Note: Before using this information and the product it supports, read the information in “Notices” on page v.

First Edition (March 2020)

This edition applies to:
SAP HANA Platform 2.0 SPS4
SAP HANA Dynamic Tiering 2.0 SPS4

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Preface

This IBM® Redpaper publication provides SAP HANA platform migration information and details for successful migration planning to IBM Power Systems servers.

This publication addresses topics for sellers, IT architects, IT specialists, and anyone who wants to migrate and manage SAP workloads on IBM Power Systems servers. Moreover, this guide provides documentation to transfer how-to skills to the technical teams, and it provides solution guidance to the sales team. This publication complements documentation that is available at IBM Knowledge Center, and it aligns with educational materials that are provided by IBM Systems.

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Chapter 1. Introduction to SAP platform migration

This chapter introduces the SAP concepts for SAP system database migration. The terms homogeneous system copy, and heterogeneous system copy are also explained.

Also, this chapter brings a list of possible migrations scenarios for SAP HANA databases on IBM Power Systems, and describes the different SAP migration tools to accomplish each scenario.

The purpose of this publication is to provide an overview of the SAP tools and methods you can use to migrate your source SAP environment to SAP HANA on IBM Power Systems including its prerequisites. For detailed information about the technical step-by-step procedure and preparations, refer to the SAP official documentation at the SAP HANA Help Portal at the following website:

https://help.sap.com

The following sections are described in this chapter:

- Database migration concepts for SAP systems
- Tools and methods provided by SAP for database migration to SAP HANA database on IBM Power Systems
1.1 Database migration concepts for SAP systems

Migrating an SAP system database consists of moving it or copying it from one server host to a different server host by changing or not changing the database type and operating system type.

SAP system databases can be migrated to:

- Another server host with same database and operating system types
- Another server host with same database type and different operating system type
- Another server host with different database type and same operating system type
- Another server host with different database type and different operating system type

In this matter, SAP has two concepts for SAP systems migration: homogeneous system copy and heterogeneous system copy.

1.1.1 Homogeneous system copy concept

Homogeneous system copy consists of moving or copying an SAP system to a new environment with the following considerations:

- Source and target system will use the same operating system (OS) and database system (DB)
- The hardware architecture remains the same, or is a certified successor, where SAP supports homogeneous system copies

For the operating and database systems, the following considerations apply:

- SAP-released combinations of OS and DB versions
- In some cases an OS or DB upgrade might be necessary on the source system before a system copy can be performed

The following are the methods for performing an SAP homogeneous system copy:

- Database export and import using SAP migration tools
- Database backup and recovery using backup tools supported for the database
- Hardware migration and clones using supported tools for the hardware
- Virtual machines copy
Figure 1-1 illustrates the concept of homogeneous system copy.

Figure 1-1  Homogeneous system copy concept

1.1.2 Heterogeneous system copy concept

Heterogeneous system copy consists of moving or copying an SAP system to a new environment, considering that:

- Source and target system will use different operating system (OS) and database system (DB)
- A change in the hardware architecture may be involved

For the operating and database systems, the following considerations apply:

- SAP released combinations of OS and DB versions
- In some cases an OS or DB upgrade might be necessary on the source system before a migration can be performed

In the heterogeneous system copy, the source database is exported to database and operating system platform-independent files. The files are then transferred to the target server host and imported into the target database.
The method for performing an SAP heterogeneous system copy is to first export the database, and then import it using SAP migration tools.

Figure 1-2 illustrates the concept for heterogeneous system copy.

**Figure 1-2  Heterogeneous system copy concept**

1.2 Tools and methods provided by SAP for database migration to SAP HANA database on IBM Power Systems

To carry out any migration of SAP applications (for example, based on SAP NetWeaver) to SAP HANA, or migration of SAP HANA as a source database to SAP HANA as a target database, it is recommended to use appropriate method and tools.

Software Provisioning Manager (SWPM) is a tool that performs software provisioning processes such as system installation, system copy and migration, system rename and dual-stack\(^1\) split (SAP Business Suite system and SAP NetWeaver system). SWPM is delivered with the SAP Software Logistics Toolset. SWPM calls the R3load process at the operating system level for migration of the SAP ABAP stack database objects, and the Jload process for migration of the SAP JAVA stack database objects.

Table 1-1 on page 5 shows possible migration methods and tools, considering various common scenarios.

**Note:** Table 1-1 on page 5 addresses only migration to SAP HANA database on Power Systems as a target operating system only.

\(^1\) Software Provisioning Manager: Dual-stack split case

### Table 1-1  Tools and methods for HANA to HANA migration

<table>
<thead>
<tr>
<th>Source database</th>
<th>Target HANA on IBM Power Systems</th>
<th>SAP application?</th>
<th>Method and tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-HANA database type</td>
<td>SAP HANA 1.0 (BE) SAP HANA 2.0</td>
<td>Yes</td>
<td>- SWPM (R3load and Jload) - DMO</td>
</tr>
<tr>
<td>SAP HANA 1.0 (BE)</td>
<td>SAP HANA 1.0 (BE)</td>
<td>Yes</td>
<td>- SWPM (R3load and Jload) - HANA System Replication - Backup and recovery</td>
</tr>
<tr>
<td>SAP HANA 1.0 (BE)</td>
<td>SAP HANA 1.0 (BE)</td>
<td>No</td>
<td>- HANA System Replication - Backup and recovery</td>
</tr>
<tr>
<td>SAP HANA 1.0 (LE)</td>
<td>SAP HANA 1.0 (BE)</td>
<td>Yes</td>
<td>- SWPM (R3load and Jload)</td>
</tr>
<tr>
<td>SAP HANA 1.0 (BE)</td>
<td>SAP HANA 2.0</td>
<td>Yes</td>
<td>- SWPM (R3load and Jload) - HANA migration tool - Combined SWPM and HANA migration tool</td>
</tr>
<tr>
<td>SAP HANA 1.0 (BE)</td>
<td>SAP HANA 2.0</td>
<td>No</td>
<td>- HANA Migration Tool</td>
</tr>
<tr>
<td>SAP HANA 1.0 (LE)</td>
<td>SAP HANA 2.0</td>
<td>Yes</td>
<td>- SWPM (R3load and Jload) - Backup and recovery - HANA System Replication</td>
</tr>
<tr>
<td>SAP HANA 1.0 (LE)</td>
<td>SAP HANA 2.0</td>
<td>No</td>
<td>- Backup and recovery - HANA System Replication</td>
</tr>
<tr>
<td>SAP HANA 2.0</td>
<td>SAP HANA 2.0</td>
<td>Yes</td>
<td>- SWPM (R3load and Jload) - HANA System Replication - Backup and recovery</td>
</tr>
<tr>
<td>SAP HANA 2.0</td>
<td>SAP HANA 2.0</td>
<td>No</td>
<td>- Backup and recovery - HANA System Replication</td>
</tr>
</tbody>
</table>

HANA migration tool is a toolkit that comes along with the SAP HANA 2.0 installation package for Power Systems. It performs the migration and conversion of all database objects from SAP HANA 1.0 Big Endian for IBM Power Systems to SAP HANA 2.0 Little Endian for Power Systems. Chapter 3, “SAP HANA to SAP HANA on IBM Power Systems migration” on page 17 mentions the procedure for using this tool.

**Note:** Endianness means the order in which a sequence of bytes is stored in the computer memory. For more detailed information about it, refer to [SAP Note 552464 - What is Big Endian or Little Endian? What Endian do I have?](https://launchpad.support.sap.com/#/notes/552464) at the following website: https://launchpad.support.sap.com/#/notes/552464
Database Migration Option (DMO) is a tool integrated in the SAP Software Update Manager tool (SUM). SUM tool is delivered with the SAP Software Logistics Toolset.

HANA System Replication is a SAP HANA Platform feature for replication of one source HANA database to a target HANA database. It is primarily used for disaster recovery and high availability purposes, but can also be used for performing migration of the SAP HANA database.

**Warning:**
- For backup and recovery and HANA System Replication methods, check the SAP Note 1948334 - SAP HANA database Update Paths for SAP HANA Maintenance Revisions at the following website: https://launchpad.support.sap.com/#/notes/1948334. The same path for SAP HANA updates must be followed for backup and recovery and System Replication too.
- Also, check SAP Note 1642148 - FAQ: SAP HANA database Backup & Recovery and SAP Note 1844468 - Homogeneous system copy on SAP HANA for further and relevant information at the following websites: https://launchpad.support.sap.com/#/notes/1642148 https://launchpad.support.sap.com/#/notes/1844468
- Check SAP Note 2188482 - SAP HANA on IBM Power Systems: Allowed Hardware before installing any SAP HANA 1.0 or 2.0 on IBM Power Systems at the following website: https://launchpad.support.sap.com/#/notes/2188482
- Also, take a look in SAP Product Availability Matrix (PAM) for an overall compatibility check (https://apps.support.sap.com/sap/support/pam)
Migration of SAP systems from non-HANA source database to SAP HANA database on IBM Power Systems

This chapter introduces the methods and tools provided by SAP for the migration of SAP systems and applications (for example SAP NetWeaver) from non-HANA source database (Oracle, IBM DB2, Microsoft SQL Server) to SAP HANA database on Power Systems.

The following section is described in this chapter:
- The SAP Software Provisioning Manager tool and the R3load and Jload processes
2.1 The SAP Software Provisioning Manager tool and the R3load and Jload processes

When performing a migration of an SAP application from any other source database to SAP HANA, this means you are carrying out an heterogeneous system copy (refer to 1.1.2, "Heterogeneous system copy concept" on page 3). In this case, it is necessary to work with the appropriate SAP migration tools for performing this migration. This migration consists of exporting the entire database to an database-independent export (dump) files in the source, and then importing it in the target database.

Note: This section does not discuss migration from other database types to SAP HANA. This migration does not apply for SAP/4HANA and BW/4HANA products, as these products run in SAP HANA only.

2.1.1 The SAP Software Provisioning Manager tool

The SAP Software Provisioning Manager is a tool that performs software provisioning processes such as system installation, system copy and migration, system rename and dual-stack splitting. The Software Provisioning Manager is delivered with the SAP Software Logistics Toolset.

Since SAP Software Logistics Toolset 1.0 SPS 23, there are two versions of SAP Software Provisioning Manager available: v1.0 and v2.0.

Version 1.0 supports provisioning scenarios of SAP systems of any supported database type other than SAP HANA. Version 2.0 supports provisioning scenarios of SAP systems on HANA only.

For version 1.0, there are two options: one for SAP systems based on NetWeaver 7.0X and one for SAP systems based on NetWeaver higher than 7.0X (for example, 7.4, 7.5).

Figure 2-1 shows a panel of the Software Provisioning Manager 1.0 for SAP NetWeaver-based systems higher than 7.0X. Note that all SAP Products are available in one tool, comprising the capabilities of SAP Software Logistics Toolset.

Figure 2-1   Software Provisioning Manager Initial window
**Note:** SAP Software Logistic Toolset is a toolbox where SAP delivers all the provisioning, upgrade and update tools together, such as the Software Update Manager and SAP Provisioning Manager (refer to Figure 2-2). In the past, SAP tools have been delivered together with individual product releases, hence the Software Logistic Toolset for that product can only be updated or enhanced along with a new version of the product. SAP now delivers these tools with the Software Logistics Toolset, which is updated several times a year, so you get the latest improvements and updates in time. This way, the tool delivers software logistics tool improvements on a continuous basis, independent from the SAP application product shipments.

For more information, refer to SAP page at the following website:

Software Provisioning Manager window for export and import

Figure 2-3 shows the Software Provisioning Manager for performing a migration using the System Copy option. Note that the options for export from source and importing into target are available.

Figure 2-3   System Copy options in Software Provisioning Manager initial window

2.1.2 The R3load and Jload processes

The R3load and Jload are the core of the migration process. These are called by the Software Provisioning Manager and executed in the background at the operating system level to generate the database-independent export files during the export of the source system, and make the import of the database into the target database (as called by the Software Provisioning Manager from the target side).

R3load performs the export and import of SAP NetWeaver ABAP based products, and Jload performs the export and import of SAP NetWeaver Java based products.

Table 2-1 on page 11 shows the capabilities of R3load and Jload processes.
2.1.3 Advanced migration techniques for Software Provisioning Manager and R3load and Jload

One common problem involving migration of SAP systems is the time taken for the export and import processes. For example, when migrating an SAP system with a large database, it can take a long time for the entire export and import to complete, making it challenging to find a migration window feasible for the enterprise.

In this case, there are options available to speed up the export and import processes as explain this section.

**Parallel export and import**

In a standard migration process, the export of the entire database is carried out first, and then the export files are copied to the target server host. Finally the import process can be started. With the parallel export and import, the migration can be setup so that the import process in the target system is carried out in parallel with the export.

To transfer the export files from the source to the target environment, the tool provides two options: transfer the files using the integrated File Transfer Protocol (FTP) utility or using Network File System (NFS) shares from the source environment to the target environment.

You have to decide between one of these two options based on the latency of your network, and choose one that fits your situation better.

<table>
<thead>
<tr>
<th>R3load process capabilities</th>
<th>Jload process capabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementation is database- and platform-specific</td>
<td>NetWeaver version specific</td>
</tr>
<tr>
<td>Dump format is independent of database and platform</td>
<td>Dump format is independent of database and operating system</td>
</tr>
<tr>
<td>Efficient data compression</td>
<td>Efficient data compression</td>
</tr>
<tr>
<td>Data integrity checked by checksum calculation</td>
<td>Data integrity checked by checksum calculation</td>
</tr>
<tr>
<td>Syntax check of R3load control files</td>
<td>N/A</td>
</tr>
<tr>
<td>Parallel call of multiple R3load processes is common</td>
<td>Multiple Jload processes can run simultaneously</td>
</tr>
<tr>
<td>Restart capable for data export and import</td>
<td>Restart capable for data export and import</td>
</tr>
<tr>
<td>Requires migration key for heterogeneous data import</td>
<td>Exports Java metadata (dictionary definitions) and table data</td>
</tr>
<tr>
<td>Table splitting</td>
<td>Table splitting</td>
</tr>
<tr>
<td>Character set conversion (EBCDIC, Unicode)</td>
<td>N/A</td>
</tr>
</tbody>
</table>
The Parallel Export and Import feature is fully integrated in the Software Provisioning Manager. In the SAP System Database Export for setting up export parameters window, there is the option *Perform Parallel Export and Import* as shown in Figure 2-4.

![Figure 2-4  Parallel Export and Import option in the Software Provisioning Manager tool](image)

Figure 2-4  Parallel Export and Import option in the Software Provisioning Manager tool

Figure 2-5 shows the export files transfer options you can choose: NFS or FTP.

![Figure 2-5  Parallel Export and Import in Software Provisioning Manager tool: Data transfer method](image)
Figure 2-6 illustrates how the parallel export and import works.

![Figure 2-6 Parallel Export and Import illustration](image)

**Table splitting**

Another advanced and useful technique to speed up the migration process is table splitting.

When using the standard configuration for the export process, all tables are exported by one R3load process each. Depending on the size of the table, the export process can take a long time for just that table.

Using the table splitting technique, large tables of the source database can be exported in a number of predefined segments. Hence the table is exported in parallel by several R3load processes, one for each table segment.

A text file needs to be created that defines the splitting criteria of each table to be exported in parallel. Each table is alphabetically defined by name, followed by a % and the number of segments to split the table into. For example, CDCLS%30 will split the table CDCLS into 30 segments.

Software Provisioning Manager then splits the defined tables using the R3ta process from the SAP system kernel. The R3ta process creates text control files for each table that defines the split criteria, which is based on primary key data from the table and is automatically chosen by the R3ta processes. This information is then used by the R3load process to split export the of table into parallel processes.

After the export process starts, one R3load process starts for each split of the table, dramatically speeding up the table export.
In the Software Provisioning Manager **SAP System Split STR Files** window (when splitting tables, this option is used before the export process), select and define the parameters for the splitting tool as shown in Figure 2-7.

![Figure 2-7 Table Splitting options in Software Provisioning Manager](image)

**Database tuning**

Before starting the export process, adjust your source database to improve the export. In the SAP Support Portal ([https://support.sap.com/en/index.html](https://support.sap.com/en/index.html)), you can search for SAP Notes for tuning the source database. For example, if the source database is Oracle, **SAP Note 936441 - Oracle settings for R3load based system copy** ([https://launchpad.support.sap.com/#/notes/936441](https://launchpad.support.sap.com/#/notes/936441)), can be used to apply important recommendations before starting the export.

**Note:** For information of all the prerequisites, necessary preparation activities, and details about migration advanced techniques, refer to the SAP System Copy guide for your SAP system version. Also, refer to the SAP Installation Guide of your SAP system version for detailed information about the Software Provisioning Manager tool. To find these documentation, refer to the Guide Finder for SAP NetWeaver and ABAP Platform at the following website:

2.1.4 Database Migration Option (DMO) tool

DMO is an SAP tool for migration of SAP systems based on SAP NetWeaver to SAP HANA database. DMO stands for Database Migration Option, and it is integrated in the Software Update Manager tool (SUM tool). Therefore, the environment supports a migration to HANA database, SUM gives the option for migration using DMO in phase PREP_INPUT/MIG2NDDB_INI, as shown in Figure 2-8.

![Figure 2-8 DMO option window in the Software Update Manager tool](image)

Because DMO is a component of SUM, it is also part of the Software Logistics Toolset, so it is updated in a regular basis regardless of SAP products releases.

With DMO, you cannot only migrate your SAP System to SAP HANA, but also perform a combined SAP upgrade or Support Package update and migration to SAP HANA, all in one step. As DMO is integrated to SUM tool, it uses all SUM capabilities for the upgrade/update.
Another advantage of the DMO option is that the source system is not altered during the upgrade/update and migration process. All upgrade and update processing is performed in the target system. This will allow for an instant reactivation of the source system if there are any problems or failures during the DMO process. Refer to Figure 2-9 for an overview of the DMO update/upgrade migration process.

![DMO functioning diagram](illustration)

DMO performs the table splitting and most of the preparation steps automatically (for example, generation of the DDL statements with report SMIGR_CREATE_DDL).

When DMO was first released, only the migration of the database to HANA was supported. The application environment had to be migrated manually.

Starting with SUM 1.0 SP20, SAP introduced a new feature for DMO called *DMO with System Move*. With this new feature, you can migrate your entire SAP System using DMO, that is, the database and the SAP application servers.

**Caution:** DMO is not supported for migration from SAP HANA database to SAP HANA database.

For all detailed information about how to work with DMO for migration to SAP HANA database and all necessary preparation activities, refer to the SAP guide *Database Migration Option: Target Database SAP HANA*. It can be found on SAP Help Portal ([https://help.sap.com](https://help.sap.com)). Refer also to the DMO release SAP Note for the version of SUM you are using. For example, for DMO with SUM 2.0 SP07, refer to the following SAP Note: [https://launchpad.support.sap.com/#/notes/2840346](https://launchpad.support.sap.com/#/notes/2840346)
SAP HANA to SAP HANA on IBM Power Systems migration

This chapter covers the methods and tools for the migration of an SAP System on HANA database (for example, based on SAP NetWeaver) and native applications running on HANA database to Power Systems.

The sections described in this chapter are:

- Migration of SAP Systems on HANA database
- Migration of native applications on HANA database
3.1 Migration of SAP Systems on HANA database

If you plan to migrate an SAP System already running on a HANA database to a HANA database on Power Systems, the following tools or methods can be used.

Tools and methods for HANA database source and target running on same endianness\(^1\):

- Software Provisioning Manager (R3load and Jload)
- Backup and recovery
- HANA System Replication

Tools and methods for HANA database source and target running on different endianness:

- Software Provisioning Manager (R3load and Jload)
- HANA Migration Tool and Smart Data Integration or Smart Data Access (SDI / SDA) – only used when migrating from HANA 1.0 on Power Systems to HANA Database 2.0 on Power Systems

Note: Endianness means the order in which a sequence of bytes is stored in the computer memory. For more detailed information about it, refer to SAP Note 552464 - What is Big Endian and Little Endian? What Endian do I have? at the following website:

https://launchpad.support.sap.com/#/notes/552464

3.1.1 Software Provisioning Manager (R3load and Jload)

The SAP Software Provisioning Manager tool can be used to migrate SAP systems running on HANA from the same or different endianess. Refer to section 2.1.1, “The SAP Software Provisioning Manager tool” on page 8 for details on how this tool is used for migration.

3.1.2 Backup and recovery

This section describes the backup and recovery option for SAP system migrations. The following apply when using this method:

- The source and target of the SAP HANA databases must have the same endianness.
- For HANA 1.0, there is no support to take a backup of single container system, and then restore it into a multi-tenant database system. Only a backup from a tenant database system can be utilized to copy into a tenant of another database system.
- The source and target HANA version or revision must follow the path contained in SAP Note 1948334 - SAP HANA Database Update Paths for SAP HANA Maintenance Revisions (https://launchpad.support.sap.com/#/notes/1948334), otherwise the recovery fails.
- If the SAP HANA source database is a multi-node environment, the target HANA database must be multi-node as well (and vice-versa), and must have the same topology (same number of nodes and services, like the indexserver).

Note: HANA 1.0 on Power Systems is only Big Endian. HANA 2.0 on Power Systems is only Little Endian.

The complete procedure for performing this activity for SAP systems running on SAP HANA is described in SAP Note 1844468 - Homogeneous system copy on SAP HANA (https://launchpad.support.sap.com/#/notes/1844468).

\(^1\) Endianness: https://techterms.com/definition/endianness
3.1.3 SAP HANA System Replication

HANA System Replication provides the option to copy and continuously synchronize a HANA database to a secondary location in the same or remote data center. Usually system replication is used to support high availability and disaster recovery, but it can also be used for system copies.

When configuring HANA System Replication (HSR), it first performs an initial synchronization of the entire database from the primary HANA environment (source) to the secondary HANA environment (target), then the continuous replication ensures synchronization until a takeover is made in the secondary environment as shown in Figure 3-1.

The following constraints apply when working with HSR:

- The source and target SAP HANA databases must have the same endianness.
There is no support to perform an HSR from HANA 1.0 single container to HANA 1.0 MDC (multi-tenant database container) tenant database, or even from HANA 1.0 single container to a HANA 2.0 MDC tenant database.

If the source and target HANA version or revision are different, they must follow the path contained in SAP Note 1948334 - SAP HANA Database Update Paths for SAP HANA Maintenance Revisions (https://launchpad.support.sap.com/#/notes/1948334), otherwise the takeover fails.

If the SAP HANA source database is a scale-out environment, the target HANA database must be scale-out and must have the same topology (same number of nodes and services, like the indexserver).

Migration preparation with HANA System Replication
To migrate an SAP system based on SAP NetWeaver on HANA database using HSR, it is necessary to perform an initial installation of a HANA database with the same topology as the source HANA database (single-node, multi-node, number of services), and an initial installation of an SAP system of the same source version in the target environment (SAP NetWeaver 7.X, SAP Business Suite ECC, CRM, and so on).

Configuring the HANA System Replication
After the initial installation is completed, the HSR can be configured. The HSR configuration consists basically on enabling the system replication in the primary (source) HANA system, and registering the secondary (target) HANA system to the primary one.

To enable and register the HANA environments, HANA Studio, HANA Cockpit and HANA command line can be used.

There are a few prerequisites:

- An initial database backup of the primary HANA database must exist. In a HANA MDC environment, the system database and all tenant databases must be backed up
- The log_mode parameter in the primary HANA database must be set to normal. In a HANA MDC environment, this parameter must be normal for all tenant databases
- In HANA 2.0, the PKI SSFS key and data file must be copied from the primary HANA system to the target HANA system, in the same path. The keys location are /usr/sap/<SID>/SYS/global/security/rsecssfs/data/SSFS_<SID>.DAT and /usr/sap/<SID>/SYS/global/security/rsecssfs/key/SSFS_<SID>.KEY
- The primary and secondary HANA systems must have the same SID (system ID)
- The primary and secondary HANA systems must have the same instance number

In the command line, HSR can be enabled in the primary HANA system with the **hdbnsutil** command as `<sid>adm` user, and using the syntax as shown in Example 3-1.

```
Example 3-1  HANA System Replication: Enabling the primary with the hdbnsutil command

hdbnsutil -sr_enable --name=<siteName>
```

Where `<siteName>` = Alias is used to represent your primary system. Assign it as the primary system for system replication.

To check if the system has been successfully enabled for system replication run the command as shown in Example 3-2.

```
Example 3-2  HANA System Replication: Checking if primary is activated

hdbnsutil -sr_state
```
Then, to enable the secondary system, HANA must be stopped, and the command as shown in Example 3-3 on page 21 is used with the `<sid>adm` user.

**Example 3-3  HANA System Replication: Registering secondary system with the hdbnsutil command**

```
hdbnsutil -sr_register --name=<secondarySiteName> --remoteHost=<primary_host>
--remoteInstance=<primary_systemnr>
--replicationMode=[sync|syncmem|async]--operationMode=[delta_datashipping|logreplay]
```

Where:
- `--name` = Alias used to represent the secondary system
- `--remoteHost` = Name of the primary host that the secondary registers with
- `--remoteInstance` = Instance number of primary
- `--replicationMode` = Log replication modes
- `--operationMode` = Log operation mode
- `--online` = If the system is running you can use this parameter to automatically perform a system restart. Not relevant if the system is shut down
- `--force_full_replica` = Use this parameter to initiate a full data shipping. Otherwise a delta data shipping is attempted

Once this command is executed on the secondary system, HANA starts the system replication process synchronizing data from the source system. To check if the system has been successfully registered for system replication run the command as shown in Example 3-4.

**Example 3-4  HANA System Replication: Checking if secondary system is registered**

```
hdbnsutil -sr_state
```

In HANA Studio → Landscape → System Replication, you can see the initial full replica window as shown in Figure 3-2.

![Figure 3-2  HANA System Replication: Initial full replica running](image)

This graphic shows that the replication has started for the indexserver service, which has the database.

After the initial full replica is completed, all the services status change to ACTIVE as shown in Figure 3-3.

![Figure 3-3  HANA System Replication: Replication in active status](image)
When possible, to complete the migration process, the following steps can be done:

- Stop the source SAP system (not the HANA database)
- Perform a takeover on the HANA secondary system
- Start the target SAP system
- Stop the source HANA database

To perform the takeover on the HANA secondary system run the command as shown in Example 3-5.

**Example 3-5  HANA System Replication - Takeover command with hdbnsutil command**

```
hdbnsutil -sr_takeover
```


### 3.1.4 HANA Migration Tool and combining SWPM with the HANA Migration Tool

If you are migrating from SAP HANA 1.0 on Power Systems to SAP HANA 2.0 on Power Systems, the HANA Migration Tool can be used.

HANA Migration Tool was developed to migrate from the Big-Endian mode used in HANA 1.0 for Power Systems to the Little-Endian mode used in HANA 2.0 for Power Systems.

HANA 1.0 for Power Systems was developed with Big-Endian mode only, and SAP HANA 2.0 for Power Systems was developed with Little-Endian only, so it is not possible to use the Backup and Restore or HANA System Replication methods.

The HANA Migration Tool can be used to migrate the entire source Big Endian database to the target little Endian system. But the Migration Tool is not as fast or efficient as the Software Provisioning Manager. Therefore, using the Migration tool by itself can take considerable time if migrating a large sized database.

The migration of a HANA 1.0 database to HANA 2.0 can not be completely done using only the Software Provision Manager. HANA 1.0 has some required schema objects that the SWPM is not able to migrate. Using a combination of both the HANA Migration Tool to move these schema objects and the SWPM to migrate the core database table data together can significantly speed up the migration process when compared to using the Migration Tool alone.
The migration process using the HANA Migration Tool combined with SWPM is shown in Figure 3-4.

![Figure 3-4 HANA migration tools](image)

Refer to the following document and SAP Notes for this procedure at the following website:

- [SAP Note 2802500 - Combined SWPM and HANA Migration Tool Database Migration](https://launchpad.support.sap.com/#/notes/2802500)
- [SAP Note 2537080 - Migrate SAP HANA 1.0 on IBM Power Systems Big-Endian to SAP HANA 2.0 on IBM Power Systems Little-Endian](https://launchpad.support.sap.com/#/notes/2537080)

### 3.2 Migration of native applications on HANA database

When migrating an SAP HANA system without an SAP application platform like SAP NetWeaver, S/4HANA, and BW/4HANA, it is not possible to use the SWPM to migrate the database. This because the tool exports SAP schema objects only which are part of the SAP application platform. Native applications do not have as supported SAP schema that the SWPM tool can migrate. This section describes other SAP tools and methods that can be used to migrate native application from HANA 1.0 to HANA 2.0 on Power Systems.

#### 3.2.1 Migration of HANA database with same endianness for native applications

For migration of SAP HANA with same endianness (Big-Endian to Big-Endian, or Little-Endian to Little-Endian), you can use the already mentioned methods 3.1.2, “Backup and recovery” on page 18 and 3.1.3, “SAP HANA System Replication” on page 19.
3.2.2 Migration of HANA database with different endianness

This case only exists if you have an SAP HANA Database 1.0 on Power Systems as the source database, because it is Big-Endian only, and need to migrate to SAP HANA 2.0 on Power Systems (which is Little-Endian only).

For other scenarios (SAP HANA Database 2.0 on Power Systems or SAP HANA 1.0 on X86 platform as the source database), both source and target will be Little-Endian mode.

Therefore, for this singular case, you have to use the HANA Migration Tool. Refer to the following IBM white paper at the following website:

https://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP102761

And SAP Note 2537080 - Migrate SAP HANA 1.0 on IBM Power Systems Big-Endian to SAP HANA 2.0 on IBM Power Systems Little-Endian at the following website:

https://launchpad.support.sap.com/#/notes/2537080

Note: SAP HANA database Big-Endian was only released on version 1.0 for Power Systems.
Related publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this paper.

IBM Redbooks

The following IBM Redbooks publications provide additional information about the topic in this document. Note that some publications referenced in this list might be available in softcopy only.

- **SAP HANA on IBM Power Systems: High Availability and Disaster Recovery Implementation Updates**, SG24-8432
- **IBM Power Systems Virtualization Operation Management for SAP Applications**, REDP-5579
- **IBM Power Systems Security for SAP Applications**, REDP-5578
- **SAP Landscape Management 3.0 and IBM Power Systems Servers**, REDP-5568

You can search for, view, download or order these documents and other Redbooks, Redpapers, Web Docs, draft and additional materials, at the following website:

[ibm.com/redbooks](http://ibm.com/redbooks)

Online resources

These websites are also relevant as further information sources:

- **SAP Support Portal**
  
- **Software Logistics Tools**
  
- **Guide Finder for SAP NetWeaver and ABAP Platform**
  
- **Welcome to the SAP Help Portal**
  
  [https://help.sap.com](https://help.sap.com)

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