Database Administration Guide | PUBLIC
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Enabling SAP Business Warehouse Systems to Use IBM Db2 for Linux, UNIX, and Windows as Near-Line Storage (NLS)

For SAP Systems Based on SAP BW 7.01 and Higher

THE BEST RUN SAP

Content

1 Introduction

Here you'll learn how to enable an SAP Business Warehouse (SAP BW) system to use IBM Db2 for Linux, UNIX, and Windows as a near-line storage (NLS) database.

> **i** Note
>
> The near-line storage (NLS) technology is available only for SAP BW. You cannot use NLS for other SAP applications such as SAP BW for HANA (BW/4HANA).

Data that needs to be available for further analysis but that is rarely required places a load on your SAP BW system. Near-line storage is a technology that helps you keep your SAP BW database at a manageable size. In contrast to data in classic data archiving, data in a near-line storage system can still be accessed during query processing.

You can use IBM Db2 for Linux, UNIX, and Windows as a database to store NLS data coming from SAP BW. In this guide, we'll tell you how to install and set up IBM Db2 as NLS system.

The NLS system running on Db2 can also be connected to SAP BW systems running on databases other than Db2. In this guide, you'll also learn more details about how to set this up.

Document History

> **⚠** Caution
>
> Before you start the implementation, make sure you have the latest version of this document. You can find the latest version on SAP Help Portal at http://help.sap.com/viewer/db6_nls. If you need a PDF version, use the PDF button on the right of the Web page. For more information about the latest corrections and news after the publication of this guide, see SAP Note 1405664.

The following tables provide an overview of the most important document changes to this guide. Note that this guide is an NLS guide covering all SAP BW releases starting from release 7.0 including enhancement package 1 (SAP BW 7.01 and higher). This guide replaces the previous separate guides that were relevant for SAP BW 7.01/7.02 and for SAP BW 7.3 and higher, respectively.

Document History of Current Document

Version	Date	Description
3.95	2023-12-01	Minor corrections
3.9	2023-08-31	Information about system copy completely revised and updated

Version	Date	Description
3.8	2023-02-20	IBM documentation links updated SAP systems running on IBM Db2 10.1 and lower are out of mainstream maintenance.
3.7	2019-11-05	Minor updates for IBM Db2 for Linux, UNIX, and Windows, version 11.5
3.62	2019-02-12	Information was added to Introduction [page 5] and to Setting Up NLS for SAP BW Running on a Non-Db2 for LUW Database [page 43]
3.61	2018-11-07	Corrected parameters for setting up the DBA Cockpit with non-Db2 databases
3.6	2018-09-13	Updates: • Updated links to SAP Support Portal and SAP Help Portal • Authorizations for DAPs added
3.5	2017-10-16	Updates: • More detailed, updated information about BLU Acceleration • Renaming from DB2 to Db2 • Updated section about system copy • Updated links to SAP Support Portal and SAP Help Portal
3.4	2016-10-28	Updates for: • Monitoring NLS with SAP BW on Non-DB2 for LUW Databases • System copy
3.3	2016-08-15	Minor updates; DB2 version 11.1 added

Version	Date	Description
3.2	2016-05-24	Updates and additions: • Updated and enhanced chapter about system copy • Additional constraint added for dimension tables of InfoCubes (see also SAP Note 2313066) • Release SAP BW 7.5 added • Mandatory minimum DB2 version for NLS with BLU Acceleration: DB2 10.5 FP5SAP2
3.1	2015-07-01	Updates and additions: • Flat InfoCubes and DataStore objects with column-organized tables are now the default for NLS systems running on DB2 10.5 FP4 and higher. • The required minimum support packages for SAP BW 7.01 and 7.02 were added. • Two additional subchapters were added (*Setting Up an Additional Application Server for IBM DB2 for i*; *Setting Up a Detailed Verification of Data Archived to NLS*). • With the correction in SAP Note 2063589, it is also no longer necessary to load InfoCubes back to SAP BW to add columns to an InfoCube table. You can add a table column to the InfoCube in the SAP BW system and re-activate the archiving process.
3.0	2015-03-19	Guide completely revised and updated; NLS guide now covers contents for SAP BW 7.3 and higher and for SAP BW 7.0-based releases

Document History of Previous Guide for SAP NetWeaver 7.3 and Higher

Version	Date	Description
2.02	2014-05-28	Minor update: Correction of navigation path in chapter *Enabling BW Queries to Read NLS Data* **i Note** End of a separate guide for SAP NetWeaver 7.3 and higher: After this version, the guide is merged with the guide for SAP NetWeaver 7.01 and 7.02.
2.01	2014-04-24	Minor update: New tablespace names for NLS tablespaces (chapter *Database Layouts for NLS Objects*)
2.0	2013-12-03	Updated version: Additional information about NLS databases running on IBM DB2 10.5 for Linux, UNIX, and Windows
1.3	2013-05-10	Updated version: Small additions for SAP NetWeaver BW 7.4
1.2	2012-09-05	Updated version: Additional information about NLS databases running on IBM DB2 10.1 for Linux, UNIX, and Windows
1.1	2010-11-21	Updated version: Additional information about deleting archived data from NLS
1.0	2010-11-29	Initial version for SAP NetWeaver BW 7.3 and higher

Document History of Previous Guide for SAP NetWeaver 7.01 and 7.02

Version	Date	Description
2.01	2014-04-24	Minor update: New tablespace names for NLS tablespaces (chapter *Database Layouts for NLS Objects*) **i Note** End of a separate guide for SAP NetWeaver 7.01 and 7.02: After this version, the guide is merged with the guide for SAP NetWeaver 7.3 and higher.
2.0	2013-12-03	Updated version: Additional information about NLS databases running on IBM DB2 10.5 for Linux, UNIX, and Windows
1.2	2012-09-05	Updated version: Additional information about NLS databases running on IBM DB2 10.1 for Linux, UNIX, and Windows
1.1	2010-11-22	Updated version with the GA release of Enhancement Package 2 for SAP NetWeaver 7.0
1.0	2010-02-09	Initial version for SAP NetWeaver BW 7.0 including SAP enhancement package 1 or 2

1.1 Naming Conventions in This Guide

In this guide, the following naming conventions apply:

- Near-line storage is referred to as “NLS”.
- IBM Db2 for Linux, UNIX, and Windows is referred to as “Db2 11.5”, “Db2 11.1”, “Db2 10.5”, “Db2 for LUW”, or “Db2”, depending on the context used.
- SAP Business Warehouse is referred to as “SAP BW”.

Renaming: IBM DB2 for Linux, UNIX, and Windows is now IBM Db2

Some of you might wonder why we spell Db2 with a lowercase 'b' now. IBM has changed the database name from “IBM DB2 for Linux, UNIX, and Windows” to “IBM Db2 for Linux, UNIX, and Windows” or simply “IBM

Db2". In this document, we use "IBM Db2" or "Db2" to refer to the Db2 database, regardless of its version. In older SAP publications, you will also still find the old product name, but in all future documentation, we will gradually use the new term, sometimes extended by "for Linux, UNIX, and Windows" to avoid confusion with other products of the IBM Db2 family, such as IBM Db2 for z/OS or IBM Db2 for i.

Renaming SAP NetWeaver Business Warehouse is now SAP Business Warehouse

SAP Business Warehouse was formerly known as SAP NetWeaver Business Warehouse. Throughout this document, the term "SAP Business Warehouse" and the abbreviation "SAP BW" are used. If you use additional documentation for SAP Business Warehouse on SAP Help Portal, for example, you might also find the former term "SAP NetWeaver Business Warehouse".

1.2 Near-Line Storage: Introduction

One of the challenges that you might face as a database administrator is the increase of data volume during the lifecycle of a database. You can archive old data that is no longer used, but there is often older data that is accessed infrequently, but it's still occasionally used. This is where a near-line storage solution comes into play. Near-line storage is a compromise between keeping the data in the database and archiving it.

You can use near-line storage solutions to reduce your data volume in SAP Business Warehouse (SAP BW). Storing historical data in near-line storage reduces the data volume of InfoProviders; however, the data is still available for BEx queries in SAP BW. You can also access the data archived in near-line storage from the query monitor, and there is no need to load the data back into the SAP BW system.

You already archive data using the Archive Development Kit (ADK) from SAP NetWeaver? You can combine near-line storage with ADK-based archiving. We recommend that you use a combination of near-line storage and ADK-based archiving if you want an extra backup of your data in addition to near-line storage.

You can use IBM Db2 for Linux, UNIX, and Windows as a database to store NLS data coming from SAP BW. Data in the NLS database is accessed using a secondary SAP ABAP connection.

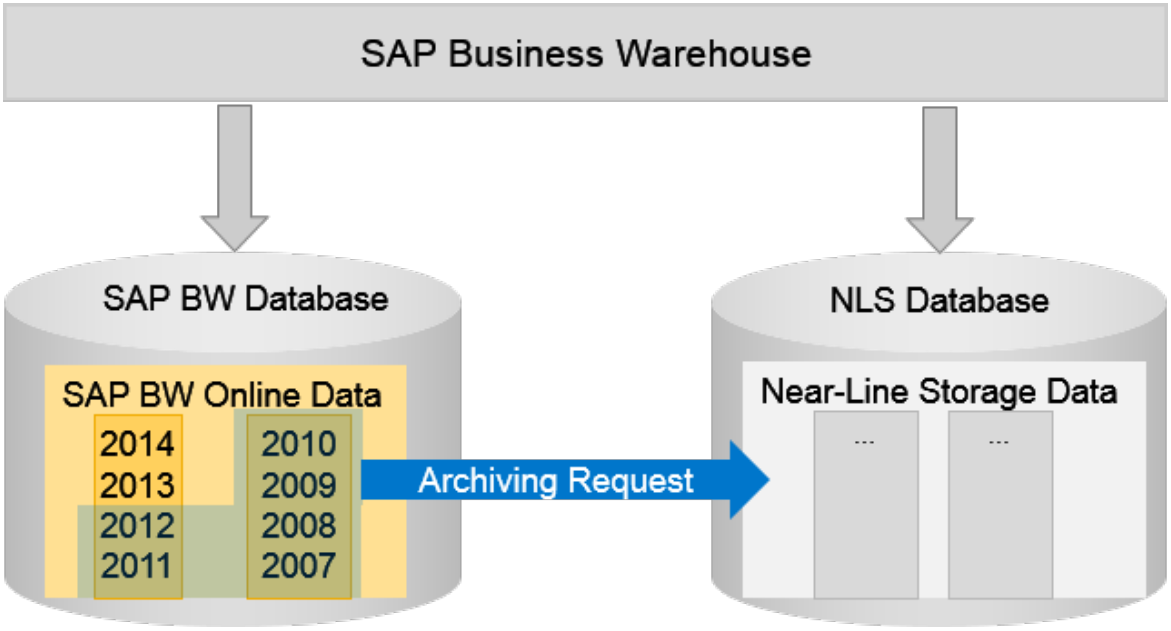
Data Transfer from the SAP BW Database to the NLS Database

Let's guide you through the data transfer from SAP BW to the NLS database.

When data becomes read-only and is rarely used, you can transfer it from the SAP BW database to the NLS database. You transfer data to the NLS database using archiving requests.

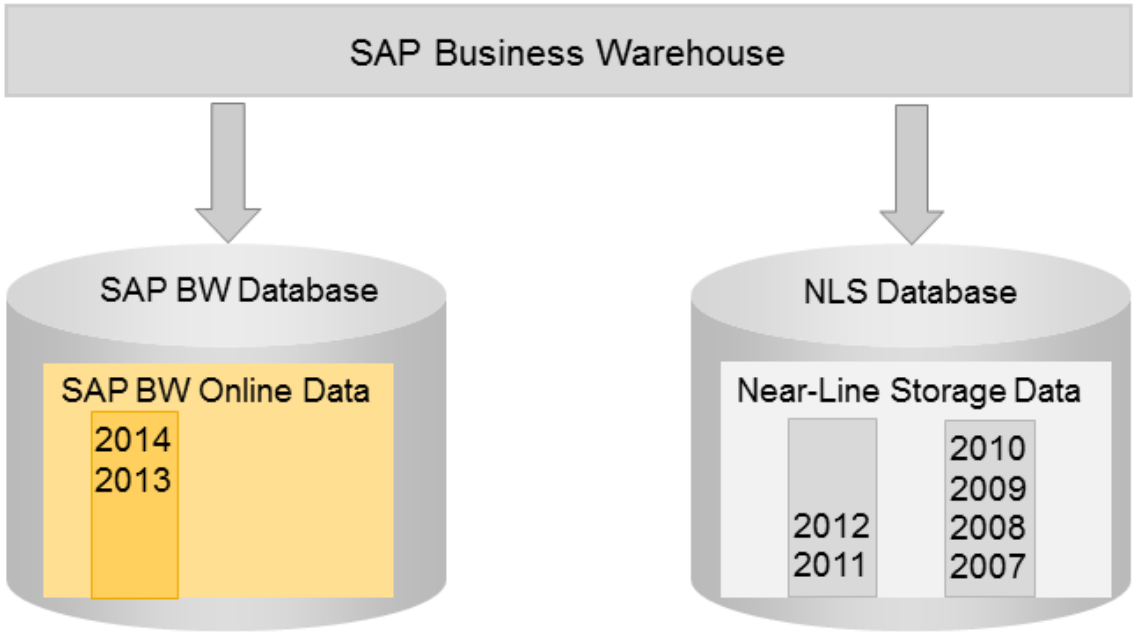
The process steps of the NLS data transfer are as follows:

1. Data is read from the InfoProvider in the SAP BW database into data packages.
2. The data is written to the near-line storage object that corresponds to the InfoProvider in SAP BW.



Transfer of Older Data to NLS Using an Archiving Request

3. To verify the data transfer, the NLS data is compared with the SAP BW data.
4. After a successful data verification, the original data in the SAP BW InfoProvider is deleted from the SAP BW database.

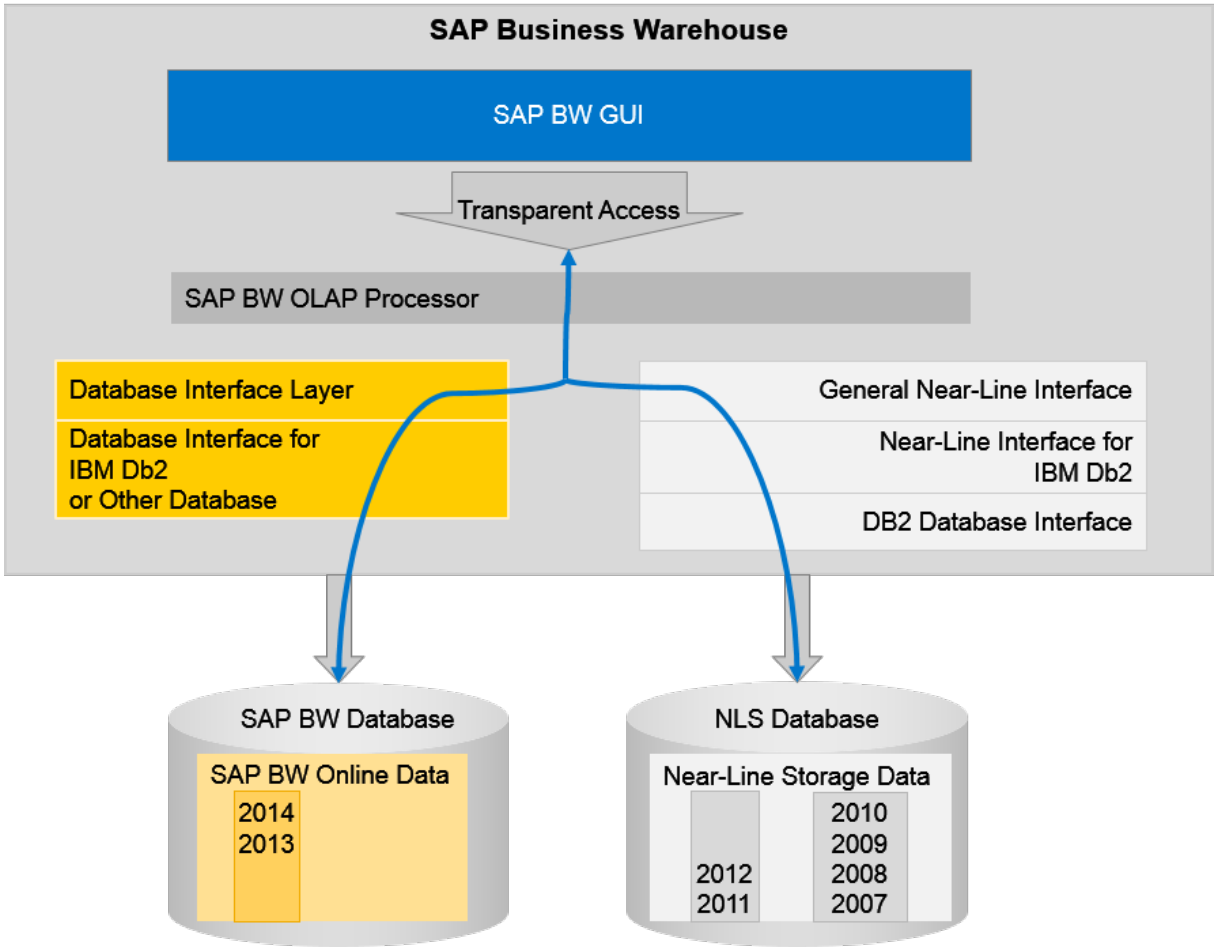


Original Data Deleted from the SAP BW Database After Data Verification

Even after the transfer to the NLS database, data can still be accessed for query processing from SAP BW. However, changes are not possible to data that has been transferred to the NLS database. If you need to make changes to NLS data, you have to reload it back from the NLS database to the SAP BW system.

Data Access During Query Processing

The following figure shows how data is accessed in a system landscape with SAP BW and with IBM Db2 for Linux, UNIX, and Windows as NLS database:



Transparent Access to SAP BW Online Data and NLS Data During Query Processing

Near-line storage data is accessed online using the OLAP processor in SAP BW and the additional near-line storage interface that consists of the following parts:

- A general near-line storage interface, which is database-independent
- A Db2-specific interface, which establishes a database connection to the near-line storage database server and accesses the near-line storage data

When data needs to be extracted from the NLS database, this happens completely transparently for the user. Online access to both SAP BW and NLS data is possible during query processing. The SAP BW OLAP processor splits a query into two parts and sends the parts to the SAP BW database and to the NLS database, which return the relevant data. The SAP BW OLAP processor calculates the final result and returns it to the SAP BW GUI.

1.3 BLU Acceleration (As of Db2 10.5)

BLU Acceleration is a column-organized table format that ensures, among other benefits, better archiving and query performance for NLS. Before you implement a near-line storage (NLS) database, it's crucial that you understand what BLU Acceleration is, when it is enabled automatically, and that you plan your hardware and software accordingly.

What Is BLU Acceleration?

IBM Db2 Version 10.5 for Linux, UNIX, and Windows introduces column-organized tables. Column-organized tables are tables with pages containing column data instead of row data. Column-organized tables support analytic workloads with complex queries that are characterized by multi-table joins, grouping and aggregation, and table scans over a star schema. This new capability is also referred to as “BLU Acceleration”.

Column-organized tables can be used in the NLS database even if the SAP BW database still uses row-organized tables.

Benefits

Benefits of Db2 BLU Acceleration are:

- Faster reporting and analytics
- Automatic compression of column-organized tables and automatic reclamation of free space in the table
- Automatic workload concurrency management
- Better archiving and query performance for NLS

Because of these benefits, we strongly recommend that you use BLU Acceleration for NLS databases, if possible.

BLU Acceleration as Default in NLS Databases

As of IBM Db2 10.5 FP1 and with SAP Notes 2155374 and 2517998, BLU Acceleration is automatically enabled if one of the following applies:

- The `RSADMIN` parameter `DB6_NLS_USE_CDE` is set to `YES`.
- The `RSADMIN` parameter `DB6_NLS_USE_CDE` is not set, and at least one data archiving process already exists in the NLS database where BLU Acceleration is used.
- The `RSADMIN` parameter `DB6_NLS_USE_CDE` is not set, and no data archiving processes exist in the NLS database.

As of IBM Db2 10.5 FP1 and with SAP Note 2155374 **only**, BLU Acceleration is always automatically enabled.

If BLU Acceleration has been automatically enabled, this means that all new NLS InfoCubes and DataStore objects are created as column-organized objects.

> ⚠ Caution
>
> Even though BLU Acceleration is automatically enabled, this doesn't necessarily mean that it's advisable to use it. It might well be that your NLS system does not fulfill the hardware and software requirements for BLU Acceleration. For example, we require that the NLS database runs on Db2 10.5 FP5SAP2 or higher; 10.5 FP1 is not enough for BLU Acceleration. Therefore, check the requirements for BLU Acceleration first before you accept BLU Acceleration as default. If your system doesn't meet the requirements for BLU Acceleration, you must disable BLU Acceleration to avoid possible errors during the data archiving process from SAP BW to the NLS system.
>
> For more information and guidance what to do, see Disabling and Enabling BLU Acceleration as Default Table Layout for New Tables [page 103] and SAP Note 2517998.

Hardware and Software Requirements

NLS databases with BLU Acceleration have additional requirements on hardware and software in comparison to NLS databases with row-organized tables. For more information about the additional prerequisites for BLU Acceleration in NLS databases, see Additional Prerequisites for NLS with BLU Acceleration [page 16].

More Information

For more information about how to set up an NLS system with BLU Acceleration, see Checklist: Installing the NLS Database (With BLU Acceleration) [page 19].

For more information about implementing BLU Acceleration in SAP BW, see the database administration guide *SAP Business Warehouse on IBM Db2 10.5 and Highger for Linux, UNIX, and Windows: Administration Tasks* on SAP Help Portal at https://help.sap.com/viewer/db6_bw.

1.4 Prerequisites and Constraints for NLS

Required Db2 Versions and SAP BW Releases

The NLS solution described in this document is available with the following minimum SAP BW releases and Db2 versions:

- For the NLS database, you need IBM Db2 for Linux, UNIX, and Windows version 9.7 or higher.

  > i Note
  >
  > Db2 for LUW 10.1 and lower are out of mainstream maintenance.
  >
  > We strongly recommend that you use Db2 for LUW 10.5 or higher. As of Db2 10.5, you benefit from major performance improvements with Db2 BLU Acceleration.

- For the SAP BW system, you need one of the following:
  - SAP BW 7.0 including SAP enhancement package 1 and support package 6, with Db2 9.1 or higher
  - SAP BW 7.0 including SAP enhancement package 2 and support package 3, with Db2 9.1 or higher
  - SAP BW 7.3 or higher, with Db2 9.7 or higher

> ⚠ Caution
>
> In addition to these minimum releases and support packages, make sure that you implement SAP Note 2162768 or the support packages mentioned in this SAP Note. This SAP Note is mandatory for SAP BW with NLS. Using NLS without the corrections in this SAP Note might lead to data loss.

Unicode

Only Unicode SAP BW systems are supported.

Constraint: Index Width Limit for Dimension Tables

In the NLS database, InfoCubes with row-organized tables might exceed the limit for index widths.

Background

In Db2, the width of an index is limited to a quarter of the index tablespace page size. In NLS, there is a unified page size of 16K for all tablespaces, so the limit for any index width is 4K in the NLS database. Since indexes for row-organized InfoCubes are created over all columns of a dimension table, the overall index width of a dimension table might exceed the 4K limit, which results in an inconsistent state of the NLS InfoCube: tables and indexes might be created for some dimensions, but not for all when the index limit for one dimension is exceeded.

Recommended Procedure

If you already have InfoCubes with inconsistencies, open a customer incident on BW-SYS-DB-DB6 to get support.

To prevent new inconsistent InfoCubes, implement SAP Note 2313066 or the related support packages listed in the SAP Note. After you have implemented SAP Note 2313066, a new index width check is available. If the index is too wide, the activation of a data archiving process (DAP) after creating or changing an InfoCube aborts with the error message "Index for dimension XXX cannot be created due to size limit". The NLS InfoCube still remains in a consistent state.

If you get the error message saying that index size limit is exceeded, consider one of the following options:

- Use flat NLS InfoCubes (available with BLU Acceleration), which do not have dimensions.
- Reduce the number of Info Objects assigned to one dimension, for example by splitting a large dimension into two smaller dimensions.

> → Recommendation
>
> We strongly recommend that you use flat NLS InfoCubes wherever possible.

Related Information

Data Model of an NLS InfoCube [page 54]

1.5 Additional Prerequisites for NLS with BLU Acceleration

If your NLS system runs with BLU Acceleration, the NLS system and the relevant SAP BW system must meet additional hardware and software prerequisites.

> ⚠ Caution
>
> BLU Acceleration might be automatically enabled for your NLS database (see BLU Acceleration (As of Db2 10.5) [page 13]). In this case, you must check whether your database meets the hardware and software requirements for BLU Acceleration.

Hardware Requirements and Db2 Requirements for the NLS System

Make sure that the NLS database fulfills the following requirements:

- You need IBM Db2 for Linux, UNIX, and Windows version 10.5 FP5SAP2 or higher. Do not use any lower Fix Pack versions.
- Your database server runs on one of the following operating systems:
  - AIX
  - Linux on the X86_64 platform
  - Windows
- You must use Db2 reclaimable storage tablespaces.
- The use of BLU Acceleration is only useful if your database server is well equipped with CPU cores and memory. For more information regarding the required hardware resources for BLU Acceleration, see SAP Note 1819734.

Required Support Packages for SAP Business Warehouse

Make sure that your SAP BW system runs at least on the following support packages:

SAP BW Release	Recommended Support Package	Required Minimum Support Package
7.01 (7.0 EHP1)	15	13
7.02 (7.0 EHP2)	15	13

SAP BW Release	Recommended Support Package	Required Minimum Support Package
7.30	11	8
7.31 (7.3 EHP1)	10	5
7.4	5	2
7.5 and higher	0	0

Required Additional SAP Notes for SAP Business Warehouse

Implement the following BLU-independent corrections on top of the support packages:

SAP Note Number	Description
2045353	DB6: NLS Impl. - Archiving of InfoCubes with dimensions with more than 64 characteristics
1902899	DB6: NLS Impl. - Reduction of commits during archiving
1882230	DB6: NLS Impl. - Correction for Db2 10.5 compression usage

Implement the following SAP Notes for BLU Acceleration on top of the support packages:

SAP Note Number	Description
1834310	DB6: Use of Db2 BLU Acceleration with Db2 Near-Line Storage
2063589	DB6: NLS Impl. - Mandatory corrections for NLS with Db2 10.5 FP4 release

Settings for BLU Acceleration

For NLS databases with BLU Acceleration, you must enable intrapartition parallelism: Set the Db2 database manager configuration parameter `INTRA_PARALLEL` to `YES`.

In addition, settings specific to BLU Acceleration are required, for a complete checklist, see Checklist: Installing the NLS Database (With BLU Acceleration) [page 19].

BLU Acceleration with Parallel Insert

You can run your SAP BW system on IBM Db2 11.5 to benefit from performance improvements that come with parallel insert on flat InfoCubes. If you are using this scenario in SAP BW, please note that you also need to run your NLS system on Db2 11.5. With SAP BW and NLS systems on Db2 11.5, data archiving processes run significantly faster. If you keep the NLS system on Db2 11.1 or lower, however, you might experience negative performance impacts with parallel insert, so we strongly recommend that you upgrade the NLS system to Db2 11.5.

For more information about the required settings for parallel insert in SAP BW, see the database administration guide for SAP Business Warehouse on IBM Db2 for Linux, UNIX, and Windows 10.5 and higher on SAP Help Portal at https://help.sap.com/viewer/db6_bw.

1.6 Supported SAP BW Objects for NLS

The following SAP BW objects are supported for NLS:

- InfoCubes
  - Standard InfoCubes
  - Real-time InfoCubes
  - SAP BW 7.01 and 7.02: For InfoCubes, InfoCube compression is needed before data can be transferred to NLS. Data is transferred to NLS from the E fact table.
  - As of SAP BW 7.3: InfoCube compression is no longer a prerequisite. Data transfer from the F fact table is possible.
  - As of SAP BW 7.4: Flat InfoCubes
- DataStore Objects (DSOs)
  - Standard DataStore objects
  - Write-optimized DataStore objects
  - DataStore objects for direct update
- MultiProvider
  - SAP BW 7.01 and 7.02: Modeling solution for NLS with VirtualProviders is available, supported by an ABAP tool
  - As of SAP BW 7.3: Native support for NLS
- As of SAP BW 7.3: Semantically partitioned InfoCubes and DataStore objects

The following SAP BW objects are **not** supported for NLS:

- Non-cumulative InfoCubes
- InfoSets
- PSA tables

We recommend that you do not use PSA tables to store data in SAP BW for a longer period of time. Instead, use write-optimized DataStore objects. Write-optimized DataStore objects are supported for NLS, which allows you to archive data to NLS when it becomes older and is rarely used.

2 Installing the NLS Database and Setting Up NLS for SAP BW

Here's a section about installing and setting up the NLS database. Use the following checklists to guide you through the entire process.

The checklists are followed by chapters with more detailed descriptions of the individual steps. Note that there are two checklists, one for NLS databases with BLU Acceleration, one for NLS databases without it.

> → Recommendation
>
> As of Db2 10.5 FP5SAP2, we strongly recommend that you use BLU Acceleration.

2.1 Checklist: Installing the NLS Database (With BLU Acceleration)

Use this checklist to install and connect a new Db2 NLS system to your SAP BW database and use BLU Acceleration for NLS.

The following checklist provides you with an overview of the required steps. Use the links in the text to navigate to more detailed documentation for the individual steps.

1. Make sure that your planned NLS database fulfills the hardware and software requirements for NLS and for NLS with BLU Acceleration.
   For more information, see the following:
   - Prerequisites and Constraints for NLS [page 14]
   - Additional Prerequisites for NLS with BLU Acceleration [page 16]
2. Decide on the NLS database layout.
   For more information, see Database Layout of the NLS Database: Recommendations [page 21].
3. Install the Db2 near-line storage system on IBM Db2.
   For more information, see Installing IBM DB2 for Linux, UNIX, and Windows as NLS Database [page 22].
4. Start and activate the NLS database.
   For more information, see Starting and Activating the NLS Database [page 24].
5. In the NLS database, maintain the relevant Db2 parameters and other settings.
   For more information, see the following:
   - DB2 Parameters and Registry Values for NLS Systems [page 24]
   - Setting the Maximum Number of Parallel BLU Queries (BLU Acceleration) [page 25]
6. Upgrade your SAP BW system to the required support packages for using Db2 BLU Acceleration on Db2 near-line storage systems. Implement the required corrections on top of the support packages.
   For more information, see Additional Prerequisites for NLS with BLU Acceleration [page 16].
7. In SAP BW, maintain the relevant settings for NLS.

For more information, see the following:

- Specifying the Maximum Size of NLS Tablespaces [page 27]
- Setting Up the Enhanced Query Lookup in SAP BW [page 28]

8. Set up a connection from the SAP BW system to the NLS database.
   For more information, see Setting Up the Connection to the NLS Database Using the DBA Cockpit [page 29].
9. Create data archiving processes for the InfoProviders.
   For more information, see Creating a Data Archiving Process for an InfoProvider [page 30].
10. Enable SAP BW queries to read NLS data.
    For more information, see the following:
    - Enabling SAP BW Queries to Read NLS Data [page 32]
    - Enabling SAP BW Queries of a MultiProvider to Read NLS Data [page 35]

Result

After these steps, you can archive SAP BW data to NLS.

2.2 Checklist: Installing the NLS Database (Without BLU Acceleration)

You want to connect a new Db2 NLS system to your SAP BW database and store InfoCubes and DataStore objects in NLS in row-organized tables (without BLU Acceleration).

> **i** Note
>
> This checklist is only relevant for NLS installations where BLU Acceleration is not supported, such as all Db2 versions up to and including Db2 10.1. As of Db2 10.5, we recommend that you use BLU Acceleration for NLS. For more information, see Checklist: Installing the NLS Database (With BLU Acceleration, as of Db2 10.5) [page 19].

The following checklist provides you with an overview of the required steps. Use the links in the text to navigate to more detailed documentation for the individual steps.

1. Make sure that your planned NLS database fulfills the hardware and software requirements for NLS.
   For more information, see Prerequisites and Constraints for NLS [page 14].
2. Decide on the NLS database layout.
   For more information, see Database Layout of the NLS Database: Recommendations [page 21].
3. Install the Db2 near-line storage system on IBM Db2.
   For more information, see Installing IBM DB2 for Linux, UNIX, and Windows as NLS Database [page 22].
4. Start and activate the NLS database.
   For more information, see Starting and Activating the NLS Database [page 24].
5. In the NLS database, maintain the relevant Db2 parameters and other settings.
   For more information, see DB2 Parameters and Registry Values for NLS Systems [page 24].

6. In SAP BW, maintain the relevant settings for NLS.
   For more information, see the following:
   - Specifying the Maximum Size of NLS Tablespaces [page 27]
   - Setting Up the Enhanced Query Lookup in SAP BW [page 28]
7. **NLS databases as of Db2 10.5 only**: Even though we do not recommend this, you might want to run the NLS database without BLU Acceleration on Db2 10.5 or higher. If this is the case, you might have to disable BLU Acceleration as the default table layout.
   For more information, see Disabling and Enabling BLU Acceleration as Default Table Layout for New Tables [page 103].
8. Set up a connection from the SAP BW system to the NLS database.
   For more information, see Setting Up the Connection to the NLS Database Using the DBA Cockpit [page 29].
9. Create data archiving processes for the InfoProviders.
   For more information, see Creating a Data Archiving Process for an InfoProvider [page 30].
10. Enable SAP BW queries to read NLS data.
    For more information, see the following:
    - Enabling SAP BW Queries to Read NLS Data [page 32]
    - Enabling SAP BW Queries of a MultiProvider to Read NLS Data [page 35]

Result

After these steps, you can archive SAP BW data to NLS.

2.3 Database Layout of the NLS Database: Recommendations

Intrapartition Parallelism

By default, the software provisioning manager installs the NLS database with a single partition. On a single-partition database, we recommend that you use intrapartition parallelism to speed up the performance of the database. To enable intrapartition parallelism in your NLS database, set the Db2 database manager configuration parameter `INTRA_PARALLEL` to `YES`.

> **i** Note
>
> Intrapartition parallelism is required if you have an NLS database with BLU Acceleration.

Not Recommended: Db2 Data Partitioning Feature

While it is technically possible to use the Db2 database partitioning feature (DPF) for the NLS database, this is **not** a recommended option. We recommend that you use a single-partition database for NLS with intrapartition

parallelism. Note that there is no SAP tool support available if you decide to use DPF for NLS. The options in the software provisioning manager and in the DBA Cockpit to manage DPF database partitions cannot be used with NLS databases.

Not Supported: Db2 PureScale

The Db2 pureScale Feature is **not** supported for NLS.

2.4 Installing IBM Db2 for Linux, UNIX, and Windows as NLS Database

Use

The installation process of the NLS database has been completely integrated in the SAP installation tool, the software provisioning manager, and is similar to the installation of other SAP products. The installation is fast and simple because only the database is created and no content is loaded at the time of installation.

> → Recommendation
>
> We recommend that you always use SAP's standard installation tool, the software provisioning manager.
>
> The **minimal** level of the software provisioning manager supporting the NLS database installation is the SAP NetWeaver 7.02-based version. If you are using an SAP BW 7.0 system with enhancement package 1, you can download the 7.02-based version of the software provisioning manager from SAP Support Portal at http://support.sap.com/sltoolset.

Procedure

1. To install the NLS database, run the SAP installer as described in *Installing a Near-Line Storage Database for an SAP BW* in the installation documentation *Installation Guide – SAP NetWeaver <Release> on <OS>: IBM Db2 for Linux, UNIX, and Windows* that is available on SAP Support Portal at http://support.sap.com/sltoolset.
2. During the dialog mode of the NLS database installation, follow the instructions of the installation wizard. The installer prompts you to specify the following parameters:

Parameter	Description
Database ID (`DBSID`)	Three-letter database identifier of the NLS database

Parameter	Description
Password of database administrator	Enter the password for the database administrator. The default user name for the database administrator user is `db2<dbsid>`, where `<dbsid>` is the three-letter database identifier of your NLS database. The user name cannot be changed.
Database communication port	Required for TCP/IP communication between the NLS database server and the remote Db2 clients **i Note** You can leave this field empty. If you do not enter any value in this field, the installer automatically chooses the port number for you.
Instance memory size	Amount of memory (RAM) used by the Db2 instance running the NLS database. Since the installation tool assumes that there might be other applications running on the same host (for example, another database or an SAP application server), the installer automatically proposes the memory size, which is approximately one third of the overall system memory. However, this is only a proposal. You can optionally adapt this value to improve the performance of your NLS database. If you are installing the NLS database on a dedicated host, you might want to increase the instance memory to approximately 90% of the overall system memory to achieve optimal performance.

Result

The SAP installer performs the following steps:

- It installs the Db2 software on the appropriate server.
- It creates the operating system users and groups.
- It creates a Db2 instance.
- It creates and activates the Db2 database for NLS.

More Information

For more information about the installation of SAP systems and NLS databases, see the *Installation Guide – SAP NetWeaver <Release> on <OS>: IBM Db2 for Linux, UNIX, and Windows* on SAP Support Portal at http://support.sap.com/sltoolset.

2.5 Starting and Activating the NLS Database

Use

After you have started the NLS database, make sure that the NLS database is also active. If you only execute `db2start` for the NLS database and possibly connect to it, then the NLS database will stop after the last disconnect and restart with the next database connect, which leads to unnecessary resource consumption.

Procedure

1. Log on as user `db2<sid>`.

   > **i** Note
   >
   > If you use a user other than `db2<sid>`, your user must have either the role `SAPTOOLS` or `SAPMON`; in addition, the user must be in the group `SYSMON`. For more information, see the document *Role-Based Security Concept for Database Users on IBM DB2 for Linux, UNIX, and Windows* on SAP Community Network at http://scn.sap.com/docs/DOC-22756.

2. Execute the command `db2start`.
3. Execute the command `db2 activate db db<sid>`.

2.6 Db2 Parameters and Registry Values for NLS Systems

General Db2 Parameters

If you use Db2 as NLS database in an SAP environment, make sure that Db2 parameters are correctly set. This includes, for example, settings for the database manager, database configuration, and recommended buffer pool sizes. For more information, see the respective SAP Note for your database version:

Db2 Parameter Notes

Database Version	SAP Note Number
Db2 11.5	2751102
Db2 11.1	2303771
Db2 10.5	1851832
Db2 10.1 (out of mainstream maintenance)	1692571

Database Version	SAP Note Number
Db2 9.7 (out of mainstream maintenance)	1329179

The SAP Notes contain information about Db2 parameter settings in an SAP environment; there are no NLS-specific settings. You must align the Db2 parameters for your NLS database with the BW-related settings, which are indicated as follows:

Marker	Related To
`BI=YES`	General BW-related settings
`CDE=YES`	Settings related to column-organized tables (only relevant for BLU Acceleration)

Additional Settings for BLU Acceleration

The Db2 parameter notes mentioned above also contain a section about BLU Acceleration, which describes settings for intrapartition parallelism, memory settings, and so on. Make sure that you follow the instructions in the Db2 parameter notes if you use BLU Acceleration for your NLS database.

Db2 Registry Variables

As of Db2 10.1, we recommend that you use adaptive compression as the default compression mode for your NLS database. Therefore, in Db2 10.1, you must set the Db2 registry variable `DB2_ROWCOMPMODE_DEFAULT` to `ADAPTIVE`. As of 10.5, this is the default for Db2.

2.7 Setting the Maximum Number of Parallel BLU Queries (BLU Acceleration Only)

Context

For BLU Acceleration, you must set a Db2 threshold for the number of expensive BLU queries that can run in parallel in the database.

Procedure

1. Run the Db2 configuration advisor against the NLS database to determine the following:
   - Recommended maximum number of concurrent queries (<value1>)
   - Minimum number of timerons (time unit in Db2) that the query needs to have to be regarded as “expensive” (<value2>)

   To determine these values, run the following Db2 commands:

   ```
   db2 connect to SID
   ```

   ```
   db2 autoconfigure apply none
   ```

2. In the output of the `autoconfigure` command, scroll to the section with current and recommended values for system WLM objects, as in the following example:

   ```
   Current and Recommended Values for System WLM Objects
   Description                              Current Value       Recommended Value
   ------------------------------------------------------------------------------
    Work Action SYSMAPMANAGEDQUERIES Enabled      = Y                 Y
    Work Action Set SYSDEFAULTUSERWAS Enabled     = Y                 Y
    Work Class SYSMANAGEDQUERIES Timeroncost      = 1.50000E+05       1.50000E+05
    Threshold SYSDEFAULTCONCURRENT Enabled        = Y                 N
    Threshold SYSDEFAULTCONCURRENT Maxvalue       = 11                11
   ```

3. Use the recommended value for `Work Class SYSMANAGEDQUERIES Timeroncost` as `<value1>` and the recommended value for `Threshold SYSDEFAULTCONCURRENT Maxvalue` as `<value2>`.
4. Replace `<value1>` and `<value2>` in the following commands with the recommended values and execute the commands from an SQL script or the Db2 command line:

   ```
   -- create alter commands with recommended values from config advisor
   alter threshold SYSDEFAULTCONCURRENT enable;
   alter threshold SYSDEFAULTCONCURRENT  when CONCURRENTDBCOORDACTIVITIES >
   <value1> AND QUEUEDACTIVITIES UNBOUNDED stop execution;
   alter work action set SYSDEFAULTUSERWAS enable;
   alter work action set SYSDEFAULTUSERWAS alter work action
   SYSMAPMANAGEDQUERIES enable;
   alter work class set SYSDEFAULTUSERWCS alter work class SYSMANAGEDQUERIES FOR
   TIMERONCOST FROM <value2> TO UNBOUNDED;
   ```

2.8 Specifying the Maximum Size of NLS Tablespaces

To avoid that NLS tablespaces become too large, specify the `RSADMIN` parameter `DB6_NLS_TBSP_SIZE_PART`.

Prerequisites

Your SAP BW system has the following minimum support packages:

SAP BW Release	Required Support Package
SAP BW 7.01	13
SAP BW 7.02	13
SAP BW 7.3	8
SAP BW 7.31	5
SAP BW 7.4	2
SAP BW 7.5 and higher	0

If your SAP BW system runs with lower support packages, implement SAP Note 1744756.

Context

The tablespaces for fact tables of InfoCubes and for DataStore objects in the NLS database can become very large after some data has been archived. Large tablespaces are inconvenient to manage. For example, the runtime of Db2 backups can increase with large tablespace sizes.

Therefore, you can specify the maximum tablespace size in GB using the `RSADMIN` parameter `DB6_NLS_TBSP_SIZE_PART`. This parameter limits the total size of the tablespace. If you use DPF, the parameter defines the size of the tablespace for each partition. The initial value for `DB6_NLS_TBSP_SIZE_PART` is 800.

You only need to set the `RSADMIN` parameter if you need a value other than 800 GB. This parameter only has an effect if your SAP BW support package level is at least the required support package level listed under *Prerequisites*.

Procedure

1. For SAP BW systems running on the support packages listed under *Prerequisites*, proceed as follows:
   a. Start the ABAP editor (transaction SE38).
   b. Run program SAP_RSADMIN_MAINTAIN.
   c. To change the maximum size of NLS tablespaces, adapt the parameter DB6_NLS_TBSP_SIZE_PART.
2. For SAP BW systems running on lower support packages, follow the instructions in SAP Note 1744756.

2.9 Setting Up the Enhanced Query Lookup in SAP BW

To improve performance of queries using the enhanced query lookup, set RSADMIN parameter RSDAI_LOOKUP.

Context

The enhanced query lookup in SAP BW uses a dedicated temporary table to store the records for lookup. Using a dedicated temporary table improves the performance of some queries that retrieve data from the NLS database in combination with time-dependent filtering criteria. The NLS interface implementation for IBM Db2 for Linux, UNIX, and Windows can take advantage of this lookup functionality. To activate the use of the enhanced query lookup in your SAP BW system, you need to set the RSADMIN parameter RSDAI_LOOKUP to 3.

Procedure

1. Call the ABAP editor (transaction SE38) to run program SAP_RSADMIN_MAINTAIN.
2. Set the RSADMIN parameter RSDAI_LOOKUP to 3.

   For more information, see SAP Note 1167489. This SAP Note also contains detailed information about all available values for this parameter as well as the behavior of the NLS solution for each of the values.

2.10 Setting Up the Connection to the NLS Database Using the DBA Cockpit

Use

To set up a connection from the SAP BW system to the Db2 NLS database, you can use the NLS-specific extension of the DBA Cockpit. To set up this connection, you require the following information that is specified during the installation of the NLS database:

- Remote database name
- Remote database host name
- Remote communication port

> **i Note**
>
> When you set up a connection from the SAP BW system to the Db2 NLS database, make sure that you use a connection name such as `myNLS` that does not contain a system name. This way you ensure that you can keep a meaningful connection name after a system copy.

Prerequisites

Use this procedure if your SAP BW system is running on the Db2 database. If your BW system is running on a different database platform, follow the instructions in Enabling Db2 as NLS Database with an SAP BW System Running on a Non-Db2 Database [page 43].

For the NLS connection, you need a connect user with `SYSCTRL` authority on the NLS database.

Procedure

1. In your SAP BW system, call the DBA Cockpit (transaction `DBACOCKPIT`).
2. In the SAP GUI navigation frame or on the *Database* tab page of the DBA Cockpit, choose *BW Administration* > *NLS Configuration*.

   > **i Note**
   >
   > Make sure that you use **the NLS Configuration screen**, not the *Database Connection* screen. The configuration data for the NLS connection is only created if you are using the *NLS Configuration* screen.

3. Create the NLS connection.

More Information

Section *Configuration of the Connection to the NLS Database* in the documentation *Database Administration Using the DBA Cockpit: IBM Db2 for Linux, UNIX, and Windows* on SAP Help Portal at https://help.sap.com/viewer/db6_dbacockpit

2.11 Creating a Data Archiving Process for an InfoProvider

Before you can archive data to the NLS database, you have to enable the InfoProvider (the InfoCube or DataStore object) to use IBM Db2 for Linux, UNIX, and Windows as NLS database. You enable an InfoProvider to use Db2 as NLS database by creating a data archiving process (DAP) for the InfoProvider.

Prerequisites

You have the authorizations to activate the DDIC definitions of tables.

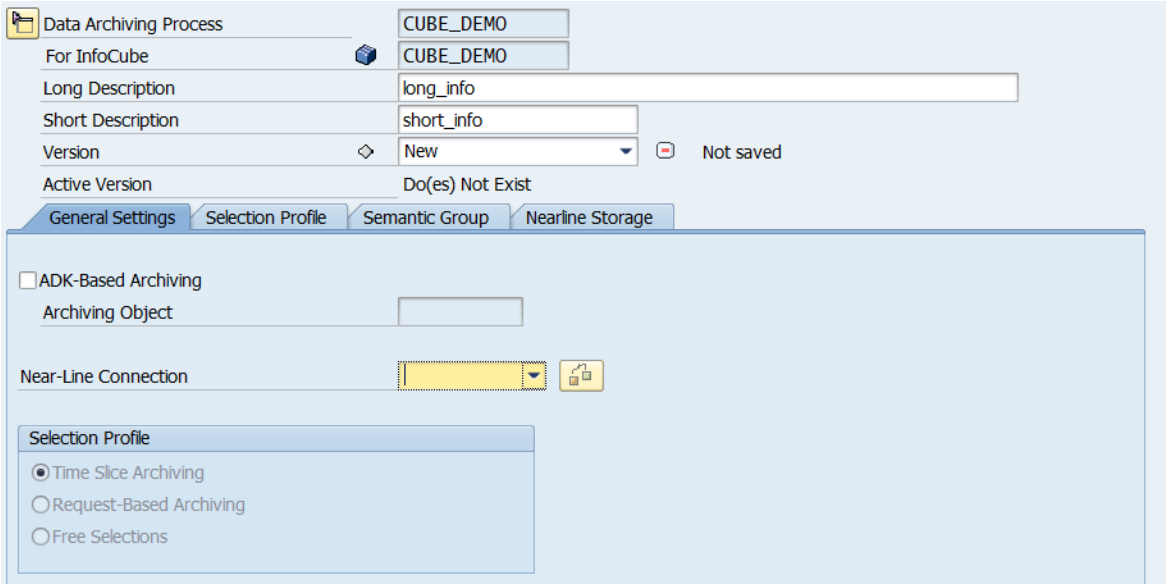
Context

The data archiving process is the central object used by the SAP system during archiving. When you define a data archiving process, you specify whether you want to use classic ADK archiving, near-line storage, or a mix of both solutions. In addition, you can specify settings for archiving requests such as the granularity of the archiving time slices or archiving of uncompressed data.

> ⚠ Caution
>
> During DAP creation, do not define semantic groups. This can lead to performance issues or even errors during archiving.

Procedure

1. In your SAP BW system, call the Data Warehousing Workbench (transaction RSA1).
2. Choose the required InfoProvider and choose *Create Data Archiving Process* from the context menu. The screen *Change Data Archiving Process* appears.



Change Data Archiving Process Screen

3. On the tab page *General Settings*, perform the following steps:
   - In the field *Long Description*, enter the long text for the DAP description.
   - In the field *Short Description*, enter the short text for the DAP description.
   - If you do not use ADK-based archiving, make sure that the checkbox *ADK-Based Archiving* is unselected. ADK is used for traditional SAP BW data archiving.
   - In the field *Nearline Connection*, enter the name of the connection to the NLS database (see also Setting Up the Connection to the Near-Line Storage Database [page 29]).

> **i Note**
>
> If you are creating a DAP for a write-optimized DataStore object, you can only choose *Request-Based Archiving* in the group box *Selection Profile* (instead of *Time Slice Archiving*).
>
> For write-optimized DataStore objects, only complete requests can be archived. If you do not select at least one complete request with the selected time slice condition during the actual archiving, no data is archived.

4. If you want to further customize the DAP, you can optionally perform the following steps on the *Selection Profile* tab page:
   - In the field *Characteristic for Time Slices*, choose the required level of time granularity from the dropdown list. For example, if you select `0CALMONTH`, you can archive data only as complete months.
   - In the group box *Additional Partitioning Characteristics*, define the required additional characteristics. That is, if you define values here, you can set additional restrictions during the data archiving process (for example, *0CALDAY < 01.01.2000 AND 0SALESORG = EUROPE*).

> **i Note**
>
> **SAP BW 7.3 and higher only:**
>
> If you want to create a DAP for an InfoCube and you want to allow archiving of uncompressed requests to the NLS database, you must choose the checkbox *Allow Archiving of Non-Compressed Data* on the *Selection Profile* tab page.

5. Save and activate the DAP.
   The dialog box *Log Display* appears displaying the detailed status information about the created DAP for your InfoProvider.

   > **i Note**
   >
   > If you encounter an error during the activation or re-activation of a data archiving process, check whether your user has the authorizations to activate the DDIC definitions of tables.

Result

After you have successfully activated the DAP, the appropriate NLS tables and, if required, the tablespaces are created in the NLS tablespace. You can now archive data from this InfoProvider to the NLS database.

More Information

For more information about data archiving processes, see the SAP Library for SAP BW on SAP Help Portal at http://help.sap.com/netweaver *SAP Business Warehouse* `<Your SAP BW release>` `<Business Warehouse/Intelligence>` - *Function-Oriented View* *Data Warehousing* *Data Warehouse Management* *Information Lifecycle Management* *Data Archiving Process*.

2.12 Enabling SAP BW Queries to Read NLS Data

Use

SAP BW reporting tools can transparently access data in the NLS database the same way as they access regular data in the BW database. That is, SAP BW users cannot see a difference if data for the SAP BW query is being read from the BW database or from the NLS database. To be able to use data from the NLS database, you need to enable the SAP BW queries to also read NLS data.

After you have enabled SAP BW queries to read NLS data, the SAP BW OLAP processor connects to both the NLS database and the BW database and reads data that corresponds to the query restrictions. The NLS data is also read if queries are executed using external tools, for example, the Business Explorer (BEx).

Depending on your SAP BW release, the following tools and transactions are available to enable SAP BW queries to read data:

Tool or transaction	Description	Available
DBA Cockpit (transaction `DBACOCKPIT`)	You can enable the queries of an InfoProvider for NLS.	As of SAP BW 7.01
Data Warehousing Workbench (transaction `RSA1`)	You can enable the queries of an InfoProvider or a MultiProvider for NLS.	As of SAP BW 7.3
Transaction `RSRT`	You can enable a **single** query for NLS.	SAP BW 7.01 and 7.02 only
BEx query monitor	You can enable a **single** query for NLS.	As of SAP BW 7.3

As a standard, we recommend that you use the DBA Cockpit or the Data Warehousing Workbench. In addition to these tools, you can also use transaction `RSRT` or the BEx query monitor to enable single queries for NLS. This is relevant if you usually only query productive data from the SAP BW system without accessing NLS data, but you want to include NLS data for a specific report.

Procedure

Enabling all SAP BW Queries of an InfoProvider to Read NLS Data Using the DBA Cockpit

1. In your SAP BW system, call the DBA Cockpit (transaction `DBACOCKPIT`).
2. On the *Database* tab page of the Web UI or in the SAP GUI navigation frame, choose *BW Administration* > *NLS Overview*.
3. To enable the NLS access for an InfoProvider, choose the *Enable Queries* pushbutton.

Enabling all SAP BW Queries of an InfoProvider to Read NLS Data Using the Data Warehousing Workbench

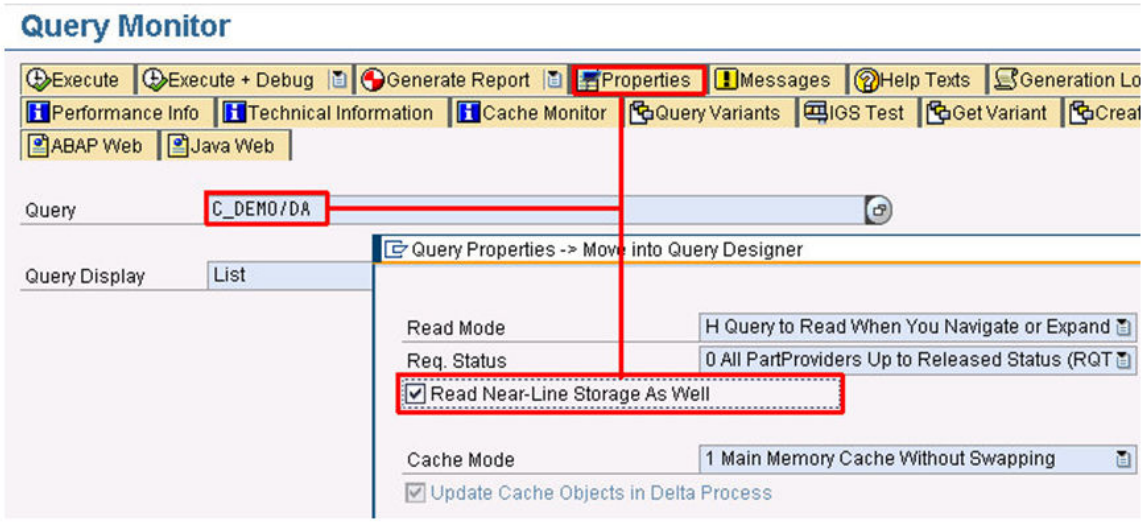
1. In your SAP BW system, call the Data Warehousing Workbench (transaction `RSA1`).
2. Select the relevant InfoProvider and choose *Display* from the context menu.
   The *Display* `<InfoProvider>` screen appears (where `<InfoProvider>` can be, for example, an InfoCube or a DataStore Object).
3. From the menu, choose *Extras* > *InfoProvider Properties* > *Change*.
4. On the *InfoProvider: Edit Properties* screen, choose *X Near-Line Access Switched On* from the dropdown list of the *NLS Storage* field.
   If you want to disable the queries of an InfoProvider to read data from the NLS database, choose *Near-Line Access Switched Off (Default)*.
5. If the InfoProvider is a MultiProvider, the value *P Near-Line Access Set the Same as for PartProvider* is additionally available in the dropdown list. To activate native NLS support for MultiProviders, choose *P Near-Line Access Set the Same as for PartProvider*. Make sure that the queries of the InfoProviders that are contained in the MultiProvider are also enabled to read data from the NLS database.

> **Note**
>
> For SAP BW 7.0 with enhancement package 1 or 2, there is no native NLS support for MultiProviders, but you can enable queries for MultiProviders using VirtualProviders (see Enabling SAP BW Queries of a MultiProvider to Read NLS Data [page 35]).

6. Save your changes.
   All queries of this InfoProvider are now enabled to read data from the NLS database.

Enabling a Single SAP BW Query to Read NLS Data Using Transaction RSRT

1. In your BW system, call transaction **RSRT**.
   The *Query Monitor* screen appears.
2. On the *Query Monitor* screen, enter the name of the BW query in the *Query* field and choose the *Properties* pushbutton.
   The ▶ *Query Properties* ▶ *Move into Query Designer* ▶ dialog box appears.
3. Select the checkbox *Read Near-Line Storage As Well*.



Query Monitor

> **Note**
>
> Once the checkbox *Read Near-Line Storage As Well* is selected, the BW query permanently keeps this status until you actively disable it again.

4. To confirm your selection, choose *Enter*.

Enabling a Single SAP BW Query for NLS Using the BEx Query Monitor

Enable a single SAP BW query for NLS using the BEx query monitor as described in section *Read Stored Data* in the SAP Library for SAP Business Warehouse at http://help.sap.com.

More Information

For more information about enabling SAP BW queries for NLS using the DBA Cockpit, see chapter *Overview of the NLS Database* in the document *Database Administration Using the DBA Cockpit: IBM Db2 for Linux, UNIX, and Windows* on SAP Help Portal at https://help.sap.com/viewer/db6_dbacockpit.

2.13 Enabling SAP BW Queries of a MultiProvider to Read NLS Data

> **i** Note
>
> This section is only relevant if you run your SAP BW system on SAP BW 7.0 with enhancement package 1 or 2. As of SAP BW 7.3, you can enable SAP BW queries of MultiProviders to read NLS data more easily in the Data Warehousing Workbench (see Enabling SAP BW Queries to Read NLS Data [page 32]).

To enable NLS support in MultiProviders for SAP BW 7.0 including enhancement package 1 or 2, you cannot use the Data Warehousing Workbench. Instead, you need to extend the MultiProviders with VirtualProviders.

VirtualProviders are objects in SAP BW that allow you to access transactional data directly in SAP systems. VirtualProviders can be based on DataSources or on InfoProviders. From a structural point of view, VirtualProviders look like InfoCubes with their star schemas, but the data being queried resides on a remote system. With VirtualProviders, you can also access data that is stored in an NLS database from an SAP BW system. This is a workaround for SAP BW 7.0 systems where you cannot enable NLS for MultiProviders directly.

To enable NLS for MultiProviders using VirtualProviders, you can use one of the following options:

- One VirtualProvider for all InfoProviders with an NLS data archiving process (DAP) in a single MultiProvider
  This approach requires minimal modeling effort. However, note that using this approach can have an impact on the performance of MultiProvider queries that read data from NLS database.
- As many VirtualProviders as there are InfoProviders with an NLS data archiving process (DAP)
  This approach requires a higher modeling effort, although it provides faster performance due to parallel data access.

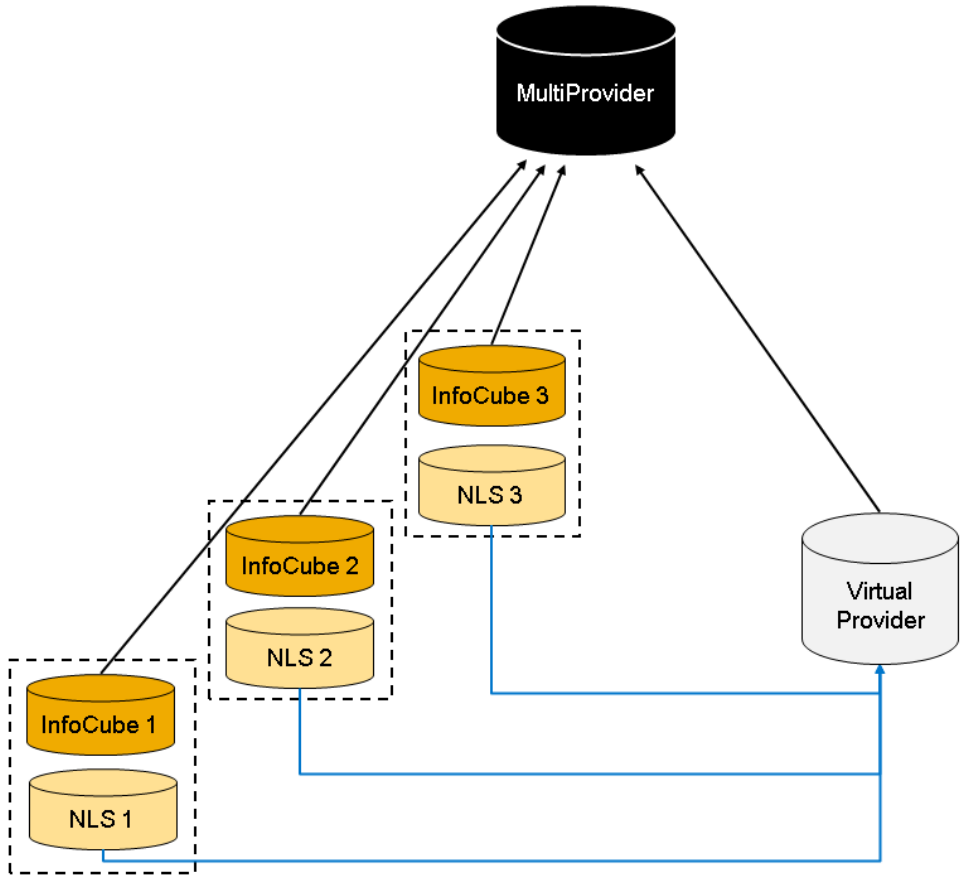
  > **i** Note
  >
  > To reach an optimal balance between performance and modeling effort, you can combine the modeling methods described in the following sections. If you have, for example, one MultiProvider with ten InfoProviders that each have an NLS DAP, you can create two VirtualProviders and configure each of them to access five InfoProviders with NLS.

2.13.1 Enabling NLS Using One VirtualProvider for All InfoProviders with an NLS DAP Belonging to a Single MultiProvider

Use

> **i** Note
>
> This section is only relevant if you run your SAP BW system on SAP BW 7.0 with enhancement package 1 or 2. As of SAP BW 7.3, you can enable SAP BW queries of MultiProviders to read NLS data more easily in the Data Warehousing Workbench (see Enabling SAP BW Queries to Read NLS Data [page 32]).

The VirtualProvider shown in the following figure only allows sequential access to all NLS objects of all single InfoProviders that belong to the MultiProvider:

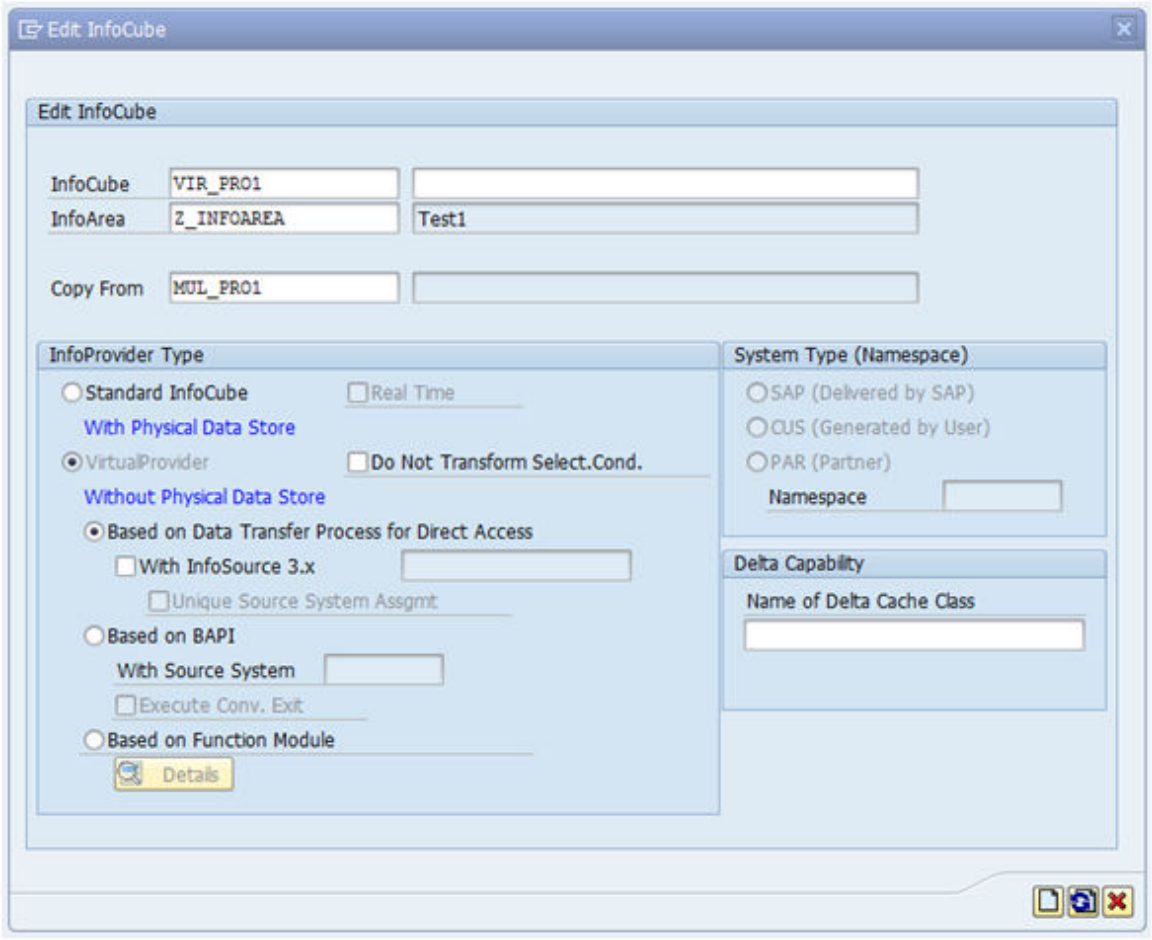


Using One Virtual Provider for All InfoProviders

In this approach, at least one of the created data transfer processes must be selected in the dialog *Activate Direct Access*.

Procedure

1. In your SAP BW system, call the Data Warehousing Workbench (transaction RSA1), select the appropriate InfoArea, and choose *Create VirtualProvider* from the context menu.
   The dialog box *Edit InfoCube* appears.
2. In the *Edit InfoCube* dialog box, enter the following data:
   - In the *InfoCube* field, specify a name for the VirtualProvider to be created.
   - In the *Copy From* field, enter the name of the MultiProvider that you want to use as copy source.
   - Choose the *Based on Data Transfer Process for Direct Access* radio button and do not specify any other values.



The "Edit InfoCube" dialog box

   To continue, choose the *Create* pushbutton.
   The screen *Data Warehousing Workbench: Modeling* appears.
3. Save and activate the newly created VirtualProvider.
4. On the screen *Data Warehousing Workbench: Modeling*, choose *Create Data Transfer Process* from the context menu of the newly created VirtualProvider.
   The dialog box *Creation of Data Transfer Process* appears.
5. Specify *DTP for Direct Access* for your data transfer process (DTP) and specify the first InfoProvider with NLS in your original MultiProvider as data source for the DTP.

The screen *Change Data Transfer Process* appears.

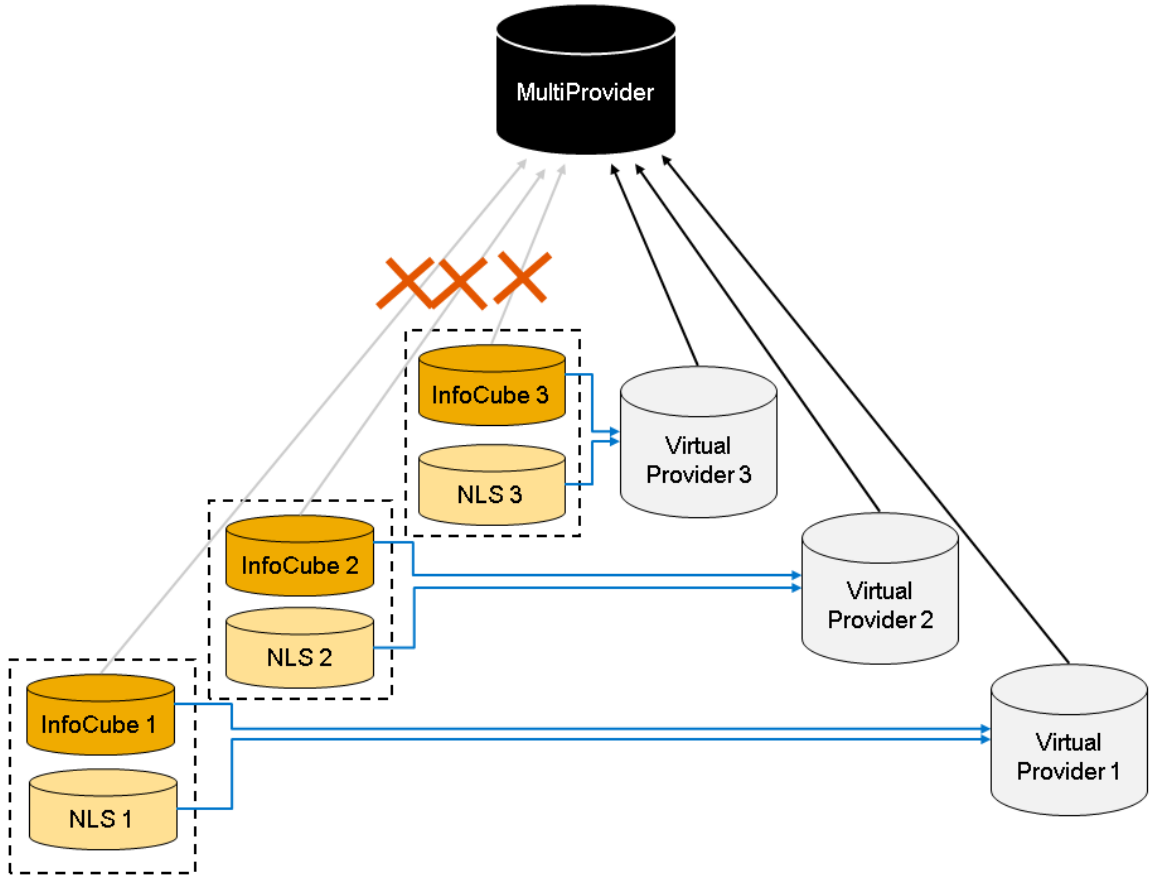
6. Choose the radio button *Archive (Full Extraction Only)* and save your changes.
7. Repeat steps 4 to 6 for each InfoProvider with NLS in your original MultiProvider. That is, you create several new DTPs on the same VirtualProvider.
8. On the screen *Data Warehousing Workbench: Modeling*, choose *Activate Direct Access* from the context menu of the VirtualProvider.
   In the dialog box *Activate Direct Access*, select all DTPs shown in the list and confirm your selection to activate the direct access by choosing the *Save Assignments* (Ctrl+S) pushbutton.
9. To enable the MultiProvider to read the NLS data, extend the MultiProvider by adding the VirtualProvider as a new data source.

2.13.2 Enabling NLS Using One VirtualProvider for Each InfoProvider with an NLS DAP

Use

> **i Note**
>
> This section is only relevant if you run your SAP BW system on SAP BW 7.0 with enhancement package 1 or 2. As of SAP BW 7.3, you can enable SAP BW queries of MultiProviders to read NLS data more easily in the Data Warehousing Workbench (see Enabling SAP BW Queries to Read NLS Data [page 32]).

The following figure shows what a setup looks like if you use as many VirtualProviders as there are InfoProviders with an NLS data archiving process (DAP):



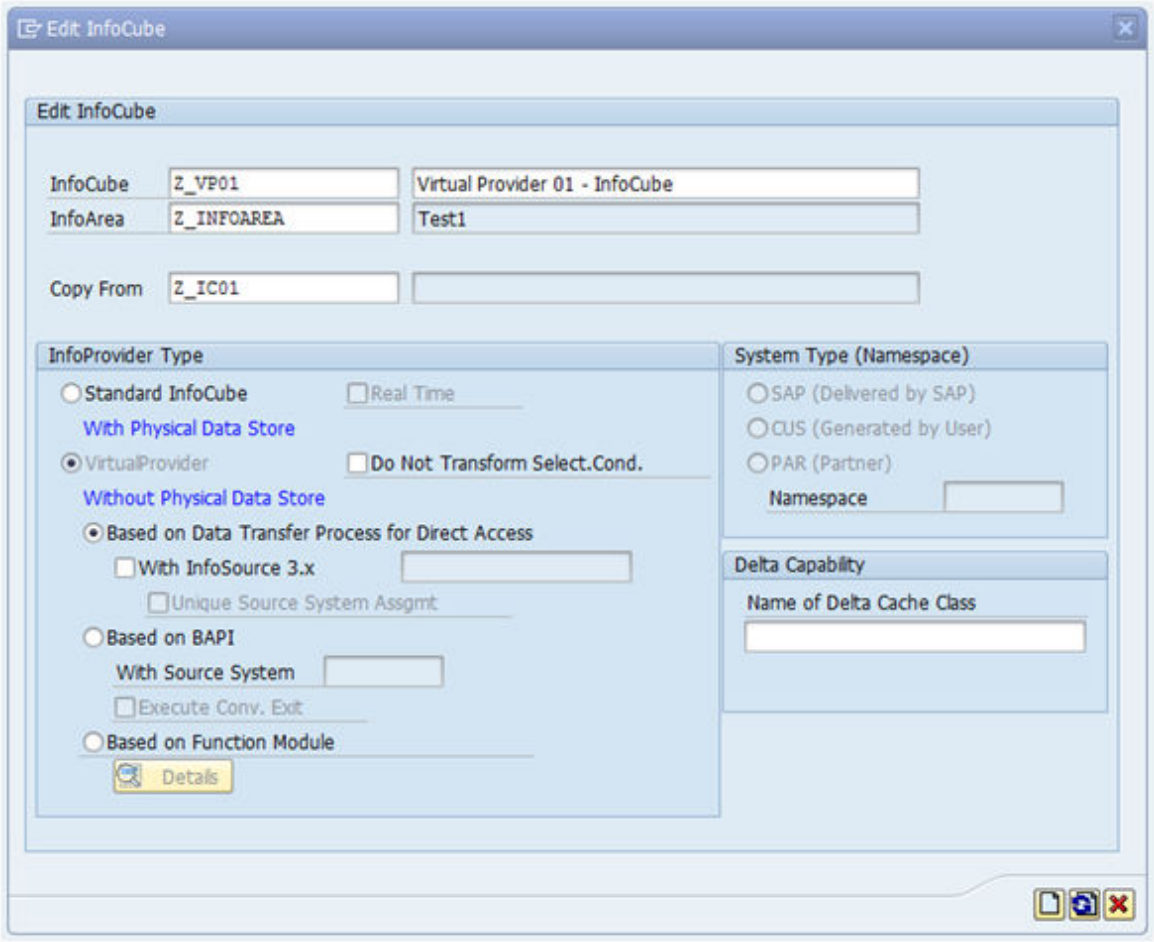
Using as Many VirtualProviders as InfoProviders

In this approach, one VirtualProvider is created for each single InfoProvider. Each VirtualProvider is configured with two data transfer processes: one to access online data and one to access NLS data.

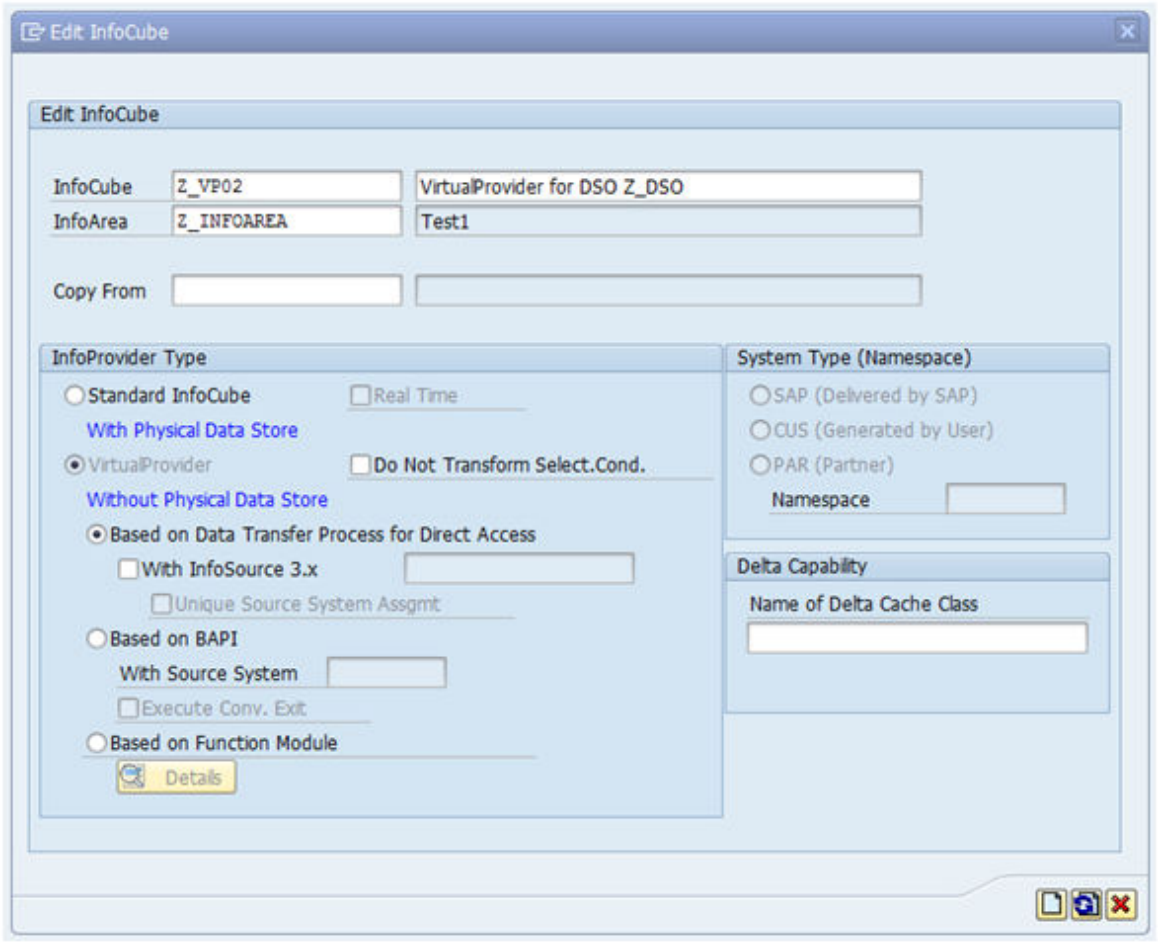
Procedure

Creating the VirtualProviders

1. In your SAP BW system, call the Data Warehousing Workbench (transaction RSA1), select the appropriate InfoArea and choose *Create VirtualProvider* from the context menu.
   The *Edit InfoCube* dialog box appears.
2. For an InfoProvider contained in the original MultiProvider, create a VirtualProvider as follows:
   - Specify a name for the VirtualProvider to be created.
   - **Only if the InfoProvider that is contained in the MultiProvider is an InfoCube:** Enter the name of the InfoCube that you want to use as copy source.
   - Choose the radio button *Based on Data Transfer Process for Direct Access*
   - Do **not** specify any other values.



Creating a VirtualProvider for an InfoCube Contained in the MultiProvider



Creating a VirtualProvider for a DataStore Object Contained in the MultiProvider

3. To continue, choose the *Create* pushbutton.
   The screen *Edit* `<InfoCube/DataStore Object>` appears.
4. If you created the VirtualProvider as a copy from an InfoCube, the VirtualProvider already has a complete structure. You can proceed with saving and activating the VirtualProvider.
5. If you created the VirtualProvider for a DataStore object, you need to assign the key fields and the data fields of the DataStore object to the InfoCube structure of the VirtualProvider as follows:
   1. In the third screen area of the *Edit DataStore Object* screen, choose the DataStore object in the original MultiProvider as a template.
   2. Drag the relevant key fields and key figures of the DataStore object to the right screen area to add them to the structure of the VirtualProvider.
6. Save and activate the newly created VirtualProvider.

Creating the Data Transfer Processes

1. To create a data transfer process for the newly created VirtualProvider to access the data **residing in the SAP BW database**, proceed as follows:
   1. On the screen *Data Warehousing Workbench: Modeling*, choose *Create Data Transfer Process* from the context menu of the newly created VirtualProvider.
   2. In the *Creation of Data Transfer Process* dialog box, specify *DTP for Direct Access for your DTP* and specify the InfoProvider with NLS as data source for the data transfer process.

3. On the *Change Data Transfer Process* screen, choose the radio button *Active Table (Without Archive)* and save your changes.

2. To create a data transfer process for the newly created VirtualProvider to access the data **residing in the NLS database**, proceed as follows:
   1. On the screen *Data Warehousing Workbench: Modeling*, choose *Create Data Transfer Process* from the context menu of the newly created VirtualProvider.
   2. In the *Creation of Data Transfer Process* dialog box, specify *DTP for Direct Access* for your data transfer process and specify the InfoProvider with NLS as data source for the data transfer process.
   3. Choose the radio button *Archive (Full Extraction Only)* and save your changes.

Repeating the Steps for All InfoProviders and Changing the MultiProvider

1. For each InfoProvider (with an NLS DAP), repeat the steps above to create one VirtualProvider with two data transfer processes (the first one to access the data residing in the SAP BW database and the second one to access the data residing in the NLS database).
2. To enable the MultiProvider to read the NLS data, change the MultiProvider by adding the VirtualProviders as new data sources and by removing the original InfoProviders.

3 Setting Up NLS for SAP BW Running on a Non-Db2 for LUW Database

This section provides information that you have to consider if you are planning to use the NLS solution for IBM Db2 for Linux, UNIX, and Windows (Db2 for LUW) with an SAP BW system that is running on a database other than Db2 for LUW.

> **i Note**
>
> NLS can only be used with SAP BW. You cannot use it for other SAP applications such as SAP BW for HANA (BW/4HANA).

If your SAP BW system is running on different database platform, you can also archive data from your InfoProviders to the Db2 NLS database, reload data into the SAP BW system, and query NLS data. In addition to the steps mentioned in Installing the NLS Database and Setting Up NLS for SAP BW [page 19], you need to perform a few additional steps:

- Download and install the latest DBSL and client software for Db2 for LUW on your SAP BW system.
- Change settings in SAP BW to set up the DBA Cockpit for NLS monitoring.

> **i Note**
>
> The database shared library (DBSL) for Db2 is available only on operating systems that are supported as application servers against a Db2 database. Consult the platform availability matrix (PAM) at http://support.sap.com/PAM to understand which application server platforms are supported with Db2.

3.1 NLS with SAP BW on a Database Other Than Db2 for LUW: Supported Databases and Minimum SAP Releases and Support Packages

Use

The IBM Db2 NLS solution for SAP BW on database platforms other than IBM Db2 for Linux, UNIX, and Windows (Db2 for LUW) is available for the following databases:

- SAP HANA database
- SAP MaxDB
- IBM Db2 for i
- Oracle database

To be able to run the IBM Db2 NLS solution with SAP BW on SAP HANA, SAP MaxDB, and IBM Db2 for i, you need the following SAP Notes or support packages:

Minimum Support Packages for SAP BW

Database	Minimum Support Packages	More Information
SAP HANA database	• SAP BW 7.30: Support Package 8 • SAP BW 7.31: Support Package 4	SAP Note 1695150 SAP Note 1807855
IBM Db2 for i SAP MaxDB	• SAP BW 7.01: Support Package 12 • SAP BW 7.02: Support Package 12 • SAP BW 7.30: Support Package 8 • SAP BW 7.31: Support Package 4	SAP Note 1695150

> **i** Note
>
> These are the minimum support packages that are required for SAP BW if you run NLS without BLU Acceleration. If you want to run NLS with BLU Acceleration, you need higher support packages for SAP BW. For more information, see Additional Prerequisites for NLS with BLU Acceleration [page 16].

More Information

For more information about required SAP releases and support packages for SAP BW running on the mentioned databases, see also the relevant installation guides and the product availability matrix at http://support.sap.com/pam.

3.2 Installing the Client Software and the SAP Database Shared Library (DBSL) for IBM Db2 for LUW in an SAP BW System Running on a Different Database

Use

If your SAP BW database runs on a different database platform than IBM Db2 for Linux, UNIX, and Windows (Db2 for LUW) and you want to use IBM Db2 for LUW as NLS database, you have to perform additional steps to set this up: You need to install the SAP database shared library (DBSL) for Db2 for LUW and the Db2 client software in the SAP BW system that runs on a different database platform.

> **i** Note
>
> The DBSL is part of every SAP kernel as of 7.20. However, make sure that you use the latest version of the DBSL so that you have all the latest corrections and enhancements available.

Procedure

1. Download the DBSL for Db2 for LUW as follows:
   1. Open a Web browser and enter the following URL: http://support.sap.com/swdc.
   2. Choose *Support Packages and Patches* > *Access downloads*.
   3. In the alphabetical list, choose *N*.
   4. Choose *SAP NETWEAVER* > `<Your SAP NetWeaver release>` > *Entry by Component* > *Application Server ABAP*.
   5. Choose *SAP KERNEL* `<Your kernel release>` `<64|32>` *BIT {UNICODE}*.
      Choose 32-bit or 64-bit and, if required, UNICODE, depending on your existing installation.
   6. Choose *<Operating system> <64|32> bit* in accordance with your installation, and then choose *DB2 UDB*.
   7. Scroll down to the screen area *Downloads* and select the file `lib_dbsl_<patchlevel>-<nnnnnnnn>.sar`. Make sure that you select the file with the highest patch level.
   8. Download this file to a temporary folder.
   9. To unpack the archive, enter the following command:
      `SAPCAR -xvf lib_dbsl_<patchlevel>-<nnnnnnnn>.sar`
      After you have successfully unpacked the archive, you no longer require the file `lib_dbsl_<patchlevel>-<nnnnnnnn>.sar` and you can delete it.
2. Download the Db2 client software as follows:
   1. Open a Web browser and enter the following URL:http://support.sap.com/swdc.
   2. Choose *Databases* > *Access downloads*.
   3. Choose *IBM Db2* > *DB2 for LUW* `<Latest DB2 Version>` > *Installation*.
   4. In the *Downloads* screen area, download the latest available *DB2 LUW <latest_version> FP<latest_fixpack> RDBMS Client* package to a temporary directory by selecting *<DVD-Number>.ZIP* and unpack the archive.
      After you have successfully unpacked the archive, you no longer require the file `<DVD-Number>.ZIP` and you can delete it.
3. Install the DBSL for Db2 for LUW on the ABAP central instance and on all ABAP application servers of your SAP BW system.
   Windows only: Move the file `dbdb6slib.dll` to the following directory of your SAP BW system:`<drive>:\usr\sap\<SAPSID>\SYS\exe`
   Linux and UNIX only: Move the file `dbdb6slib.s[ol]` (the extension `.so` or `.sl` depends on your operating system) to the following directory of your SAP BW system:`/usr/sap/<SAPSID>/SYS/exe/run`
4. Install the Db2 for LUW client software on the ABAP central instance and on all ABAP application servers of your SAP BW system.
   Windows only:
   1. Go to the temporary directory where you unpacked the downloaded file `<DVD-Number>.ZIP`.
   2. To change to the subdirectory `CLIENT`, enter the following command:
      `cd <temp>\CLIENT`
   3. To display the list of platforms, enter the following command:
      `db6_update_client.bat -h`
   4. To install the Db2 CLI client, enter the following command (the specified example refers to Windows x86-64):
      `db6_update_client.bat -nodb -c WINDOWS_AMD64`

If you receive an error message saying that the environment variable `DSCDB6HOME` is not set, set it to the host name of the server where the password file `dscdb6.conf` is located.

Linux and UNIX only:

1. Go to the temporary directory where you unpacked the downloaded file `<DVD-Number>.ZIP`.
2. Change to the subdirectory `CLIENT` by entering the following command:
   ```
   cd <temp>/CLIENT
   ```
3. To display the list of platforms, enter the following command:
   ```
   ./db6_update_client.sh -h
   ```
4. Install the Db2 CLI client using the following command (the specified example refers to AIX 64):
   ```
   ./db6_update_client.sh -nodb -c AIX_64
   ```

3.3 Setting Up an Additional Application Server (IBM Db2 for i only)

Use

If your SAP BW database runs on IBM Db2 for i, you need to set up an additional SAP application server on a Windows machine and install the Db2 CLI client and DBSL library.

Procedure

1. Install the additional SAP application server on a Windows machine.
2. Make sure that the Db2 CLI client and the DBSL library are installed.
   For more information, see Installing the Client Software and the SAP Database Shared Library [page 44].
3. If the connection from the additional application server to the NLS system does not work, verify that you have the libraries installed in side-by-side assemblies by searching in the %SYSTEMROOT%\WinSxS folder. Run the following command to search for the libraries:
   ```
   dir /b %SYSTEMROOT%\WinSxS\*VC90.CRT* | find "9.0.21022.8"
   ```
4. If the libraries are installed, you will see the following libraries corresponding to system specifications:
   - For 32-bit operating systems: `x86_Microsoft.VC90.CRT_1fc8b3b9a1e18e3b_9.0.21022.8_x-ww_d08d0375`
   - For 64-bit operating systems: `amd64_Microsoft.VC90.CRT_1fc8b3b9a1e18e3b_9.0.21022.8_x-ww_0296e955`
   - If the libraries are not installed, obtain them from the Microsoft Visual C++ 2008 Redistributable Package.

3.4 Enabling the DBA Cockpit for NLS Monitoring with SAP BW Running on a Non-Db2 for LUW Database (SAP BW 7.02 and Higher)

Use

With the DBA Cockpit, you can set up the database connection from the SAP BW system to the NLS database easily. You can also use the DBA Cockpit to monitor NLS databases.

If your SAP BW runs on a database other than IBM Db2 for Linux, UNIX, and Windows, the NLS monitoring screens are not visible by default. You need to configure the DBA Cockpit so that the NLS screens are available in the menus of the DBA Cockpit.

Prerequisites

To be able to use the DBA Cockpit for NLS monitoring, you must have SAP Business Warehouse installed with at least the following releases and support packages:

- SAP BW 7.02 SP13
- SAP BW 7.30 SP9
- SAP BW 7.31 SP7
- SAP BW 7.4 and higher

To be able to use the DBA Cockpit for deleting data from the NLS database (see Deleting Invalid Data Physically from the Database [page 75]), you also need SAP Note 2096669.

> **i Note**
>
> If your SAP BW runs on lower releases or support packages, you cannot use the DBA Cockpit for NLS setup, monitoring, and administration. In this case, follow the instructions in Configuring the NLS Connection for Non-IBM Db2 for LUW Databases Manually [page 48] and Monitoring NLS with SAP BW on Non-Db2 for LUW Databases [page 50].

Procedure

1. In your SAP BW system, call the data browser (transaction `SE16`) to edit the table `DBA_CONFIG`.
2. Create a new entry with the following values:

Field	User Entry
SYSID	*

Field	User Entry
DBSYS	*
ID	**BI_NLS_ACTIVE**
VALUE	**X**

Result

You can now proceed with setting up the connection from SAP BW to the NLS system.

More Information

Setting Up the Connection to the NLS Database Using the DBA Cockpit [page 29]

3.5 Setup and Monitoring of NLS Databases (SAP BW 7.01/Low Support Packages Only)

The following chapters only apply if you run SAP BW on release 7.0 with enhancement package 1 or if you run SAP BW on release 7.0 with enhancement package 2 or higher, but your support package level is lower than the levels listed in the *Prerequisites* section of Enabling the DBA Cockpit for NLS Monitoring with SAP BW Running on a Non-Db2 for LUW Database [page 47].

3.5.1 Configuring the NLS Connection for Non-IBM Db2 for LUW Databases Manually

Use

> **i** Note
>
> This section is only relevant if you use SAP BW 7.01 or if you use SAP BW 7.02 with low support packages.

As of SAP BW 7.02, you can use the DBA Cockpit to configure the NLS connection for SAP BW systems (see Setting Up the Connection to the NLS Database Using the DBA Cockpit [page 29]). The following manual steps are only necessary if you cannot use the DBA Cockpit because your release and support package level for SAP

BW is too low (see the *Prerequisites* section in Enabling the DBA Cockpit for NLS Monitoring with SAP BW Running on a Non-Db2 for LUW Database [page 47]).

Procedure

Adding a New Secondary Connection to the NLS Database

1. To add a new secondary connection to the NLS database, use the DBA Cockpit as follows:
   1. In your SAP BW system, call the DBA Cockpit (transaction `DBACOCKPIT`).
   2. On the *System Landscape Configuration* screen of the DBA Cockpit, choose the pushbutton *DB Connections* for your SAP BW system.
2. If it is not possible to add a connection using the DBA Cockpit, proceed as follows:
   1. Call transaction `DBCO`.
   2. In the field *Conn. info*, enter the following values:
      `DB6_DB_NAME=<NLS_DBSID>;DB6_DB_SVCENAME=<PORT_NR>;DB6_DB_HOST=<NLS_DBHOST>;DB6_DB_SCHEMA=<DB_SCHEMA>`,
      where `NLS_DBSID` is the near-line database name, `PORT_NR` is the near-line database communication port, `NLS_DBHOST` is the hostname of the near-line server and `DB_SCHEMA` is the database schema in the near-line database that you use for this connection

Adding a New Near-Line Storage Connection in the Data Warehousing Workbench

1. In the Data Warehousing Workbench (transaction `RSA1`), add a new near-line storage connection by choosing *Administration* > *Current Settings* > *Near-Line Storage Connections*.
2. In the field *Nearline Conn.*, enter the same name as for the secondary connection that you created in the previous step.
3. In the field *Name of Class*, enter the value **`CL_RSDA_DB6_CONNECTION`**.
4. Leave the field *Destination* empty.
5. In the field *Conn. Parameters*, enter the folowing values:
   `DBCON=<CONNAME>;BW_SAPSID=<SAPSID>;BW_HOST=<SAPDBHOST>`,
   where `CONNAME` is the same name as you entered as near-line connection in the previous step, `SAPSID` is the value of the `SAPSYSTEMNAME` profile parameter and `SAPDBHOST` is the value of the `SAPDBHOST` profile parameter. All parameters are in upper case. For more information, see SAP Note 1484102.
6. Save the configuration.

Running SQL Script configure_nls_database_template.txt

1. Log on to the host where you installed Db2 for LUW as NLS database with the appropriate user name.
2. Download the SQL script `configure_nls_database_template.txt` that is attached to SAP Note 1405664.
3. Edit the SQL script `configure_nls_database_template.txt` and replace the string `<DB6NLSDB>` with the name of the NLS database, the string `<DB6NLSSCHEMA>` with the schema name entered in the configuration of the secondary connection in the BW system and the string `<SAPSID>` with the three-symbol system identifier of your SAP BW system.
4. Save the edited SQL script with an appropriate name, for example, `configure_nls_database.sql`.
5. Execute the edited SQL script as NLS database administrative user (`db2<db6nlsdb>`) using the following command:
   `db2 -tvf configure_nls_database.sql`

Result

After you have configured the database connection and the NLS connection, you can start creating data archiving processes (DAPs) for your InfoProviders and transferring data into the Db2 NLS database.

3.5.2 Monitoring NLS with SAP BW on Non-Db2 for LUW Databases

For SAP NetWeaver releases with low support packages, you cannot use the DBA Cockpit for monitoring. Follow the steps here to be able to use the function module `FM_RSDA_DB6_OBJECTS_VIEWER` for NLS monitoring instead.

Use

> **i Note**
>
> This section is only relevant if you use SAP BW 7.01 or if you use SAP BW 7.02 with low support packages.

As of SAP BW 7.02, you can use the DBA Cockpit to monitor NLS databases even if your SAP BW system runs on a database other than IBM Db2 for Linux, UNIX, and Windows (see Monitoring and Administration of the NLS Database Using the DBA Cockpit [page 83]). To be able to use the DBA Cockpit, you need certain minimum SAP BW releases and support packages (see the *Prerequisites* section in Enabling the DBA Cockpit for NLS Monitoring with SAP BW Running on Non-Db2 for LUW Databases [page 47]).

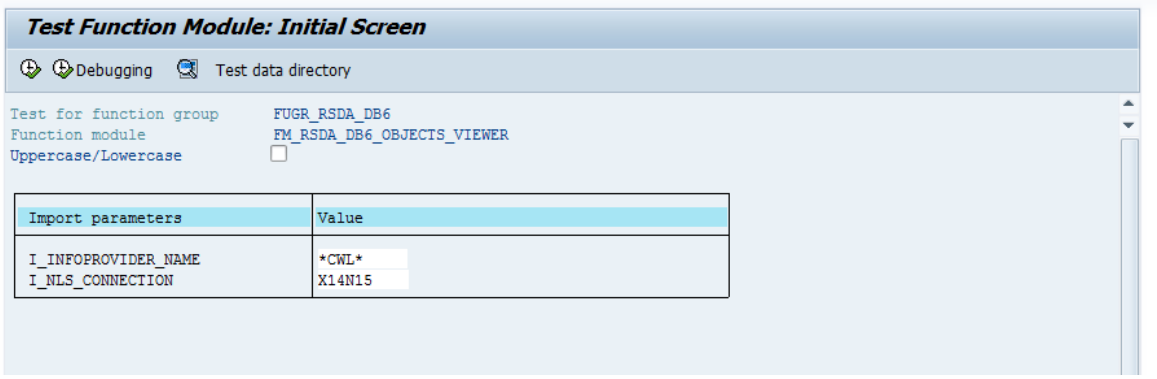
For SAP BW 7.01 and for SAP BW releases with lower support packages, you can use the function module `FM_RSDA_DB6_OBJECTS_VIEWER` for NLS monitoring. You can use this function module to display the list of the BW tables for a given InfoProvider and the corresponding list of NLS tables. You must also use this function module for higher SAP BW releases if you don't have the necessary authorizations to call up the *NLS Overview* screen in the DBA Cockpit.

Procedure

1. In your SAP BW system, call the function builder transaction `SE37`.
   The screen *Function Builder: Initial Screen* appears.
2. Enter `FM_RSDA_DB6_OBJECTS_VIEWER` in the *Function Module* input field and choose the *Test/Execute* pushbutton.
   The screen *Test Function Module: Initial Screen* appears.
3. Enter values for the following parameters and choose the *Execute* pushbutton:
   - `I_INFOPROVIDER_NAME`:
     Enter the name of the InfoProvider using NLS.

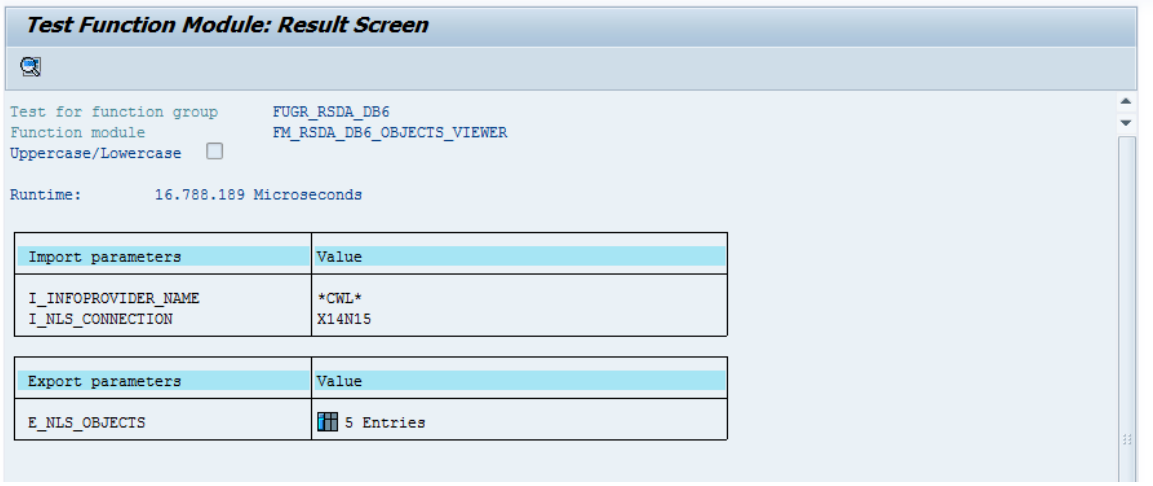
> **Note**
>
> You can also specify the wildcard “*” as part of the name, or just enter the wildcard “*” to display all NLS tables for all InfoProviders.

- `I_NLS_CONNECTION`:
  Enter the name of the NLS connection.



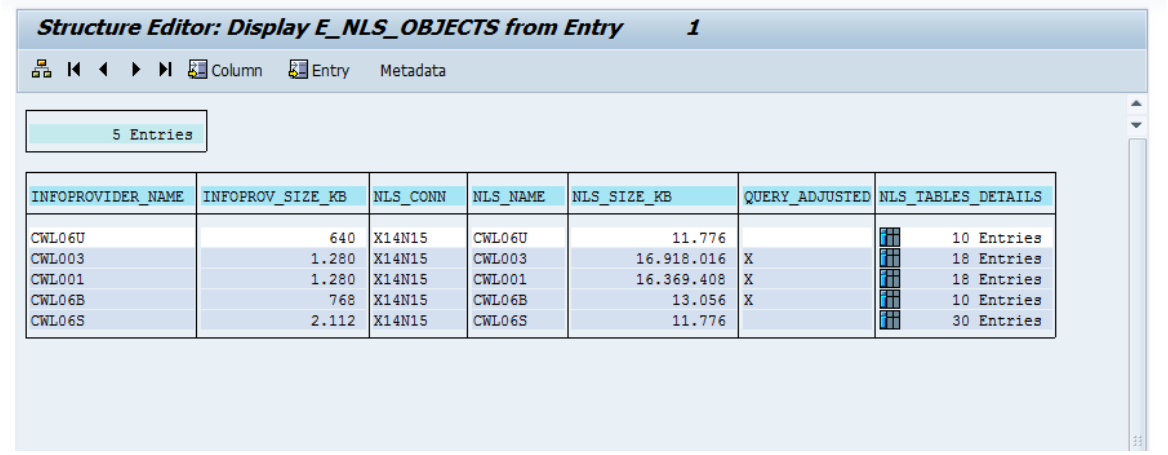
Initial Screen - Entering the InfoProvider and NLS Connection

4. On the following result screen, in the *Value* column of `E_NLS_OBJECTS`, doubleclick the icon that indicates the number of entries to display a list of the InfoProviders matching the selection criteria specified in step 3:



Test Function Module: Result Screen

5. The function module displays information about InfoProviders that are archived in the NLS. The InfoProvider size in BW is displayed in the column *INFOPROV_SIZE_KB*, and its size in NLS in the *NLS_SIZE_KB* column (both in KB). Doubleclick an entry in the `NLS_TABLES_DETAILS` column:



Structure Editor: Display E_NLS_OBJECTS from Entry 1

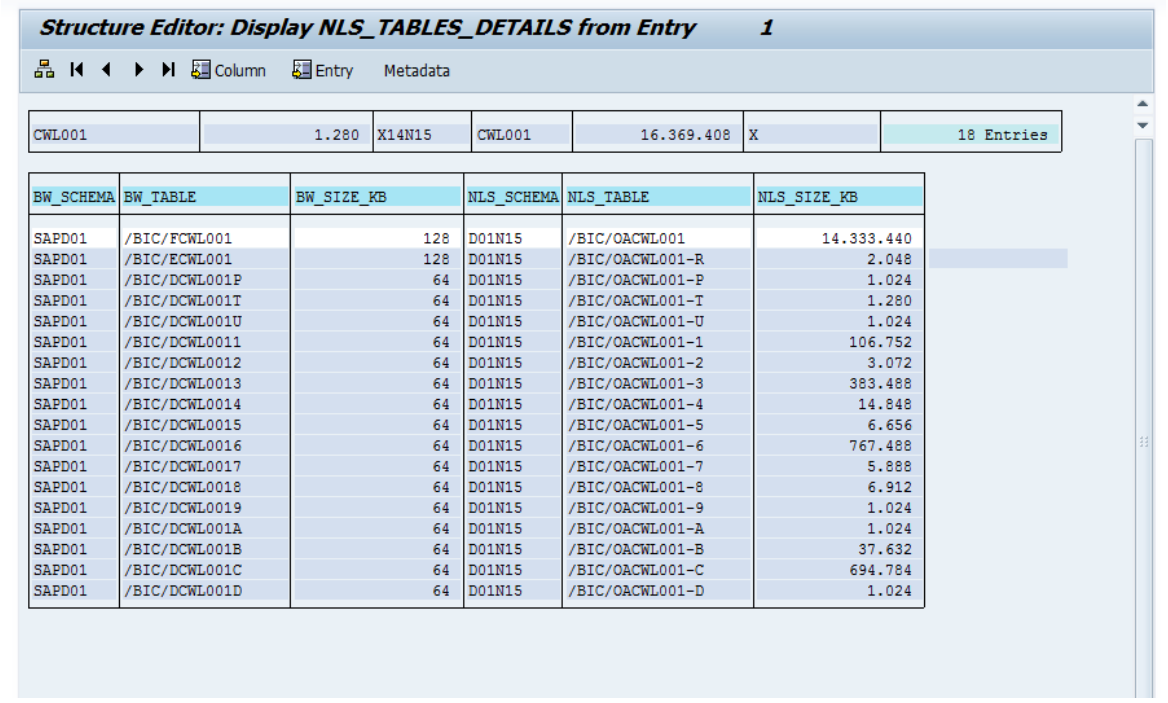
Column | Entry | Metadata

5 Entries

INFOPROVIDER_NAME	INFOPROV_SIZE_KB	NLS_CONN	NLS_NAME	NLS_SIZE_KB	QUERY_ADJUSTED	NLS_TABLES_DETAILS
CWL06U	640	X14N15	CWL06U	11.776		10 Entries
CWL003	1.280	X14N15	CWL003	16.918.016	X	18 Entries
CWL001	1.280	X14N15	CWL001	16.369.408	X	18 Entries
CWL06B	768	X14N15	CWL06B	13.056	X	10 Entries
CWL06S	2.112	X14N15	CWL06S	11.776		30 Entries

Structure Editor: Display E_NLS_OBJECTS

6. The function module displays another table with detailed information, including the table names of both the BW InfoProvider and the appropriate NLS object. The table size information is displayed in KB in the columns *BW_SIZE_KB* and *NLS_SIZE_KB*:



Structure Editor: Display NLS_TABLES_DETAILS from Entry 1

Column | Entry | Metadata

CWL001	1.280	X14N15	CWL001	16.369.408	X	18 Entries

BW_SCHEMA	BW_TABLE	BW_SIZE_KB	NLS_SCHEMA	NLS_TABLE	NLS_SIZE_KB
SAPD01	/BIC/FCWL001	128	D01N15	/BIC/OACWL001	14.333.440
SAPD01	/BIC/ECWL001	128	D01N15	/BIC/OACWL001-R	2.048
SAPD01	/BIC/DCWL001P	64	D01N15	/BIC/OACWL001-P	1.024
SAPD01	/BIC/DCWL001T	64	D01N15	/BIC/OACWL001-T	1.280
SAPD01	/BIC/DCWL001U	64	D01N15	/BIC/OACWL001-U	1.024
SAPD01	/BIC/DCWL0011	64	D01N15	/BIC/OACWL001-1	106.752
SAPD01	/BIC/DCWL0012	64	D01N15	/BIC/OACWL001-2	3.072
SAPD01	/BIC/DCWL0013	64	D01N15	/BIC/OACWL001-3	383.488
SAPD01	/BIC/DCWL0014	64	D01N15	/BIC/OACWL001-4	14.848
SAPD01	/BIC/DCWL0015	64	D01N15	/BIC/OACWL001-5	6.656
SAPD01	/BIC/DCWL0016	64	D01N15	/BIC/OACWL001-6	767.488
SAPD01	/BIC/DCWL0017	64	D01N15	/BIC/OACWL001-7	5.888
SAPD01	/BIC/DCWL0018	64	D01N15	/BIC/OACWL001-8	6.912
SAPD01	/BIC/DCWL0019	64	D01N15	/BIC/OACWL001-9	1.024
SAPD01	/BIC/DCWL001A	64	D01N15	/BIC/OACWL001-A	1.024
SAPD01	/BIC/DCWL001B	64	D01N15	/BIC/OACWL001-B	37.632
SAPD01	/BIC/DCWL001C	64	D01N15	/BIC/OACWL001-C	694.784
SAPD01	/BIC/DCWL001D	64	D01N15	/BIC/OACWL001-D	1.024

Structure Editor: Display NLS_TABLES_DETAILS

4 Table Layout of NLS Objects

This section provides information about the table layout of the NLS objects that are created in the NLS database for the different types of supported InfoProviders.

Row-Organized or Column-Organized Table Layout (BLU Acceleration)

If you want to know more about the table layout of NLS object, you first need to understand the difference between row-organized and column-organized tables (BLU Acceleration). Have a look at the following if you don't know this already: BLU Acceleration (As of Db2 10.5) [page 13]

Depending on whether BLU Acceleration is used in an NLS database, certain table layouts are supported or not. For example, you can only have flat NLS InfoCubes with BLU Acceleration.

Supported NLS Objects and their Table Layout

The number of NLS tables and their layout mainly depends on the type of InfoProvider for which you enabled NLS. Even though there are different types of InfoProviders, the NLS solution with Db2 mainly uses two data models: a data model for InfoProvider that are like InfoCubes and a data model for InfoProviders that are like DataStore objects.

The following types of InfoProviders are supported for NLS:

- Standard InfoCubes
- Real-time InfoCubes
- Flat InfoCubes (as of SAP BW 7.4)
- Standard DataStore objects
- Write-optimized DataStore objects
- DataStore objects for direct update
- MultiProviders (only if each single InfoProvider of the MultiProvider is one of the previous types)
- Semantically partitioned InfoCubes and DataStore objects (as of SAP BW 7.3)

To learn more about their table layout, see the following:

- Data Model of an NLS InfoCube [page 54]
- Data Model of an NLS DataStore Object [page 57]

Multidimensional Clustering

This section is only relevant if you are using Db2 up to version 10.1, where BLU Acceleration is not available.

4.1 Data Model of an NLS InfoCube

Layout Types for InfoCubes

There are two layouts for InfoCubes in NLS:

- Flat NLS InfoCube with column-organized tables (BLU Acceleration)
- Standard NLS InfoCube with row-organized tables

With flat column-organized InfoCubes, you achieve a better archiving and query performances in comparison to standard NLS InfoCubes.

> **i** Note
>
> With lower releases of SAP BW, a standard NLS InfoCube with dimension tables and with column-organized tables was supported. This type of NLS InfoCube becomes obsolete with the implementation of SAP Note 2155374 or as of the following releases and support packages:
>
> - SAP BW 7.01 SP18
> - SAP BW 7.02 SP18
> - SAP BW 7.3 SP14
> - SAP BW 7.31 SP17
> - SAP BW 7.4 SP12
> - SAP BW 7.5 and higher

As of these releases and support packages, the system automatically decides on the physical layout of an NLS InfoCube. By default, flat InfoCubes are created in NLS with column-organized tables (BLU Acceleration) if the following prerequisites are met:

- IBM Db2 with BLU Acceleration is supported (as of Db2 10.5).
- The line length of the fact table of the flat InfoCube does not exceed the ABAP Dictionary limit.

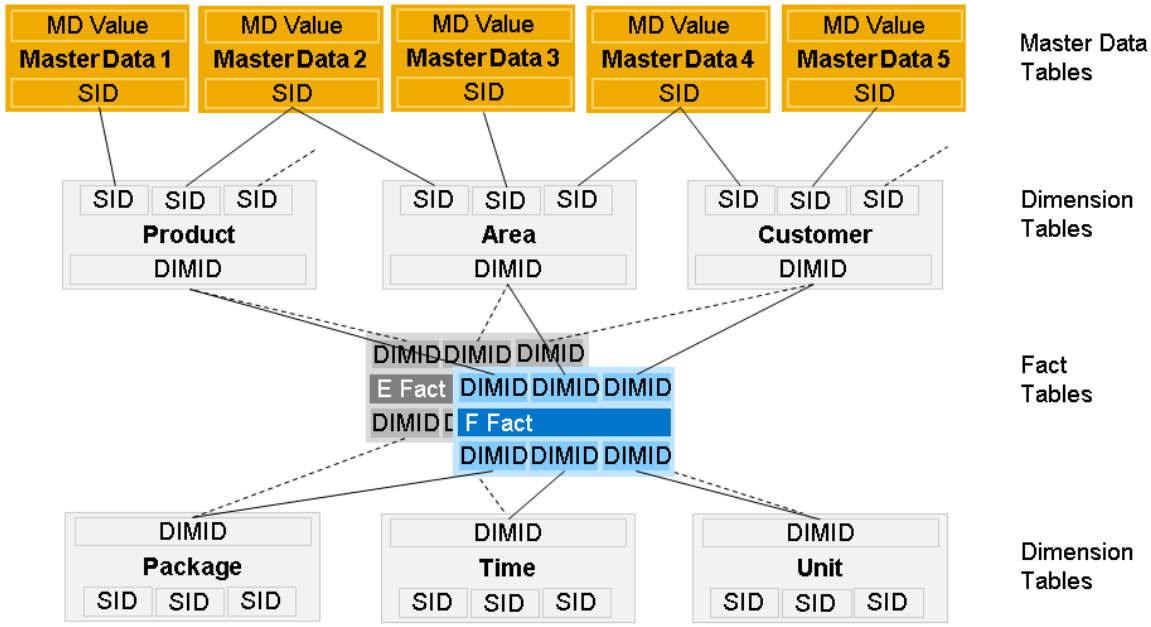
If the prerequisites are not met, for example, because Db2 runs on a version lower than 10.5, standard NLS InfoCubes are created with row-organized tables in the star schema layout.

Row-Organized Standard InfoCubes in SAP BW

A standard InfoCube in SAP BW is created with the following tables:

- Two fact tables (F fact table and E fact table)
- Up to 16 dimension tables
- A certain number of master data tables containing the characteristics of the InfoCube

This kind of data model for an SAP BW InfoCube is also referred to as “enhanced star schema”:



Legend

DIMID: Dimension ID

SID: Surrogate ID

MD Key: Master Data Value

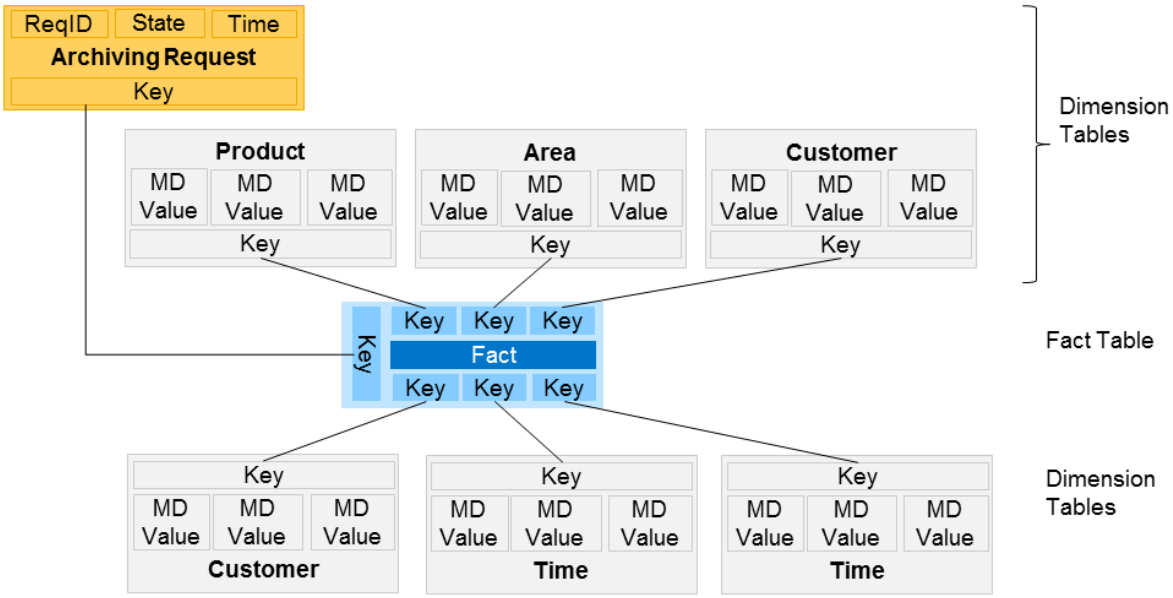
Enhanced Star Schema of SAP BW InfoCube

Row-Organized Standard InfoCubes in NLS

A standard InfoCube in the NLS database is created with the following tables:

- One table to store the archiving request information
  Throughout this document, this table is called archiving request table. Every move of SAP BW data to the NLS database is triggered by an archiving request.
- One fact table
  This fact table stores the key figures of the original InfoCube, references to dimension tables, a reference to the NLS archiving request table, and other archiving information.
- A set of dimension tables
  The number of dimension tables for the NLS object equals the number of dimension tables for the original InfoCube in the SAP BW database. The NLS dimension tables store the characteristics of the original InfoCube. Each NLS dimension table has an additional column for automatically generated, unique identifiers for the different combinations of characteristic values.

In contrast to an InfoCube in an SAP BW system, an InfoCube in the NLS database is modeled according to a **simplified star schema**:



Legend

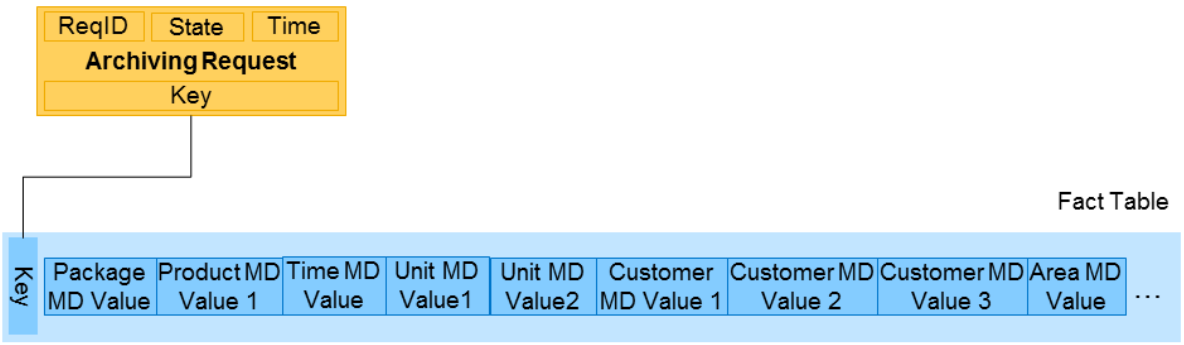
ReqID: Archiving Request ID

Simplified Star Schema of Row-Organized NLS InfoCube

Whereas the SAP BW InfoCube has two fact tables (F fact table and E fact table), the NLS InfoCube only has one fact table. The dimension tables of the SAP BW InfoCube only contain the SIDs for the master data tables. The master data tables contain the actual values of the master data and the tables might reference additional master data tables and InfoObject tables. As opposed to the SAP BW InfoCube, all values from master data tables are directly stored in the NLS dimension tables of the NLS InfoCube. As a result, NLS dimension tables are larger, but due to the simpler structure of NLS InfoCubes, fewer joins are needed during query processing.

Column-Organized Flat InfoCubes in NLS

The flat NLS InfoCube consists only of a fact table, which is column-organized. All additional dimension information is saved in the fact table.



Legend
MD Key: Master Data Key
ReqID: Archiving Request ID

Flat Column-Organized NLS InfoCube

This has significant performance advantages when data is read from NLS. The simple layout avoids complex data transformations and achieves a better archiving and query performance in comparison to standard NLS InfoCubes with row-organized tables.

More Information

For more information about the data model and tables of standard and flat InfoCubes in SAP BW, see the database administration guide *SAP Business Warehouse on IBM Db2 for Linux, UNIX, and Windows: Administration Tasks* on SAP Help Portal at http://help.sap.com/db6_bw.

4.2 Data Model of an NLS DataStore Object

Data Model

In comparison to a DataStore object in an SAP BW system, the corresponding NLS DataStore object has a simplified structure.

In an SAP BW system, a standard DataStore object is created with the following tables:

- Activation queue table
- Active data table
- Change log table

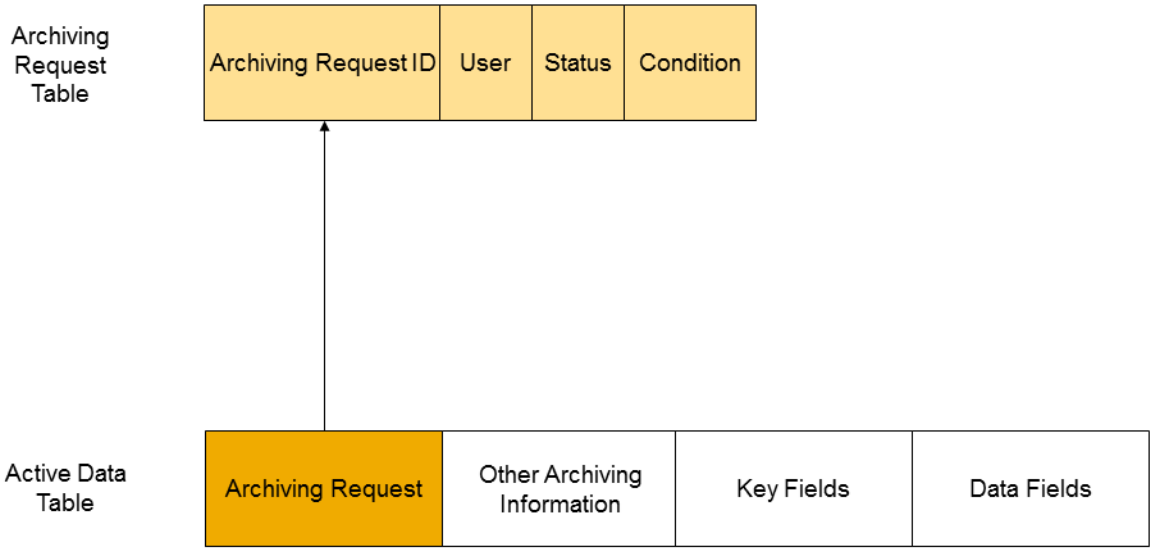
Write-optimized DataStore objects and DataStore objects for direct update only have an active data table.

Since data that is transferred to the NLS database is only read from the active data table, the structures of the corresponding DataStore objects in the NLS database are much simpler. This applies to all types of DataStore objects.

The following tables are created in the NLS database for a DataStore object:

- NLS archiving request table
  This table stores the archiving request information. Every move of SAP BW data to the NLS database is triggered by an archiving request.
- NLS active data table
  This table stores the business-related information of the original DataStore object (that is, key columns and non-key columns). In addition, the references to the corresponding archiving request record and other archiving information are stored in this table.

The following figure shows the data model of a DataStore object in the NLS database:



Data Model of a DataStore Object in the NLS Database

Row-Organized vs. Column-Organized Tables

If your Db2 database for NLS is at least version 10.5 and meets the requirements for BLU Acceleration, NLS DataStore objects are created with column-organized NLS active data tables by default. This default becomes effective with SAP Note 2155374 or with the following support packages:

- SAP BW 7.01 SP18
- SAP BW 7.02 SP18
- SAP BW 7.3 SP14
- SAP BW 7.31 SP17
- SAP BW 7.4 SP12
- SAP BW 7.5 and higher

If BLU Acceleration is not supported, the NLS DataStore objects are created with row-organized NLS active data tables.

More Information

For more information about the data model and tables of SAP BW DataStore objects, see the database administration guide *SAP Business Warehouse on IBM Db2 for Linux, UNIX, and Windows: Administration Tasks* on SAP Help Portal at http://help.sap.com/db6_bw.

4.3 NLS Tables and Naming Conventions

The NLS table names consist of the following elements in the sequence given here:

- Namespace of the original InfoProvider
- Db2 NLS-specific prefix (0A)
- Technical name of the original InfoProvider
- A request identifier
- For row-organized InfoCubes only: A dimension identifier

> **i** Note
>
> Only the fact table of an InfoCube and the active data table of a DataStore object are created as transparent tables in the ABAP Dictionary of the SAP BW system. The remaining tables are created in the NLS database without a corresponding ABAP Dictionary entry.

Identifiers for Column-Organized NLS Tables

The following table lists the values that are used as identifiers for **column-organized** tables of NLS objects:

Value	Description
-R	Archiving request data

Identifiers for Row-Organized NLS Tables

The following table lists the values that are used as identifiers for **row-organized** tables of NLS objects:

Value	Description
-R	Archiving request data
-P	Package dimension data

Value	Description
`-T`	Time dimension data
`-U`	Unit dimension data
`-1`	First user-defined dimension data
`-2`	Second user-defined dimension data
...	...
`-9`	Ninth user-defined dimension data
`-A`	Tenth user-defined dimension data As the identifier is a single value, the value for the tenth user-defined dimension data continues with a letter.
...	...
`-D`	13th user-defined dimension data

Examples of NLS Tables for an InfoCube

The table name of the NLS fact table for the InfoCube `ZBENCH` is `/BIC/OAZBENCH`, where `/BIC/` is the namespace, `OA` the NLS-specific prefix, and `ZBENCH` the technical name of the original InfoCube in SAP BW.

The following table lists the tables in SAP BW and the corresponding row-organized tables in the NLS database for InfoCube `ZBENCH`:

SAP BW and NLS Tables for an InfoCube (Row-Organized)

Table Name in SAP BW	NLS Table Name	Description
`/BIC/FZBENCH` `/BIC/EZBENCH`	`/BIC/OAZBENCH`	Fact table
`/BIC/DZBENCHP`	`/BIC/OAZBENCH-P`	Package dimension table
`/BIC/DZBENCHT`	`/BIC/OAZBENCH-T`	Time dimension table
`/BIC/DZBENCHU`	`/BIC/OAZBENCH-U`	Unit dimension table
`/BIC/DZBENCH1`	`/BIC/OAZBENCH-1`	First user-defined dimension table

Table Name in SAP BW	NLS Table Name	Description
...	...	...
/BIC/DZBENCHD	/BIC/OAZBENCH-D	13th user-defined dimension table
N/A	/BIC/OAZBENCH-R	Archiving request table

If you use Db2 10.5 with BLU acceleration, the NLS InfoCube will be flat and therefore have no dimension tables:

SAP BW and NLS Tables for an InfoCube (Column-Organized)

Table Name in SAP BW	NLS Table Name	Description
/BIC/FZBENCH /BIC/EZBENCH	/BIC/OAZBENCH	Fact table
N/A	/BIC/OAZBENCH-R	Archiving request table

Example of NLS Tables for a DataStore Object

The following table lists the tables in SAP BW and the corresponding tables in the NLS database for the standard DataStore object ZDSOBEN:

SAP BW and NLS Tables for a Standard DataStore Object

Table Name in SAP BW	NLS Table Name	Description
/BIC/AZDSOBEN00 (Active data table) /BIC/AZDSOBEN40 (Activation queue table) /BI0/B0... (Change data table)	/BIC/OAZDSOBEN	Active data table
N/A	/BIC/OAZDSOBEN-R	Archiving request table

The following table lists the tables in SAP BW and the corresponding tables in the NLS database if the DataStore object ZDSOBEN is a write-optimized DataStore object or a DataStore object for direct update:

SAP BW and NLS Tables for Write-Optimized DataStore Object/DataStore Object for Direct Update

Table Name in SAP BW	NLS Table Name	Description
/BIC/AZDSOBEN00	/BIC/OAZDSOBEN	Active data table

Table Name in SAP BW	NLS Table Name	Description
N/A	/BIC/OAZDSOBEN-R	Archiving request table

4.4 Multidimensional Clustering (Up to DB2 10.1)

4.4.1 Multidimensional Clustering (MDC) in NLS Databases

Multidimensional clustering (MDC) is a Db2 feature for clustering data in tables according to multiple dimensions in a flexible, continuous, and automated way. MDC allows you to physically cluster a table according to more than one key or dimension simultaneously.

With MDC, performance of queries on InfoCubes and DataStore objects with restrictions on MDC columns can be significantly improved. In the NLS database, you can use MDC for the fact tables of InfoCubes and the active tables of NLS DataStore objects.

> **i** Note
>
> As of Db2 10.5, you should use BLU Acceleration for NLS instead of MDC because BLU Acceleration improves NLS performance better than MDC. Use MDC only if your database does not meet the requirements for BLU Acceleration. For more information about BLU Acceleration, see BLU Acceleration (As of Db2 10.5) [page 13].
>
> Note that it is also possible to use BLU Acceleration for the NLS database if the SAP BW database still uses MDC, and vice versa.

MDC for NLS InfoCubes

MDC can be used for the fact tables of NLS InfoCubes. The columns used in the MDC definition are (in the order of their use) as follows:

- Column containing the archiving request identifier
- Columns of the original InfoCube for which MDC has also been defined

The MDC dimension on the archiving request identifier is always enabled in the NLS database, even if there are no other MDC dimensions defined.

MDC for NLS DataStore Objects

MDC can be used for the active data table of an NLS DataStore object. The columns used in the MDC definition are (in the order of their use) as follows:

- Column containing the archiving request identifier
- Columns of the original DataStore object for which MDC has also been defined

The MDC dimension on the archiving request identifier is always enabled in the NLS database, even if there are no other MDC dimensions defined.

More Information

For more information about MDC, see the database administration guide *SAP Business Warehouse on IBM Db2 for Linux, UNIX, and Windows: Administration Tasks* on SAP Help Portal at http://help.sap.com/db6_bw.

4.4.2 Creating InfoProviders with MDC in the NLS Database

You cannot set up MDC directly in the NLS database. Instead, you set up MDC in the SAP BW system for some or all InfoProviders, depending on your requirements.

The NLS DataStore objects and InfoCubes are then created with the same MDC dimensions as in the SAP BW system. The exception is the MDC dimension on the archiving request ID, which is always defined in the NLS database for fact tables of NLS InfoCubes and active tables of DataStore objects.

> **i** Note
>
> This procedure only applies for newly created NLS InfoProviders. If you want to recluster NLS InfoProviders, you must reload the data into the SAP BW system and recluster the data there (see Reclustering NLS InfoProviders with MDC [page 80]).

Procedure

1. Create the relevant InfoCubes and DataStore objects in the SAP BW system with MDC as clustering option.
2. Create a data archiving process for the InfoProviders.
   The corresponding NLS InfoCubes and DataStore objects are created with MDC during the activation of the data archiving process.

More Information

Creating a Data Archiving Process for an InfoProvider [page 30]

Chapter *Implementing Multidimensional Clustering (MDC) for SAP BW Objects* in the database administration guide *SAP Business Warehouse on IBM Db2 for Linux, UNIX, and Windows: Administration Tasks* on SAP Help Portal at http://help.sap.com/db6_bw.

5 Archiving, Reloading, and Deleting NLS Data

This section provides information about basic operations on the NLS database, such as archiving data to and reloading data from the NLS database and deleting NLS data.

5.1 Archiving Data to the NLS Database

Use

For each InfoProvider for which you want to archive data to NLS, you create an archiving request with the relevant time interval or request IDs for archiving.

> **i** Note
>
> You can also automate the data archiving steps by defining process chains in SAP BW.
>
> For more information about how to schedule data archiving processes using process chains, see the SAP Library for your SAP BW release on SAP Help Portal at:
>
> http://help.sap.com/netweaver ▶ *SAP Business Warehouse* ▶ `<Your SAP BW release>` ▶ `<Business Warehouse/Intelligence>` - *Function-Oriented View* ▶ *Data Warehousing* ▶ *Data Warehouse Management* ▶ *Information Lifecycle Management* ▶ *Data Archiving Process* ▶ *Scheduling Data Archiving Processes Using Process Chains*

Prerequisites

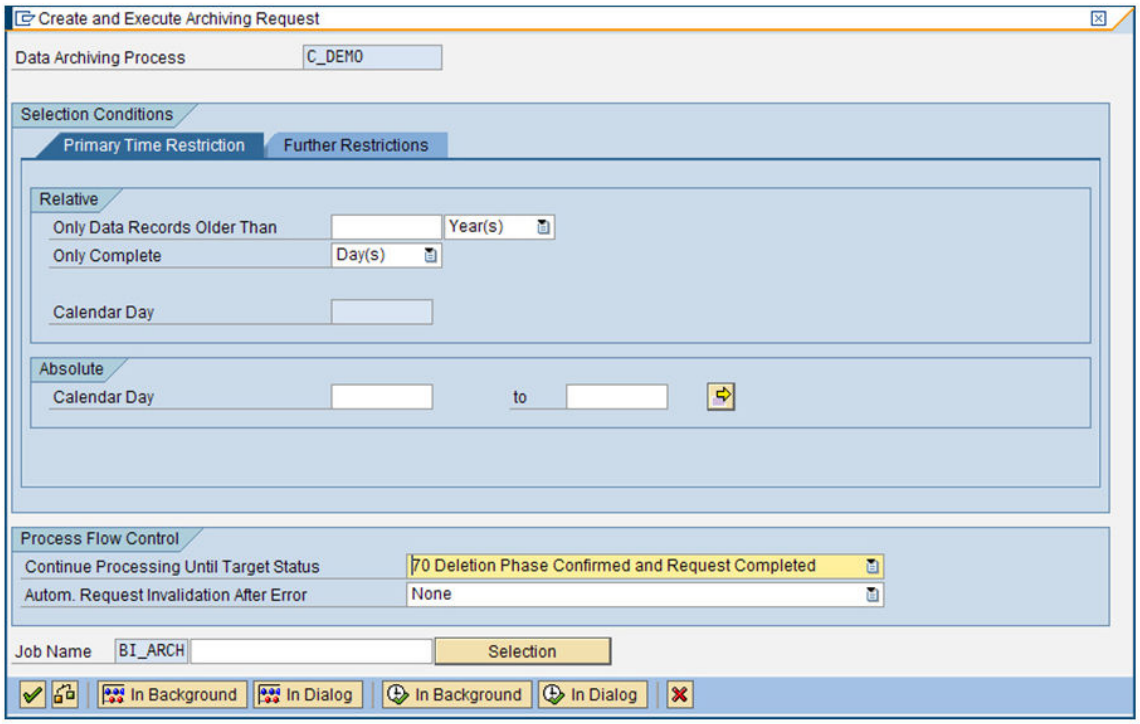
With SAP Business Warehouse (SAP BW) 7.01 and 7.02, you can only archive data from InfoCubes if the SAP BW requests containing this data have been completely compressed into the E fact table.

As of SAP BW 7.3 and higher, you can archive InfoCube data belonging to uncompressed and compressed requests. To be able to do so, you must configure the data archiving process to allow the archiving of data that is not compressed (see Creating a Data Archiving Process for an InfoProvider [page 30]).

Procedure

1. In your SAP BW system, call the Data Warehousing Workbench (transaction RSA1).

2. Select the relevant InfoProvider and choose *Manage* from the context menu.
   The screen *InfoProvider Administration* appears.
3. Choose the tab page *Archiving*.
   If you access this screen for the first time, there are no archiving requests available.
4. To create a new archiving request, choose the *Archiving Request* pushbutton.
   The dialog box *Create and Execute Archiving Request* appears.

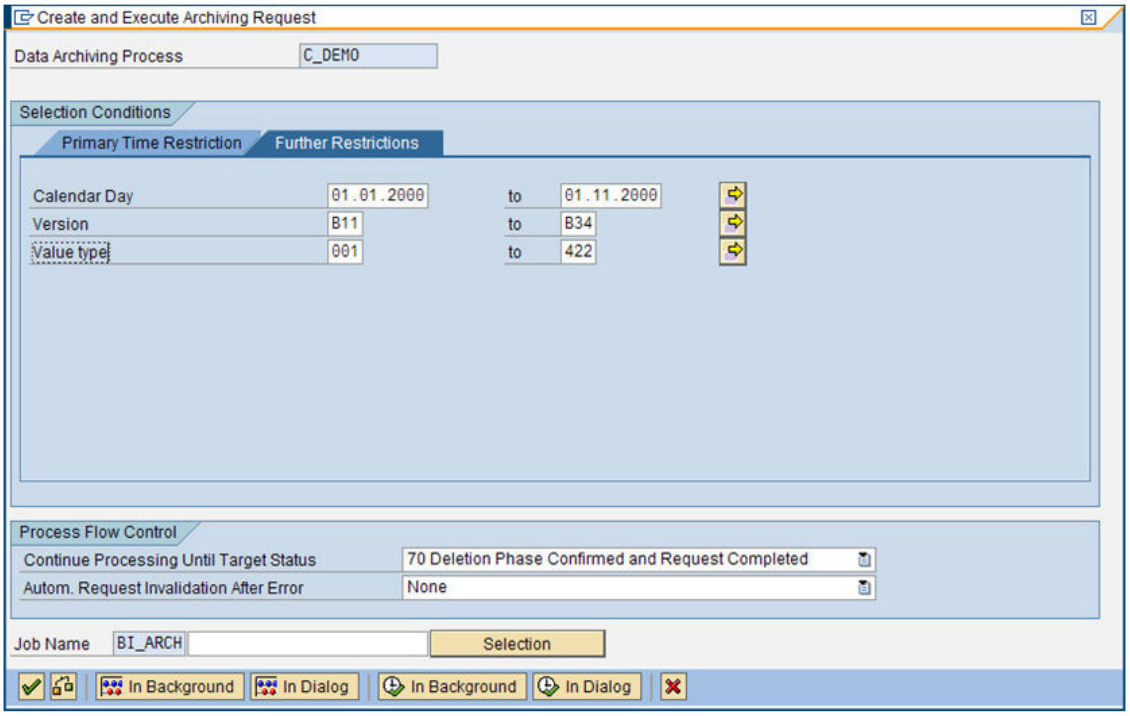


Create and Execute Archiving Request: Primary Time Restriction

5. On the tab page *Primary Time Restriction*, choose between the following ways to specify a time interval:
   - Specify a relative time restriction.
     In the *Relative* group box, you can specify if you want to archive records older than a certain time period, counting from today.
   - Specify an absolute time restriction.
     In the *Absolute* group box, you can specify if you want to archive records that belong to an exactly specified time frame.

> **i Note**
>
> You can also combine both methods. In this case, only the records that meet both restrictions are archived.

6. To define further restrictions, for example, for partitioning characteristics, choose the *Further Restrictions* tab page:



Create and Execute Archiving Request: Further Restrictions

Choosing further restrictions is only possible if you selected, for example, additional partitioning characteristics on the tab page *Selection Profile* when you created the data archiving process.
To define restrictions as in the example shown here, specify values in the *Calendar Day*, *Version*, and *Value type* fields.

7. In the field *Continue Processing Until Target Status*, select the target status for the processing of the archiving request, which can be as follows:
   - *10 Request Generated*
   - *30 Data Area of the Request is Locked Against Changes*
   - *40 Write Phase Completed Successfully*
   - *50 Verification Phase Ended Successfully*
   - *70 Deletion Phase Confirmed and Request Completed*

   Once the archiving request processing has been initiated, it has the status *10 Request Generated* and the archiving request is continuously processed until the status set by you has been reached.
   By default, the status *70 Deletion Phase Confirmed and Request Completed* is selected. The archiving request is **only** completed and available for reporting after it has reached status 70. Therefore, if you set one of the other status values (for example, 40 or 50), you have to complete the processing of the archiving request at a later point in time until status 70 is reached.
8. To execute the archiving request, you can either choose the pushbutton *Create Request and Execute in Background* (`F9`) or *Create Request and Execute in Dialog* (`F8`).

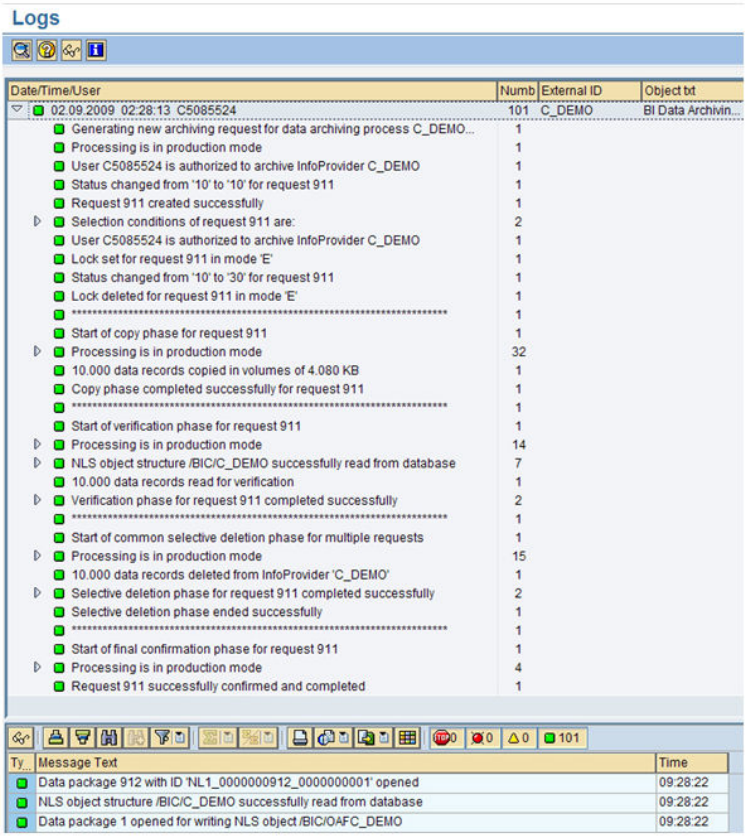
> **i Note**
>
> You can also simulate a data archiving process by choosing either the pushbutton *Simulate Request Processing in the Background* (`Shift`+`F9`) or *Simulate Request Processing in Dialog* (`Shift`+`F8`).

> Simulation mode means that no data is transferred to the NLS database and no data is deleted from the SAP BW database. However, all required parts of the process are executed. You can check the amount of records to be archived and whether any errors occurred during the simulation.

Result

If data has been successfully archived (that is, transferred to the NLS database) and deleted from the SAP BW database, the archiving request has now status 70.

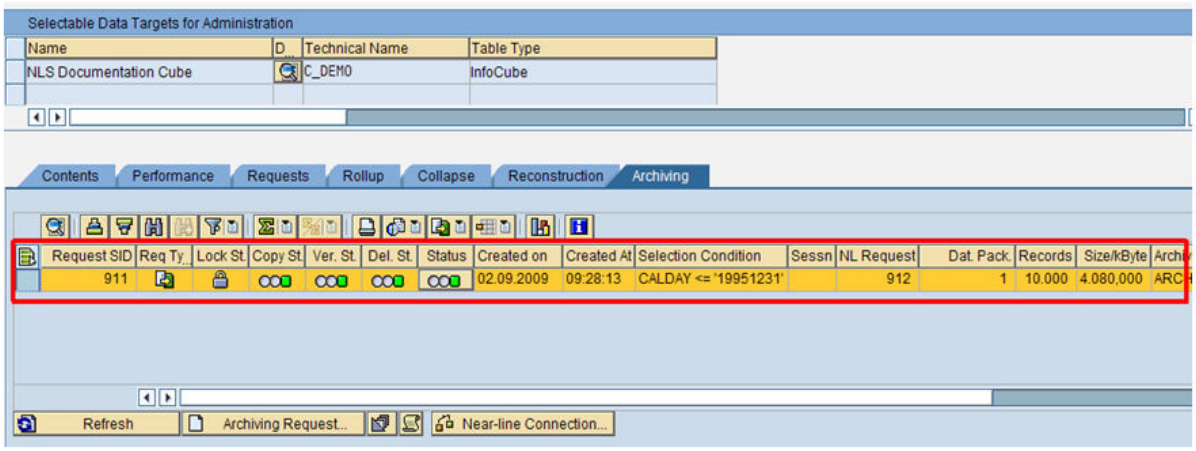
If you have executed the archiving request in dialog mode, a new screen appears at the end of the data archiving process, displaying the status of the archiving request as well as log information, as shown in the following figure:



Logs

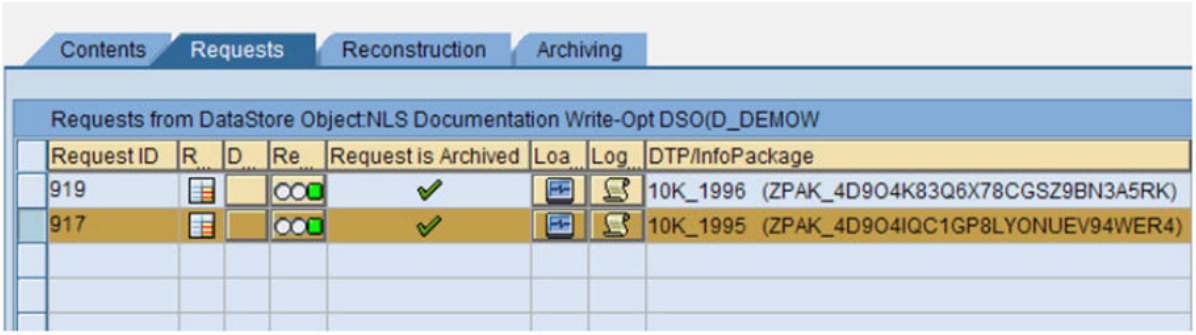
If the archiving request has run as a background job, you can view the log information for completed archiving processes (that is, processes that are currently not running because they have reached their target status): Choose the *Display Logs* pushbutton on the *Archiving* tab page of the *InfoProvider Management* screen.

If you go back from the logs to the *InfoProvider Administration* screen, you can see that all status indicators for your archiving request are displayed in green. If your archiving request has run as a background job, you need to refresh the data after the archiving request has finished to see up-to-date status indicators.



InfoProvider Administration

For write-optimized DataStore objects, there is a minor difference in the display options on the *Requests* tab page. Since write-optimized DataStore objects only support the request-based NLS archiving, a green check mark in the column *Request is Archived* is set for all SAP BW requests that have been transferred to the NLS database as shown in the following figure:



Requests Tab Page

5.2 Setting Up a Detailed Verification for Data Archived to NLS

Use

After data archiving to NLS, the system runs a general data verification, whose result is also displayed in the Data Warehousing Workbench (see Archiving Data to the NLS Database [page 65]). This check verifies written data to NLS by checking the number of rows written to the NLS object. This verification leads to status *50 Verification phase ended successfully* on the *Archiving* tab page of the InfoProvider in the Data Warehousing Workbench. This is the default verification.

In addition to this default verification, you can run a specific verification for NLS with IBM Db2 for Linux, UNIX, and Windows. This is a detailed verification based on the comparison of all fields of the transferred rows. This verification is executed within the archiving step. If the verification fails, the archiving step aborts and does not reach the status *40 Write phase completed successfully*.

If you want to use this verification, the `RSADMIN` parameter `DB6_NLS_VERIFY_COUNT` needs to be set to a value larger than 0. The parameter defines the percentage of rows that should be checked in detail. With the implementation of SAP Note 2204240 or the support packages mentioned in the SAP Note, the `RSADMIN` parameter `DB6_NLS_VERIFY_COUNT` is set to 1 by default. If you have not implemented SAP Note 2204240 or the relevant support packages, or if you want to set a parameter value other than 1, you can use program `SAP_RSADMIN_MAINTAIN` to change the parameter.

Procedure

1. In your SAP BW system, call the ABAP editor (transaction `SE38`) to run program `SAP_RSADMIN_MAINTAIN`.
2. Set the parameter `DB6_NLS_VERIFY_COUNT` in table `RSADMIN` to a value between 0 and 100.

5.3 Recommendations for Parallel NLS Archiving

To improve the performance of the data load process for InfoCubes and standard DataStore Objects, you can also start several archiving requests in parallel for the same InfoProvider. Before you do so, you should consider the following recommendations:

- When you define multiple data archiving requests, define them with time restrictions that do not overlap. Otherwise, an error can occur and the archiving process is terminated.

  > **Example**
  >
  > The following is an example of how you can define the time interval for parallel NLS archiving:
  >
  > You want to archive historical data between 2001 and 2003 from your InfoProvider to the NLS database. If you want to archive the data in three parallel archiving requests, you define absolute time restrictions by splitting the data into complete years, for example, `Year 2001`, `Year 2002`, and `Year 2003`. If you want to archive the data in six parallel archiving requests, you define time restrictions by splitting the data into six-month periods: `January 2001-June 2001`, `July 2001-December 2001`, and so on.

- You can only execute parallel archiving requests for an InfoProvider up to the target status of *50 Verification Phase Ended Successfully*. After status 50 has been reached, the deletion of data from the InfoProvider starts, which cannot be executed in parallel: When some parallel-running archiving requests start data deletion, other archiving requests might still be in the process of archiving to NLS. As a result, since the InfoProvider is locked during data archiving, deletion is not possible.
- After all parallel archiving requests have successfully reached status 50, create and schedule a process chain that executes every request sequentially until the final status *70 Deletion Phase Confirmed and Request Completed* is reached. Alternatively, you can manually continue every request sequentially in the Data Warehousing Workbench (transaction `RSA1`) until status 70 is reached.

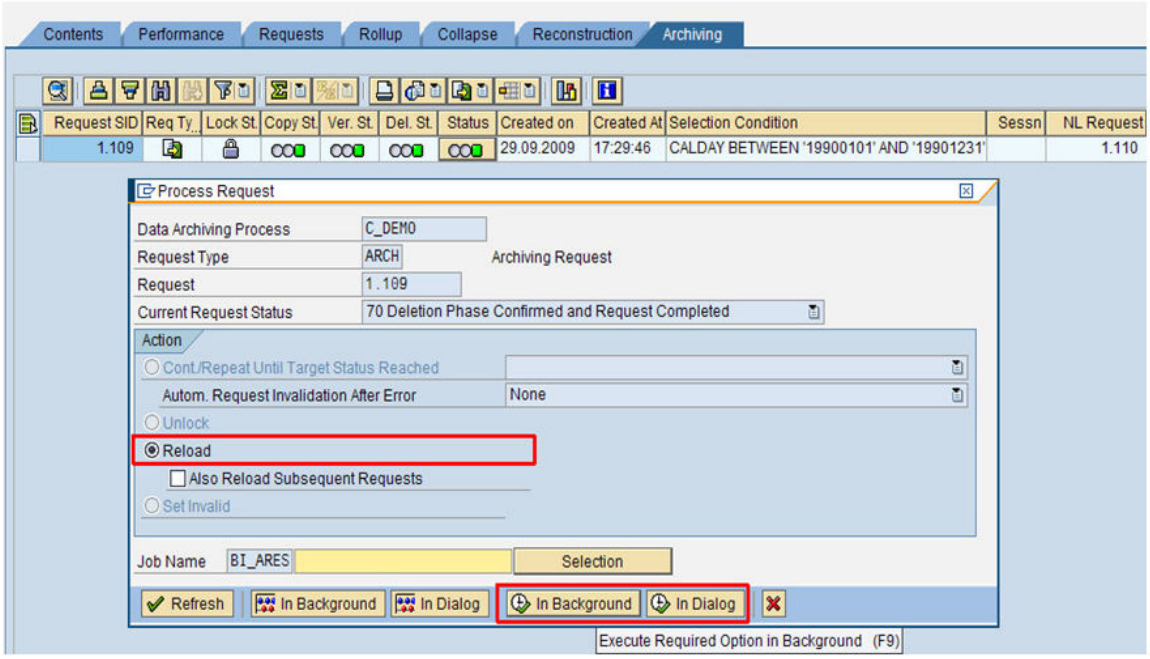
5.4 Reloading Archived Data From NLS to SAP BW

Use

After data has been successfully archived, you can no longer modify the data in the NLS database. For example, you cannot add records to data in the archived time frame. For SAP BW 7.01 and 7.02, you also cannot delete data from the NLS database. If you want to delete the archived data from your InfoProvider or if you want to modify the data of this InfoProvider, you must reload the data from the NLS database back into the SAP BW system where data becomes changeable.

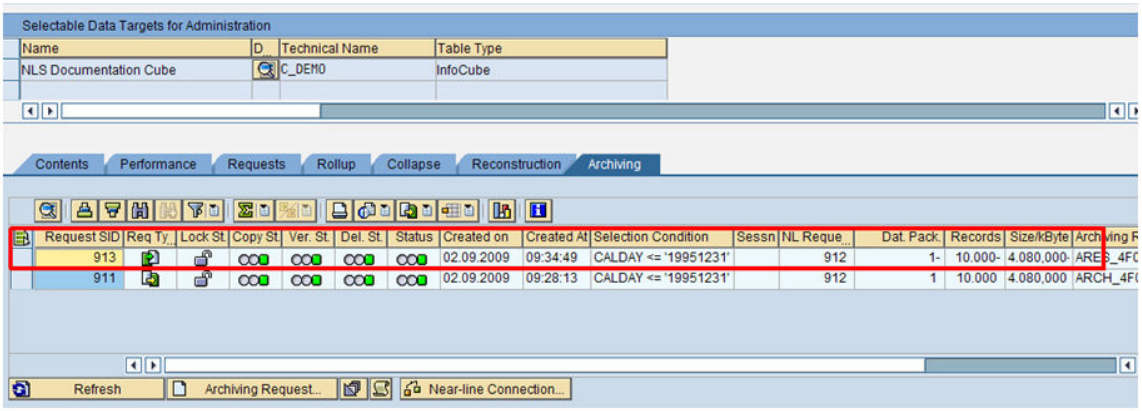
Procedure

1. In your SAP BW system, call the Data Warehousing Workbench (transaction RSA1).
2. Select the required InfoProvider and choose *Manage* from the context menu.
   The *InfoProvider Administration* screen appears.
3. To reload data, choose the *Archiving* tab page and double-click the required archiving request.
   The *Process Request* dialog box appears.



Process Request

4. Choose the *Reload* radio button and execute the request either by choosing the pushbutton *Execute Required Option in Background* (F9) or the *Execute Required Option in Dialog* (F8).
   The *Archiving* tab page appears again. The new request transfers data from the NLS database back to the SAP BW system.



Archiving Tab Page

5. To display the latest request on the *Archiving* tab page, choose the *Refresh* pushbutton.
   The time restriction for the reloading request is the same as for the corresponding archiving request. The values displayed in the *Records* and *Size/KByte* columns are the same for both types of archiving requests (archiving or reloading). However, the value for the reloading request has a negative sign indicating that data was transferred from the NLS database back to the SAP BW system.

> **i Note**
>
> Even after the data in the request was reloaded into the SAP BW system and after data was marked as invalid in the NLS database, the data records belonging to that request still exist in the NLS database. Invalid data records are not available for query reporting. To delete these data records from the NLS database, you can use the DBA Cockpit as described in Deleting Invalid Data Physically from the NLS Database [page 75].

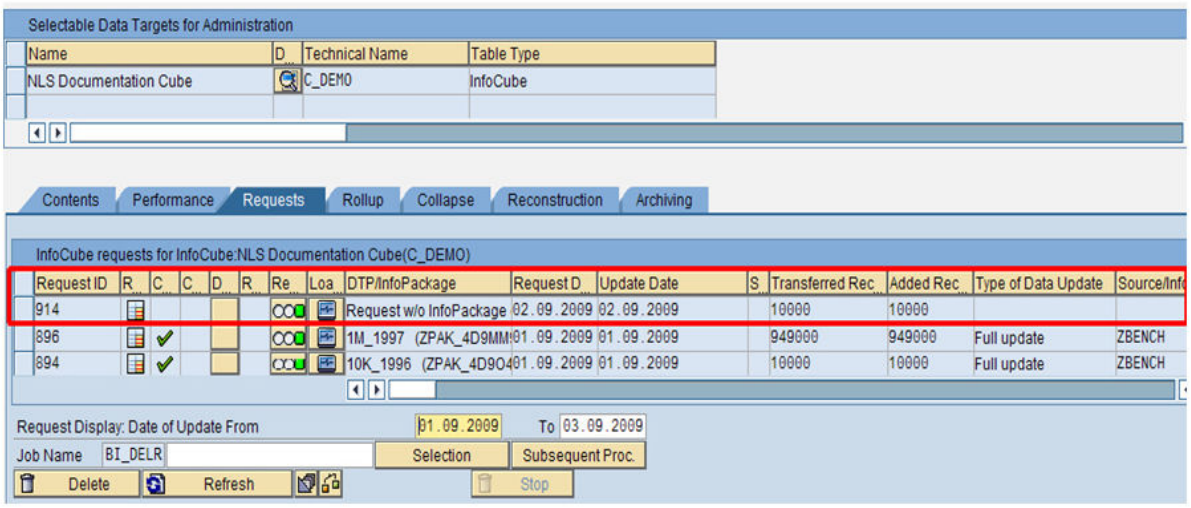
Result

You can now check whether the NLS data has been successfully reloaded into the SAP BW system. After a successful reload, you can modify the data in the SAP BW system and, if needed, archive it again to the NLS database.

Checking for Reloaded Requests

To check whether data has been successfully reloaded into the SAP BW system, go to the *Requests* tab page on the *InfoProvider Administration* screen and choose the *Refresh* pushbutton.

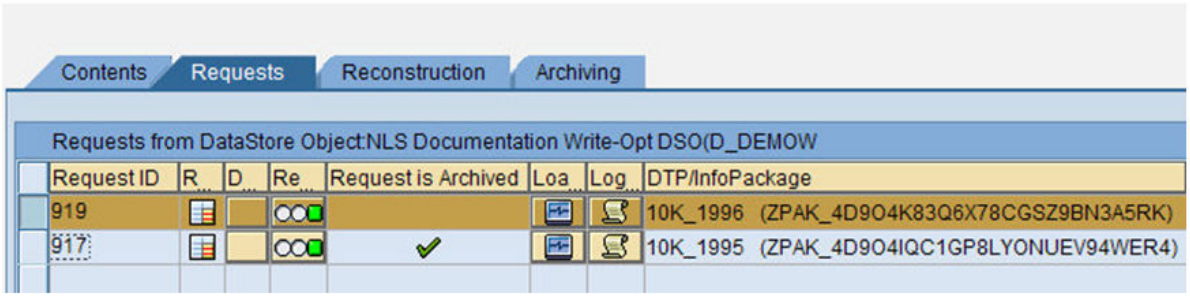
After a successful reload, the request appears on the list as shown in the following figure:



Reloaded Requests

This new SAP BW request contains all data from the NLS archiving request that was reloaded. You can now perform all usual operations on this request, such as, reporting, aggregate rollup, compression into the E fact table (for an InfoCube), deletion, and so on. Note that, as opposed to SAP BW requests that contain new data from external sources, the reloaded SAP BW request does not have an InfoPackage because InfoPackages are only used for loading completely new data into the SAP BW system.

For write-optimized DataStore objects, there is a small difference in the reloading algorithm for the archived data: After the data was reloaded, no new requests appear on the *Requests* tab page. The green check mark in the column *Request is Archived* is removed from the SAP BW requests that were previously archived to the NLS database, as shown in the following figure:



Reloaded Data for Write-Optimzed DataStore Objects

Modifying and Archiving Reloaded Data Again

After data was reloaded into the SAP BW system, you can modify data by loading new data into your SAP BW InfoProvider with the same time characteristics as the reloaded data. After you have modified the data, you can archive it again.

SAP BW 7.01 and 7.02 only: If you want to archive such a reloaded request again and the data archiving process configuration does not allow the archiving of uncompressed data, you must first compress the selected SAP BW request into the E fact table (on the *Collapse* tab page on the *InfoProvider Administration* screen). Afterwards, you can archive the data to the NLS database.

5.5 Deleting NLS Requests (SAP BW 7.3 and Higher)

To save space in the NLS database, you can delete archived data that you no longer need.

Procedure

1. Mark the relevant NLS requests for deletion.
2. Delete the data physically from the NLS database.

Related Information

Selecting NLS Requests for Deletion [page 74]
Deleting Invalid Data Physically from the Database [page 75]

5.5.1 Selecting NLS Requests for Deletion

Use

To save space in the NLS database, you can delete archived data that you no longer need. Before you physically delete the data from the NLS database, you must first mark the corresponding NLS requests for deletion.

Prerequisites

To be able to select archived data from NLS for deletion, you need the following minimum releases and support package levels:

- SAP Business Warehouse (SAP BW) 7.3 with Support Package 5
- SAP BW 7.31 with Support Package 2
- SAP BW 7.4 or higher

If you work with SAP BW 7.3 or 7.31 and a lower support package level, you need SAP Note 1620752.

> **i** Note
>
> If you work with SAP BW 7.01 or 7.02, selecting NLS requests for deletion is **not** possible.

Procedure

1. In your SAP BW system, call the Data Warehousing Workbench (transaction `RSA1`).
2. Select the required InfoProvider and choose *Manage* from the context menu.
   The InfoProvider administration screen appears.
   You can only select near-line requests for deletion if the corresponding archiving request has run successfully and has the request status *Deletion Phase Confirmed and Request Completed*. This is indicated with the green traffic light icon in the *Status* column on the *Archiving* tab page.
3. To delete the data of the archiving request, click the green traffic light icon.
4. In the *Process Request* dialog box, choose *Delete NLS-Request* and schedule the request in the background or in dialog.

Result

The NLS request is now marked for deletion in the `RSDANLREQ` table. The new status of the request is also displayed in the *NL Req-Status* column on the *Archiving* tab page.

If a near-line request is marked for deletion, the system considers the request as deleted. This means that SAP does not support an undo of the actions `INVALIDATE` or `DELETE`. Even if you use NLS without ADK, you cannot access the data any more: the data of the time slice that you marked for deletion remains locked.

To physically delete the data from the database, use the NLS cleanup job in the DBA planning calendar of the DBA Cockpit or run the program `RSDA_NEARLINE_REQUEST_DELETE`.

More Information

Deleting Invalid Data Physically from the Database [page 75]

5.5.2 Deleting Invalid Data Physically from the Database

Use

To save space in the NLS database, you can delete archived data that you no longer need. Such unneeded data might originate from the following sources:

- When data is reloaded from the NLS database into the SAP BW system, it is marked as invalid, but continues to exist in the NLS database.
- You have selected NLS requests for deletion (see Selecting NLS Requests for Deletion [page 74]).

This type of data is marked as invalid, but still on the database. To remove the data from the NLS database, you need to delete the data physically.

You can choose between the following tools to do this:

- Use the NLS cleanup job in the DBA planning calendar of the DBA Cockpit.
- Use program `RSDA_NEARLINE_REQUEST_DELETE`.

Prerequisites

The NLS cleanup job in the DBA Cockpit is available as of SAP BW 7.02. Depending on your SAP BW release and support package level, the job is also available if you use the NLS database with an SAP BW system running on IBM Db2 for Linux, UNIX, and Windows (Db2 for LUW) (see Enabling the DBA Cockpit for NLS Monitoring with SAP BW Running on a Non-Db2 for LUW Database [page 47]).

The program `RSDA_NEARLINE_REQUEST_DELETE` is available with SAP BW 7.3 SP05, SAP BW 7.31 SP02, and SAP BW 7.4 or higher or with SAP Note 1614142. You can also use the program if your SAP BW database does not run on Db2 for LUW.

> → Recommendation
>
> We recommend that you use the DBA Cockpit, if possible.

Procedure

1. Follow the instructions in section *Running the NLS Cleanup Job* in the separate document *Database Administration Guide Using the DBA Cockpit: IBM Db2 for Linux, UNIX, and Windows* on SAP Help Portal at https://help.sap.com/viewer/db6_dbacockpit.
2. Alternatively, use program `RSDA_NEARLINE_REQUEST_DELETE`.
   For more information, see SAP Note 1614142.

5.6 Deleting NLS Requests (SAP BW 7.01 and 7.02)

To save space in the NLS database, you can delete archived data that you no longer need. With SAP BW 7.01 and 7.02, you cannot delete NLS requests in the NLS system, but you need to reload them to SAP BW first.

Procedure

1. Since you cannot mark the relevant NLS requests for deletion, reload the NLS requests back to SAP BW and delete them in SAP BW.
2. Delete the data physically from the NLS database.

Related Information

Reloading Archived Data From NLS to SAP BW [page 71]
Deleting Invalid Data Physically from the Database [page 75]

5.7 Reloading Deleted Requests from ADK to NLS

Use

If you use NLS with the Archive Development Kit (ADK), the ADK files remain on the database although the nearline request has been deleted. If you want to make the physically deleted nearline requests visible for queries again, you can reload requests from ADK to NLS.

Procedure

1. In the SAP BW system, on the InfoProvider administration screen, double-click the archiving request that is marked for deletion.
2. In the *Process Request* dialog box, choose *Reload NLS-Request from ADK*.

Result

The system displays a new near-line request SID in the *NL Req.* column and the *Delete* icon in the *NL Req.-Status* column has disappeared.

6 Changing the Table Layout, Reclustering, and Converting the Table Format to Column-Organized

The following sections cover how you can recluster NLS objects, convert them to another table format, or change the table layout of the source InfoProviders in SAP BW. During the productive use of SAP BW with NLS, the need for such activities arises in the following situations:

- **Reclustering NLS objects to align settings for multidimensional clustering (MDC)**
  You use MDC in SAP BW. You have reclustered SAP BW InfoProviders. You want to recluster your NLS InfoProviders, too, to take advantange of the performance benefit of using MDC in your NLS database.
- **Changing the table layout of source InfoProviders in SAP BW**
  You want to change the table layout of source InfoProviders in SAP BW while keeping the NLS archiving process running correctly.
- **Converting the table format of NLS objects from row-organized to column-organized**
  After you have already loaded data into the NLS tables, you want to convert the tables from a row-organized to a column-organized table layout in the NLS database to profit from the performance benefits of BLU Acceleration.

6.1 Changing the Layout of Source InfoProviders of Row-Organized NLS InfoProviders

Use

If you use row-organized tables for NLS InfoCubes and DataStore objects, you can change the layout of the source InfoCubes and DataStore objects in the SAP BW database to a limited degree without having to reload the NLS data back into the SAP BW system: Compatible changes such as adding new characteristics and key figures are possible. For a full list of possible compatible changes, see SAP Notes 1005040 and 1717889.

If you need to make incompatible layout changes in the SAP BW system, you first need to reload the archived data of the relevant InfoProviders from NLS to SAP BW.

Prerequisites

To be able to make compatible changes, you must have implemented SAP Notes 1005040 and 1717889 or the minimum support packages listed in these SAP Notes.

Procedure

Making Compatible Changes to SAP BW InfoProviders

1. Check whether your planned changes are compatible changes (see SAP Notes 1005040 and 1717889).
2. Perform the compatible changes to the InfoProviders in SAP BW.
3. Re-activate the data archiving process.
   The changes will be applied to the NLS InfoProviders.

Making Incompatible Changes to SAP BW InfoProviders

1. If your changes to the source InfoProviders in SAP BW are not listed as compatible changes in SAP Notes 1005040 and 1717889, reload the archived data from NLS to the SAP BW system.
2. Delete the data archiving process.
3. Change the layout of the InfoCube or DataStore object in the SAP BW system.
4. Re-create the data archiving process.
5. Re-archive the data.

More Information

Reloading Archived Data From NLS to SAP BW [page 71]

Creating a Data Archiving Process for an InfoProvider [page 30]

Archiving Data to the NLS Database [page 65]

6.2 Changing the Layout of Source InfoProviders of Column-Organized NLS InfoProviders

Use

If you use column-organized tables for NLS InfoCubes and DataStore objects, you can add new characteristics and key figures to the source InfoCubes and DataStore objects in the SAP BW database without having to reload the NLS data back into the SAP BW system. This also includes characteristics in new dimensions

If you need to make other layout changes in the SAP BW system as described in SAP Note 1005040, you first need to reload the archived data of the relevant InfoProviders from NLS to SAP BW.

Prerequisites

For Adding New Key Figures or Characteristics Only

To be able to add new key figures or characteristics to an DataStore object or InfoCube table, you need an NLS system running on Db2 10.5 FP5SAP2 or higher. In addition, you need SAP Note 2063589 or the relevant support packages listed in this SAP Note.

Procedure

Adding a New Key Figure or Characteristic to the Source InfoProvider

1. Add a new characteristic or key figure to the InfoCube or to the DataStore object in the SAP BW system.
2. Re-activate the data archiving process.

Performing Other Structural Changes to the Source InfoProvider

1. Reload the archived data from the NLS database to the SAP BW system.
2. Delete the data archiving process.
3. Change the layout of the InfoCube or DataStore object in the SAP BW system.
4. Re-create the data archiving process.
5. Re-archive the data.

More Information

Reloading Archived Data From NLS to SAP BW [page 71]

Creating a Data Archiving Process for an InfoProvider [page 30]

Archiving Data to the NLS Database [page 65]

SAP Note 2063589

6.3 Reclustering NLS InfoProviders with MDC

If you want to recluster NLS InfoProviders, you must reload the data into the SAP BW system and recluster the data there. You cannot recluster InfoProviders in the NLS database.

Context

If you have reclustered InfoProviders in your SAP BW system, these reclusterings are not automatically taken over by the NLS database. Query processing and data archiving will continue to work without changes even if the clustering settings of BW InfoProviders and NLS InfoProviders diverge. However, you might want to consider reclustering your NLS InfoProviders together with the SAP BW InfoProviders to take advantage of the performance benefit of using MDC in your NLS database.

Procedure

1. Reload the data of the relevant InfoProviders from the NLS database back into the SAP BW system.
2. Recluster the relevant InfoProviders in SAP BW using the SAP BW reclustering tool.
3. Transfer the data of the InfoProviders back to the NLS database using an archiving request.

Result

The NLS InfoProviders have now adopted the new clustering settings from the SAP BW system.

More Information

Reloading Archived Data from NLS to SAP BW [page 71]

Archiving Data to the NLS Database [page 65]

Chapter *Reclustering Existing SAP BW Objects* in the database administration guide *SAP Business Warehouse on IBM Db2 for Linux, UNIX, and Windows: Administration Tasks* on SAP Help Portal at http://help.sap.com/db6_bw.

6.4 Converting NLS InfoProvider Tables From Row-Organized to Column-Organized and Vice Versa

Use

You want to use column-organized tables for the following NLS InfoProviders:

- Fact tables and dimension tables of NLS InfoCubes
- Active tables of NLS DataStore objects

If you have already loaded data into the NLS tables, you cannot convert the tables from a row-organized to a column-organized table layout in the NLS database. It is also not possible to convert column-organized tables to a row-organized layout in the NLS database. Instead, you must reload the data from the NLS database back to the SAP BW system, then make sure that the desired NLS table layout is configured correctly in SAP BW, and archive the data to NLS again.

Procedure

1. Reload the data from the NLS database to SAP BW.
   For more information, see Reloading Archived Data From NLS to SAP BW [page 71].
2. Delete the relevant data archiving process.
3. Configure the relevant settings in SAP BW that ensure that tables in the NLS database are created as column-organized or row-organized (as desired).
   For more information, see Creating InfoProviders with Column-Organized Tables in the NLS Database [page 103].
4. Create a new data archiving process for the data.
   For more information, see Archiving Data to the NLS Database [page 65].

7 Monitoring and Administration of the NLS Database Using the DBA Cockpit

Use

You can monitor and administer the Db2 NLS database remotely from your SAP BW system or any other ABAP-based SAP system using the DBA Cockpit. The DBA Cockpit is an SAP tool for the monitoring and administration of databases and is part of every SAP NetWeaver-based system as of release 7.0.

Prerequisites

You have added the NLS database as a remote system to your system landscape as described in the documentation *Database Administration Using the DBA Cockpit: IBM Db2 for Linux, UNIX, and Windows*. For more information about setting up the NLS database for monitoring in the DBA Cockpit, see SAP Note 1124987.

In addition to the NLS database connection, you have set up another secondary database connection for monitoring with the DBA Cockpit. The connect user specified for the NLS database connection requires access to application data. Therefore, for security reasons, the NLS database connection should not be the same as the database connection that is used for the monitoring of the NLS database itself.

If you use a database other than IBM Db2 for Linux, UNIX, and Windows for your SAP BW system, you have enabled the DBA Cockpit for NLS monitoring. For more information, see Enabling the DBA Cockpit for NLS Monitoring with SAP BW Running on a Non-Db2 for LUW Database [page 47].

Features

The following general monitoring screens are available in the DBA Cockpit, which you can also use for monitoring NLS databases:

- *Space* > *Tablespaces*
  On this screen, you can retrieve a list of the tablespaces created in the remote NLS database. By selecting a tablespace and using the *Contents* pushbutton, you can retrieve a list of tables that were created in a particular tablespace.
- *Performance* > *Tablespaces*
  On this screen, you can access performance data for tablespaces, including performance metrics for I/O operations.
- *Performance* > *Buffer Pools*
  On this screen, you can access performance data for the available buffer pools.
- *Backup and Recovery* > *Backup and Recovery: Overview*
  On this screen, you can retrieve information about the existing backups of your NLS database.

In addition to the general monitoring screens, the DBA Cockpit of your SAP BW system offers the following NLS-specific screens:

- *BW Administration* > *NLS Configuration*
  This screen provides an overview of existing connections to NLS databases. On this screen, you can also maintain the connection to an NLS database.
- *BW Administration* > *NLS Overview*
  On this screen, you can monitor the space consumed by the InfoProviders in the SAP BW database and by NLS objects in the NLS database. In addition, you can use this screen to enable SAP BW queries to automatically access the NLS database.
- *Jobs* > *DBA Planning Calendar*
  On this screen, you can use the job *NLS Cleanup Job* to remove invalid data from your NLS database.

More Information

Setting Up the Connection to the NLS Database [page 29]

Enabling BW Queries to Read NLS Data [page 32]

Deleting Invalid Data Physically from the Database [page 75]

Database Administration Using the DBA Cockpit: IBM Db2 for Linux, UNIX, and Windows on SAP Help Portal at https://help.sap.com/viewer/db6_dbacockpit

8 Backup and Recovery of the NLS Database

The following sections provide basic information about the backup and recovery of an NLS database.

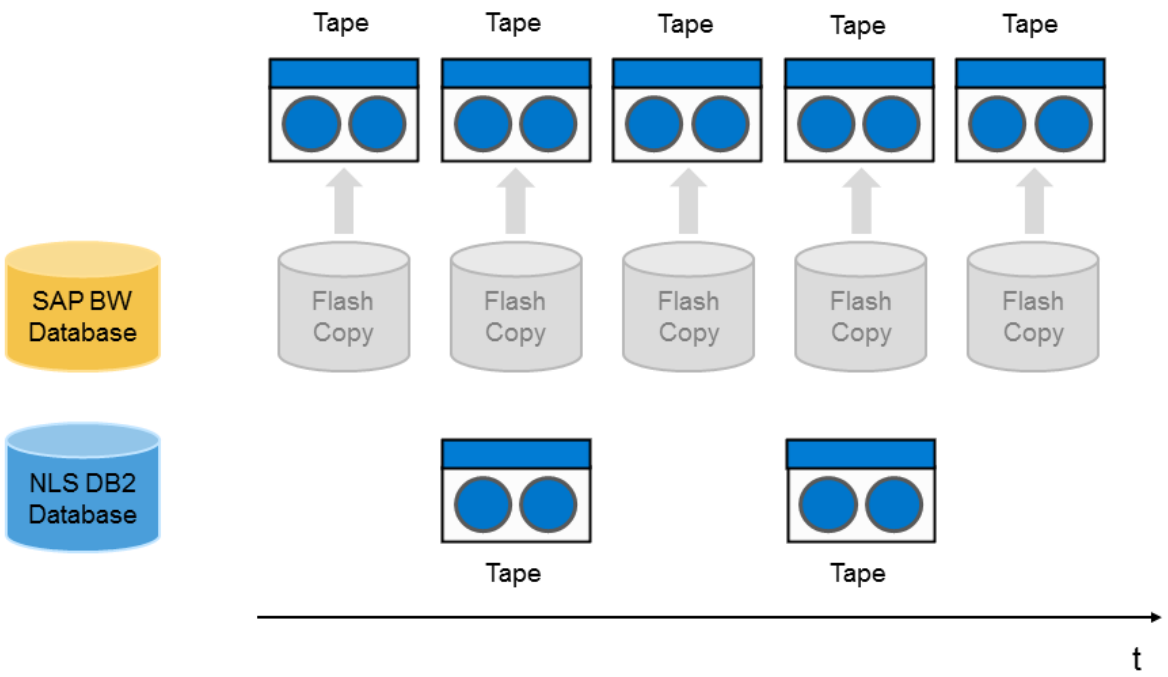
8.1 Backup of the NLS Database

As for any other database in your system landscape, you have to define an appropriate backup and recovery strategy for the NLS database. This NLS-specific strategy depends on, for example, available hardware, backup devices, and so on.

New data is less frequently added to the NLS database than to an SAP BW database. The execution of SAP BW queries does not change the data in the NLS database because the SAP BW queries only read data. The only operations that change data in the NLS database are creating, modifying, or deleting data archiving processes, archiving data to the NLS database, and reloading data back into the SAP BW system.

Therefore, you can devise a different backup strategy for the NLS database. For example, database backups of the NLS system can be performed using a different infrastructure, such as an online backup instead of a flash copy that is used for SAP BW.

> → Recommendation
>
> We recommend that you still perform frequent backups of the NLS database, especially after larger archivings of data to near-line storage. Remember that if it comes to inconsistencies between the SAP BW and the NLS database or any other issues, the backup of the NLS database is the only backup that you can resort to for archived data.



Example: Backup Intervals and Backup Media for SAP BW and NLS Databases

For the NLS database, the same backup methods are supported as for the SAP BW database because the NLS database is a standard Db2 database. That is, you can perform offline or online backups, you can start a backup directly from the Db2 command prompt, or you can schedule a backup job using the DBA Planning Calendar in the DBA Cockpit.

More Information

For more information about how to schedule a backup job in the DBA Planning Calendar of the DBA Cockpit, see *Database Administration Using the DBA Cockpit: IBM Db2 for Linux, UNIX, and Windows* on SAP Help Portal at https://help.sap.com/viewer/db6_dbacockpit.

For more information about database backups, see the *Database Administration Guide – SAP on IBM Db2 for Linux, UNIX, and Windows* on SAP Help Portal at http://help.sap.com/db6_bw.

8.2 Configuring the NLS Database for Archive Logging

Before you can take an online backup from an NLS database, you must configure it for **archive logging**. Archive logging enables you to take online backups as well as to recover the NLS database to a certain point in time in the event of a system failure.

> **i** Note
>
> Make sure that you've configured your NLS database for archive logging before you start using the NLS database.

Procedure

To enable the NLS database for archive logging, set the database configuration parameter `LOGARCHMETH1`.

More Information

Chapter *Enabling the Database for Rollforward Recovery* in the document *Database Administration Guide – SAP on IBM Db2 for Linux, UNIX, and Windows* on SAP Help Portal at http://help.sap.com/db6_admin.

8.3 Recovering the NLS Database

Use this procedure to recover your NLS database after a hardware failure.

Context

You need to recover the NLS database if a hardware failure has caused your NLS database to crash. In addition, a restore and rollforward of the NLS database might be necessary as a last resort in the following cases:

- The SAP BW database failed while data was being transferred to the NLS database.
- You have restored and rolled forward the SAP BW database to a specific point in time.

In these two situations, you can keep the NLS database as it is if you manage to resynchronize the SAP BW and NLS systems. If a resynchronization is not possible, you must restore and roll forward the NLS database to achieve consistency with the SAP BW system. For more information, see Achieving System Consistency After a SAP BW or NLS Database Recovery [page 88].

Procedure

1. Restore the NLS database using a suitable backup image.
2. Roll forward the NLS database using the available log files to the end of logs or, if needed, to a specific point in time.

Result

The NLS database is recovered.

After the recovery, you must check whether the information in the NLS database is now logically consistent with the BW database, that is, whether the data in the SAP BW database and in the NLS database are in sync. Therefore, always proceed with running a consistency check of the NLS database and the SAP BW database.

More Information

Chapter *Backup and Recovery* in the document *Database Administration Guide: SAP on IBM Db2 for Linux, UNIX, and Windows* on SAP Help Portal at http://help.sap.com/db6_admin.

Achieving System Consistency After an SAP BW or NLS Database Recovery [page 88]

Running the Consistency Check for the NLS Database and the SAP BW Database [page 94]

8.4 Achieving System Consistency After an SAP BW or NLS Database Recovery

Use

After a database recovery of the SAP BW database or the NLS database, you must check whether the information in the NLS database is still logically consistent with the SAP BW database.

> ✤ Example
>
> For example, the SAP BW database is in a consistent state and contains the data from today. The NLS database is also in consistent state but only contains data up to yesterday. This means that the data that was archived to the NLS database today is missing, and the databases are regarded as logically inconsistent.

The NLS solution based on IBM Db2 for Linux, UNIX, and Windows is able to identify whether the NLS database is logically consistent with the SAP BW database by comparing the time stamps of the last changes in the respective databases. If the time stamps are not identical, no connection from the SAP BW system to the NLS database is allowed until the inconsistencies have been resolved.

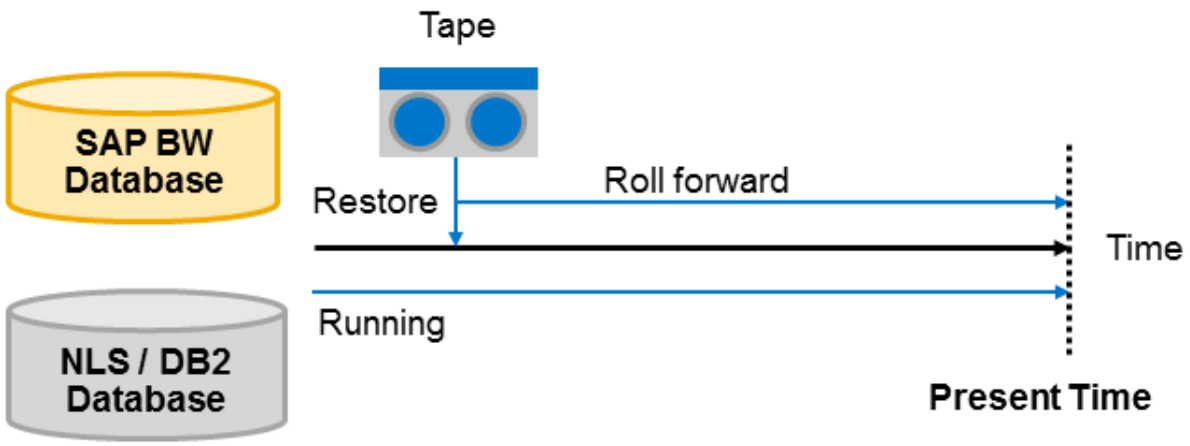
Achieving system consistency might be relevant in the following scenarios:

- The SAP BW database crashed and had to be recovered, and you were able to restore and roll it forward to the end of logs (present point in time).
- The NLS database crashed and had to be recovered, and you were able to restore and roll it forward to the end of logs (present point in time).
- The SAP BW database crashed and had to be recovered, but you had to perform a point-in-time recovery. For example, due to a loss of log files, you were unable to restore and roll it forward to the end of logs.
- Both the SAP BW Database and NLS Database crashed and had to be recovered.
- The NLS database crashed and had to be recovered, but you had to perform a point-in-time recovery. For example, due to a loss of log files, you were unable to restore and roll it forward to the end of logs.

In the following, these scenarios are described in more detail.

SAP BW Database Restore and Rollforward to the End of Logs

After an SAP BW database crash and database restore, we recommend that you always roll forward the restored database to the end of logs (present point in time). This is the standard procedure.

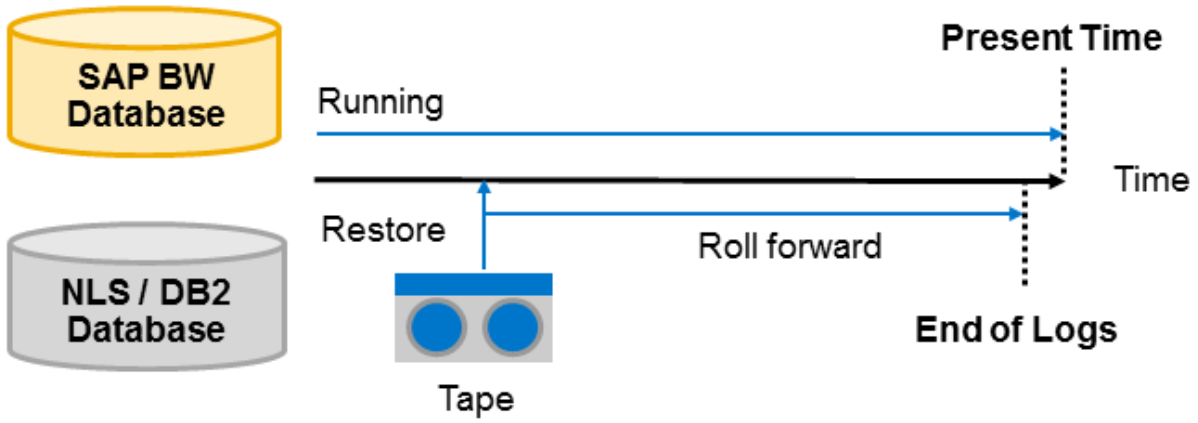


Restore and Rollforward of the SAP BW Database to the Present Point in Time

In this case, no inconsistencies between the SAP BW database and the NLS database should exist. As a best practice, we recommend that you perform a consistency check.

NLS Database Restore and Rollforward to the End of Logs

After an NLS database crash, restore and roll forward the NLS database to the end of logs. Again, this is a standard procedure.



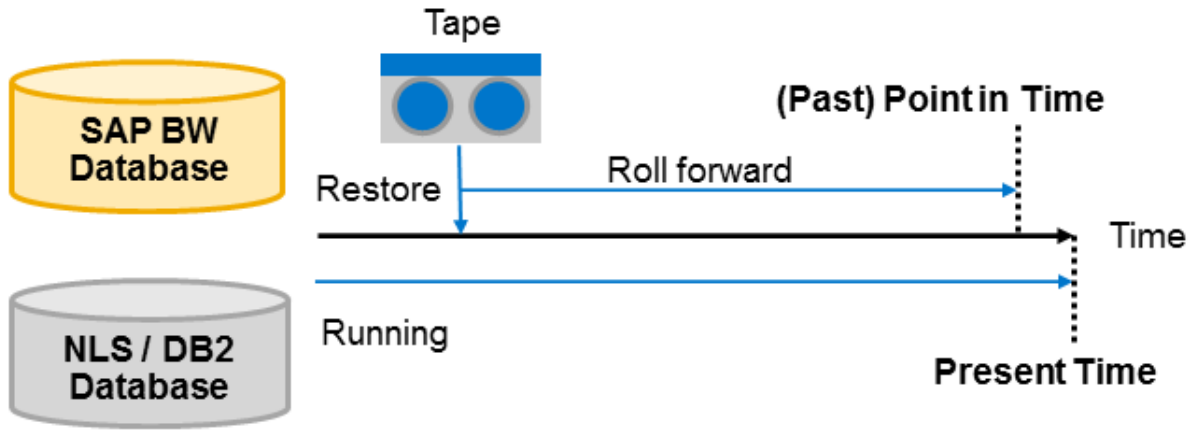
Restore and Rollforward of the NLS Database to the End of Logs

When the NLS database is being recovered, the SAP BW system can be kept up and running as normal. Users can perform their regular activities. However, when users try to run queries in SAP BW or start other activities that need to access data in the NLS database, this will be stopped by the system. The users get error messages because the NLS data is not available.

After the restore and rollforward of the NLS database, no inconsistencies between the SAP BW database and the NLS database should exist. We recommend that you run a consistency check of the databases.

SAP BW Database Restore and Point-in-Time Rollforward

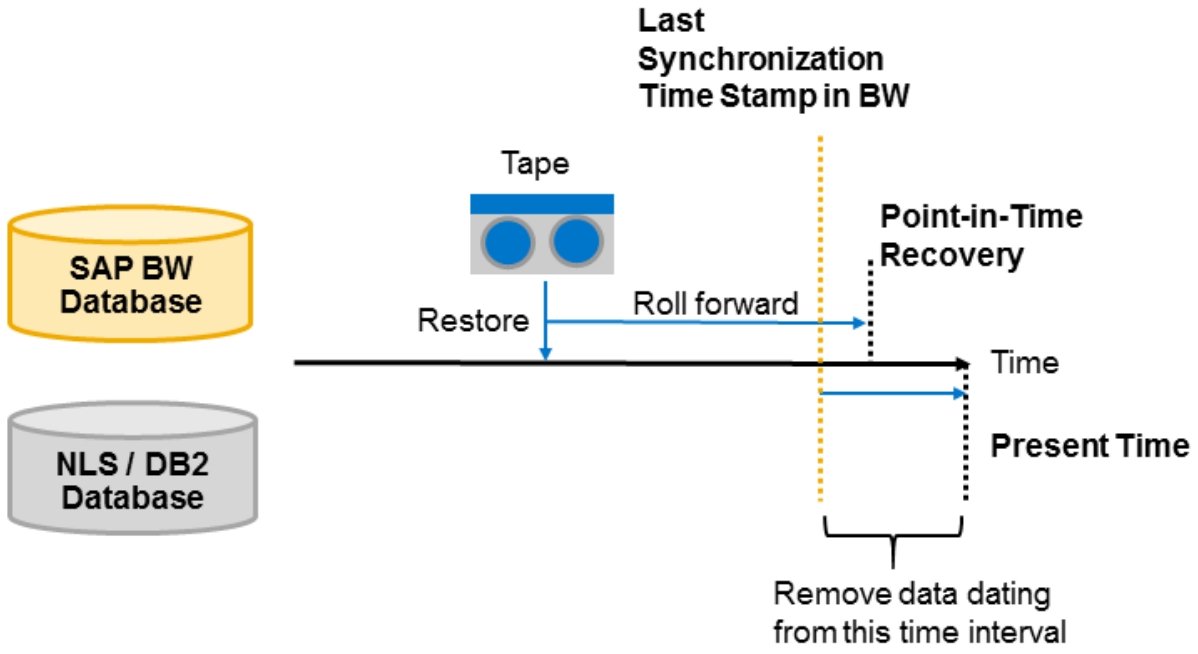
An SAP BW database recovery should be done to end of logs. A point-in-time rollforward should be the exception and might be necessary, for example, in the case of lost or corrupt log files. In this case, the SAP BW database is up and running again after the restore and rollforward, but it is out of sync with the NLS database. The NLS database might contain data that was archived to NLS after the point in time to which the SAP BW database was recovered.



Situation After a Restore and Rollforward of the SAP BW Database to a Point in the Past

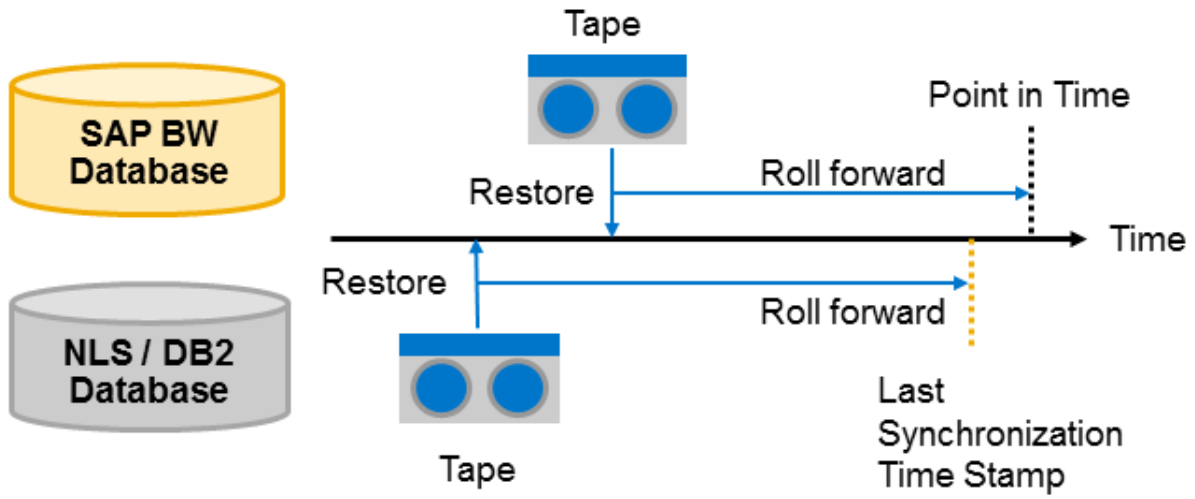
In this situation, no work with the NLS database is possible, even though it is up and running. Access from the SAP BW system to an inconsistent NLS system is automatically blocked to avoid any data modifications, which would increase the inconsistency.

In this case, one way to correct the inconsistency between SAP BW and NLS is to clean up the NLS database and remove all data from NLS that was archived to NLS after the point in time to which SAP BW was recovered. To clean up the NLS database, run the consistency check using the DBA Cockpit or using the function module `FM_RSDA_DB6_SYNC_CHECKER`. If the consistency check returns the result that the NLS database is not consistent with SAP BW database, but it can be resynchronized, you can run the resynchronize function in the DBA Cockpit or execute the function module `FM_RSDA_DB6_SYNC_CHECKER` in repair mode. For more information, see the DBA Cockpit documentation or the `FM_RSDA_DB6_SYNC_CHECKER` documentation attached to SAP Note 1515422.



Option 1: Resynchronize SAP BW and NLS (Recommended)

Another option to correct the inconsistency is to restore the NLS database and roll forward the NLS database up to the time stamp when the restored SAP BW last synchronized with the NLS database (last synchronization time stamp in SAP BW). You can find the last synchronization time stamp in the *Target Timestamp* field on the *NLS Synchronization Check* screen of the DBA Cockpit and in the `E_BW_TIMESTAMPL` field of the the function module `FM_RSDA_DB6_SYNC_CHECKER`.



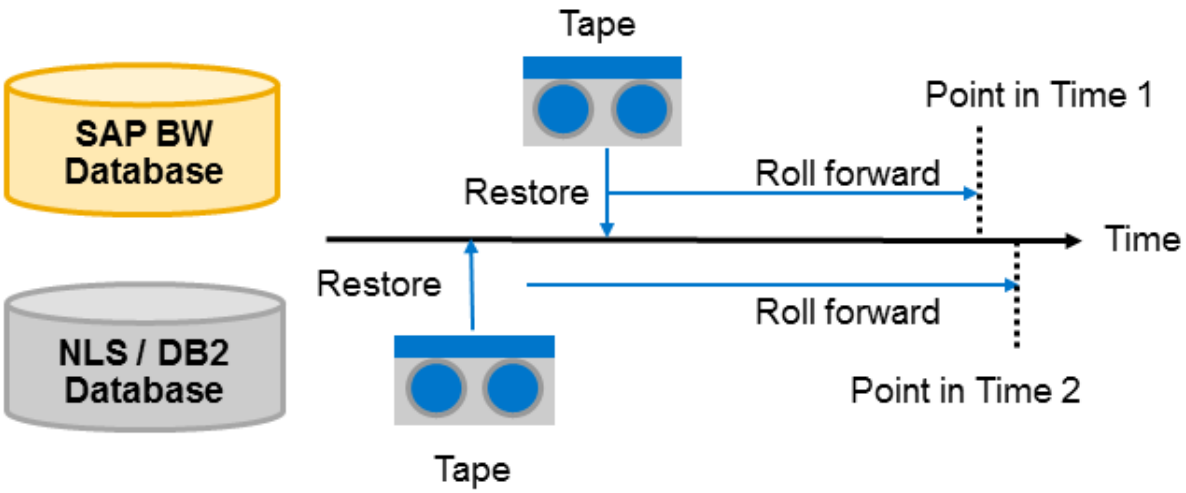
Option 2: Restore and Rollforward of the NLS Database to Achieve Logical Consistency

> → Recommendation
>
> Since a restore and a rollforward of the NLS database require a longer downtime for the NLS system, we recommend that you remove the inconsistency between SAP BW and NLS using the resynchronize function in the DBA Cockpit or using the function module `FM_RSDA_DB6_SYNC_CHECKER` in repair mode, if possible.

SAP BW Database and NLS Database Restore and Point-in-Time Rollforward

When both the SAP BW and NLS databases have crashed, we recommend a restore and follforward to the end of logs as a standard procedure. In an exceptional situation, you might decide that the SAP BW database and the NLS database need to be recovered to a specific point in time, for example, because of a loss of log files.

If such a point-in-time recovery must be done, recover the SAP BW database first. Then make sure that the recovered NLS database is as up-to-date or more up-to-date than the SAP BW database. It might not be possible to get NLS and SAP BW in sync if the NLS data is older than the SAP BW data. If NLS is older than SAP BW, then data might already have been removed from SAP BW but not yet be in NLS. Such data would be lost.



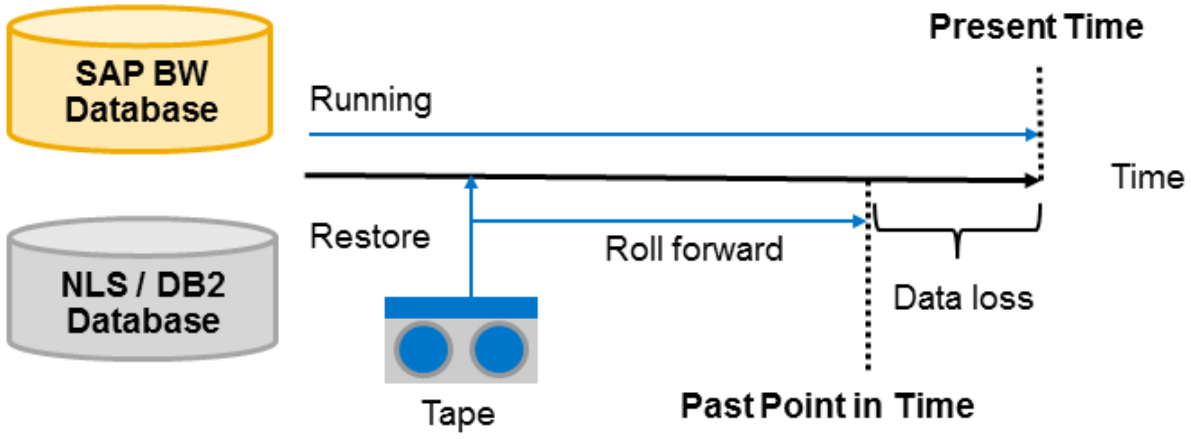
Exceptional Case: Restore and Rollforward of SAP BW and NLS to a Point in Time

After you have recovered both databases, you can perform a consistency check. The consistency check determines whether the SAP BW and NLS databases are still out of sync. You can resynchronize the databases using the consistency check. If a resynchronization is not possible, an additional restore and rollforward of the NLS database is needed. Repeat the restore and rollforward of the NLS database to the last synchronization point in SAP BW, as displayed by the consistency check. For more information, see the *SAP BW Database Restore and Point-in-Time Rollforward* section in this chapter.

NLS Database Restore with Incomplete or No Rollforward to End of Logs

An NLS database restore with incomplete or no rollforward to the end of logs is another exceptional scenario that might happen, for example, due to a loss of log files. In this case, the NLS database can only be recovered and rolled forward to a point in time. Even though the SAP BW and the NLS databases are now both up and running again, they might be out of sync. To determine whether they are out of sync, run the consistency check. If the consistency check returns no error, no data was archived to NLS in the time window between the recovery point of the SAP BW database and the present time. You can continue working.

If the consistency check returns an error, SAP BW and NLS are out of sync and cannot be resynchronized. Data that was archived from SAP BW to the NLS database but that is not in NLS is lost.



Restore and Incomplete Rollforward of NLS Database After Data Loss

In such an exceptional case, you need to open a customer incident in the SAP customer support system to receive assistance from SAP support.

More Information

Running the Consistency Check of the NLS Database and the SAP BW Database [page 94]

8.5 Running the Consistency Check for the NLS Database and the SAP BW Database

Use

After the execution of an archiving request, the transferred data must reside in the NLS database only. The SAP BW system records internal information stating that data has been successfully transferred to the NLS system. To ensure consistency, the NLS solution runs consistency checks of the SAP BW and the NLS systems every time a connection is opened from the SAP BW system to the NLS system. If there is an inconsistency, the NLS connection is not established and an error message is displayed, describing the cause of the problem.

If one of the databases is recovered to a previous state, the SAP BW system and the NLS system might no longer be consistent.

As of Support Package 8 for SAP BW 7.0, the DBA Cockpit for Db2 for LUW provides an option to check the consistency of the NLS and SAP BW systems. For SAP BW systems with a lower support package level, you can use the function module `FM_RSDA_DB6_SYNC_CHECKER` with the same functions. With the checks provided in the DBA Cockpit and in the function module, you get the current status of both databases and, if required, suggested steps that you need to perform to reach a consistent state again.

→ Recommendation

We recommend that you use the DBA Cockpit for the consistency check.

You should run a consistency check in the following situations:

- The NLS or the BW database have been restored.
  This is particularly important if the database has not been rolled forward to the end of its log files.
- You have tried to open a connection to the NLS system and you receive the error message that the data in the NLS system is no longer consistent with the data in the SAP BW system.
- One of the databases failed, and some transactions were rolled back.
- You have changed the system landscape setup of the SAP BW and NLS databases (see Redesigning Your System Landscape to a 1:1 Setup for SAP BW and NLS [page 97]).
- You have performed a system copy.

Prerequisites

If you want to use the function module `FM_RSDA_DB6_SYNC_CHECKER`, you must have implemented SAP Note 1515422 or the support packages listed in this SAP Note.

Procedure

Running the Consistency Check Using the DBA Cockpit

1. In your SAP BW system, call the DBA Cockpit (transaction `DBACOCKPIT`).
2. In the SAP GUI navigation frame or on the *Database* tab page of the Web browser-based UI, choose *BW Administration* > *NLS Synchronisation Check*
3. Follow the instructions of the DBA Cockpit documentation.

Running the Consistency Check Using Function Module FM_RSDA_DB6_SYNC_CHECKER

1. In your SAP BW system, call transaction `SE38` and run the function module `FM_RSDA_DB6_SYNC_CHECKER`.
2. Follow the instructions of SAP Note 1515422 and of the documentation attached to the SAP Note.

More Information

Database Administration Using the DBA Cockpit: IBM Db2 for Linux, UNIX, and Windows on SAP Help Portal at https://help.sap.com/viewer/db6_dbacockpit

SAP Note 1515422

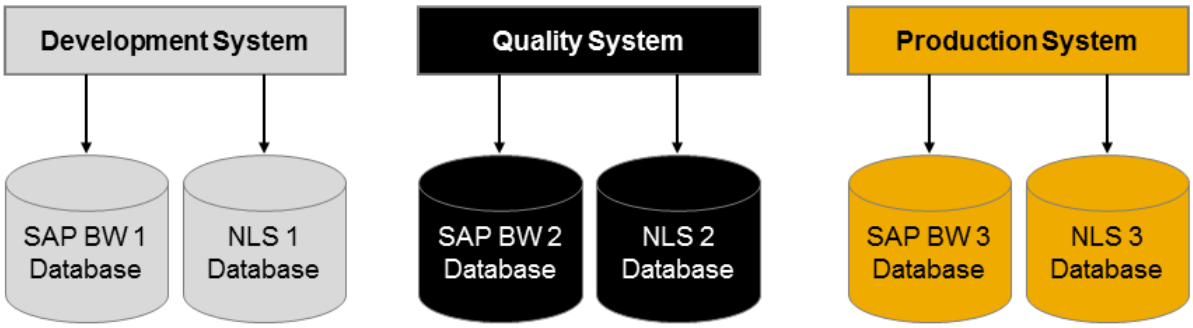
9 System Landscape Setup and System Copy

9.1 System Landscape Setups with SAP BW and NLS

When you set up a system landscape with SAP BW and an NLS database, we recommend that you set up a separate NLS database for each SAP BW system.

Separate NLS Database for Each SAP BW System (Recommended)

We recommend that you set up a separate NLS database for each SAP BW system in your system landscape (for example, development system, quality system, and production system):



Example System Landscape with Separate NLS Database for Each SAP BW System

The advantages of this approach are that you can control database recovery and system copy independently for each NLS system and that you can monitor and fine-tune the NLS performance on database level.

Other System Landscape Setups (Not Recommended)

When you set up a system landscape with SAP BW and an NLS database, the following alternatives are also possible, but **not** recommended:

- One NLS database for multiple SAP BW systems (not recommended)
  In this alternative, you set up one NLS database for multiple SAP BW systems. Each SAP BW system in this setup gets its own separate database schema on the NLS database.
- A mix of both approaches (not recommended)
  In this mixed approach, a separate NLS database is used for the production system, where availability and performance are critical, and a shared NLS database for development and quality systems.

→ Recommendation

While using one NLS database for multiple SAP BW systems or a mixed approach is technically possible, it can create multiple issues during system copy because a single schema cannot be restored separately. In addition, you might experience data loss for more than one SAP BW system if you have issues with the NLS database. Therefore, we highly recommend that you install a separate NLS database for each SAP BW system. If you already use one NLS database for multiple SAP BW systems or a mixed approach, we recommend that you change your system landscape to separate NLS databases for each SAP BW system.

9.2 Redesigning Your System Landscape to a 1:1 Setup for SAP BW and NLS

If you have a system setup where multiple SAP BW systems use one single NLS system, change your system landscape so that there's a one-to-one relationship between SAP BW and NLS systems.

Context

Technically, it's also possible that you set up one NLS database for multiple SAP BW systems. Each SAP BW system in this setup gets its own separate database schema on the NLS database. However, this option is **not** recommended. For example, if the NLS database gets corrupted, you might experience data loss with multiple SAP BW systems. During a system copy, a schema level restore is not possible.

→ Recommendation

We recommend that you always maintain a one-to-one relationship between SAP BW and NLS systems. Such a system landscape setup is also easier to administrate.

If you already use a system landscape with one NLS system for multiple SAP BW systems, follow the instructions to change your system landscape to the recommended 1:1 setup. The procedure assumes that you have two SAP BW systems called A and B sharing one NLS system.

i Note

This procedure describes system copies where you stay on the same operating system platform. If you want to migrate your NLS database to another operating system platform, redesign your system landscape using database-specific tools of your vendor, request database consulting, or open a customer case on component BW-SYS-DB-DB6.

Procedure

1. To set up an additional, empty NLS database system, use the software provisioning manager.

2. Copy the existing NLS database including its multiple schemas to the new, empty database using redirected restore.
3. For one of the SAP BW systems (for example, A), change the configuration of the NLS connection in such a way that the SAP BW system now uses the new NLS system as follows:
   a. In your SAP BW system, call the DBA Cockpit (transaction `DBACOCKPIT`).
   b. In the navigation frame of the DBA Cockpit, choose *BW Administration* > *NLS Configuration*.
   c. Select the NLS connection that you want to change from the list.
   d. Choose *Change* to modify the configuration parameters of the NLS connection.
4. In the new NLS system, keep the schema for its corresponding SAP BW system A and delete the schema for the other SAP BW system B.
5. In the existing NLS system, delete the schema for the other SAP BW system A, which now has its own NLS system.

> → Recommendation
>
> We recommend that you use the Db2 procedure `ADMIN_DROP_SCHEMA` to drop the NLS schemas and the corresponding objects that are no longer needed. For more information about `ADMIN_DROP_SCHEMA`, see the IBM documentation ADMIN_DROP_SCHEMA procedure - Drop a specific schema and its objects .

Next Steps

After the system landscape redesign, run a consistency check for the NLS database and the SAP BW database.

Related Information

Installing the NLS Database and Setting Up NLS for SAP BW [page 19]
Running the Consistency Check for the NLS Database and the SAP BW Database [page 94]

9.3 Setting Up or Removing an NLS Database After an SAP BW System Copy

You have copied an SAP BW system that had already data archived to a near-line storage database. To be able to use the copied SAP BW system with or without a near-line storage, you must follow steps to create a new NLS database or to remove unwanted data archiving processes from the SAP BW system.

As a first step, you must decide between the following scenarios:

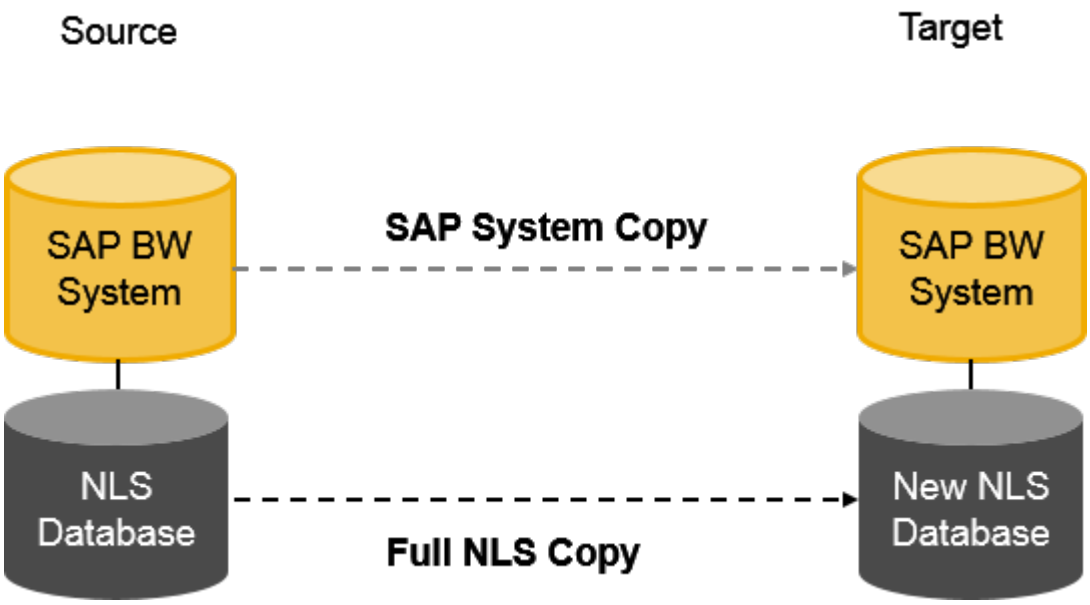
- You want to copy both your SAP BW system **and** the connected NLS database.
- You only want to copy the SAP BW system, and you don't want to use the existing NLS database for the SAP BW system.

Depending on whether you want to set up a new NLS database for the new BW system or remove the near-line storage for the new SAP BW system, you need to proceed differently.

Scenario 1: Create a Full NLS Copy

You want to copy both your SAP BW system and the connected NLS database. The new NLS database should contain a copy of the archived data from the original source NLS system from the same point in time as the SAP BW system. This is relevant, for example, if you want to use the SAP BW system copy as a new production SAP BW system.

For this scenario, create a full system copy of the existing NLS database using backup and restore. For more information about how to proceed, see Creating a Full Copy of the NLS Database [page 100].



Full NLS Copy Using Backup and Restore

> ⚠ Caution
>
> If you use one NLS database for multiple SAP BW systems, we highly recommend that you migrate to a one-to-one setup (see Redesigning Your System Landscape to a 1:1 Setup for SAP BW and NLS [page 97]). The approach with the full NLS system copy only works for 1:1 setups. If you need to keep multiple NLS schemas in one NLS database, please open a customer case on component BW-SYS-DB-DB6.

Scenario 2: Use SAP BW System Copy Without NLS

You want to use the new SAP BW system without any near-line storage. However, in this case, you cannot immediately start working. If you do not connect the BW system to the existing NLS database, you get errors

as soon as the NLS data of the InfoProviders is accessed using the existing DAPs. This also applies if you try to delete DAPs. Depending on your SAP BW release and support package, proceed as follows:

- As of SAP Business Warehouse 7.4 SP 9, you can turn the near-line connection mode in the new SAP BW system to *Off*, and then delete the DAPs in the SAP BW system. If you do not need near-line storage for your new SAP BW system, this alternative allows you to avoid an NLS installation or an NLS system copy. For more information, see Deleting Copied Data Archiving Processes After an SAP BW System Copy (As of SAP BW 7.4 SP9) [page 101] and Deleting Invalid Data Physically from the Database [page 75].
- If you are still on SAP BW 7.4 SP 8 or lower, upgrade to SAP BW 7.4 and implement at least SP 9. If this is not possible, open a customer case on component BW-SYS-DB-DB6 to get support.

9.3.1 Creating a Full Copy of the NLS Database

You create a full copy of the NLS database with filled NLS objects if your new SAP BW system still needs to access to a copy of the NLS data of the original source NLS system.

Prerequisites

> ⚠ Caution
>
> If you use one NLS database for multiple SAP BW systems, we highly recommend that you migrate to a one-to-one setup (see Redesigning Your System Landscape to a 1:1 Setup for SAP BW and NLS [page 97]). The approach with the full NLS system copy only works for 1:1 setups. If you need to keep multiple NLS schemas in one NLS database, please open a customer case on component BW-SYS-DB-DB6.
>
> To avoid inconsistencies between the SAP BW system and the NLS database, do not run any archiving or reloading requests after the SAP BW system copy was done and before the full NLS system copy has finished.

Procedure

1. To create a full copy of the NLS database with filled NLS objects, you can use, for example, the Db2 restore command to create a new NLS database from an existing NLS database backup.

   The new NLS database contains all the archived data of the source SAP BW system.
2. Connect the new NLS system to the new SAP BW system using the DBA Cockpit.

   For more information, see Setting Up the Connection to the NLS Database Using the DBA Cockpit [page 29].
3. Run the consistency check to verify that SAP BW and NLS are in sync.

   For more information, see Running the Consistency Check for the NLS Database and the SAP BW Database [page 94].

9.3.2 Deleting Copied Data Archiving Processes After an SAP BW System Copy (As of SAP BW 7.4 SP9)

You have copied an SAP BW system that had already data archived to a near-line storage database. To be able to use the copied SAP BW system without a near-line storage, you must delete unwanted data archiving processes from the SAP BW system. You can also delete and recreate DAPs to be able to use a BW system copy with a new NLS database.

Context

After an SAP BW system copy, the target SAP BW system contains the existing data archiving processes (DAPs) and administration information about data archiving processes (DAPs) and individual archiving requests to NLS (so-called "NLS metadata") from the source SAP BW system. The NLS database contains similar metadata. Data archiving processes in the newly copied SAP BW system will only work if the new BW system is connected to an NLS database that contains the corresponding NLS metadata. This works if you connect the new SAP BW system to the existing NLS database. If you do not connect the BW system to the existing NLS database, you get errors as soon as the NLS data of the InfoProviders is accessed using the existing DAPs. Up to SAP BW 7.4 SP8, the only possibility to avoid these errors is to create a full system copy of the existing NLS database.

However, in some cases you do not want to use an NLS database for the new SAP BW system at all or you want to use a completely new NLS database for your new SAP BW system. This is the case, for example, if you want to create a system copy of your SAP BW system to set up a test BW system. In this case, copying existing NLS metadata or creating a full system copy of the NLS database would be extra effort that you want to avoid.

As of SAP BW 7.4 SP9, you can avoid this extra effort as follows: You can set the near-line connection mode to *Off*. This mode should be used if a near-line storage has been permanently disconnected from the SAP BW system, but there are still active data archiving processes (DAPs) in the SAP BW system. In this mode, deletion of DAPs is possible without having to connect the SAP BW system with near-line storage again.

With the near-line connection mode set to *Off*, you can delete all existing DAPs in the new SAP BW system that were copied from the source SAP BW system. If you do not want to use NLS at all, you can then continue using your SAP BW system. If you want to use a newly installed NLS database, switch the near-line connection mode to *Productive* again and create new DAPs in the new SAP BW system using a near-line storage connection to the new NLS database.

Procedure

1. Start the Data Warehousing Workbench in your SAP BW system (transaction RSA1).
2. In the navigation pane to the left, choose *Administration* > *Current Settings* > *Near-Line Storage Connections*.
3. Set the connection mode of the relevant near-line connection to *Off*.

More Information

For more information, see the documentation for SAP Business Warehouse under Creating Near-Line Storage Connections

Related Information

Setting Up or Removing an NLS Database After an SAP BW System Copy [page 98]
Deleting Invalid Data Physically from the Database [page 75]

9.4 Adjusting the Near-Line Storage Connections

Use the Data Warehousing Workbench to adjust near-line storage connections.

Context

If you move the SAP BW system to a different host (for example, into a Cloud infrastructure), or if you change the SYSSID of the SAP BW system, you must adjust the near-line storage connection.

Procedure

1. Start the Data Warehousing Workbench in your SAP BW system (transaction `RSA1`).
2. In the navigation pane to the left, choose *Administration* > *Current Settings* > *Near-Line Storage Connections* .
3. Change the connection parameters of the relevant near-line connection, for example, the `BW_HOST` parameter.

10 Troubleshooting

10.1 Disabling and Enabling BLU Acceleration as Default Table Layout for New Tables

You can use the `RSADMIN` parameter `DB6_NLS_USE_CDE` to enable or disable BLU Acceleration in your NLS database.

Prerequisites

You have implemented SAP Note 1834310.

Context

You might have to change the default table layout for new NLS DataStore objects and InfoCubes from column-organized to row-organized or vice versa. Such a change might be relevant in the following scenarios:

- You have implemented your NLS database with BLU Acceleration, but the performance improvements are not as expected. Therefore, you want to change the default table layout for new NLS objects to row-organized.
- You have installed or upgraded your NLS database, or you have upgraded your SAP BW system, and the default table layout has automatically changed to BLU Acceleration. However, your NLS database doesn't fulfill the requirements for BLU Acceleration, and you want to set the default back to row-organized.
- You have installed or upgraded your NLS database, or you have upgraded your SAP BW system, and your NLS database fulfills now all hardware and software requirements for BLU Acceleration. The default table layout, however, is still “row-organized”. You want to enable BLU Acceleration for new NLS objects.

> ⚠ Caution
>
> - It's important to know that the hardware and software requirements for BLU Acceleration differ considerably from the requirements for databases with row-organized table layout. Therefore, check carefully if the hardware and software of your NLS database are adequate, and don't forget to set all the required settings for BLU Acceleration (see Additional Prerequisites for NLS with BLU Acceleration [page 16] and Checklist: Installing the NLS Database (With BLU Acceleration) [page 19]). Just setting the `DB6_NLS_USE_CDE` parameter is not enough.
> - Setting BLU Acceleration as the new default only applies to newly created NLS InfoCubes and NLS DataStore objects. Existing NLS InfoCubes and NLS DataStore objects remain as they are.

Procedure

1. In your SAP BW system, call the ABAP editor (transaction `SE38`).
2. Run program `SAP_RSADMIN_MAINTAIN`.
3. Set the `RSADMIN` parameter `DB6_NLS_USE_CDE` to `NO` (for row-organized tables as default) or to `YES` (for BLU Acceleration as default).

11 Additional Sources of Information

In this section, you can find additional sources of information about SAP on IBM Db2 for Linux, UNIX, and Windows:

- Online information from SAP
- Online information from IBM
- SAP Notes

Online Information from SAP

Guides and Additional Resources for SAP Systems Running on IBM Db2 for Linux, UNIX, and Windows

Type of Information	Internet Address
Database administration guide: *SAP Business Warehouse on IBM Db2 for Linux, UNIX, and Windows: Administration Tasks*	http://help.sap.com/db6_bw
Database Administration Guide for SAP on IBM Db2 for Linux, UNIX, and Windows	http://help.sap.com/db6_admin
Database Administration Using the DBA Cockpit: IBM Db2 for Linux, UNIX, and Windows	https://help.sap.com/viewer/db6_dbacockpit
Installation Guides for SAP Systems based on SAP NetWeaver 7.0 and higher	http://support.sap.com/sltoolset > *System Provisioning*
SAP on Db2 for Linux, UNIX, and Windows Community	https://community.sap.com/topics/db2-for-linux-unix-windows

Online Information from IBM

IBM Db2 Documentation

Database Version	Internet Address
Db2 11.5	https://www.ibm.com/docs/en/db2/11.5
Db2 11.1	https://www.ibm.com/docs/en/db2/11.1
Db2 10.5	https://www.ibm.com/docs/en/db2/10.5

Database Version	Internet Address
Db2 10.1 (out of mainstream maintenance)	https://www.ibm.com/docs/en/db2/10.1.0
Db2 9.7 (out of mainstream maintenance)	https://www.ibm.com/docs/en/db2/9.7

SAP Notes

Database Administration and Troubleshooting

SAP Note Number	Title
1027146	Database administration and monitoring in the DBA Cockpit
1167489	Enhancement to near-line interface for lookups (implem.)
1405664	DB6: Near-Line Storage Impl. (Supplementary Note)
1513862	DB6: Table conversion using DB6CONV
1695150	DB6: NLS Impl. - Usage for HANA DB, MaxDB and DB2 for i
1807855	DB6: Using IBM Db2 Near-Line Storage with SAP BW on HANA
1834310	DB6: Use of Db2 BLU Acceleration with Db2 Near-Line Storage

Db2 Parameter Settings for SAP Systems

SAP Note Number	Title
2751102	DB6: Db2 11.5 Standard Parameter Settings
2303771	DB6: Db2 11.1 Standard Parameter Settings
1851832	DB6: Db2 10.5 Standard Parameter Settings
1692571	DB6: Db2 10.1 Standard Parameter Settings (out of mainstream maintenance)
1329179	DB6: Db2 V9.7 Standard Parameter Settings (out of mainstream maintenance)

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