

[MS-SCCSTR]: SqlClient Connection String Structure

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Contents

1 Introduction	4
1.1 Glossary	4
1.2 References	5
1.2.1 Normative References	5
1.2.2 Informative References	5
1.3 Overview	6
1.4 Relationship to Other Protocols	6
1.5 Applicability Statement	6
1.6 Versioning and Capability Negotiation	7
1.7 Vendor-Extensible Fields	7
2 Structures	8
2.1 SqlConnection Connection String	8
2.1.1 Guidelines	9
2.1.2 Restrictions	10
2.2 Keys and Values	10
3 Structure Examples	18
3.1 Trusted Connection	18
3.2 Standard Security Connection	18
3.3 Named Instance	18
3.4 SQL Server Express LocalDB Default Instance	18
3.5 Escaped Single Quote	19
4 Security Considerations	20
4.1 Security Considerations for Implementers	20
4.2 Index of Security Parameters	20
5 Appendix A: Product Behavior	21
6 Change Tracking	25
7 Index	27

1 Introduction

The SqlConnection Connection String structure specifies the format of the **connection strings** that are used by Microsoft .NET Framework **applications** that connect to Microsoft SQL Server by using the Microsoft .NET Framework Data Provider for SQL Server ("SqlClient"). SqlConnection is a set of .NET Framework classes that are designed to enable developers to query, update, insert, and delete data on SQL Server.

A connection string is a series of arguments, delimited by a semicolon, that describe the location of a **database** and how to connect to it.

Sections 1.7 and 2 of this specification are normative and can contain the terms MAY, SHOULD, MUST, MUST NOT, and SHOULD NOT as defined in RFC 2119. All other sections and examples in this specification are informative.

1.1 Glossary

The following terms are defined in [\[MS-GLOS\]](#):

- application**
- Augmented Backus-Naur Form (ABNF)**
- authentication (2)**
- certificate chain**
- connection (1)**
- context**
- credential**
- encryption**
- named pipe**
- remote procedure call (RPC)**
- replication**
- Secure Sockets Layer (SSL)**
- transaction**
- Unicode**

The following terms are defined in [\[MS-OFCGLOS\]](#):

- channel URI**
- connection string**
- data source (1)**

The following terms are defined in [\[MS-TDS\]](#):

- Multiple Active Result Sets (MARS)**

The following terms are specific to this document:

connection pool: A cache of opened **connections** to **data sources**.

database: A repository of data.

database instance: A **database** that has a unique set of services that can have unique settings.

database mirroring: An availability solution that is based on keeping copies of the same **database** in different servers.

default database: The current **database** just after the **connection** is made to the instance of SQL Server.

idle connection: An active **connection** that was opened but that does not have any pending data.

in-process connection: A **connection** that is opened from within the server, such as a connection that is opened by a .NET stored procedure.

MAY, SHOULD, MUST, SHOULD NOT, MUST NOT: These terms (in all caps) are used as described in [\[RFC2119\]](#). All statements of optional behavior use either MAY, SHOULD, or SHOULD NOT.

1.2 References

References to Microsoft Open Specifications documentation do not include a publishing year because links are to the latest version of the documents, which are updated frequently. References to other documents include a publishing year when one is available.

1.2.1 Normative References

We conduct frequent surveys of the normative references to assure their continued availability. If you have any issue with finding a normative reference, please contact dochelp@microsoft.com. We will assist you in finding the relevant information.

[MS-TDS] Microsoft Corporation, "[Tabular Data Stream Protocol](#)".

[RFC791] Postel, J., Ed., "Internet Protocol: DARPA Internet Program Protocol Specification", RFC 791, September 1981, <http://www.rfc-editor.org/rfc/rfc791.txt>

[RFC793] Postel, J., Ed., "Transmission Control Protocol: DARPA Internet Program Protocol Specification", RFC 793, September 1981, <http://www.rfc-editor.org/rfc/rfc793.txt>

[RFC1002] Network Working Group, "Protocol Standard for a NetBIOS Service on a TCP/UDP Transport: Detailed Specifications", RFC 1002, March 1987, <http://www.rfc-editor.org/rfc/rfc1002.txt>

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997, <http://www.rfc-editor.org/rfc/rfc2119.txt>

[RFC2460] Deering, S., and Hinden, R., "Internet Protocol, Version 6 (IPv6) Specification", RFC 2460, December 1998, <http://www.rfc-editor.org/rfc/rfc2460.txt>

[RFC4120] Neuman, C., Yu, T., Hartman, S., and Raeburn, K., "The Kerberos Network Authentication Service (V5)", RFC 4120, July 2005, <http://www.rfc-editor.org/rfc/rfc4120.txt>

[RFC5234] Crocker, D., Ed., and Overell, P., "Augmented BNF for Syntax Specifications: ABNF", STD 68, RFC 5234, January 2008, <http://www.rfc-editor.org/rfc/rfc5234.txt>

[UNICODE2.0.0] UNICODE, "Unicode 2.0.0", July 1996, <http://www.unicode.org/versions/Unicode2.0.0/>

1.2.2 Informative References

[MS-GLOS] Microsoft Corporation, "[Windows Protocols Master Glossary](#)".

[MS-OFCGLOS] Microsoft Corporation, "[Microsoft Office Master Glossary](#)".

[MSDN-DAD] Microsoft Corporation, "Database Detach and Attach (SQL Server)", <http://msdn.microsoft.com/en-us/library/ms190794.aspx>

[MSDN-DLO] Microsoft Corporation, "default language Option", Administering SQL Server (SQL Server 2000), [http://msdn.microsoft.com/en-us/library/aa196707\(SQL.80\).aspx](http://msdn.microsoft.com/en-us/library/aa196707(SQL.80).aspx)

[MSDN-FILE] Microsoft Corporation, "Naming Files, Paths, and Namespaces", <http://msdn.microsoft.com/en-us/library/aa365247.aspx>

[MSDN-NETLIB] Microsoft Corporation, "Network Libraries", [http://msdn.microsoft.com/en-us/library/aa176603\(SQL.80\).aspx](http://msdn.microsoft.com/en-us/library/aa176603(SQL.80).aspx)

[MSDN-SD] Microsoft Corporation, "Selecting a Database", <http://msdn.microsoft.com/en-us/library/ms180770.aspx>

[MSDN-UNI] Microsoft Corporation, "Using Named Instances", <http://msdn.microsoft.com/en-us/library/ms165614.aspx>

[MSFT-KB313295] See [MSKB-313295].

[MSFT-KB328383] See [MSKB-328383].

[MSKB-313295] Microsoft Corporation, "How to use the server name parameter in a connection string to specify the client network library", <http://support.microsoft.com/kb/313295>

[MSKB-328383] Microsoft Corporation, "SQL Server clients may change protocols when the client computers try to connect to an instance of SQL Server", <http://support.microsoft.com/kb/328383>

[NTLM] Microsoft Corporation, "Microsoft NTLM", <http://msdn.microsoft.com/en-us/library/aa378749.aspx>

[PIPE] Microsoft Corporation, "Named Pipes", <http://msdn.microsoft.com/en-us/library/aa365590.aspx>

1.3 Overview

The SqlConnection Connection String Structure specifies a method for a .NET Framework application to specify the parameters that are used to connect to a **data source**. A connection string specifies a set of properties as keys and their associated values. The connection string can include one or more key/value pairs to specify information such as the user identification, the password, the server name, and the database name. The values that are specified in the connection string affect the way an application connects to the data source.

1.4 Relationship to Other Protocols

Some of the properties of the SqlConnection connection string set specific tabular data stream (TDS) fields.

For more details, see section [2.2](#).

1.5 Applicability Statement

This document describes the format of SqlConnection connection strings that are used to establish a **connection** between a .NET Framework application and a Microsoft SQL Server data source in scenarios where network or local connectivity is available. If network or local connectivity is not available, attempts to establish a connection will fail.

1.6 Versioning and Capability Negotiation

The SqlConnection connection string **TypeSystemVersion** property (see section [2.2](#)) MUST be used to indicate the type of system that is expected by the .NET Framework application.

The SqlConnection connection string **PacketSize** property (see section [2.2](#)) MUST be used to specify the packet size, in bytes, to use for the data exchange between a data source object and a database.

1.7 Vendor-Extensible Fields

None.

2 Structures

2.1 SqlClient Connection String

A SqlClient connection string MUST conform to the **Augmented Backus-Naur Form (ABNF)** [\[RFC5234\]](#) grammar. In accordance with section 2.4 of the RFC, this description assumes external encoding of **Unicode**.

```
SqlClientConnectionString = *(KeyValuePair SC) [KeyValuePair] *(WhiteSpace / NullTerm)

KeyValuePair=*WhiteSpace /
(*WhiteSpace Key *WhiteSpace EQ (*WhiteSpace / Value) *WhiteSpace)

Key="Addr" / "Address" / "App" / "ApplicationIntent" / "Application Name" / "Async" /
"Asynchronous Processing" / "AttachDBFilename" / "Connection Lifetime" / "Connection Reset" /
"ConnectionRetryCount" / "ConnectionRetryInterval" / "Connect Timeout" / "Connection Timeout"
/ "Context Connection" / "Current Language" / "Database" / "Data Source" / "Encrypt" /
"Enlist" / "Extended Properties" / "Failover Partner" / "Initial Catalog" / "Initial File
Name" / "Integrated Security" / "Language" / "Load Balance Timeout" / "Max Pool Size" / "Min
Pool Size" / "MultipleActiveResultSets" / "MultiSubnetFailover" / "Net" / "Network" /
"Network Address" / "Network Library" / "Packet Size" / "Password" / "Persist Security Info"
/ "PersistSecurityInfo" / "Pooling" / "PWD" / "Replication" / "Server" / "Timeout" /
"Transaction Binding" / "Trusted Connection" / "TrustServerCertificate" / "Type System
Version" / "UID" / "User" / "User ID" / "User Instance" / "Workstation ID" / "WSID"

Value= UnquotedValue / SingleQuotedValue / DoubleQuotedValue

SingleQuotedValue = SQUOTE *(NonNullSQuote / EscSQuote)SQUOTE
NonNullSQuote=%x0001 - %x0026 / %x0028-%xFFFF; not null, not single quote
EscSQuote=SQUOTE SQUOTE; Escaped single quote

DoubleQuotedValue = DQUOTE *( NonNullDQuote / EscDQuote) DQUOTE
NonNullDQuote= %x0001 - %x0021 / %x0023-%xFFFF; not null, not double quote
EscDQuote=DQUOTE DQUOTE; Escaped double quote

UnquotedValue = (UnquotedStart / (1*WhiteSpace EQ)) *NonCtrlSC UnquotedEnd

; not control chars, not white space, not single quote, not double quote, not semicolon
UnquotedEnd= UnquotedStart / EQ

; not control chars, not white space, not single quote, not double quote
; not semicolon, not equal sign
UnquotedStart=%x0021-%x0021 / %x0023-%x0026 / %x0028-%x003A /
%x003C / %x003E-%x007E / %x00A0-%x167F / %x1681-%x180D /
%x180F-%x1FFF / %x200B-%x2027 / %x202A-%x202E /
%x2030-%x205E / %x2060-%x2FFF / %x3001-%xFFFF

; not control chars, not semicolon,
NonCtrlSC=%x0020-%x003A / %x003C-%x007E / %x00A0-%xFFFF

WhiteSpace=SP / OSM / MVS / ENQD / EMQD / ENSP / EMSP / TPMSMP / FPMSMP / SPMSMP /
FSP / PSP / TSP / HSP / NNOBRKSP / MMSMP / ISP / LS / PS / CHTAB / LF /
LNTAB / FF / CR / NL / NBRKSP

NullTerm= %x0000; NULL terminator (U+0000)
SP= %x0020; SPACE (U+0020)
OSM= %x1680; OGHAM SPACE MARK (U+1680)
MVS= %x180E; MONGOLIAN VOWEL SEPARATOR (U+180E)
ENQD= %x2000; EN QUAD (U+2000)
```

EMQD= %x2001; EM QUAD (U+2001)
 ENSP= %x2002; EN SPACE (U+2002)
 EMSP= %x2003; EM SPACE (U+2003)
 TPMSF= %x2004; THREE-PER-EM SPACE (U+2004)
 FPMSF= %x2005; FOUR-PER-EM SPACE (U+2005)
 SPMSF= %x2006; SIX-PER-EM SPACE (U+2006)
 FSP= %x2007; FIGURE SPACE (U+2007)
 PSP= %x2008; PUNCTUATION SPACE (U+2008)
 TSP= %x2009; THIN SPACE (U+2009)
 HSP= %x200A; HAIR SPACE (U+200A)
 NNOBRKSP= %x202F ; NARROW NO-BREAK SPACE (U+202F)
 MMSP= %x205F ; MEDIUM MATHEMATICAL SPACE (U+205F)
 ISP= %x3000; IDEOGRAPHIC SPACE (U+3000);

 LS= %x2028; LINE SEPARATOR character (U+2028)

 PS= %x2029; PARAGRAPH SEPARATOR character (U+2029)

 CHTAB= %x0009; CHARACTER TABULATION (U+0009)
 LF= %x000A; LINE FEED (U+000A)
 LNTAB= %x000B; LINE TABULATION (U+000B)
 FF= %x000C; FORM FEED (U+000C)
 CR= %x000D; CARRIAGE RETURN (U+000D)
 NL= %x0085; NEXT LINE (U+0085)
 NBRKSP= %x00A0; NO-BREAK SPACE (U+00A0)

 SC= %x003B; SEMICOLON (U+003B)
 EQ= %x003D; EQUAL SIGN (U+003D)
 SQUOTE= %x0027; SINGLE QUOTE (U+0027)
 DQUOTE= %x0022; DOUBLE QUOTE (U+0022)

2.1.1 Guidelines

The following list contains guidelines for the components of the SqlConnection String.

- **KeyValuePair**
 - A **KeyValuePair** structure is a collection of keys and values in which each key is associated with one or more values. In a SqlConnection string, **KeyValuePair** structures follow the following format: key1=value1, key2=value2, and so on.
 - If only white spaces are inside a **KeyValuePair** structure, the **KeyValuePair** structure MUST be ignored.
- **Key**
 - Any white spaces that precede the **Key** value MUST be ignored.
 - Any white spaces that precede the **EQ** value MUST be ignored.
 - The **Key** value MUST be case insensitive.
- **Value**
 - The value in a **KeyValuePair** MUST be **UnquotedValue**, **SingleQuotedValue**, **DoubleQuotedValue**, or empty.

- **UnquotedValue**, which starts with **EQ**, MUST be preceded by at least one space. **UnquotedValue** MUST NOT end with **SQUOTE** or **DQUOTE**.
- A single quote symbol MUST be escaped to be used within **SingleQuotedValue** (use **EscdQuote**). A double quote symbol MUST be escaped to be used within **DoubleQuotedValue** (use **EscdQuote**).
- Any white spaces that precede or trail **Value** MUST be ignored. **Value** MUST be case insensitive, with the exception of the value of **Password Key**. The value of **Password Key** MUST be case sensitive.

2.1.2 Restrictions

Only the keys specified in **Key** are valid in the SqlConnection Connection String structure, and their meanings are described in section [2.2](#). Any other **KeyValuePair** properties MUST be treated as errors.

If there are duplicate keys, the last instance wins.

If **Context Connection** is set to "true", the only other key allowed is **Type System Version**.

If the **MultiSubnetFailover** key is set to "true", the **Failover Partner** key MUST NOT be allowed.

If the **ApplicationIntent** key is set to "ReadOnly", the **Failover Partner** key MUST NOT be allowed.

There MUST be no default values for keys if the **KeyValuePair** (whole pair) is missing, unless otherwise specified in section [2.2](#).

2.2 Keys and Values

The following table provides a list of all keys accepted as a SqlConnection Connection String.

Keyword	Description
Addr	Synonym of the Data Source key.
Address	Synonym of the Data Source key.
App	Synonym of the Application Name key.
ApplicationIntent	When the value of this key is set to "ReadOnly", the client MUST request a read workload when connecting to an AlwaysOn-enabled database. The value of this key MUST be "ReadOnly" or "ReadWrite". The default value of this key is "ReadWrite".
Application Name	Sets the name of the application in the application identifier as specified by the ibAppName and cchAppName fields in section 2.2.6.3 of [MS-TDS] . The value of this key MUST be a string that has a maximum length of 128 characters. The default value of this key is ".NET SqlConnection Data Provider".
Async	Synonym of the Asynchronous Processing key.
Asynchronous Processing <1>	When the value of this key is set to "true", asynchronous support MUST

Keyword	Description
	<p>be enabled.</p> <p>The value of this key MUST be "true", "false", "yes", or "no".</p> <p>A value of "yes" MUST be treated the same as a value of "true".</p> <p>A value of "no" MUST be treated the same as a value of "false".</p> <p>The default value of this key is "false".</p>
AttachDBFilename	<p>Sets the name of the primary file of an attachable database<2> as specified by the ibAtchDBFile and cchAtchDBFile fields in section 2.2.6.3 of [MS-TDS].</p> <p>The default value of this key is "".</p> <p>If the value of the AttachDBFilename key is specified in the connection string, the database is attached and becomes the default database for the connection.</p> <p>If this key is not specified and if the database was previously attached, the database will not be reattached. The previously attached database will be used as the default database for the connection.</p> <p>If this key is specified together with the AttachDBFilename key, the value of this key SHOULD be used as the alias. However, if the name is already used in another attached database, the connection MUST fail.</p> <p>For more information about attachable databases, see [MSDN-DAD].</p> <p>For more information about default databases, see [MSDN-SD].</p>
Connection Lifetime	<p>The minimum time, in seconds, for the connection to live in the connection pool before it is destroyed.</p> <p>Valid values MUST be unsigned integers that range from greater than or equal to 0 to less than or equal to 2147483647.</p> <p>The default value of this key is 0, which means no pool usage at all.</p>
Connection Reset	<p>The value of this key MUST be "true", "false", "yes", or "no".</p> <p>A value of "yes" MUST be treated the same as a value of "true".</p> <p>A value of "no" MUST be treated the same as a value of "false".</p> <p>The default value of this key is "true", and "false" is ignored.</p>
ConnectionRetryCount	<p>Specifies the number of reconnection attempts if an idle connection failure is detected.</p> <p>Valid values MUST be unsigned integers that range from greater than or equal to 0 to less than or equal to 255.</p> <p>The default value of this key is 1.</p>
ConnectionRetryInterval	<p>Specifies the amount of time, in seconds, between each reconnection attempt.</p> <p>Valid values MUST be unsigned integers that range from greater than or equal to 1 to less than or equal to 60.</p> <p>The default value of this key is 10.</p>
Connection Timeout	<p>Specifies the amount of time, in seconds, to wait for a connection to complete.</p> <p>Valid values MUST be unsigned integers that range from greater than or equal to 0 to less than or equal to 2147483647.</p> <p>The default value of this key is 15.</p>

Keyword	Description
Connect Timeout	Synonym of the Connection Timeout key.
Context Connection	<p>The value of this key MUST be "true" to open an in-process connection to the server.</p> <p>The value of this key MUST be "true", "false", "yes", or "no".</p> <p>A value of "yes" MUST be treated the same as a value of "true".</p> <p>A value of "no" MUST be treated the same as a value of "false".</p> <p>The default value of this key is "false".</p>
Current Language	<p>Sets the language used for database server warning or error messages as specified by the ibLanguage and cchLanguage fields in section 2.2.6.3 of [MS-TDS].</p> <p>For more information about default language, see [MSDN-DLO].</p> <p>The value of this key MUST be a string that has a maximum length of 128 characters.</p> <p>The default value of this key is "".</p>
Database	Synonym of the Initial Catalog key.
Data Source	<p>Specifies the network address of an instance of the database server.<3></p> <p>The value of this key MUST be a string that has a maximum length of 128 characters.</p> <p>The default value of this key is "".</p> <p>Data Source MUST be the TCP format, the Named Pipes format, or the LocalDB format.</p> <p>TCP format is as follows:</p> <ul style="list-style-type: none"> ▪ tcp:<host name>\<instance name> ▪ tcp:<host name>,<TCP/IP port number> <p>The TCP format MUST start with the prefix "tcp:" and is followed by the database instance, as specified by a host name and an instance name.</p> <p>The host name MUST be specified in one of the following ways:</p> <ul style="list-style-type: none"> ▪ NetBIOSName [RFC1002] ▪ IPv4Address [RFC791] ▪ IPv6Address [RFC2460] <p>The instance name is used to resolve to a particular TCP/IP port number [RFC793] on which a database instance is hosted. Alternatively, specifying a TCP/IP port number directly is also allowed. If both instance name and port number are not present, the default database instance is used.</p> <p>For more information about instance name, see [MSDN-UNI].</p> <p>The Named Pipes format is as follows:</p> <ul style="list-style-type: none"> ▪ np:\\<host name>\pipe\<pipe name> <p>The Named Pipes format MUST start with the prefix "np:" and is followed by a named pipe name.</p>

Keyword	Description
	<p>The host name MUST be specified in one of the following ways:</p> <ul style="list-style-type: none"> ▪ NetBIOSName [RFC1002] ▪ IPv4Address [RFC791] ▪ IPv6Address [RFC2460] <p>The pipe name is used to identify the database instance to which the .NET Framework application will be connected.</p> <p>If the value of the Network key is specified, the prefixes "tcp:" and "np:" SHOULD NOT <4> be specified.</p> <p>The LocalDB format MUST start with "(localdb)" followed by a "\" and either the instance name or the LocalDB version number in the format "vXX.X". The format is as follows:</p> <ul style="list-style-type: none"> ▪ (localdb)\<instance name>, where <instance name> MUST be case insensitive and MUST NOT contain the terms Default, MSSQLServer, or other reserved keywords. If a reserved keyword is used in an instance name, an error will occur. Also, <instance name> MUST be limited to 16 characters, where the first character MUST be a letter or an underscore (_). Acceptable letters are those that are defined by the Unicode Standard 2.0 [UNICODE2.0.0], including Latin characters a-z and A-Z, and letter characters from other languages. Subsequent characters MUST be letters defined by the Unicode Standard 2.0, decimal numbers from Basic Latin or other national scripts, the dollar sign (\$), or an underscore (_). Embedded spaces or other special characters MUST NOT be allowed in instance names. The backslash (\), comma (,), colon (:), semicolon (;), single quotation mark ('), ampersand (&), number sign (#), or at sign (@) also MUST NOT be allowed in instance names. ▪ (localdb)\vXX.X, for the default instance, where X MUST be any valid decimal number from Basic Latin or other national scripts. <p>For more information about the format of the Data Source key, see [MSKB-313295].</p> <p>For more information about named pipes, see [PIPE].</p>
Encrypt	<p>Specifies whether encryption is used as specified by section 2.2.6.4 of [MS-TDS]. The valid values for this key are "yes" and "no". If the value "yes" is not specified, the value "no" is used.</p> <p>The value of this key MUST be "true", "false", "yes", or "no".</p> <p>A value of "yes" MUST be treated the same as a value of "true".</p> <p>A value of "no" MUST be treated as a value of "false".</p> <p>The default value of this key SHOULD <5> be "false".</p>
Enlist	<p>When the value of this key is set to "true", the connection MUST be automatically enlisted in current transaction context.</p> <p>The value of this key MUST be "true", "false", "yes", or "no".</p> <p>A value of "yes" MUST be treated the same as a value of "true".</p> <p>A value of "no" MUST be treated the same as a value of "false".</p> <p>The default value of this key MAY <6> be "false".</p>
Extended Properties	<p>Synonym of the AttachDBFilename key.</p>

Keyword	Description
Failover Partner<7>	<p>The name of the failover partner server where database mirroring is configured. This parameter is optional.</p> <p>If the value of this key is "", then Initial Catalog MUST be present, and its value MUST NOT be "".</p> <p>The value of this key MUST be a string that has a maximum length of 128 characters.</p> <p>The default value of this key is "".</p>
Initial Catalog	<p>Sets the name of the initial or default database of a data source as specified by the ibDatabase and cchDatabase fields in section 2.2.6.3 of [MS-TDS].</p> <p>The value of this key MUST be a string that has a maximum length of 128 characters.</p> <p>The default value of this key is "".</p> <p>For more information about default databases, see [MSDN-SD].</p>
Initial File Name	Synonym of the AttachDBFilename key.
Integrated Security	<p>Specifies whether a user connects through a user account<8> by using either Kerberos [RFC4120] or another platform-specific authentication process<9> as specified by the fIntSecurity field in section 2.2.6.3 of [MS-TDS].</p> <p>The valid values for this key are "sspi", "yes", "true", "no", or "false".</p> <p>The default value of this key is "false".</p> <p>If the value of this key is "no", the User ID and PWD keys MUST be used to establish a connection with the data source.</p> <p>If the value of this key is "yes", the User ID and PWD keys MUST be ignored; otherwise, the User ID key MUST be specified.</p> <p>The value of this key MUST be "sspi", "true", "false", "yes", or "no".</p> <p>A value of "yes" or "sspi" MUST be treated the same as a value of "true".</p> <p>A value of "no" MUST be treated the same as a value of "false".</p> <p>The default value of this key is "false".</p>
Language	Synonym of the Current Language key.
Load Balance Timeout	Synonym of the Connection Lifetime key.
Max Pool Size	<p>The maximum number of connections that are allowed in the pool.</p> <p>Max Pool Size does not impose any restrictions other than those implied or explicitly stated in this section. Examples of such restrictions can be derived from limitations on available resources or of a targeted system.</p> <p>Valid values MUST be unsigned integers that are greater than or equal to 1. Values that are less than Min Pool Size MUST raise an error.</p> <p>The default value of this key is 100.</p>
Min Pool Size	<p>The minimum number of connections that are allowed in the pool.</p> <p>Valid values MUST be unsigned integers that are greater than or equal to 0. Zero (0) in this field means no minimum connections are initially opened.</p> <p>Values that are greater than Max Pool Size MUST raise an error.</p> <p>The default value of this key is 0.</p>

Keyword	Description
MultipleActiveResultSets<10>	<p>When the value of this key is set to "true", the application MUST maintain multiple active result sets (MARS). When the value of this key is set to "false", the application MUST process or cancel all result sets from one batch before it can execute any other batch on that connection.</p> <p>The value of this key MUST be "true", "false", "yes", or "no".</p> <p>A value of "yes" MUST be treated the same as a value of "true".</p> <p>A value of "no" MUST be treated the same as a value of "false".</p> <p>The default value of this key is "false".</p>
MultiSubnetFailover	<p>The value of this key MUST be "true", "false", "yes", or "no".<11></p> <p>A value of "yes" MUST be treated the same as a value of "true".</p> <p>A value of "no" MUST be treated the same as a value of "false".</p> <p>The default value of this key is "false".</p>
Net	Synonym of the Network Library key.
Network	Synonym of the Network Library key.
Network Address	Synonym of the Data Source key.
Network Library	<p>Specifies the network component used in communication between the client and the data source. The behavior is platform-dependent.</p> <p>The supported values for this key include the following. There are several of these named components (values),<12> each of which implements a specific protocol behavior.</p> <ul style="list-style-type: none"> ▪ dbnmpntw (Named Pipes [MSDN-NETLIB]) ▪ dbmsrpcn (Multiprotocol [MSDN-NETLIB], Windows RPC [MSDN-NETLIB]) ▪ dbmsadsn (Apple Talk [MSDN-NETLIB]) ▪ dbmsgnet (VIA [MSDN-NETLIB]) ▪ dbmslpcn (Shared Memory [MSDN-NETLIB]) ▪ dbmsspxn (IPX/SPX [MSDN-NETLIB]) ▪ dbmssocn (TCP/IP [RFC793]) ▪ Dbmsvinn (Banyan Vines [MSDN-NETLIB]) <p>The corresponding network library MUST be installed in the client system.</p> <p>If a network is not specified to connect to a local server, the shared memory library MUST be used.</p> <p>The default value of this key is "".</p>
Packet Size	<p>Sets the network packet size in bytes (as specified by the PacketSize field in section 2.2.6.3 of [MS-TDS]) to be used for data exchange between the data source object and the database.</p> <p>Valid values MUST be unsigned integers that range from greater than or equal to 512 to less than or equal to 32767.</p> <p>The default packet size is 8000 bytes.</p>

Keyword	Description
Password	<p>Specifies the password associated with User ID.</p> <p>The value of this key MUST be a string that has a maximum length of 128 characters.</p> <p>The default value of this key is "".</p>
Persist Security Info	<p>When the value of this key is set to "false", security-sensitive information, such as the password, MUST NOT be returned as part of the connection if the connection is open or has ever been in an open state.</p> <p>The value of this key MUST be "true", "false", "yes", or "no".</p> <p>A value of "yes" MUST be treated the same as a value of "true".</p> <p>A value of "no" MUST be treated the same as a value of "false".</p> <p>The default value of this key is "false".</p>
PersistSecurityInfo	<p>Synonym of the Persist Security Info key.</p>
Pooling	<p>When the value of this key is set to "true", any newly created connection MUST be added to the pool when closed by the application. In a next attempt to open the same connection, that connection MUST be drawn from the pool.</p> <p>Connections are considered the same if they have the same connection string. Different connections MUST have different connection strings.</p> <p>Connection strings MUST be compared as is.</p> <p>The value of this key MUST be "true", "false", "yes", or "no".</p> <p>A value of "yes" MUST be treated the same as a value of "true".</p> <p>A value of "no" MUST be treated the same as a value of "false".</p> <p>The default value of this key is "true".</p>
PWD	<p>Synonym of the Password key.</p>
Replication	<p>When the value of this key is set to "true", replication MUST be supported using the connection.</p> <p>The value of this key MUST be "true", "false", "yes", or "no".</p> <p>A value of "yes" MUST be treated the same as a value of "true".</p> <p>A value of "no" MUST be treated the same as a value of "false".</p> <p>The default value of this key is "false".</p>
Server	<p>Synonym of the Data Source key.</p>
Timeout	<p>Synonym of the Connection Timeout key.</p>
Transaction Binding	<p>Controls a connection association with an enlisted transaction.</p> <p>The value of this key MUST be one of the following:</p> <ul style="list-style-type: none"> ▪ Transaction Binding=Implicit Unbind ▪ Transaction Binding=Explicit Unbind <p>The Implicit Unbind value MUST cause the connection to detach from the transaction when it ends. After the connection detaches and/or after the transaction ends, additional requests on the connection MUST be committed automatically.</p> <p>The Explicit Unbind value MUST cause the connection to remain attached to the transaction until the connection is closed or if an explicit call to the</p>

Keyword	Description
	SqlConnection.TransactionEnlist(null) method is made. The default value of this key is none.
Trusted Connection	Synonym of the Integrated Security key.
TrustServerCertificate	When the value of this key is set to "true", SSL MUST be used to encrypt the channel URI when bypassing the step of walking the certificate chain to validate trust. The channel MUST NOT be encrypted if TrustServerCertificate is set to "true" and Encrypt is set to "false". The value of this key MUST be "true", "false", "yes", or "no". A value of "yes" MUST be treated the same as a value of "true". A value of "no" MUST be treated the same as a value of "false". The default value of this key is "false".
Type System Version	A string value that indicates the type system that the .NET Framework application expects.<13> When the value of this key is set to "Latest", the latest version that can be handled by the client-server pair MUST be used. This MUST automatically move forward as the client and server components are upgraded.<14> The default value of this key is none.
UID	Synonym of the User ID key.
User	Synonym of the User ID key.
User ID	Specifies the user identification to be used when connecting to the data source. The value of this key MUST be a string that has a maximum length of 128 characters. The default value of this key is "".
User Instance	The value of this key MUST be "true", "false", "yes", or "no".<15> A value of "yes" MUST be treated the same as a value of "true". A value of "no" MUST be treated the same as a value of "false". The default value of this key is "false".
Workstation ID	Sets the workstation identifier as specified by the ibHostName and cchHostName fields in section 2.2.6.3 of [MS-TDS]. The default value is the name of the workstation that is running the ODBC application. The value of this key MUST be a string that has a maximum length of 128 characters. The default value of this key is none.
WSID	Synonym of the Workstation ID key.

3 Structure Examples

The following section contains connection string examples that are based on the **SqlConnectionStringBuilder** structure.

3.1 Trusted Connection

The **Trusted Connection** connection string is expressed as follows.

```
Integrated Security=Yes; Data Source=ServerName; Initial Catalog=DatabaseName;
```

"Integrated Security=Yes" specifies that a user account [<16>](#) is used to establish this connection.

"Data Source=ServerName" specifies that ServerName is the name of the server to which the connection is established.

"Initial Catalog=DatabaseName" specifies that DatabaseName is the name of the data source.

3.2 Standard Security Connection

The **Standard Security Connection** connection string is expressed as follows.

```
Data Source =ServerName;Initial Catalog=DatabaseName; User ID=UserName;  
Password=UserPassword;
```

"User ID=UserName" specifies that UserName is the name of the user who establishes the connection.

"Password=UserPassword" specifies that UserPassword is the password of the user who establishes the connection.

3.3 Named Instance

The named instance connection string is expressed as follows.

```
Data Source= ServerName\InstanceName;Initial Catalog=DatabaseName; Integrated Security=Yes
```

"Data Source=ServerName\InstanceName" specifies that the connection is being established to the named instance InstanceName on the server whose name is ServerName.

The LocalDB named instance connection string is expressed as follows.

```
Data Source= (localdb)\InstanceName;Initial Catalog=DatabaseName; Integrated Security=Yes
```

"Data Source=(localdb)\InstanceName" specifies that the connection is being established to the named instance InstanceName on the LocalDB server.

3.4 SQL Server Express LocalDB Default Instance

The SQL Server Express LocalDB default instance connection string is expressed as follows.

```
Data Source= (localdb)\v11.0;Initial Catalog=DatabaseName; Integrated Security=Yes
```

"Data Source=(localdb)\v11.0" specifies that the connection is being established to the default instance on the SQL Server Express LocalDB server.

3.5 Escaped Single Quote

The **Escaped Single Quote** connection string is expressed as follows.

```
Data Source=ServerName;DATABASE=DatabaseName; Application Name='John''s Application'
```

"Application Name='John''s Application'" specifies that "John's Application" is the name of the application.

4 Security Considerations

4.1 Security Considerations for Implementers

A connection string can contain **credential** information in clear text. .NET Framework applications should [take special care](#) when accessing credential information; whenever possible, .NET Framework applications should avoid passing the credential information in the connection string. Instead, it is recommended that applications use a key such as the **Integrated Security** key in the SqlConnection Connection String structure.

4.2 Index of Security Parameters

The following security parameters for SqlConnection Connection String are described in section [2.2](#).

- Encrypt
- Password
- Integrated Security
- User ID

5 Appendix A: Product Behavior

This document specifies version-specific details in the Microsoft .NET Framework. For information about which versions of .NET Framework are available in each released Windows operating system product or as supplemental software, see [.NET Framework](#).

The information in this specification is applicable to the following Microsoft products or supplemental software. References to product versions include released service packs:

- Microsoft SQL Server 2000
- Microsoft .NET Framework 1.0
- Microsoft .NET Framework 1.1
- Microsoft .NET Framework 2.0
- Microsoft SQL Server 2005
- Windows Vista operating system
- 2007 Microsoft Office system
- Windows Server 2008 operating system
- Microsoft .NET Framework 3.5
- Microsoft SQL Server 2008
- Microsoft SQL Server 2008 Express
- Windows 7 operating system
- Windows Server 2008 R2 operating system
- Microsoft .NET Framework 4.0
- Microsoft SQL Server 2008 R2
- Microsoft Office 2010 system
- Microsoft SQL Server 2012
- Microsoft .NET Framework 4.5
- Windows Server 2012 operating system
- Windows 8 operating system
- Microsoft Office 2013 system
- Windows 8.1 operating system
- Windows Server 2012 R2 operating system
- Microsoft SQL Server 2014

Exceptions, if any, are noted below. If a service pack or Quick Fix Engineering (QFE) number appears with the product version, behavior changed in that service pack or QFE. The new behavior

also applies to subsequent service packs of the product unless otherwise specified. If a product edition appears with the product version, behavior is different in that product edition.

Unless otherwise specified, any statement of optional behavior in this specification that is prescribed using the terms SHOULD or SHOULD NOT implies product behavior in accordance with the SHOULD or SHOULD NOT prescription. Unless otherwise specified, the term MAY implies that the product does not follow the prescription.

<1> [Section 2.2](#): In .NET Framework 4.5, the **Asynchronous Processing** key is ignored.

<2> [Section 2.2](#): A file path that conforms to the format specified in [\[MSDN-FILE\]](#).

<3> [Section 2.2](#): The value of the **Data Source** key can be either the name of a server on the network or the name of a SQL Server Configuration Manager advanced server entry. To specify a named instance of SQL Server, the server name can be specified as ServerName\InstanceName. Otherwise, if InstanceName is omitted, SqlClient connects to the default server. "(Local)" is also a valid name representing a copy of SQL Server that is running on the same computer. SQL Server 2000 does not support multiple instances of SQL Server that run on the same computer.

<4> [Section 2.2](#): In Microsoft implementations, if the value of the **Network** key is specified as "DBNETLIB," the protocol prefixes "tcp:" and "np:" can still be used.

<5> [Section 2.2](#): Even if the **Encrypt** key is set to "false", SqlClient looks at [Software\Microsoft\MSSQLServer\Client\SuperSocketNetLib], and if the value of **Encrypt** is set to "true", the encryption is considered enabled.

<6> [Section 2.2](#): The default value is "true" if the platform is WIN32NT. Otherwise, the default value is "false".

<7> [Section 2.2](#): The **Failover Partner** key is not supported by .NET Framework 1.0 or .NET Framework 1.1.

<8> [Section 2.2](#): In Microsoft implementations, the user account is a Windows user account.

<9> [Section 2.2](#): In Microsoft implementations, NTLM authentication [\[NTLM\]](#) is used when the value of the **Integrated Security** key is "yes".

<10> [Section 2.2](#): The **MultipleActiveResultSets** key is not supported by .NET Framework 1.0 or .NET Framework 1.1.

<11> [Section 2.2](#): When the value of the **MultiSubnetFailover** key is set to "true", SQL Server 2012 and SQL Server 2014 enable fast failover for all AlwaysOn availability groups and failover cluster instances.

<12> [Section 2.2](#): In Microsoft implementations, the behaviors of the values for the various components are described in the following table.

Value	Meaning
DBNMPNTW	The component DBNMPNTW implements the named pipes protocol [PIPE] .
DBMSSOCCN	The component DBMSSOCCN implements the TCP/IP protocol.
DBMSSPXN	The component DBMSSPXN implements the NWLink IPX/SPX protocol.
DBMSRPCN	The component DBMSRPCN implements the Multi-Protocol protocol.

Value	Meaning
DBMSVINN	The component DBMSVINN implements the Banyan Vines protocol.
DBMSADSN	The component DBMSADSN implements the ADSP protocol.
DBMSSHRN	The component DBMSSHRN implements the Shared Memory protocol.
DBMSLPCN	The component DBMSLPCN implements the Shared Memory protocol.
DBNETLIB	The default search order of network component can be used.

If the value specified is not listed above, or if the **Network** key is not specified, the default search order of network component can be used. For more information about the default search order of network component, see [\[MSKB-328383\]](#).

<13> [Section 2.2](#): The value is one of the following:

- **Type System Version**=SQL Server 2000
- **Type System Version**=SQL Server 2005
- **Type System Version**=SQL Server 2008 (Applicable to only .NET Framework 2.0 SP1, .NET Framework 3.5, .NET Framework 4.0, and .NET Framework 4.5)
- **Type System Version**=SQL Server 2012 (Applicable to only .NET Framework 4.5)
- **Type System Version**=Latest

When the value of the **Type System Version** key is set to "SQL Server 2000", SQL Server 2000 is used.

The following conversions are performed when connecting to an instance of SQL Server other than SQL Server 2000:

- XML to NTEXT
- UDT to VARBINARY
- VARCHAR(MAX) to TEXT
- NVARCHAR(MAX) to NEXT

When the value of this key is set to "SQL Server 2005", SQL Server 2005 is used. No conversions are made for the version of the .NET Framework that is running in the context of the application.

<14> [Section 2.2](#): SQL Server 2000, SQL Server 2005, SQL Server 2008, and SQL Server 2008 R2 require that the latest version that can be handled by the client-server pair be used when the **Type System Version** key has a value of "Latest" set. SQL Server 2012 and SQL Server 2014 require that users provide the correct version number.

<15> [Section 2.2](#): The value for the **User Instance** key indicates whether to redirect the connection from the default instance of SQL Server 2008 Express to another connection that is running in the same context of the user.

<16> [Section 3.1](#): In Microsoft implementations, the user account is a Windows user account.

<17> [Section 4.1](#): Connection strings are stored "as is" in memory or in any other persistent media. The application should safeguard any credential information.

6 Change Tracking

This section identifies changes that were made to the [MS-SCCSTR] protocol document between the December 2013 and February 2014 releases. Changes are classified as New, Major, Minor, Editorial, or No change.

The revision class **New** means that a new document is being released.

The revision class **Major** means that the technical content in the document was significantly revised. Major changes affect protocol interoperability or implementation. Examples of major changes are:

- A document revision that incorporates changes to interoperability requirements or functionality.
- The removal of a document from the documentation set.

The revision class **Minor** means that the meaning of the technical content was clarified. Minor changes do not affect protocol interoperability or implementation. Examples of minor changes are updates to clarify ambiguity at the sentence, paragraph, or table level.

The revision class **Editorial** means that the formatting in the technical content was changed. Editorial changes apply to grammatical, formatting, and style issues.

The revision class **No change** means that no new technical changes were introduced. Minor editorial and formatting changes may have been made, but the technical content of the document is identical to the last released version.

Major and minor changes can be described further using the following change types:

- New content added.
- Content updated.
- Content removed.
- New product behavior note added.
- Product behavior note updated.
- Product behavior note removed.
- New protocol syntax added.
- Protocol syntax updated.
- Protocol syntax removed.
- New content added due to protocol revision.
- Content updated due to protocol revision.
- Content removed due to protocol revision.
- New protocol syntax added due to protocol revision.
- Protocol syntax updated due to protocol revision.
- Protocol syntax removed due to protocol revision.

- Obsolete document removed.

Editorial changes are always classified with the change type **Editorially updated**.

Some important terms used in the change type descriptions are defined as follows:

- **Protocol syntax** refers to data elements (such as packets, structures, enumerations, and methods) as well as interfaces.
- **Protocol revision** refers to changes made to a protocol that affect the bits that are sent over the wire.

The changes made to this document are listed in the following table. For more information, please contact dochelp@microsoft.com.

Section	Tracking number (if applicable) and description	Major change (Y or N)	Change type
2.2 Keys and Values	Updated for Microsoft SQL Server 2014.	Y	Content updated.
2.2 Keys and Values	Removed SQL Server 2008 Express from and added SQL Server 2014 to the list of applicable products when the value of the Type System Version key is set to "Latest".	Y	Content updated.
5 Appendix A: Product Behavior	Added SQL Server 2014 to the list of applicable products.	Y	Content updated.

7 Index

A

[Applicability](#) 6

[Values](#) 10
[Versioning](#) 7

C

[Capability negotiation](#) 7
[Change tracking](#) 25

E

[Escaped Single Quote connection string](#) 19

G

[Glossary](#) 4

K

[Keys](#) 10

N

[Named instance connection string](#) 18

O

[Overview](#) 6

P

[Product behavior](#) 21

R

References
[informative](#) 5
[normative](#) 5
[Relationship to other protocols](#) 6

S

Security
[considerations for implementers](#) 20
[parameters](#) 20
[SQL Server Express LocalDB default instance](#) 18
[SqlClient connection string guidelines](#) 9
[SqlClient connection string overview](#) 8
[SqlClient connection string restrictions](#) 10
[Standard Security Connection connection string](#) 18

T

[Tracking changes](#) 25
[Trusted Connection connection string](#) 18

V