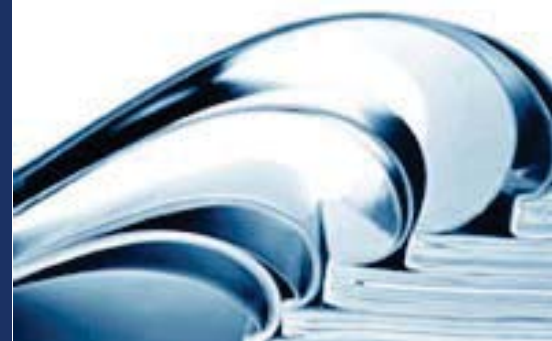


DataFlux Secure Administrator's Guide



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DataFlux® Secure 2.9: Administrator's Guide

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Accessibility

The DataFlux Secure software includes features that improve usability for the disabled. These accessibility features are related to standards for electronic information technology that were adopted by the United States (U.S.) Government under Section 508 of the U.S. Rehabilitation Act of 1973, as amended.

If you have questions or concerns about the accessibility of SAS products, please send an e-mail to techsupport@sas.com.

What's New in DataFlux Secure 2.9

The August, 2020 update for DataFlux Secure 2.9 now supports SSL 1.1 on Linux. Also, DataFlux Data Management Server now requires the implementation of the TLSv1 protocol when SSL is enabled. For more information, see the [system requirements](#).

Critical Changes

If you are using any of the following SAS products, see the corresponding topics in the [SAS® 9.4 Guide to Software Updates and Product Changes](#).

- SAS Business Data Network
- SAS Visual Process Orchestration and Server
- SAS Data Management Console
- DataFlux Web Studio and Server
- DataFlux Authentication Server

Recommended Reading

DataFlux Data Management Server: Administrator's Guide
DataFlux Data Management Studio: Installation and Configuration Guide
DataFlux Data Management Studio: User's Guide
SAS Drivers for Federation Server: User's Guide
SAS 9.4 Intelligence Platform: Security Administration Guide
SAS Federation Server: Administrator's Guide
SAS Federation Server Manager: User's Guide

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Overview of DataFlux Secure

- [Applicability](#)
- [Features and Scope](#)

Applicability

DataFlux Secure is distributed with and can be enabled for the following products:

- DataFlux Data Management Studio
- DataFlux Data Management Server
- SAS Federation Server 4.2

Features and Scope

The DataFlux Secure software provides three high-assurance features:

- Enhanced encryption for network communication and passwords. Multiple encryption algorithms are supported, up to and including the 256-bit private keys of [AES](#).
- The Secure Sockets Layer ([SSL](#)) protects HTTPS connections.
- [FIPS](#) compliance to help ensure that your site meets regulatory requirements.

DataFlux Secure is installed by default, in a disabled state, alongside each supported client or server. You can enable the security enhancements at any time.

In order to maintain interoperability, you need to install, enable, and similarly configure DataFlux Secure on all of the clients and servers that interact at your site.

DataFlux Secure provides the following security enhancements for the following clients and servers:

Client or Server	Description	DataFlux Secure Implementation
DataFlux Data Management Studio	Enables the creation of jobs and services that run on the client and on DataFlux Data Management Server, SAS Federation Server, and DataFlux Web Studio Server. DataFlux Data Management Studio also provides the administrative interface for DataFlux Data Management Server and DataFlux Authentication Server.	DataFlux Secure allows DataFlux Data Management Studio to communicate with servers that are configured to use enhanced encryption. Without DataFlux Secure, DataFlux Data Management Studio is limited to using basic HTTP connections for SOAP

Client or Server	Description	DataFlux Secure Implementation
		communications and SAS Proprietary encryption for communication with the SAS Metadata Server.
DataFlux Data Management Server	Runs jobs and services created in DataFlux Data Management Studio, stores job output and data collections, and implements access controls for data, jobs, and services. It can authenticate and use group membership data from the SAS Metadata Server. Network clients can run jobs and services using a GSOAP interface. Server connections can be disabled by IP address, or by global ALLOW or DENY groups.	Uses configurable encryption, SSL, and available FIPS compliance to protect all network traffic, including GSOAP connections. Users and groups are defined and maintained on the SAS Metadata Server. The encryption algorithm is specified as part of the server definition on the SAS Metadata Server.
SAS Federation Server	Runs jobs that collect data from multiple enterprise sources. Provides centralized access to collected data. Manages access to jobs and data collections using users and groups defined on the SAS Metadata Server.	Uses configurable encryption and can use FIPS compliance to support connections to similarly configured clients and servers.
SAS Federation Server Client	This package provides the SAS drivers for Federation Server, which enable your applications to connect to data sources on SAS Federation Server.	DataFlux Secure allows SAS Federation Server to communicate with servers that are configured to use enhanced encryption. Without DataFlux Secure, SAS Federation Server is limited to using basic HTTP connections for SOAP communications and SAS Proprietary encryption for communication with the SAS Metadata Server.

DataFlux Secure does not provide a graphical user interface or run any daemon processes.

AES

When enabled, AES (Advanced Encryption Standard) algorithms can be specified by the SAS Metadata Server. Several other encryption algorithms are available, as defined in the metadata definitions of the servers on the data management platform.

AES encryption and decryption protects the following:

- All passwords that are stored on disk. For information about passwords, see [About Password Protection](#).

- All interprocess communication between components that use the Integrated Object Model (IOM).

AES is separately enabled, so you can choose to retain the default encryption algorithm and use DataFlux Secure for SSL only. The default encryption algorithm is SASPROPRIETARY, which uses 56-bit keys.

Administrators manually encrypt passwords using AES to replace SASPROPRIETARY passwords using a [password encryption tool](#).

SSL

Support for Secure Sockets Layer (SSL) uses private-key encryption and signed digital certificates to protect HTTPS connections.

When a server is configured for SSL, it accepts only HTTPS connections. HTTP connections are not used or accepted.

SSL is implemented using OpenSSL. OpenSSL is downloaded and distributed across your site according to your company's existing security policies. Those policies address the tasks of requesting and installing the keys and digital certificates that are used by SSL.

The supported versions of OpenSSL for all clients and servers are 1.0.x and 1.1.x.

FIPS

Compliance with the Federal Information Processing Standard 140-2 is required by certain businesses and governmental entities.

FIPS compliance is optional, as are the other features in DataFlux Secure.

Like SSL, FIPS compliance is generally applied across all of the clients and servers that are part of a data management platform, including network clients.

FIPS compliance for the DataFlux Data Management Server includes full encryption support for all GSOAP connections. Clients use GSOAP connections to request the execution of jobs and services.

For further information about FIPS 140-2, refer to the document [Security Requirements for Cryptographic Modules](#).

About Password Protection

The supported clients and servers store a minimum number of passwords, and all passwords are encrypted for storage on disk.

Passwords are limited in number because user passwords are not stored on the supported clients and servers. Instead, user credentials are delivered to your existing authentication providers for validation. Only stored login passwords are stored, in encrypted form, on the SAS Metadata Server. These servers are known as authentication providers.

Shared logins are collections of users that share credentials for a given enterprise database. For example, if a user wants to run a SAS Federation Server job that collects data from an Oracle database, she authenticates initially, and then she submits inbound credentials for a shared login to the authentication provider. If she is a consumer of that shared login, then the authentication provider provides SAS Federation Server with the credentials that are necessary to open the connection to the database.

The passwords for shared logins, along with the outbound credentials for databases, are stored only on the authentication provider.

The only other stored passwords are those that are used to open connections between servers. One such connection is used to connect a server to the authentication provider. Jobs running on the DataFlux Data Management Server can also use a stored password to open connections to the SAS Federation Server.

Passwords are not displayed in any graphical user interface.

For more information about using the SAS Metadata Server passwords, see the section Update a Managed Password in the [SAS 9.4 Intelligence Platform: Security Administration Guide](#). For information about password maintenance, see the How to Re-Encrypt Stored Passwords section of the [SAS 9.4 Intelligence Platform: Security Administration Guide](#).

Install and Configure

- [Installation Notes](#)
- [About Configuration](#)
- [Configure OpenSSL](#)
- [Configure DataFlux Data Management Studio](#)
- [Configure DataFlux Data Management Server](#)
- [Configure SAS Federation Server](#)
- [Configure SAS Federation Server Client](#)
- [Configure SAS Visual Process Orchestration Runtime Server](#)
- [Configure SAS Visual Process Orchestration Web Client](#)
- [Configure DataFlux Web Studio](#)
- [Configure DataFlux Web Studio Server](#)
- [Configure DataFlux Authentication Server](#)
- [Encrypt Passwords](#)
- [Administer DataFlux Secure](#)

Installation Notes

DataFlux Secure is installed and licensed by default when you install a client or server that supports DataFlux Secure.

DataFlux Secure is installed in a disabled state. You can enable the security enhancements that are provided by DataFlux Secure at any time.

DataFlux Secure is installed in the same default directory as the related client or server.

The system requirements for DataFlux Secure are the same as those of the clients and servers that use DataFlux Secure, as provided on the [SAS System Requirements](#) page.

In this document, the default installation path is indicated by the term *install-path*.

About Configuration

DataFlux Secure provides configurable enhanced encryption, SSL connection protection, and FIPS compliance. These features require different levels of configuration after installation.

Configure encryption similarly on all instances of DataFlux Secure. First execute the command that enables encryption. Then replace all of your stored passwords with passwords that have been encrypted with the selected encryption algorithm.

When you configure SSL with DataFlux Secure, it is recommended that you enable SSL on all supported clients and servers. Most of the supported clients and servers requires you to install OpenSSL.

Configure FIPS compliance on the DataFlux Authentication Server by entering a command that enables the feature.

Clients that access FIPS-enabled servers need to connect with DataFlux device drivers, rather than SOAP or HTTP addresses. To learn about client-side drivers for the SAS Federation Server, see *SAS Drivers for Federation Server*.

Configure OpenSSL

- [OpenSSL System Requirements](#)
- [Download and Deploy OpenSSL onto Windows Hosts](#)
- [Create SSL Certificates](#)

OpenSSL System Requirements

OpenSSL is an open-source software package that enables HTTPS connections. OpenSSL is required on all of the hosts that run DataFlux Secure.

For all DataFlux Secure hosts, the system requirement for OpenSSL is requirement for OpenSSL is release 1.0.x or 1.1.x.

On Windows hosts, deploy a supported version of OpenSSL from the provider of your choice.

On UNIX and Linux hosts, OpenSSL is delivered as part of the operating environment. Those libraries should be included in LD_LIBRARY_PATH.

After you deploy OpenSSL, request and add certificates from a Certificate Authority (CA). Then enable SSL for DataFlux Secure, as described in this chapter.

Download and Deploy OpenSSL onto Windows Hosts

Follow these steps to download and deploy OpenSSL onto all of the Windows hosts that will use SSL:

1. On your first Windows host, download OpenSSL 1.0.x or 1.1.x or later from a provider such as [Shining Light Productions](#).

DataFlux Data Management Studio is a 32-bit application. It requires the 32-bit OpenSSL even when installed on 64-bit operating systems.

Most modern server environments run with 64-bit operating systems. DataFlux

Data Management Server, DataFlux Web Studio Server, and SAS Visual Process Orchestration Runtime Server will deploy to match their operating system. 64-bit servers require 64-bit OpenSSL. 32-bit OpenSSL and 64-bit OpenSSL can coexist on the same 64-bit system.

Install OpenSSL by executing the following:

```
Winbit-lengthOpenSSLversion-number.exe
```

For example:

```
Win64OpenSSL1.0.2.exe
```

1. Install OpenSSL to `C:\OpenSSL-Win64` or `C:\OpenSSL-Win32`.
2. Select the installer option **Copy OpenSSL DLLs to the Windows System Directory**.
3. If you are installing OpenSSL on a client, the installation process is complete. Move on to [Create a Trusted Certificate](#).
4. If you are installing OpenSSL on a server, either reboot the server or enter the following command before you create a certificate:

```
set OPENSSL_CONF=C:\OpenSSL-Win64\bin\openssl.cfg
```

or:

```
set OPENSSL_CONF=C:\OpenSSL-Win32\bin\openssl.cfg
```

Create SSL Certificates

When a client requests an SSL connection, the server delivers a certificate containing the server's public key. The client uses the server's certificate to verify the identity of the server. Certificates can be trusted or self-signed. Trusted certificates are provided by a Certificate Authority. Self-signed certificates can be created with an OpenSSL command.

Privacy Enhanced Mail Format

The Privacy Enhanced Mail format or PEM, format contain the public certificate and the private key for DataFlux Data Management Server and SAS Federation Server.

This PEM file is Base64 encoded and is easily read with a simple text editor.

However, do not edit with a robust editor such as WordPad, or Word, which can change the format to introduce Windows line termination characters, a Windows end-of-file character, or to use Unicode representation.

If you have a Base64 encoded certificate and private key from a CA, you can create a PEM by using the command line on these:

```
Windows: copy myhost.crt+myhost.key myhost.pem
```

Unix: `cat myhost.crt myhost.key >myhost.pem`

The OpenSSL commands below will create the PEM file containing a self-signed certificate.

The resulting PEM file should not be generally available. The server using the PEM will extract the public certificate and return it to requesting clients.

Create a Trusted Certificate

A trusted certificate certifies the ownership of a public key by the named subject of the certificate.

This allows clients to rely upon signatures or on assertions made by the private key that corresponds to the certified public key.

In this model of trust relationships, a CA is a trusted third party that is trusted both by the subject, who is the owner of the certificate, and by the party that is relying upon the certificate.

To create a trusted certificate on a host with OpenSSL, simply purchase the certificate from a CA.

Create a Self-Signed Certificate on Windows

A self-signed certificate is an identity certificate that is signed by the same entity whose identity it certifies. Follow these steps to create a self-signed certificate on a Windows host that includes OpenSSL:

1. In the Run dialog box or on a DOS command line, change to the OpenSSL directory:

```
cd /d c:\openssl-win32 or  
cd /d c:\openssl-win64
```

2. Create a directory named `certificates`:

```
md certificates
```

3. Change to the `bin` directory:

```
cd bin
```

4. Enter the command that creates the key file and the certificate file, and inserts the key file into the certificate:

```
openssl req -x509 -nodes -days 1095 -newkey rsa:1024  
-keyout ..\certificates\%COMPUTERNAME%.pem  
-out ..\certificates\%COMPUTERNAME%.pem
```

This command creates a certificate that remains valid for three years. Windows will supply a value for `%COMPUTERNAME%`.

5. The command above presents you with a number of prompts. The only significant prompt asks you for the host's common name. The common name is required to be a fully qualified domain name, such as w64213.us.ourco.com.

Create a Self-Signed Certificate on UNIX or Linux

1. Create a directory named certificates:

```
mkdir /home/yourUserid/certificates
```

2. Change to the certificates directory:

```
cd /home/yourUserid/certificates
```

3. Enter the command that creates the key file and the certificate file, and inserts the key file into the certificate:

```
openssl req -x509 -nodes -days 1095 -newkey rsa:1024  
-keyout computerName.pem -out computerName.pem
```

4. The command above presents you with a number of prompts. The only significant prompt asks you for the host's common name. The common name is required to be a fully qualified domain name, such as w64213.us.ourco.com.

Configure DataFlux Data Management Studio

The DataFlux Secure software is installed in a disabled state on all instances of DataFlux Data Management Studio. The only time that DataFlux Secure is not installed by default is when export restrictions prevent the distribution of security software.

DataFlux Data Management Studio requires the use of SSL when that client communicates with SSL-enabled DataFlux Data Management Server. To configure SSL on a client host, [install 32-bit OpenSSL](#). Note that you should install 32-bit OpenSSL even when the 32-bit client is installed on a 64-bit host. The 32-bit and 64-bit versions of OpenSSL can reside on the same host without conflict.

When you install DataFlux Data Management Studio, the SSL DLL is disabled unless the installation process finds OpenSSL in the system path. If you install OpenSSL after you install DataFlux Data Management Studio, then you need to enable the SSL DLL. Log in as an administrator and enter the following command:

For OpenSSL versions prior to 1.1:

```
bin\set_soap ssl
```

For OpenSSL 1.1 and later:

```
bin\set_soap ssl11x
```

The SSL DLL remains enabled until you enter the following command:

```
bin\set_soap std
```

Note that DataFlux Data Management Studio *without* OpenSSL enabled can still connect to DataFlux Data Management Server *with* OpenSSL enabled.

If you enable the SSL DLL, and if you do not install OpenSSL, then DataFlux Data Management Studio will not start. Use the Windows Task Manager to kill the process DMStudio.exe.

When DataFlux Data Management Studio needs to connect to a SAS Federation Server that is enabled for FIPS compliance, you need to configure DataFlux Data Management Studio to communicate using the DataFlux drivers for ODBC or JDBC, rather than using a direct connection. For more information about the drivers, see the *SAS Drivers for Federation Server User's Guide*.

The configuration files for DataFlux Data Management Studio are not affected by the installation of DataFlux Secure.

Configure DataFlux Data Management Server

Overview

When configured with DataFlux Secure, the DataFlux Data Management Server can be enabled to use SSL to protect HTTP connections. In addition, the server configuration can be further enhanced to comply with the FIPS standard 140-2.

When SSL is enabled, the DataFlux Data Management Server accepts only HTTPS connections. To send HTTPS requests, SSL must also be enabled on clients and other servers.

When configured for SSL, the DataFlux Data Management Server requires OpenSSL. Most modern server environments run with 64-bit operating systems. DataFlux Data Management Server deploys to match its operating system. 64-bit servers require 64-bit OpenSSL. 32-bit servers require [32-bit OpenSSL](#). 32-bit OpenSSL and 64-bit OpenSSL can coexist on the same 64-bit system.

Starting with the software release in August, 2020, DataFlux Data Management Server requires the TLSv1 protocol.

The encryption level or algorithm for the DataFlux Data Management Server is determined by the server definition on the SAS Metadata Server.

Prerequisites

OpenSSL must be fully configured before security can be enabled on the DataFlux Data Management Server.

On the SAS Management Console, create a new HTTPS server metadata object for the DataFlux Data Management Server. In that metadata object, select the encryption algorithm that you want to apply to HTTPS connections.

If FIPS compliance is to be enabled, then FIPS-compliant OpenSSL DLL libraries must be deployed on the server host.

DataFlux Data Management Server uses the OpenSSL FIPS 140-2 module. The module must be compiled and installed by the customer to build the OpenSSL libraries in order to ensure FIPS 140-2 compliance. DataFlux Data Management Server uses OpenSSL 1.0.2 and uses the FIPS 2.0.16 module with a certificate number of 1747.

The only certified UNIX operating environments included are HP-UX for Itanium Processor, Solaris for SPARC Processor, Solaris for Intel 64 and AMD64 Processor, and Linux for Intel 64 and AMD64 Processor. AIX is not certified.

If your DataFlux Data Management Server needs to connect to a FIPS-enabled server, then the DataFlux Data Management Server needs to connect with a DataFlux driver, either ODBC or JDBC. For more information about the drivers, see the *SAS Drivers for Federation Server User's Guide*.

Configure SSL and FIPS

Follow these steps to configure SSL and FIPS, if desired, on your DataFlux Data Management Server:

1. If the DataFlux Data Management Server is running, then stop the server.
2. Open the configuration file `dmserver.cfg`.
3. Add the following option or enter a value of YES to enable SSL on the DataFlux Data Management Server:

```
DMSERVER/SOAP/SSL = YES
```

Enter a value of NO to disable SSL.

4. To identify a key file and password, add these two options:

```
DMSERVER/SOAP/SSL/KEY_FILE = path-to-key-file  
DMSERVER/SOAP/SSL/KEY_PASSWD = encrypted-password-for-key-file
```

To encrypt a password, see [Encrypt Passwords](#).

5. To identify trusted certificates (if you use certificates):

```
DMSERVER/SOAP/SSL/CA_CERT_FILE = trusted-certificates-filename  
DMSERVER/SOAP/SSL/CA_CERT_PATH = path-to-trusted-certificates-file
```

6. If desired, set the following option to enable FIPS compliance.

```
DMSERVER/SOAP/SSL/FIPS = Yes
```

7. Enter one of the following commands to configure the SOAP DLL:

For all versions prior to OpenSSL 1.1:

```
bin\set_soap ssl
```

For OpenSSL 1.1 and later:

```
bin\set_soap ssl11x
```

To enable FIPS compliance:

```
bin\set_soap fips
```

8. Save and close the configuration file.
9. Start the DataFlux Data Management Server.

Configure Encryption

The encryption algorithm used by DataFlux Data Management Server is determined by the server definition of the SAS Metadata Server. To view or change the encryption algorithm, edit the server definition in SAS Management Console. For specific instructions, see the [How to Change Over-the-Wire Encryption for IOM Servers](#) topic in the *SAS Intelligence Platform: Security Administration Guide*.

Configure SAS Federation Server

Enable or Disable FIPS

FIPS support is enabled during installation if FIPS is determined to be enabled on the SAS Metadata Server.

Follow these steps to disable and re-enable FIPS support:

1. Enable or disable FIPS on the SAS Metadata Server.
2. Open the file `fed-server-config-path/etc/dfs_serv.xml`.
3. Change the EncryptFIPS option to True or False:

```
<Option name="EncryptFIPS">TRUE</Option>
```

Or:

```
<Option name="EncryptFIPS">FALSE</Option>
```

4. Restart the DataFlux Data Management Server.

Configure Encryption

The encryption algorithm used by the DataFlux Data Management Server is determined by the server definition on the SAS Metadata Server. To view or change the encryption algorithm, edit the server definition in SAS Management Console. For specific instructions, see the [How to Change Over-the-Wire Encryption for IOM Servers](#) topic in the *SAS Intelligence Platform: Security Administration Guide*.

Configure SAS Federation Server Client

The SAS Federation Server Client software selectively installs the SAS Drivers for Federation Server. The SAS Drivers for Federation Server are used by your applications to connect to data sources on SAS Federation Servers. The Secure drivers require no additional configuration to implement Secure features. The drivers are transparently configured to work with AES encryption and, if enabled, FIPS

compliance. To learn more about the drivers, see the *SAS Drivers for Federation Server User's Guide*.

Encrypt Passwords

The DataFlux Data Management Server is delivered with a utility that converts a plain text password into an encrypted password. The password is encrypted with the 256-bit AES algorithm. You can copy the encrypted password into files and fields.

An encrypted password is required as the value of the option `DMSERVER/SOAP/SSL/KEY_PASSWD`.

In Windows, run `install-path\bin\EncryptPassword.exe`. Enter the password, confirm your initial entry, and receive the encrypted password.

In UNIX and Linux, run `dmsadmin crypt`.

A similar encryption tool is provided with the SAS drivers that are used by your clients to connect to data sources on SAS Federation Servers. For further information about this encryption utility, see the *SAS Drivers for Federation Server User's Guide*.

Administer DataFlux Secure

After you [install and configure](#) DataFlux Secure, the software requires no maintenance other than the periodic replacement of the license file.

When you upgrade a client or server that uses DataFlux Secure, you need to reconfigure DataFlux Secure.

DataFlux Secure does not have a separate uninstall process. If you uninstall a client or server that uses DataFlux Secure, then DataFlux Secure is removed along with the client or server.

Troubleshoot DataFlux Secure

If you cannot open a trusted connection between two hosts, then you should first ensure that DataFlux Secure has been installed on each host. Next, confirm that the configuration files on both hosts contain the option values and environment variables that are described in the [Install and Configure](#) chapter.

If DataFlux Secure has been installed and configured on both hosts, you can check the log files on the hosts to help isolate the error. To obtain additional information, contact [SAS Technical Support](#) to temporarily increase the amount of data that is collected in the log files.

For more information about logging, including the locations of the log files, refer to the user's guides and administrator's guides for your clients and servers, as listed in [Recommended Reading](#).

Appendixes

- [ODBC Drivers](#)
- [Legal Notices](#)

ODBC Drivers

Various Data Management products use Open Database Connectivity (ODBC) database drivers to link applications to a variety of database management systems. The ODBC drivers are deployed with those products without the secure components. A secure component that enables encrypted connections to databases is available for some of these DataDirect 7.1 ODBC drivers. These drivers are enabled for Secure Sockets Layer (SSL) technology that establishes an encrypted link between the application and the database.

The current 64-bit branded ODBC drivers that are available with DataFlux Secure include the following:

DataDirect ODBC Drivers	Driver Enabled for SSL Encryption
Apache Hive Wire Protocol	x
DB2 Wire Protocol	x
Greenplum Wire Protocol	x
Impala Wire Protocol	
Informix Wire Protocol	
MySQL Wire Protocol	x
Oracle	
Oracle Wire Protocol	x
Postgres Wire Protocol	x
Progress OpenEdge Wire Protocol	x

DataDirect ODBC Drivers	Driver Enabled for SSL Encryption
Salesforce	x
SQL Server Legacy Wire Protocol	
SQL Server Wire Protocol	x
Sybase IQ Wire Protocol	
Sybase Wire Protocol	x
Teradata	

For more information about these drivers, see the documentation in the ODBC folder of your application.

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