Migrating Java Open-Source Application From ORACLE To SAP HANA

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OVERVIEW

The purpose of this document is to guide the process of migrating OLTP systems from a source ORACLE database to a target SAP HANA database. The Java Open-Source mvnForum is used in this guide to simulate the example of an OLTP system on the source ORACLE database.

Pre-requisites for the reader are having basic database knowledge (ORACLE and SAP HANA), basic Java knowledge, administrator rights on the source and target database, and meeting the minimum environment requirements.

(Example of a migration landscape is shown.)

Java Open-Source mvnForum

mvnForum is an open source, easy to setup bulletin board (forum) built on the Java J2EE technology (Jsp/Servlet). mvnForum is compatible with any servlet containers which support Jsp 1.2 and Servlet 2.3. mvnForum is free, open source and released under the terms of the GNU General Public License. It means that you could use it free of charge to build your own discussion communities. More information can be found at [http://www.mvnforum.com/mvnforumweb/index.jsp](http://www.mvnforum.com/mvnforumweb/index.jsp)

Environment Requirements

<table>
<thead>
<tr>
<th>Environment</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAP HANA Server</td>
<td>HANA Server version HANA SP05</td>
</tr>
<tr>
<td>SAP HANA Client</td>
<td>HANA Studio version 1.0.46</td>
</tr>
<tr>
<td>Application Server</td>
<td>Tomcat7</td>
</tr>
<tr>
<td>Java Running Environment</td>
<td>JDK1.6 (JDK1.7 does not work, compile error will be happened.)</td>
</tr>
<tr>
<td>Java IDE</td>
<td>Eclipse EE</td>
</tr>
</tbody>
</table>
PREPARING THE TARGET DATABASE FOR MIGRATION

A database schema shall be constructed in the target SAP HANA database to receive organized data from a source database. In this guide, the source database is ORACLE and the following steps shall refer to procedures that are executed on SAP HANA.

The following steps can still be of reference if a different source is used.

Comparison of ORACLE Database and SAP HANA Database
The following table shows the differences as far as mvnForum is concerned.

<table>
<thead>
<tr>
<th></th>
<th>Source ORACLE Database</th>
<th>Target SAP HANA Database</th>
</tr>
</thead>
<tbody>
<tr>
<td>Database Schema</td>
<td>Database schema is associated to each database user</td>
<td>Database schema is associated to each database instance</td>
</tr>
<tr>
<td>Data Type</td>
<td>LONG VARCHAR</td>
<td>NVARCHAR</td>
</tr>
<tr>
<td>Table Type</td>
<td>Row based</td>
<td>Column and row based</td>
</tr>
<tr>
<td>Sequence</td>
<td>Same sequence grammar</td>
<td>Same sequence grammar</td>
</tr>
<tr>
<td>Trigger</td>
<td>Automatic increment primary key</td>
<td>Does not support automatic increment primary key</td>
</tr>
</tbody>
</table>

Setting Up The Database

The target SAP HANA database schema shall match the source database schema for organized data to be migrated.

For this example, the mvnForum schema from the source ORACLE database shall be created in the target SAP HANA database from the following procedure.

Procedure

1. After the connection is established with the SAP HANA Server, on the Administration Console window enter the SQL statement to create a schema. In this example, a mvnForum schema shall be created.
2. After the schema is created, enter the SQL statement to set it as default.

3. After the schema has been set as default, enter the SQL statement to create a sequence. In this example, a `mvnForum_seq` shall be created. The created sequence is to support the automatic increment primary key from the source ORACLE database.
4. After the sequence has been created, enter the SQL statement to create the following tables found in the source ORACLE database. The declaration of LONG VARCHAR from the source database shall be replaced with NVARCHAR in the target database.

<table>
<thead>
<tr>
<th>Table Name</th>
<th>Table Name</th>
<th>Table Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>mvnForumCategory</td>
<td>mvnForumForum</td>
<td>mvnForumGroupForum</td>
</tr>
<tr>
<td>mvnForumGroupPermission</td>
<td>mvnForumGroups</td>
<td>mvnForumMember</td>
</tr>
<tr>
<td>mvnForumMemberGroup</td>
<td>mvnForumMemberPermission</td>
<td>mvnForumMessageFolder</td>
</tr>
<tr>
<td>mvnForumPost</td>
<td>mvnForumThread</td>
<td>mvnForumWatch</td>
</tr>
<tr>
<td>mvnForumAttachment</td>
<td>mvnForumMemberForum</td>
<td>mvnForumFavoriteThread</td>
</tr>
<tr>
<td>mvnForumRank</td>
<td>mvnForumMessage</td>
<td>mvnForumMessageStatistics</td>
</tr>
<tr>
<td>mvnForumPmAttachement</td>
<td>mvnForumPmAttachMessage</td>
<td></td>
</tr>
</tbody>
</table>

A sequence is required to be created for some table from the source database. Perform step 3 and 4 for all tables from the source database.

5. Refer to Appendix A for an explanation of a trigger on the target SAP HANA database. Theoretically this is required to support the automatic increment primary key, but is not available in the current version.
PREPARING THE APPLICATION SERVER
The Application Server settings shall be modified to access the migrated data for the first time. In this example, a JDBC connection is used as the mvnForum is built on open source Java.

Setup Application Development Environment Procedure
1. Import the mvnForum and myVietnam projects into Eclipse. These projects can be downloaded from (http://www.mvnForum.com/mvnForumWeb/index.jsp?main_idx=2&idx=2).

2. Import the SAP HANA JDBC driver(ngdbc.jar) to mvnForum project.

3. Add the Tomcat7 Application Server into Eclipse Server Perspective.
   - Configuration File: `mvncore.xml`

Modify Application Code In The mvnForum Project

Procedure

1. The JDBC Paging program shall be modified to work around SAP HANA JDBC limitation on paging mechanism. The syntax shall be modified from `resultSet_SCROLL` to 'limit' and 'Offset'.

2. Amending the Java insert code to support the automatic increment primary key function, which is also mentioned in the next chapter for Migrating Data From The Source To The Target Database.
MIGRATING DATA FROM THE SOURCE TO THE TARGET DATABASE

As a work around, the automatic increment of primary key shall be done during the migration of data, specifically when inserting data into the target SAP HANA database.

The following steps are SQL insert statements that populate data into the target database.

**Procedure**

1. On the Administration Console window, enter the SQL statement to insert data into the target database. The seq.nextval shall act as the automatic increment trigger.

Refer to Appendix B sample data for migration.

**Comparison of ORACLE and SAP HANA Insert Statement**

<table>
<thead>
<tr>
<th>Source ORACLE Database</th>
<th>Target SAP HANA Database</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>INSERT INTO mvnforumRank (RankMinPosts, RankLevel, RankTitle, RankImage, RankType, RankOption) VALUES (0, 0, 'Stranger', '', 0, 0);</code></td>
<td><code>INSERT INTO mvnforumRank (RANKID, RankMinPosts, RankLevel, RankTitle, RankImage, RankType, RankOption) VALUES (mvnforumRank_seq.nextval, 0, 0, 'Stranger', '', 0, 0);</code></td>
</tr>
</tbody>
</table>
ACCESSING the migrated DATA ON THE TARGET SAP HANA DATABASE

After successful migration, the migrated data shall be available on your new forum. The following steps are to restart the Tomcat server activating the forum URL.

Procedure
1. Starting the Tomcat server.

2. Checking the URL http://localhost:8080/mvnForum is active.

3. Posting threads on the forum.

4. You have successfully migrated the mvnForum from ORACLE to SAP HANA.
APPENDICES

Appendix A

SAP HANA Trigger Limitation
The SAP HANA trigger should be created to support auto-increment. And the Oracle trigger should be converted to SAP HANA ones as the follow Oracle trigger. The oracle trigger look like:

```
BEGIN
  IF (:new.ForumID IS NULL) THEN
    SELECT mfnforumForum seq.nextval INTO :new.ForumID FROM DUAL;
  END IF;
END;
```

Theoretically we should convert it to SAP HANA trigger like:

```
CREATE TRIGGER mfnforumForum trig_autoincrement
  BEFORE INSERT ON mfnforumForum
  FOR EACH ROW
  BEGIN
    IF (:new.ForumID IS NULL) THEN
      SELECT mfnforumForum seq.nextval INTO :new.ForumID FROM DUAL;
    END IF;
  END;
```

The SAP HANA trigger is not enough strong, so the trigger cannot implement the above trigger to support the Primary ID auto-increment generation. Please reference the URL: http://help.sap.com/hana/html/sql_create_trigger.html as follow:

```
```

So current migration need not the triggers conversion.

Appendix B

SAP HANA Landscape Options:
If you don’t have a HANA server in your company yet, a system in the cloud might be the best option to get started. Check out the SAP Community Network pages for more information.

SAP HANA Developer Center on SCN: http://scn.sap.com/community/developer-center/h