



# **SequeLink<sup>®</sup>**

## Getting Started

Release 6.0  
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# Preface

This book is your guide to getting started with DataDirect SequeLink® 6.0 from DataDirect Technologies. Read on to find out more about your SequeLink environment and how to use this book.

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## What Is DataDirect SequeLink®?

DataDirect SequeLink is a middleware product that provides point-to-point connections from a client to a server for the latest data access standards, including Open Database Connectivity (ODBC), JDBC, ActiveX Data Objects (ADO), and ADO.NET.

In this documentation, references to SequeLink Server and SequeLink Client apply to both the 32-bit and 64-bit versions. Information that applies to a specific version of SequeLink Server or SequeLink Client is identified.

---

## Using This Book

This book assumes that you are familiar with your operating system and its commands; the concept of directories; the management of user accounts and security access; and your network protocol and its configuration.

This book contains the following information:

- [Chapter 1 “Introduction” on page 17](#) introduces some concepts that will help you use SequeLink to provide data access across your enterprise.
- [Chapter 2 “Sample Scenarios” on page 37](#) provides sample scenarios that describe how SequeLink might be used to implement data access for a data consumer application.
- [Chapter 3 “Planning Your SequeLink® Configuration” on page 47](#) provides information you need to know as you plan your SequeLink configuration.

The book also contains a glossary.

NOTE: This book refers the reader to Web URLs for more information about specific topics, including Web URLs not maintained by DataDirect Technologies. Because it is the nature of Web content to change frequently, DataDirect Technologies can guarantee only that the URLs referenced in this book were correct at the time of publishing.

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# SequeLink® Documentation

The following table provides a guide for finding information in your SequeLink documentation:

For information about...	Go to...
SequeLink concepts and planning your SequeLink environment	<i>Getting Started with SequeLink</i>
Installing the SequeLink middleware components	<i>SequeLink Installation Guide</i>
Administering your SequeLink environment	<i>SequeLink Administrator's Guide</i>



For information about...	Go to...
Developing ODBC, ADO, JDBC, and .NET applications for the SequeLink environment	<i>SequeLink Developer's Reference</i>
Troubleshooting and referencing error messages	<i>SequeLink Troubleshooting Guide and Reference</i>

## HTML Version



All of these books can be placed on your system as HTML-based online help during a normal installation of the product. They are located in the help subdirectory of the product installation directory. To use the help, you must have one of the following browsers installed:

- Internet Explorer 5.x or higher
- Netscape 4.x, 6.1, or higher
- FireFox 1.0 or higher

If you choose to install the online books, you can access the entire help system by selecting the help icon that appears in the DataDirect program group.



On UNIX and Linux platforms, if you want the help files, copy the /bookshtml subdirectory from the product DVD to a local directory.

To open the help system from a command-line environment, at a command prompt, enter:

```
browser_exe my_local_dir/bookshtml/help.htm
```

where *browser\_exe* is the name of your browser executable and *my\_local\_dir* is the path to the product installation directory.

After the browser opens, the left pane displays the Table of Contents, Index, and Search tabs for the entire documentation library. When you have opened the main screen of the help system in your browser, you can bookmark it in the browser for quick access later.

**NOTE:** Security features set in your browser can prevent the help system from launching. A security warning message is displayed. Often, the warning message provides instructions for unblocking the help system for the current session. To allow the help system to launch without encountering a security warning message, the security settings in your browser can be modified. Check with your system administrator before disabling any security features.

Help is available from the setup dialog box for the ODBC driver and ADO data provider. When you click **Help**, your browser opens to the correct topic in the help system, without opening the help Table of Contents. A grey toolbar appears at the top of the browser window.



This tool bar contains previous and next navigation buttons.

## PDF Version

DataDirect product documentation is also provided in PDF format, which allows you to view it, perform text searches, or print it. You can view the PDF documentation using the Adobe Acrobat Reader. The PDF documentation is available on the product DVD and also on the DataDirect Technologies Web site:

[http://www.datadirect.com/support/product\\_info/proddoc\\_product/index.ssp](http://www.datadirect.com/support/product_info/proddoc_product/index.ssp)

You can download the entire library in a compressed file. When you uncompress the file, it appears in the correct directory structure.

If you want to copy the documentation library from the product DVD, you must maintain the same directory structure that is on the DVD.

- **To copy all product books**, copy the entire \bookspdf directory to your local or network drive.
- **To copy a specific book**, copy that book's directory structure (beneath the \bookspdf subdirectory) to your local or network drive. For example, to copy the *SequeLink Administrator's Guide*, you would copy the entire \admin subdirectory:

```
\bookspdf\admin
```

Maintaining the correct directory structure allows cross-book text searches and cross-references. If you download or copy the books individually outside of their normal directory structure, their cross-book search indexes and hyperlinked cross-references to other volumes will not work. You can view a book individually, but it will not automatically open other books to which it has cross-references.

To help you navigate through the library, a file, called **books.pdf**, is provided. This file lists each online book provided for the product. We recommend that you open this file first and, from this file, open the book you want to view.

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# Typographical Conventions

Convention	Explanation
<i>italics</i>	Introduces new terms with which you may not be familiar, and is used occasionally for emphasis.
<b>bold</b>	Emphasizes important information. Also indicates button, menu, and icon names on which you can act. For example, click <b>Next</b> .
UPPERCASE	Indicates keys or key combinations that you can use. For example, press the ENTER key.  Also used for SQL reserved words.
monospace	Indicates syntax examples, values that you specify, or results that you receive.
<i>monospaced italics</i>	Indicates names that are placeholders for values that you specify. For example, <i>filename</i> .
forward slash /	Separates menus and their associated commands. For example, Select File / Copy means that you should select Copy from the File menu.  The slash also separates directory levels when specifying locations under UNIX.
vertical rule	Indicates an "OR" separator used to delineate items.
brackets [ ]	Indicates optional items. For example, in the following statement: SELECT [DISTINCT], DISTINCT is an optional keyword.  Also indicates sections of the Windows Registry.
braces { }	Indicates that you must select one item. For example, {yes   no} means that you must specify either yes or no.
ellipsis . . .	Indicates that the immediately preceding item can be repeated any number of times in succession. An ellipsis following a closing bracket indicates that all information in that unit can be repeated.

---

## Environment-Specific Information

This book supports users of various operating environments. Where it provides information that does not apply to all supported environments, the following symbols are used to identify that information:



*Windows.* Information specific to the Microsoft Windows 2000, Windows Server 2003 (32-bit), Windows XP, and Windows Vista environment is identified by Windows symbol.



*UNIX and Linux.* Information specific to UNIX and Linux environments is identified by this symbol, which applies to all UNIX and Linux environments supported. UNIX is a registered trademark of The Open Group in the US and other countries.

*z/OS*

*z/OS.* Information specific to z/OS and OS/390 environments is identified by the characters z/OS.

---

## Contacting Technical Support

DataDirect Technologies offers a variety of options to meet your technical support needs. Please visit our Web site for more details and for contact information:

<http://support.datadirect.com>

The DataDirect Technologies Web site provides the latest support information through our global service network. The SupportLink program provides access to support contact details, tools, patches, and valuable information, including a list of FAQs for each product. In addition, you can search our Knowledgebase for technical bulletins and other information.

To obtain technical support for an evaluation copy of the product, go to:

[http://www.datadirect.com/support/eval\\_help/index.ssp](http://www.datadirect.com/support/eval_help/index.ssp)

or contact your sales representative.

When you contact us for assistance, please provide the following information:

- The serial number that corresponds to the product for which you are seeking support, or a case number if you have been provided one for your issue. If you do not have a SupportLink contract, the SupportLink representative assisting you will connect you with our Sales team.
- Your name, phone number, email address, and organization. For a first-time call, you may be asked for full customer information, including location.
- The DataDirect product and the version that you are using.
- The type and version of the operating system where you have installed your DataDirect product.

- Any database, database version, third-party software, or other environment information required to understand the problem.
- A brief description of the problem, including, but not limited to, any error messages you have received, what steps you followed prior to the initial occurrence of the problem, any trace logs capturing the issue, and so on. Depending on the complexity of the problem, you may be asked to submit an example or reproducible application so that the issue can be recreated.
- A description of what you have attempted to resolve the issue. If you have researched your issue on Web search engines, our Knowledgebase, or have tested additional configurations, applications, or other vendor products, you will want to carefully note everything you have already attempted.
- A simple assessment of how the severity of the issue is impacting your organization.





# 1 Introduction

DataDirect SequeLink is a middleware product that provides point-to-point connections from client to server for the latest data access standards—Open Database Connectivity (ODBC 3.52), JDBC 3.0, ActiveX Data Objects (ADO 2.7), and Microsoft .NET 1.1. In addition, SequeLink allows you to centrally configure your data access environment and manage data access activity.

Today's complex Information Technology (IT) environments require data access components that provide superior interoperability, performance, and manageability. SequeLink middleware fulfills these requirements by providing the following key advantages for complex IT environments:

- **Data Connectivity.** SequeLink provides universal data connectivity for the latest ODBC, JDBC, ADO, and .NET standards to a variety of data stores, including mainframe data. Additionally, SequeLink supports distributed transactions for Microsoft Distributed Transaction Coordinator (MS DTC) and Java Transaction API (JTA). SequeLink's component implementation allows you to manage your entire data access environment regardless of the operating systems on which the SequeLink components run. In addition, SequeLink Client is database-independent—no extra client components are required if you decide to incorporate additional data store technologies in your data access infrastructure.
- **Interoperability.** SequeLink allows you to leverage existing and evolving technologies by adhering to industry standards rather than a proprietary standard. In addition to supporting the latest data access standards, SequeLink allows you to use Lightweight Directory Access Protocol (LDAP) for centralized connection and configuration information.

- **Security.** The messages between SequeLink middleware components that involve data requests and data transmitted over a network, Internet, or Intranet can be scrambled or, in some cases, encrypted. In addition, SequeLink supports authentication mechanisms provided by the database or by the operating system on which the SequeLink components run, such as Integrated NT Security on Windows and Resource Access Control Facility (RACF) on z/OS. SequeLink also supports a variety of other security mechanisms such as Kerberos authentication to create a single-sign on environment, Secure Sockets Layer (SSL) data encryption, and read-only data store connections to keep the data in your data store secure from updates.
- **Systems management.** SequeLink delivers key Reliability, Availability, and Serviceability (RAS) by providing dynamic service attributes. The majority of SequeLink's service configuration attributes are dynamic, meaning that if you change a setting for an attribute, the change takes affect immediately. SequeLink Clients provide connection failover and client load balancing features to further enhance availability and reliability.
- **Scalability.** SequeLink provides superior performance and scalability through connection pooling at the client, through efficient use of server resources, and through its configurable multi-threaded implementation, which uses a dynamic worker thread model.

This chapter introduces some concepts that will help you use SequeLink to provide data access across your enterprise.

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# Features in This Release

SequeLink provides the following standard features:

- Centralized management, administration, and monitoring capabilities using the SequeLink Manager
- Great scalability and performance using a thread-pool engine within the SequeLink Server
- Support for the latest data access specifications, databases, and operating system versions

In addition, this SequeLink release provides the following new features:

- SequeLink Client *for* JDBC enhancements include:
  - Java EE 5 certified and Java EE 5 SDK 5 enabled
  - SSL data encryption
  - Kerberos authentication
  - DataDirect Spy™ *for* JDBC Log Connection information
  - Connection failover and client load balancing
- SequeLink Client *for* ODBC enhancements include:
  - SSL data encryption
  - Kerberos authentication
  - 64-bit client support
  - OpenLDAP support
  - Connection failover and client load balancing

- SequeLink Client *for* ADO enhancements include:
  - SSL data encryption
  - Connection failover and client load balancing
- SequeLink Client *for* .NET enhancements include connection failover and client load balancing
- SequeLink Server enhancements include:
  - SSL data encryption on Linux/UNIX/Windows.
  - Kerberos authentication support.
  - Support for 64-bit environment.
  - SequeLink Server for DB2 for z/OS via DRDA
    - Fully enabled for Unicode
    - Support for DB2 UDB v8.1 (all modes)
    - Certified against DB2 V9.1
  - SequeLink Server for DB2 on Linux/UNIX/Windows is certified against DB2 V9.1.
  - SequeLink Server for Informix is certified against Informix 10.
  - SequeLink Server for Oracle is certified against Oracle10g R2.
  - SequeLink Server for SQL Server supports Microsoft SQL Server 2005.
  - SequeLink Server for Sybase is certified against Sybase 15.
  - SequeLink Server for ODBC Socket enhancements include:
    - Support for the latest DataDirect Connect® drivers.
    - Support for Shadow ODBC driver.
  - SequeLink Server for JDBC Socket provides support for BEA LiquidData JDBC driver.

- SequeLink administration tools, such as the SequeLink MMC Snap-in and the Command Line Administrator, support Kerberos authentication and SSL data encryption.

For a complete list of the databases supported by SequeLink, see:

<http://www.datadirect.com/products/sequelink/matrix/slwebmatrixosvendorview.htm>

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## Where to Start

The following table provides a guide to topics about the key features of SequeLink to help you plan, configure, and administer your SequeLink environment:

SequeLink Feature	See...
SequeLink Client	<a href="#">“Understanding the SequeLink® Client” on page 25</a> to learn how SequeLink’s thin-client component can ease configuration and administration
SequeLink Server	<a href="#">“Understanding SequeLink® Services” on page 25</a> to learn how SequeLink provides optimized data connectivity, performance, and administration
SequeLink Manager	<a href="#">“Understanding the SequeLink® Manager Tool” on page 27</a> to learn about the type of tasks you can perform using the SequeLink Manager to configure and manage your SequeLink environment and monitor data access activity

---

## About the SequeLink® Components

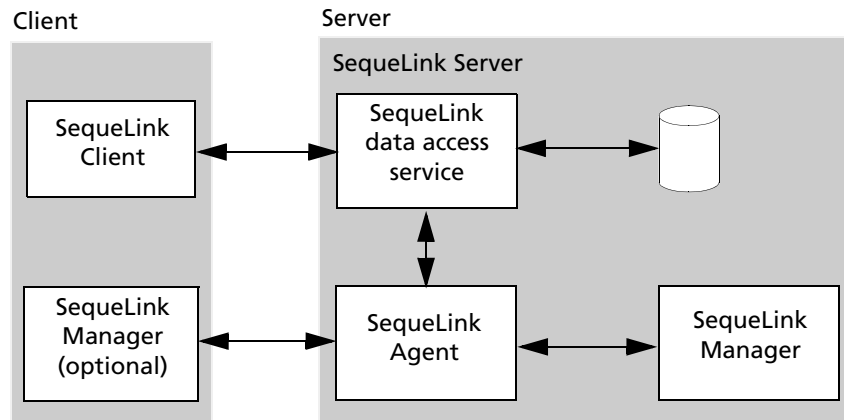
SequeLink operates through the following middleware components shown in [Figure 1-1](#):

- SequeLink Client
- SequeLink Server
- SequeLink Manager

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**Figure 1-1. SequeLink Components**

---



### SequeLink® Client

SequeLink Client uses a thin-client architecture to provide a single, universal interface for data access that is easy to install and requires “near-zero” administration. SequeLink supports four different clients:

- SequeLink Client *for* ODBC supports ODBC applications.
- SequeLink Client *for* JDBC supports JDBC applications.

- SequeLink Client *for .NET* supports .NET applications.
- SequeLink Client *for ADO* supports ADO/OLE DB applications.

The SequeLink Client is database independent, so, if you decide to incorporate additional data store technologies, you do not need to update or install a new SequeLink Client.

See [“Understanding the SequeLink® Client” on page 25](#) for more information about SequeLink Client.

## SequeLink® Server

SequeLink Server installs the following server software service components to provide data connectivity, performance, and administration for two-tier client/server and *n*-tier Web/application server environments:

- **SequeLink data access services** handle data access requests from any SequeLink Client. Multiple SequeLink data access services can run on the same SequeLink Server. For example, SequeLink Server for Oracle and SequeLink Server for Microsoft SQL Server can run side-by-side on the same machine.
- **SequeLink Agent services** carry out configuration, management, and monitoring requests from any SequeLink Manager. The SequeLink Agent can service multiple SequeLink services on the same SequeLink Server.

See [“Understanding SequeLink® Services” on page 25](#) for more information about SequeLink services.

## SequeLink® Server on z/OS

SequeLink Server installs the following server software service components to provide data connectivity, performance, and administration for two-tier client/server and *n*-tier Web/application server environments:

- **SequeLink data access services** handle data access requests from any SequeLink Client. Each SequeLink Server can host only one SequeLink data access service. Multiple SequeLink Servers can run on the LPAR. For example, SequeLink Server for DB2 v8.1 and DB2 V9.1 can run side-by-side on the same machine.
- **SequeLink Agent services** carry out configuration, management, and monitoring requests from any SequeLink Manager. The SequeLink Agent can only service its own SequeLink service within the SequeLink Server.

## SequeLink® Manager

SequeLink Manager is a tool that allows you to centrally configure, manage, and monitor your entire data access infrastructure. By default, this tool is installed on the server that contains the SequeLink Server software; optionally, you can install it on a networked machine.

The SequeLink Manager is implemented differently depending on the platform.

See [“Understanding the SequeLink® Manager Tool” on page 27](#) for more information about the SequeLink Manager.



## Understanding the SequeLink® Client

SequeLink's thin-client component drastically reduces the initial configuration that you must perform and the time you must spend to reconfigure your data access infrastructure when a server configuration changes. Client data sources contain minimal information; most configuration information resides on the server, resulting in "near-zero" client administration.

Also, SequeLink allows administrators to use Lightweight Directory Access Protocol (LDAP) directories for centralized information retrieval. An ODBC, ADO, or JDBC client data source can reference an LDAP directory to retrieve server connection information, which can reduce the time it takes to reconfigure your infrastructure when a change takes place. For example, if a database must be moved to a different server, the administrator does not have to reconfigure user applications or the client data sources that must now access the new server because the connection information is stored centrally in an LDAP directory. The administrator simply updates the LDAP directory entries to allow the SequeLink Clients to connect to the new server.

NOTE: The .NET data provider does not support LDAP.

---

## Understanding SequeLink® Services

In this section, we take a closer look at SequeLink services and how they work. Remember that SequeLink services are components of SequeLink Server.

SequeLink data access services can handle data access requests from any SequeLink Client. A data access service "services" a specific type of data store (for example, Oracle or DB2). SequeLink provides an optimized data access service for each type of data store it supports. Multiple SequeLink data access

services can run on the same server. When you complete the installation of the SequeLink Server software as documented in the *SequeLink Installation Guide*, a SequeLink data access service is configured for the type of SequeLink Server you installed (for example, SequeLink Server for Oracle or SequeLink Server for DB2).

When a SequeLink Client connects to a SequeLink data access service, the data access functionality of the session is governed by the attributes defined for the data access service. For example, if the service attribute `DataSourceReadOnly=Select`, the client application can perform only Select statements when using that service. Refer to [Appendix D “SequeLink® Service Attributes”](#) in the *SequeLink Administrator’s Guide* for a complete list of service attributes.

SequeLink Agent services carry out configuration, management, and monitoring requests from any SequeLink Manager. When you complete the installation of the SequeLink Server software as documented in the *SequeLink Installation Guide*, the SequeLink Agent functionality that is integrated into the Data Access Service is created, configured, and is ready for requests.

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# Understanding the SequeLink® Manager Tool

The SequeLink Manager tool can be used to perform administrative and monitoring requests.

## ***Administrative Requests***

The type of administrative requests you can issue to a SequeLink Agent and the SequeLink Manager tool you can use to issue the requests depends on the platform you are administering. The following list describes the types of administrative requests you can issue:

### ■ **Configuration**

- Creating and managing SequeLink services
- Creating and managing SequeLink server data sources
- Configuring monitoring profiles, which determine the data access events that can be monitored (viewed) using the SequeLink Manager
- Configuring event-tracing profiles, which determine the data access events that are written to an event trace file

### ■ **Management**

- Starting and stopping SequeLink services
- Stopping active data access user sessions
- Reviewing traced events to analyze a problem during an earlier data access activity

## ***Monitoring Requests***

The SequeLink Manager allows you to perform the following monitoring tasks:

- Viewing details about active services
- Viewing active user sessions and information about live data access activities

For example, you can easily view the number of transactions that have been processed or the number of rows that have been fetched by all user sessions. Also, if a user session is not performing correctly (such as the session repeatedly fetches thousands of rows), you can use the SequeLink Manager to identify and end that specific user session.

Additionally, the SequeLink Manager allows you to troubleshoot previous events. For example, if an error occurs during a nightly data processing job, you can view an event trace to troubleshoot the problem.

## ***SequeLink® Manager Implementations***

SequeLink provides the following implementations of the SequeLink Manager:

- **SequeLink Manager Snap-in** is a GUI designed as a snap-in to the Microsoft Management Console (MMC). It can be used to configure and manage SequeLink services, and to monitor data access activity.
- **SequeLink Manager Command-Line Tool** is a command-line interface that can be used to configure and manage SequeLink services. Similarly, it can be used to monitor data access activity.
- **SequeLink Manager for z/OS** is an ISPF dialog tool that can be used to create data access services on the z/OS platform, as well as configure and manage SequeLink services and monitor

data access activity on z/OS. It can be installed only on z/OS platforms.

Table 1-1 shows the platforms on which you can install and run the different implementations of the SequeLink Manager.

Table 1-1. Installation Platforms for the SequeLink Manager Tools

SequeLink Manager	Windows	Linux/ UNIX	z/OS
SequeLink Manager Snap-in	X		
SequeLink Manager Command-Line Tool	X	X	
SequeLink Manager for z/OS			X

# SequeLink® Environment

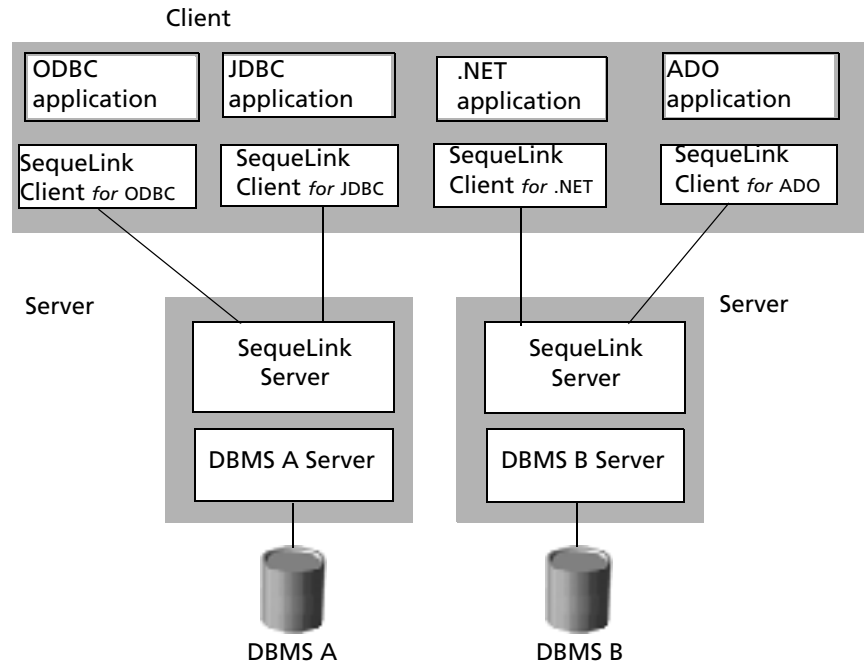
Today’s data access computing environments typically involve multiple and disparate data stores accessed over a variety of infrastructures. In addition, many businesses are relying more on the Internet to provide access to corporate data for their employees, customers, and partners.

SequeLink simplifies data access middleware requirements by providing data access for multiple data stores with a single client component as shown in Figure 1-2.

---

**Figure 1-2. SequeLink Middleware Solution for Data Access**

---



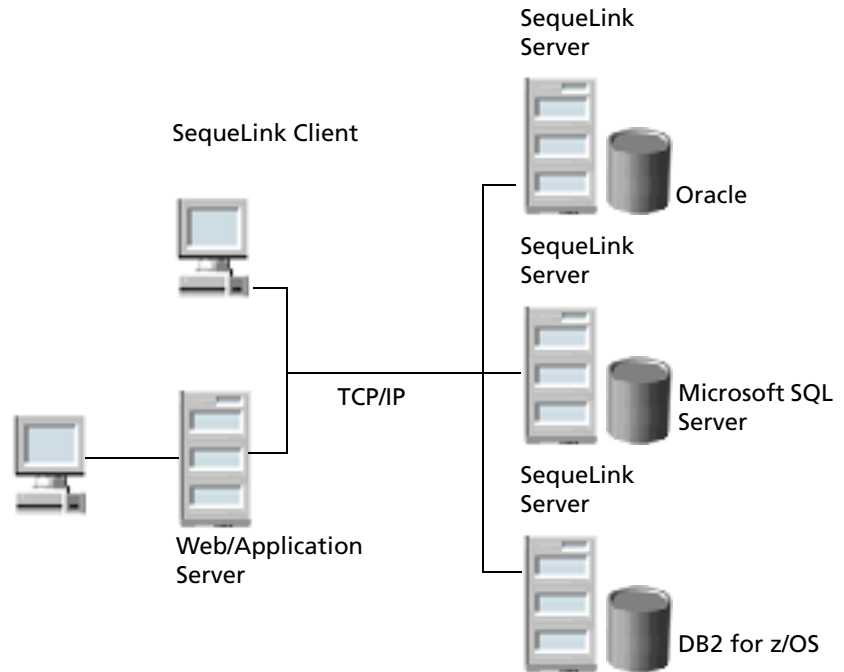
## Providing Data Access

ODBC, ADO, JDBC, and .NET are application programming interfaces (APIs) that allow developers to develop, compile, and ship an application without targeting a specific type of data store. Developers can use SequeLink as the middleware that allows their applications to access data from a choice of supported data stores. SequeLink provides ODBC, ADO, JDBC, and .NET data access from a client workstation directly to a server running the SequeLink Server software or from a Web/application server to a server running SequeLink Server as shown in [Figure 1-3](#).

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**Figure 1-3. SequeLink Data Access in Client/Server and Web/Application Server Environments**

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## Using SequeLink® to Link an Application to a Data Store

Typically, a data access application accesses a SequeLink Server (specifically, a SequeLink data access service) by specifying a client data source that provides connection information to a specific server running SequeLink Server. SequeLink uses two different types of data sources—server data sources and client data sources.

## ***Server Data Sources***

*Server data sources* are data sources configured on the SequeLink Server. These data sources contain settings that affect how the SequeLink service operates and settings that affect how data is accessed by SequeLink Clients. Centralizing this information on the server, instead of distributing it among hundreds of SequeLink Clients, provides easier management of your entire data access infrastructure. When you install SequeLink Server, a default server data source, named *Default*, is automatically created on the server. If necessary, you can modify the definition of the default server data source.

## ***Client Data Sources***

*Client data sources* are minimal data sources configured on the SequeLink Client that contain connection instructions to a SequeLink data access service. Client data sources are required when configuring the SequeLink Client *for* ODBC or the SequeLink Client *for* ADO. For SequeLink Client *for* JDBC, you can configure a client data source or a connection URL. For SequeLink Client *for* .NET clients, you configure a connection string.

A client data source can be configured to retrieve connection information from an LDAP directory server (or from any JNDI-enabled directory service for JDBC applications). The connection information stored in an LDAP directory contains the IP address of the server that runs SequeLink Server. Therefore, if a database must be moved to a different server, the administrator does not have to reconfigure user applications or the client data sources that must now access the new server because the connection information is stored centrally in an LDAP directory. The administrator only needs to update the LDAP directory entries to allow the SequeLink Clients to connect to the new server.



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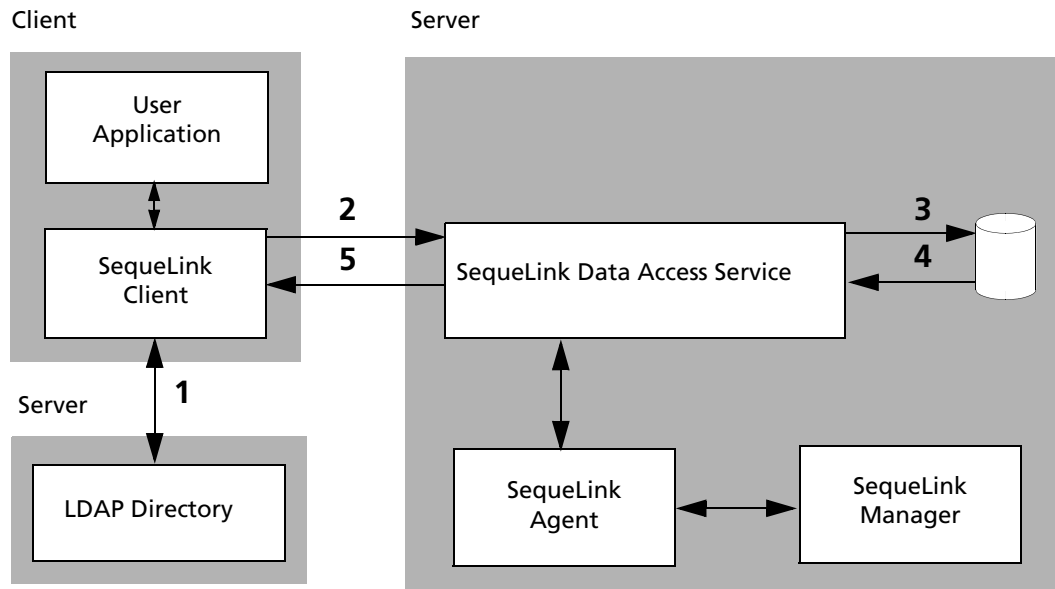
# SequeLink® Architecture

This section shows examples of SequeLink environments implemented with two-tier and  $n$ -tier architectures. These configurations explain the data access flow through the SequeLink components.

Additionally, the configurations show the SequeLink Manager and SequeLink Agent, which, together, allow the SequeLink administrator to control data access activities. For example, using the SequeLink Manager, an administrator can end an active data access user session. All actions the administrator performs on a data access service are handled by the SequeLink Agent.

## SequeLink® Two-Tier Architecture

SequeLink Server is often installed on the same server on which the database engine resides, and the SequeLink Client is often installed on the same workstation as the user application, as shown in [Figure 1-4 on page 34](#). This is a two-tier architecture because only two machines are needed for the configuration.

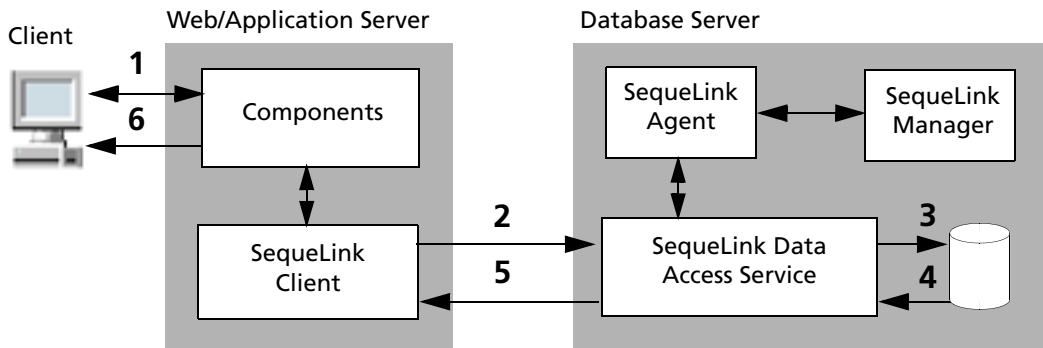
**Figure 1-4. SequeLink Two-Tier Architecture****Data Access Architecture:**

- 1** SequeLink Clients can be configured to connect directly to a specific SequeLink Server or, for ODBC, ADO, or JDBC Clients, retrieve connection information from an LDAP directory.
- 2** User applications use the SequeLink Client to connect to the SequeLink Server. Applications make SQL calls from the SequeLink Client to the SequeLink Server using standard APIs, such as ODBC, ADO, or JDBC.
- 3** The SequeLink data access service passes the SQL request to the database engine.
- 4** The database engine processes the SQL request and passes results back to the SequeLink data access service.
- 5** The SequeLink data access service returns the results directly to the SequeLink Client and the user application.

## SequeLink® *n*-Tier Architecture

For maximum flexibility and centralized access, SequeLink Client can be installed on a middle-tier server between the client and a database server as shown in Figure 1-5. An example of this configuration is when a client (tier 1) runs a Web browser that downloads and displays a Web page stored on the Web/Application Server (tier 2). On the Web page, the user clicks a button that launches an application (component) on the Web/Application Server. This application uses ODBC, ADO, JDBC, or .NET to access a SequeLink Client that is also on the Web/Application Server. The SequeLink Client accesses data from the data store that is serviced by the SequeLink data access service residing on the Database Server (tier 3).

**Figure 1-5. SequeLink *n*-Tier Architecture**



### Data Access Architecture:

- 1 In a three-tier architecture, a user application (for example, a Web browser) in tier 1 may invoke components residing on the Web/Application Server that need to load the SequeLink Client to gain access to the data store on the Database Server.

- 2 A SequeLink Client is installed on the Web/Application Server. Applications make SQL calls from the Web/Application Server running the SequeLink Client to the SequeLink Server using standard APIs, such as ODBC, ADO, JDBC, or .NET.
- 3 The SequeLink data access service passes the SQL request to the database engine.
- 4 The database engine processes the SQL request and passes results back to the SequeLink data access service.
- 5 The SequeLink data access service returns the results to the Web/Application Server.
- 6 The client receives the results from the Web/Application Server.

---

## SequeLink® Packages

For the latest information about the operating system platforms, database management systems, and data access APIs supported by SequeLink, go to the following Web URLs:

**For SequeLink Servers:**

<http://www.datadirect.com/products/sequelink/matrix/slwebmatrixosvendorview.htm>

**For SequeLink Clients:**

<http://www.datadirect.com/products/sequelink/matrix/slwebmatrixclients.htm>

## 2 Sample Scenarios

This chapter provides sample scenarios that describe how SequeLink might be used to implement data access for a data consumer application. Each scenario describes the technology issue being solved, the environment in which the solution is implemented, and illustrates the implementation using SequeLink middleware.

---

### Scenario 1

Bank International is a large, international banking firm that has grown from multiple acquisitions. It offers many financial services including general banking, investments, stocks, bonds, and credit cards. Bank International wants to align its business and Information Technology strategies so that it can better serve current customers as well as new ones. The company also needs to deal with the formidable challenges related to ongoing mergers and acquisitions.

### Technology Issues

Bank International wants to move to a network-centric, distributed architecture using Java and CORBA. It will need to integrate legacy applications and migrate quickly to new systems. Distributed transactions are a key element for the future, especially as the company moves toward Internet and business-to-business applications involving multiple data stores.

## Environment

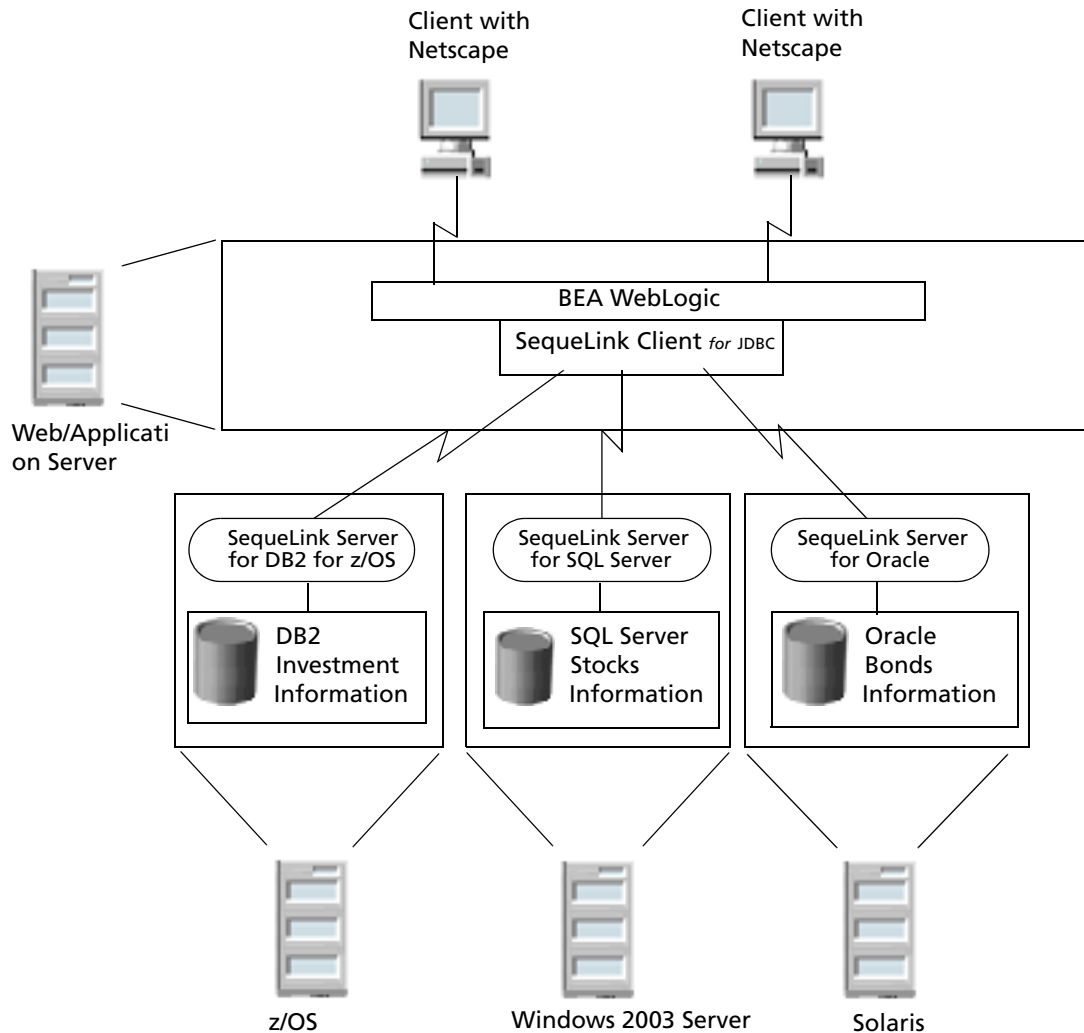
Because of previous mergers and acquisitions, Bank International has a wide variety of data and systems including DB2 on z/OS, Japanese Microsoft SQL Server on Windows Server 2003, and a Unicode Oracle database on Solaris. It uses commercial software, as well as systems developed internally with Borland JBuilder and some Sun Microsystems Java development tools. The Web/Application server uses BEA WebLogic.

Bank International has branches in Europe and Asia, and needs to be able to use international characters in the Oracle and Microsoft SQL Server databases.

# SequeLink® Solution

Because BEA WebLogic is Java-based, it requires the SequeLink Client *for* JDBC as shown in [Figure 2-1](#).

**Figure 2-1. Scenario 1**



In this scenario, you install the SequeLink Client *for* JDBC on the application server, and SequeLink Servers for DB2 for z/OS, Microsoft SQL Server, and Oracle on the database servers. SequeLink allows quick and easy changes to Bank International's environment to accommodate its frequent merger and acquisition activity by allowing administrators to add SequeLink Servers for data access to new data stores and to add different SequeLink Clients for data access applications written in different APIs.

---

## Scenario 2

International Motor Corporation is an automobile manufacturer with several IT implementations. There is no current centralization, but management has decided to control costs through streamlined, thin-client desktop standardization. The company wants to provide better service to remote sites, eventually evolving a system offering a single, company-wide view of all available information.

### Technology Issues

Technology issues include the reuse of business logic across applications and the deployment of centralized views of company business systems.

### Environment

The current environment includes Windows and UNIX clients. The Windows clients are standardized on Microsoft Office applications as well as specific business intelligence and third-party tools. The UNIX clients run legacy UNIX ODBC



applications. Databases are maintained using DB2 for z/OS and Oracle on AIX.

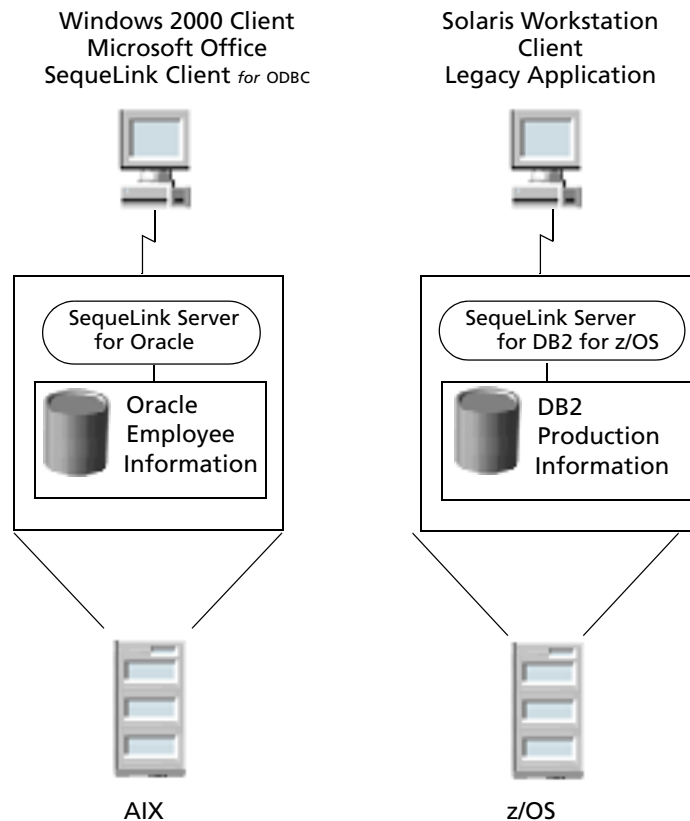
## SequeLink® Solution

The client machines use a combination of applications on Windows and UNIX that require the SequeLink Client *for* ODBC on both platforms as shown in [Figure 2-2](#).

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**Figure 2-2. Scenario 2**

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In this example, you install the SequeLink Client *for* ODBC on the client machine and SequeLink Servers for DB2 for z/OS and Oracle on the database servers.

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## Scenario 3

BigStore is a large store with branches in several locations. Because they guarantee that their advertised merchandise is always available, an accurate inventory is essential. They want to move to a "just-in-time" approach to inventory control to improve efficiency and reduce waste.

### Technology Issues

The sales personnel use handheld devices to determine prices and total customer purchases, and transfer the data to point-of-sale devices. A cashier then handles the sales transaction, and separates the inventory control tickets. The tickets are sent to the data processing department daily, delaying the update of the inventory data, which is stored in a proprietary database. Data from the point-of-sale devices goes to an Oracle database to generate daily sales totals.

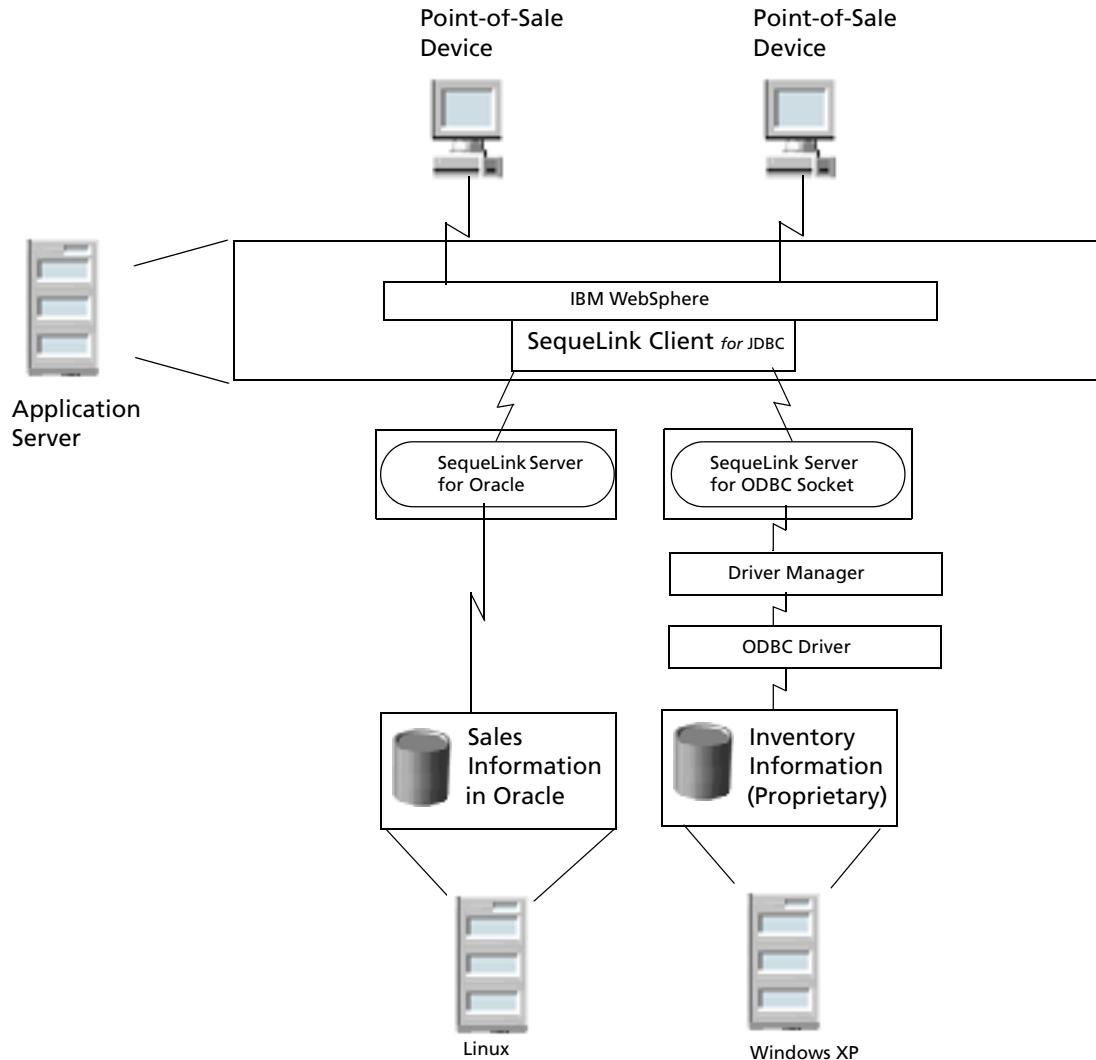
### Environment

The sales force uses Java-based handheld devices, which beam data to the point-of-sale devices. It uses commercial software, as well as systems developed internally with PowerBuilder. Inventory is monitored in a proprietary ODBC 3.0-compliant database.

## SequeLink® Solution

Because the point-of-sale devices are Java-based, the solution requires the SequeLink Client *for JDBC* as shown in [Figure 2-3](#).

**Figure 2-3. Scenario 3**



In this scenario, you install the SequeLink Client *for* JDBC on the IBM WebSphere application server and SequeLink Server for ODBC Socket on the server for the proprietary database.

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## Scenario 4

UsedTextbooksOnline is a Web-based company that links stores that sell used textbooks. Databases track inventory information supplied by the stores and supply buyers with a list of stores that carry the requested book, with the price information from each store. A separate database handles the sales made through UsedTextbooksOnline.

### Technology Issues

Technology issues include the reuse of business logic across applications and the deployment of centralized views of company business systems.

### Environment

The current environment includes Windows and UNIX clients. The Windows clients are standardized on Microsoft Office applications as well as specific business intelligence and third-party tools. The external databases are maintained using Oracle9i on Red Hat Linux, and Informix on Windows 2000.

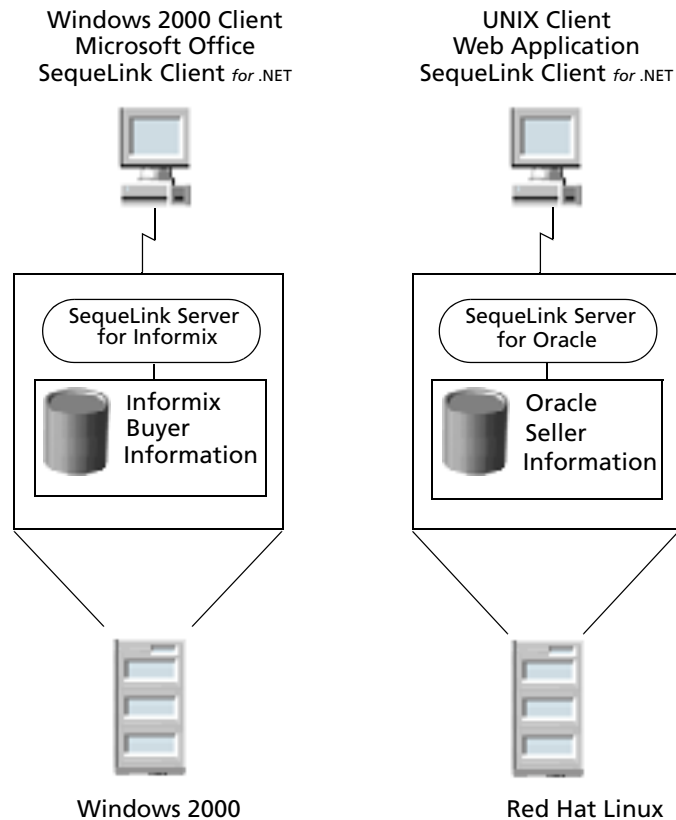
## SequeLink® Solution

The .NET security, in combination with SequeLink authentication process, protects the privacy of the buyers and sellers, as well as securing the integrity of the UsedTextbooksOnline system.

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**Figure 2-4. Scenario 4**

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In this example, you install the SequeLink Client for .NET on the application server and SequeLink Servers for Informix and Oracle on the database servers.



# 3 Planning Your SequeLink® Configuration

Many of the configuration decisions you need to make depend on which server and client platforms SequeLink is installed on, which databases you will be accessing, and which SequeLink Client you are using (ODBC, ADO, JDBC, or .NET). See [Chapter 1 “Introduction” on page 17](#) for a description of the SequeLink components and architecture.

This chapter provides information you need to know as you plan your SequeLink configuration, including:

- [“Information You Need Before You Configure” on page 48](#)
- [“Summary of What You Must Configure” on page 49](#)
- [“Planning Client Data Sources” on page 50](#)
- [“Planning SequeLink® Server Data Sources” on page 54](#)
- [“Planning SequeLink® Data Access Services” on page 56](#)
- [“Planning Connection Models” on page 59](#)
- [“Planning Security” on page 60](#)
- [“Planning System Administration” on page 71](#)
- [“Planning Monitoring and Event Tracing” on page 73](#)
- [“Default Behavior of Data Access Services” on page 75](#)

- [“Planning Your SequeLink® Server for ODBC Socket Configuration” on page 89](#)
- [“Planning Your SequeLink® Server for JDBC Socket Configuration” on page 90](#)
- [“Using Multiple Versions of SequeLink®” on page 104](#)

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## Information You Need Before You Configure

Before you configure your SequeLink environment, you need to know the following information about your SequeLink installation:

- Platforms on which the SequeLink Server software is installed
- Type of SequeLink Servers that are installed—for example, SequeLink Server for Oracle
- Platforms on which the SequeLink Client software is installed
- Types of SequeLink Clients that are installed—ODBC, ADO, JDBC, or .NET



---

## Summary of What You Must Configure

After you have completed the installation of the SequeLink Client and SequeLink Server as documented in the *SequeLink Installation Guide*, you must configure a client component. The client component you configure depends on your SequeLink Client:

- For an ODBC Client or ADO Client, you must configure a client data source.
- For a JDBC Client, you must configure a client data source or a connection URL.
- For a .NET Client, you must configure a connection string.

A client data source is a minimal data source that is stored on the client. It provides connection information—a server, a port, and a server data source—to a specific server. By default, a client data source uses the default server data source for the characteristics of the connection between the SequeLink Client and the database.

This default server data source, named *Default*, is automatically created and configured when you install the SequeLink Server. A server data source defines the characteristics of the connection between the SequeLink Client and the database. You can modify the definition of the default server data source if needed. See [“Planning SequeLink® Data Access Services” on page 56](#) for information about the default behavior of the default server data source.

**NOTE:** A server data source, although it resides on the server, also contains settings that are relevant to the SequeLink Client. Centralizing data source information on the server allows SequeLink to provide "near-zero" client administration.

---

## Planning Client Data Sources

Configuring SequeLink Client data sources is a simple task, but before you configure the data sources, you must make the following decisions:

- You must decide which server connection method to use—direct connection or retrieving the connection parameters from a Lightweight Directory Access Protocol (LDAP) directory.
- You must decide whether to reference the default server data source or another server data source.

## Planning ODBC Client and ADO Client Configurations



On Windows platforms, ensuring that multiple ODBC or ADO Clients have the same configuration is an easy task when you create a predefined client installation image called a *Quick Install image*. After you define a Quick Install image, users can install this image on their client machines.

### ***Configuring Quick Install Images***

A Quick Install image can be stored on a file server and used for all ODBC or ADO Client installations within a workgroup. Installing a Quick Install image requires minimal user interaction and ensures that every client for which you are responsible has the same configuration. You can also define multiple Quick Install images, which allows you to customize each image for different workgroups within your organization.

When configuring a Quick Install image, you define the following information:

- Whether the installation is a workstation or network installation
- The location of the installation directory
- Which SequeLink components to install
- Which mode the installation will run in (interactive or batch)
- Whether client data sources are installed (see [“Including Client Data Source Configurations in Quick Install Images” on page 51](#))

Refer to the *SequeLink Installation Guide* for instructions on how to define a Quick Install image.

## ***Including Client Data Source Configurations in Quick Install Images***

As part of a Quick Install image, you can specify client data sources that are to be installed on the client machines, which ensures that each client has the same client data source configuration. See [“Planning Client Data Sources” on page 50](#) for more information. The client data sources that are part of a Quick Install image first must be exported to a data source file using the SequeLink Data Source SyncTool Administrator. The SequeLink Data Source SyncTool Administrator allows you to create data source files and export data source definitions to data source files. Refer to the *SequeLink Administrator's Guide* for information about how to use the SyncTool and its administrator.

To maintain client data source configurations, you can distribute a data source file and have users import the data source definitions from the data source file to their client machines.

This ensures that the same client data source configuration is installed on all client machines.

## Planning for Connection Pooling

To implement JDBC connection pooling for the JDBC Client, the JDBC application must use a `DataSource` object (an object implementing the `DataSource` interface) to obtain a connection instead of using the `DriverManager` class. A class implementing the `DataSource` interface may or may not provide connection pooling. A `DataSource` object registers with a JNDI naming service. Once a `DataSource` object is registered, the application retrieves it from the JNDI naming service in the standard way.

The .NET data provider automatically implements connection pooling. No changes are needed.

For information about creating a `DataSource` object and using the DataDirect Connection Pool Manager to create your own connection pooling implementation, refer to the *SequeLink Developer's Reference*.

## Planning Connection Failover

You can customize the SequeLink Clients for connection failover by configuring a list of alternate servers that are tried if the primary server is not accepting connections. Connection attempts continue until a connection is successfully established or until all the alternate servers have been tried the specified number of times.

Optionally, you can specify the following additional connection failover features:

- The number of times the SequeLink Client attempts to connect to the primary and alternate SequeLink servers after the initial unsuccessful connection attempt. By default, the SequeLink Client does not retry. To set this feature, use the Connection Retry Count (`ConnectionRetryCount`) connection option.
- The wait interval, in seconds, between attempts to connect to the primary and alternate database servers. To set this feature, use the Connection Retry Delay (`ConnectionRetryDelay`) connection option.
- Whether the SequeLink Client will use client load balancing in its attempts to connect to primary and alternate SequeLink servers. If load balancing is enabled, the driver uses a random pattern instead of a sequential pattern in its attempts to connect. The default value is not to use load balancing. To set this feature, use the Load Balancing (`LoadBalancing`) connection option.

For detailed information on configuring the connection failover features for each SequeLink Client, refer to the *SequeLink Administrator's Guide*.

---

## Planning SequeLink® Server Data Sources

Server data sources define the characteristics of the connection between the SequeLink Client and the database. A server data source, although it resides on the server, also contains settings that are relevant to the SequeLink Client. When you centralize data source information on the server, SequeLink can provide "near-zero" client administration.

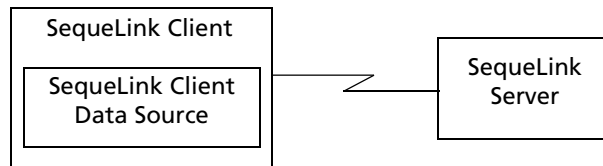
When you install the SequeLink Server, a default server data source, named Default, is automatically created and configured. See [“Planning SequeLink® Data Access Services” on page 56](#) for information about the default behavior of this data source.

If the default server data source definition does not meet your needs, you can modify the default data source, or you can create a new server data source, and specify it when you configure the client data source.

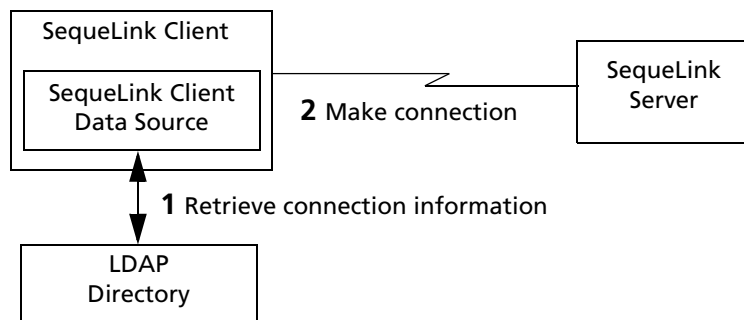
## Configuring a Connection to a SequeLink® Server

SequeLink allows you to configure a connection from the SequeLink Client to a SequeLink Server in either of the following ways:

- Specify the connection information directly in the SequeLink ODBC, ADO, .NET, or JDBC Client data source. This information includes the TCP/IP address (or host name), the port number of the SequeLink Server, and, optionally, a SequeLink Server data source to use.



- Specify a Distinguished Name (DN) identifying a specific entry in an LDAP directory. The LDAP directory entry contains the information needed to connect to the SequeLink Server. Using this method, the ODBC, ADO, or JDBC Client retrieves the connection information from the LDAP directory.



The advantage of using LDAP is that you can centrally store connection information, which provides the flexibility to make environment changes. For example, if you move the database

and SequeLink Server to a different server, you do not have to reconfigure your user applications or multiple SequeLink Client data sources that access the SequeLink Server; the connection information is specified in an LDAP directory, not in the SequeLink Client data source. Therefore, you need only make a single change in the LDAP directory entries.

For JDBC Clients, JDBC data sources store connection instructions in a JNDI infrastructure, which can support LDAP.

## Referencing a Server Data Source

If you do not specify a server data source when configuring a client data source, the client data source uses the default server data source. [“General Data Source Default Behavior” on page 79](#) describes the behavior of the default server data source. If the default server data source definition does not meet your needs, you can modify the default server data source, or you can create a new server data source and then specify the new server data source when configuring your client data source.

---

## Planning SequeLink® Data Access Services

A SequeLink data access service, which resides on the server, allows a SequeLink Client to connect to a database and is required for your SequeLink configuration. On Windows and UNIX, a SequeLink data access service is automatically created and configured when you install SequeLink Server, so you do not have to define one. On z/OS, defining a SequeLink data access service is part of the installation process as described in the *SequeLink Installation Guide*.



After the installation, only the default service will be defined and running. If you need support for internationalization, you must add a service with enhanced code page support and modify that service for the needs of your environment.

## Defining Server Data Sources

Part of the definition of each data access service is a server data source. A data access service has one default server data source defined. You can define additional server data sources, but a SequeLink Client data source or connection string can reference only one server data source. Therefore, if you create a second server data source for a data access service and you want the SequeLink Client to reference the second server data source, you must create a new client data source or connection string and configure it to reference the new server data source.

See [“Default Behavior of Data Access Services” on page 75](#) for the definition of the default behavior of SequeLink data access services.

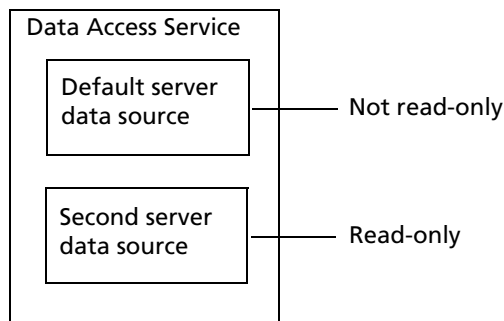
## Changing Default Behavior

The examples in this section demonstrate possible scenarios and reasons that you may have to modify the default behavior of a data access service. In addition, this section describes reasons why you may need more than one server data source for a data access service.

### Example A:

You may want most of your client applications that use a specific data access service (such as SequeLink Server for DB2) to connect to the database with read-only functionality. Therefore, you would change the value of the DataSourceReadOnly service attribute to read-only.

The `DataSourceReadOnly` service attribute is an attribute of a server data source. Because changing the value of the default server data source would cause all connections to the database to be read-only, you would choose to create a second server data source for the data access service and change the value of the `DataSourceReadOnly` service attribute of the new server data source as shown:



#### Example B:

You may want to configure your data access service to use data scrambling. By default, messages between the client and server are transmitted over the network as cleartext.

In this case, you would change the value of the `ServiceEncryptionAlgorithm` service attribute to one of the three available data scrambling options: byte swapping, DES, or 3DES. The `ServiceEncryptionAlgorithm` attribute is set at the data access service level and is not part of the definition of a server data source. Therefore, any client application that uses the data access service will have data scrambling set.

#### Example C:

ODBC Clients support multiple workarounds to circumvent limitations in some applications (such as Microsoft Access). Using SequeLink, these workarounds can be configured at the server for a specific server data source. This example shows why you

may want to configure multiple server data sources for a data access service.

The service attribute `DataSourceFetchTimeStampAsString` specifies whether a workaround for a Microsoft Access problem with timestamps is turned on. The workaround is turned off by default (FALSE). You can create a new server data source and set the `DataSourceFetchTimeStampAsString` attribute to TRUE to turn on this workaround. With the workaround turned on, the Microsoft Access application can use the client data source that references this server data source.

---

## Planning Connection Models

The type of connection model you choose for your SequeLink configuration partly depends on your SequeLink Server platform, the scalability requirements, and whether you are using the distributed transaction functionality of a DBMS. SequeLink provides the following types of connection models:

- The **ThreadPool** connection model starts SequeLink with a preallocated minimum number of threads that can be increased when needed to a specified maximum number of threads. These threads can be shared by multiple SequeLink Clients connected to the SequeLink Server. This connection model provides optimum scalability—many client connections can be serviced with the same system resources on the server. It is the default connection model for all platforms. (`ServiceConnectionModel=ThreadPool`)



See [“Connection Model Default Behavior” on page 76](#) for information about the SequeLink service attributes that define the size of the thread-pool engine and that govern how the thread-pool engine works.

- The **Process/Connection** connection model creates a separate operating system process for each SequeLink Client

connection request. This connection model is **not** valid on z/OS. (ServiceConnectionModel=Process/Connection)



■ The **Thread/Connection** connection model provides a dedicated thread for each SequeLink Client connection to a SequeLink Server. Use the Thread/Connection connection model for client applications that are database-intensive, such as bulk load or bulk transfer applications. (ServiceConnectionModel=Thread/Connection)

---

## Planning Security

This section first discusses the security mechanisms supported by SequeLink and identifies the service attributes that must be set to configure each security mechanism. Next, two planning sections are provided—one for Windows and UNIX, and another for z/OS—that discuss the default behavior of security on each platform.

SequeLink supports security mechanisms for the following purposes:

- Verification of a user by the SequeLink Server. The **Authentication** security mechanism allows the SequeLink Server to verify the identity of the user.
- Defining the types of requests that are accepted by the server. The **Authorization** security mechanism controls whether the user can send data access requests and administrative (SequeLink Manager) requests. Server configuration settings determine whether the server can accept the requests.


- Connection to a data store using the following security mechanisms:
  - **Data Store Logon** controls whether a user who is connected to the SequeLink Server can connect to the data store.
  - **Application IDs** control whether a client application can connect to the data store. This mechanism adds a layer of security on top of Data Store Logon.
  - **TCP/IP Location Filters** control whether a client application can connect to the data store based on the TCP/IP network identifier from which the connection request originates.
  - **Terminal Security** is supported for connections to SequeLink Servers on z/OS. It controls whether the client application requesting access to the SequeLink data access service has permission to access it based on the TCP/IP address (terminal ID) originating the request.
- Defining the types of SQL statements accepted by the data store. The **ReadOnly** security mechanism controls whether the data store connection is read-only.
- The privacy of the data being transmitted. The **data privacy** security mechanism ensures that data transmitted between the client and server is kept private using data scrambling methods and encryption using SSL. SSL is supported for the ODBC Client, JDBC Client, and ADO Client.

## Authentication

Authentication allows the SequeLink Server to verify the identity of the SequeLink Client when the client connects to the SequeLink Server. If authentication fails, the SequeLink Client disconnects from the server.

You must set an authentication method separately for users who send data access requests and users who send SequeLink Manager requests. For example, you may want to use an operating system user ID and password for administrative activities and Kerberos for data access activities.

Depending on the combination of client and server platforms involved in the connection, SequeLink supports the following authentication methods:

- **Anonymous.** The SequeLink Server accepts connections from any SequeLink Client without verifying the client's identity.
- **Operating system user ID and password.** The SequeLink Server verifies the identity of the SequeLink Client using a user ID and password that must be valid for the platform on which the SequeLink Server is running. If verified, the server accepts the user ID as the identity of the client and permits the connection.
- **Kerberos.** Kerberos authentication uses Kerberos, a trusted third-party authentication service, to verify user identities. Kerberos authentication can take advantage of the user name and password maintained by the operating system to authenticate users to the database. This method requires knowledge of how to configure your Kerberos environment.
-  ■ **Integrated NT.** This option is supported for connections between SequeLink Server for Windows servers and ODBC Clients, ADO Clients, and .NET Clients on Windows only. The SequeLink Server verifies the identity of the SequeLink Client using the client's Windows network logon credentials instead of a Windows user ID and password.

Although a user may be able to connect to the SequeLink Server, the user does not automatically have access to the database that the SequeLink Server services.

Access to the database is controlled by:

- Authorization settings (see [“Authorization” on page 64](#))
- Data Store Logon (see [“Data Store Logon” on page 66](#))
- Application IDs (see [“Application IDs” on page 67](#))
- TCP/IP location filters (see [“TCP/IP Location Filters” on page 67](#))
- Terminal security, on z/OS only (see [“Terminal Security on z/OS” on page 68](#))

## ***Authentication for the SequeLink Manager***

You configure the authentication for data access requests and for SequeLink Manager requests separately. To configure authentication for data access, set the `ServiceAuthMethods` or `ServiceAdminAuthMethods` attributes for access to the SequeLink Agent Service. For example, to configure Kerberos authentication for data access requests, you would set the following attribute for the data access service:

```
ServiceAuthMethods=kerberos
```

To configure Kerberos authentication for SequeLink Manager requests, you would set the following attribute for the SequeLink Agent service:

```
ServiceAdminAuthMethods=kerberos
```

On z/OS, before enabling Kerberos security for your server, do the following configuration steps:

- Set up a Kerberos server and define the realm to RACF, and supply a Kerberos password for RACF.
- Define the SequeLink Server started task user ID for use with Kerberos.
- Define the Kerberos and RACF user mapping.

## Authorization

After the SequeLink Server has authenticated the client, SequeLink verifies that the client is authorized to perform data access activities or SequeLink Manager activities. SequeLink supports authorization for data access requests and for SequeLink Manager requests. You configure the authorization for the two types of requests separately. Authorization options depend on your SequeLink Server platform.

### *Authorization for Windows and UNIX*



You configure the authorization for data access requests and for SequeLink Manager requests separately:

- To configure authorization for data access, set the ServiceUser attribute. If you want to configure authorization for user groups defined on Linux/UNIX/Windows, set the ServiceUserGroup attribute. These attributes should be added to data access services only.
- To configure authorization for SequeLink Manager requests, set the ServiceAdministrator attribute. If you want to configure authorization for user groups defined on Linux/UNIX/Windows, set the ServiceAdministratorGroup attribute. These attributes should be added to SequeLink Agent services only.

The ServiceUser and ServiceAdministrator attributes can have the following values:

- **Everyone.** The SequeLink Server will process all requests sent by the user, regardless of how the user is authenticated. For example:

```
ServiceUser=everyone
```



If you set authentication to anonymous, you must set authorization to everyone (`ServiceUser=everyone` or `ServiceAdministrator=everyone`).

This is the default for data access services.

- **Authenticated.** The SequeLink Server will process all requests sent by the user if the user can be authenticated (authentication is set by the `ServiceAuthMethods` and `ServiceAdminAuthMethods` attributes). For example:

```
ServiceAdminAuthMethods=authenticated
```

- **User\_id.** The SequeLink Server will process all requests sent by a designated user if the user ID has been specified as authorized. For example, to configure permission for the user ID `marym` to send data access requests, you would set the following attribute for the data access service:

```
ServiceUser=marym
```

And, to configure permission for this user ID to send SequeLink Manager requests, you would set the following attribute for the SequeLink Agent service:

```
ServiceAdministrator=marym
```

`User_id` is the default for `ServiceAdministrator`. You specify a user ID as the default administrator ID during the installation of the SequeLink Server.

#### NOTES:

- Alternatively, you can set the `ServiceUserGroup` and `ServiceAdministratorGroup` attributes to configure authorization for groups of users defined on Linux/UNIX/Windows.
- On Windows, users who are allowed to manage SequeLink services using the SequeLink Manager must have administrator rights.

## z/OS **Authorization for z/OS**

On z/OS, you can configure authentication with or without additional authorization for SequeLink data access services, SequeLink data sources, and SequeLink management activities. If you configure additional authorization, you must specify a security class and a security resource by setting the following attributes:

- To activate service or data source authorization checking, set `MVSServiceAuthorizationEnable` or `MVSServiceDataSourceAuthorizationEnable` to `True`.
- To activate administration authorization checking for SequeLink administration tasks, set `MVSServiceAdminAuthorizationEnable` to `True`.

For more information about the values for the authorization attributes, refer to the *SequeLink Administrator's Guide*.

## Data Store Logon

Once a connection is established, authentication is complete, and the type of requests accepted by the server has been established, a connection from the SequeLink Server to the database can be established by using either of the following methods:

- Specifying data store logon information (a valid DBMS user ID and password). This is the default for Windows and UNIX (`DataSourceLogonMethod=DBMSLogon(UID,PWD)`).
- Allowing the database to inherit the logon user ID that was established during the authentication process. This method **must** be used for z/OS, but it also can be used for Windows and UNIX (`DataSourceLogonMethod=OSIntegrated`).

## Application IDs

*Application IDs* are alphanumeric strings passed by a SequeLink Client that identify the client application to a SequeLink service that has been configured to accept connections only from specific application IDs.

Application IDs add another layer of security for the connection to the data store beyond that provided by the Data Store Logon security mechanism. Data Store Logon allows all users of client applications to access the data store if they meet the qualifications set by Data Store Logon. Using application IDs, you can restrict connections to the data store to only those client applications that identify themselves to the SequeLink Server through an application ID.

The service attributes that control application IDs are `DataSourceApplId` and `DataSourceAutoApplId`.

## TCP/IP Location Filters

Using TCP/IP network identifiers, such as TCP/IP host names (for example, `burner.ddtek.com`) or a range of TCP/IP addresses (for example, `192.16.*.*`), TCP/IP location filters allow you to specify which clients can access a SequeLink data access service or SequeLink agent service.

The service attributes that control TCP/IP location filters are `ServiceAuthorizedClient` and `ServiceAuthorizedAdminClient`.

## z/OS **Terminal Security on z/OS**

When terminal security is enabled, through activating the RACF **TERMINAL** security class, the SequeLink Server verifies that the client application requesting access to the SequeLink data access service has permission to access it based on the TCP/IP address (terminal ID) originating the request. You can use terminal security to make sure that:

- Only specific TCP/IP addresses can be used by specific users to connect to the SequeLink Server.
- Only specific groups of users can use specific TCP/IP addresses to connect to the SequeLink Server. For example, you may want to make sure that a user ID associated with an application running on an application server can only log on to the SequeLink Server from a specific TCP/IP address.

Terminal security is controlled by activating the RACF **TERMINAL** security class instead of setting a service attribute.

## **Read Only**

SequeLink allows you to configure the types of SQL statements the data store connection will accept:

- Select statements only (makes the connection read-only)
- Select statements and Stored Procedures
- All SQL statements
- Read-only settings of the database

The service attribute that controls this functionality is `DataSourceReadOnly`.

## Data Privacy

SequeLink provides data scrambling to ensure the privacy of data. In addition, you can use data encryption to provide a more secure transmission of data across the network. For example, you may want to use data encryption in the following scenarios:

- You have offices that share confidential information over an intranet.
- You send sensitive data, such as credit card numbers, over a database connection.
- You need to comply with government or industry privacy and security requirements.

NOTE: Data encryption may adversely affect performance because of the additional overhead (mainly CPU usage) required to encrypt and decrypt data.

### *Data Scrambling*

Data scrambling ensures that no cleartext messages are transmitted between the client and server over the network. SequeLink provides the following implementations of data scrambling:

- **Fixed-key DES** operates using a 56-bit key.
- **Fixed-key 3DES** operates using a 168-bit key.
- **Byte swapping** means that bytes of data are randomly swapped to scramble data. Different encoded mappings are used for different sessions.

Data scrambling does not provide the same level of security as data encryption and is not enabled by default.

NOTE: Even if you choose not to use a data scrambling method, user IDs and passwords are *never* sent as cleartext.

To configure SequeLink to use DES, 3DES, or byteswap, set the `ServiceEncryptionAlgorithm` service attribute, for example, `ServiceEncryptionAlgorithm=DES`. The default is none, which means cleartext messages are transmitted between the client and server over the network.

## ***Data Encryption***

Secure Sockets Layer (SSL) is an industry-standard protocol for sending encrypted data over database connections. SSL secures the integrity of your data by encrypting information and providing client/server authentication.

SequeLink supports SSL for the following types of data transfers:

- Between a SequeLink Client and a SequeLink Server. SequeLink uses SSL for data encryption. For an SSL connection to be successful, both the SequeLink Server and SequeLink Client must be configured for SSL encryption. If a SequeLink Client that is not configured for SSL attempts to connect to a SequeLink Server configured for SSL, the SequeLink Server rejects the connection request and returns the following error message: `TCP/IP, connection reset by peer`.

NOTE: The SequeLink Server for DB2 for z/OS cannot be configured for SSL encryption. Use the SequeLink Proxy Server to provide SSL encryption in your DB2 for z/OS environment.

- Between a SequeLink Client *for* JDBC and the SequeLink Proxy Server. SequeLink uses SSL for data encryption and authentication.

The SequeLink Server is configured for SSL by setting the `ServiceSSLEnabled` service attribute to true. For details on configuring SSL for the SequeLink Server and for configuring SSL over the SequeLink Proxy Server, refer to the *SequeLink Administrator's Guide*.

---

# Planning System Administration

SequeLink provides the following options for configuring and managing your SequeLink environment:

- **Local system administration** allows you to configure and manage your SequeLink environment using the SequeLink Manager installed locally on a SequeLink Server.
- **Remote system administration** allows you to configure and manage your SequeLink environment using the SequeLink Manager installed on the desktop of a networked client.

NOTE: Only SequeLink 6.0 services can be configured, managed, or monitored with the SequeLink Manager 6.0.

## Local System Administration

You can use the SequeLink Manager locally from the SequeLink Server to configure and manage your SequeLink environment; however, which SequeLink Manager tool you can use locally depends on your SequeLink Server platform.

See [“Understanding the SequeLink® Manager Tool” on page 27](#) for a description of the SequeLink Manager tools and information about the platforms on which they can be installed.

Although local system administration (administration from the server) works for all SequeLink Server platforms, it is not always a convenient way to handle administration of your SequeLink environment. It may be, however, the best solution for z/OS because remote administration for z/OS is limited. To configure and manage SequeLink services on z/OS, or create z/OS core entities such as DB2 interfaces, you must use the SequeLink Manager Tool for z/OS locally.

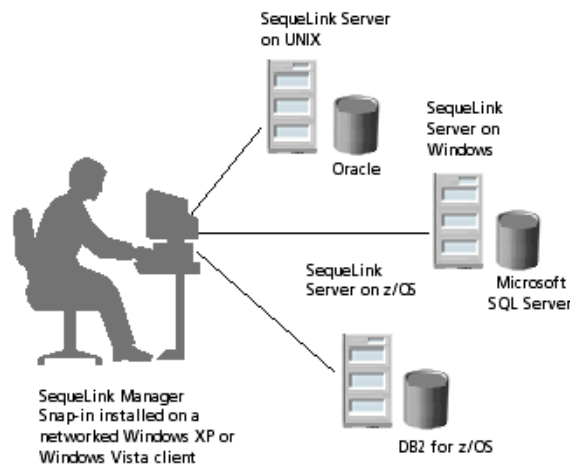
## Remote System Administration

Remote system administration allows you to configure and manage your data access environment from the convenience of your desktop regardless of your SequeLink Server platform. For example, suppose you are responsible for administering an environment with distributed data access involving a variety of data stores across your enterprise, such as Oracle on UNIX and Windows, and Microsoft SQL Server on Windows as shown in [Figure 3-1](#). You can install the SequeLink Manager Snap-in on a Windows XP or Windows Vista networked client and perform administration tasks, such as configuring SequeLink service settings, from the convenience of your desktop.

---

**Figure 3-1. Remote System Administration for Data Access Environments**

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If you prefer to use a command-line tool rather than a GUI tool, you can use the SequeLink Manager Command-Line Tool to remotely administer your SequeLink environment.



NOTE: The availability of remote system administration depends on your SequeLink license.

---

## Planning Monitoring and Event Tracing

SequeLink *monitoring* allows the SequeLink administrator to see what is currently happening in the SequeLink environment. SequeLink *event tracing* allows SequeLink administrators to store information about events that occur in an event trace file, allowing them, for example, to check on events that happened overnight.

To enable monitoring and event tracing for SequeLink services, you must have a monitoring profile and an event trace profile configured for each service you want to monitor. On Linux, UNIX, and Windows, both a monitoring and an event trace profile are enabled when you install SequeLink Server. On z/OS, the monitoring and event trace profile can be enabled during configuration.

### Monitoring

SequeLink provides the following levels of monitoring for SequeLink data access services, listed here from highest-level to lowest-level. Some of the monitoring levels are also supported for the SequeLink Agent service.

■ **Service monitoring** monitors these activities by service:

- Statistics of received packets and sent packets
- Sessions started and statements opened
- Active statements and sessions
- Fetched rows and affected rows
- Transactions

- **Session monitoring** monitors these activities by session within a service:
  - Statistics of received packets and sent packets
  - Statements opened and active statements
  - Fetched rows and affected rows
  - Transactions
  - Information about each session, such as start time, client information (network address, data source used by the client, and type of client), native database session identification, and database user
- **Statement monitoring** monitors these activities by statement within a session:
  - Fetched rows and affected rows
  - SQL statements issued

## Event Tracing

Event tracing provides a method for the SequeLink administrator to store persisted information about an event. Events are generated when a client application accesses data and when certain server activities take place, such as when a service starts or an error occurs. SequeLink can trace the following types of events:

- |           |               |
|-----------|---------------|
| ■ Service | ■ Statement   |
| ■ Session | ■ Transaction |
| ■ Network | ■ Others      |
| ■ Error   |               |

To make the event trace information persistent, an event trace file is created during the installation or start-up of the SequeLink Server. The service attributes that define characteristics of the event trace file are `ServiceEventTraceSize` and `ServiceEventTraceLocation`. See [“Event Handling Default](#)

[Behavior” on page 76](#) for the default settings of these two attributes.

---

## Default Behavior of Data Access Services

When planning your SequeLink configuration, you may find it helpful to know the definition of the default (or newly created) data access service on Linux/UNIX/Windows, and z/OS so that you can decide whether the default definition fits your needs. If it does not, you can change the values of the service’s attributes. The attributes can be modified using one of the SequeLink Manager tools. For instructions on using the SequeLink Manager, refer to the *SequeLink Administrator’s Guide*.

### Default Behavior on Linux, UNIX, and Windows



The following sections define the default behavior of the default SequeLink data access service on Linux/UNIX/Windows, and provide the name of the attribute that dictates the behavior. All attribute names are shown in parentheses. The attributes that begin with DataSource (for example, DataSourceReadOnly) are the attributes that define a server data source. For complete information about service attributes, see the *SequeLink Administrator’s Guide*.

## Connection Model Default Behavior

The connection model default is ThreadPool.  
(ServiceConnectionModel)

The ThreadPool connection model default behavior is:

- The number of prestarted threads in the thread pool is 8. (ServiceMinThreads)
- The maximum number of threads to which the thread pool can increase to accommodate peak activity is 64. (ServiceMaxThreads)
- The time allowed for thread-pool synchronization actions to take place before an internal error is generated is 60000 milliseconds. (ServiceInternalTimeout)
- The idle time after which a thread allocated to a specific connection is released to the thread pool is 2000 milliseconds. (DataSourceThreadRpcTimeout)
- The maximum number of requests after which a thread allocated to a specific connection is released to the thread pool is 10. (DataSourceThreadMaxRpc)

See [“Planning Connection Models” on page 59](#) for more information.

## Event Handling Default Behavior

- The size of the event trace file is 1000000 bytes. (ServiceEventTraceSize)
- The default location of the event trace file is the tracing subdirectory of the SequeLink Server installation directory. (ServiceEventTraceLocation)



- On Windows, the default location is:  
\\Program Files\\DataDirect\\SLServer60\\tracing



- On Linux/UNIX, the default location is:  
`/usr/slsrver60/tracing`
- On z/OS, the default location is:  
`hlq.servicename.SWEVLOG`.

See [“Planning Monitoring and Event Tracing” on page 73](#) for more information.

## Security Default Behavior for Users

The SequeLink Server accepts connections from all users, but only the users who can provide a valid DBMS user ID and password are allowed to access the database.

The database connection accepts all types of SQL statements. Once connected to the database, the database security system guarantees that the user can only perform actions that are allowed by the database administrator. Messages (except for user IDs and passwords) sent between the client and the server are sent as cleartext. The service attributes are set as follows:

```
ServiceAuthMethods=anonymous
ServiceUser=everyone
DataSourceLogonMethod=DBMSLogon (UID, PWD)
DataSourceReadOnly=No
ServiceEncryptionAlgorithm=none
```

See [“Planning Security” on page 60](#) for more information.

Refer to the *SequeLink Administrator's Guide* for complete information about configuring SequeLink security.

## Security Default Behavior for Administrators

Only the person who logs on using the administrator ID entered when the SequeLink Server software was installed is allowed to manage the SequeLink environment. The SequeLink Server Setup prompts for the SequeLink administrator's user ID when you install the SequeLink Server.

```
ServiceAdminAuthMethods=OSlogon (UID, PWD)  
ServiceAdministrator=User_ID
```

NOTE: On Windows, the SequeLink administrator must have administrator rights.

See [“Planning Security” on page 60](#) for more information.

Refer to the *SequeLink Administrator's Guide* for complete information about configuring SequeLink security.

## Debug Default Behavior

Debugging is disabled. ([ServiceDebugLogLevel](#) and [ServiceDebugLogPath](#))

Refer to the *SequeLink Troubleshooting Guide and Reference* for complete information about debugging.

## General Service Default Behavior

- The service tries to recover from unexpected exceptions, rather than passing the exception to the operating system, which would result in a core dump. ([ServiceCatchExceptions](#))

## General Data Source Default Behavior

- No schema names are specified to filter the result set returned by SQLTables and SQLProcedures (ODBC), getTables and getProcedures (JDBC), and TABLES and PROCEDURES (ADO). ([DataSourceSchemaFilterList](#))
- No list of tables types is specified to filter the result set returned for SQLTables (ODBC), getTables (JDBC), and TABLES (ADO). ([DataSourceTableTypeFilterList](#))
- The size of the buffer to use for array fetch is 65536 bytes. ([DataSourceArrayFetchMaxBytes](#))
- The SequeLink Client can perform all supported SQL statements; the database connection is **not** read-only. (DataSourceReadOnly)
- No default database catalog is used when connected to a SequeLink data access service. ([DataSourceCurrentCatalog](#))

## Internationalization Default Behavior

The SequeLink administrator defines when SequeLink will support international code pages by selecting a service template with enhanced code page support. Support for international code pages is influenced by a combination of platform- and database-specific attributes.

When using the standard service template, SequeLink supports ASCII/EBCDIC transliteration for ODBC and ADO Clients. For JDBC and .NET Clients, SequeLink supports ASCII/EBCDIC conversion to UTF-16. The standard service template can also be used when the database code page maps to the client application code page. (ServiceCodePage=Default)

The standard service template can also be used when the SequeLink Client transliterates character data from the code page that the SequeLink service is using to the code page of the client application or system. (ServiceCodePage=OS)

When using the service template with enhanced code page support, SequeLink transliterates between the database code page and the application code page. See the default behavior section for each database for more information. (ServiceCodePage=Database)

## DB2 Service Default Behavior

- The default database catalog is an empty string, which causes the ODBC Client and ADO Client to prompt for a valid DB2 database alias when connecting. ([DataSourceCurrentCatalog](#))
- No DB2 connection options are set for the service. ([DataSourceDB2ConnectOptions](#))
- Support for international characters depends on the service template used:
  - When using the standard DB2 service template, SequeLink supports standard ASCII/EBCDIC transliteration for ODBC and ADO Clients. For JDBC and .NET Clients, SequeLink supports ASCII/EBCDIC conversion to UTF-16.
  - Using the service template with enhanced code page support, DB2 double byte character data types (graphics and dbclobs) are supported. ([ServiceCodePage](#))

## Informix Service Default Behavior

- The default database catalog is an empty string, which causes the ODBC Client and ADO Client to prompt for a valid Informix database name. ([DataSourceCurrentCatalog](#))



- A value for the Informix environment variable INFORMIXSERVER is set for the service. ([ServiceEnvironmentVariable](#) on Linux/UNIX, [DataSourceINFormixServer](#) on Windows)
- A value for the Informix environment variable INFORMIXDIR is set for the service. ([ServiceEnvironmentVariable](#) on Linux/UNIX, [DataSourceINFormixDir](#) on Windows)
- Informix delimited identifiers are enabled for the service. ([ServiceEnvironmentVariable](#) on Linux/UNIX, [DataSourceINFDelimIdent](#) on Windows)
- SequeLink uses the standard service template to support standard ASCII/EBCDIC transliteration. ([ServiceCodePage](#))

## Microsoft SQL Server Service Default Behavior

- No default catalog is specified for use with Microsoft SQL Server when connecting to the database. ([DataSourceCurrentCatalog](#))
- No warning is passed to the client application if Microsoft SQL Server encounters a problem opening server-side cursors. ([DataSourceMSSCursorWarnings](#)).
- The type of cursor used is specified using the [DataSourceMSSCursorType](#) attribute.
- SequeLink Server uses a server-side cursor, which allows multiple concurrent statements (and cursors) to be active at the same time for each connection. ([DataSourceMSSCursorType](#))

- Support for international characters depends on the service template used:
  - Using the standard SQL Server service template, SequeLink supports ASCII/EBCDIC transliteration for ODBC and ADO Clients. For JDBC and .NET Clients, SequeLink supports ASCII/EBCDIC conversion to UTF-16. Unicode is not supported. ([ServiceCodePage](#))
- Using the service template with enhanced code page support, data type support for international characters is influenced by a combination of service attributes. ([ServiceCodePage](#))
  - With the enhanced code page template, SequeLink supports Unicode databases.

## Oracle Service Default Behavior

- Synonyms of remote Oracle objects are **not** supported in catalog statements. ([DataSourceORASynDBLinkObjSupp](#))
- All Oracle API calls that must be executed to establish a connection with the Oracle database will be serialized. ([ServiceORASerializeLogon](#))
- Support for international characters depends on the service template used:
  - Using the standard Oracle service template, SequeLink supports ASCII/EBCDIC transliteration for ODBC and ADO Clients. For JDBC and .NET Clients, SequeLink supports ASCII/EBCDIC conversion to UTF-16. Unicode data types are not supported. ([ServiceCodePage](#))
  - Using the service template with enhanced code page support, support for internationalization data types is influenced by `ServiceCodePage=Database` and by the environment variable `NLS_LANG`, which is set by default to `AMERICAN_AMERICA.UTF8`. ([ServiceCodePage](#))

## Sybase Service Default Behavior

- A value for the Sybase network address (*hostname, port*) is set for the service. ([DataSourceSybNetworkAddress](#))
- Parameter description requests are disabled. ([DataSourceDescribeParam](#))
- Support for international characters depends on the service template used:
  - Using the standard Sybase service template, SequeLink supports ASCII/EBCDIC transliteration for ODBC and ADO Clients. For JDBC and .NET Clients, SequeLink supports ASCII/EBCDIC conversion to UTF-16. Unicode data types are not supported. ([ServiceCodePage](#))
  - Using the service template with enhanced code page support, data type support for international characters is influenced by [ServiceCodePage=Database](#) and by [DataSourceSybConnectOptions](#).

## ODBC Socket Service Default Behavior

- The ODBC Socket service uses a connection string to make a connection to the back-end ODBC system data source for the database you want to access. The back-end ODBC driver can be a third-party driver or a DataDirect Connect *for* ODBC driver. ([DataSourceSOCODBCConnStr](#))
- The name of the default file that contains the information returned from the OLE DB Provider\_Types call by an ADO provider data source is swsoc.ini. ([DataSourceProviderTypesSection](#))

- Support for international characters depends on the service template used:
  - Using the standard Socket Server service template, SequeLink supports ASCII/EBCDIC transliteration for ODBC and ADO Clients. For JDBC and .NET Clients, SequeLink supports ASCII/EBCDIC conversion to UTF-16. Unicode data types are not supported.
  - Using the service templates with enhanced code page support for UTF-8 and UTF-16, support for Unicode data types depends on the back-end ODBC driver.  
([ServiceCodePage](#))

## JDBC Socket Service Default Behavior

- The JDBC Socket service uses the connection URL to make a connection to the back-end JDBC driver for the database you want to access. The back-end JDBC driver can be a third-party driver or a DataDirect Connect *for* JDBC driver.  
([DataSourceSOCJDBCConnectionURL](#))
- The name of the default file that contains the information returned from the OLE DB Provider\_Types call by an ADO provider data source is swsoc.ini.  
([DataSourceProviderTypesSection](#))
- Using the standard Socket Server service template, SequeLink supports ASCII/EBCDIC transliteration for ODBC and ADO Clients. For JDBC and .NET Clients, SequeLink supports ASCII/EBCDIC conversion to UTF-16. Unicode data types are not supported. (ServiceCodePage)

## Default Behavior on z/OS

The following sections define the default behavior of a SequeLink data access service on z/OS and provide the name of the attribute that dictates the behavior in parentheses. The attributes that begin with DataSource (for example, DataSourceReadOnly) are the attributes that define a server data source. For complete information about service attributes, refer to the *SequeLink Administrator's Guide*.

### ***Connection Model Default Behavior***

The ThreadPool connection model is the default.  
(ServiceConnectionModel)

The ThreadPool connection model default behavior is:

- The number of prestarted threads in the thread pool is 32.  
(ServiceMinThreads)
- The maximum number of threads to which the thread pool can increase to accommodate peak activity is 64.  
(ServiceMaxThreads)
- The time allowed for thread-pool synchronization actions to take place before an internal error is generated is 60000 milliseconds. (ServiceInternalTimeout)
- The idle time after which a thread allocated to a specific connection is released to the thread pool is 2000 milliseconds. (DataSourceThreadRpcTimeout)
- The maximum number of requests after which a thread allocated to a specific connection is released to the thread pool is 50. (DataSourceThreadMaxRpc)
- The percentage of ServiceMaxThreads below which a connection is allowed to lock the thread for another DataSourceThreadRpcTimeout period is 10.  
(ServiceThreadLockThreshold)

See [“Planning Connection Models” on page 59](#) for more information.

## ***Event Handling Default Behavior***

The size of the event trace file is 1000000 bytes.  
([ServiceEventTraceSize](#))

See [“Planning Monitoring and Event Tracing” on page 73](#) for more information.

## ***Security Default Behavior for Users***

The SequeLink Server accepts connections from all users. However, only users who can provide a valid operating system user ID and password are allowed to access the database. If the RACF TERMINAL class is not activated, the terminal ID is not verified.

The database connection accepts all types of SQL statements. Once connected to the database, the database security system guarantees that the user can only perform actions that are allowed by the database administrator. Messages (except for user IDs and passwords) sent between the client and the server are sent as cleartext. The service attributes are set as follows:

```
MVSServiceAuthorizationEnable=FALSE  
ServiceAuthMethods=OSLogon (UID, PWD, NWPD)  
DataSourceLogonMethod=OSIntegrated  
DataSourceReadOnly=No  
ServiceEncryptionAlgorithm=none
```

See [“Planning Security” on page 60](#) for more information.

Refer to the *SequeLink Administrator's Guide* for complete information about configuring SequeLink security.

## ***Security Default Behavior for Administrators***

The SequeLink Server accepts connections from all users. Only users who can provide a valid operating system user ID and password are allowed to access the SequeLink Agent service, which means they can manage the SequeLink environment. If the RACF TERMINAL class is not activated, the terminal ID is not verified. The service attributes are set as follows:

```
MVSServiceAuthorizationEnable=FALSE  
ServiceAdminAuthMethods=OSLogon (UID, PWD)
```

See [“Planning Security” on page 60](#) for more information.

Refer to the *SequeLink Administrator’s Guide* for complete information about configuring SequeLink security.

## ***Internationalization Default Behavior***

Because the SequeLink Server for DB2 for z/OS is a Unicode service, no configuration is required. The ServiceCodePage attribute is defined by default and cannot be changed in the SequeLink Manager or Command Line interface.

## ***Debug Default Behavior***

Debugging is not enabled. ([ServiceDebugLogLevel](#) and [ServiceDebugLogPath](#))

Refer to the *SequeLink Troubleshooting Guide and Reference* for complete information about debugging.

## ***General Service Default Behavior***

- The name of the service program is VAISTHRD and should not be modified, except on request of DataDirect technical support. (MVSServiceLoadModule)
- The maximum number of concurrent sessions for a service is 2000. When this threshold is reached, the server refuses subsequent connection requests for the service. ([ServiceMaxSessions](#))
- Workload Manager (WLM) support is not enabled. (MVSGlobalWLMEnclaves)

Refer to the *SequeLink Administrator's Guide* for complete information about WLM.

## ***General Data Source Default Behavior***

- Server data sources have no name or description specified. (DataSourceName and [DataSourceDescription](#))
- Transaction isolation levels are supported on connections. The default is Read Committed (cursor stability). ([DataSourceTransactionIsolation](#))
- Cursors are not destroyed when the transaction is committed. ([DataSourceCursorHold](#))
- No schema names are specified to filter the result set returned by SQLTables and SQLProcedures (ODBC), getTables and getProcedures (JDBC), and TABLES and PROCEDURES (ADO). ([DataSourceSchemaFilterList](#))
- No list of table types is specified to filter the result set returned for SQLTables (ODBC), getTables (JDBC), and TABLES (ADO). ([DataSourceTableTypeFilterList](#))
- The SequeLink Client can perform all supported SQL statements; the database connection is **not** read-only. ([DataSourceReadOnly](#))



- No default database catalog is used when connected to a SequeLink data access service. ([DataSourceCurrentCatalog](#))

---

## Planning Your SequeLink® Server for ODBC Socket Configuration

When your application connects to SequeLink Server for ODBC Socket, you can access any databases that are accessible through an ODBC 2.0, 3.0, or higher compliant driver. You only need a back-end ODBC driver, that is, the specific ODBC driver for the data store you want to access. Refer to the *SequeLink Administrator's Guide* for more information on configuring the SequeLink Server for ODBC Socket.

### To connect with ODBC drivers using SequeLink Server for ODBC Socket:

- 1 On the SequeLink Server, create an ODBC system data source for the back-end driver and check the connection. For information about defining the system data source using the ODBC Administrator, refer to your ODBC driver documentation.

- 2 Install the SequeLink Server for ODBC Socket. For more information, refer to the *SequeLink Installation Guide*.

- 3 On the SequeLink Server, create an ODBC Socket service.

NOTE: Select the ODBC Socket service that meets the transliteration needs of the data store you want to access. For information on the different SequeLink services, refer to the *SequeLink Administrator's Guide*.

- 4 Create a SequeLink Server-side data source. Use the name of the data source that you created in [Step 1](#) in the server-side data source connection string (the [DataSourceSOCODBCConnStr](#) attribute). This connection

string consists of `DSN=ODBC_system_DS`, where `ODBC_system_DS` is the name of the ODBC system data source.

NOTE: Installation of SequeLink Server for ODBC Socket automatically creates a server-side data source called Default.

- 5 On the SequeLink Client, create a SequeLink data source.
  - When connecting through the JDBC, .NET, or ODBC Client, no additional configuration tasks are needed.
  - If you are connecting to SequeLink Server for ODBC Socket through an ADO Client, you must perform additional configuration tasks. For detailed instructions, refer to the *SequeLink Administrator's Guide*.

---

## Planning Your SequeLink® Server for JDBC Socket Configuration

Using SequeLink Server for JDBC Socket, your application can access any databases that are accessible through a JDBC 2.0- or 3.0-compliant driver. You only need a back-end JDBC driver, that is, the specific JDBC driver for the data store you wish to access. Refer to the *SequeLink Administrator's Guide* for more information on configuring the SequeLink Server for JDBC Socket.

### To connect to a SequeLink Server for JDBC Socket:

- 1 Install the SequeLink Server for ODBC Socket. For more information, refer to the *SequeLink Installation Guide*.
- 1 On the SequeLink Server, create a JDBC Socket service.
- 2 Create a SequeLink Server-side data source that specifies the driver name and the connection URL of your JDBC driver.

NOTE: When you install SequeLink Server for JDBC Socket, a server-side data source called Default is created automatically.

- 3 Check the ServiceEnvironmentVariable. The CLASSPATH should contain the paths to the class-files or class-libraries used by the driver referenced in the data source you created in [Step 2](#). If necessary, add these paths and restart SequeLink Server.
- 4 On the SequeLink Client, create a SequeLink data source.
  - When connecting through the JDBC, .NET, or ODBC Client, no additional configuration tasks are needed.
  - If you are connecting to SequeLink Server for JDBC Socket through an ADO Client, you must perform additional configuration tasks. For detailed instructions, refer to the *SequeLink Administrator's Guide*.

---

## SequeLink® Configuration Example

The examples show the configuration tools used on Windows and UNIX.

In this example, the ODBC Client has been installed on multiple Windows workstations and the SequeLink Server for DB2 has been installed on a z/OS server.

Four user applications use the SequeLink Server for DB2 to connect to a DB2 database. One application is an order-entry application that needs the ability to update the database. The other applications are reporting applications that must **not** have the ability to update; therefore, they must connect with read-only functionality to the database.

We have decided to place an added layer of security on the order-entry application because it allows updates. The security

mechanism that will be used is application IDs (see [“Planning Security” on page 60](#)). By using the application ID security mechanism, we can ensure that if one of the reporting applications is modified to use the same client data source as the order-entry application, the reporting application will be unable to update the database because it is not configured with an application ID.

To configure SequeLink for use with the report applications, we will modify the default server data source to make it read-only by setting the `DataSourceReadOnly` attribute to `Select`, which means only SQL `Select` statements are allowed. Also, we will create a client data source that uses the default data source. We will name the client data source `DB2ReadOnly`. The reporting applications will connect to the DB2 database using the `DB2ReadOnly` client data source.

Also, we will configure SequeLink for use with the order-entry application. To make sure that the application is certified to the server, we will assign it an application ID, and set the `DataSourceAppID` service attribute to the value of the order-entry application’s ID. We must create and configure a server data source that sets the `DataSourceAppID` attribute; we will name the server data source `DB2Update`. In addition, we must create and configure a client data source that references the `DB2Update` server data source. We will name the client data source `DB2OrderEntry`.

The following summary lists the components that must be configured:

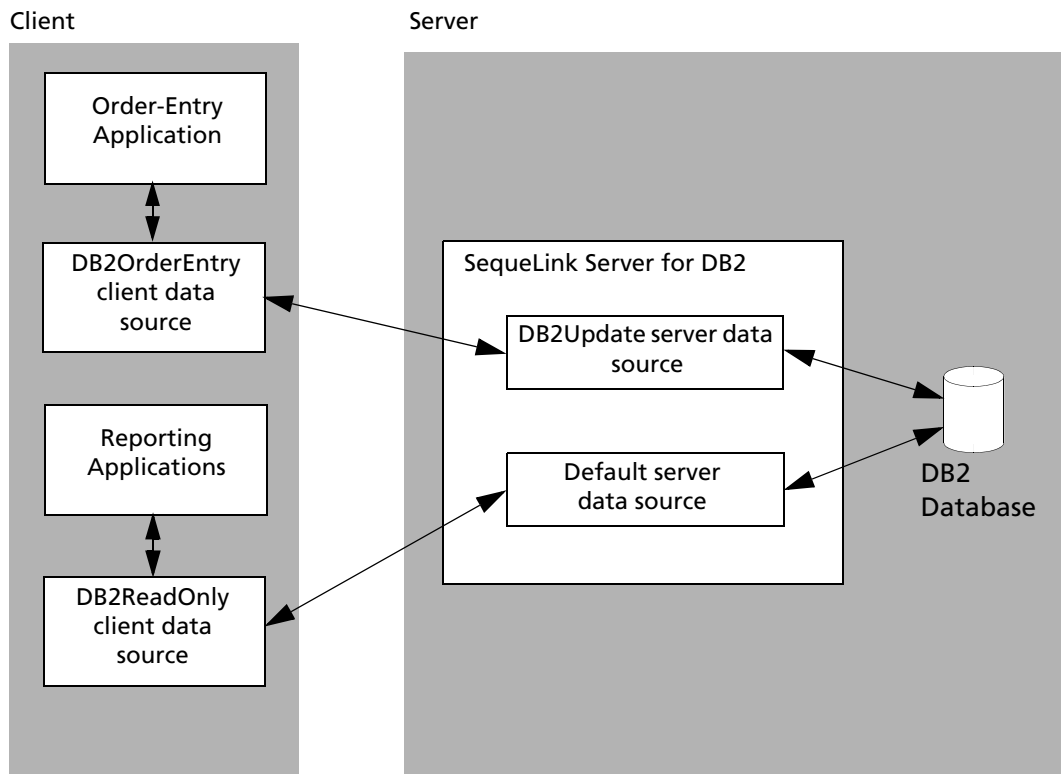
- A new server data source named `DB2Update` must be created. This server data source uses application IDs to certify the order-entry application to the server.
- The default server data source must be modified to make it read-only.
- An ODBC client data source named `DB2OrderEntry` must be created. This client data source will reference the newly

created server data source, DB2Update. The order-entry application must connect to this ODBC client data source. For information about how to connect ODBC applications to SequeLink Client data sources, refer to the *SequeLink Administrator's Guide*.

- An ODBC client data source named DB2ReadOnly must be created. This client data source will reference the default server data source. The reporting applications must connect to this ODBC client data source.

Figure 3-2 shows how all of the components fit together.

**Figure 3-2. Example Configuration**

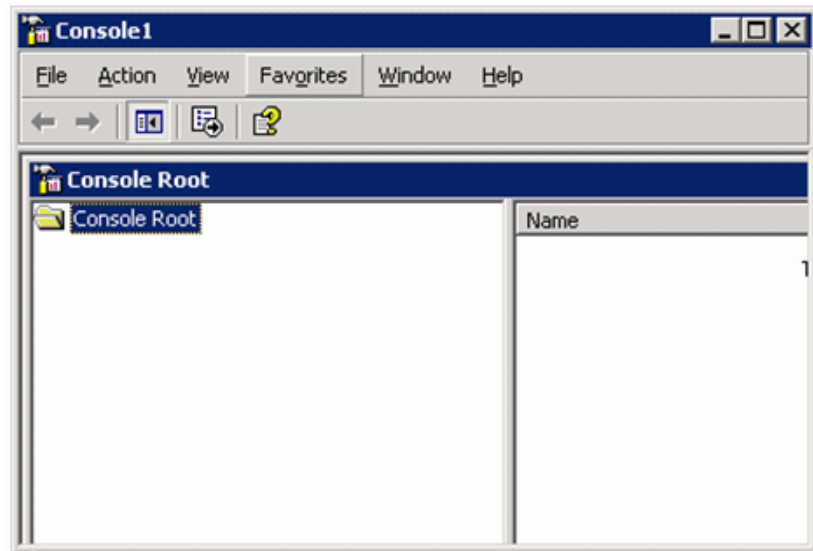


## Creating a Server Data Source

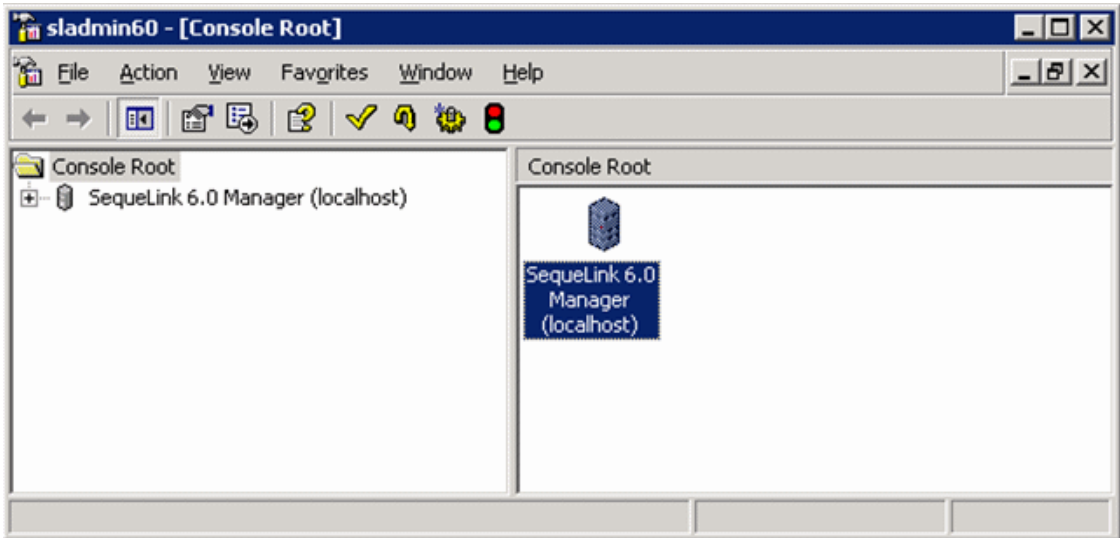
This example shows how to use the SequeLink Manager Snap-in to create a server data source. You could also use the SequeLink Manager Command-Line tool or the SequeLink Manager for tool. Refer to the *SequeLink Administrator's Guide* for complete instructions on using the SequeLink Manager tools.

**To create a server data source:**

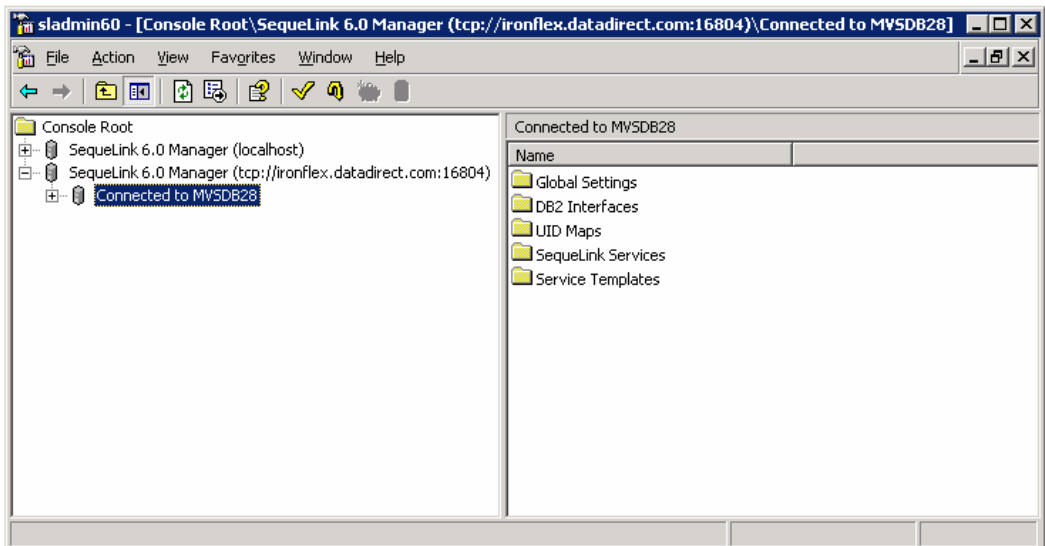
- 1 Start the SequeLink Manager MMC Snap-in by clicking **Start / Run**. In the Run field, type `mmc` and click **OK**. An MMC console window appears.



- 2 From the Console menu, select **Console / Open**. Select the SequeLink Manager console you want to start; then, click **Open**. The SequeLink Manager appears in the MMC console window.

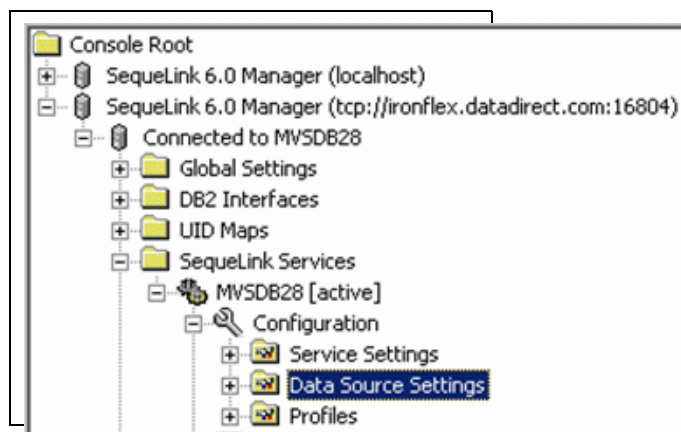
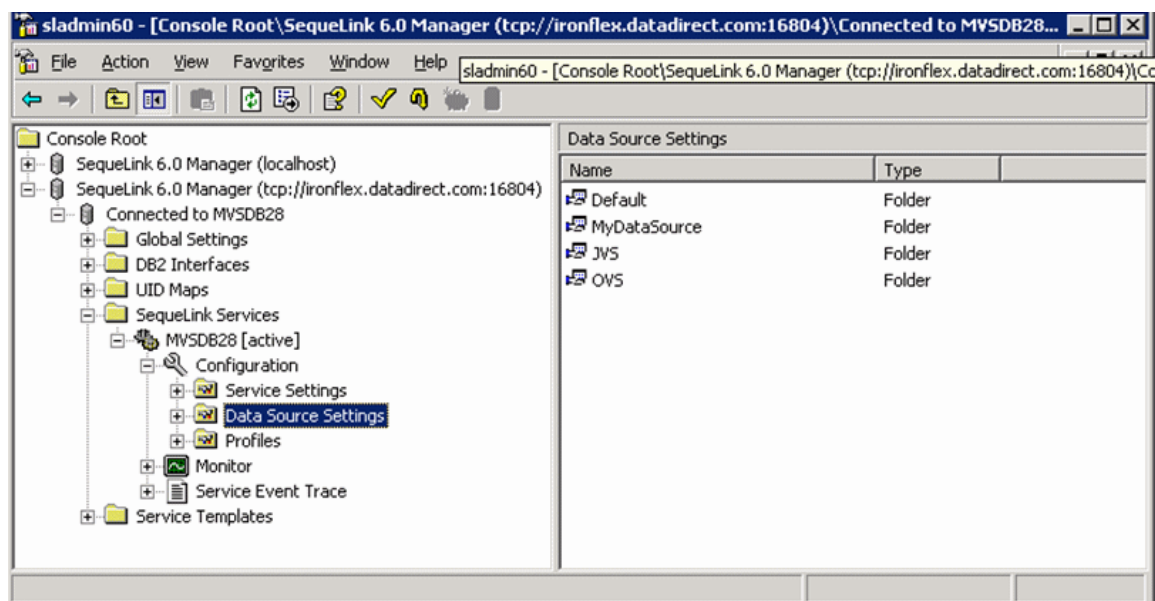


- 3 Connect to the SequeLink Server.



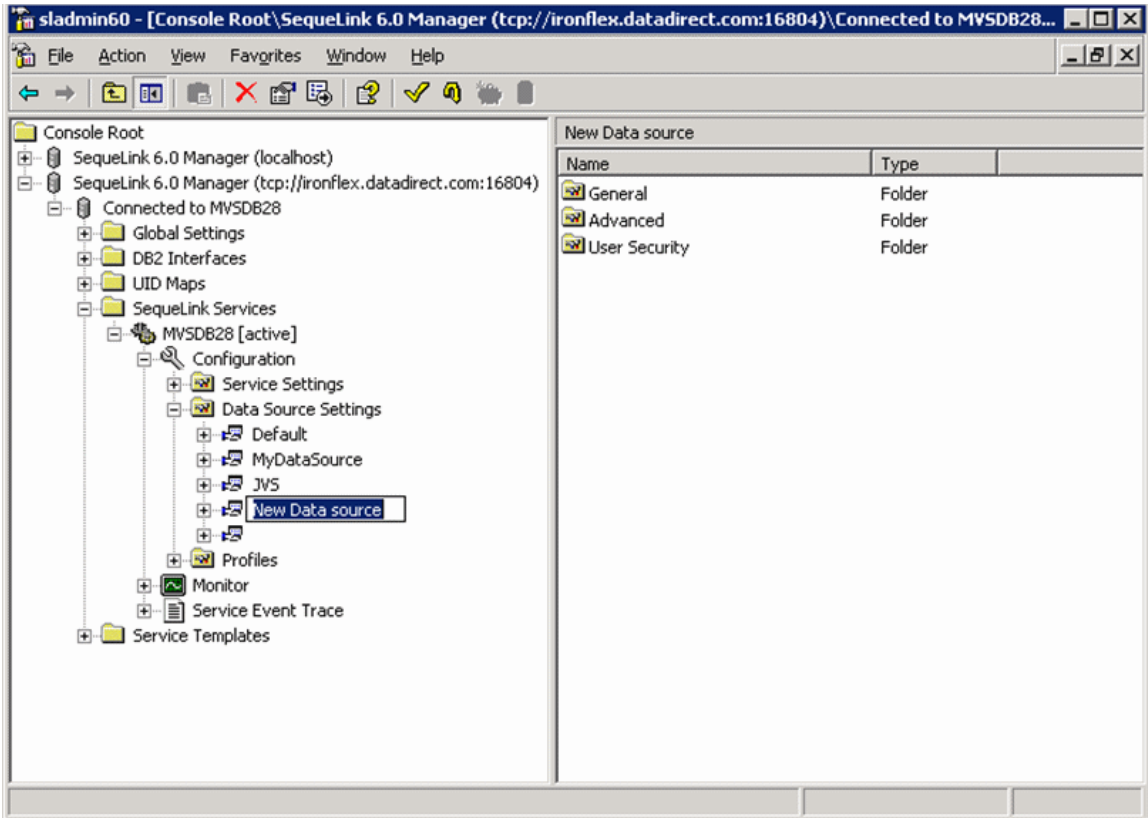
## 4 Open the following nodes:

- Connected to MVSDB28
- SequeLink Services
- MVSDB28
- Configuration

5 Click **Data Source Settings** to display the existing data sources in the Details pane (right pane).

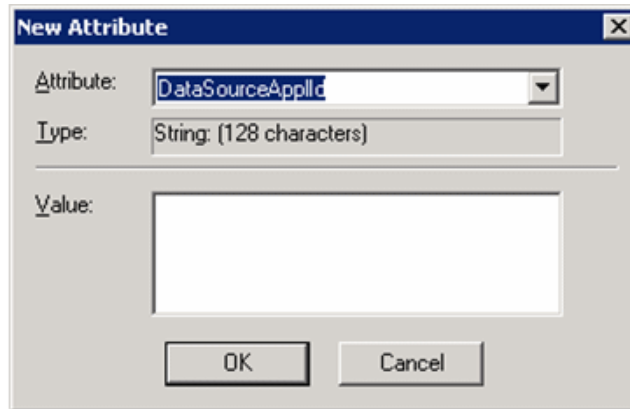


- 6 Right-click the **Data Source Settings** node and select **New / Data source**. A new server data source appears in the left pane as an editable field.



- 7 To name the server data source, type `DB2Update`, and press ENTER.

- 8 Add the DataSourceApplId attribute to the DB2Update data source. Right-click the **DB2Update** data source and select **New / Attribute**. The New Attribute window appears.
- 9 In the Attribute drop-down list, select **DataSourceApplID**.



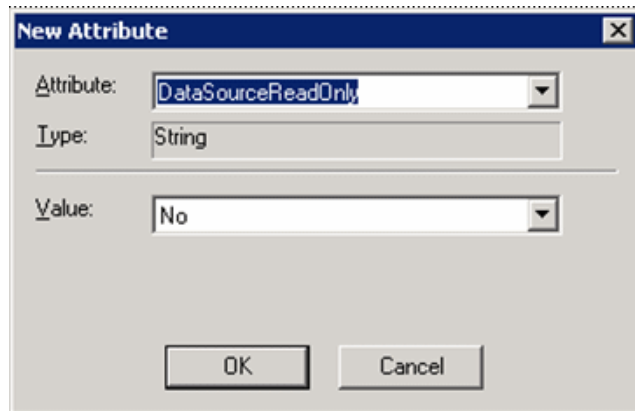
- 10 In the Value field, type the application ID that the order-entry application will use to identify itself to the SequeLink service. Refer to the *SequeLink Developer's Reference* for information about specifying application IDs for ODBC client applications.
- 11 Click **OK**. The attribute is added to the server data source.

For a description of SequeLink service attributes, refer to the *SequeLink Administrators Guide*.

## Modifying the Default Server Data Source

NOTE: This procedure assumes that the SequeLink Manager is running and that you have completed the previous procedure.

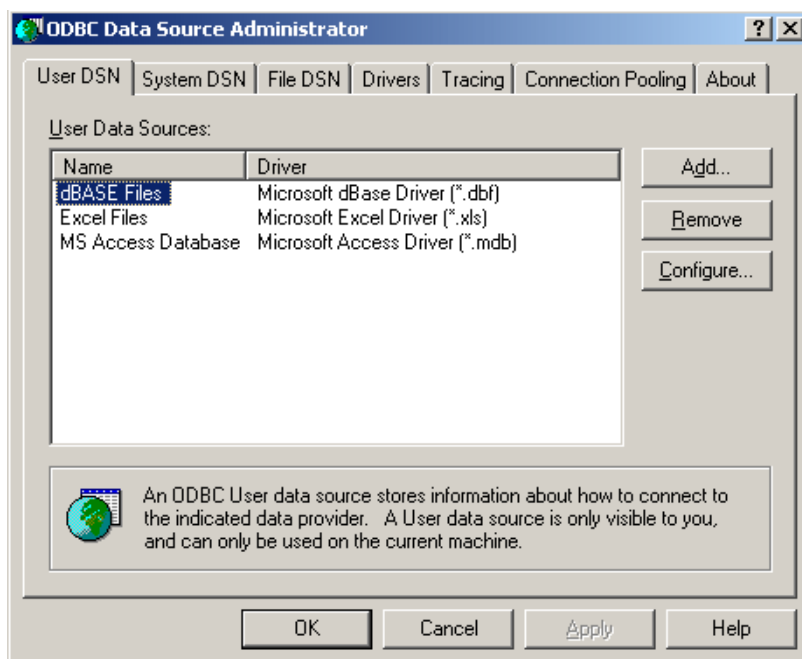
- 1 Select the **Data Source Settings** node to display the existing data sources in the Details pane (right pane).
- 2 Add the DataSourceReadOnly attribute to the Default data source. Right-click **Default** in the Details pane and select **New / Attribute**. The New Attribute window appears.



- 3 In the Attribute drop-down list, select **DataSourceReadOnly**.
- 4 In the Value field, select **Select**, which means only Select statements are allowed.
- 5 Click **OK**. The attribute is added to the default server data source.

## Configuring ODBC Client Data Sources

- 1 Start the ODBC Administrator by selecting its icon from the DataDirect SequeLink 6.0 Client for ODBC program group. Click the **User DSN** tab to view a list of existing user data sources.



- 2 Create and configure the first data source by clicking **Add**. The Create New Data Source window appears. Select **DataDirect SequeLink 6.0** from the list of installed drivers; then, click **Finish**.

The SequeLink for ODBC Driver Setup window appears.

The screenshot shows the 'DataDirect SequeLink for ODBC Setup' dialog box. It has a title bar with a question mark and close button. Below the title bar are three tabs: 'General', 'Failover', and 'About'. The 'General' tab is selected. The dialog contains the following fields and controls:

- Data Source Name:** A text input field with a 'Help' button to its right.
- Description:** A text input field with a 'Translate...' button to its right.
- Use LDAP:** A checkbox.
- SequeLink Server Host:** A text input field.
- SequeLink Server Port:** A text input field.
- Server Data Source:** A text input field with a '...' button to its right.
- Distinguished Name:** A text input field.
- Encrypted (SSL):** A checkbox.
- Buttons:** 'Test Connect', 'OK', 'Cancel', and 'Apply' are located at the bottom of the dialog.

- 3 Provide the following information; then, click **OK**.

**Data Source Name:** Type `DB2ReadOnly`.

**Description:** Type `DB2 read-only connection for Accounting`. This field is optional.

**SequeLink Server Host:** Type `speedy.na.DataDirect.com`. This field identifies the TCP/IP host name of the SequeLink service to which you want the ODBC Client to connect.

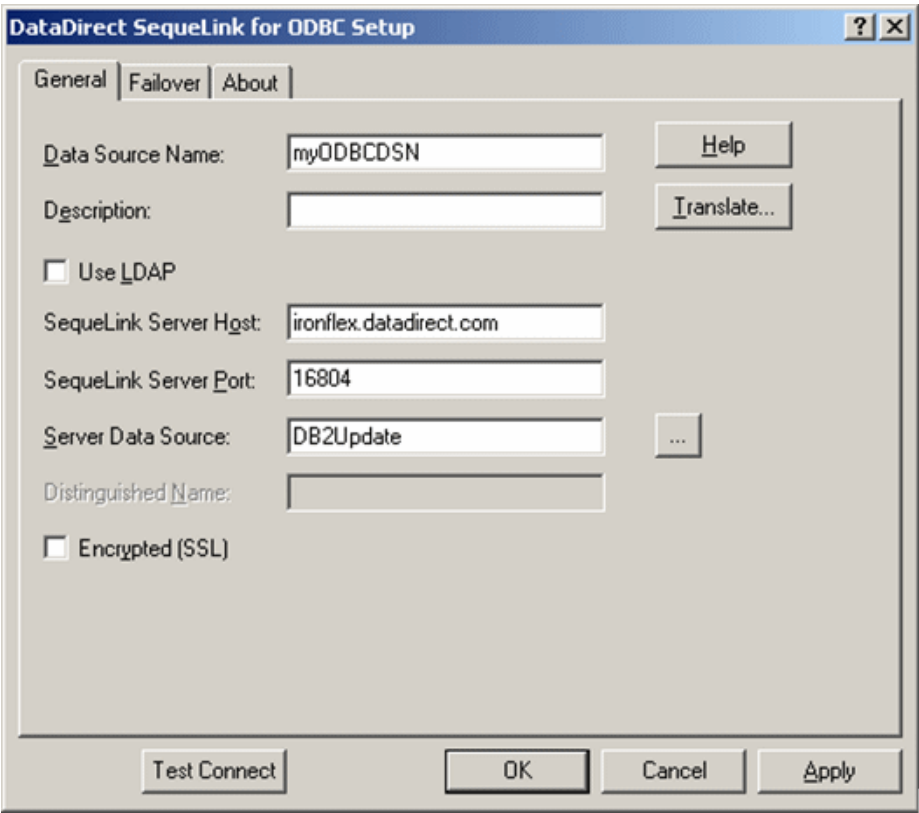
**SequeLink Server Port:** Type `19996`, which is the default TCP/IP port the SequeLink service is listening on for incoming connection requests. The port that you specify must be the same as the one that was specified for the SequeLink service when the SequeLink Server was installed.

**SequeLink Data Source:** Leave this field blank. This client data source is to use the default server data source; therefore, a server data source does not have to be specified.

NOTE: This example does not use LDAP. If you wanted to configure the ODBC Client to retrieve connection information from an LDAP directory, you would select the Use LDAP check box. The fields change on the lower half of the screen to accommodate the information required to query an LDAP server for connection information.

- 4 Create and configure the second data source by clicking **Add**. The Create New Data Source window appears. Select **DataDirect SequeLink 6.0** from the list of installed drivers; then, click **Finish**.

The SequeLink for ODBC Driver Setup window appears.



- 5 Provide the following information; then, click **OK**.

**Data Source Name:** Type `DB2OrderEntry`.

**Description:** Type `DB2 update connection`. This field is optional.

**SequeLink Server Host:** Type `speedy.na.DataDirect.com`. This field identifies the TCP/IP host name of the SequeLink service to which you want the ODBC Client to connect.

**SequeLink Server Port:** Type `19996`, which is the default TCP/IP port the SequeLink service is listening on for incoming connection requests. The port you specify must be the same as the one that was specified for the SequeLink service when the SequeLink Server was installed.

**SequeLink Data Source:** Type `DB2Update`, which is the name of the server data source that was created for update capabilities and the use of application IDs, or select the value from the drop-down list.

The configuration of SequeLink client and server data sources is complete. The reporting applications can now use the `DB2ReadOnly` client data source, and the order-entry application can use the `DB2OrderEntry` client data source.

For information about how to configure the order-entry application to specify an application ID, refer to the *SequeLink Developer's Reference*.

---

## Using Multiple Versions of SequeLink®

You may want to install multiple versions of SequeLink side-by-side so that you can implement the migration to SequeLink 6.0 without any interruption in your everyday use of an earlier version of SequeLink 5.x. Then, when you have completed the configuration and testing of SequeLink 6.0, you can delete the earlier version of SequeLink from your clients and servers.



**NOTE:** On Windows, you cannot install a 32-bit and a 64-bit version of SequeLink side-by-side.

You must use the appropriate version of the SequeLink Manager to administer the SequeLink services. That is, you can use only the SequeLink Manager 6.0 to configure, manage, and monitor SequeLink 6.0 services.

**IMPORTANT:** You must configure a different TCP/IP port for each version of SequeLink that you install. You must also configure a different port for the Agent and one for each data access service that you want to duplicate.



# Glossary

<b>ADO.NET</b>	The data access standard for the Microsoft .NET platform.
<b>ActiveX Data Objects (ADO)</b>	A high level object-oriented database API built on OLE DB.
<b>authentication</b>	The process of identifying a user, typically based on a user ID and password. Authentication ensures that the user is who they claim to be. See also <i>client authentication</i> , <i>NTLM authentication</i> , <i>OS authentication</i> , and <i>user ID/password authentication</i> .
<b>client authentication</b>	Client authentication uses the user ID and password of the user logged onto the system on which the driver is running to authenticate the user to the database. The database server depends on the client to authenticate the user and does not provide additional authentication. See also <i>authentication</i> .
<b>Client data sources</b>	Minimal ODBC, ADO, or JDBC data sources that store connection instructions to a SequeLink Server.
<b>client load balancing</b>	Client load balancing distributes new connections in a computing environment so that no one server is overwhelmed with connection requests.
<b>connection failover</b>	Connection failover allows an application to connect to an alternate, or backup, database server if the primary database server is unavailable, for example, because of a hardware failure or traffic overload.
<b>connection pooling</b>	Connection pooling allows you to reuse connections rather than create a new one every time a driver needs to establish a connection to the database. Connection pooling manages connection sharing across different user requests to maintain performance and reduce the number of new connections that must be created. See also <i>DataDirect Connection Pool Manager</i> .

<b>connection retry</b>	Connection retry defines the number of times the driver attempts to connect to the primary and, if configured, alternate database servers after an initial unsuccessful connection attempt. Connection retry can be an important strategy for system recovery.
<b>Database Management System (DBMS)</b>	A layer of software between the physical database and the user. The DBMS manages all access to the database.
<b>data store</b>	The storage device for data a user accesses, such as the data in a database or a file. A data store owns data and exposes its data in a tabular form as a rowset over a native data format. Data stores can include a full SQL DBMS, an ISAM file, or a text file or data stream.
<b>DataDirect Connection Pool Manager</b>	The DataDirect Connection Pool Manager is a component shipped with DataDirect SequeLink Client <i>for</i> JDBC that allows applications to use connection pooling.
<b>Distinguished Name (DN)</b>	A name that identifies an LDAP entry in an LDAP directory. See also <a href="#">Lightweight Directory Access Protocol (LDAP)</a> .
<b>DataDirect Spy</b>	DataDirect Spy is a component shipped with DataDirect SequeLink Client <i>for</i> JDBC for tracking JDBC calls at runtime. It passes calls issued by an application to an underlying JDBC driver and logs detailed information about the calls.
<b>DataDirect Test</b>	DataDirect Test is a menu-driven component shipped with DataDirect SequeLink Client <i>for</i> JDBC that helps you debug your applications and learn how to use the drivers. DataDirect Test displays the results of all JDBC function calls in one window, while displaying fully commented, Java JDBC code in an alternate window.
<b>isolation level</b>	An isolation level represents a particular locking strategy employed in the database system to improve data consistency. The higher the isolation level number, the more complex the locking strategy behind it. The isolation level provided by the database determines how a transaction handles data consistency.

The American National Standards Institute (ANSI) defines four isolation levels:

- Read uncommitted (0)
- Read committed (1)
- Repeatable read (2)
- Serializable (3)

<b>J2EE</b>	J2EE (Java 2 Platform, Enterprise Edition) technology and its component-based model simplify enterprise development and deployment. The J2EE platform manages the infrastructure and supports the Web services to enable development of secure, robust and interoperable business applications.
<b>JDBC</b>	A data access API standard for Java-enabled applets, applications, or Web browsers.
<b>JNDI</b>	The Java Naming and Directory Interface (JNDI) is a standard extension to the Java platform, providing Java technology-enabled applications with a unified interface to multiple naming and directory services in the enterprise. As part of the Java Enterprise API set, JNDI enables seamless connectivity to heterogeneous enterprise naming and directory services. Developers can now build powerful and portable directory-enabled applications using this industry standard.
<b>JTA</b>	JTA (Java Transaction API) specifies standard Java interfaces between a transaction manager and the parties involved in a distributed transaction system: the resource manager, the application server, and the transactional applications.
<b>Kerberos authentication</b>	Kerberos is an OS authentication protocol that provides authentication using secret key cryptography. See also <i>authentication</i> and <i>OS authentication</i> .
<b>load balancing</b>	See <i>client load balancing</i> .
<b>Lightweight Directory Access Protocol (LDAP)</b>	A standard protocol for accessing and updating common directory information.

<b>locking level</b>	Locking is a database operation that restricts a user from accessing a table or record. Locking is used in situations where more than one user might try to use the same table at the same time. By locking the table or record, the system ensures that only one user at a time can affect the data.
<b>Microsoft .NET</b>	A set of Microsoft software technologies for connecting information, systems, and devices. Microsoft .NET enables software integration through the use of XML Web services as well as to other, larger applications using the Internet.
<b>Microsoft Management Console (MMC)</b>	A common console framework for management applications. SequeLink Manager requires MMC 1.1 or higher.
<b>middleware</b>	Software that mediates the communication between an application and a data store. The middleware provides an interface that manages the differences in the application's and the data store's data formats.
<b>NTLM authentication</b>	NTLM (NT LAN Manager) is an OS authentication protocol that provides security for connections between Windows NT clients and servers. See also <i>authentication</i> and <i>OS authentication</i> .
<b>ODBC</b>	Microsoft's Open Database Connectivity (ODBC) specification. The ODBC specification for an Application Programming Interface (API) allows applications to access multiple database systems using Structured Query Language (SQL). For detailed information on ODBC, refer to the Microsoft programming documentation on ODBC.
<b>OLE DB</b>	Microsoft's low-level specification for access to different data sources. OLE DB includes SQL capabilities as well as access to other types of data. For detailed information on OLE DB, refer to the Microsoft programming documentation on OLE DB.
<b>OS authentication</b>	OS authentication can take advantage of the user name and password maintained by the operating system to authenticate users to the database or use another set of user credentials specified by the application. By allowing the database to share the user name and password used for the operating system, users with a valid operating system account can log into the database

without supplying a user name and password. See also *authentication*, *Kerberos authentication*, and *NTLM authentication*.

<b>resource adapter</b>	A resource adapter is a system-level software driver used by an application server to connect to an Enterprise Information Service (EIS). The resource adapter communicates with the server to provide the underlying transaction, security, and connection pooling mechanisms.
<b>Secure Sockets Layer (SSL)</b>	SSL is an industry-standard protocol for sending encrypted data over database connections. SSL secures the integrity of your data by encrypting information and providing SSL client/SSL server authentication. See also <i>SSL client/server authentication</i> .
<b>SequeLink administrator</b>	Typically, the person who configures, manages, and monitors the SequeLink environment.
<b>SequeLink Agent</b>	The SequeLink service that acts as a proxy to carry out configuration, management, and monitoring requests from the SequeLink Manager.
<b>SequeLink Client</b>	A SequeLink software component that can be installed on a client machine or on a Web/Application Server. The ODBC Client provides ODBC access; the JDBC Client provides JDBC access; the ADO Client provides ADO/OLE DB access; the .NET Client provides .NET access.
<b>SequeLink configuration file</b>	A file that contains configuration information for SequeLink services.
<b>SequeLink data sources</b>	Optional data sources stored on the SequeLink server containing service-specific instructions that affect how data is accessed by a connection. Centralizing this information on the server, instead of distributing it among hundreds of clients, provides easier management of your entire data access infrastructure.
<b>SequeLink <i>for</i> .NET Provider</b>	The data provider that is installed with the .NET Client to provide .NET access.

<b>SequeLink for ADO Data Provider</b>	The data provider that is installed with the ADO Client to provide ADO access.
<b>SequeLink for JDBC Driver</b>	The driver that is installed within the JDBC Client to provide JDBC access.
<b>SequeLink for ODBC Driver</b>	The driver that is installed within the ODBC Client to provide ODBC access.
<b>SequeLink Manager</b>	A tool that you can use to configure, manage, and monitor your SequeLink environment. The SequeLink Manager is provided as an MMC Snap-in on Windows, a command-line tool on Windows and UNIX, and an ISPF dialog tool on z/OS.
<b>SequeLink Manager Command-Line Tool</b>	A command-line tool supported on Windows and UNIX platforms that allows you to configure, manage, and monitor your SequeLink environment.
<b>SequeLink Manager for z/OS</b>	An ISPF panel tool supported on z/OS that allows you to configure, manage, and monitor your SequeLink Server for z/OS services locally from a z/OS machine.
<b>SequeLink Manager Snap-in</b>	A GUI-based tool supported on Windows platforms that allows you to configure, manage, and monitor your SequeLink environment. Before you can use the SequeLink Manager Snap-in remotely, you must add it to the MMC.
<b>SequeLink profile</b>	Predefined profiles that you can use for monitoring your SequeLink environment, such as viewing details about active services, viewing active sessions, and requesting information about traced events.
<b>SequeLink Server</b>	The SequeLink software component that is installed on the server to provide data access services from client applications to data stores.
<b>SequeLink service</b>	<p>SequeLink provides the following service types:</p> <ul style="list-style-type: none"><li>■ <i>SequeLink data access services</i> handle data access requests from any SequeLink client. Multiple SequeLink data access services can run on the same SequeLink server. For example, SequeLink Server for Oracle and SequeLink Server for</li></ul>

Microsoft SQL Server can run side-by-side on the same machine. Some data services come with an enhanced code page version in addition to the default version.

- *SequeLink Agent services* act as a proxy to carry out configuration, management, and monitoring requests from any SequeLink Manager. The SequeLink Agent can service multiple SequeLink services on the same SequeLink server.

**SequeLink service template**

A template that contains predefined attributes for a particular service type, for example, Oracle9i. Some data services come with an enhanced code page version in addition to the default version.

**SQL**

Structured Query Language. A language used by relational databases to query, update, and manage data.

**SSL client/server authentication**

SSL works by allowing the client and server to send each other encrypted data that only they can decrypt. SSL negotiates the terms of the encryption in a sequence of events known as the SSL handshake. The handshake involves the following types of authentication:

- SSL server authentication requires the server to authenticate itself to the client.
- SSL client authentication is optional and requires the client to authenticate itself to the server after the server has authenticated itself to the client.

See also *Secure Sockets Layer (SSL)*.

**Sysplex cluster**

z/OS sysplex cluster technology allows multiple servers to work in a cluster to provide sufficient processing power and availability to handle disparate demands of clients.

**Workload Manager (WLM)**

WLM is a z/OS construct that provides services to manage workload distribution, balance workload, and distribute resources.





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