

IBM i
7.3

*Connecting to IBM i
IBM i Access Client Solutions: Linux,
macOS, and PASE Application Packages*



Note

Before using this information and the product it supports, read the information in [“Notices” on page 13.](#)

This edition applies to version 6, release 1, modification 0 of System i Access for Linux (product number 5761-XL1) and to all subsequent releases and modifications until otherwise indicated in new editions. This version does not run on all reduced instruction set computer (RISC) models nor does it run on CISC models.

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Linux, macOS, and PASE Application Packages

IBM® i Access Client Solutions provides optional, operating system-specific packages called Application Packages. These Application Packages provide an ODBC driver for accessing Db2® data residing on an IBM i system.

The Application Packages are supported on the following operating systems and environments: Linux®, macOS and IBM PASE for i.

Note: By using the code examples, you agree to the terms of the [Code license and disclaimer information](#).

PDF file for the Application Package

You can view and print a PDF file of this information.

To view or download the PDF version of this document, select [IBM i Access Client Solutions - Linux, macOS, and PASE Application Packages](#).

You can view or download these related topics:

- [IBM i Access ODBC](#)
- [IBM DB2® for i SQL Reference](#)

Web sites

- [IBM Client Solutions](#)  Visit this site to learn more about Linux, macOS, and PASE Application Packages.
- [The unixODBC project](#)  This site provides information on the unixODBC Driver Manager. Among other things, there are links here to see what is fixed in a particular release and a spot to download the latest version of the unixODBC Driver Manager.
- [Microsoft Open Database Connectivity](#)  This site gets you to information about the ODBC specification and examples on how to use it.
- [IBM support portal](#)  IBM i technical support and resources.

Saving PDF files

To save a PDF on your workstation for viewing or printing:

1. Right-click the PDF in your browser (right-click the link above).
2. Click the option that saves the PDF locally.
3. Navigate to the directory in which you want to save the PDF.
4. Click **Save**.

Prerequisites for using the Application Package

Identify the IBM i and the client requirements for using the Application Package.

IBM i prerequisites

The IBM i requirements are as follows:

- IBM i currently in support are supported. Unexpected results are produced when using the product with earlier or unsupported releases.

- The QUSER user profile must be enabled. From a IBM i command line type the following:

DSPUSRPRF USRPRF(QUSER)

Press ENTER to display the status for QUSER.
Use the **CHGUSRPRF** command to change the profile if necessary.

- The host servers must be started. Type STRHOSTSVR and press ENTER to start the IBM i host servers.
- TCP/IP must be started. To start TCP/IP, you must have the TCP/IP Utilities (IBM i licensed program 5770-TC1) installed on the system. For more information on host server options and TCP/IP, see the TCP/IP topic in the IBM i Information Center.

Linux Application Package prerequisites

Supported Linux Distributions are listed below:

- SUSE LINUX Enterprise
- Red Hat Enterprise Linux
- Ubuntu

Note: Only versions in mainstream support are supported by the Application Package. See the Application Package readme for current OS and version support.

Supported Linux architectures are listed below:

- x86_64 / amd64
- x86
- ppc64le
- ppc64 (rpm-only)
- ppc (rpm-only)

macOS Application Package prerequisites

Only hardware and operating system software currently supported by Apple is supported. See the Application Package readme for current version support. Both 64-bit Intel and ARM processors are supported.

PASE Application Package prerequisites

Only currently supported versions of IBM i are supported. See the Application Package readme for current version support.

Note: The PASE Application Package installs using the yum package manager provided by the IBM i Open Source Environment. Refer to <https://ibmi-oss-docs.readthedocs.io/en/latest/yum/README.html> for information on setting up this environment.

Getting started with the Application Package

The Application Package is available as a zip archive file that can be downloaded from the Entitled Software Support web site.

1. Download the Application Package archive file.
2. Extract the contents of the zip archive file.
3. The product Documentation directory contains a readme file with installation instructions.

See the IBM i Access Client Solutions web site for additional details.

Related information

[Entitled Software Support](#)

[IBM i Access Client Solutions web site](#)

Security

You can use Kerberos and single sign on with the Application Package on Linux and Transport Layer Security (TLS) with the Application Package on Linux, macOS, and PASE.

Kerberos

The Linux Application Package supports IBM i authentication using Kerberos. To install and configure the IBM i platform for Kerberos, see the Single signon topic, in the Security topic collection in the IBM i Information Center.

Note: Most Linux distributions include at least one version of Kerberos 5, either Heimdal or MIT. However, some distributions do not create a symbolic link for the Kerberos shared library for Heimdal (**/usr/lib/libgssapi.so**) or MIT (**/usr/lib/libgssapi_krb5.so**). The Linux Application Package dynamically loads the Kerberos shared library, using the associated .so name. If a symbolic link is not available, you get the following error: CWBSY1015 - Kerberos not available on this version of the operating system.

To use Kerberos with the Linux Application Package, you must first authenticate to your Kerberos domain using the **kinit** command or by setting up your initial Linux login to authenticate with the pluggable authentication module (PAM) Kerberos plugin. After successful authentication, you should be able to do a **klist -f** to see the status of your Kerberos tickets.

For any IBM i Access function, you can use ***kerberos** in place of the IBM i user profile to use your Kerberos tickets. Any password is ignored in this case.

The Kerberos principle name is based upon the fully qualified TCP/IP name received from the reverse lookup of the TCP/IP address. If you use a host file to resolve TCP/IP addresses, be sure to include the fully qualified TCP/IP system name. For example: 1.2.3.4 mysystem.example.com mysystem.

Transport Layer Security (TLS)

To enable the Application Package to use TLS, stunnel can be used. An example stunnel configuration file is provided for each of the supported OS platforms:

- /opt/ibm/iaccess/doc/iaccess.stunnel.config (Linux)
- /Library/IBMiAccess/doc/iaccess.stunnel.config (macOS)
- /QOpenSys/pkgshare/doc/ibm-iaccess/iaccess.stunnel.config (PASE)

IBM i Access ODBC

The following contain information on using Open Database Connectivity (ODBC) with the Linux, macOS, and PASE Application Packages.

Related information

[System i Access for Windows ODBC](#)

[Version and release changes in the ODBC driver behavior](#)

ODBC language considerations

The ODBC Driver included with the Application Package product handles many types of data conversions.

The character code page conversions involve using conversion tables and the `iconv` interfaces. Some of the conversion tables are shipped with the driver, others are downloaded from the server when needed. `iconv` is a library that also handles character data conversions.

Coded Character Set Identifiers (CCSID)

The ODBC Driver included with the Application Package product uses a pair (to and from) of Coded Character Set Identifiers (CCSID) to convert character data. The conversion uses a conversion table or the `iconv` interfaces.

Conversion Tables

Conversion tables use the following naming convention:

```
<4 byte hex number of FROM CCSID><4 byte hex number of TO CCSID>.tbl
```

For example, the conversation table for 819 to 500 is 033301f4.tbl.

Many conversion tables are shipped with the IBM i Access ODBC Driver. Additional conversion tables are downloaded from the server when they are needed. You can also download conversion tables using the `cwbn1tbl` utility. These conversion tables are stored in the following locations:

- `/opt/ibm/iaccess/conv_tables` (Linux)
- `/Library/IBMiAccess/conv_tables` (macOS)
- `/QOpenSys/var/cache/ibm-iaccess` (PASE)

ODBC Application Character Set

The ODBC application character set is defined by the current locale's character set. To find out the current locale, use the following command:

```
locale
```

To find out the current mapping between the current locale's character set and the CCSID that is used, use the following command:

```
cwbn1tbl
```

Overriding the Character Set CCSID Mappings

To change or the add character set CCSID mapping, add the following lines to the `$HOME/.iSeriesAccess/cwb_userprefs.ini` configuration file.

```
[CWB_CURRUSER\Software\IBM\Client Access Express\CurrentVersion\NLS] CCSID-  
CODESET=attr_str:939,IBM939,819,IBM819
```

The above example creates mappings for CCSID 939 to character set "IBM939" and for CCSID 819 to character set "IBM819".

List of Available Locales

To list the available locales, use the following command:

```
locale -a
```

List of Available iconv Character Sets

To list the available `iconv` character sets, use the following command:

```
iconv -l
```

How to Investigate Conversion Problems

Most conversion problems are logged in the History Log. To turn on history logging, use the following command:

```
cwbtrc /hl:1
```

(Refer to `cwbtrc` for more about the trace utility.)

The history log output is in `$HOME/.iSeriesAccess/cwbhistory-<application name>-$HOME/.iSeriesAccess/cwbhistory.csv`. Use either a text editor or a spread sheet to view the contents of the history log.

ODBC usage restrictions

Learn about restrictions for using the ODBC driver with the Application Package when running on non-Windows platforms..

The following table describes the Application Package restrictions when using ODBC.

<i>Table 1. ODBC restrictions.</i>	
Restriction	Reason
MTS is not supported.	This depends on Microsoft Windows-specific components which are only available on Windows. Note: Open XA Transaction API's are supported.
APIs that display a graphical user interface are not supported.	The API call completes but displaying the GUI fails.
Translation DLLs	Translation DLLs are not currently supported. Attempts to use them are ignored.
DSN connection option for user ID / password prompting via a sign-on dialog is not supported.	There is no standardized support for graphical user interfaces in unixODBC.
See Unsupported Connection String Keywords for other DSN options that are not supported in Linux.	These keywords correspond with options that are not supported.
Transport Layer Security (TLS) component	The TLS component is not included with the Application Package. You can use a common SSL tunnel or Socks server.
Connection Timeout	The connection timeout option is not supported with the driver.

Configure an ODBC data source

Use this information to configure an ODBC data source.

It is strongly recommended that you reference the Connection string keywords topic before manually configuring connection options.

Use the following steps to add connection options to the `odbc.ini` file:

1. Open the `odbc.ini` file on your workstation using a text editor. Refer to the output of `odbcinst -j` for the location of System and User Data Sources on your system.
2. If there are multiple ODBC data sources in the `odbc.ini` file, locate the section in the file that contains the data source, that is the target for the connection options you are configuring.
3. Add a new line after the last entry in the data source and enter the new connection option and its value.
 - The syntax is `keyword = value`.
 - For example, if you want to change the date format from its default of 5 (yyyy-mm-dd or *ISO), to 1 (mm/dd/yy or *MDY), you would add `DFT = 1` in the new line.
4. Repeat step 3 to add additional connection options to the data source.
5. Save the `odbc.ini` file.

```
[DSN]
Description = Example DSN
Driver = IBM i Access ODBC Driver
System = HostName
```

Figure 1. An example of a `odbc.ini` file DSN entry

Note:

1. Do not add multiple entries for the same connection option to the same section for a specific data source. This can lead to unpredictable behavior.
2. Options specified by the application in the connection string override any options specified in the `odbc.ini` file.

Related information

[Connection string keywords](#)

Troubleshoot ODBC

Use this information to help you understand, isolate, and resolve problems with ODBC.

ODBC problem isolation

Use this information to isolate problems with ODBC.

Communications

Use the `cwbping` program to verify the IBM i connection with the Linux workstations, and to verify the host servers are started.

Tracing and Logging

Once you verify your connection to the server, there see the following trace files for problem isolation:

- **SQL log.** The `unixODBC sql.log` will show the input and output parameters for ODBC API calls made. The `sql.log` is activated using the `unixODBC ODBCConfig` program. From the Advanced tab, you can enable sql tracing and configure the location of the log file.
- **History log.** The history log will show high-level communication, security and data conversion error messages. The History log is activated using the `cwbtrc` program.
- **Detail trace.** The detail trace will show low-level driver information and is intended for use in reporting problems to IBM. Detail trace is activated using the `cwbtrc` program.
- **Service information collection tool.** The service information collection tool is intended for use in reporting problems to IBM. The service information collection tool is activated using the `cwbmedic` program.

Related reference

[CWBMEDIC - Service information collection tool](#)

Use this command to gather service information for IBM.

[CWBPING - Test the connection to the server](#)

Use this command from a console prompt to determine if an IBM i connection can be successfully established, or to help determine the cause of a connection failure.

[CWBTRC - Trace Application Package](#)

Use this command from a console prompt to configure tracing.

Error messages

When an error occurs, the ODBC Driver included with the Application Package returns the SQLSTATE (an ODBC error code) and an error message. The driver obtains this information both from errors that are detected by the driver and from IBM i errors that are returned.

For errors that occur in the data source, the ODBC Driver maps the returned native error to the appropriate SQLSTATE. When both the driver and the driver manager detect an error, they generate the appropriate SQLSTATE. The ODBC Driver returns an error message based on the IBM i returned message.

For errors that are detected within the ODBC Driver, the driver returns an error message based on the text associated with the SQLSTATE. These error messages are translated messages. Error message files and the help text for error messages found in the underlying components of the IBM i Access product are shipped in the doc directory under the installation prefix.

Error message format

Error messages have the following format:

```
[vendor] [ODBC-component] [data-source]error-message
```

The prefixes in brackets ([]) identify the source of the error. When the error occurs in the data source, the [vendor] and [ODBC-component] prefixes identify the vendor and name of the ODBC component that received the error from the data source. The following table shows the values of these prefixes returned by the IBM i Access ODBC Driver:

Error Source	Value	
Driver Manager	[unixODBC] [Driver Manager]	
IBM i Access ODBC Driver	[unixODBC] [IBM] [System i Access ODBC Driver]	
NLS messages	[unixODBC] [IBM] [System i Access ODBC Driver] Column #: NLS error message number NLS error message text See the message prefix table below to find second level help text.	
Communication and Security	[unixODBC] [IBM] [System i Access ODBC Driver] Communications link failure. comm rc=xxxx - (message text) xxxx is the error number in decimal, not hexadecimal, format. Message text describing the nature of your error appears with the error number. See the message prefix table below to find second level help text.	
Db2 for IBM i	[unixODBC] [IBM] [System i Access ODBC Driver] [DB2] Server error message To view error message text for Db2 for IBM i errors:	
	For errors that begin with:	Use this IBM i command
	SQL	DSPMSGD RANGE (SQLxxxx) MSGF (QSQLMSG)
IWS or PWS	DSPMSGD RANGE (ZZZxxxx) MSGF (QIWS/QIWSMSG), where ZZZ is either IWS or PWS	

For other prefixes that may be seen through the ODBC Driver included with the Application Package, see the following table:

Message Prefix	Message File	Description
CWB####	cwber.html	Base error messages
CWBCO####	cwbcocer.html	Communication error messages
CWBNL####	cwbnler.html	Conversion error messages
CWBSY####	cwbsyer.html	Security error messages
CWBRC####	cwbrcer.html	Remote Command error messages
CWBLM####	cwblmer.html	License error messages

IBM i Access Client Solutions - Application Package utilities

Several utilities are included with the Application Package.

Use the following links for more information on the Application Package utilities.

CWBMEDIC - Service information collection tool

Use this command to gather service information for IBM.

Syntax

```
cwbmedic
```

Parameters

There are no parameters.

This command creates a .tgz file in the user's home directory. If requested, please send this file to IBM Service for analysis.

Examples

- To run the command, enter `cwbmedic`.
- To view the contents of this file, enter the following commands:

```
tar xvzf /home/username/cwbmedic.tgz
cat cwbmedic.out
```

CWBNLTBL - Download conversion tables

Use this command from a console prompt to download conversion tables.

Syntax

```
cwbntbl [source-code-page] [target-code-page] [system] [userid] [password]
```

Parameters

- `source-code-page` = source code page for the table
- `target-code-page` = target code page for the table
- `system` = IBM i name, from which tables are downloaded.

Note: If a IBM i connection is necessary, the user ID and password must also be specified.

- userid = IBM i user ID
- password = IBM i password

The tables share a common location on the system depending on the operating system:

- /opt/ibm/iaccess/conv_tables (Linux)
- /Library/IBMiAccess/conv_tables (macOS)
- /QOpenSys/var/cache/ibm-iaccess (PASE)

Many conversions tables are already shipped with the product. The product also uses iconv conversion where necessary. Use the History Log to look for conversion information.

Examples

- To download the 819 to 13488 conversion table from the system if necessary, run `cwbn1tbl 819 13488 myIBMiSystem myUserid myPassword`
- To show the current locale charset and its code-page mapping, run `cwbn1tbl`

CWBPING - Test the connection to the server

Use this command from a console prompt to determine if an IBM i connection can be successfully established, or to help determine the cause of a connection failure.

CWBPING checks of the status of the IBM i host servers. The name of the communications provider is shown, as well as the result of connecting to each of the host socket servers. To see detailed messages, use the (/v) verbose option.

Syntax

```
cwbping system [/v] [/pl:#] [/al:#] [/serv:name] [/port:#] [/user:userid] [/password:password] [/all]
```

Parameters

- system = name of the server
- /v = verbose output
- /pl:# = port mode (0 = Server services file, 1 = Local services file, 2 = Standard port)

Note: If the /port:# is specified, the port mode is ignored.

- /al:# = address mode
 - 0 = Always use gethostbyname
 - 1 = Lookup after 1 hour
 - 2 = Lookup after 1 day
 - 3 = Lookup after 1 week
 - 4 = Never use gethostbyname, use configured IP address
 - 5 = Lookup once after each PC restart

Note: If the system name is specified as an IP Address, the address mode will be ignored.

- /serv:name = name of the service to connect to (i.e. /serv:telnet or /serv:ftp)

Note: Any TCP/IP service name can be used. For example, see CWBCO1003 or your local services file.

- /port:# = port number to connect to in decimal (i.e. /port:23 or /port:21)

Note: Any TCP/IP port number can be used. For example, see CWBCO1003 or your local services file

- /user:userid = IBM i user ID to use only if the server requires security on startup

- /password:password = IBM i password to use only if the server requires security on startup
- /all = verify all possible servers, by default only common servers are verified.

Examples

To check the status of the IBM i host servers named System1 with address 198.51.100.34:

```
cwbping System1
```

Alternatively, you can check the status using the IP address:

```
cwbping 198.51.100.34 /v
```

CWBTRC - Trace Application Package

Use this command from a console prompt to configure tracing.

Syntax

```
cwbtrc [/DT:0-1] [/DPATH:path] [/DWRAP:0-4000] [/DFLTR:0-1] [/DTICK:0-1] [/DFRMT:0-1] [/HL:0-1]
[/HPATH:path] [/HWRAP:0-4000] [/HFLTR:0-1] [/HTICK:0-1]
```

Parameters

Note: Defaults shown in bold.

- /DT:0-1 = turn detail trace **off/on**
- /DPATH:path = detail trace path, default is \$HOME/.iSeriesAccess
- /DWRAP:0-4000 = detail trace wrap size (MB), default is 1. An <EOF> symbol will be placed after the last record.
- /DFLTR:0-1 = detail trace filter **off/on**
- /DCOMP:abc,abc = filter component list. Where components are: Configuration, Communication, Comm-API, Comm-SPI, Comm-System, Comm-Base, License Management, NLS, ODBC, ODBC-Error, Emulator, Remote Command, Service, Security.
- /DTICK:0-1 = **timestamp** or tick count in trace entries
- /DFRMT:0-1 = limit tcp hex data **off/on**
- /HL:0-1 = turn history log **off/on**
- /HPATH:path = history log path, default is \$HOME/.iSeriesAccess /HWRAP:0-4000 = history log wrap size (MB), default is 1. An <EOF> symbol will be placed after the last record.
- /HFLTR:0-1 = history log filter **off/on**
- /HCOMP:abc,abc = filter component list. Where components are: Configuration, Communication, Comm-API, Comm-SPI, Comm-System, Comm-Base, License Management, NLS, ODBC, ODBC-Error, Emulator, Remote Command, Service, Security.
- /HTICK:0-1 = **timestamp** or tick count in traces entry

Running **CWBTRC** without any parameters will show the command syntax and the current status of each parameter.

The output from **CWBTRC** will have the following naming convention:

```
cwbdetail-<process name>-<pid>.csv
cwbhistory-<process name>-<pid>.csv
```

The output files will be in semicolon separated record format, suitable for input into spreadsheets for viewing.

Examples

The following command will turn on detail trace and allow it to grow to a 10 megabyte file before wrapping. It will also turn on history logging.

```
cwbtrc /dt:1 /dwrap:10 /hl:1
```

The following command will turn on history log and change the path to /usr/traces

```
cwbtrc /hl:1 /hpath:/usr/traces
```

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