISION	Oracle
INT	Oracle
SMALL INT	Oracle
Number (Decimal)	Oracle
INT KEY	PostgreSQL
BOOLEAN	PostgreSQL
SMALLINT	PostgreSQL
INTEGER	PostgreSQL
BIGINT	PostgreSQL
REAL	PostgreSQL
DOUBLE PRECISION	PostgreSQL
NUMERIC(10, 2)	PostgreSQL

Database Type	Database Server
TEXT	PostgreSQL
VARCHAR(255)	PostgreSQL
CHAR(10)	PostgreSQL
BYTEA	PostgreSQL
INET	PostgreSQL
CIDR, , , , TIMETZ,	PostgreSQL
UUID	PostgreSQL
DATE	PostgreSQL
TIME	PostgreSQL
TIMETZ	PostgreSQL
TIMESTAMP	PostgreSQL
TIMESTAMPTZ	PostgreSQL
HSTORE	PostgreSQL
XML	PostgreSQL
BOOLEAN, BOOL	MySQL
BIT(1)	MySQL
BIT(>1)	MySQL
TINYINT	MySQL
SMALLINT[(M)]	MySQL

Database Type	Database Server
MEDIUMINT[(M)]	MySQL
INT, INTEGER[(M)]	MySQL
BIGINT[(M)]	MySQL
REAL[(M,D)]	MySQL
FLOAT[(P)]	MySQL
DOUBLE[(M,D)]	MySQL
CHAR(M)]	MySQL
VARCHAR(M)]	MySQL
BINARY(M)]	MySQL
VARBINARY(M)]	MySQL
TINYBLOB	MySQL
TINYTEXT	MySQL
BLOB	MySQL
TEXT	MySQL
MEDIUMBLOB	MySQL
MEDIUMTEXT	MySQL
LONGBLOB	MySQL
LONGTEXT	MySQL
JSON	MySQL

Database Type	Database Server
ENUM	MySQL
SET	MySQL
YEAR[(2|4)]	MySQL
TIMESTAMP[(M)]	MySQL
DATE	MySQL
TIME	MySQL
DATETIME	MySQL
NUMERIC[(M[,D])]	MySQL
DECIMAL[(M[,D])]	MySQL
SPATIAL	MySQL
INTEGER	DB2
SMALLINT	DB2
BIGINT	DB2
DECIMAL	DB2
FLOAT	DB2
REAL	DB2
DOUBLE	DB2
CHAR	DB2
VARCHAR	DB2

Database Type	Database Server
DATE	DB2
TIME	DB2
TIMESTAMP	DB2
VARGRAPHIC	DB2
BINARY	DB2
VARBINARY	DB2

Note:

- CLOB and BLOB datatypes are not supported when Oracle DB is used.
- The plug-in does not support the Oracle `Interval` datatype.
- The MSSQL Boolean datatype output comes as `true` or `false` instead of bit `1` or `0`.
- The Oracle Timestamp datatype value comes as epoch time.
- The CLOB, DBCLOB, Boolean, and XML datatypes are not supported when DB2 is used.

CDC-SAP Listener Activity

The CDC SAP Listener activity listens to Change Data Capture data from SAP using the SAP ODP 2.0 framework.
The ODP sources supported are datasources/extractors that are provided by SAP or custom. The Change Data Capture data can either be a full extract (snapshot) or a delta.

Important:

- The replication mode available in ODP as `Recovery of Previous Deltas` is not supported. In the event there is an issue with the processing of delta data, it is recommended that full extracts be used to remediate any issues encoutered during delta processing.
- The maximum number of records received from the SAP ODP source is not configurable in the plug-in. The maximum number of records is `52428800`. Flow limit and load balancing are not supported by the CDC SAP Listener activity.

General

The **General** tab contains the following fields.

Property	Module Property?	Visual Diff?	Description
Name	No	Yes	Name of the palette activity.
CDC Resource	Yes	Yes	The CDC Connection shared resource establishes connections between the plug-in and the SAP system at run time. Ensure that you have created a CDC Connection shared resource.
Subscriber Type	No	Yes	Subscriber Type describes the target application that processes the Change Data Capture data. **Important:** The Subscriber type must match the value defined in SAP transaction ODQMON that is relevant for the receipt of data from the plug-in.
Subscriber Name	Yes	Yes	Subscriber Name is the subscription name associated to the target application that processes the Change Data Capture data.

Property	Module Property?	Visual Diff?	Description
			Important: The Subscriber Name must match the Subscription value defined in SAP transaction ODQMON that is relevant for the receipt of data from the plug-in.
Context	No	Yes	The type of the ODP source that generates the Change Data Capture data.
ODP Name	No	Yes	Name of the ODP source.
ODP Mode	No	Yes	Mode to extract data from a SAP ODP source, the valid values include Full and Delta.
Output Format	No	Yes	The following are the output formats: • JSON • XML • Avro

Description

Provide a short description for the activity.

Advanced

The **Advanced** tab contains the following fields.

Property	Module Property?	Visual Diff?	Description
Sequence Key	No	Yes	This field contains an XPath expression that

Property	Module Property?	Visual Diff?	Description
			specifies the order in which the process runs. Process instances with sequencing keys that have the same value are run sequentially in the order in which the process instances were created.
Custom Job Id	No	Yes	This field contains an XPath expression that specifies a custom job ID for the process instance. This ID is displayed in the $_processContext process variable. The custom job ID for the process instance.
Batch Size	Yes	Yes	The number of records that a job can contain. The defaults to –1, which means that a job contains all of the data from the ODP source.
Explicit Close	No	Yes	Do not close the request automatically, the receipt of data is confirmed separately.
Return Error on Close	No	Yes	Subscriber is canceled and data is not collected.
Trigger Event	No	Yes	Specifies when to process the data from the ODP source. The valid values include Local and SAP. It defaults to Local. Local means that the extraction is triggered by local timer. SAP means the receipt of data by an event from SAP server.
Start Time	Yes	Yes	Time to start the receipt of data, it is available only when the trigger event Local is selected.
Run Once	No	Yes	Indicates if the receipt of data runs only once. It defaults to true, it is available only when the trigger event Local is selected.
Time Interval	Yes	Yes	The time interval between processing, it is available only when the trigger event Local is

Property	Module Property?	Visual Diff?	Description
			selected.
Interval Unit	No	Yes	Time unit for timer, it is available only when the trigger event Local is selected.
End After	No	Yes	Specify the action after the receipt of data, the following are the valid values available only when the trigger event Local is selected. • **Never**: The connection never ends • **Occurrences**: When **Occurrences** is selected, the **Occurrences** field is enabled, enter the preferred Occurrences value. • **End time**: When **End time** is selected, the **End time** field is enabled. You can choose a date and time.

Tags

Conversations

You can use the Conversations tab to initiate or join a conversation.

Conversations receive a message after the creation of the process instance, which is initiated or joined by an activity. This activity can be used to initiate a conversation. Click the **Add New Conversation** icon to initiate a conversation. For more information about conversations, see *TIBCO ActiveMatrix BusinessWorks™ Application Design*.

Output

The following is the output for the activity.

Output Item	Data Type	Description
Header	String	• `SAPName?`: The SAP system ID with which the activity is performed. • `ODPSource?`: Name of the ODP source. • `ODPMode?`: Type of extract data from SAP ODP source, the valid values include Full and Delta. • `SubscriberName`: • `timestamp?`: The time at which an event occurs. • `date?`: The date when an event is performed. • `time?`: The time when an event is performed. • `messageID?`: It is a Unique ID for an event. **Important:** When data from an ODP source is processed across multiple jobs, the `messageID` value would be the same in all the jobs. • `recordCount?`: The count of the records that a job contains. Based on the output format selected, the Output item and corresponding Body Data section would undergo changes respectively. • For JSON: `data?`: The Change Data Capture data is transformed into a JSON object that is subsequently serialized into a string. • For XML: `Records`: The records of the data section. `Items:` One or more records from the SAP ODP source. The schema is dependent on the schema of the ODP source.

Output Item	Data Type	Description
		• For Avro: `data?`: The Change Data Capture data is transformed into a JSON object that is subsequently serialized into Avro as a binary string.

Fault

The **Fault** tab lists exceptions that are generated by this activity.

Error Schema Element	Data Type	Description
msg	string	The error message is returned by the plug-in.
msgCode	string	The error code returned by the plug-in.

- **CDCPluginException:** The exception is generated when the plug-in cannot send the request or parse the response.
- **CDCSAPException:** The exception is generated when any SAP related error occurs.

SAP ODP Change Event Information

To identify the type of change event from the SAP ODP Source, specific fields are included in the activity output, regardless of the output format. These fields are sourced directly from the ODP Source.

SAP ODP Field	Data Type	Description
ODQ_	String	Identifies the type of change event. Possible values are 'C' for

SAP ODP Field	Data Type	Description
CHANGEMODE		create, 'U' for update, and 'D' for delete.
ODQ_ ENTITYCNTR	Integer	Value sent from SAP ODP Source is used in conjunction with the ODQ_CHANGEMODE to further describe the change event.

Supported Datatypes

Datatype	Meaning
INT1	1-byte integer
INT2	2-byte integer
INT8	4-byte integer
DEC	Decimal floating point number stored in BCD format
DF16_DEC	Decimal floating point number stored in binary format
DF16_RAW	Decimal floating point number stored in binary format
DF34_DEC	Decimal floating point number stored in BCD format
DF34_RAW	Decimal floating point number stored in binary format
FLTP	Binary floating point number
CHAR	Character string
LCHR	Long character string
STRING	Character string
SSTRING	Character string (CLOB)

Datatype	Meaning
RAW	Byte string
LRAW	Long byte string
RAWSTRING	Byte string (BLOB)
DATS	Date in the format YYYYMMDD
TIMS	Time in the format HHMMSS
ACCP	Posting period in the format YYYYMM
NUMC	Numeric text
CLNT	Client
LANG	Language key
CURR	Currency field in BCD format
CUKY	Currency key for currency fields
QUAN	Quantity field in BCD format
UNIT	Unit key of a quantity field

Preparing SAP System

Before using the plug-in, you have to ensure that your SAP account and your SAP system meet the following requirements.
No modifications of code are required in the SAP system itself.

SAP Account Requirements
An SAP account is required to connect to the SAP system to communicate with the plug-in.

Before configuring the plug-in at design time, ensure that your SAP account and your SAP system meet the following requirements:
Your SAP account has access to a dedicated SAP application server and has permission to

extract metadata for SAP ODP Datasources or Extractors by using TIBCO Business Studio for BusinessWorks.

- If you want to use different connections between design-time and runtime, obtain the relevant connection information.
- If you want to configure a load-balanced inbound activity, obtain the parameters used to connect to a **Messaging Server** for a specific **Logon Group** from the SAP Connection shared resource.
- Your SAP account has authorization from the SAP system administrator to execute RFCs in function group `RODPS_REPL` in the SAP system.

CDC NoSql DB Listener activity

The CDC-NoSql DB Listener activity listens to the operations performed on database tables. When CDC is enabled for a table the data change events for the respective table are logged. The Debezium engine collects these data change event logs and returns the details of the data change.

By default, the plug-in initializes Debezium to capture change data events for Insert (i), Update (u), Delete (d), and Snapshot operations.

However, you can pass the appropriate Operation Options value so that the data changes specific to these activities performed on a table are captured.

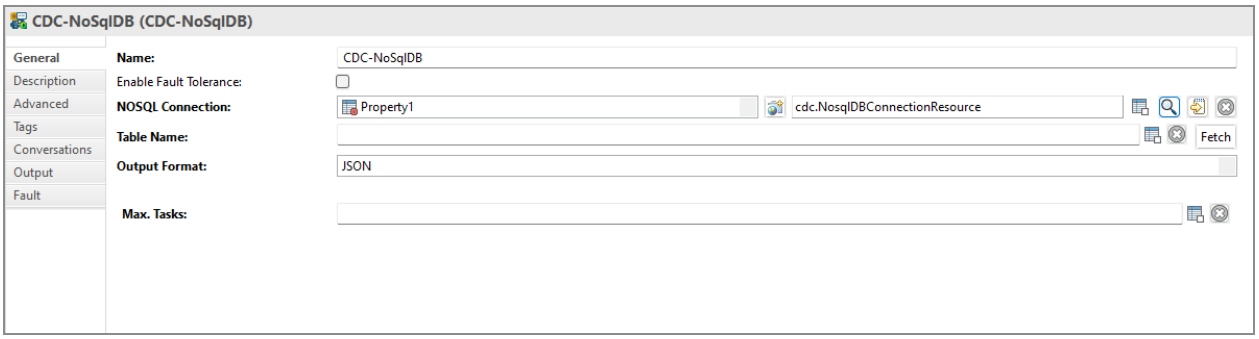
Note:

- The CDC NoSql DB listener activity does not support concurrency, as the events are read sequentially.
- The **Flowlimit** is not supported in the CDC NoSql DB listener activity due to the behavior of the Debezium engine.
- If you have issues running the NoSQL Cassandra Database activity, see the Important Note on mandatory VM arguments in the Deploying an Application section.

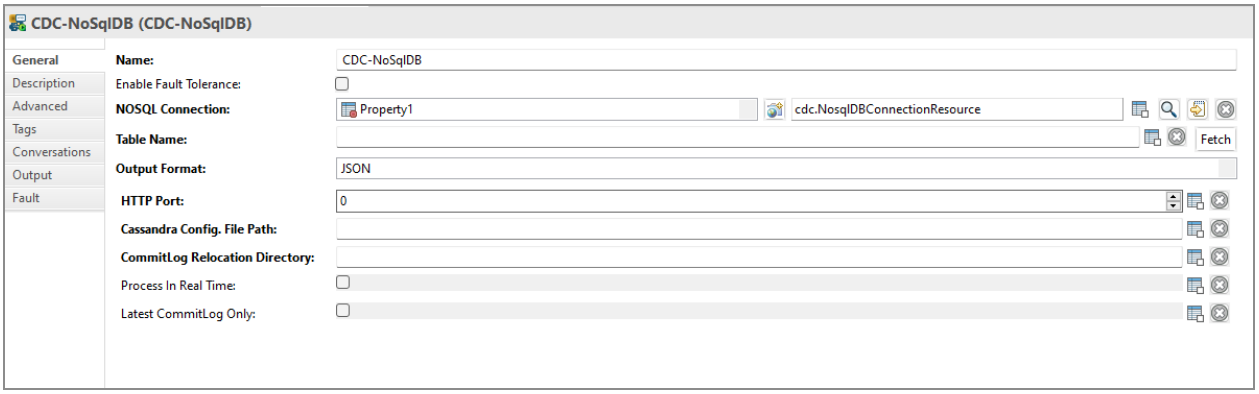
General

The **General** tab contains the following fields:

For MongoDB



For Cassandra



Property	Module Property?	Visual Diff?	Description	Applies To
Name	No	Yes	Name of the palette activity	Cassandra, MongoDB
NoSQL Connection	Yes	Yes	The name to be displayed as the label for the NoSql connection resource.	Cassandra, MongoDB
Table Name	Yes	Yes	The table name displayed as the label. Multiple tables can be specified in a comma-separated list. **Note:** If a listening table is deleted from the database, the plug-in does not generate any exception.	Cassandra, MongoDB

Property	Module Property?	Visual Diff?	Description	Applies To
Output Format	No	Yes	The following are the output formats: • JSON • XML	Cassandra, MongoDB
Max. Tasks	Yes	Yes	This flag, related to the `task.max` Kafka property, specifies the maximum number of workers a connector or job can run.	MongoDB
HTTP Port	Yes	Yes	Specify the port on which Cassandra is running.	Cassandra
Cassandra Config. File Path	Yes	Yes	Specify the path to the `cassandra.yaml` file from the Cassandra installation directory.	Cassandra
CommitLog Relocation Directory	Yes	Yes	Specify the path to the commitlog directory created for storing Cassandra commit logs.	Cassandra
Process in Real Time	Yes	Yes	Set this field to enable the `commit.log.real.time.processing.enabled` flag, which helps eliminate processing delays.	Cassandra
Latest CommitLog Only	Yes	Yes	Enable this flag to process only the latest commit log.	Cassandra

The following fields are displayed only when the **Enable Fault Tolerance** checkbox is selected:

Property	Module Property?	Visual Diff?	Description
Engine Name	Yes	Yes	Specify the name of the Debezium

Property	Module Property?	Visual Diff?	Description
			engine.
Offset File Path	Yes	Yes	Specify the file path for storing the offset.
Flush Interval(ms)	Yes	Yes	Specify the interval at which to attempt committing offsets for tasks.
Topic Prefix Name	Yes	Yes	Specify the topic prefix for the `topic.prefix` property in Debezium.

Description

Provide a short description for the activity.

Advanced

The **Advanced** tab contains the following fields:

Property	Module Property?	Visual Diff?	Description
Sequence Key	No	Yes	This field contains an XPath expression that specifies which processes should run in sequence. Process instances with sequencing keys evaluating to the same value, are executed sequentially in the sequence the process instance was created.
Custom Job Id	No	Yes	This field contains an XPath expression that specifies a custom ID for the process instance.
Operation Options	Yes	Yes	Facilitate the selection of the appropriate operation.

Property	Module Property?	Visual Diff?	Description
			• **Insert**: When the **Insert** checkbox is selected and insert operation is performed on DB, we receive the event with Opcode value `i`. • **Update**: When the **Update** checkbox is selected and update operation is performed on DB, we receive the event with Opcode value `u`. • **Delete**: When the **Delete** checkbox is selected and delete operation is performed on DB, we receive the event with Opcode value `d`. • **Snapshot**: Scans database tables or objects and creates reference point to capture change data information and we receive the event with Opcode value `r`.

Module Property

Any additional database or Debezium property can be specified using the `com.tibco.bw.palette.cdc.additionalDbProperties` module property.

Note:

- If you specify an include column list in the module property and exclude the primary key column, the primary key is not shown in the activity output.
- When the `provide.transaction.metadata` property is set to `true`, transaction metadata is not returned in the response.
- You can provide multiple `additionalDbProperties` by separating them with a semicolon (for example: `prop_name1=prop_value1;prop_name2=prop_value2`).

Tags

Conversations

You can use the Conversations tab to initiate or join a conversation.

Conversations receive a message after the creation of the process instance, which is initiated or joined by an activity. This activity can be used to initiate a conversation. Click the **Add New Conversation** icon to initiate a conversation. For more information about conversations, see *TIBCO ActiveMatrix BusinessWorks™ Application Design*.

Output

The following is the output for the activity.

Output Item	Data Type	Description
Global Scope	String	The Global scope checkbox makes output variable of the activity from current scope to global level which is at the process level.
item?	String	`Header`: Based on the output formats, the Output item differs • `keySpaceName?`: The name of the keyspace used for the created session. • `databaseName?`: The database name with which the activity is performed. • `table?`: The table on which operations are performed. • `collection?`: The name of MongoDB collection/table. • `opcode?`: The opcode value that is set to perform a specific operation. • `timestamp?`: The time required to perform the specific activity.

Output Item	Data Type	Description
		• `date?`: The date when an event is performed. • `time?`: The time at which an event occurs. • `messageID?` It is an Unique ID for an event.
		`Body`: Data of records that undergo change based on the output formats that are chosen. • For JSON: `data?`: Depending on the insert, update, and delete operations performed, we obtain respective source and target values. ◦ For Insert operation the source is null, target consists of values which are inserted. ◦ For Update operation the source is null, target consists of new updated values. ◦ For Delete operation the source is null, target consists of deleted values. • For XML: `Source Column` and `Target Column`: Depending on the insert, update, and delete operations performed, we obtain respective Source Column and Target Column values. ◦ For Insert operation the Source Column is null, whereas the Target Column consists of values which are inserted. ◦ For Update operation the Source Column is null and the Target Column consists of new updated values. ◦ For Delete operation the Source Column is null and the Target Column consists of deleted values.

Fault

The **Fault** tab lists exceptions that are generated by this activity.

Error Schema Element	Data Type	Description
msg	string	The error message returned by the plug-in.
msgCode	string	The error code returned by the plug-in.

- **CDCPluginException**: The exception is generated when the plug-in cannot send the request or parse the response.
- **CDCNoSqlDBException**: The exception is generated when any database related error occurs.

Working with Sample Projects

The ActiveMatrix BusinessWorks™ Plug-in for Change Data Capture packages sample projects, which helps to understand how TIBCO ActiveMatrix BusinessWorks™ Plug-in for Change Data Capture works. The following sample project is located in the *<TIBCO_HOME>/bw/palettes/cdc/<version_number>/samples* directory:

- Sample Plug-in Project for the CDC-DB Listener Process Activity
- Sample Plug-in Project for the CDC-SAP Listener Process Activity
- Sample Plug-in Project for the CDC-Cassandra DB Listener Process Activity
- Sample Plug-in Project for the CDC-MongoDB Listener Process Activity

Importing Sample Projects

Before you begin

Before running the project, you must import the sample projects to TIBCO Business Studio for BusinessWorks.

Procedure

1. Depending on the platform applicable to your plug-in, start TIBCO Business Studio for BusinessWorks:

Platform	Step
Microsoft Windows	Click **Start** > **All Programs** > **TIBCO > TIBCO_HOME > TIBCO Business Studio <version> > Studio for Designers**
Linux or macOS	Run the TIBCO Business Studio for BusinessWorks executable file in the *TIBCO_HOME/studio/<version>/eclipse* directory.

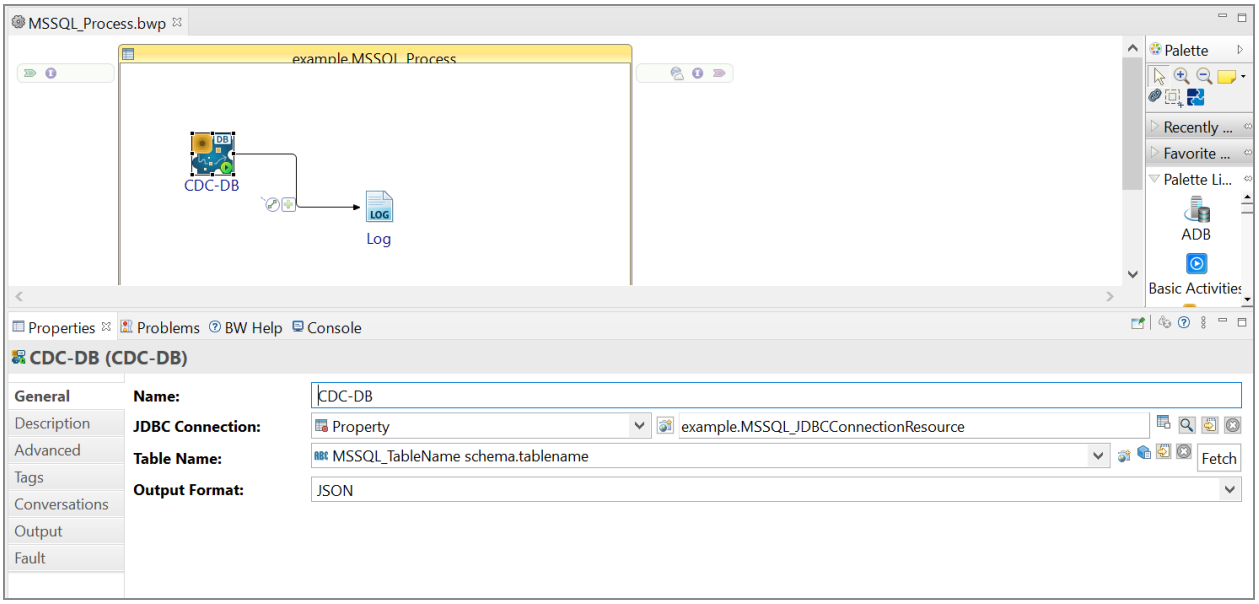
For the list of platforms supported by your plug-in, see the Readme file.

2. Click **File > Import**.
3. In the **Import** dialog, expand the **General** folder and select the **Existing Studio Projects into Workspace** item. Click **Next**.
4. Next to the **Select root directory** field, click **Browse** to locate the samples. Click **Finish**.

   The sample project is stored in the *<TIBCO_HOME>\bw\palettes\cdc\<version_number>\samples* directory.

Result

The sample project is imported to TIBCO Business Studio for BusinessWorks.



Setting Up a Project

Before you begin

Ensure that you have imported the sample project as described in Importing Sample Projects.

Procedure

1. Expand the imported project in the **Project Explorer** view.
2. Expand the Module Descriptors resource, and then double-click Module Properties.
3. In the Module Properties panel, complete the following tasks:
    - Enter the **Username**
    - Enter the **Password**
    - Select the **Database Driver**
    - Select the **Database URL**
    - Select the **TableName**
4. Expand the resource folder and double-click JDBC connection resource.
5. Click the **Test Connection** on the Configuration tab.
6. From the menu bar, click **File** > **Save** to save the project.

Running the Project

After importing the sample project, you can run the project to see how the plug-in works.

Before you begin

Ensure that you have imported the sample project to TIBCO Business Studio as described in Importing Sample Projects.

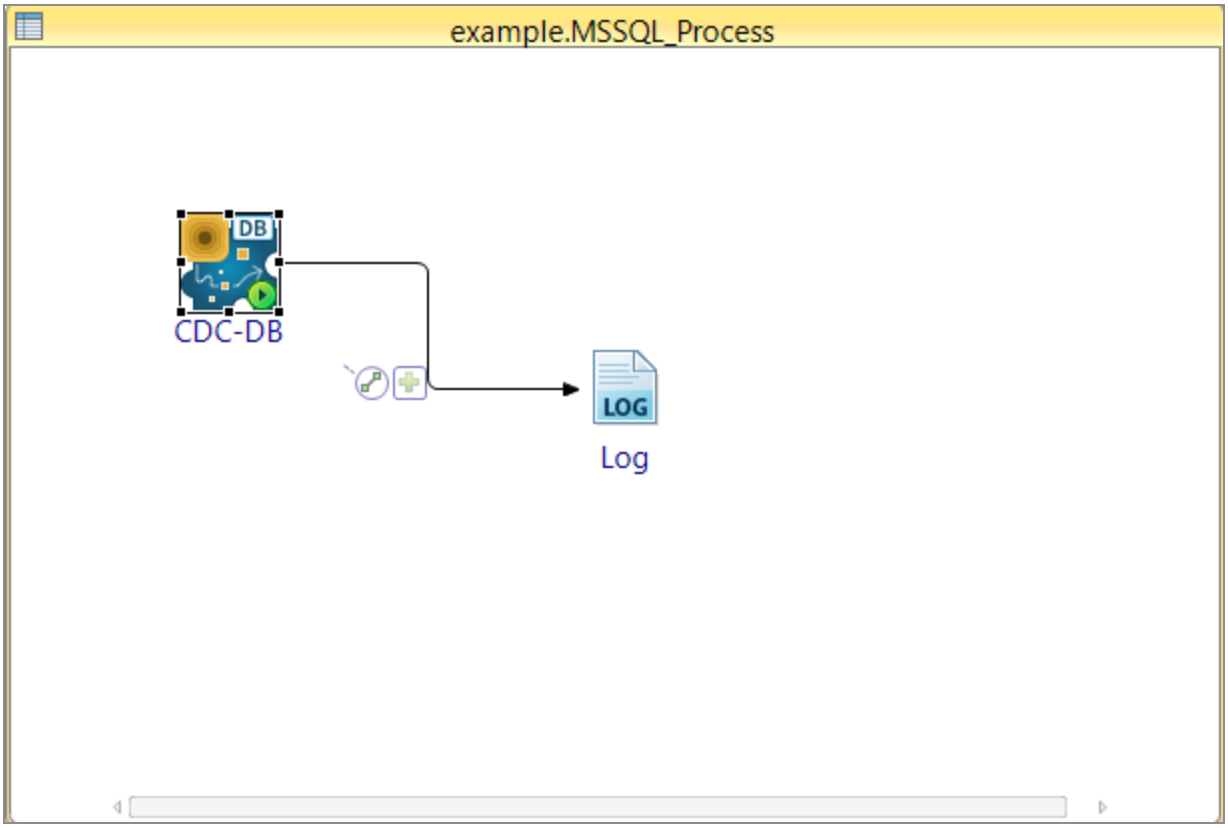
Procedure

1. From the menu, click **Run** > **Run Configurations**.
2. In the Run Configurations dialog, expand **BusinessWorks Application**, and then click **BWApplication**.
3. On the **Applications** tab, all the sample applications are selected. You can clear the sample applications that you do not want to run.
4. Click **Run** to run the process.
5. Click the stop icon to stop the process.

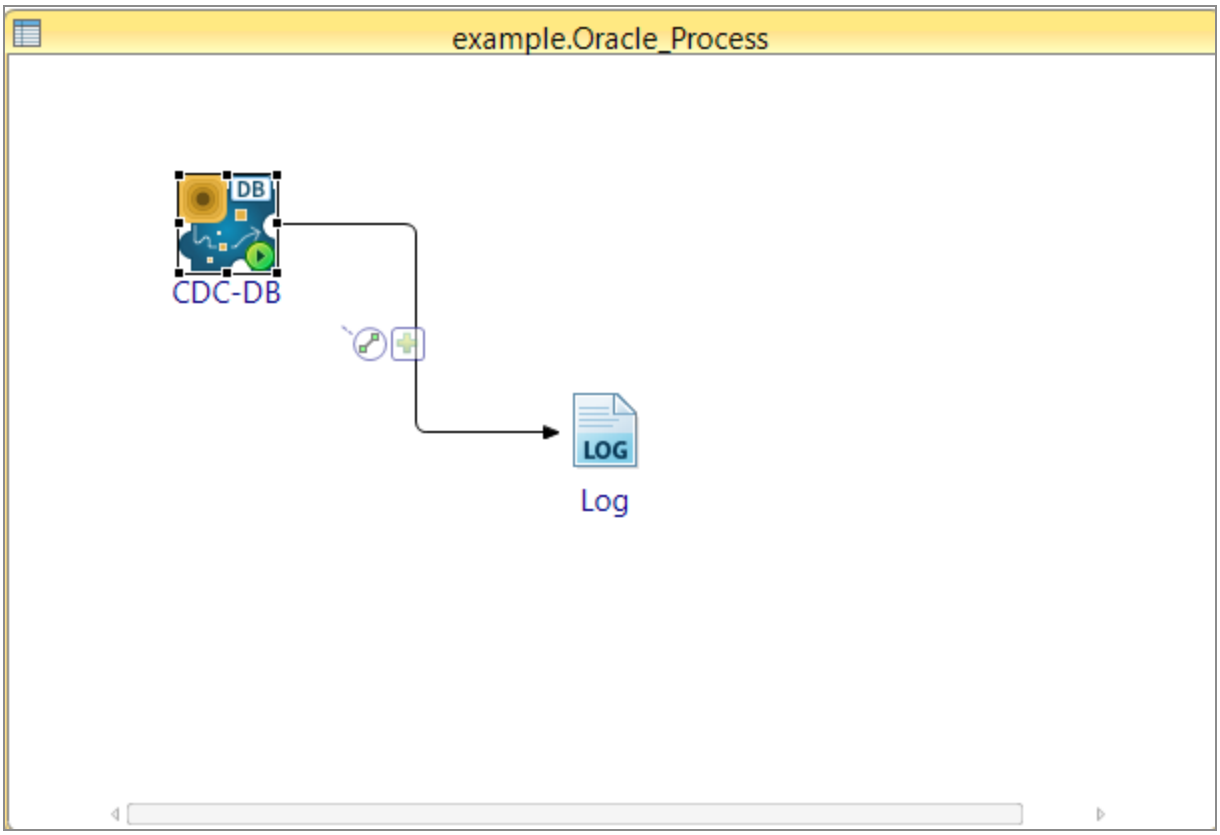
Sample Plug-in Project for the CDC-DB Listener Process Activity

The examples mentioned in this section for the CDC-DB Listener activity can be found in the *Examples.zip* file available in the samples directory of the plug-in.
Also, there are five process provided in the sample for each supported database.

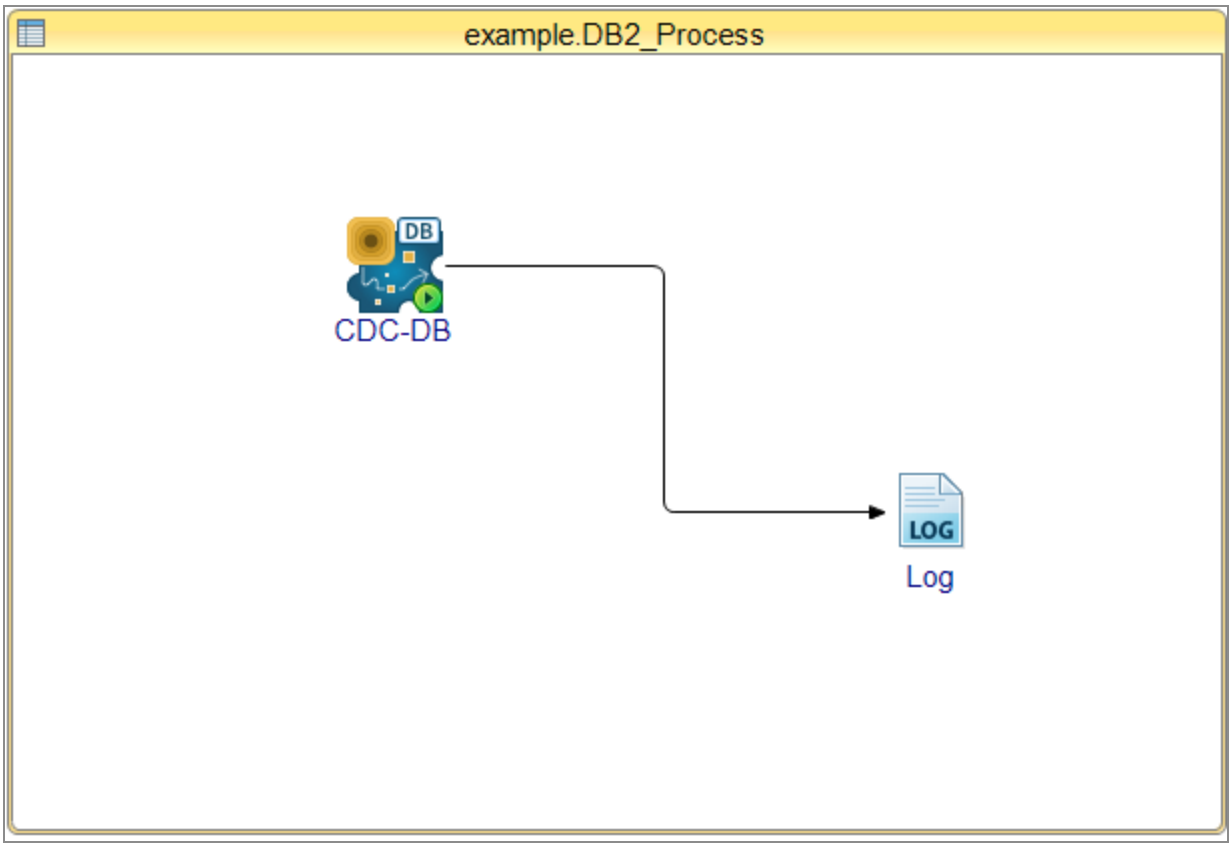
You can use the example `MSSQL_Process.bwp` to understand how the CDC-DB Listener Process activity behaves for MSSQL DB.



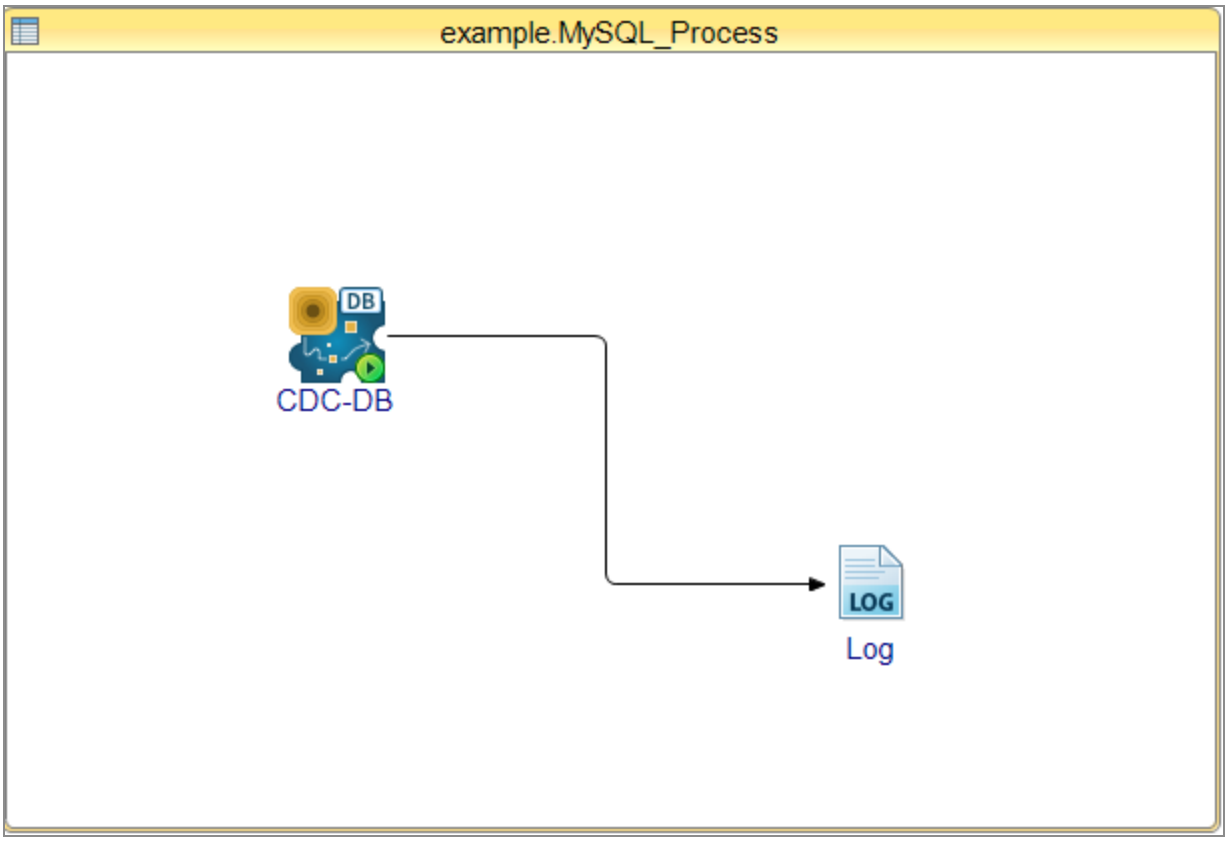
You can use the example `Oracle_Process.bwp` to understand how the CDC-DB Listener Process activity behaves for Oracle DB.



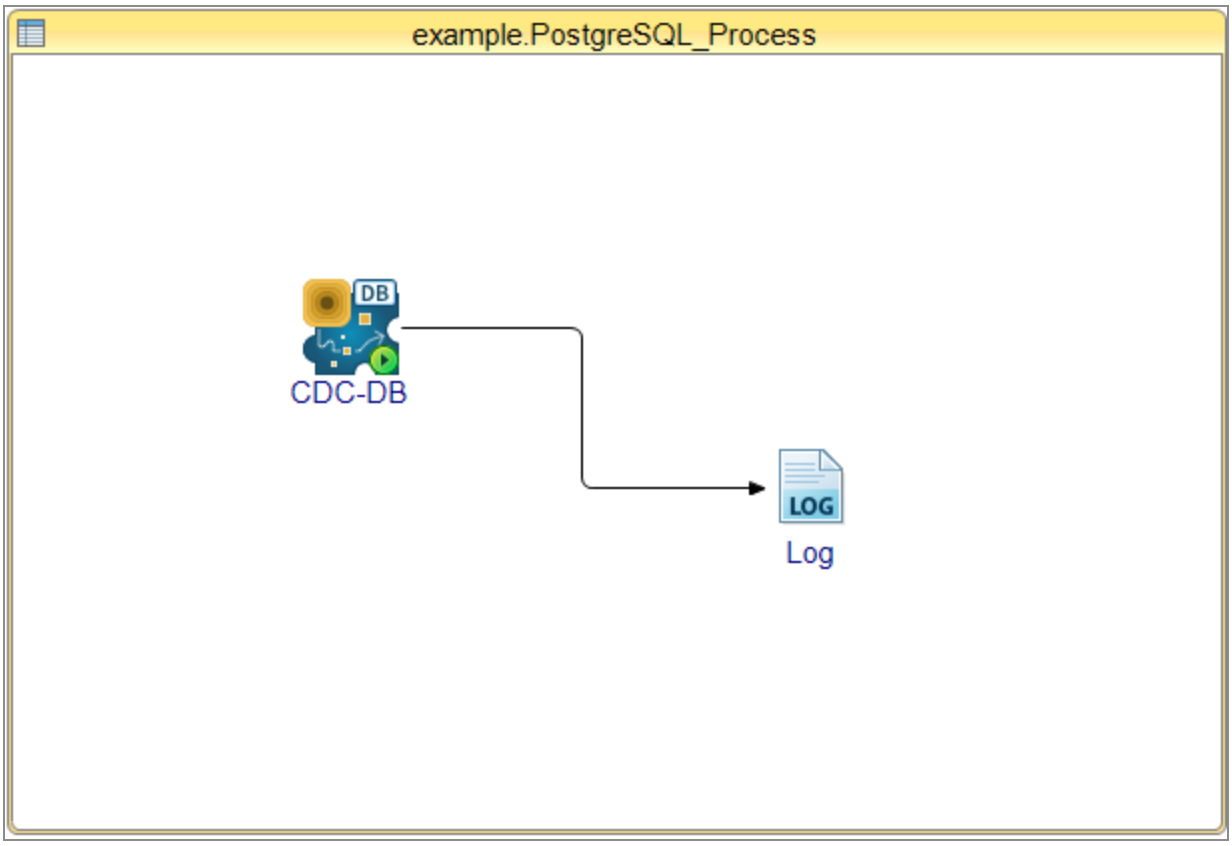
You can use the example `DB2_Process.bwp` to understand how the CDC-DB Listener Process activity behaves for IBM DB2.



You can use the example `example.MySQL_Process.bwp` to understand how the CDC-DB Listener Process activity behaves for MySQL database.



You can use the example `example.PostgreSQL_Process.bwp` to understand how the CDC-DB Listener Process activity behaves for PostgreSQL database.

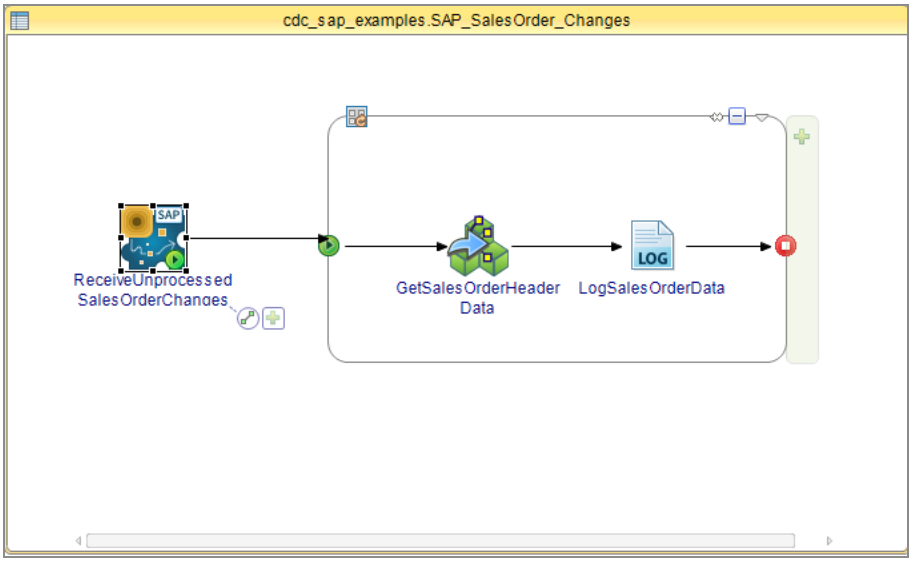

example.PostgreSQL_Process
DB
CDC-DB
LOG
Log

Sample Plug-in Project for the CDC-SAP Listener Process Activity

The examples mentioned in this section for the CDC-SAP Listener activity can be found in the *CDC_SAP_Examples.zip* file available in the samples directory of the plug-in.

Important: In order to run this example, the TIBCO AtiveMatrix BusinessWorks Plug-in for SAP Solutions must be installed in the same BusinessWorks home.

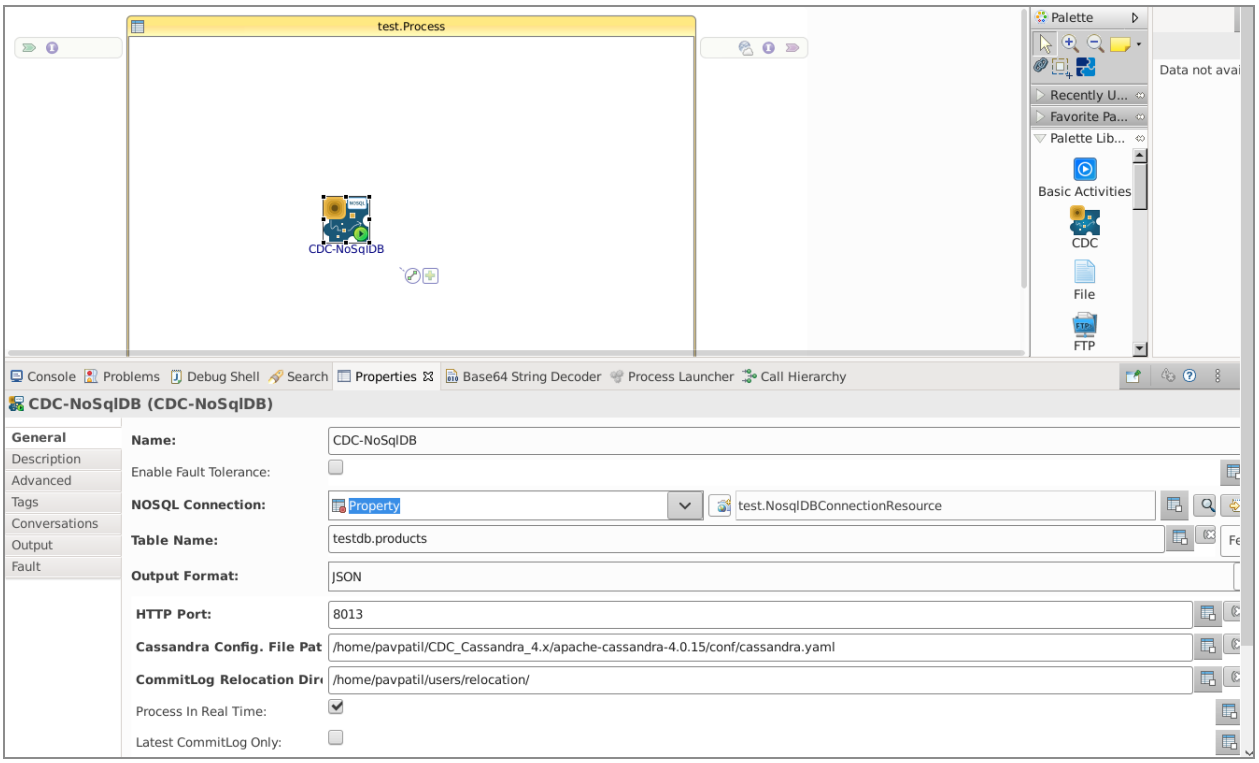
You can use the example `SAP_SalesOrder_Changes.bwp` to understand how the CDC-SAP Listener Process activity behaves for SAP ODP Framework.



Sample Plug-in Project for the CDC-Cassandra DB Listener Process Activity

The example mentioned in this section for the CDC-NoSql-DB Listener activity can be found in the `CDC_NoSQLDB_Examples.zip` file available in the samples directory of the plug-in.

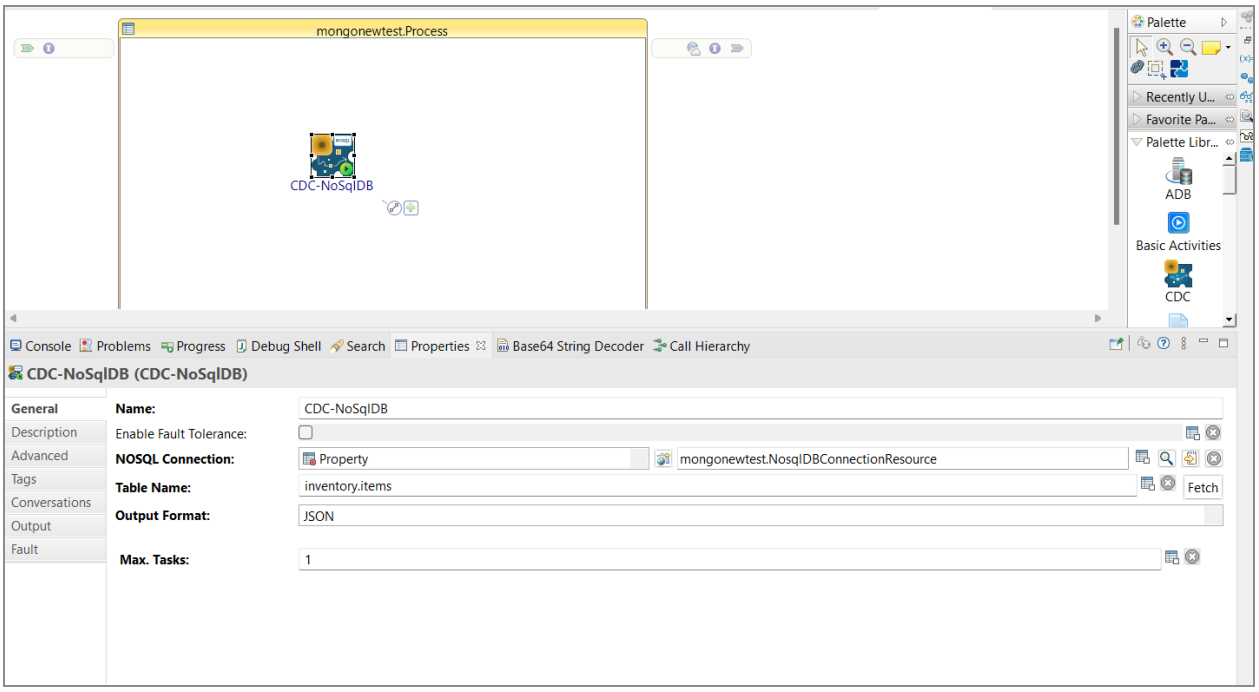
You can use the example `NoSQL_Cassandra.bwp` to understand how the CDC-NoSql-DB Listener Process activity behaves for Apache Cassandra.



Sample Plug-in Project for the CDC-MongoDB Listener Process Activity

The example mentioned in this section for the CDC-NoSql-DB Listener activity can be found in the `CDC_NoSQLDB_Examples.zip` file available in the samples directory of the plug-in.

You can use the example `NoSQL_MongoDB.bwp` to understand how the CDC-NoSql-DB Listener Process activity behaves for MongoDB.



Log Management

When an error occurs, you can check logs to trace and troubleshoot the plug-in exceptions.

A `logback.xml` file is in the `<TIBCO_HOME>\bw\<version_number>\config\design\logback` directory. Update this file to set up log levels and export logs to a file.

By default, error logs are displayed in the Console view when you run a process in debug mode. You can change the log level of the plug-in to trace different messages and export logs to a file. Different log levels correspond to different messages, as described in Log Levels.

Log Levels

Different log levels include different information. The plug-in supports the following log levels.

Property	Description
Trace	Includes all information regarding the running process.
Debug	Indicates a developer-defined tracing message.
Info	Indicates normal plug-in operations. No action is required. A tracing message tagged with Info indicates that a significant processing step is reached, and logged for tracking or auditing purposes. Only info messages preceding a tracking identifier are considered as significant steps.
Warn	Indicates that an abnormal condition occurred. Processing continues, but for best practice, you can contact the administrator to investigate it.
Error	Indicates that an unrecoverable error occurred. Depending on the severity of the error, the plug-in might continue with the next operation or might stop.

Setting Up Log Levels

In the `logback.xml` file, you can configure a different log level for the plug-in and plug-in activities to trace different messages.

If you do not configure any log levels, the plug-in uses the default log level of TIBCO ActiveMatrix BusinessWorks™. The default log level is `Error`.

Procedure

1. Navigate to the `<BW_HOME>\bw\<version_number>\config\design\logback` directory and open the `logback.xml` file.
2. Add the following node in the **BusinessWorks Palette and Activity loggers** area to specify a log level for the plug-in:

   ```
   <logger name="com.tibco.bw.palette.cdc.runtime">
      <level value="DEBUG"/>
   </logger>
   ```

   The value of the level element can be Error, Info, or Debug.

   > **Note:** If you set the log level to Debug, the input and output for the plug-in activities are also displayed in the Console view. For more details about each log level, see Log Levels.

3. Optional: Add different nodes in the **BusinessWorks Palette and Activity loggers** area to specify different log levels for the activities.
   - For the TIBCO ActiveMatrix BusinessWorks™ Plug-in for Change Data Capture Connection shared resource, add the following node:

     ```
     <logger
     name="com.tibco.bw.sharedresource.cdcresource.runtime">
     <level value="DEBUG"/>
     </logger>
     ```

   - For the CDC-SAP Listener activity, add the following node:

     ```
     <logger name="com.tibco.bw.palette.cdc.runtime.saplistener">
     <level value="DEBUG"/>
     ```

```
</logger>
```

- For the CDC-DB Listener activity, add the following node:

```
<logger name="com.tibco.bw.palette.cdc.runtime.dblistener">
<level value="DEBUG"/>
</logger>
```

> **Note:** The activities that are not configured with specific log levels use the log level configured for the plug-in.

4. Save the file.

> **Note:** For Avro Output Format when you set the plug-in logger to `TRACE`, by using additional `com.tibco.bw.palette.cdc.AvroDeserializationOn=true` **Arguments** in the TIBCO Business Studio™ then in logs you can see Deserialized Source or Target Data Avro message.

Exporting Logs to a File

To export plug-in logs to a file, modify the `logback.xml`.

Procedure

1. Navigate to the `<BW_HOME>\bw\<version_number>\config\design\logback` directory and open the `logback.xml` file.
2. Add the following node to specify the file location:

```
<appender name="FILE" class="ch.qos.logback.core.FileAppender">
   <file>c:/.log</file>
      <encoder>
        <pattern>%d{HH:mm:ss.SSS} [%thread] %-5level %logger
{36}-%msg%n</pattern>
      </encoder>
</appender>
```

The `file` tag defines the location to which the log is exported, and the value in the tag is the absolute path of the file.

> **Note:** You also need to add the file name in the file path.

3. To enable exporting the logs to a file, add the following node to the root node at the end of the `logback.xml` file:

```
<appender-ref ref="FILE" />

<root level="DEBUG">
   <appender-ref ref="STDOUT" />
   <appender-ref ref="FILE" />
</root>
```

4. Save the file.

Error Codes

The following table lists error codes, a detailed explanation of each error, and where applicable, ways to resolve different errors.

> ⚠ **Caution:** Code snippets in the PDF can have undesired line breaks because of space constraints. Before directly copying and running them in your program, they must be verified.

TIBCO-BW-PALETTE-CDC Loggers

Role: Trace

Error code and error message	Role	Category	Description	Solution
TIBCO-BW-PALETTE-CDC-100000 `start {0} CDC Activity`	Trace	CDC-DBListener	Includes all information regarding the running process.	None
TIBCO-BW-PALETTE-CDC-100001 `stop {0} of CDC Activity`	Trace	CDC-DBListener	Includes all information regarding the running process.	None
TIBCO-BW-PALETTE-CDC-100002 `Initiate CDC {0} Activity`	Trace	CDC-DBListener	Includes all information regarding the running process.	None
TIBCO-BW-PALETTE-CDC-100003 `Destroy CDC {0} Activity`	Trace	CDC-DBListener	Includes all information regarding the running process.	None

Error code and error message	Role	Category	Description	Solution
TIBCO-BW-PALETTE-CDC-100004 `Event received from DBZ with MessageID:{0} for {1} Activity`	Trace	CDC-DBListener	Includes all information regarding the running process.	None
TIBCO-BW-PALETTE-CDC-100005 `{0} Activity prepared the output and sending to activity output tab for MessageId:{1}`	Trace	CDC-DBListener	Includes all information regarding the running process.	None
TIBCO-BW-PALETTE-CDC-100006 `Deserialized {0} avro message : {1}`	Trace	CDC-DBListener	Includes all information regarding the running process.	None
TIBCO-BW-PALETTE-CDC-100007 `Connection to Oracle done`	Trace	CDC-DBListener	Includes all information regarding the running process.	None
TIBCO-BW-PALETTE-CDC-100008 `Connection to Oracle failed due to {0}`	Trace	CDC-DBListener	Includes all information regarding the running process.	None
TIBCO-BW-PALETTE-CDC-100009 `Current operation is {0}`	Trace	CDC-DBListener	Includes all information regarding the running process.	None
TIBCO-BW-PALETTE-CDC-100010	Trace	CDC-DBListener	Includes all information	None

Error code and error message	Role	Category	Description	Solution
`Current operation data is {0}`			regarding the running process.	
TIBCO-BW-PALETTE-CDC-100011 `The module property, {0} passed the following property values: {1}`	Trace	CDC-DBListener	Includes all information regarding the running process.	None
TIBCO-BW-PALETTE-CDC-100012 `The Process Nullable Columns For Avro is {0}`	Trace	CDC-DBListener	Includes all information regarding the running process.	None
TIBCO-BW-PALETTE-CDC-100013 `The values of DB encryption, trust server certificate and offset flush interval are: {0}, {1} and {2}.`	Trace	CDC-DBListener	The values of DB encryption, trust server certificate and offset flush interval are set to the following values.	None
TIBCO-BW-PALETTE-CDC-100014 `Table {0} is available in {1} DB`	Trace	CDC-DBListener	Table is available in DB.	None
TIBCO-BW-PALETTE-CDC-100015 `Fetching data from ODP source {0}`	Trace	BW-Plug-in	Fetching data from the selected table.	None
TIBCO-BW-PALETTE-CDC-100016 `Fetched data from ODP source {0}, Number of rows: {1}, Elapsed Time: {2} ms.`	Trace	BW-Plug-in	Number of rows fetched from the given table.	None

Error code and error message	Role	Category	Description	Solution
TIBCO-BW-PALETTE-CDC-100017 `Data processing is complete for ODP source {0}, Elapsed Time: {1} ms.`	Trace	BW-Plug-in	Inform about data processing for the ODP source.	None

Role: Debug

Error code and error message	Role	Category	Description	Solution
TIBCO-BW-PALETTE-CDC-200000 `{0}`	Debug	BW-Plug-in	Generic debug message.	None
TIBCO-BW-PALETTE-CDC-200001 `CDC Activity {0} generated output:\n {1}`	Debug	DBListener	Activity output schema.	None
TIBCO-BW-PALETTE-CDC-200002 `Preparing the output schema for {0} Activity.`	Debug	DBListener	Preparing the output schema for activity.	None
TIBCO-BW-PALETTE-CDC-200003 `Returning the ActivityOutput element:{0}.`	Debug	DBListener	Printing activity output element.	None
TIBCO-BW-PALETTE-CDC-200004 `Initializing Debezium Engine`	Debug	DBListener	Debezium engine is initialized with the mentioned table in the configuration.	None

Error code and error message	Role	Category	Description	Solution
`for {0} Listener thread:{1} to listen the data for table: {2}`				
TIBCO-BW-PALETTE-CDC-200005 `Creating Debezium Engine for {0} Listener thread:{1} to listen the data for table: {2}`	Debug	DBListener	Debezium engine is created with the mentioned table in configuration.	None
TIBCO-BW-PALETTE-CDC-200006 `Starting Debezium Engine for {0} Listener thread:{1} to listen the data for table: {2}`	Debug	DBListener	Debezium engine is started with mentioned table in configuration.	None
TIBCO-BW-PALETTE-CDC-200007 `Response received from DBZ:{0}`	Debug	DBListener	Event response received from Debezium engine.	None
TIBCO-BW-PALETTE-CDC-200008 `Data retrieved from DBZ response: {0}`	Debug	DBListener	Data retrieved from Debezium engine.	None
TIBCO-BW-PALETTE-CDC-200009 `Module property {0} is defined but`	Debug	BW-Plug-in	Module property `com.tibco.bw.palette.cdc.enableOutputValidation` is set to false, therefore output validation defaulted to	None

Error code and error message	Role	Category	Description	Solution
`it is set to false hence output validation is defaulted to platform which is set to {1}.`			platform.	
TIBCO-BW-PALETTE-CDC-200010 `Module property {0} is defined and set to to {1}.`	Debug	BW-Plug-in	Module property `com.tibco.bw.palette.cdc.enableOutputValidation` is set to false or true.	None
TIBCO-BW-PALETTE-CDC-200011 `Module property {0} is not defined, so output validation is defaulted to platform which is set to {1}.`	Debug	BW-Plug-in	Module property `com.tibco.bw.palette.cdc.enableOutputValidation` is not defined, therefore output validation defaulted to platform.	None
TIBCO-BW-PALETTE-CDC-200012 `Error encountered while fetching module property {0}, so returning additional properties value {1}.`	Debug	CDC-DBListener	Error occurred while module property `com.tibco.bw.palette.cdc.additionalDbProperties` fetching.	None
TIBCO-BW-PALETTE-CDC-200013 `{0} is set to {1}.`	Debug	CDC-DBListener	Heart beat property set to mentioned value.	None

Error code and error message	Role	Category	Description	Solution
TIBCO-BW-PALETTE-CDC-200014 `Got exception while reading {0} module property. Exception is {1}. Setting {0} to default value {2}.`	Debug	CDC-DBListener	Exception got while reading a module property. Setting to the default value for the module property.	None
TIBCO-BW-PALETTE-CDC-200015 `{0} value is less than {1}. Setting {0} default value to {2}.`	Debug	CDC-DBListener	The given value is less than the minimum threshold value. Therefore setting the value to the minimum threshold value.	None
TIBCO-BW-PALETTE-CDC-200016 `DBListenerHBThread sleeping for interval {0} milliseconds....`	Debug	CDC-DBListener	Heart beat thread is sleeping for mentioned milliseconds.	None
TIBCO-BW-PALETTE-CDC-200017 `DBListenerHBThread is updated now and current captured messageID is {0}`	Debug	CDC-DBListener	Heart beat thread is polling.	None
TIBCO-BW-PALETTE-CDC-200018 `DBListenerHBThread polling....`	Debug	CDC-DBListener	Heart beat thread updated the heat beat table. A new messageID is captured.	None
TIBCO-BW-PALETTE-	Debug	CDC-	The heartbeat thread checks	None

Error code and error message	Role	Category	Description	Solution
CDC-200019 `DBListenerHBThread is updated {0} number of rows`		DBListener	and displays the number of rows updated for the performed operation.	
TIBCO-BW-PALETTE-CDC-200020 `DBListenerHBThread number of attempts decrement to {0}`	Debug	CDC-DBListener	The heartbeat thread attempts to check for a heartbeat.	None
TIBCO-BW-PALETTE-CDC-200023 `Input of activity {0}: {1}`	Debug	BW-Plug-in	Shows the input JSON polled by the Debezium engine.	None
TIBCO-BW-PALETTE-CDC-200024 Output of activity {0}: {1}	Debug	BW-Plug-in	Shows the output schema of the table rows fetched by the Debezium engine.	None

Role: Info

Error code and error message	Role	Category	Description	Solution
TIBCO-BW-PALETTE-CDC-300000 `Starting {0} Listener thread:{1} to listen the data for table:{2}`	Info	CDC-DBListener	Starting a DB listener thread and listening to mentioned tables.	None
TIBCO-BW-PALETTE-CDC-300001 `{0} Listener thread:{1} is stopped, which listening the data for table:{2}`	Info	CDC-DBListener	Stopped DB listener thread and listening to mentioned tables.	None
TIBCO-BW-PALETTE-CDC-300002	Info	CDC-	Mentioned Java	None

Error code and error message	Role	Category	Description	Solution
`Java property {0} is set to {1}`		DBListener	property is set to mentioned value.	
TIBCO-BW-PALETTE-CDC-300003 `Java propertDBListenerHBThread started....}`	Info	CDC-DBListener	Heart beat thread is started.	None
TIBCO-BW-PALETTE-CDC-300004 `DBListenerServiceThread stopping....`	Info	CDC-DBListener	Heart beat thread is stopping.	None
TIBCO-BW-PALETTE-CDC-300005 `DBListenerServiceThread starting....`	Info	CDC-DBListener	Heart beat thread is starting.	None
TIBCO-BW-PALETTE-CDC-300006 `DBListenerServiceThread starting....`	Info	CDC-DBListener	Heat beat thread stopped.	None

Role: Warn

Error code and error message	Role	Category	Description	Solution
TIBCO-BW-PALETTE-CDC-400001 `Error while deserializing avro message : {0}`	Warn	CDC-DBListener	Indicates that an abnormal condition has occurred. Processing continues, however to investigate the issue further, contact the administrator.	Check before and after JSON, also exception from Avro library.
TIBCO-BW-PALETTE-CDC-400002	Warn	CDC-DBListener	Indicates that an abnormal condition has occurred. Processing continues, however	Check before and after JSON, also

Error code and error message	Role	Category	Description	Solution
`Error while serializing avro message : {0}`			to investigate the issue further, contact the administrator.	exception from Avro library.
TIBCO-BW-PALETTE-CDC-400003 `Avro data is empty`	Warn	CDC-DBListener	Error while serializing Avro output format data.	Check before and after JSON, also exception from Avro library.

Role: Error

Error code and error message	Role	Category	Description	Solution
TIBCO-BW-PALETTE-CDC-500001 `Error while parsing the received data and preparing the output tab, error:{0}`	Error	BW-Plug-in	Error while parsing JSON or preparing activity output.	None
TIBCO-BW-PALETTE-CDC-500002 `Exception occurred while creating Debezium Engine : {0}`	Error	BW-Plug-in	Error occurred while initializing the Debezium engine.	Check the configuration of the plug-in.
TIBCO-BW-PALETTE-CDC-500003 `The {0} db is not supported by CDC-DB Listener Activity.`	Error	BW-Plug-in	Unsupported DB details given for DBListener activity.	Check DB configuration.

Error code and error message	Role	Category	Description	Solution
TIBCO-BW-PALETTE-CDC-500004 `The Table name field can't be null or blank in the CDC-DB Listener Activity`	Error	BW-Plug-in	Table name is null or blank.	Give the table name under the DBListener activity General tab.
TIBCO-BW-PALETTE-CDC-500005 `Error while parsing the received data and retrieving the data, error:{0}`	Error	BW-Plug-in	Error while parsing output JSON.	Put the valid table name in the Table Name field.
TIBCO-BW-PALETTE-CDC-500006 `Exception occurred while closing Debezium Engine : {0}`	Error	BW-Plug-in	Error occurred while closing the Debezium engine.	None
TIBCO-BW-PALETTE-CDC-500007 `Exception occurred while handling DB Listener activity : {0}`	Error	BW-Plug-in	Exception occurred while handling DB listener activity.	None
TIBCO-BW-PALETTE-CDC-500008 `Source data is null for changed event, cannot process change request`	Error	BW-Plug-in	Data coming from the Debezium engine is null.	None
TIBCO-BW-PALETTE-CDC-500009	Error	BW-Plug-in	Table is not available in the	Create respective table

Error code and error message	Role	Category	Description	Solution
`Table {0} is not available in {1} DB`			respective DB.	or give permission to access table.
TIBCO-BW-PALETTE-CDC-500010 `Connection to {0} failed due to {1}`	Error	BW-Plug-in	Connection to the database failed due to the issue mentioned.	
TIBCO-BW-PALETTE-CDC-500011 `Issue faced while closing connection with {0} DB; facing issue as {1}`	Error	BW-Plug-in	Issue faced while closing connection with respective DB; facing issue mentioned in error.	Check database admin for more details.
TIBCO-BW-PALETTE-CDC-500012 `DBListenerHBThread interrupted due to {0}`	Error	BW-Plug-in	DBListenerHBThread interrupted due to mentioned error.	None
TIBCO-BW-PALETTE-CDC-500013 `Client Connection not available in the activity {0}`	Error	BW-Plug-in	The CDC shared resource is unavailable.	Verify the activity configuration and make sure that the CDC resource is configured properly.
TIBCO-BW-PALETTE-CDC-500014 `Failed to extract the data from ODP source, due to {0}.`	Error	BW-Plug-in	The data extraction failed.	Check the error message provided and take action accordingly.

Error code and error message	Role	Category	Description	Solution
TIBCO-BW-PALETTE-CDC-500015 `Failed to open the session, Error {0}.`	Error	BW-Plug-in	The session to SAP ODP Source failed to open.	Check the error message provided and take action accordingly.
TIBCO-BW-PALETTE-CDC-500016 `Failed to fetch ODP source, Error {0}.`	Error	BW-Plug-in	The fetch to SAP ODP Source failed.	Check the error message provided and take action accordingly.
TIBCO-BW-PALETTE-CDC-500017 `Failed to close the session, Error {0}.`	Error	BW-Plug-in	The session to SAP ODP Source failed to close.	Check the error message provided and take action accordingly.
TIBCO-BW-PALETTE-CDC-500018 `The SAP trigger event is selected for the activity {0}, however, server connection is not available.`	Error	BW-Plug-in	The server connection is not available for the activity.	Check the error message provided and take action accordingly.
TIBCO-BW-PALETTE-CDC-500019 `The Engine Name field can't be null or blank in the CDC-DB Listener Activity when FT mode is enabled.`	Error	BW-Plug-in	Engine name field is empty when FT mode is enabled.	Provide a Valid engine name.
TIBCO-BW-PALETTE-CDC-500020 `The Offset File Path field can't be null or blank in the CDC-DB Listener`	Error	BW-Plug-in	The file offset path field is empty when FT mode is enabled.	Ensure that the offset path is valid & exist.

Error code and error message	Role	Category	Description	Solution
`Activity when FT mode is enabled.`				
TIBCO-BW-PALETTE-CDC-500021 `The Flush Interval field can't be less than zero in the CDC-DB Listener Activity when FT mode is enabled.`	Error	BW-Plug-in	Provided negative value for flush interval when FT mode is enabled.	Keep the flush interval greater than 0 when FT mode is enabled.
TIBCO-BW-PALETTE-CDC-500022 `The Server ID field can't be less than 10000 in the CDC-DB Listener Activity when FT mode is enabled.`	Error	BW-Plug-in	Server ID field less than 10000 when FT mode is enabled.	Provide a Server ID field value greater than 10000 when FT mode is enabled.
TIBCO-BW-PALETTE-CDC-500023 `The Topic Prefix field can't be null or blank in the CDC-DB Listener Activity when FT mode is enabled.`	Error	BW-Plug-in	Topic prefix field is empty when FT mode is enabled.	Provide the appropriate value for Topic Prefix when FT mode is enabled.
TIBCO-BW-PALETTE-CDC-500024 `The Schema History File Path field can't be null or blank in the CDC-DB Listener Activity when FT mode is enabled.`	Error	BW-Plug-in	The schema history file path field is empty when FT mode is enabled.	Provide appropriate value for schema history file path when FT mode is enabled.
TIBCO-BW-PALETTE-CDC-500025 `The Offset File Path is not available.`	Error	BW-Plug-in	The offset file path is invalid.	Ensure that a valid offset file path is provided.

Error code and error message	Role	Category	Description	Solution
TIBCO-BW-PALETTE-CDC-500026 `The Schema History File Path is not available.`	Error	BW-Plug-in	The schema history file path is invalid.	Ensure that a valid schema history file path is provided.

TIBCO-BW-SR-CDCRESOURCE Loggers

Role: Error

Error code and error message	Role	Category	Description	Solution
TIBCO-BW-SR-CDCRESOURCE-000001 `{0}`	Error	BW-Plug-in	Generic error message	None

Role: Debug

Error code and error message	Role	Category	Description	Solution
TIBCO-BW-SR-CDCRESOURCE-200001 `{0}`	Debug	BW-Plug-in	Generic debug message	None
TIBCO-BW-SR-CDCRESOURCE-200002 `Creating Shared Resource {0}.`	Debug	BW-Plug-in	Generic debug message	None
TIBCO-BW-SR-CDCRESOURCE-200003 `Starting Shared Resource {0}.`	Debug	BW-Plug-in	Generic debug message	None
TIBCO-BW-SR-CDCRESOURCE-200004 `Updating Shared Resource {0}.`	Debug	BW-Plug-in	Generic debug message	None
TIBCO-BW-SR-CDCRESOURCE-	Debug	BW-Plug-in	Generic debug	None

Error code and error message	Role	Category	Description	Solution
200005 `Stopping Shared Resource {0}.`			message	
TIBCO-BW-SR-CDCRESOURCE-200006 `Deleting Shared Resource {0}.`	Debug	BW-Plug-in	Generic debug message	None
TIBCO-BW-SR-CDCRESOURCE-200007 `Properties in the connection string: {0}`	Debug	BW-Plug-in	Generic debug message	None

Role: Info

Error code and error message	Role	Category	Description	Solution
TIBCO-BW-SR-CDCRESOURCE-300001 `{0}`	Info	BW-Plug-in	Generic info message	None
TIBCO-BW-SR-CDCRESOURCE-300002 `Using a dedicated connection`	Info	BW-Plug-in	Generic info message	None
TIBCO-BW-SR-CDCRESOURCE-300003 `Number of connections: {0}`	Info	BW-Plug-in	Generic info message	None
TIBCO-BW-SR-CDCRESOURCE-300004 `Connection {0} State: Available`	Info	BW-Plug-in	Generic info message	None
TIBCO-BW-SR-CDCRESOURCE-300005 `Client connection pool name: {0} updated successfully, connection count={1}`	Info	BW-Plug-in	Generic info message	None
TIBCO-BW-SR-CDCRESOURCE-300006 `Activated timer to check connectivity to R/3 for connection-pool {0}`	Info	BW-Plug-in	Generic info message	None

Error code and error message	Role	Category	Description	Solution
TIBCO-BW-SR-CDCRESOURCE-300007 `Reconnect succeeded on attempt {0} for connection {1}`	Info	BW-Plug-in	Generic info message	None
TIBCO-BW-SR-CDCRESOURCE-300008 `Activating connections associated to connection-pool {0}...`	Info	BW-Plug-in	Generic info message	None
TIBCO-BW-SR-CDCRESOURCE-300009 `Reconnect attempt {0} for connection {1}`	Info	BW-Plug-in	Generic info message	None
TIBCO-BW-SR-CDCRESOURCE-300010 `Connection re-established`	Info	BW-Plug-in	Generic info message	None
TIBCO-BW-SR-CDCRESOURCE-300011 `Connection disconnected`	Info	BW-Plug-in	Generic info message	None
TIBCO-BW-SR-CDCRESOURCE-300012 `Cancelled to reconnect to client connection {0}`	Info	BW-Plug-in	Generic info message	None
TIBCO-BW-SR-CDCRESOURCE-300013 `ABAP Repository refreshed for client connection pool: {0}`	Info	BW-Plug-in	Generic info message	None
TIBCO-BW-SR-CDCRESOURCE-300014 `Start to clean SAP JCo repository {0} with type {1}`	Info	BW-Plug-in	Generic info message	None
TIBCO-BW-SR-CDCRESOURCE-300015 `Removed Function template {0} from SAP JCo Repository {1} with type {2}`	Info	BW-Plug-in	Generic info message	None
TIBCO-BW-SR-CDCRESOURCE-300016 `Finish cleaning SAP JCo repository {0} with type {1}`	Info	BW-Plug-in	Generic debug message	None

Error code and error message	Role	Category	Description	Solution
TIBCO-BW-SR-CDCRESOURCE-300017 `Cleared SAP JCo repository {0} of JCo Destination {1}`	Info	BW-Plug-in	Generic debug message	None
TIBCO-BW-SR-CDCRESOURCE-300018 `Using a load balancing connection`	Info	BW-Plug-in	Generic debug message	None
TIBCO-BW-SR-CDCRESOURCE-300019 `Creating a Server connection`	Info	BW-Plug-in	Generic debug message	None
TIBCO-BW-SR-CDCRESOURCE-300020 `Server connection pool: gatewayHost={0} gatewayService={1} programID={2} updated successfully, connection count={3}`	Info	BW-Plug-in	Generic debug message	None
TIBCO-BW-SR-CDCRESOURCE-300021 `Connection Manager stopped`	Info	BW-Plug-in	Generic debug message	None

Role: Warn

Error code and error message	Role	Category	Description	Solution
TIBCO-BW-SR-CDCRESOURCE-400001 `{0}`	Warn	BW-Plug-in	Generic warning message	None
TIBCO-BW-SR-CDCRESOURCE-400002 `Reconnect failed on attempt {0} for connection {1} will retry in {2} ms`	Warn	BW-Plug-in	Show the status of the reconnection process	None
TIBCO-BW-SR-CDCRESOURCE-400003 `Invalid JCo option(s) found. {0}`	Warn	BW-Plug-in	Show the invalid JCo properties	None

Role: Error

Error code and error message	Role	Category	Description	Solution
TIBCO-BW-SR-CDCRESOURCE-500001 {0}	Error	BW-Plug-in	Generic error message	None
TIBCO-BW-SR-CDCRESOURCE-500002 Creating Shared Resource {0} failed.	Error	BW-Plug-in	Failed to create the shared resource.	Verify the configuration of the shared resource.
TIBCO-BW-SR-CDCRESOURCE-500003 Starting Shared Resource {0} failed.	Error	BW-Plug-in	Failed to start the shared resource.	Verify the configuration of the shared resource and SAP connection.
TIBCO-BW-SR-CDCRESOURCE-500004 Connection Error. Unable to create a connection with the target application {0} using connection parameters {1} and the target application error is {2}	Error	BW-Plug-in	Connection error	Verify the SAP connectivity.
TIBCO-BW-SR-CDCRESOURCE-500005 Client connection pool name: {0} update error: {1}	Error	BW-Plug-in	Connection error	Check the error message provided.
TIBCO-BW-SR-CDCRESOURCE-500006 Connection Error. {0} stopping due to persistent connection errors to the SAP R/3 system(s)	Error	BW-Plug-in	Connection error	None
TIBCO-BW-SR-CDCRESOURCE-500007	Error	BW-Plug-in	Connection error	Check the configuration

Error code and error message	Role	Category	Description	Solution
`Client connection {0} is invalid`				and connectivity.
TIBCO-BW-SR-CDCRESOURCE-500008 `Failed to clean SAP JCo repository {0} of JCo Destination due to {1}`	Error	BW-Plug-in	Failed to stop the shared resource	Check the error message provided.
TIBCO-BW-SR-CDCRESOURCE-500009 `Invalid destination {0} specified`	Error	BW-Plug-in	Connection error	Check the error message provided.
TIBCO-BW-SR-CDCRESOURCE-500010 `Failed to access the field, error: {0}`	Error	BW-Plug-in	The JCo property in question does not exist.	Verify the JCo property in question.
TIBCO-BW-SR-CDCRESOURCE-500011 `Server Error: {0}`	Error	BW-Plug-in	Connection error	Check the error message provided.
TIBCO-BW-SR-CDCRESOURCE-500012 `Server Exception: {0}`	Error	BW-Plug-in	Connection error	Check the error message provided.
TIBCO-BW-SR-CDCRESOURCE-500013 `Server connection pool: {0} suspended due to exceeded attempts to connect to SAP system`	Error	BW-Plug-in	Connection error	Check the SAP connectivity.
TIBCO-BW-SR-CDCRESOURCE-500014 `Server connection {0} is invalid: {1}`	Error	BW-Plug-in	Connection error	Check the error message provided.

Error code and error message	Role	Category	Description	Solution
TIBCO-BW-SR-CDCRESOURCE-500015 `Server connection pool: gatewayHost={0} gatewayService={1} programID={2} update error: {3}`	Error	BW-Plug-in	Connection error	Check the error message provided.

TIBCO-BW-SR-NOSQLRESOURCE Loggers

Role: Error

Error code and error message	Role	Category	Description	Solution
TIBCO-BW-SR-NOSQLRESOURCE-000001 `{0}`	Error	BW-Plug-in	Generic error message	None

Role: Trace

Error code and error message	Role	Category	Description	Solution
TIBCO-BW-SR-NOSQLRESOURCE-100001 `{0}`	Trace	BW-Plug-in	Generic trace message	None

Role: Debug

Error code and error message	Role	Category	Description	Solution
TIBCO-BW-SR-NOSQLRESOURCE-200001 `{0}`	Debug	BW-Plug-in	Generic debug message	None
TIBCO-BW-SR-NOSQLRESOURCE-200002 `Creating Shared Resource {0}.`	Debug	BW-Plug-in	Generic debug message	None

Error code and error message	Role	Category	Description	Solution
TIBCO-BW-SR-NOSQLRESOURCE-200003 `Starting Shared Resource {0}.`	Debug	BW-Plug-in	Generic debug message	None
TIBCO-BW-SR-NOSQLRESOURCE-200004 `Updating Shared Resource {0}.`	Debug	BW-Plug-in	Generic debug message	None
TIBCO-BW-SR-NOSQLRESOURCE-200005 `Stopping Shared Resource {0}.`	Debug	BW-Plug-in	Generic debug message	None
TIBCO-BW-SR-NOSQLRESOURCE-200006 `Deleting Shared Resource {0}.`	Debug	BW-Plug-in	Generic debug message	None

Role: Error

Error code and error message	Role	Category	Description	Solution
TIBCO-BW-SR-NOSQLRESOURCE-500001 `{0}`	Error	BW-Plug-in	Generic error message	None
TIBCO-BW-SR-NOSQLRESOURCE-500002 `Creating Shared Resource {0} failed.`	Error	BW-Plug-in	Failed to create the shared resource	Verify the configuration of the shared resource.

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