The New DB2 Client Setup in SAP Systems with DB2 for Linux, UNIX, and Windows

Applies to:
SAP NetWeaver AS ABAP and AS Java on IBM DB2 for Linux, UNIX, and Windows. For more information, visit the Landscape Design and Architecture homepage.

Summary
To enable the communication between an SAP application server and the database management system a database client must be installed on every application server. Beginning with SAP NetWeaver 7.0 SR3 a new DB2 client and a new concept for maintaining DB2 client software was introduced. This concept, called ‘New Client Connectivity’, offers various improvements regarding the maintenance of the DB2 client software.

In part 1 of this article the new and the old client concept is explained in detail. The discussion covers the SAP Application Server ABAP as well as the SAP Application Server Java. As a prerequisite, a terminology regarding DB2 clients is presented. Part 2 outlines various procedures which can be used to check the DB2 client setup of a SAP system running on DB2 for Linux, UNIX, and Windows.

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Introduction

Terminology and Basic Description of DB2 Clients

IBM DB2 for Linux, UNIX, and Windows contains a set of different clients. The following table contains the exact names for all DB2 clients which are relevant to SAP systems. The last column shows how they are usually named in SAP documentation and in this paper.

<table>
<thead>
<tr>
<th>DB2 UDB V8</th>
<th>DB2 V9.1</th>
<th>DB2 V9.5</th>
<th>SAP documentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application Development client</td>
<td>DB2 Client</td>
<td>IBM Data Server Client (full) DB2 Client</td>
<td></td>
</tr>
<tr>
<td>Administration client/Run-Time Client</td>
<td>DB2 Runtime Client</td>
<td>IBM Data Server Runtime Client (DB2) Runtime Client</td>
<td></td>
</tr>
<tr>
<td>n/a</td>
<td>IBM DB2 Driver for ODBC and CLI</td>
<td>IBM Data Server Driver for ODBC and CLI (DB2) CLI Driver</td>
<td></td>
</tr>
<tr>
<td>Universal Driver for SQLJ and JDBC</td>
<td>IBM DB2 Driver for JDBC and SQLJ</td>
<td>IBM Data Server Driver for JDBC and SQLJ (DB2) JDBC Driver</td>
<td></td>
</tr>
</tbody>
</table>

The **DB2 Client** offers the most comprehensive set of DB2 client functionality. Besides support for handling database connections and the underlying network communication it contains graphical tools for configuration and administration of an DB2 database and support for developing applications which access the database by common APIs like ODBC, JDBC, OLE.DB, ADO.NET and the DB2 Call Level Interface (CLI). In DB2 V9.5 this client was renamed to 'IBM Data Server client'.

The **DB2 Runtime Client** offers that part of the functionality of the DB2 client that is needed to run applications. It contains no administration and configuration tools besides the DB2 Command Line Processor (CLP). The client was renamed to 'IBM Data Server Runtime Client' in DB2 V9.5.

The **DB2 CLI Driver** (sometimes also referred as 'Thin Client' or 'CTC Driver'), introduced with DB2 V9.1, provides runtime support for applications which use the ODBC or CLI API. It is not part of any of the other clients and must be installed separately. The DB2 CLP is also not part of the driver. As the name suggest, it is not considered as a 'real' client. The term 'Driver' here suggests that it can only be used by applications to access the database. Contrary to the other DB2 clients the DB2 CLI Driver can be installed on an NFS mounted file system or on a Windows share. The DB2 CLI Driver was renamed to 'IBM Data Server Driver for ODBC and CLI' in DB2 V9.5.

The **DB2 JDBC Driver** is a 100% pure Java (Type 4) platform-independent Driver for JDBC and SQL with support for the JDBC 3.0 specification. A special JDBC Driver with support for JDBC 4.0 was added in DB2 V9.5. The JDBC Driver is part of every full DB2 Client and DB2 Runtime Client installation, but it can also be installed separately. Again the installation on a shared file system is possible. The JDBC Driver is called 'IBM Data Server Driver for JDBC and SQLJ' in DB2 V9.5.
### Terminology of SAP System Components

An SAP system consists of SAP instances. An SAP instance is a group of processes that are started and stopped at the same time. The naming of the different SAP instances has changed over time. The following table summarizes the terminology used throughout this paper.

<table>
<thead>
<tr>
<th>SAP System Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Database Instance</strong></td>
<td>The database instance comprises the database management system (here: DB2 for Linux, UNIX, and Windows) and the databases for the AS ABAP and/or AS Java. There is exactly one database instance in a SAP system.</td>
</tr>
<tr>
<td><strong>Central Services Instance (SCS, ASCS)</strong></td>
<td>The central services instance allows communication and synchronization within the SAP system. It consists of the so-called ‘enqueue server’ and the ‘message server’. There is exactly one central services instance in every SAP system. This instance does not need to connect to the database and therefore does not require the installation of database client software.</td>
</tr>
<tr>
<td><strong>Application Server (Instance), Application Server Java (AS Java), Application Server ABAP (AS ABAP)</strong></td>
<td>Provides the runtime environment to execute SAP applications in Java (AS Java) or ABAP (AS ABAP). There is at least one designated application server instance in every SAP system (also called ‘central instance’ or ‘primary application server instance’). Optionally, more application server instances (also called ‘dialog instances’ or ‘additional application server instances’) can be installed. Each application server instance needs to connect to the database and therefore must have access to the database client software.</td>
</tr>
<tr>
<td><strong>Central SAP System</strong></td>
<td>An SAP system where all SAP instances are installed on one single host.</td>
</tr>
<tr>
<td><strong>Distributed SAP System</strong></td>
<td>An SAP system where the SAP instances are distributed across several hosts.</td>
</tr>
<tr>
<td><strong>Remote Application Server (Instance), Remote AS Java, Remote AS ABAP</strong></td>
<td>Term used in this paper to describe an application server instance in a distributed SAP system which is not installed on the host where the database instance is installed.</td>
</tr>
</tbody>
</table>
Relevant Directories

This article refers to the following directories.

<table>
<thead>
<tr>
<th>DB2_SW_DIR</th>
<th>DB2 software installation directory</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB2_INST_DIR</td>
<td>DB2 instance directory</td>
</tr>
<tr>
<td></td>
<td>for SAP installations on Linux and UNIX: /db2/db2&lt;dbsid&gt;/sqlib</td>
</tr>
<tr>
<td></td>
<td>for SAP installations on Windows: DB2_SW_DIR\sqllib</td>
</tr>
<tr>
<td>DIR_GLOBAL</td>
<td>The SAP system global directory which must be accessible on all servers.</td>
</tr>
<tr>
<td></td>
<td>Linux and UNIX: /sapmnt/&lt;SAPSID&gt;/global</td>
</tr>
<tr>
<td></td>
<td>Windows: %DSCDB6HOME%\sapmnt&lt;SAPSID&gt;\SYS\global</td>
</tr>
<tr>
<td></td>
<td>where DSCDB6HOME is an environment variable of user &lt;sapsid&gt;adm which contains the name of the host where the global directory is located</td>
</tr>
<tr>
<td>DIR_EXECUTABLE</td>
<td>local directory for SAP executables e.g. /usr/sap/&lt;SAPSID&gt;/DVEBMGS00/exe</td>
</tr>
<tr>
<td>DIR_CT_RUN</td>
<td>central directory for SAP executables, e.g. /usr/sap/&lt;SAPSID&gt;/SYS/exe</td>
</tr>
</tbody>
</table>

Variables

The following variables are used in this article.

<table>
<thead>
<tr>
<th>Name of Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;SAPSID&gt;</td>
<td>SAP system ID in upper case</td>
</tr>
<tr>
<td>&lt;sapid&gt;</td>
<td>SAP system ID in lower case</td>
</tr>
<tr>
<td>&lt;DBSID&gt;</td>
<td>Database name in upper case</td>
</tr>
<tr>
<td>&lt;dbsid&gt;</td>
<td>Database name in lower case</td>
</tr>
</tbody>
</table>

Note: In special environments like MCOD (Multiple Components in One Database) the database name is not necessarily the same name as the SAP system ID.
Overview: New Client Connectivity (NCC) vs. Old Client Connectivity (OCC)

The New DB2 Client Setup in SAP Systems with DB2 for Linux, UNIX, and Windows

Client Connectivity Scenarios

Overview: New Client Connectivity (NCC) vs. Old Client Connectivity (OCC)

The AS ABAP uses the DB2 Call Level Interface (CLI) API and the AS Java uses the JDBC API to access the database.

SAP systems based on releases below SAP NetWeaver 7.0 SR3 use a DB2 client setup which is furthermore referred to as Old Client Connectivity (OCC). In this scenario every AS ABAP has an own DB2 Runtime Client installed. For a remote AS Java only the DB2 JDBC Driver is installed. All these clients must be maintained separately, installing a DB2 Fix Pack or upgrading to a higher database version (also called database migration in IBM terminology) requires manual actions on all application servers.

Starting with SAP NetWeaver 7.0 SR3 a new DB2 client setup called New Client Connectivity (NCC) was introduced. Here instead of the DB2 Runtime Client the new DB2 CLI Driver is used for the AS ABAP. The CLI Driver is installed once in a directory which is shared between all servers of the SAP system. During start of an application server the CLI Driver is copied to a local directory. The same mechanism is used for the DB2 JDBC Driver of the AS Java. This new scenario has several advantages

- The AS ABAP uses a more lightweight DB2 client with a small footprint
- Maintenance of the DB2 client is simplified dramatically. During the installation of a DB2 Fix Pack or a database migration the client software must be installed only once in the shared directory. After a restart all application servers use automatically the new version of the DB2 CLI Driver.

Both DB2 client setups are described in the following in detail.

Note: Some SAP products based on a SAP basis release 7.00 but below SAP NetWeaver 2004s SR3 also use the NCC setup. To find out which DB2 client setup is actually used in a SAP system see the chapter Check Which DB2 Client/Which DB2 Client Setup is Used.

Note: The full DB2 Client is part of every DB2 server installation. In an SAP environment the full DB2 Client is not used for remote application servers.

Old Client Connectivity

Installation of the DB2 Runtime Client (AS ABAP)

In the OCC setup a DB2 Runtime Client must be installed on each application server. Newer SAP installations perform this automatically; otherwise this is a manual step before the installation. The SAP installation afterwards

- Creates the local users <sapsid>adm and db2<dbsid> if necessary and sets their environment.
- Creates a DB2 client instance named db2<dbsid> for user db2<dbsid>. A DB2 instance is a logical database manager environment with support for a DB2 catalog (see below) and database manager configuration parameters.
- Catalogs the DB2 database. The DB2 catalog (also called 'database directory') contains database access information for all databases to which a client can connect.

Here is an excerpt from a DB2 command line session which shows the type of the instance and the entries of the database catalog:

```
db2 => get dbm cfg
Database Manager Configuration

Node type = Client
...

db2 => list db directory
```

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System Database Directory

Number of entries in the directory = 1

Database 1 entry:

- Database alias = SQJ
- Database name = SQJ
- Node name = NODESQJ
- Database release level = b.00
- Comment = Remote database SQJ
- Directory entry type = Remote
- Catalog database partition number = -1
- Alternate server hostname =
- Alternate server port number =

db2 => list node directory

Node Directory

Number of entries in the directory = 1

Node 1 entry:

- Node name = NODESQJ
- Comment = TCPIP Node for database SQJ
- Directory entry type = LOCAL
- Protocol = TCPIP
- Hostname = pcibm18
- Service name = sapdb2SQJ

Maintenance of the DB2 Runtime Client

Up to and including DB2 UDB V8 SAP requires that the version of the DB2 client software exactly matches the version of the DB2 server software. As of DB2 V9.1 you may use the same or a lower version of the client software.

Note: SAP recommends that the DB2 client version matches exactly the DB2 server version. For details refer to SAP note 101809.

Note: The use of a higher client version with a lower server version is not supported.

This means that

- Fix Packs which are applied to the server should also be applied to all clients
- During a database migration, all clients must be migrated with the db2imigr command.

Both actions require manual administrator intervention. For details on the installation of Fix Packs see the respective SAP Notes (e.g. 978554 and 978555 for DB2 V9.1). For more information regarding the migration see the SAP Migration Guides for IBM DB2 for Linux, UNIX, and Windows.
Installation of the DB2 JDBC Driver (AS Java)

The DB2 JDBC Driver consists of the two files db2jcc.jar (the actual driver) and db2jcc_license_cu.jar (the license). From DB2 V9.5 on only the file db2jcc.jar is needed. The files are located in the <DB2_instance_dir>/sqllib/java directory and must be present in the classpath of the AS Java. As they are part of the DB2 Runtime Client, the DB2 JDBC Driver will be always available in an installation which includes the AS ABAP and the AS Java.

Installations with the AS Java only contain the DB2 Runtime Client (and therefore the DB2 JDBC Driver) on the database server only. For the installation of a remote AS Java the DB2 JDBC Driver must be provided by one of the following manual actions:

- By installing the DB2 Runtime Client (which contains the DB2 JDBC Driver).
- By copying the DB2 JDBC Driver files to a place in the local file system of the application server.
- By copying the DB2 JDBC Driver files in a shared directory which is accessible to all application servers.

During the installation of a remote AS Java SAPinst asks for the location of the JDBC Driver files. The installation also creates the user <sapsid>adm. A DB2 client instance is not needed and therefore not created. Information on how to access the database is part of this JDBC URL which is maintained in the secure store of the configuration manager of the AS Java.

Maintenance of the DB2 JDBC Driver

As long as the DB2 JDBC Driver is part of a DB2 Runtime Client installation the same maintenance operations as for the DB2 Runtime Client must be taken. If only the DB2 JDBC Driver files are stored on a local or shared directory of a remote application server, they must be updated manually during the installation of a Fix Pack or during a DB2 database migration. If the files are not stored in a shared directory this must be accomplished on all remote application servers.
New Client Connectivity

A SAP system which uses the NCC setup can be obtained by one of the following three ways:

- You install a new SAP system which supports the NCC setup. All SAP products based on release 7.1 and some products based on release 7.0 support the NCC setup.
- You upgrade to a SAP product / SAP release which supports the NCC setup. As a manual step before the upgrade you must install the DB2 CLI Driver and the JDBC Driver manually.
- You convert a SAP product based on release 7.00 which uses the OCC setup manually to an NCC setup. Here you must install the DB2 CLI Driver and the JDBC Driver manually and adapt profile settings of the system. The exact procedure is described in SAP note 1091801.

As a prerequisite, at least version 9.1 of DB2 must be used.

Installing the DB2 CLI Driver Manually

The manual installation of the DB2 CLI Driver is described in detail in the respective upgrade guide and in SAP note 1091801. In short, the script db6_update_client (which is available on the DB2 Client DVD or as an attachment to SAP note for 978554 Linux and UNIX or 978555 for Windows) is executed with the -c option (to install both the DB2 CLI Driver and the DB2 JDBC Driver) or with the -j option (to install only the DB2 JDBC Driver for AS Java only installations). The script creates a directory structure like the following in DIR_GLOBAL:

```
db6
|-- <platform>
    |-- db6_clidriver
        |-- adm
        |-- bin
        |-- cfg
        |-- conv
        |    |-- alt
        |    `-- ms
        |-- db2dump
        |-- 1ib
        |    |-- icc
        |    `-- license
        |    `-- UNIX
        |         `-- msg
        |             `-- en_US.iso88591
        |                 `-- security64
        |                     `-- plugin
        `-- db2dump
`-- jdbc
```

The script also creates an appropriate CLI initialization file db2cli.ini in the db6 directory. The file contains the connection information to the database - a DB2 catalog like in installation with the DB2 Runtime Client is not needed anymore. Here is an excerpt of the db2cli.ini from an SAP system:

```
[DEF]
Database=DEF
Protocol=tcpip
Hostname=is0016
Servicename=5912
```

For details on the possible content see the IBM documentation about the db2cli.ini initialization file.
Structure of the DB2 CLI Driver in a SAP Installation

The DB2 CLI Driver is placed in the DIR_GLOBAL/db6/<platform>/db6_clidriver directory, where <platform> currently is one of AIX_64, HP11_64, HPIA64, LINUXIA64_64, LINUXPPC64_64, LINUXX86_64, LINUX_32, SUNOS_64, WINDOWS_AMD64, WINDOWS_I386, WINDOWS_IA64. If the application servers run different operating systems the CLI Driver is installed for each OS in the respective <platform> directory. The CLI Driver itself consists basically of a shared DB2 library (libdb2 on Linux and UNIX, db2app.dll on Windows) which is dynamically loaded by the applications. On Linux and UNIX the library is located in the lib directory of the CLI Driver, on Windows it is in bin. Various additional tools like db2level and the DB2 trace utility db2trc are located in the bin or adm (Linux and UNIX only) folder of the DB2 CLI Driver.

Diagnostic data of the DB2 CLI Driver is written to the DIR_GLOBAL/db6/db2dump directory. SAP installations of the DB2 CLI Driver always contain the DB2 JDBC Driver in directory DIR_GLOBAL/db6/java. AS Java only installations do not contain the DB2 CLI Driver.

Location of the DB2 CLI Driver

In SAP systems based on Release 7.00 or later, a mechanism called 'Automatic Synchronization' is used during application server start to update binaries in the local executable directory DIR_EXECUTABLE with newer binaries which might be available in the global executable directory DIR_CT_RUN. The idea behind this mechanism is that the binaries can be exchanged with newer version in the global executable directory while the system is online. Once the application servers are restarted the newer binaries are automatically propagated to the local executable directory. This makes an update of the binaries very easy.

In an SAP system which is using the NCC setup, the same mechanism is used for the DB2 CLI Driver and the DB2 JDBC Driver. To accomplish this several modifications to the SAP instance profile must be carried out. First, the location of the DB2 CLI Driver is published to the application server by means of the DB2_CLI_DRIVER_INSTALL_PATH environment variable. Here is an example from a profile of a SAP system:

```
SETENV_04 = DB2_CLI_DRIVER_INSTALL_PATH=$(DIR_EXECUTABLE)/db6_clidriver
```

Second, during the start of an application server the system checks if the files presented in DIR_CT_RUN are newer than the one in DIR_EXECUTABLE. If this is the case the SAP tool sapcpe is used to copy the DB2 CLI Driver and the DB2 JDBC Driver to the local executable directory of the application server. The respective call of the sapcpe utility is located in the profile of the application server and looks for example like this:

```
# Database specific change for release 710
_CPDB0 = list:$(DIR_GLOBAL)/db6/AIX_64/clidriver.lst source:$(DIR_GLOBAL)/db6/AIX_64
Execute_09 = immediate $(DIR_CT_RUN)/sapcpe$(FT_EXE) pf=($(_PF) $(_CPDB0))
# Copy IBM DB2 for Linux, UNIX, and Windows database client software
# Database specific change for release 710
_CPDB1 = list:$(DIR_GLOBAL)/db6/jdbc/jdbcdriver.lst source:$(DIR_GLOBAL)/db6/jdbc
Execute_10 = immediate $(DIR_CT_RUN)/sapcpe$(FT_EXE) pf=($(_PF) $(_CPDB1))
```
In general, the ABAP kernel looks for the DB2 CLI libraries in the following directories in the sequence given here:

1. If set in the environment, `DB2_CLI_DRIVER_INSTALL_PATH`
2. If it exists, `/usr/sap/<SAPSID>/SYS/global/db6/<OS>/db6_clidriver`. This is the default path.
3. In `DB2_INST_DIR/lib` or `DB2_INST_DIR/lib64`.
4. In the directories that are specified by the environment settings for the OS library path.

**Note:** The CLI Driver initialization file `db2cli.ini` is always taken from the global directory.

**Maintenance of the DB2 CLI Driver**

An update of the DB2 CLI Driver and the DB2 JDBC Driver is recommended after every Fix Pack installation and required after a database migration. The process of updating the driver is again simplified by the script `db6_update_client`. You need to run this script once with the `-u` option as advised in SAP note [978554](https://support.sap.com) (Linux and UNIX) or [978555](https://support.sap.com) (Windows). The script can be executed while the SAP system is running. Because of the copy mechanism explained above the new version of the DB2 client software will be in use after the next restart of the application server(s).

**Coexistence of the DB2 Runtime Client and the DB2 CLI Driver**

After a manual installation of the DB2 CLI Driver the DB2 Runtime Client is still available. Every ABAP kernel which supports the DB2 CLI Driver tries to load this driver first. If it cannot find the driver it will try to load the DB2 Runtime Client.

The client loading behavior of the AS ABAP can be influenced with two environment variables of the `<sapsid>adm` user.

- If `DB2DB6_FORCE_RUNTIME_CLIENT` is set to an arbitrary value, the AS ABAP will only start with the DB2 Runtime Client.
- Similarly, if `DB2DB6_FORCE_CLI_DRIVER` is set, the AS ABAP starts only if it finds a DB2 CLI Driver.

If a variable is set and the respective DB2 client is not found, the test connection via `R3trans -d` will fail during `startsap`. In the generated `trans.log` you will find e.g. a message like the following:

```
4 ETW000  [dbdb6.c     ,00000] *** ERROR => Path for db2 library 'libdb2.a(shr_64.o)' could not be determined. DB2DB6_FORCE_CLI_DRIVER is on. Is it possible that this executable requires a full runtime client ?
```

**Note:** To avoid unnecessary double maintenance of DB2 software, we recommend that you deinstall the local DB2 Runtime Clients on remote application servers that use the new client connectivity.
Check the DB2 Client Setup in an SAP system

If the version of the DB2 client software is not appropriate for the DB2 server several error conditions can occur. Here is a typical scenario:

- A system with the AS Java is installed. The DB2 JDBC Driver for a remote AS Java is placed manually in an arbitrary directory.
- The system is upgraded to the next release. This includes a database upgrade and the change to a new JDK.
- The JDBC Driver on the remote application server is not upgraded. Now applications which use new functionality provided with the new Java version will fail on the remote application server until the JDBC Driver is updated manually.

Checking the client software setup comprises two steps:

- Check that the correct client version is installed on every application server
- Check that the correct client is actually used by the SAP system

Check Which DB2 Client/Which DB2 Client Setup is Used

For SAP system administrators it is important to know which client setup scenario is actually used and where the client is located in a system. Here is a description on how to figure this out.

- If the system has a basis release below 7.00, the system uses the OCC setup.
- If the system is on basis release 7.00 and DB2 V8.2 or lower is used, again the OCC setup is in place.
- If the system is on basis release 7.00 and at least DB2 V9.1 is used: both scenarios could be in place. See below for a procedure to determine the used scenario.
- If the system is on basis release 7.10 or higher: the NCC setup is used.

To exactly determine the client setup of the AS ABAP and to find out the path to the DB2 clients which are used use the following procedure.

- Log on to the application server where you want to check the DB2 client type as user <sapsid>adm.
- Enter the following command:
  R3trans -x
  R3trans loads the DB2 library and connects to the database. A log file trans.log is created in the current directory.
- Open an editor and search for the term "DB2 library" in the log file trans.log.

If the message "Running with CLI driver" is part of the trans.log file the application server uses the DB2 CLI Driver and therefore the NCC setup. Here is an example output:

```plaintext
... 4 ETW000 [dev trc ,00000] DB2 library successfully loaded DB2 library '/usr/sap/<SAPSID>/SYS/global/db6/<platform>/db6_clidriver/lib/libdb2.so' successfully loaded  
... 4 ETW000 [dev trc ,00000] Running with CLI driver  40239  0.468024  ...
```
If the DB2 Runtime Client is used, the output looks as follows:

```plaintext
4 ETW000 [dev trc 00000] DB2 library successfully loaded DB2 library
'/db2/db2<dsid>/sqllib/lib/libdb2.so' successfully loaded
```

This means that the system uses the OCC setup.

**Note:** Standalone tools like R3trans use the DB2 CLI Driver from DIR_GLOBAL/db6. The AS ABAP uses the CLI Driver which is copied to the local executable directory. To check this you can search in the developer traces for the ABAP work processes (e.g. dev_w0) for the term "DB2 library". You will find a line like the following:

```plaintext
DB2 library '/usr/sap/X95/DVEBMGS01/exe/db6_clidriver/lib/libdb2.a(shr_64.o)' successfully loaded
```

Use the following procedure to determine the client setup of an AS Java:

- Log on to the application server where you want to check the DB2 client type as user <sapsid>adm.
- Change to the system global directory:
  ```bash
cdglo
  
  Check if the subdirectory 'db6' exists. If this subdirectory is not present the OCC setup is used.
  
  Change to the profile directory:
  ```bash
  cdpro
  
  Search the profiles for the term 'db2jcc.jar'
  ```bash
  grep db2jcc.jar * on Linux and UNIX
  find "db2jcc.jar" *.* on Windows
  ```

The output contains the `j2ee/dbdriver` property which points to the location of the used DB2 JDBC Driver files. If the files are taken from the local executable directory, the NCC setup is used. Here is an example:

```plaintext
j2ee/dbdriver = $(DIR_EXECUTABLE)/db2jcc.jar:$(DIR_EXECUTABLE)/db2jcc_license_cu.jar
```

If the JDBC Driver files are taken from another location the OCC setup is used. The output would look for example like this:

```plaintext
j2ee/dbdriver =
/db2/db2jaj/sqllib/java/db2jcc.jar:/db2/db2jaj/sqllib/java/db2jcc_license_cu.jar
```

Note that the JDBC Driver files of a remote AS Java can be found in an arbitrary location.
Check for Version Mismatches Between Client and Server

The version of the database clients should always match the version of the database server.

Check the Version of the Database Server

- Log on to the database server as user <sapsid>adm
- Issue the following command
db2level

This result e.g. in an output like this:

```
DB21085I  Instance "db2bn7" uses "64" bits and DB2 code release "SQL09014" with level identifier "01050107".
    Informational tokens are "DB2 v9.1.0.4", "special_19276", "U811792_19276", and Fix Pack "4".
    Product is installed at "/mnt/vol_nfs/db2/db2bn7/db2_software".
```

Here a DB2 server version 9.1 with Fix Pack 4 (09014) is installed.

Check the Version of the DB2 Runtime Client

Use the same procedure as in Check the Version of the Database Server, but log on to the relevant application server.

Check the Version of the DB2 CLI Driver

- Log on to the application server as user <sapsid>adm
- Change to the SAP instance directory:
cdD
or
cdDi (remote application server)
- Change to the bin directory of the local copy of the DB2 CLI Driver
cd exe/db6_clidriver/bin

Note: If this directory does not exist the SAP system uses the OCC setup and the DB2 CLI Driver is not installed or - after the installation of the DB2 CLI Driver - there was no restart of the application server so far.

- Issue the db2level command from within the bin directory
  ./db2level

The output looks for example like this:

```
DB21085I  Instance "DB2" uses "64" bits and DB2 code release "SQL09011" with level identifier "01020107".
    Informational tokens are "DB2 v9.1.0.1", "s061104", "U809676", and Fix Pack "1".
    Product is installed at "..".
```

Here the DB2 CLI Driver has version 9.1 with Fix Pack 1 (09011).
AS ABAP Only: Use db6level to Check the Client Version

Since SAP release 7.00 the tool 'db6level' is available to the <sapsid>adm user. Called without options it displays the version of the DB2 Client. In verbose mode, called with the option -v, it also displays the library loading sequence. Here is an example output:

```
is0016:bn7adm 1> db6level -v
Trace CB: reasonCode=4 reasonText=DB2NOEXITLIST not set in environment
Trace CB: reasonCode=4 reasonText=putenv(DB2NOEXITLIST=ON)
Trace CB: reasonCode=4 reasonText=DB2COUNTRY not set in environment
Trace CB: reasonCode=4 reasonText=putenv(DB2COUNTRY=1)
Trace CB: reasonCode=4 reasonText=DB2DB6_FORCE_RUNTIME_CLIENT not set in environment
Trace CB: reasonCode=4 reasonText=DB2DB6_FORCE_CLI_DRIVER not set in environment
Trace CB: reasonCode=4 reasonText=CLl driver first
Trace CB: reasonCode=4 reasonText=DB2_CLI_DRIVER_INSTALL_PATH not set in environment
Trace CB: reasonCode=4 reasonText=DB2_CLI_DRIVER_INSTALL_PATH=/usr/sap/BN7/SYS/global/db6/AIX_64/db6_clidriver
Trace CB: reasonCode=4 reasonText=path
/usr/sap/BN7/SYS/global/db6/AIX_64/db6_clidriver/lib64 does not exist or cannot be accessed
Trace CB: reasonCode=4 reasonText=path
/usr/sap/BN7/SYS/global/db6/AIX_64/db6_clidriver/lib does not exist or cannot be accessed
Trace CB: reasonCode=4 reasonText=DB2INSTANCE=db2bn7
Trace CB: reasonCode=4 reasonText=Home directory of user db2bn7 is /db2/db2bn7
Trace CB: reasonCode=4 reasonText=path /db2/db2bn7 exists and it is a directory
Trace CB: reasonCode=4 reasonText=path /db2/db2bn7/sqllib/lib64 exists and it is a directory
Trace CB: reasonCode=4 reasonText=path /db2/db2bn7/sqllib/lib64 exists and it is a directory
Trace CB: reasonCode=4 reasonText=use runtime client driver from
/db2/db2bn7/sqllib/lib64
Trace CB: reasonCode=1 reasonText=sucessfully loaded DB2 library
'/db2/db2bn7/sqllib/lib64/1ibdb2.a(shr_64.o)'
Trace CB: reasonCode=2 reasonText=sucessfully loaded symbol 'SQLGetInfoW' from
library '1ibdb2.a(shr_64.o)'
09.01.0004
```

In this example, the ABAP kernel uses the DB2 Runtime Client of Version 9.1 with Fix Pack 4 (09.01.0004). The system uses the OCC setup. As db6level also checks the library loading sequence you should use this tool to determine the DB2 Client version whenever possible.

Check the Version of the DB2 JDBC Driver

- Log on to the application server as user <sapsid>adm
- Find out the path to the DB2 JDBC Driver as described in Check Which DB2 Client/Which DB2 Client Setup is Used and change to the directory which contains the JDBC Driver files.
- Assuming java is in your path, issue the following command:
  
  ```
  java -cp ./db2jcc.jar com.ibm.db2.jcc.DB2Jcc -version
  ```

  The output looks for example like this:

  ```
  IBM DB2 JDBC Universal Driver Architecture 3.50.153
  ```
The version of the DB2 JDBC Driver does not directly match the DB2 server version. To find out to which DB2 server version a JDBC Driver belongs you need to look up one of the following IBM web pages (see also SAP note 1079888 for the current list of IBM web pages):

- Supported Java SDK and Java Runtime Environment levels for DB2 UDB Version 8 platforms for DB2 UDB V8
- Supported stand-alone Java application development software for DB2 V9.1
- Java software support for DB2 products for DB2 V9.5

The JDBC Driver in the example belongs to DB2 V9.5 GA.

**Check the Path to the DB2 JDBC Driver**

A special problem on Linux and UNIX can appear if the JDBC Driver is taken from a local installation of the DB2 server or of the DB2 Runtime client. Here, the link `java` in the DB2 instance directory points to the `java` subdirectory of the DB2 software installation. This directory contains the files for the DB2 JDBC Driver. During a DB2 update (migration or Fix Pack installation), the link is automatically adapted so that the new version of the DB2 JDBC Driver is used. Therefore, the JDBC Driver should be always referenced with this link.

If however the JDBC Driver is used directly from the DB2 software installation directory, the old version of the JDBC Driver is used after migration.

**Note:** Due to an error in the SAPinst installation procedure for the 6.40 version of the AS Java, the JDBC Driver from the DB2 software directory was taken. This can lead to problems after a database migration.

Here is an example of a correct path setting in the profile of the AS Java:

```plaintext
j2ee/dbdriver =
/db2/db2jaj/sqllib/java/db2jcc.jar:/db2/db2jaj/sqllib/java/db2jcc_license_cu.jar
```

The following shows an example for an incorrect path setting:

```plaintext
j2ee/dbdriver =
/opt/IBM/db2/V8.1/java/db2jcc.jar:/opt/IBM/db2/V8.1/java/db2jcc_license_cu.jar
```

The software of a new DB2 version will be copied to another directory, e.g. `/opt/IBM/db2/V9.1`. The `j2ee/dbdriver` property will be not adapted automatically and therefore points to the old version of the JDBC Driver.

To correct the path settings for the JDBC Driver in a 6.40 or 7.00 AS Java installation follow the instructions in SAP note 867976.
Summary

With SAP NetWeaver SR3 a new DB2 client setup called 'New Client Connectivity' was introduced for SAP systems running on DB2 for Linux, UNIX and Windows. In this setup the AS ABAP uses the DB2 CLI Driver, a new and lightweight alternative to the DB2 Runtime Client. Maintenance of the DB2 client software is simplified because it is now possible to install the DB2 clients for the AS Java and for the AS ABAP on a shared directory which is visible to all application servers of a SAP system.

SAP System Administrators need to be aware of the changed DB2 client setup. To ease the transition period between the new and the old client setup several procedures which can be used to check the correct installation of the DB2 clients in an SAP system were presented in this article.

Related Content

Quick Beginnings for DB2 Clients, Version 8.2; IBM documentation
Quick Beginnings for DB2 Clients, DB2 Version 9; IBM documentation
Quick Beginnings for IBM Data Server Clients, DB2 Version 9.5; IBM documentation
Understanding the DB2 UDB JDBC Universal Driver by Anson Kokatt; IBM developerWorks article
Which DB2 9.5 client connectivity option is right for you? by Paul C. Zikopoulos, IBM developerWorks article

For more information, visit the Landscape Design and Architecture homepage.
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