WebSphere software

WebSphere Process Server Version 7.0 with Oracle 10g & 11g

Configuring for XA Recovery

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This document is subject to change without notification and will not comprehensively cover the issues encountered in all customer situations.

The information contained in this document has not been submitted to any formal IBM test and is distributed AS IS.

For updates or newer releases please contact the service team.

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We would like to thank the WebSphere Business Process Management test team for their contributions to this document.

Summary of changes

This document is a logical successor of the document *WebSphere Process Server Version 6.2.0 with Oracle 10g & 11g Configuring for XA Recovery* which can be found at

http://www.ibm.com/support/docview.wss?uid=swg27015748

The main differences are:

- This version of the document is related to WebSphere Process Server 7.0.
- Due to changes in the WebSphere Process Server there is no need of changing the JDBC providers and datastore helpers anymore.
- The only Oracle JDBC drivers supported for Websphere Process Server are the Java 1.6 (ojdbc6.jar) drivers from the Oracle 11g database.
- The Oracle 11g Java 1.6 JDBC drivers can be used to access Oracle 11g and 10g databases.

How to read this document

This document describes what needs to be done to modify a the WebSphere Process Server setup (with Oracle as the database) so that it can be used in a production environment.

It assumes that you are familiar with the basic architecture, concepts, installation and configuration of WebSphere Process Server. This document focuses on how to set up a WebSphere Process Environment with Oracle as the database – more specifically, how to set up and configure the environment in a way that ensures transaction safety for business data.

Where applicable, we have provided links to further documentation that provides more detailed information on a topic.

For easy readability, the illustrations in this document are shown as described.

- *Graphical interactions*
  Typical interactions with the system are shown using screenshots. Information on what to enter or which buttons to click will be highlighted as shown below.

Title of the screen

1. Notes and instructions relating to the screenshots are shown in a shaded box.

- ***Interaction via the console***

  Where input from a console is required, it is shown as text in a yellow box. Output from a console is shown in a box with beige background. Important information will be highlighted, as in the example below.

```
Console input (sometimes referred to as command line input)
```

```
Console output
Can consist of  several rows
In  large lists, important aspects are highlighted in this way
```

- ***Listings***

  File contents and lists of parameters are shown as follows. In large lists, highlighting is used to focus on the important aspects.

```
Parameter1 = value1
Parameter2 = value2
Parameter3 = string1
etc
```

- ***Hyperlinks***

  For easy reference, hyperlinks are used and formatted as shown in the following example, which links to the IBM Redbooks homepage:

```
http://www.redbooks.ibm.com/
```

- ***Notices***

  To emphasize information, two types of formatted notices are used:

  Standard notice

  Special notice – used for important information.

Table of Contents

Chapter 1   Introduction

This document describes how to set up and configure WebSphere Process Server 7.0 for distributed transactions (XA) using Oracle as the database product. It describes what is necessary to ensure transactional safety of WebSphere Process Server data, including transaction recovery with Oracle. In addition to the configuration information, this document also describes the required database privileges and the expected results during and after an XA recovery of WebSphere Process Server 7.0.

To provide real-life data, XA recovery was tested for failures occurring during the two-phase commit cycle between Oracle and WebSphere Process Server 7.0. In particular, failures during the prepare and during the commit phase were tested for appropriate recovery.

To ensure that XA recovery behaves as expected in a production environment of WebSphere Process Server using Oracle as database system, it is important to configure the related XA and recovery settings correctly to ensure that no business data get lost in case of an unexpected failure like a sudden power outage.

Why would you need to do this?

WebSphere Application Server provides a test connection service for validating data source configurations including the actual used JDBC provider. This service is intended to verify the general aspects of the connection for example when the credentials have been changed. The WebSphere Process Server does not extend this service and especially XA and recovery related test capabilities are not covered by this service.

Following the information provided in this document you will get a XA and recovery safe production environment.

Note that the WebSphere Process Server configuration and the Oracle database privileges vary depending on which Oracle database version, database patch level, and Oracle JDBC driver version are used. For information on which JDBC drivers support which versions of Oracle database refer to the Oracle JDBC driver FaQ available here:

```
http://www.oracle.com/technology/tech/java/sqlj_jdbc/htdocs/jdbc_faq.html#0
2_02
```

All Oracle JDBC drivers can be downloaded from the Oracle technology network available here.

```
http://www.oracle.com/technology/software/tech/java/sqlj_jdbc/index.html
```

The information in the following chapters is based on the following assumptions:

- You have installed WebSphere Process Server Version 7.0.0.2
  (or a later fixpack of WebSphere Process Server)

- You are using Oracle 10g or 11g for the database

- You have configured either a managed server or a clustered topology of the
  WebSphere Process Server.

- You want to modify this configuration to cater for ensured XA transaction
  recovery.

For more information on any of the above, refer to the publication:

Configuring WebSphere Process Server Version 7.0 in a Clustered Environment
http://www.ibm.com/support/docview.wss?uid=swg27018621

Chapter 2   Oracle drivers and privileges

When creating a WebSphere Process Server profile, you will need to use the Oracle Java 1.6 (ojdbc6.jar) JDBC driver. This is an Oracle 11g JDBC driver and it is the only supported Oracle driver for WebSphere Process Server 7.0. You will use this JDBC driver to connect to the Oracle 11g and the Oracle 10g database.

But having only one supported Oracle JDBC driver makes it easier to setup XA recovery than for example configuring XA recovery for WebSphere Process Server 6.2 because in 7.0 we do not need to change the JDBC providers and the data store helpers in the WebSphere Process Server profile.

The only thing we have to concentrate on are the different Oracle user privileges used for the different Oracle database versions (11g / 10g). This is described in the next chapter.

2.1   Defining Oracle database privileges for XA

This chapter lists and describes all required Oracle database user privileges for WebSphere Process Server 7.0 using an Oracle 10g or 11g database. These privileges are needed in the combinations listed in the next chapter.

There are two possible approaches to assigning these privileges to the WebSphere Process Server database schema users for Oracle:

1. Each involved database schema user needs the Oracle XA privileges.

2. One dedicated database user is used for XA with Oracle being responsible for all schemata in the database. In this case an XA authentication alias needs to be configured. This approach is not described in this document. For detailed information on this topic refer to the following document instead:

Configuring WebSphere Process Server Version 7.0 in a Clustered Environment
http://www.ibm.com/support/docview.wss?uid=swg27018621

The following table lists the required privileges for XA recovery when using an Oracle 10g or 11g database:

Ref.	Privilege	Description
1	CONNECT	Enables a user to connect to the database. Grant this role to any user or application that needs database access. If you create a user using Oracle Enterprise Manager Database Control, this role is automatically granted to the user.
2	RESOURCE	Enables a user to create, modify, and delete certain types of schema objects in the schema associated with that user. Grant this role only to developers and to other users that must create schema objects. This role grants a subset of the create object system privileges. For example, it grants the CREATE TABLE system privilege, but does not grant the CREATE VIEW system privilege. It grants only the following privileges: CREATE CLUSTER, CREATE INDEXTYPE, CREATE OPERATOR, CREATE PROCEDURE, CREATE SEQUENCE, CREATE TABLE, CREATE TRIGGER, CREATE TYPE. In addition, this role grants the UNLIMITED TABLESPACE system privilege, which effectively assigns a space usage quota of UNLIMITED on all tablespaces in which the user creates schema objects.
3	SELECT ON DBA_PENDING_TRANSACTIONS	Information about unresolved global transactions
4	SELECT ON PENDING_TRANS$	List of in-doubt transactions.
5	SELECT ON DBA_2PC_PENDING	Information about distributed transactions awaiting recovery
6	EXECUTE ON DBMS_XA	Used to execute XA recovery action in the Oracle database. This privilege is required if you are using the Oracle 10.2.0.4.0 JDBC driver or higher.
7	EXECUTE ON DBMS_SYSTEM	Used to execute XA recovery action in the Oracle database. This privilege is required if you are using the Oracle 10.2.0.3.0 JDBC driver or lower.

Legend:	
Ref.	Reference number for the Oracle user privilege. Used in the following chapter.
Privilege	The Oracle user privilege on the needed object.
Description	A short description of the Oracle user privilege and the database object.

Chapter 3   Oracle database and driver privilege combinations

This chapter gives an overview of the most common Oracle database and JDBC driver combinations used for WebSphere Process Server.

Note that this document does not cover the Oracle 9i database and JDBC driver, since it is not supported by WebSphere Process Server version 7.0.

The following two tables provide an Oracle database-JDBC driver-database privileges matrix and note whether our tests ran without errors for these combinations or found possible issues with them.

We have used the **Oracle 11.1.0.7.0 Java 1.6 JDBC driver** for all our tests.

Ref.	Oracle database	DB user privileges ref.	Result
M1	11.1.0.6.0	1,2,3,4,5,6	Usable
M2	11.1.0.7.0	1,2,3,4,5,6	Usable
M3	10.2.0.4.0	1,2,3,4,5,6	Usable
M4*	10.2.0.3.0	1,2,3,4,5,7	Usable

Legend:	
Ref.	Reference number for the result matrix entry. Used in the next chapter
Oracle Database	Used Oracle database version
DB user privileges ref.	Reference number of the required privileges for the WPS Oracle database user from the previous chapter
Result	Overall result of the combination

*   While using an Oracle 10.2.0.3.0 or prior database with the Oracle 11.1.0.6.0 or 11.1.0.7.0 Java 1.6 JDBC driver you have to use the SYS.DBMS_SYSTEM package for XA execution. The SYS.DBMS_XA package was introduced by Oracle in the Version 10.2.0.4.0. The Oracle 11g JDBC driver will automatically detect the Oracle database version and use the correct package.

Chapter 4   Detailed recovery results

This chapter details the database-driver-privilege matrix results for the matrix combinations listed in the previous chapter "WPS" denotes the WebSphere Process Server.

Ref.	Detailed results for recovery after WPS server down in two-phase commit *prepare* cycle:
M1 M2 M3 M4	There is no exception thrown. Running processes are rolled back successfully. Stop and restart the server again.

Ref.	Detailed results for recovery after WPS server down in two-phase commit *commit* cycle:
M1 M2 M3 M4	The 5.1 XA Exception is thrown once during server startup. This exception can be ignored. Running processes are committed successfully. Stop and restart the server again.

Legend:	
Ref.	Reference number of the matrix entry from the previous chapter.
Detailed results	Detailed result which might occur during recovery depending on the used database and JDBC driver version.

Chapter 5   Known error messages

This chapter lists the Java exceptions to be found in the SystemOut.log during an XA recovery.

5.1   XA Exception

The following exception can be found in the SystemOut.log when using an Oracle 10g or 11g database.

```
...
00000012 WSRdbXaResour E   DSRA0304E:  XAException occurred. XAException
contents and details are:
The XA Error is             : -4
The XA Error message is     : The XID is not valid.
The Oracle Error code is    : 24756
The Oracle Error message is: Internal XA Error
The cause is                : null.
00000012 WSRdbXaResour E   DSRA0302E:  XAException occurred.  Error code
is: XAER_NOTA (-4).  Exception is: <null>
...
```

Chapter 6 Supporting documents

Oracle JDBC FaQ

http://www.oracle.com/technology/tech/java/sqlj_jdbc/htdocs/jdbc_faq.html#0
2_02

Oracle JDBC driver download

http://www.oracle.com/technology/software/tech/java/sqlj_jdbc/index.html

Configuring WebSphere Process Server Version 7.0 in a Clustered Environment

http://www.ibm.com/support/docview.wss?uid=swg27018621

Oracle privilege JAVAUSERPRIV

http://www.ibm.com/support/docview.wss?uid=swg21377372