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Microsoft SQL Server Connector

Informatica Data Integration - Free & PayGo Microsoft SQL Server Connector
November 2023

Publication Date: 2023-12-12

Table of Contents

Preface

Use *Microsoft SQL Server Connector* to learn how to read from or write to Microsoft SQL Server by using Data Integration. Learn to create a connection, develop mappings, and run mapping and data transfer tasks. You can also learn how to configure SQL ELT optimization to a Microsoft SQL Server database.

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CHAPTER 1

Introduction to Microsoft SQL Server Connector

You can use Microsoft SQL Server Connector to connect to Microsoft SQL Server databases from Data Integration. Use Microsoft SQL Server connector to read data from the Microsoft SQL Server databases.

You can also use a Microsoft SQL Server connection to connect to the following databases:

- Microsoft Azure SQL Database
- Audit-enabled Azure SQL Database and pre-V12 Azure SQL Database
- Azure SQL Database from Secure Agents deployed on Azure virtual machines
- Azure SQL Database managed instance
- Amazon RDS SQL Server and Azure SQL Server private endpoints on virtual networks

You can use Microsoft SQL Server objects as sources in mappings, mapping tasks, and data transfer tasks.

Microsoft SQL Server Connector assets

Create assets in Data Integration to integrate data using Microsoft SQL Server Connector.

When you use Microsoft SQL Server Connector, you can include the following Data Integration assets:

- Data transfer task
- Mapping
- Mapping task

For more information about configuring assets and transformations, see *Mappings*, *Transformations*, and *Tasks* in the Data Integration documentation.

Administration of Microsoft SQL Server Connector

You can use Kerberos authentication to connect to Microsoft SQL Server databases by placing the required configuration files on the Secure Agent machine.

To connect to Microsoft SQL Server databases using Kerberos authentication, see "Kerberos authentication" on page 7.

Kerberos authentication

You can use Kerberos authentication to connect to Microsoft SQL Server databases by placing the required configuration files on the Secure Agent machine. You can also use Kerberos authentication to connect to SSL-enabled Microsoft SQL Server databases.

When you configure Kerberos authentication to connect to Microsoft SQL Server, consider the following guidelines:

- You can't use the Hosted Agent.
- Ensure that the Secure Agent and database server that you use are registered in the KDC server.
- You can't add more than one KDC to a krb5.conf file.
- You can't generate a credential cache file for more than one Kerberos principal user.

Configuring Kerberos authentication

Before you use Kerberos authentication to connect to Microsoft SQL Server on Linux or Windows, the organization administrator needs to perform the prerequisite tasks.

1. To configure the Java Authentication and Authorization Service configuration file (JAAS), perform the following tasks:
   a. Create a JAAS configuration file on the Secure Agent machine.
   b. Add the following entries to the JAAS configuration file:

```
JDBC_DRIVER_01 {
com.sun.security.auth.module.Krb5LoginModule required useTicketCache=true;
};
```

2. To configure the `krb5.conf` file, perform the following tasks:
   a. Create a `krb5.conf` file on the Secure Agent machine.
   b. Add the details of the Key Distribution Center (KDC) and admin server to the `krb5.conf` file in the following format:

```
[libdefaults]
default_realm = <Realm name>
forwardable = true
ticket_lifetime = 24h

[realms]
<REALM NAME> = {
kdc = <Location where KDC is installed>
admin_server = <Location where KDC is installed>
                                    }
 [domain_realm]
<domain name or host name> = <Domain name or host name of Kerberos>
<domain name or host name> = <Domain name or host name of Kerberos>
```

3. Set the following environment variables on the Secure Agent machine.
   For more information about the required environment variables, see "Setting environment variables" on page 8.
4. Restart the Secure Agent.
5. To generate the credential cache file on the Secure Agent machine and use Kerberos authentication to connect to Microsoft SQL Server, perform the following tasks:
   a. On the Secure Agent machine, run the following command and specify the Microsoft SQL Server user name and realm name:

```
Kinit <user name>@<realm_name>
```

b. When prompted, enter the password for the Kerberos principal user.

Setting environment variables

To use Kerberos authentication to connect to Microsoft SQL Server, you need to set the required environment variables on the Secure Agent machine.

Set the following environment variables:

- `setenv KRB5CCNAME <Absolute path and file name of the credentials cache file>`
- `setenv KRB5_CONFIG <Absolute path of the Kerberos configuration file>\krb5.conf`
- `setenv JAASCONFIG <Absolute path of the JAAS config file>\<File name>.conf`
- `setenv KRB5CONFIG <Absolute path of the Kerberos configuration file>\krb5.conf`

After you set the environmental variables, you need to restart the Secure Agent.

Alternatively, you can add the environment variables when you create a Microsoft SQL Server connection.

To add the environment variables when you configure a connection and use Kerberos authentication, you need to add the *KRB5CONFIG*, *KRB5CCNAME*, and *JAASCONFIG* properties in the **Metadata Advanced Connection Properties** field in a Microsoft SQL Server connection.

For example, add the properties in the following format:

```
KRB5CONFIG=<Absolute path of the Kerberos configuration file>
\krb5.conf;KRB5CCNAME=<Absolute path of the credential cache file>/<File
name>;JAASCONFIG=<Absolute path of the JAAS config file>\<File name>.conf
```

Note: Ensure that you separate each key-value pair with a semicolon.

CHAPTER 2

Microsoft SQL Server connections

Create a Microsoft SQL Server connection to connect to Microsoft SQL Server so that the Secure Agent can read data from Microsoft SQL Server. You can also use a Microsoft SQL Server connection to connect to Microsoft Azure SQL Database.

You create a Microsoft SQL Server connection on the **Connections** page. Use the connection when you create the mappings, mapping tasks, and data transfer tasks.

Microsoft SQL Server connection properties

When you set up a Microsoft SQL Server connection, configure the connection properties.

The following table describes the Microsoft SQL Server connection properties:

Property	Description
Connection Name	Name of the connection. Each connection name must be unique within the organization. Connection names can contain alphanumeric characters, spaces, and the following special characters: _ . + -, Maximum length is 255 characters.
Description	Description of the connection. Maximum length is 4000 characters.
Type	Type of connection. Select SQL Server from the list.
Runtime Environment	The name of the runtime environment where you want to run the tasks. Specify a Secure Agent or a Hosted Agent.
SQL Server Version	Microsoft SQL Server database version.

Property	Description
Authentication Mode	Authentication method to access Microsoft SQL Server. Select one of the following methods: - SQL Server Authentication. Uses your Microsoft SQL Server user name and password to access Microsoft SQL Server. - Windows Authentication (Deprecated). Uses the Microsoft Windows authentication to access Microsoft SQL Server. This option is available when you access Data Integration by using Microsoft Windows. When you choose this option, you don't need to enter credentials to access Microsoft SQL Server and ensure that the user account that starts the Secure Agent service is available in the Microsoft SQL Server database. **Note:** Windows authentication is not certified for Microsoft SQL Server 2017 version hosted on Linux. - Active Directory Password. Uses the Azure Active Directory user name and password to authenticate and access the Microsoft Azure SQL Database. - Windows Authentication v2. Uses this authentication method to access Microsoft SQL Server from Data Integration using the agent hosted on a Linux or Windows machine. When you choose this option on Linux, enter your domain name and Microsoft Windows credentials to access Microsoft SQL Server. When you choose this option on Windows, the agent uses the user credentials specified in the connection only to test the connection. During runtime, the agent uses the credentials of the user who started the Secure Agent service. Ensure that the user account that starts the Secure Agent service is available in the Microsoft SQL Server database. - Kerberos. Uses Kerberos authentication to connect to Microsoft SQL Server. When you choose this option on Windows, ensure that the user account that starts the Secure Agent service is available in the Microsoft SQL Server database. You don't need to enter your credentials to access Microsoft SQL Server. **Note:** You can't configure the Kerberos authentication when you use a Hosted Agent.
Domain	Applies to Windows Authentication v2. The domain name of the Windows user.
User Name	User name for the database login. The user name can't contain a semicolon. To connect to Microsoft Azure SQL Database, specify the user name in the following format: `username@host` If you use Windows Authentication v2 on Windows, the user name is used as follows: - During design time, the agent uses the user name specified here to test the connection. - During runtime, the Microsoft SQL server driver ignores the user name specified in this field and uses the credentials of the user who started the Secure Agent service. If you use Windows Authentication v2 on Linux, the user name specified here is used both during design time and runtime. **Note:** This property is not applicable if you use the Windows Authentication mode to access Microsoft SQL Server.
Password	Password for the database login. The password can't contain a semicolon. If you use Windows Authentication v2 on Windows, the password is used as follows: - During design time, the agent uses the password specified here to test the connection. - During runtime, the Microsoft SQL server driver ignores the password specified in this field and uses the credentials of the user who started the Secure Agent service. If you use Windows Authentication v2 on Linux, the password specified here is used both during design time and runtime. **Note:** This property is not applicable if you use the Windows Authentication mode to access Microsoft SQL Server.

Property	Description
Host	Name of the machine hosting the database server. To connect to Microsoft Azure SQL Database, specify the fully qualified host name. For example, `vmjcmwxsfboheng.westus.cloudapp.azure.com`.
Port	Network port number used to connect to the database server. Default is 1433.
Instance Name	Instance name of the Microsoft SQL Server database.
Database Name	Database name for the Microsoft SQL Server target connection. Database name is case-sensitive if the database is case-sensitive. Maximum length is 100 characters. Database names can include alphanumeric and underscore characters.
Schema	Schema used for the target connection.
Code Page	The code page of the database server.
Encryption Method	The method that the Secure Agent uses to encrypt the data sent between the driver and the database server. You can use the encryption method to connect to Microsoft Azure SQL Database. Default is None.
Crypto Protocol Version	Cryptographic protocols to use when you enable SSL encryption.
Validate Server Certificate	When set to True, Secure Agent validates the certificate that is sent by the database server. If you specify the HostNameInCertificate parameter, Secure Agent also validates the host name in the certificate. When set to false, the Secure Agent doesn't validate the certificate that is sent by the database server.
Trust Store	The location and name of the truststore file. The truststore file contains a list of Certificate Authorities (CAs) that the driver uses for SSL server authentication.
Trust Store Password	The password to access the contents of the truststore file.
Host Name in Certificate	Host name of the machine that hosts the secure database. If you specify a host name, the Secure Agent validates the host name included in the connection with the host name in the SSL certificate.
Metadata Advanced Connection Properties	Additional properties for the JDBC driver to fetch the metadata. If you specify more than one property, separate each key-value pair with a semicolon.
Runtime Advanced Connection Properties	Additional properties for the ODBC driver to run mappings. If you specify more than one property, separate each key-value pair with a semicolon.

CHAPTER 3

Mappings and mapping tasks with Microsoft SQL Server Connector

Use the Data Integration Mapping Designer to create a mapping. When you create a mapping, you configure a source to represent a Microsoft SQL Server object.

Describe the flow of data from source and target along with the required transformations before the agent writes data to the target. When you create a mapping task, select the mapping that you want to use. Use the Mapping Task wizard to create a mapping task. Validate and run the mapping to read data from sources and write to a target. The mapping task processes data based on the data flow logic you define in the mapping.

Microsoft SQL Server sources in a mapping

To read data from a Microsoft SQL Server database, configure a Microsoft SQL Server object as the Source transformation in a mapping. You can use the source or full SQL ELT optimization to read data from Microsoft SQL server.

Specify the name and description of the Microsoft SQL Server source. Configure the source, query options, and advanced properties for the source object.

The following table describes the source properties that you can configure for a Microsoft SQL Server source:

Property	Description
Connection	Name of the source connection. You can select an existing connection, create a new connection, or define parameter values for the source connection property. If you want to overwrite the source connection properties at runtime, select the **Allow parameter to be overridden at run time** option. Specify the parameter file directory and name in the advanced session properties.
Source Type	Type of the Microsoft SQL Server source object available. You can choose from the following source types: - Single - Multiple - Query - Parameter
Parameter	A parameter file where you define values that you want to update without having to edit the task. Select an existing parameter for the source object or click **New Parameter** to define a new parameter for the source object. The **Parameter** property appears only if you select parameter as the source type. If you want to overwrite the parameter at runtime, select the **Allow parameter to be overridden at run time** option. When the task runs, the Secure Agent uses the parameters from the file that you specify in the advanced session properties.
Object	Name of the Microsoft SQL Server source object.
Filter	Configure a simple filter or an advanced filter to remove rows at the source. You can improve efficiency by filtering early in the data flow. A simple filter includes a field name, operator, and value. Use an advanced filter to define a more complex filter condition, which can include multiple conditions using the AND or OR logical operators.
Sort	Select the fields and type of sorting to use. To sort data for a parameterized source, you must use a parameter for the sort options.
Select distinct rows	Select this option to extract only distinct rows.

The following table describes the advanced source properties that you can configure for a Microsoft SQL Server source:

Property	Description
Tracing level	Amount of detail that appears in the log for this transformation. You can choose terse, normal, verbose initialization, or verbose data. Default is normal.
Pre SQL	Pre-SQL command that must be run before reading data from the source.
Post SQL	Post-SQL command that must be run after reading data from the source.

Property	Description
Output is Deterministic	Relational source or transformation output that does not change between session runs when the input data is consistent between runs. When you configure this property, the Secure Agent does not stage source data for recovery if transformations in the pipeline always produce repeatable data.
Output is repeatable	Relational source or transformation output that is in the same order between session runs when the order of the input data is consistent. When output is deterministic and output is repeatable, the Secure Agent does not stage source data for recovery.
SQL Override	The SQL statement to override the default query generated from the specified source type to read data from the Microsoft SQL Server source.

Microsoft SQL Server targets in a mapping

To write data to a Microsoft SQL Server database, configure a Microsoft SQL Server object as the Target transformation in a mapping. You can use the full SQL ELT optimization to write data to Microsoft SQL Server.

Specify the name and description of the Microsoft SQL Server target. Configure the target and advanced properties for the target object.

The following table describes the target properties that you can configure for a Microsoft SQL Server target:

Property	Description
Connection	Name of the target connection. You can select an existing connection, create a new connection, or define parameter values for the target connection property. If you want to overwrite the target connection properties at runtime, select the **Allow parameter to be overridden at run time** option.
Target Type	Type of the Microsoft SQL Server target object available. You can choose from the following source types: - Single - Parameter
Parameter	A parameter file where you define values that you want to update without having to edit the task. Select an existing parameter for the target object or click **New Parameter** to define a new parameter for the target object. The **Parameter** property appears only if you select parameter as the target type. If you want to overwrite the target object at runtime, select the **Allow parameter to be overridden at run time** option. When the task runs, the Secure Agent uses the parameters from the file that you specify in the advanced session properties.
Target Object	Name of the Microsoft SQL Server target object based on target type selected. Specify the target object that you want to create at run time. You can also select an existing object from the list.

Property	Description
Operation	Select the target operation. You can perform the following operations on a Microsoft SQL Server target: - Insert - Update - Upsert - Delete - Data Driven
Truncate target	When you enable the **Truncate Target** option, the Secure Agent truncates the table before running the task. Default is not selected.
Enable Target Bulk Load	Uses Microsoft SQL Server bulk API to insert data in bulk mode. When you create a mapping task, you can use the Microsoft SQL Server bulk API to perform insert operation.
Pre SQL	Pre-SQL command to run against the target database before writing data to the target.
Post SQL	Post-SQL command to run against the target database after writing data to the target.
Update Override	An update SQL statement that updates the data in a Microsoft SQL Server target table. The update SQL statement you specify overrides the default update statements that the Secure Agent generates to update the target based on key columns. You can define an update override statement to update target tables based on both key or non-key columns. In the override statement, you must enclose all reserved words in quotation marks.

If you select the **Forward Rejected Rows** option, the Secure Agent flags the rows for reject and writes them to the reject file. If you do not select the **Forward Rejected Rows** option, the Secure Agent drops rejected rows and writes them to the session log file. The Secure Agent does not write the rejected rows to the reject file.

Configuring an update override for the target

To override the default update SQL statement that the Secure Agent generates, you can specify an SQL statement in the **Update Override** field of the advanced target properties.

1. Next to the **Update Override** field, click **Configure**.
2. In the **Update Override SQL Editor** dialog box, enter the update SQL statement that the Secure Agent must use.
3. Click **Generate SQL** to generate an SQL query.
4. Click **Format SQL** to format the SQL query you entered.

   You can modify the generated SQL query in the SQL editor based on your requirement.
5. Click **OK**.

Microsoft SQL Server lookups in mapping

You can create lookups for objects using a Microsoft SQL Server connection. You can retrieve data from a Microsoft SQL Server lookup object based on the specified lookup condition.

When you configure a lookup in Microsoft SQL Server, you select the lookup connection and lookup object.

Note: You can't configure a Lookup transformation in a data transfer task.

The following table describes the Microsoft SQL Server lookup object properties that you can configure in a Lookup transformation:

Property	Description
Connection	Name of the lookup connection. You can select an existing connection, create a new connection, or define parameter values for the lookup connection property. If you want to overwrite the lookup connection properties at runtime, select the **Allow parameter to be overridden at run time** option. Specify the parameter file directory and name in the advanced session properties.
Source Type	Type of the Microsoft SQL Server lookup object available. Select one of the following lookup object types: - Single Object - Query - Parameter When the lookup source is large, you can use a custom query to reduce the number of columns to query.
Parameter	A parameter file where you define values that you want to update without having to edit the task. Select an existing parameter for the lookup object or click **New Parameter** to define a new parameter for the lookup object. The **Parameter** property appears only if you select parameter as the source type. If you want to overwrite the parameter at runtime, select the **Allow parameter to be overridden at run time** option. When the task runs, the Secure Agent uses the parameters from the file that you specify in the advanced session properties.
Lookup Object	Name of the Microsoft SQL Server lookup object.
Multiple Matches	The behavior when the lookup condition returns multiple matches. You can select one of the following options: - Return first row - Return last row - Return any row - Return all rows - Report error
SQL Override	The SQL statement to override the default query that creates lookup data from a Microsoft SQL Server source.

Microsoft SQL Server mapping task example

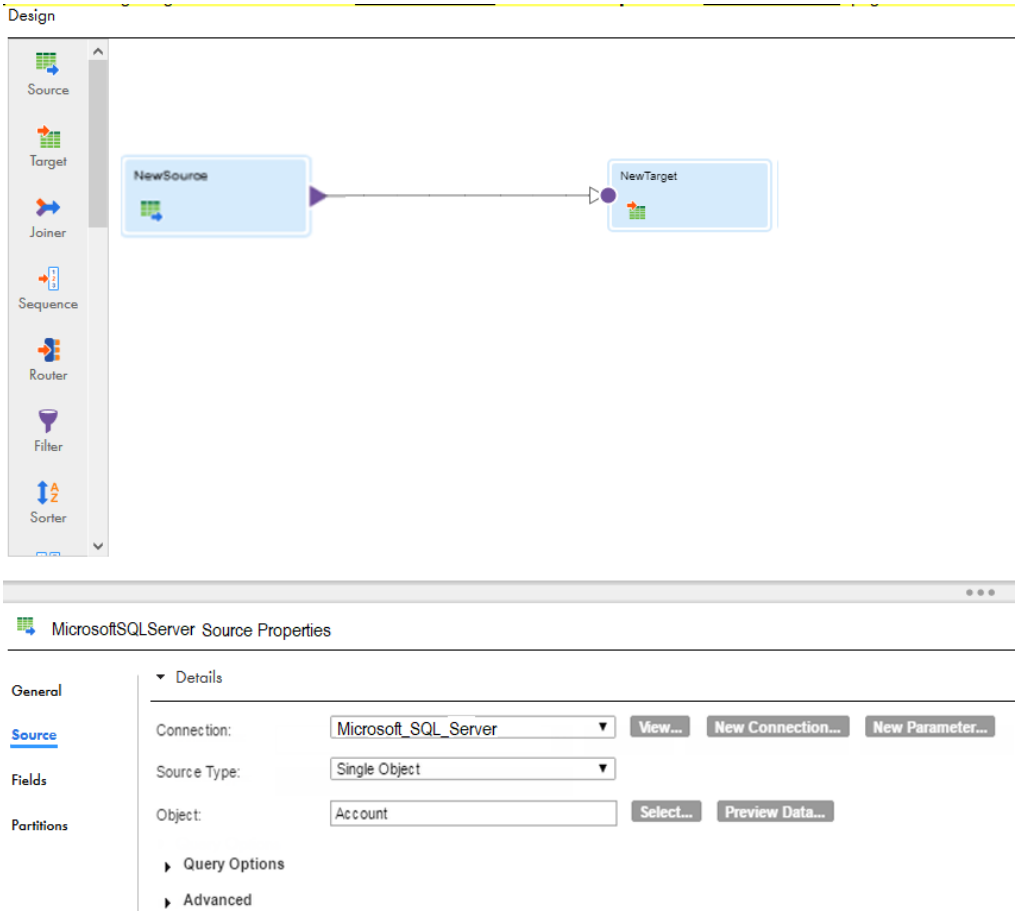
You can create a mapping task to read data from a Microsoft SQL Server source and write data to the Microsoft SQL Server target.

Perform the following task to create a mapping task:

1. In Data Integration, click **New** > **Mapping** > **Create** .

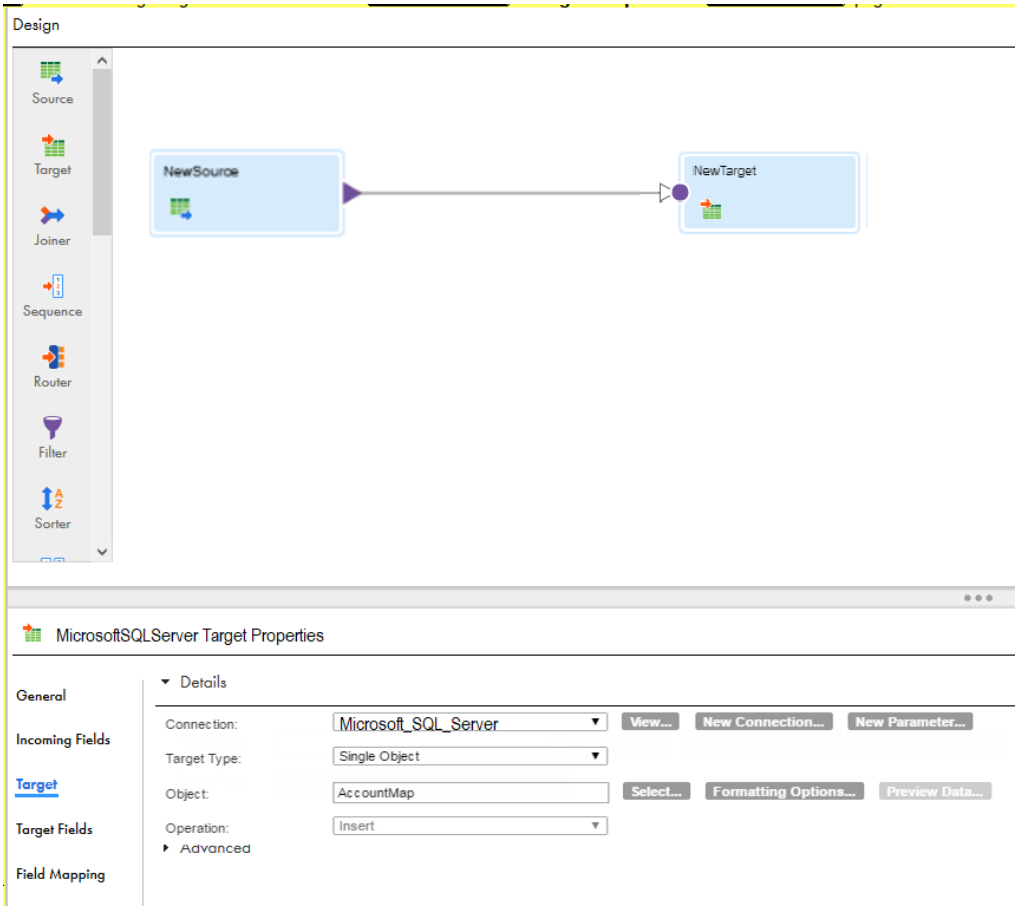
2. To configure the source properties and the advanced source properties, select **Source** from the selection panel under the **Design** section.

   The following image shows details of the **Source Properties** page:



3. To configure the target properties and the advanced target properties, select **Target** from the selection panel under the **Design** section.

The following image shows details of the **Target Properties** page:



4. Map the source and target.

5. Click **Save** > **Run**.

   In Monitor, you can monitor the status of the logs after you run the task.

Rules and guidelines for Microsoft SQL Server tasks

Consider the following rules and guidelines when you configure a task:

- When you use a custom or saved query in a task and the query contains * instead of a column list, NULL values are returned. You must use a column list instead of * in the query.
- When the source column name that you read has hyphens and you use the **Create New at Runtime** option to create a target, the hyphens in the table name are converted to underscores in the target column.

SQL ELT optimization

When you read data from a Microsoft SQL Server source, transform the data, and write the data to a target, you can configure SQL ELT optimization to push the transformation logic to the source or target database system. If the source and target databases are the same, you can configure full SQL ELT optimization for improved performance.

When the Secure Agent applies SQL ELT optimization, it pushes transformation logic to a database. The Secure Agent translates the transformation logic into SQL queries and sends the SQL queries to the database. The database runs the SQL queries to process the transformations.

SQL ELT optimization improves mapping performance when the database can process the transformation logic faster than the Secure Agent. The Secure Agent also reads less data from the database.

The amount of transformation logic that the Secure Agent pushes to the database depends on the database, the transformation logic, and the mapping task. The Secure Agent processes all transformation logic that it cannot push to a database.

When you configure SQL ELT optimization for the mapping, the Secure Agent analyzes the optimized mapping from the source to the target or until it reaches a downstream transformation that it cannot push to the source database. The Secure Agent generates and executes a SELECT statement for each source that has transformation logic pushed down. Then, it reads the results of this SQL query and processes the remaining transformations in the mapping.

Full SQL ELT optimization is enabled by default in mapping tasks.

The Secure Agent can push the following transformation logic to a Microsoft SQL Server source:

Transformations	Supported SQL ELT optimization Type
Aggregator	Source, Full
Expression	Source, Full
Filter	Source, Full
Joiner	Source, Full
Sorter	Source, Full
Union	Source, Full
Router	Full

Full SQL ELT optimization

When the Secure Agent applies full SQL ELT optimization, it pushes all the transformation logic in the mapping to the target database.

Full SQL ELT optimization is enabled by default in mapping tasks.

Source SQL ELT optimization

When the Secure Agent applies source SQL ELT optimization, it analyzes the mapping from source to target or until it reaches a downstream transformation it cannot push to the source database.

The Secure Agent generates and executes a SELECT statement based on the transformation logic for each transformation it can push to the database. Then, it reads the results of this SQL query and processes the remaining transformations.

You can configure a mapping to use source SQL ELT optimization if the source and target reside in different databases. For example, if a mapping contains a Microsoft SQL Server source and an Oracle target, you can configure source SQL ELT optimization to push some transformation logic for processing to the Microsoft SQL Server source.

SQL ELT optimization functions

When you use SQL ELT optimization, the Secure Agent converts the expression in the transformation by determining equivalent functions in the database. If there is no equivalent function in the database, the Secure Agent processes the transformation logic.

The following table summarizes the availability of SQL ELT optimization functions in Microsoft SQL Server:

Functions	SQL ELT optimization Type
ABS()	Source, Full
ADD_TO_DATE()	Full
ASCII() [1]	Full
AVG()	Source, Full
CEIL() [1]	Full
CHR()	Full
CONCAT() [1]	Full
COS()	Source, Full
COSH()	Full
COUNT()	Source, Full
DATE_COMPARE()	Source, Full
DATE_DIFF()[2]	Full
DECODE()	Source, Full
EXP()	Source, Full
FIRST()	Full
FLOOR() [1]	Full

Functions	SQL ELT optimization Type
GET_DATE_PART()	Full
IIF()	Source, Full
IN()	Source, Full
INSTR()	Full
IS_DATE()[2]	Full
IS_NUMBER()[2]	Full
ISNULL()	Source, Full
LAST_DAY()[2]	Full
LENGTH() [1]	Full
LN()	Full
LOG()	Full
LOWER()	Source, Full
LPAD()[2]	Full
LTRIM() [1]	Full
MAX()	Source, Full
MIN()	Source, Full
MD5() [2]	Source, Full
MOD() [1]	Full
POWER()	Source, Full
REPLACECHR()[2]	Full
REPLACESTR()[2]	Full
ROUND(NUMBER)	Full
RTRIM() [1]	Full
SIGN()	Full
SIN()	Source, Full
SINH()	Full
SOUNDEX()	Full

Functions	SQL ELT optimization Type
SQRT()	Source, Full
STDDEV()	Full
SUBSTR()	Full
SUM()	Source, Full
SYSTIMESTAMP() [1]	Full
TAN()	Source, Full
TANH()	Full
TO_BIGINT	Full
TO_CHAR(DATE) [1]	Full
TO_CHAR(NUMBER) [1]	Full
TO_DATE()	Full
TO_DECIMAL()	Full
TO_FLOAT()	Full
TO_INTEGER()	Full
TO_NUMBER()	Full
TRUNC(NUMBER)	Full
UPPER()	Source, Full
VARIANCE()	Full
[1]Applies also in Expression transformations for mappings enabled with source SQL ELT optimization. [2]Applies only in an Expression transformation.	

SQL ELT optimization variables

When you use SQL ELT optimization, the Secure Agent converts the expression in the transformation by determining equivalent variables in the database. If there is no equivalent variable in the database, the Secure Agent processes the transformation logic.

The following table summarizes the availability of SQL ELT optimization variables in Microsoft SQL Server:

Variables	SQL ELT optimization Type
SESSSTARTTIME	Full
SYSDATE	Full

Configuring SQL ELT optimization

To optimize a mapping, add the mapping to a task, and then configure SQL ELT optimization in the mapping task. Full SQL ELT optimization is enabled by default in mapping tasks.

1. In the **Schedule** tab of the Mapping task, navigate to the **SQL ELT Optimization** section.
2. From the **SQL ELT Optimization** list, select the required type of SQL ELT optimization.

Rules and guidelines for SQL ELT optimization

Consider the following rules and guidelines when you configure SQL ELT optimization for a Microsoft SQL Server mapping:

- When you push transformation logic to the database, ensure that the database has enough resources to process the queries faster. Otherwise, there could be a performance degradation.
- If the following transformation or mapping conditions is true, the Secure Agent processes a logic instead of pushing it to the database:
  - The transformation contains a variable port.
  - The transformation is not a Sorter transformation, Union transformation, or target in a mapping.
  - The transformation downstream from a Sorter or Union transformation, or contains a distinct sort.
  - A configured mapping task to override the default values of input or output ports.
  - The database does not have an equivalent operator, variable, or function to use in an expression in the transformation.
  - The mapping contains too many branches. The Secure Agent can't generate an SQL query for a mapping that contains more than 64 two-way branches, 43 three-way branches, or 32 four-way branches. If the number of branches exceeds these limitations, the Integration Service processes the downstream transformations.
  - A mapping task to log row errors.

Consider the following rules and guidelines when you configure full SQL ELT optimization for a Microsoft SQL Server mapping:

- You can't push the LTRIM(), RTRIM(), or MOD() function that contains more than one argument.
- To push the MOD() function to the Microsoft SQL Server database, the argument that you pass must be of the Integer date type.
- When you push the INSTR() function, you can only define string, search_value, and start arguments.

Consider the following rules and guidelines when you use an Expression transformation in a Microsoft SQL Server mapping enabled with full SQL ELT optimization:

- When you push the IS_DATE() function that contains the Text or Ntext data type, the IS_DATE() function returns 0.
- When you push the IS_DATE() and IS_NUMBER() functions and the values in the argument contain NULL, the functions return 0.
- You can't get a case-sensitive return value for the REPLACECHR() or REPLACESTR() functions.
- When you push the MD5() function that contains the nchar data type, the function returns a different value for the nchar data type as compared to a mapping that runs without SQL ELT optimization.
- To get the same return value for the nchar and char data types when you push the MD5() function, enter the `ConvertToVarcharForMD5InPDO=Yes` property in the mapping task.

- When you push the LPAD() function that contains the second_string argument, the function truncates the second string from left to right.
  For example, for the LPAD('Infa',9,'RELATIONAL CONNECTIVITY') expression, the function returns the following value: IVITYInfa
- When you push the DATE_DIFF() function that contains the date1 and date2 arguments, the function returns the following different values as compared to a mapping that runs without SQL ELT optimization:
  - The function returns a negative number when the value of date1 is later than the value of date2.
  - The function returns a positive number when the value of date1 is earlier than the value of date2.

CHAPTER 4

Data type reference

Data Integration uses the following data types in mappings and mapping tasks with Microsoft SQL Server:

Microsoft SQL Server native data types

Microsoft SQL Server data types appear in the source transformations when you choose to edit metadata for the fields.

Transformation data types

Set of data types that appear in the transformations. They are internal data types based on ANSI SQL-92 generic data types, which the Secure Agent uses to move data across platforms. Transformation data types appear in all transformations in a mapping.

When Data Integration reads source data, it converts the native data types to the comparable transformation data types before transforming the data.

Microsoft SQL Server and transformation data types

The following table lists the Microsoft SQL Server data types that Data Integration supports and the corresponding transformation data types:

Microsoft SQL Server Data Type	Description	Transformation Data Type	Description
Bigint	-9223372036854775808 to 9223372036854775807	Bigint	-9223372036854775808 to 9223372036854775807 Precision 19, Scale 0
Binary	1 to 8000 characters	Binary	1 to 104857600 bytes Precision 1 to 8000
Bit	0 to 1	Integer	0 to 1 Precision 10, Scale 0
Char	1 to 8000 characters	String	1 to 104857600 characters
Date	0001-01-01 to 9999-12-31	Date/Time	0001-01-01 to 9999-12-31 Precision 29, Scale 9

Microsoft SQL Server Data Type	Description	Transformation Data Type	Description
Datetime	**Date range**: January 1, 1753 to December 31, 9999 **Time range**: 00:00:00 to 23:59:59.997 Precision 23, scale 3	Date/Time	**Date range**: 0001-01-01 to 9999-12-31 **Time range**: 00:00:00 to 23:59:59.9999999 Precision 29, Scale 9
Datetime2	**Date range**: 0001-01-01 to 9999-12-31 **Time range**: 00:00:00 to 23:59:59.9999999 Precision 27, scale 7	Date/Time	**Date range**: 0001-01-01 to 9999-12-31 **Time range**: 00:00:00 to 23:59:59.9999999 Precision 29, Scale 9
Decimal(P,S)	Precision 1 to 28, Scale 0 to 28	Decimal	Precision 1 to 28, Scale 0 to 28
Float	-1.79E+308 to 1.79E+308	Double	Precision 15, Scale 0
Int	-2147483648 to 2147483647	Integer	-2147483648 to 2147483647 Precision 10, Scale 0
Money	-922337203685477.5808 to 922337203685477.5807	Decimal	-922337203685477.5808 to 922337203685477.5807 Precision 19, Scale 4
Nchar	1 to 4000 characters	String	1 to 104857600 characters
Ntext	1 to 1073741823 bytes	Text	1 to 104857600 characters Default is 32000
Numeric(P,S)	Precision 1 to 28, Scale 0 to 28	Decimal	Precision 1 to 28, Scale 0 to 28
Nvarchar	1 to 4000 characters	String	1 to 104857600 characters
Real	-3.40E+38 to 3.40E+38	Decimal	Precision 7, Scale 0
Smalldatetime	**Date range**: 1900-01-01 to 2079-06-06 **Time range**: 00:00:00 to 23:59:59	Date/Time	**Date range**: 0001-01-01 to 9999-12-31 **Time range**: 00:00:00 to 23:59:59.9999999 Precision 29, Scale 9
Smallint	-32768 to 32767	Integer	-32768 to 32767 Precision 10, Scale 0
Smallmoney	-214748.3648 to 214748.3647	Decimal	-214748.3648 to 214748.3647 Precision 10, Scale 4
Text	1 to 2147483647 bytes	Text	1 to 104857600 characters Default is 32000

Microsoft SQL Server Data Type	Description	Transformation Data Type	Description
Time	00:00:00.0000000 to 23:59:59.9999999	Date/Time	**Date range**: 0001-01-01 to 9999-12-31 **Time range**: 00:00:00 to 23:59:59.9999999 Precision 29, Scale 9
Tinyint	0 to 255	Integer	0 to 255 Precision 10, Scale 0
Varbinary	1 to 8000 characters	Binary	1 to 104857600 bytes Precision 1 to 8000
Varchar	1 to 8000 characters	String	1 to 104857600 characters

INDEX