



Informatica® Data Integration - Free & PayGo

Amazon Redshift V2 Connector

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Preface

Use *Amazon Redshift Connectors* to learn about the *Amazon Redshift V2 Connector*. Use Amazon Redshift V2 Connector to learn to create a connection, develop mappings, and run mapping tasks in Data Integration.

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CHAPTER 1

Introduction to Amazon Redshift V2 Connector

You can use Amazon Redshift V2 Connector to securely read data from and write data to Amazon Redshift. Amazon Redshift V2 sources and targets represent records in Amazon Redshift.

You can create an Amazon Redshift V2 connection and use the connection in mappings and mapping tasks.

Create a mapping task to process data based on the data flow logic defined in a mapping or integration template. You can also create a mapping task to capture changed data from an Oracle CDC source and write the changed data to an Amazon Redshift target table.

When you run an Amazon Redshift V2 mapping or mapping task, the Secure Agent writes data to Amazon Redshift based on the workflow and Amazon Redshift V2 connection configuration. The Secure Agent connects and writes data to Amazon Simple Storage Service (Amazon S3) through a TCP/IP network. Amazon S3 is a storage service in which you can copy data from a source and simultaneously move data to Amazon Redshift clusters. The Secure Agent issues a copy command that copies data from Amazon S3 to the Amazon Redshift target table.

Amazon Redshift V2 Connector assets

Create assets in Data Integration to integrate data using Amazon Redshift V2 Connector.

When you use Amazon Redshift V2 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.

Introduction to Amazon Redshift

Amazon Redshift is a cloud-based petabyte-scale data warehouse service that organizations can use to analyze and store data.

Amazon Redshift uses columnar data storage, parallel processing, and data compression to store data and to achieve fast query execution. Amazon Redshift uses a cluster-based architecture that consists of a leader node and compute nodes. The leader node manages the compute nodes and communicates with the external client programs. The leader node interacts with the client applications and communicates with compute nodes. A compute node stores data and runs queries for the leader node. Any client that uses a PostgreSQL driver can communicate with Amazon Redshift.

Amazon Redshift Spectrum overview

Amazon Redshift Spectrum enables you to run complex Amazon Redshift SQL queries on a large amount of data of different formats stored in Amazon S3. With Amazon Redshift Spectrum, you can directly run queries to read Amazon S3 data files without the need to load or transform the data.

You can run queries for the large amount of Amazon S3 data files without the need to scale the specified Amazon Redshift cluster.

Amazon Redshift Spectrum resides on Amazon Redshift servers independent of the Amazon Redshift cluster. When you run queries using Amazon Redshift Spectrum, the queries run faster and use less Amazon Redshift cluster processing capacity as Amazon Redshift Spectrum pushes all the compute-intensive tasks to the Amazon Redshift Spectrum layer.

External schema and external table

To use Amazon Redshift Spectrum, you must create an external table within an external schema that references a database in an external data catalog. You can create the external table for Avro, ORC, Parquet, RCFile, SequenceFile, and Textfile file formats.

The metadata of the external database and external table are stored in the external data catalog. You must provide Amazon Redshift authorization to access the data catalog and the data files in Amazon S3.

You can create an external database in Amazon Redshift. You can read data from a single external table, multiple external table, or from a standard Amazon Redshift table that is joined to the external table.

Multiple Amazon Redshift clusters can contain multiple external tables. You can run a query for the same data on Amazon S3 from any Amazon Redshift cluster in the same region. When you update the data in Amazon S3, the data is immediately available in all the Amazon Redshift clusters.

When you create an external table, you must specify the Amazon S3 location from where you want to read the data. You can create the external tables by defining the structure of the Amazon S3 data files and registering the external tables in the external data catalog. Then, you can run queries or join the external tables.

When you add an external table as source and create a mapping, the external table name is displayed in the `spectrum_schemaname` format in the **Select Source Object** dialog box.

When you create an external table using Athena or Glue data catalogs, ensure that you create the external tables using the data types that Amazon Redshift V2 Connector supports.

The following lists the data types that Amazon Redshift V2 Connector supports when you create an external table:

- Bigint (INT8)
- Boolean (BOOL)
- Char (CHARACTER)
- Date

Note: Applicable when you create an external table for the ORC, Parquet, and Textfile file formats.

- Decimal (NUMERIC)
- Double Precision (FLOAT8)
- Integer (INT, INT4)
- Real (FLOAT4)
- Smallint (INT2)
- Timestamp
- Varchar (CHARACTER VARYING)

Rules and guidelines for external tables

Consider the following rules and guidelines for external tables:

- You can only read data from the Amazon Redshift Spectrum external table. You cannot insert or update data in the Amazon Redshift Spectrum external table.
- The Secure Agent does not remove the external table names from the list of target objects available in the Target transformation.
- You cannot use pre-SQL and post-SQL commands to perform target operations on an external table.

For more information on how to create an external table, see the AWS documentation.

Administration of Amazon Redshift V2 Connector

As a user, you can use Amazon Redshift V2 Connector after the organization administrator ensures that users have access to the Secure Agent directory that contains the success and error files. The directory path must be the same on each Secure Agent machine in the runtime environment. The organization administrator must also perform the following tasks:

- Get the Amazon Redshift JDBC URL.
- Manage authentication for Amazon S3 staging. Use either of the following two methods:
 - Create an S3 Access Key ID and S3 Secret Access Key.
Provide the values for S3 access key ID and S3 secret access key when you configure the Amazon Redshift V2 connection. For more information about creating an access key ID and secret access key for S3 or Redshift, see the AWS documentation.

- Configure AWS Identity and Access Management (IAM) Authentication to enhance security. If you use IAM authentication, do not provide access key ID and secret access key explicitly in the Amazon Redshift V2 connection. Instead, you must create an Redshift Role Amazon Resource Name (ARN), add the minimal Amazon IAM policy to the Redshift Role ARN, and add the Redshift Role ARN to the Redshift cluster.

Provide the Redshift Role ARN in the AWS_IAM_ROLE option in the UNLOAD and COPY commands when you create a task.

If you specify both, access key ID and secret access key in the connection properties and AWS_IAM_ROLE in the UNLOAD and COPY commands, AWS_IAM_ROLE takes the precedence.

You must add IAM EC2 role and IAM Redshift role to the customer master key when you use IAM authentication and server-side encryption using customer master key.

Hosted Agent does not support IAM authentication and EC2 AssumeRole authentication. For more information about how to configure IAM authentication for Amazon Redshift V2 Connector, see ["IAM authentication " on page 11.](#)

- AssumeRole authentication for Amazon Redshift to access Amazon Redshift. You can use an IAM role configured with required trust policies to generate temporary security credentials to access Amazon Redshift. You can enable IAM users or define an EC2 instance to assume an IAM role to access Redshift. You can use AssumeRole to enable new or existing users to connect to the Redshift database.
- Configure Amazon Redshift for SSL if you want to support an SSL connection.
- Create a master symmetric key if you want to enable client-side encryption.
- Create an AWS Key Management Service (AWS KMS)-managed customer master key if you want to enable server-side encryption.
- Create minimal Amazon IAM policy for Amazon Redshift V2 Connector.
- To access the data catalog and the data files in Amazon S3 by using Amazon Redshift Spectrum, ensure that the Amazon Redshift cluster has the required authorization.
- Configure a CDC source if you want to create a mapping to capture changed data from the CDC source, and then run the associated mapping tasks to write the changed data to an Amazon Redshift target. To create a mapping with a CDC source, ensure that you have the PowerExchangeClient and CDC licenses.
- To use Amazon Resource Name (ARN) for cross-account access, ensure that you follow prerequisites described by AWS. For more information, see the AWS documentation.

Create a minimal Amazon IAM policy

Create an Amazon IAM policy and define the required permissions to stage the data in Amazon S3 when you want to read data from and write data to Amazon Redshift.

Use the following minimum required permissions to stage the data in Amazon S3:

- PutObject
- GetObject
- DeleteObject
- ListBucket

You can use the following sample Amazon IAM policy:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
```

```

    "Effect": "Allow",
    "Action": [
        "s3:PutObject",
        "s3:GetObject",
        "s3:DeleteObject",
        "s3:ListBucket",
    ],
    "Resource": [
        "arn:aws:s3:::<bucket_name>/*",
        "arn:aws:s3:::<bucket_name>"
    ]
}
]
}

```

Note: The **Test Connection** does not validate the IAM policy assigned to users. The Amazon S3 bucket name is available in the source and target advanced properties.

IAM authentication

Optional. You can configure IAM authentication when the Secure Agent is installed on an Amazon Elastic Compute Cloud (EC2) system. Use IAM authentication for secure and controlled access to the Amazon S3 staging bucket when you run mappings and mapping tasks.

Use IAM authentication when you want to run the mappings and mapping tasks on the Secure Agent installed on an EC2 system.

Perform the following steps to configure IAM authentication:

1. Create a minimal Amazon IAM policy. For more information, see ["Create a minimal Amazon IAM policy" on page 10](#)
2. Create roles.
 - Create the Amazon EC2 role. Associate the minimal Amazon IAM policy while creating the EC2 role. The Amazon EC2 role is used when you create or launch an EC2 instance. For more information about creating the Amazon EC2 role, see the AWS documentation.
 - Create the Amazon Redshift Role ARN for secure access to Amazon Redshift resources. Associate the minimal Amazon IAM policy while creating the Amazon Redshift role. For more information about creating the Amazon Redshift Role ARN, see the AWS documentation.

Note: Use the same Amazon Redshift Role ARN in the UNLOAD and COPY commands.
3. Assign the Amazon EC2 role that you created in step #2 to the EC2 instance.
4. Assign the Amazon Redshift Role ARN to the Amazon Redshift cluster to successfully perform read and write operations using UNLOAD and COPY commands. For more information about adding the Amazon Redshift Role ARN to the Amazon Redshift cluster, see the AWS documentation.
5. Install Secure Agent on the EC2 instance.

Temporary security credentials using AssumeRole for Amazon S3 staging

You can use the temporary security credentials using AssumeRole to access the Amazon S3 staging bucket from the same or different AWS accounts.

Ensure that you have the **sts:AssumeRole** permission and a trust relationship established within the AWS accounts to use the temporary security credentials. The trust relationship is defined in the trust policy of the IAM role when you create the role. The IAM role adds the IAM user as a trusted entity allowing the IAM users

to use the temporary security credentials and access the AWS accounts. For more information about how to establish the trust relationship, see the AWS documentation.

When the trusted IAM user requests for the temporary security credentials, the AWS Security Token Service (AWS STS) dynamically generates the temporary security credentials that are valid for a specified period and provides the credentials to the trusted IAM users. The temporary security credentials consist of access key ID, secret access key, and secret token.

To use the dynamically generated temporary security credentials, provide the value of the **S3 IAM Role ARN** connection property when you create an Amazon Redshift V2 connection. The IAM Role ARN uniquely identifies the AWS resources. Then, specify the time duration in seconds during which you can use the temporarily security credentials in the **Temporary Credential Duration** advanced source and target properties.

External ID

You can specify the external ID for a more secure cross-account access to the Amazon S3 bucket when the Amazon S3 bucket is in a different AWS account.

You can optionally specify the external ID in the AssumeRole request to the AWS Security Token Service (STS).

The external ID must be a string.

The following sample shows an external ID condition in the assumed IAM role's trust policy:

```
"Statement": [
  {
    "Effect": "Allow",
    "Principal": {
      "AWS": "arn:aws:iam::AWS_Account_ID : user/user_name"
    },
    "Action": "sts:AssumeRole",
    "Condition": {
      "StringEquals": {
        "sts:ExternalId": "dummy_external_id"
      }
    }
  }
]
```

Temporary security credential policies

To use the temporary security credentials to access the Amazon S3 staging bucket, both the IAM user and IAM role require policies.

The following section lists the policies required for the IAM user and IAM role:

IAM user

An IAM user must have the `sts:AssumeRole` policy to use the temporary security credentials in the same or different AWS account.

The following sample policy allows an IAM user to use the temporary security credentials in an AWS account:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": "sts:AssumeRole",
      "Resource": "arn:aws:iam::<ACCOUNT-HYPHENS>:role/<ROLE-NAME>"
    }
  ]
}
```

The following sample policy allows an IAM user for the China region to use the temporary security credentials in an AWS account:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow", "Action": "sts:AssumeRole", "Resource": "arn:aws-cn:iam::<ACCOUNT-HYPHENS>:role/<ROLE-NAME>"
    }
  ]
}
```

IAM role

An IAM role must have a `sts:AssumeRole` policy and a trust policy attached with the IAM role to allow the IAM user to access the Amazon S3 bucket using the temporary security credentials. The policy specifies the Amazon S3 bucket that the IAM user can access and the actions that the IAM user can perform. The trust policy specifies the IAM user from the AWS account that can access the Amazon S3 bucket.

The following policy is a sample trust policy:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Principal": { "AWS": "arn:aws:iam::AWS-account-ID:<ROLE-NAME>" },
      "Action": "sts:AssumeRole"
    }
  ]
}
```

To use the temporary security credentials with AWS Key Management Service (AWS KMS)-managed customer master key and enable the encryption with KMS, you must create a KMS policy.

You can perform the following operations to use the temporary security credentials and enable the encryption with KMS:

- `GenerateDataKey`
- `DescribeKey`
- `Encrypt`
- `Decrypt`
- `ReEncrypt`

Sample policy:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "kms:GenerateDataKey", "kms:DescribeKey", "kms:Encrypt", "kms:Decrypt",
        "kms:ReEncrypt*"
      ],
      "Resource": ["arn:aws:kms:region:account:key:<KMS_key>"]
    }
  ]
}
```

When you configure KMS and access an Amazon S3 endpoint in the China region, use the following sample policy:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
```

```

    "Action": [ "kms:GenerateDataKey", "kms:DescribeKey", "kms:Encrypt", "kms:Decrypt",
    "kms:ReEncrypt*" ],
    "Resource": [ "arn:aws-cn:kms:region:account:key:<KMS_key>" ]
  }
}

```

Temporary security credentials using AssumeRole for EC2

You can use temporary security credentials using AssumeRole for an Amazon EC2 role to access the Amazon S3 staging bucket from the same or different AWS accounts.

The Amazon EC2 role would be able to assume another IAM role from the same or different AWS account without requiring a permanent access key and secret key. The Amazon EC2 role can also assume another IAM role from a different region.

Consider the following prerequisites when you use temporary security credentials using AssumeRole for EC2:

- To use temporary security credentials using AssumeRole for EC2, install the Secure Agent on an AWS service such as Amazon EC2.
- The EC2 role attached to the AWS EC2 service must not have access to Amazon S3 but needs to have permission to assume another IAM role.
- The IAM role that needs to be assumed by the EC2 role must have a permission policy and a trust policy attached to it.

For more information about the policies for EC2 roles and IAM roles, see [“Temporary security credential policies” on page 12](#).

To configure an EC2 role to assume the IAM Role provided in the **IAM Role ARN** connection property, select the **Use EC2 Role to Assume Role** check box in the connection properties.

Rules and guidelines for using the temporary security credentials

Consider the following guidelines when you use the temporary security credentials:

- The IAM user or IAM role that requests for the temporary security credentials must not have access to any AWS resources.
- Only authenticated IAM users or IAM roles can request for the temporary security credentials from the AWS Security Token Service (AWS STS).
- Before you run a task, ensure that you have enough time to use the temporary security credentials for running the task. You cannot extend the time duration of the temporary security credentials for an ongoing task. For example, when you read from and write to Amazon Redshift and if the temporary security credentials expire, you cannot extend the time duration of the temporary security credentials that causes the task to fail.
- After the temporary security credentials expire, AWS does not authorize the IAM users or IAM roles to access the resources using the credentials. You must request for new temporary security credentials before the previous temporary security credentials expire in a mapping.
- Do not use the root user credentials of an AWS account to use the temporary security credentials. You must use the credentials of an IAM user to use the temporary security credentials.
- When you create an Amazon Redshift V2 connection with the IAM Role ARN and use the SSE-KMS encryption, you must specify AWS_IAM_ROLE as the unload option in the Amazon Redshift V2 advanced source properties.
- If both the source and target in a mapping point to the same Amazon S3 bucket, use the same Amazon S3 connection in the Source and Target transformations. If you use two different Amazon S3 connections, configure the same values in the connection properties for both the connections.

- If the source and target in a mapping point to different Amazon S3 buckets, you can use two different Amazon S3 connections.
You can configure different values in the connection properties for both the connections. However, you must select the **Use EC2 Role to Assume Role** check box in the connection property. You must also specify the same value for the **Temporary Credential Duration** field in the source and target properties.

Temporary security credentials using AssumeRole for Amazon Redshift

You can use the temporary security credentials using AssumeRole to connect to Amazon Redshift from the same or different AWS accounts.

Ensure that you have the **sts:AssumeRole** permission and a trust relationship established within the AWS accounts to use the temporary security credentials. The trust relationship is defined in the trust policy of the IAM role when you create the role. The IAM role adds the IAM user as a trusted entity allowing the IAM users to use the temporary security credentials and access Amazon Redshift. For more information about how to establish the trust relationship, see the AWS documentation.

When the trusted IAM user requests for the temporary security credentials, the AWS Security Token Service (AWS STS) dynamically generates the temporary security credentials that are valid for a specified period and provides the credentials to the trusted IAM users.

To use the dynamically generated temporary security credentials, use the AssumeRole authentication type and provide the value of the **Redshift IAM Role ARN** connection property when you create an Amazon Redshift V2 connection. The IAM Role ARN uniquely identifies the AWS resources.

Temporary security credential policies for Amazon Redshift

To use the temporary security credentials to connect to Amazon Redshift, both the IAM user and IAM role require policies.

The following section lists the policies required for the IAM user and IAM role:

IAM user

An IAM user must have the **sts:AssumeRole** policy to use the temporary security credentials in the same or different AWS account. The IAM user credentials are used to key-in the Redshift access key and Redshift secret key in the connection properties.

The following sample policy allows an IAM user to use the temporary security credentials in an AWS account:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": "sts:AssumeRole",
      "Resource": "arn:aws:iam::<ACCOUNT-HYPHENS>:role/<REDSHIFT-IAM-ROLE-NAME>"
    }
  ]
}
```

Redshift IAM role trust policy

The Redshift IAM role policy pertains to the role that is specified in the Redshift IAM Role ARN. An IAM role must have a trust policy attached with it to allow the IAM user to access Redshift using the temporary security credentials.

The following policy is a sample trust policy:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Principal": { "AWS": "arn:aws:iam::AWS-account-ID:IAM-USER" },
      "Action": "sts:AssumeRole"
    }
  ]
}
```

For example, you can specify the the role or user in the following format:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Principal": {
        "AWS": "arn:aws:iam::<AWS-account>:role/<name-of-the-role>"
      },
      "Action": "sts:AssumeRole"
    }
  ]
}

{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Principal": {
        "AWS": "arn:aws:iam::<AWS-account>:user/<name-of-the-user>"
      },
      "Action": "sts:AssumeRole"
    }
  ]
}
```

Minimum permission policies of the Redshift IAM role

The following policy shows the permissions required to the Redshift IAM Role, which will be assumed by an IAM user to connect to the Redshift database using an existing Amazon Redshift user:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "redshift:GetClusterCredentials",
        "redshift:DescribeClusters"
      ],
      "Resource": [
        "arn:aws:redshift:<REGION>:<ACCOUNT-ID>:dbuser:<Cluster_Identifier>/<USER_NAME>",
        "arn:aws:redshift:<REGION>:<ACCOUNT-ID>:dbname:<Cluster_Identifier>/<DATABASE_NAME>"
      ]
    }
  ]
}
```



```

    }
  }
}

```

The following policy shows the permissions needed to be attached to the Redshift IAM Role, which will be assumed by an IAM user to connect to the Redshift database with a newly created user by the `Auto create DBUser` checkbox:

```

{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "redshift:GetClusterCredentials",
        "redshift:DescribeClusters",
        "redshift:CreateClusterUser",
        "redshift:JoinGroup"
      ],
      "Resource": [
        "arn:aws:redshift:<REGION>:<ACCOUNT-ID>:dbuser:<Cluster_Identifier>/<USER_NAME>",
        "arn:aws:redshift:<REGION>:<ACCOUNT-ID>:dbname:<Cluster_Identifier>/<DATABASE_NAME>",
        "arn:aws:redshift:<REGION>:<ACCOUNT-ID>:dbgroup:<Cluster_Identifier>/<GROUP_NAME>"
      ]
    }
  ]
}

```

Temporary security credentials using AssumeRole for EC2 to connect to Amazon Redshift

You can use temporary security credentials using AssumeRole for an Amazon EC2 role to connect to Amazon Redshift from the same or different AWS accounts.

The Amazon EC2 role would be able to assume another IAM role from the same or different AWS account without requiring a permanent Redshift access key and Redshift secret key.

Consider the following prerequisites when you use temporary security credentials using AssumeRole for EC2:

- To use temporary security credentials using AssumeRole for EC2, install the Secure Agent on an AWS service such as Amazon EC2.
- The EC2 role attached to the AWS EC2 service must not have access to Amazon Redshift but needs to have permission to assume another IAM role.
- The IAM role that needs to be assumed by the EC2 role must have a permission policy and a trust policy attached to it.

To configure an EC2 role to assume the IAM Role provided in the Redshift IAM Role ARN connection property, select the **Use EC2 Role to Assume Role** check box in the connection properties.

EC2 service role trust policy

The following is a sample trust policy that is defined in a trust relationship of the EC2 role attached to the EC2 instance:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Principal": {
        "Service": "ec2.amazonaws.com"
      },
      "Action": "sts:AssumeRole"
    }
  ]
}
```

The following is a sample trust policy of the Redshift IAM role when you enable EC2 assume role:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Principal": {
        "Service": "redshift.amazonaws.com"
      },
      "Action": "sts:AssumeRole"
    },
    {
      "Effect": "Allow",
      "Principal": {
        "AWS": "arn:aws:iam::<Account-ID:role>/ec2_role_attached_to_ec2_instance"
      },
      "Action": "sts:AssumeRole"
    }
  ]
}
```

The permission policy that is required to be attached to the EC2 instance is same as the policy defined for the IAM user.

Amazon Redshift Spectrum prerequisite tasks

To read data from an Amazon Redshift Spectrum external table, you must provide the required authorization to Amazon Redshift cluster to access the data catalog and the data files in Amazon S3.

1. Create an AWS Identity and Access Management (IAM) role to authorize the Amazon Redshift cluster access to the external data catalog and data files in Amazon S3.
2. Associate the IAM Role with the specified Amazon Redshift cluster.
3. Create an external schema.
4. Provide Amazon Redshift Role ARN for the IAM Role in the external schema.
5. Create an external table within the external schema and specify the Amazon S3 location from where you want to read the data. For more information about creating external tables, see the AWS documentation.

Note: The Amazon Redshift cluster and the Amazon S3 bucket that contains the data files must belong to the same region. The Amazon Redshift cluster must be of version 1.0.1294 or later.

Optimize the staging performance for a mapping

Data Integration, by default, creates a flat file locally in a temporary folder to stage the data before reading from and writing to Amazon Redshift. You can set Data Integration to optimize the staging performance.

If you do not set the staging property, Data Integration performs staging without the optimized settings, which might impact the performance of the task.

Consider the following rules when you enable the staging property:

- If you run a mapping enabled for pushdown optimization, the mapping runs without pushdown optimization.
- For read operation, the staging applies only to source transformation and does not apply to lookup transformation.
- If the data contains timestamp data types with time zone, the job runs without staging the data in the local flat file.
- If the mapping contains Oracle CDC as a source and Amazon Redshift as the target, the job runs without staging the data in the local flat file.
- When you run a mapping to read multiline data from the source that contains CR or LF characters, the column data is split into multiple lines.

Enabling Amazon Redshift Connector to optimize the staging performance

Perform the following steps to enable the Amazon Redshift V2 Connector to optimize the staging performance:

1. In Administrator, click **Runtime Environments**.
2. Edit the Secure Agent for which you want to set the property.
3. In the **System Configuration Details** section, select the **Service** as **Data Integration Server** and the type as **Tomcat**.
4. Set the value of the Tomcat property *INFA_DTM_RDR_STAGING_ENABLED_CONNECTORS* for the read operation, *INFA_DTM_STAGING_ENABLED_CONNECTORS* for the write operation, and *INFA_DTM_LKP_STAGING_ENABLED_CONNECTORS* for the cached lookup operation to the plugin ID of Amazon Redshift Connector.

You can find the plugin ID in the manifest file located in the following directory: <Secure Agent installation directory>/downloads/<AmazonRedshift package>/CCIManifest

The following image shows the staging property set for the Secure Agent:

Tomcat	INFA_DTM_STAGING_ENABLED_CONNECTORS	'451600'	<input type="checkbox"/>
Tomcat	INFA_DTM_RDR_STAGING_ENABLED_CONNECTORS	'451600'	<input type="checkbox"/>
Tomcat	INFA_DTM_LKP_STAGING_ENABLED_CONNECTORS	'451600'	<input type="checkbox"/>

When you run the mapping, the flat file is created in the following directory in your machine: C:\Windows\Temp\AmazonRedshift\stage\<AmazonRedshift_Target.txt>

You can check the session logs. If the flat file is created successfully, Data Integration logs the following message in the session log: The INFA_DTM_STAGING is successfully enabled to use the flat file to create local staging files: The INFA_DTM_STAGING is enabled for connector for Source Instance [Source].

Private communication with Amazon Redshift

You can enable private communication with Amazon Redshift by configuring a gateway endpoint on AWS console.

You can configure Amazon Redshift V2 Connector to establish private communication with Amazon Redshift without exposing your traffic to the public internet. To establish a private connection with Amazon Redshift, ensure that the Secure Agent is a part of the subnet in the AWS Virtual Private Cloud (VPC). You can create a gateway endpoint and stage the Amazon S3 data to Amazon Redshift.

To configure private communication to connect to Amazon Redshift, create a cluster subnet group, create a Redshift-managed VPC endpoint, configure the gateway endpoint, and then configure the gateway endpoint in the Amazon Redshift V2 connection properties.

For more information, see

[Configuring private communication with Amazon Redshift using the Amazon Redshift V2 Connector.](#)

CHAPTER 2

Amazon Redshift V2 connections

Amazon Redshift V2 connection enables you to read data from or write data to Amazon Redshift. You can use Amazon Redshift V2 connections to specify sources or targets in mappings and mapping tasks.

You can use AWS Identity and Access Management (IAM) authentication to securely control access to Amazon S3 resources. If you have valid AWS credentials and you want to use IAM authentication, you do not have to specify the access key and secret key when you create an Amazon Redshift V2 connection.

Create an Amazon Redshift V2 connection on the **Connections** page and associate it with a mapping or mapping task. Define the source and target properties to read or write data to Amazon Redshift.

Note: If you enable both HTTP and SOCKS proxies, SOCKS proxy is used by default. If you want to use HTTP proxy instead of SOCKS proxy, set the value of the **DisableSocksProxy** property to true in the System property.

Amazon Redshift V2 connection properties

When you set up an Amazon Redshift V2 connection, configure the connection properties.

The following table describes the Amazon Redshift V2 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	The Amazon Redshift V2 connection type.
Runtime Environment	Name of the runtime environment where you want to run the tasks. You can specify a secure agent or a hosted agent.
Authentication Type	The authentication method that the connector must use to log in to Amazon Redshift. Select one of the following authentication types: <ul style="list-style-type: none">- Default. Uses the username and password to connect to Amazon Redshift.- Redshift IAM Authentication via AssumeRole. Uses AssumeRole for IAM authentication to connect to Amazon Redshift.

Property	Description
Username	User name of the Amazon Redshift account.
Password	Password for the Amazon Redshift account. Applies only to default authentication.
Use EC2 Role to Assume Role	Optional. Select the check box to enable the EC2 role to assume another IAM role specified in the IAM Role ARN option. Note: The EC2 role must have a policy attached with a permission to assume an IAM role from the same or different account.
S3 Access Key ID	Access key to access the Amazon S3 staging bucket. Enter the access key value based on the following authentication methods: <ul style="list-style-type: none"> - Basic authentication. Enter the actual access key value. - IAM authentication. - Temporary security credentials using assume role. Enter access key of an IAM user with no permissions to access the Amazon S3 staging bucket. - Assume role for EC2.
S3 Secret Access Key	Secret access key to access the Amazon S3 staging bucket. The secret key is associated with the access key and uniquely identifies the account. Enter the access key value based on the following authentication methods: <ul style="list-style-type: none"> - Basic authentication. Enter the actual access secret value. - IAM authentication. - Temporary security credentials using assume role. Enter access secret of an IAM user with no permissions to access Amazon S3 staging bucket. - Assume role for EC2.
S3 IAM Role ARN	The Amazon Resource Number (ARN) of the IAM role assumed by the user to use the dynamically generated temporary security credentials. Set the value of this property if you want to use the temporary security credentials to access the Amazon S3 staging bucket. For more information about how to get the ARN of the IAM role, see the AWS documentation.
External Id	The external ID for a more secure access to the Amazon S3 bucket when the Amazon S3 staging bucket is in a different AWS account.
Master Symmetric Key	A 256-bit AES encryption key in the Base64 format when you enable client-side encryption. You can generate a key using a third-party tool.
JDBC URL	The URL of the Amazon Redshift V2 connection. Enter the JDBC URL in the following format: <code>jdbc:redshift://<amazon_redshift_host>:<port_number>/<database_name></code>

Property	Description
Cluster Region	<p>The AWS cluster region in which the bucket you want to access resides.</p> <p>Select a cluster region if you choose to provide a custom JDBC URL that does not contain a cluster region name in the JDBC URL connection property.</p> <p>If you select a cluster region in both Cluster Region and JDBC URL connection properties, the agent ignores the cluster region that you specify in the JDBC URL connection property.</p> <p>To use the cluster region name that you specify in the JDBC URL connection property, select None as the cluster region in this property.</p> <p>You can only read data from or write data to the cluster regions supported by AWS SDK.</p> <p>Select one of the following cluster regions:</p> <ul style="list-style-type: none"> - None - Asia Pacific(Mumbai) - Asia Pacific(Seoul) - Asia Pacific(Singapore) - Asia Pacific(Sydney) - Asia Pacific(Tokyo) - Asia Pacific(Hong Kong) - AWS GovCloud (US) - AWS GovCloud (US-East) - Canada(Central) - China(Beijing) - China(Ningxia) - EU(Ireland) - EU(Frankfurt) - EU(Paris) - EU(Stockholm) - South America(Sao Paulo) - Middle East(Bahrain) - US East(N. Virginia) - US East(Ohio) - US West(N. California) - US West(Oregon) <p>Default is None.</p>
Customer Master Key ID	<p>The customer master key ID generated by AWS Key Management Service (AWS KMS) or the ARN of your custom key for cross-account access.</p> <p>You must generate the customer master key ID for the same region where your Amazon S3 staging bucket resides. You can either enter the customer-generated customer master key ID or the default customer master key ID.</p>

Amazon Redshift AssumeRole authentication

Configure the following properties when you select the Redshift AssumeRole authentication type:

Property	Description
Cluster Identifier	<p>The unique identifier of the cluster that hosts Amazon Redshift for which you are requesting the security credentials.</p> <p>Specify the cluster name.</p>
Database Name	Name of the Amazon Redshift database.

Property	Description
Database Group	Name of the database group to which an IAM user will be added. You can add multiple database groups separated by a comma. Note: If you do not specify a group, the user is added to the public group.
Expiration Time	The time duration that the password for the Amazon Redshift database user expires. Specify a value between 900 seconds and 3600 seconds. Default is 900.
Auto Create DBUser	Select to create a new Amazon Redshift database user at run time. Default is disabled.
Redshift IAM Role ARN	The Amazon Resource Number (ARN) of the IAM role assumed by the user or EC2 to use the dynamically generated temporary security credentials. Set the value of this property if you want to use the temporary security credentials to access Amazon Redshift. For more information about how to get the ARN of the IAM role, see the AWS documentation.
Redshift Access Key ID	The access key of the IAM user that has permissions to assume the Redshift IAM AssumeRole ARN.
Redshift Secret Access Key	The secret access key of the IAM user that has permissions to assume the Redshift IAM Assume Role ARN.

Note: In an Amazon Redshift V2 connection where you write to a target, and the target connection has **Auto Create DBUser** enabled, the new user cannot truncate a table created by an existing user.

Configuring proxy settings

If your organization uses an outgoing proxy server to connect to the internet, the Secure Agent connects to Informatica Intelligent Cloud Services through the proxy server. If you enable both HTTP and SOCKS proxies, SOCKS proxy is used by default. If you want to use HTTP proxy instead of SOCKS proxy, set the value of the **DisableSocksProxy** property to true in the System property.

Note: You can only use an unauthenticated proxy server to connect to Informatica Intelligent Cloud Services.

Configuring proxy settings on Windows

To configure the proxy server settings for the Secure Agent on a Windows machine, you can configure the proxy server settings through the Secure Agent.

1. Click **Start > All Programs > Informatica Cloud Secure Agent > Informatica Cloud Secure Agent** to launch the Secure Agent Manager.
The Secure Agent Manager displays the Secure Agent status.
2. Click **Proxy** in the Secure Agent Manager page.
3. Click **Use a Proxy Server** to enter proxy server settings.

4. Configure the following proxy server details:

Field	Description
Proxy Host	Required. Host name of the outgoing proxy server that the Secure Agent uses.
Proxy Port	Required. Port number of the outgoing proxy server.

5. Click **OK**.

The Secure Agent Manager restarts the Secure Agent to apply the settings.

Configuring proxy settings through Secure Agent Manager

To configure the proxy server settings through the Secure Agent Manager, perform the following steps:

1. Click **Start > All Programs > Informatica Cloud Secure Agent > Informatica Cloud Secure Agent** to launch the Secure Agent Manager.

The Secure Agent Manager displays the Secure Agent status.

2. Click **Proxy** in the Secure Agent Manager page.
3. Click **Use a Proxy Server** to enter proxy server settings.
4. Configure the following proxy server details:

Field	Description
Proxy Host	Required. Host name of the outgoing proxy server that the Secure Agent uses.
Proxy Port	Required. Port number of the outgoing proxy server.

5. Click **OK**.

The Secure Agent Manager restarts the Secure Agent to apply the settings.

Configuring the proxy settings through JVMOptions

You can configure the proxy server settings through JVMOptions for the Secure Agent on a Windows or Linux machine.

1. Log in to Informatica Intelligent Cloud Services.
2. Open Administrator and select **Runtime Environments**.
3. Select the Secure Agent for which you want to configure a proxy server.
4. On the upper-right corner of the page, click **Edit**.
5. In the **System Configuration Details** section, select the **Type** as **DTM** for the Data Integration Service.

- Add the following parameters in any **JVMOption** field and specify appropriate values for each parameter:

Parameter	Description
-Dhttps.proxyHost=	Host name of the outgoing HTTPS proxy server.
-Dhttps.proxyPort=	Port number of the outgoing HTTPS proxy server.

For example,

```
JVMOption1=-Dhttps.proxyHost=<proxy_server_hostname>
```

```
JVMOption2=-Dhttps.proxyPort=<proxy_port>
```

6. Click **Save**.

The Secure Agent restarts to apply the settings.

Configuring proxy settings on Linux

The Secure Agent installer configures the proxy server settings for the Secure Agent based on settings configured in the browser. You can update the proxy server settings defined for the Secure Agent from the command line.

To configure the proxy server settings for the Secure Agent on a Linux machine, use a shell command that updates the `proxy.ini` file. Contact the network administrator to determine the proxy settings.

1. Navigate to the following directory:

```
<Secure Agent installation directory>/apps/agentcore
```

2. Update the unauthenticated proxy details directly in the `proxy.ini` file, or run the following command to update the proxy details in the `proxy.ini` file:

```
./consoleAgentManager.sh configureProxy <proxy host> <proxy port>
```

3. Restart the Secure Agent.

CHAPTER 3

Amazon Redshift sources and targets

You can assign the source and target properties for an Amazon Redshift connection.

Amazon Redshift V2 sources

You can use an Amazon Redshift V2 object as a source in a mapping. You can use tables, views, or materialized views as Amazon Redshift V2 sources.

When you configure the advanced source properties, configure properties specific to Amazon Redshift V2. You can encrypt data, retain the staging files on Amazon S3, and securely unload the results of a query to files on Amazon Redshift.

Amazon Redshift staging directory for Amazon Redshift V2 sources

The Secure Agent creates a staging file in the directory that you specify in the source properties. The Secure Agent reads the data from Amazon Redshift V2 and writes the data to Amazon S3 and then to the local staging directory. The Secure Agent then deletes the staged files from the staging directory.

In the mapping properties, specify a staging directory with an appropriate amount of disk space that corresponds to the volume of data that you want to process. Specify a directory on the machine that hosts the Secure Agent

Data encryption in Amazon Redshift V2 sources

To protect data, you can encrypt the data when you read the data from a source.

Select the type of the encryption in the **Encryption Type** field under the Amazon Redshift V2 advanced source properties on the **Schedule** page. The Unload command creates staging files on Amazon S3 for server-side encryption with the AWS-managed encryption keys and AWS Key Management Service key.

Use the customer master key ID generated by AWS Key Management Service in the Unload command for server-side encryption.

You can select the following types of encryption:

None

The data is not encrypted.

SSE-S3

If you select the **SSE-S3** encryption type, the Unload command creates the staging files in the Amazon S3 bucket and Amazon S3 encrypts the file using AWS-managed encryption keys for server-side encryption.

SSE-KMS

If you select the **SSE-KMS** encryption type, the Unload command creates the staging files in the Amazon S3 bucket and Amazon S3 encrypts the file using AWS KMS-managed customer master key or Amazon Resource Name (ARN) for server-side encryption.

The AWS KMS-managed customer master key or ARN that you specify in the connection property must belong to the same region where Amazon S3 is hosted.

For example, if Amazon S3 is hosted in the **US West (Oregon)** region, you must use the AWS KMS-managed customer master key enabled in the same region when you select the **SSE-KMS** encryption type.

CSE-SMK

If you select the **CSE-SMK** encryption type, Amazon Redshift uploads the data to the Amazon S3 server by using the master symmetric key and then loads the data by using the copy command with the encrypted option and a private encryption key for additional security.

You must provide a master symmetric key ID in the connection property to enable **CSE-SMK** encryption type.

Note: Amazon Redshift V2 Connector does not support the server-side encryption with the master symmetric key and client-side encryption with the customer master key.

Unload command

You can use the Unload command to extract data from Amazon Redshift and create staging files on Amazon S3. The Unload command uses a secure connection to load data into one or more files on Amazon S3.

You can specify the Unload command options directly in the **Unload Options** field. Enter the options in uppercase and use a semicolon to separate the options. For example:

```
DELIMITER = \036;ESCAPE = OFF;NULL=text;PARALLEL = ON;AWS_IAM_ROLE=arn:aws:iam;;<account ID>;role/<role-name>
```

It is recommended to use octal representation of non-printable characters as DELIMITER.

If you run the Unload command as a pre-SQL or post-SQL command, specify the **ALLOWOVERWRITE** option to overwrite the existing objects.

By default, the UNLOAD property field is empty.

Unload command options

The Unload command options extract data from Amazon Redshift and load data to staging files on Amazon S3 in a particular format. You can delimit the data with a particular character or load data to multiple files in parallel.

To add options to the Unload command, use the **Unload Options** option.

You can set the following options:

DELIMITER

A single ASCII character to separate fields in the input file. You can use characters such as pipe (`|`), tilde (`~`), or a tab (`\t`). The delimiter you specify should not be a part of the data. If the delimiter is a part of data, use `ESCAPE` to read the delimiter character as a regular character. Default value is `\036`, the octal representation of the non-printable character, record separator.

ESCAPE

You can add an escape character for `CHAR` and `VARCHAR` columns in delimited unload files before the delimiter character is specified for the unloaded data. By default, the escape option is **ON**. To disable the escape option, specify **OFF** as the value of the escape option. For example, `ESCAPE = OFF`.

Note: If you enable the DTM staging property, you must use `ESCAPE=OFF` in Unload command options to enable reader DTM staging. If you do not specify `ESCAPE = OFF`, the mapping does not consider the DTM staging property and runs without optimizing the staging performance.

REGION

You can use the `REGION` attribute when the Amazon S3 staging bucket is not in the same region as the cluster region. If Amazon Redshift resides in the US East (N. Virginia) region, you can use an Amazon S3 bucket residing in the Asia Pacific (Mumbai) region to create staging files. For example, `REGION = ap-south-1`.

PARALLEL

The Unload command writes data in parallel to multiple files, according to the number of slices in the cluster. Default is on. If you turn the Parallel option off, the Unload command writes data serially. The maximum size of a data file is 6.5 GB.

NULL

You can use `NULL` Unload command option to replace the null values in an Amazon Redshift source table with the string that you specify using the `NULL` Unload command option.

Enter the value of the `NULL` Unload command option in the following format: `NULL=text`. Do not add spaces when you enter the string value. For more information about the `NULL` Unload command, see the AWS documentation.

AWS_IAM_ROLE

Specify the Amazon Redshift Role Resource Name (ARN) to run the mapping on Secure Agent installed on an Amazon EC2 system in the following format: `AWS_IAM_ROLE=arn:aws:iam::<account ID>:role/<role-name>`

For example: `arn:aws:iam::123123456789:role/redshift_read`

ADDQUOTES

`ADDQUOTES` is implemented with the `UNLOAD` command by default. The Unload command adds quotation marks to each data field. With added quotation marks, the `UNLOAD` command can read data values that contain the delimiter. If double quote (`"`) is a part of data, use `ESCAPE` to read the double quote as a regular character.

Amazon Redshift V2 targets

You can use an Amazon Redshift V2 object as a target in a mapping or mapping task. You can also create an Amazon Redshift V2 target based on the input source.

When you configure the advanced target properties, configure properties specific to Amazon Redshift V2. You can encrypt data, update statistical metadata of the database tables to improve the efficiency of queries, load data into Amazon Redshift from flat files in an Amazon S3 bucket, and use vacuum tables to recover disk space and sort rows in tables.

Note: If the distribution key column in a target table contains null values and you configure a task with an upsert operation for the same target table, the task might create duplicate rows. To avoid creating duplicate rows, you must perform one of the following tasks:

- Replace the null value with a non-null value when you load data.
- Do not configure the column as a distribution key if you expect null values in the distribution key column.
- Remove the distribution key column from the target table temporarily when you load data. You can use the Pre-SQL and Post-SQL properties to remove and then add the distribution key column in the target table.

Amazon Redshift staging directory for Amazon Redshift V2 targets

The Secure Agent creates a staging file in the directory that you specify in the target properties. The Secure Agent writes the data to the staging directory before writing the data to Amazon Redshift.

The Secure Agent deletes the staged files from the staging directory after writing the data to Amazon S3. Specify a staging directory in the mapping properties with an appropriate amount of disk space for the volume of data that you want to process. Specify a directory on the machine that hosts the Secure Agent.

The Secure Agent creates subdirectories in the staging directory. Subdirectories use the following naming convention: `<staging_directory>/infaRedShiftStaging<MMddHHmmssSSS+xyz>`

Data encryption in Amazon Redshift V2 targets

To protect data, you can enable server-side encryption or client-side encryption to encrypt the data that you insert in Amazon Redshift.

If you enable both server-side and client-side encryption for an Amazon Redshift target, then the client-side encryption is used for data load.

Server-side encryption for Amazon Redshift V2 targets

If you want Amazon Redshift to encrypt data while uploading and staging the `.csv` files to Amazon S3, you must enable server-side encryption.

To enable server-side encryption, select **S3 Server Side Encryption** in the advanced target properties and specify the **Customer Master key ID** in the connection properties.

You can configure the customer master key ID generated by AWS Key Management Service (AWS KMS) in the connection properties for server-side encryption. You must add IAM EC2 role and IAM Redshift role to the customer master key when you use IAM authentication and server-side encryption using customer master key.

If you select the server-side encryption in the advanced target properties and do not specify the customer master key ID in the connection properties, Amazon S3-managed encryption keys are used to encrypt data.

Client-side encryption for Amazon Redshift V2 targets

Client-side encryption is a technique to encrypt data before transmitting the data to the Amazon Redshift server.

When you enable client-side encryption for Amazon Redshift V2 targets, the Secure Agent fetches the data from the source, writes the data to the staging directory, encrypts the data, and then writes the data to an Amazon S3 bucket. The Amazon S3 bucket then writes the data to Amazon Redshift.

Note: If you enable both server-side and client-side encryption for an Amazon Redshift V2 target, then the client-side encryption is used for data load.

To enable client-side encryption, you must provide a master symmetric key in the connection properties and select **S3 Client Side Encryption** in the advanced target properties.

The Secure Agent encrypts the data by using the master symmetric key. The master symmetric key is a 256-bit AES encryption key in the Base64 format. Amazon Redshift V2 Connector uploads the data to the Amazon S3 server by using the master symmetric key and then loads the data to Amazon Redshift by using the copy command with the Encrypted option and a private encryption key for additional security.

Copy command

You can use the Copy command to append data in a table. The Copy command uses a secure connection to load data from flat files in an Amazon S3 bucket to Amazon Redshift.

You can specify the Copy command options directly in the **Copy Options** field. Enter the options in uppercase and use a semicolon to separate the options. For example:

```
DELIMITER = \036;ACCEPTINVCHARS = #;QUOTE = \037;COMPUPDATE =  
ON;AWS_IAM_ROLE=arn:aws:iam;;<account ID>;role/<role-name>
```

It is recommended to use octal representation of non-printable characters as DELIMITER and QUOTE.

Copy command options

The Copy command options read data from Amazon S3 and write data to Amazon Redshift in a particular format. You can apply compression to data in the tables or delimit the data with a particular character.

To add options to the Copy command, use the **CopyOptions Property File** option.

You can set the following options:

DELIMITER

A single ASCII character to separate fields in the input file. You can use characters such as pipe (|), tilde (~), or a tab (\t). The delimiter must not be a part of the data. Default is \036, the octal representation of the non-printable character and record separator.

ACCEPTINVCHARS

Loads data into VARCHAR columns even if the data contains UTF-8 characters that are not valid. When you specify ACCEPTINVCHARS, the Secure Agent replaces UTF-8 character that is not valid with an equal length string consisting of the character specified in ACCEPTINVCHARS. If you have specified 'I' in ACCEPTINVCHARS, the Secure Agent replaces the three-byte UTF-8 character with 'III'.

If you do not specify ACCEPTINVCHARS, the COPY command returns an error when it encounters an UTF-8 character that is not valid. You can use the ACCEPTINVCHARS option on VARCHAR columns. Default is question mark (?).

QUOTE

Specifies the quote character to use with comma separated values. Default is \037, the octal representation of the non-printable character, unit separator.

REGION

You can use the REGION attribute when the Amazon S3 staging bucket is not in the same region as the cluster region. If Amazon Redshift resides in the US East (N. Virginia) region, you can use an Amazon S3 bucket residing in the Asia Pacific (Mumbai) region to create staging files. For example, `REGION = ap-south-1`.

COMPUPDATE

Overrides current compression encoding and applies compression to an empty table. Use the COMPUPDATE option in an insert operation when the rows in a table are more than 100,000. The behavior of COMPUPDATE depends on how it is configured:

- If you do not specify COMPUPDATE, the COPY command applies compression if the target table is empty and all columns in the table have either RAW or no encoding.
- If you specify COMPUPDATE ON, the COPY command replaces the existing encodings if the target table is empty and the columns in the table have encodings other than RAW.
- If you specify COMPUPDATE OFF, the COPY command does not apply compression.

Default is OFF.

TRUNCATECOLUMN

Truncates the data of the VARCHAR and CHAR data types column before writing the data to the target. If the size of the data that you want to write to the target is larger than size of the target column, the Secure Agent truncates the data before writing data to the target column.

By default, the TRUNCATECOLUMNS option is OFF. To enable the TRUNCATECOLUMNS option, specify ON as the value of the TRUNCATECOLUMNS option. For example, `TRUNCATECOLUMNS=ON`.

AWS_IAM_ROLE

Specify the Amazon Redshift Role Resource Name (ARN) to run the task on Secure Agent installed on an Amazon EC2 system in the following format: `AWS_IAM_ROLE=arn:aws:iam::<account ID>:role/<role-name>`

For example: `arn:aws:iam::123123456789:role/redshift_write`

Analyze target table

To optimize query performance, you can configure a task to analyze the target table. Target table analysis updates statistical metadata of the database tables.

You can use the **Analyze Target Table** option to extract sample rows from the table, analyze the samples, and save the column statistics. Amazon Redshift then updates the query planner with the statistical metadata. The query planner uses the statistical metadata to build and choose optimal plans to improve the efficiency of queries.

You can run the **Analyze Target Table** option after you load data to an existing table by using the Copy command. If you load data to a new table, the Copy command performs an analysis by default.

Retain staging files

You can retain staging files on Amazon S3 after the Secure Agent writes data to the target. You can retain files to create a data lake of your organizational data on Amazon S3. The files you retain can also serve as a backup of your data.

When you create a target connection, you can configure a file prefix or directory prefix to save the staging files. After you provide the prefixes, the Secure Agent creates files within the directories at the Amazon S3

location specified in the target. Configure one of the following options for the **Prefix for Retaining Staging Files on S3** property:

- Provide a directory prefix and a file prefix. For example, `backup_dir/backup_file`. The Secure Agent creates the following directories and files:

- `backup_dir_<year>_<month>_<date>_<timestamp_inLong>`
- `backup_file.batch_<batch_number>.csv.<file_number>.<encryption_if_applicable>`

- Provide a file prefix. For example, `backup_file`. The Secure Agent creates the following directories and files:

- `<year>_<month>_<date>_<timestamp_inLong><3 digit of random number>00<ProcessID>`
- `backup_file.batch_<batch_number>.csv.<file_number>.<encryption_if_applicable>`

- Do not provide a prefix. The Secure Agent does not save the staging files.

Vacuum tables

You can use vacuum tables to recover disk space and sorts rows in a specified table or all tables in the database.

After you run bulk operations, such as delete or load, or after you run incremental updates, you must clean the database tables to recover disk space and to improve query performance on Amazon Redshift. Amazon Redshift does not reclaim and reuse free space when you delete and update rows.

Vacuum databases or tables often to maintain consistent query performance. You can recover disk space for the entire database or for individual tables in a database. You must run vacuum when you expect minimal activity on the database or during designated database administration schedules. Long durations of vacuum might impact database operations. Run vacuum often because large unsorted regions result in longer vacuum times.

You can enable the vacuum tables option when you configure the advanced target properties.

You can select the following recovery options:

None

Does not sort rows or recover disk space.

Full

Sorts the specified table or all tables in the database and recovers disk space occupied by rows marked for deletion by previous update and delete operations.

Sort Only

Sorts the specified table or all tables in the database without recovering space freed by deleted rows.

Delete Only

Recovers disk space occupied by rows marked for deletion by previous update and delete operations, and compresses the table to free up used space.

Reindex

Analyzes the distribution of the values in the interleaved sort key columns to configure the entire Vacuum table operations for a better performance.

Recovery and restart processing

When you run a mapping task to capture changed data from a CDC source and write the changed data to an Amazon Redshift target table, Amazon Redshift V2 Connector supports recovery and restart processing.

If a mapping task fails or is stopped before completing the task, the Secure Agent uses the recovery information stored in the `infa_recovery_table` table on the target system to resume the extraction of changed data from the point of interruption. This functionality prevents changed data loss and inconsistencies between the source and target.

To enable recovery and restart processing, set the **Recovery Strategy** advanced session property to **Resume from last checkpoint** on the **Schedule** page when you create or edit a mapping task. With this setting, the mapping task can resume processing changed data from the point of interruption.

In special situations, you can specify a restart point for a mapping task. Typically, the first time you start a mapping task, you specify a restart point that corresponds to the target materialization time so that no change records are skipped. The default restart point is the end of log (EOL), which is the current point of CDC processing in the log. You can specify a restart point that corresponds to the extraction processing starting from the earliest available record in the log or from a specific date and time. When you use a time-based restart point, extraction processing starts in the log that contains the first unit-of-work (UOW) that has an end time later than the restart time.

When you specify a restart point, consider the following points:

- The restart point applies to all sources in the mapping that is associated with the mapping task.
- If you set a restart point that is too early, it might correspond to a expired log file. In this case, the value of the restart point is considered as the earliest available record in the available log files.
- If you set a restart point that is later than the latest record in the log files, an error message is issued.

Note: Restart information is associated with a mapping task, a specific source and target combination. If you change the source object in a mapping, you must either create a new mapping task for the mapping or increment the restart revision number for the existing mapping task. To increment the restart revision number, navigate to the **CDC Runtime** page for the mapping task, open the **Select Restart Point** dialog box, and click **OK**. If you do not take one of these actions, the mapping task will fail the next time you run it.

Preserve record order on Write

You can retain the order number of the changed record when you capture the changed record from a CDC source to a target table. This property enables you to avoid inconsistencies between the CDC source and target.

When you modify a single record in a row several times in a CDC source, enable the **Preserve record order on write** option in the advanced target property to retain the order number of the changed record when you write the changed record to the target table.

For example, you have a record in the following CDC source table in which you have performed multiple of operations:

Emp ID	Emp Name	Emp Description	RowType	RowID
1	John	L1	Insert	1
1	John	L2	Update	2
1	John	L3	Update	3

Here, assume that the `RowID` shows the order of the changed record in the CDC source table.

The Secure Agent writes the following changed record along with the order number in the target table:

Emp ID	Emp Name	Emp Description	RowType	RowID
1	John	L3	Update	3

Octal values as DELIMITER and QUOTE

In addition to printable ASCII characters, you can use octal values for printable and non-printable ASCII characters as `DELIMITER` and `QUOTE`.

To use a printable character as `DELIMITER` or `QUOTE`, you can either specify the ASCII character or the respective octal value. However, to use a non-printable character as `DELIMITER` or `QUOTE`, you must specify the respective octal value.

Example for a printable character:

```
DELIMITER=# or DELIMITER=\043
```

Example for a non-printable character, file separator:

```
QUOTE=\034
```

Octal values 000-037 and 177 represent non-printable characters and 040-176 represent printable characters. The following table lists the recommended octal values, for `QUOTE` and `DELIMITER` in the `Copy` command and as `DELIMITER` in the `Unload` command, supported by Amazon Redshift:

Command Option	Recommended Octal Values
COPY QUOTE	001-010, 016-037, 041-054, 057, 073-100,133, 135-140, 173-177
COPY DELIMITER	001-011, 013, 014, 016, 017, 020-046, 050-054, 057, 073-133, 135-177
UNLOAD DELIMITER	001-011, 013, 014, 016, 017, 020-041, 043-045, 050-054, 056-133, 135-177

Success and error files

The Secure Agent generates success and error files after you run a mapping. Success and error files are `.csv` files that contain row-level details.

The Secure Agent generates a success file after you run a mapping. The success file contains an entry for each record that successfully writes into Amazon Redshift. Each entry contains the values that are written for all the fields of the record. Use this file to understand the data that the Secure Agent writes to the Amazon S3 bucket and then to the Amazon Redshift target.

The error file contains an entry for each data error. Each entry in the file contains the values for all fields of the record and the error message. Use the error file to understand why the Secure Agent does not write data to the Amazon Redshift target.

The Secure Agent does not overwrite success or error files. Access the error rows files and success rows files directly from the directories where they are generated. You can manually delete the files that you no longer need.

Consider the following guidelines when you configure the mapping properties for success files:

- You must provide the file path where you want the Secure Agent to generate the success rows file.
- The success rows file uses the following naming convention: `<timestamp>success`

Consider the following guidelines when you configure the mapping properties for error files:

- You must provide the file path where you want the Secure Agent to generate the error rows file.
- The success rows file uses the following naming convention: `<timestamp>error`

Note: The insert and upsert tasks error rows file follows the same naming convention.

- When you define a error file directory, you can use the variable `$PMBadFileDir`. When you use the `$PMBadFileDir` variable, the application writes the file to the following Secure Agent directory: `<Secure Agent installation directory>/apps/Data_Integration_Server/data/error`.

CHAPTER 4

Mappings and mapping tasks with Amazon Redshift

Create a mapping task to process data based on the data flow logic defined in a mapping or integration template. You can also create a mapping task to capture changed data from the Oracle CDC source and write the changed data to an Amazon Redshift target table.

Caution: The pre-SQL and post-SQL commands configured in the Source, Target, and Lookup transformations are not validated at run time. Ensure that the command syntax is free from potentially unsafe content and the database user you configured in the connection object has appropriate privileges. It is recommended to use TLS-enabled database connections for secure network communications.

Amazon Redshift V2 objects in mappings

When you create a mapping, you can configure a Source or Target transformation to represent an Amazon Redshift V2 object. Additionally, you can configure Lookups for mappings and mapping tasks.

Consider the following rules and guidelines when you configure Amazon Redshift V2 objects in mappings:

- When you use a simple filter in a mapping, you must specify the filter condition in the `YYYY-MM-DD HH24:MI:SS.MS` format. If you use an advanced filter, you must specify the filter condition in the `date_time_fix.f_timestamp < to_date('2012-05-24 09:13:57', 'YYYY-MM-DD HH24:MI:SS.MS')` format.
- When you define queries for sources or targets and the table names or the column names contain special characters, you must enclose the table names or column names in double quotes.
- To write special characters in the source column names to the target, you can configure a Target transformation in the mapping to create a new target at runtime. Enable the `Exact Source Field Names` in Target property in the `Create New at Runtime` window. You cannot view this checkbox if you select an existing object.
- When you select an Amazon Redshift V2 object that contains a boolean data type and preview the data, the Secure Agent truncates the value of the boolean data type and displays only the first letter of the boolean value.
- If a field contains a Date or Datetime data type, the **Data Preview** tab displays the field value with an offset of +4 hours.

Amazon Redshift V2 sources in mappings

In a mapping, you can configure a Source transformation to represent an Amazon Redshift V2 source.

The following table describes the Amazon Redshift V2 source properties that you can configure in a Source transformation:

Property	Description
Connection	Name of the source connection. Select a source connection, or click New Parameter to define a new parameter for the source connection.
Source type	Type of the source object. Select any of the following source object: <ul style="list-style-type: none">- Single Object- Multiple Objects. You can use implicit joins and advanced relationships with multiple objects.- Query. When you select the source type as query, you must map all the fields selected in the query in the Field Mapping tab.- Parameter Note: You cannot override the source query object and multiple objects at runtime using parameter files in a mapping. When you select the source type as query, the boolean values are written as 0 or false to the target. The query that you specify must not end with a semicolon (;).
Object	Name of the source object. You can select single or multiple source objects.
Parameter	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 Overwrite Parameter option.
Filter	Filters records based on the filter condition. You can specify a simple filter or an advanced filter.
Sort	Sorts records based on the conditions you specify. You can specify the following sort conditions: <ul style="list-style-type: none">- Not parameterized. Select the fields and type of sorting to use.- Parameterized. Use a parameter to specify the sort option.

The following table describes the Amazon Redshift V2 advanced source properties that you can configure in a Source transformation:

Property	Description
S3 Bucket Name	Amazon S3 bucket name for staging the data. You can also specify the bucket name with the folder path. If you provide an Amazon S3 bucket name that is in a different region than the Amazon Redshift cluster, you must configure the REGION attribute in the Unload command options.
Enable Compression	Compresses the staging files into the Amazon S3 staging directory. The task performance improves when the Secure Agent compresses the staging files. Default is selected.

Property	Description
Staging Directory Location	<p>Location of the local staging directory.</p> <p>When you run a task in Secure Agent runtime environment, specify a directory path that is available on the corresponding Secure Agent machine in the runtime environment.</p> <p>Specify the directory path in the following manner: <staging directory></p> <p>For example, C:\Temp. Ensure that you have the write permissions on the directory.</p>
Unload Options	<p>Unload command options.</p> <p>Add options to the Unload command to extract data from Amazon Redshift and create staging files on Amazon S3. Provide an Amazon Redshift Role Amazon Resource Name (ARN).</p> <p>You can add the following options:</p> <ul style="list-style-type: none"> - DELIMITER - ESCAPE - PARALLEL - NULL - AWS_IAM_ROLE - REGION - ADDQUOTES <p>For example: DELIMITER = \036;ESCAPE = OFF;NULL=text;PARALLEL = ON;AWS_IAM_ROLE=arn;aws;iam;;<account ID>;role/<role-name>;REGION = ap-south-1</p> <p>Specify a directory on the machine that hosts the Secure Agent.</p> <p>Note: If you do not add the options to the Unload command manually, the Secure Agent uses the default values.</p>
Treat NULL Value as NULL	Retains the null values when you read data from Amazon Redshift.
Encryption Type	<p>Encrypts the data in the Amazon S3 staging directory.</p> <p>You can select the following encryption types:</p> <ul style="list-style-type: none"> - None - SSE-S3 - SSE-KMS - CSE-SMK <p>Default is None.</p>
Download S3 Files in Multiple Parts	<p>Downloads large Amazon S3 objects in multiple parts.</p> <p>When the file size of an Amazon S3 object is greater than 8 MB, you can choose to download the object in multiple parts in parallel.</p> <p>Default is 5 MB.</p>
Multipart Download Threshold Size	<p>The maximum threshold size to download an Amazon S3 object in multiple parts.</p> <p>Default is 5 MB.</p>
Schema Name	<p>Overrides the default schema name.</p> <p>Note: You cannot configure a custom query when you use the schema name.</p>
Source Table Name	<p>Overrides the default source table name.</p> <p>Note: When you select the source type as Multiple Objects or Query, you cannot use the Source Table Name option.</p>
Pre-SQL	The pre-SQL commands to run a query before you read data from Amazon Redshift. You can also use the UNLOAD or COPY command. The command you specify here is processed as a plain text.

Property	Description
Post-SQL	The post-SQL commands to run a query after you write data to Amazon Redshift. You can also use the UNLOAD or COPY command. The command you specify here is processed as a plain text.
Select Distinct	<p>Selects unique values.</p> <p>The Secure Agent includes a <code>SELECT DISTINCT</code> statement if you choose this option. Amazon Redshift ignores trailing spaces. Therefore, the Secure Agent might extract fewer rows than expected.</p> <p>Note: If you select the source type as query or use the SQL Query property and select the Select Distinct option, the Secure Agent ignores the Select Distinct option.</p>
SQL Query	<p>Overrides the default SQL query.</p> <p>Enclose column names in double quotes. The SQL query is case sensitive. Specify an SQL statement supported by the Amazon Redshift database.</p> <p>When you specify the columns in the SQL query, ensure that the column name in the query matches the source column name in the mapping.</p>
Temporary Credential Duration	<p>The time duration during which an IAM user can use the dynamically generated temporarily credentials to access the AWS resource. Enter the time duration in seconds.</p> <p>Default is 900 seconds.</p> <p>If you require more than 900 seconds, you can set the time duration up to a maximum of 12 hours in the AWS console and then enter the same time duration in this property.</p>
Tracing Level	Use the verbose tracing level to get the amount of detail that appears in the log for the Source transformation.

Rules and guidelines for configuring SQL query

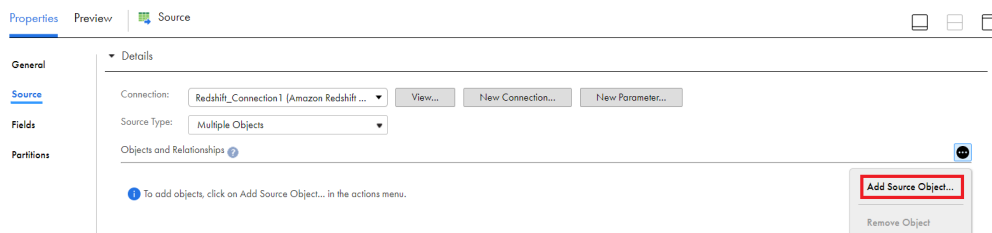
Consider the following rules and guidelines when you configure an SQL query:

- When you select the source type as Query, you can override a SQL query over a custom query by setting the flag `precedenceToSQLOverrideOverCustomQuery=True` in the JVM option. Ensure that the number of columns in the overridden SQL query is same as the custom query.

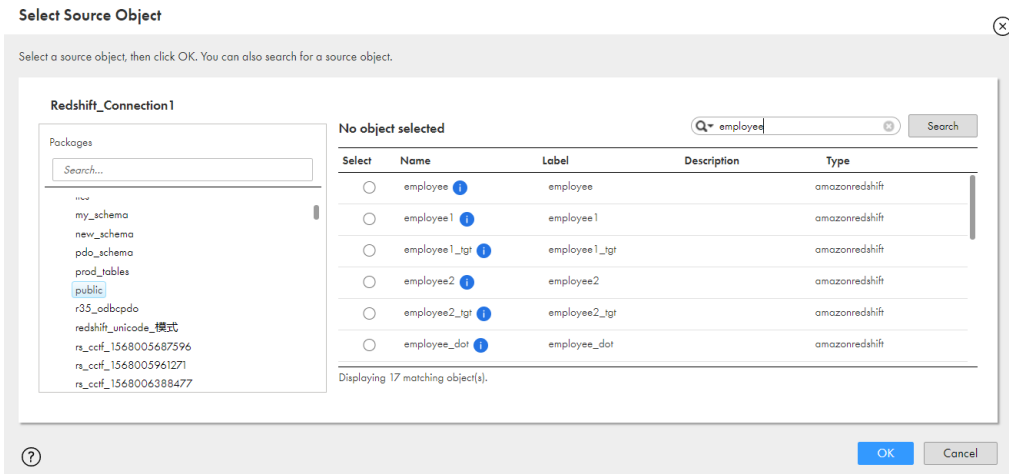
Adding multiple source objects

When you create a Source transformation, you can select Amazon Redshift V2 multiple object as the source type and then configure a join to combine the tables. You can define a relationship condition or a query to join the tables.

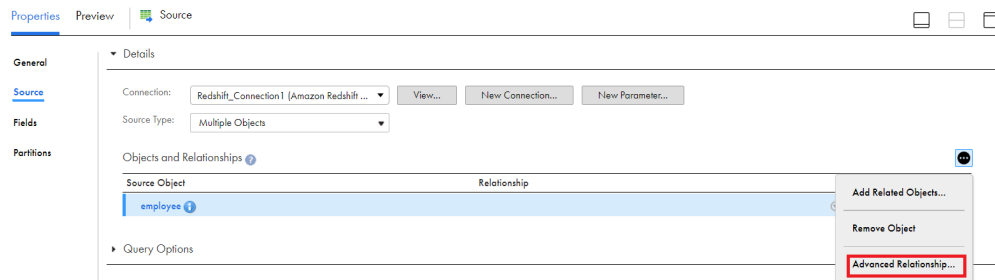
- In the Source transformation, click the **Source Type** as **Multiple Objects**.
- From the **Actions** menu, click **Add Source Object**.



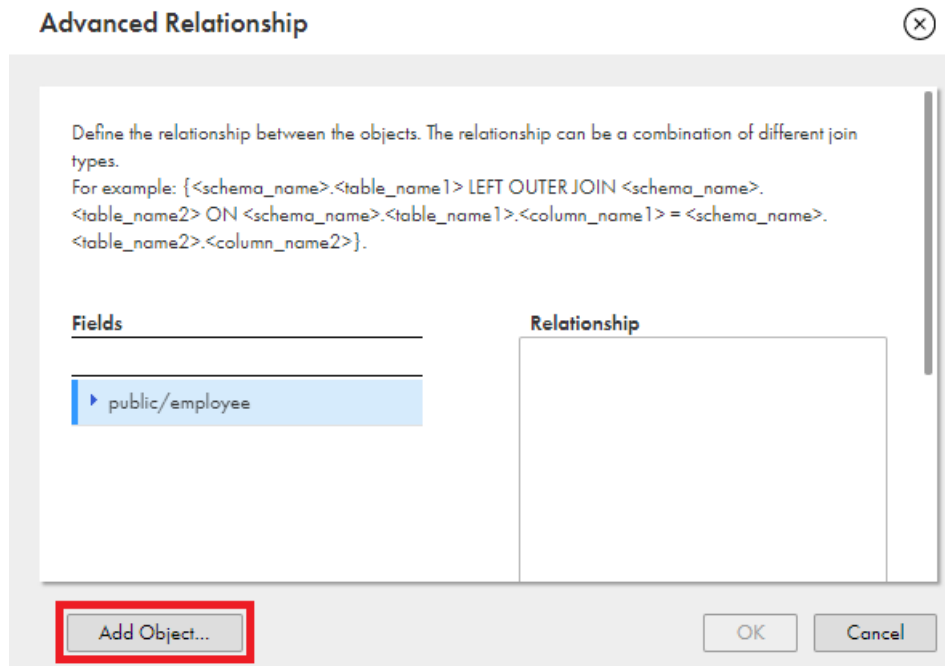
- Select the source object that you want to add from the displayed list.



- Click **OK**.
- From the **Related Objects Actions** menu, select **Advanced Relationship**:



- In the **Advanced Relationship** window, you can click **Add Object** to add more objects.



- Click **OK**.

- Set your own conditions or specify a query to define the relationship between the tables:

Advanced Relationship ✕

Define the relationship between the objects. The relationship can be a combination of different join types.
For example: {<schema_name>.<table_name1> LEFT OUTER JOIN <schema_name>.<table_name2> ON <schema_name>.<table_name1>.<column_name1> = <schema_name>.<table_name2>.<column_name2> }.

Fields	Relationship
▼ public/employee	employee.department=dept.d_id
id	
name	
salary	

Add Object... OK Cancel

Note: When you configure a join expression, select the fields and define a join condition or a query syntax.

- Click **OK**.

The following image shows an example of an advanced join condition defined between the Amazon Redshift V2 tables:

Properties Preview Source

General

Source

Fields

Partitions

Details

Connection: Redshift_Connection1 (Amazon Redshift ...) View... New Connection... New Parameter...

Source Type: Multiple Objects

Objects and Relationships

Source Object	Relationship
public/employee	employee.department=dept.d_id
public/dept	

Rules and guidelines for adding multiple source objects

Consider the following rules and guidelines when you add multiple source objects:

- You must specify double quotes for the table name when you use a reserved word for the table name and the column name.
- You cannot use a self join when you add multiple source objects.
- When you use special characters in column names for an advanced relationship, the query formed is not correct and the mapping task fails.

- When you click **Add Object** to add more objects in the **Advanced Relationship** window, the table might not load or take a lot of time to load. Import the object again.
- You cannot search for a schema when you add a related source object. You must scroll down and manually select the schema.
- You can use the full outer-join condition only with the `=`, `,`, and `AND` operators.
- When you use the advanced relationship option and specify the join queries with the schema name override, the mapping fails. The mapping fails with the following join queries:
 - inner join
 - left outer-join
 - right outer-join
 - full outer-join
 - cross join
- When you override the schema name and configure an advanced filter on a related source object, you must specify the schema name in the filter condition. Use the following syntax for the filter condition:


```
public.alldatatypes_src.f_smallint=1
```
- When you override the schema name and configure an advanced filter on a related source object, the Secure Agent applies the advanced filter only on the parent object and not on the related source object.
- When you select parent and child objects that have a primary key and foreign key relationship, and the foreign key of the related object is also a primary key in the table, the mapping task fails when you create a target.
- When you select the **Multiple Objects** source type, add a source object, for example, `emp`, and define a primary key and foreign key relationship on different columns, for example, `emp.id` and `dept.d_id`, the mapping fails with the following error:


```
[FATAL] Unload/Copy command failed with error: Invalid operation: column emp.d_id does not exist.
```

The **Select Related Objects** list shows the join condition for the `dept` related object as `emp.d_id=dept.d_id`, even though the `emp` table does not have a `d_id` column.
- When you select the `Multiple Objects` source type, ensure that the selected table names do not contain a period (`.`).

Amazon Redshift V2 targets in mappings

To write data to Amazon Redshift, configure an Amazon Redshift V2 object as the target in a mapping.

The following table describes the target properties that you can configure in a Target transformation:

Property	Description
Connection	Name of the target connection. Select a target connection, or click New Parameter to define a new parameter for the target connection.
Target Type	Type of the target object. Select Single Object or Parameter.

Property	Description
Object	<p>Name of the target object.</p> <p>You can select an existing target object or create a new target object at runtime. To create a new target at runtime, select the Create New at Runtime option</p> <p>Creates a new target at runtime based on the table type and the path you specify.</p> <p>Specify the object name, table type, and path to create a new object at runtime.</p>
Create New at Runtime	<p>Applies to the Create New at Runtime option.</p> <p>Determines if you can create a target object at runtime with the same field names as the source.</p>
Use Exact Source Field Names in Target	<p>Applies to the Create New at Runtime option. This option does not appear for an existing target.</p> <p>Select to retain all the source field names in the target exactly as in the source, including any special characters. If you disable this option, special characters in the source are replaced with underscore characters in the target.</p> <p>Default is disabled.</p>
Parameter	<p>Select an existing parameter for the target object or click New Parameter to define a new parameter for the target object.</p> <p>The Parameter property appears only if you select Parameter as the target type. If you want to overwrite the parameter at runtime, select the Overwrite Parameter option.</p>
Operation	<p>Type of the target operation.</p> <p>Select one of the following operations:</p> <ul style="list-style-type: none"> - Insert - Update - Upsert - Delete - Data Driven <p>Select Data Driven if you want to create a mapping to capture changed data from a CDC source.</p>
Data Driven Condition	<p>Enables you to define expressions that flag rows for an insert, update, delete, or reject operation. You must specify the data driven condition for non-CDC sources. For CDC sources, you must leave the field empty as the rows in the CDC source tables are already marked with the operation types.</p> <p>Note: Appears only when you select Data Driven as the operation type.</p>
Update Columns	<p>Select columns you want to use as a logical primary key for performing update, upsert, and delete operations on the target.</p> <p>Note: This field is not required if the target table already has a primary key.</p>
Create Target	<p>Creates a new target.</p> <p>When you create a new target, enter a value of the following fields:</p> <ul style="list-style-type: none"> - Name: Enter a name for the target object. - Path: Provide a schema name and create a target table within the schema. By default, the field is empty.

The following table describes the Amazon Redshift V2 advanced target properties:

Property	Description
S3 Bucket Name	Amazon S3 bucket name for writing the files to Amazon Redshift target. You can also specify the bucket name with the folder path. If you provide an Amazon S3 bucket name that is in a different region than the Amazon Redshift cluster, you must configure the REGION attribute in the Copy command options.
Enable Compression	Compresses the staging files before writing the files to Amazon Redshift. The task performance improves when the Secure Agent compresses the staged files. Default is selected.
Staging Directory Location	Location of the local staging directory. When you run a task in Secure Agent runtime environment, specify a directory path that is available on the corresponding Secure Agent machine in the runtime environment. Specify the directory path in the following manner: <staging directory> For example, C:\Temp. Ensure that you have the write permissions on the directory.
Batch Size	Minimum number of rows in a batch. Enter a number greater than 0. Default is 2000000.
Max Errors per Upload Batch for INSERT	Number of error rows that causes an upload insert batch to fail. Enter a positive integer. Default is 1. If the number of errors is equal to or greater than the property value, the Secure Agent writes the entire batch to the error file.
Truncate Target Table Before Data Load	Deletes all the existing data in the Amazon Redshift target table before loading new data.
Require Null Value For Char and Varchar	Replaces the string value with NULL when you write data to Amazon Redshift columns of Char and Varchar data types. Default is an empty string. Note: When you run a mapping to write null values to a table that contains a single column of the Int, Bigint, numeric, real, or double data type, the mapping fails. You must provide a value other than the default value in the Require Null Value For Char And Varchar property.
WaitTime In Seconds For S3 File Consistency	Number of seconds to wait for the Secure Agent to make the staged files consistent with the list of files available on Amazon S3. Default is 0.

Property	Description
Copy Options	<p>Copy command options.</p> <p>Add options to the Copy command to write data from Amazon S3 to the Amazon Redshift target when the default delimiter comma (,) or double-quote (") is used in the data. Provide the Amazon Redshift Role Amazon Resource Name (ARN).</p> <p>You can add the following options:</p> <ul style="list-style-type: none"> - DELIMITER - ACCEPTINVCHARS - QUOTE - COMPUPDATE - AWS_IAM_ROLE - REGION <p>For example:</p> <pre>DELIMITER = \036;ACCEPTINVCHARS = #;QUOTE = \037 COMPUPDATE = ON;AWS_IAM_ROLE=arn:aws:iam::<account ID>:role/<role-name>;REGION = ap-south-1</pre> <p>Specify a directory on the machine that hosts the Secure Agent.</p> <p>Note: If you do not add the options to the Copy command manually, the Secure Agent uses the default values.</p>
S3 Server Side Encryption	<p>Indicates that Amazon S3 encrypts data during upload.</p> <p>Provide a customer master key ID in the connection property to enable this property. Default is not selected.</p>
S3 Client Side Encryption	<p>Indicates that the Secure Agent encrypts data using a private key.</p> <p>Provide a master symmetric key ID in the connection property to enable this property. If you enable both server-side and client-side encryptions, the Secure Agent ignores the server-side encryption.</p>
Analyze Target Table	<p>Runs an ANALYZE command on the target table.</p> <p>The query planner on Amazon Redshift updates the statistical metadata to build and choose optimal plans to improve the efficiency of queries.</p>
Vacuum Target Table	<p>Recovers disk space and sorts the row in a specified table or all tables in the database.</p> <p>You can select the following recovery options:</p> <ul style="list-style-type: none"> - None - Full - Sort Only - Delete Only - Reindex <p>Default is None.</p>
Prefix to retain staging files on S3	<p>Retains staging files on Amazon S3.</p> <p>Provide both a directory prefix and a file prefix separated by a slash (/) or only a file prefix to retain staging files on Amazon S3. For example, <code>backup_dir/backup_file</code> or <code>backup_file</code>.</p>
Success File Directory	<p>Directory for the Amazon Redshift success file.</p> <p>Specify a directory on the machine that hosts the Secure Agent.</p>
Error File Directory	<p>Directory for the Amazon Redshift error file.</p> <p>Specify a directory on the machine that hosts the Secure Agent.</p>

Property	Description
Treat Source Rows As	<p>Overrides the default target operation. Default is INSERT. Select one of the following override options:</p> <p>NONE</p> <p>By default, none is enabled. The Secure Agent considers the task operation that you select in the Operation target property.</p> <p>INSERT</p> <p>Performs insert operation. If enabled, the Secure Agent inserts all rows flagged for insert. If disabled, the Secure Agent rejects the rows flagged for insert.</p> <p>DELETE</p> <p>Performs delete operation. If enabled, the Secure Agent deletes all rows flagged for delete. If disabled, the Secure Agent rejects all rows flagged for delete.</p> <p>UPDATE and UPSERT</p> <p>Performs update and upsert operations. To perform an update operation, you must map the primary key column and at least one column other than primary key column. You can select the following data object operation attributes:</p> <ul style="list-style-type: none"> - Update as Update: The Secure Agent updates all rows as updates. - Update else Insert: The Secure Agent updates existing rows and inserts other rows as if marked for insert. <p>For more information, see "Troubleshooting for Amazon Redshift V2 Connector" on page 84.</p> <p>Amazon Redshift V2 Connector does not support the Upsert operation in the Upgrade Strategy transformation. To use an Update Strategy transformation to write data to an Amazon Redshift target, you must select Treat Source Rows As as None.</p> <p>By default, the Secure Agent performs the task operation based on the value that you specify in the Operation target property. However, if you specify an option in the Treat Source Rows As property, the Secure Agent ignores the value of that you specify in the Operation target property or in the Update Strategy transformation.</p>
Override Target Query	Overrides the default update query that the Secure Agent generates for the update operation with the update query that you specify.
TransferManager Thread Pool Size	Number of threads to write data in parallel. Default is 10.
Pre-SQL	The pre-SQL commands to run a query before you read data from Amazon Redshift. You can also use the UNLOAD or COPY command. The command you specify here is processed as a plain text.
Post-SQL	The post-SQL commands to run a query after you write data to Amazon Redshift. You can also use the UNLOAD or COPY command. The command you specify here is processed as a plain text.
Preserve record order on write	<p>Retains the order of the records when you read data from a CDC source and write data to an Amazon Redshift target.</p> <p>Use this property when you create a mapping to capture the changed record from a CDC source. This property enables you to avoid inconsistencies between the CDC source and target.</p>

Property	Description
Minimum Upload Part Size	Minimum size of the Amazon Redshift object to upload an object. Default is 5 MB.
Number of files per batch	Calculates the number of the staging files per batch. If you do not provide the number of files, Amazon Redshift V2 Connector calculates the number of the staging files.
Schema Name	Overrides the default schema name.
Target table name	Overwrites the default target table name.
Recovery Schema Name	Schema that contains recovery information stored in the <code>infa_recovery_table</code> table on the target system to resume the extraction of the changed data from the last checkpoint.
Temporary Credential Duration	The time duration during which an IAM user can use the dynamically generated temporarily credentials to access the AWS resource. Enter the time duration in seconds. Default is 900 seconds. If you require more than 900 seconds, you can set the time duration maximum up to 12 hours in the AWS console and then enter the same time duration in this property.
Forward Rejected Rows	This property is not applicable for Amazon Redshift V2 Connector.

Rules and guidelines for creating a target

The Secure Agent converts the target table names that you specify in the **Create Target** field into lower case.

When you create a target, you can view and edit the metadata of the target object in the **Target Fields** tab. You can edit the data type, precision and define primary key of the columns in the target objects. To edit the metadata, click **Options > Edit Metadata** in the **Target Fields** tab.

Consider the following rules and guidelines when you create a target:

- When you create a target if the source table contains column of Text data type, the Secure Agent displays the following error message:

```
Unsupported datatype - 'text' for column
'LONGTXTAREA__C'
```

You must edit the data type of the source column in the Source transformation.
- You cannot parameterize the target at runtime.
- When you create a target and specify a table name or column name in uppercase or mixed case alphabets, the Secure Agent converts the target table name or column name into lowercase alphabets and the mapping task runs successfully. However, the tomcat log shows the following error message:

```
An unexpected exception occurred while fetching metadata:[The following object is not
found].
```
- When you create a target with Time data type, the new target will have the data type as Timestamp.
- When you run a mapping task with a vacuum command using the pre-SQL or post-SQL queries, the mapping fails.

Rules and guidelines to override the target query

You can specify a target query override to override the update query that the Secure Agent generates for the update operation.

Consider the following rules and guidelines when you use the override target query property for an Amazon Redshift target:

- Select **Update** for the **Treat source rows as** property in the advanced target properties.
- You cannot use the override target query for an upsert operation.
- Specify the override target query in the following format:

```
UPDATE <Target Schema Name here>.<Target TABLE NAME here>
SET <column1> = {{TU}}.<column1>,
    <column2> = {{TU}}.<column2>,
    <column> = {{TU}}.<column>
FROM {{TU}}
WHERE <Target Schema Name>.<Target TABLE NAME here> .<update column1> = {{TU}}.
<update column1>
AND <Target Schema Name>.<Target TABLE NAME here> .<update column2> = {{TU}}.
<update column2>
AND ... <Target Schema Name>.<Target TABLE NAME here> .<update column> = {{TU}}.
<update column>
```

- Column names for :TU must match the target table column names.
- The `WHERE` column is mandatory in the query.
- You cannot use left, right, or full outer joins in the `FROM` column of an override target query statement.
- All the column names in the query must be qualified names and the table name and schema name must be associated with the column names.
Note: For the `SET` columns, Amazon Redshift does not allow a column name with a table. SET columns must have column names only.
- You must specify the override target query with a valid SQL syntax because Amazon Redshift V2 Connector replaces :TU with a temporary table name and does not validate the update query.
- You cannot change the order of the column mappings using the override target query.
- You cannot specify multiple override target queries for an update operation.
- When you use the override target query option, do not additionally configure an override for the schema and table name from the **Schema Name** and **Target table name** fields.

Amazon Redshift V2 lookups in mappings

You can create lookups for objects in an Amazon Redshift V2 mapping. You can retrieve data from an Amazon Redshift V2 lookup object based on the specified lookup condition.

Use an Amazon Redshift V2 Lookup transformation to look up data in an Amazon Redshift object. For example, the source table includes the customer code, but you want to include the customer name in the target table to make summary data easy to read. You can use the Amazon Redshift V2 Lookup transformation to look up the customer name in another Amazon Redshift object.

You can add the following lookups to a mapping:

- Connected with cached
- Connected with uncached. Applicable only to mappings.
- Unconnected with cached
- Dynamic lookup cache. Applicable only to mappings.

Use the JDBC URL specified in the connection properties to create lookups.

The following table describes the Amazon Redshift V2 lookup object properties that you can configure in a Lookup transformation:

Property	Description
Connection	<p>Name of the lookup connection.</p> <p>You can select an existing connection, create a new connection, or define parameter values for the lookup connection property.</p> <p>If you want to overwrite the lookup connection properties at runtime, select the Allow parameter to be overridden at run time option.</p>
Source Type	<p>Type of the source object. Select Single Object, Query, or Parameter.</p> <p>Note: You cannot configure uncached lookups when you select the source type as query.</p>
Parameter	<p>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.</p> <p>The Parameter property appears only if you select parameter as the lookup type.</p> <p>If you want to overwrite the parameter at runtime, select the Allow parameter to be overridden at run time option.</p> <p>When the task runs, the Secure Agent uses the parameters from the file that you specify in the advanced session properties.</p>
Lookup Object	Name of the lookup object for the mapping.
Multiple Matches	<p>Behavior when the lookup condition returns multiple matches. You can return all rows, any row, the first row, the last row, or an error.</p> <p>You can select from the following options in the lookup object properties to determine the behavior:</p> <ul style="list-style-type: none"> - Return first row - Return last row - Return any row - Return all rows - Report error
Filter	Not applicable
Sort	Not applicable

The following table describes the Amazon Redshift V2 advanced lookup properties that you can configure in a Lookup transformation:

Property	Description
S3 Bucket Name ¹	<p>Amazon S3 bucket name for staging the data.</p> <p>You can also specify the bucket name with the folder path. If you provide an Amazon S3 bucket name that is in a different region than the Amazon Redshift cluster, you must configure the REGION attribute in the Unload command options.</p>
Enable Compression ¹	<p>Compresses the staging files into the Amazon S3 staging directory.</p> <p>The task performance improves when the Secure Agent compresses the staging files. Default is selected.</p>

Property	Description
Staging Directory Location ¹	<p>Location of the local staging directory.</p> <p>When you run a task in Secure Agent runtime environment, specify a directory path that is available on the corresponding Secure Agent machine in the runtime environment.</p> <p>Specify the directory path in the following manner: <staging directory></p> <p>For example, C:\Temp. Ensure that you have the write permissions on the directory.</p>
Unload Options ¹	<p>Unload command options.</p> <p>Add options to the Unload command to extract data from Amazon Redshift and create staging files on Amazon S3. Provide an Amazon Redshift Role Amazon Resource Name (ARN).</p> <p>You can add the following options:</p> <ul style="list-style-type: none"> - DELIMITER - ESCAPE - PARALLEL - NULL - AWS_IAM_ROLE - REGION - ADDQUOTES <p>For example: DELIMITER = \036;ESCAPE = OFF;NULL=text;PARALLEL = ON;AWS_IAM_ROLE=arn:aws:iam::<account ID>;role/<role-name>;REGION = ap-south-1</p> <p>Specify a directory on the machine that hosts the Secure Agent.</p> <p>Note: If you do not add the options to the Unload command manually, the Secure Agent uses the default values.</p>
Treat NULL Value as NULL ¹	Retains the null values when you read data from Amazon Redshift.
Encryption Type ¹	<p>Encrypts the data in the Amazon S3 staging directory.</p> <p>You can select the following encryption types:</p> <ul style="list-style-type: none"> - None - SSE-S3 - SSE-KMS - CSE-SMK <p>Default is None.</p>
Download S3 Files in Multiple Parts ¹	<p>Downloads large Amazon S3 objects in multiple parts.</p> <p>When the file size of an Amazon S3 object is greater than 8 MB, you can choose to download the object in multiple parts in parallel. Default is 5 MB.</p>
Multipart Download Threshold Size ¹	<p>The maximum threshold size to download an Amazon S3 object in multiple parts.</p> <p>Default is 5 MB.</p>
Schema Name	<p>Overrides the default schema name.</p> <p>Note: You cannot configure a custom query when you use the schema name.</p>
Source Table Name	<p>Overrides the default source table name.</p> <p>Note: When you select the source type as Multiple Objects or Query, you cannot use the Source Table Name option.</p>
Pre-SQL	The pre-SQL commands to run a query before you read data from Amazon Redshift. You can also use the UNLOAD or COPY command. The command you specify here is processed as a plain text.

Property	Description
Post-SQL	The post-SQL commands to run a query after you write data to Amazon Redshift. You can also use the UNLOAD or COPY command. The command you specify here is processed as a plain text.
Select Distinct ¹	<p>Selects unique values.</p> <p>The Secure Agent includes a <code>SELECT DISTINCT</code> statement if you choose this option. Amazon Redshift ignores trailing spaces. Therefore, the Secure Agent might extract fewer rows than expected.</p> <p>Note: If you select the source type as query or use the SQL Query property and select the Select Distinct option, the Secure Agent ignores the Select Distinct option.</p>
SQL Query ¹	<p>Overrides the default SQL query.</p> <p>Enclose column names in double quotes. The SQL query is case sensitive. Specify an SQL statement supported by the Amazon Redshift database.</p> <p>When you specify the columns in the SQL query, ensure that the column name in the query matches the source column name in the mapping.</p>
Temporary Credential Duration ¹	<p>The time duration during which an IAM user can use the dynamically generated temporarily credentials to access the AWS resource. Enter the time duration in seconds.</p> <p>Default is 900 seconds.</p> <p>If you require more than 900 seconds, you can set the time duration up to a maximum of 12 hours in the AWS console and then enter the same time duration in this property.</p>
Tracing Level	Use the verbose tracing level to get the amount of detail that appears in the log for the Source transformation.
¹ Does not apply to uncached lookups.	

For more information about the Lookup transformation, see *Transformations*.

Unconnected Lookup transformation

You can configure an unconnected Lookup transformation for the Amazon Redshift source in a mapping. Use the Lookup transformation to retrieve data from Amazon Redshift based on a specified lookup condition.

An unconnected Lookup transformation is a Lookup transformation that is not connected to any source, target, or transformation in the pipeline.

An unconnected Lookup transformation receives input values from the result of a :LKP expression in another transformation. The Integration Service queries the lookup source based on the lookup ports and condition in the Lookup transformation and passes the returned value to the port that contains the :LKP expression. The :LKP expression can pass lookup results to an expression in another transformation.

For more information about the Lookup transformation, see *Transformations*.

Configuring an unconnected Lookup transformation

To configure an unconnected Lookup transformation, select the **Unconnected Lookup** option, add incoming fields, configure the lookup condition, and designate a return value. Then configure a lookup expression in a different transformation.

1. Add a Lookup transformation in a mapping.

2. On the **General** tab of the Lookup transformation, enable the **Unconnected Lookup** option.

The screenshot displays the Looker Studio interface. On the left is a vertical toolbar with icons for various transformations: Source, Target, Aggregator, Cleanse, Data Masking, Expression, Filter, and a plus sign for more options. The main workspace shows a data pipeline with three components: a 'Source' box, an 'Expression' box containing the formula $f(x)$, and a 'Target' box. Arrows indicate the flow of data from Source to Expression and then to Target. Below the pipeline is a separate box labeled 'lkp' with a magnifying glass icon. At the bottom of the screen is the 'Properties' panel for the 'lkp' transformation. The 'General' tab is selected, showing the 'Name' field set to 'lkp' and the 'Unconnected Lookup' checkbox checked. Other tabs in the properties panel include 'Incoming Fields', 'Lookup Object', 'Lookup Condition', 'Return Fields', and 'Advanced'.

Properties | lkp

General

Name: * lkp

Description:

☒ Unconnected Lookup

Incoming Fields

Lookup Object


Lookup Condition

Return Fields

Advanced

3. On the **Incoming Fields** tab of the Lookup transformation, create an incoming field for each argument in the :LKP expression.

For each lookup condition you create, add an incoming field to the Lookup transformation.

Properties | 

General

Incoming Fields

Lookup Object

Lookup Condition

Return Fields

Advanced


Incoming Field:

Not Parameterized

Incoming Fields

Field Name
LOCATIONADDRESS

4. In the **Lookup Object** tab, import the lookup object.

Properties | Preview | 

General

Incoming Fields

Lookup Object

Lookup Condition

Return Fields

Lookup Object Details

Connection:

rs (Amazon Redshift v2)

View...

New Connection...

New Parameter...

Source Type:

Single Object

Lookup Object:

lcts/lkp_tbl

Select...

Preview Data...


Multiple Matches:

Return any row

The **Multiple Matches** property value **Return all rows** in an unconnected lookup is not applicable.

5. Designate a return value.

You can pass multiple input values into a Lookup transformation and return one column of data. Data Integration can return one value from the lookup query. Use the return field to specify the return value.

Properties | 

General

Incoming Fields

Lookup Object

Lookup Condition

Return Fields

Advanced

Lookup Condition:

Simple

Lookup Conditions

Lookup Field	Operator	Incoming Field
LOCADDR	=	LOCATIONADDRESS

6. Configure a lookup expression in another transformation.

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Supply input values for an unconnected Lookup transformation from a :LKP expression in a transformation that uses an Expression transformation. The arguments are local input fields that match the Lookup transformation input fields used in the lookup condition.

Field Expression: NewField(decimal, 10, 0)

Configure expression by adding fields and functions.

Expression: Not Parameterized

Fields

LOCATIONID
LOCATIONNAME
LOCATIONPHONE
LOCATIONADDRESS

Expression

:LKP.lkp(LOCATIONADDRESS)

Validate

OK Cancel

7. Map the fields with the target.

Enabling lookup caching

When you configure a Lookup transformation in a mapping, you can cache the lookup data during the runtime session.

When you select **Lookup Caching Enabled**, Data Integration queries the lookup source once and caches the values for use during the session, which can improve performance. You can specify the directory to store the cached lookup.

Lookup Cache Persistent

Use lookup cache persistent to save the lookup cache file to reuse it the next time Data Integration processes a Lookup transformation configured to use the cache.

You can specify the file name prefix to use with persistent lookup cache files in the **Cache File Name Prefix** field.

If the lookup table changes occasionally, you can enable the **Re-cache from Lookup Source** property to rebuild the lookup cache.

Dynamic Lookup Cache

Use a dynamic lookup cache to keep the lookup cache synchronized with the target. By default, the dynamic lookup cache is disabled and represents static cache.

If the cache is static, the data in the lookup cache does not change as the mapping task runs.

If the task uses the cache multiple times, the task uses the same data. If the cache is dynamic, the task updates the cache based on the actions in the task, so if the task uses the lookup multiple times, downstream transformations can use the updated data.

For information about lookup caching, see *Transformations* in the Data Integration documentation.

Rules and guidelines for configuring lookup transformations

Consider the following rules and guidelines when you configure an Amazon Redshift lookup transformation:

- You cannot use the SQL query property for uncached lookups.

Mapping task with Oracle CDC sources example

Your organization needs to replicate real-time changed data from a mission-critical Oracle production system to minimize intrusive, non-critical work, such as offline reporting or analytical operations system. You can use Amazon Redshift V2 Connector to capture changed data from the Oracle CDC source and write the changed data to an Amazon Redshift target table. Add the Oracle CDC sources in mappings, and then run the associated mapping tasks to write the changed data to the target.

1. In Data Integration, click **New > Mapping > Create**.
The **New Mapping** dialog box appears.
2. Enter a name and description for the mapping.
3. On the Source transformation, specify a name and description in the general properties.
4. On the **Source** tab, select the configured Oracle CDC connection and specify the required source properties.
5. On the Target transformation, specify a name and description in the general properties.
6. On the **Target** tab, perform the following steps to configure the target properties:
 - a. In the **Connection** field, select the Amazon Redshift V2 connection.
 - b. In the **Target Type** field, select the type of the target object.
 - c. In the **Object** field, select the required target object.
 - d. In the **Operation** field, select **Data Driven** to properly handle insert, update, and delete records from the source.
 - e. In the **Data Driven Condition** field, leave the field empty.
 - f. In the **Advanced Properties** section, provide the values of the required target properties. You must select the **Preserve record order on write** check box and enter the value of the **Recovery Schema Name** property.
7. On the **Field Mapping** tab, map the incoming fields to the target fields. You can manually map an incoming field to a target field or automatically map fields based on the field names.
8. In the **Actions** menu, click **New Mapping Task**.
The **New Mapping Task** page appears.
9. In the **Definition** tab, enter the task name and select the configured mapping.
10. In the **CDC Runtime** tab, specify the required properties.
For more information about the **CDC Runtime** properties, see the help for Oracle CDC Connector.
11. In the **Schedule** tab, specify the following properties in the **Advanced Session Properties** section:
 - a. In the **Commit on End of File** field, select the value of the property as **No**.
 - b. In the **Commit Type** field, select the value of the property as **Source**.
 - c. In the **Recovery Strategy** field, select the value of the property as **Resume from last checkpoint**.
12. Click **Save > Run** the mapping.

Alternatively, you can create a schedule that runs the mapping task on a recurring basis without manual intervention. You can define the schedule to minimize the time between mapping task runs.

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

Process SQL queries using an SQL transformation

You can configure an SQL transformation to process SQL queries midstream in an Amazon Redshift V2 mapping.

When you add an SQL transformation to the mapping, on the SQL tab, you define the connection and the type of SQL that the transformation processes.

Process SQL queries and stored procedures using an SQL transformation

When you add an SQL transformation to the mapping, on the SQL tab, you define the database connection and the type of SQL that the transformation processes.

The SQL transformation can process the following types of SQL statements:

Stored procedure

You can configure an SQL transformation to call a stored procedure in Amazon Redshift. The stored procedure must exist in the Amazon Redshift database before you create the SQL transformation. When the SQL transformation processes a stored procedure, it passes input parameters to the stored procedure. The stored procedure passes the return value to the output fields of the transformation.

The screenshot shows the 'SQL' tab in a configuration tool. On the left is a sidebar with tabs: 'Properties', 'General', 'Incoming Fields', 'SQL' (selected), 'Input Fields', 'Field Mapping', 'Output Fields', and 'Advanced'. The main area has a 'Connection' dropdown set to 'rs' with buttons 'View...', 'New Connection...', and 'New Parameter...'. Below is 'SQL Type' set to 'Stored Procedure'. Then 'Stored Procedure' is set to 'qatest/sp_bigint' with a 'Select...' button. At the bottom, 'Description' is 'sp_bigint'.

SQL Query

You can configure an SQL transformation to process an entered query that you define in the SQL editor. The SQL transformation processes the query and returns the rows. The SQL transformation also returns any errors that occur from the underlying database or if there is an error in the user syntax.

The screenshot shows the 'SQL' tab in a configuration tool. The sidebar is the same as the previous image. In the main area, 'Connection' is 'redshiftv2' with 'View...', 'New Connection...', and 'New Parameter...' buttons. 'SQL Type' is 'SQL Query'. 'Query Type' is 'Entered Query'. Below this is a 'Query' section with a 'Fields' list on the left containing 'emp_id', 'last_name', 'dept_id', and 'dept_id'. To the right is a 'Query' text area with a 'Format SQL' and 'Validate' button. The query text is:

```
1 select
2 *
3 from
4 redshift_ero.employeeaddress
```

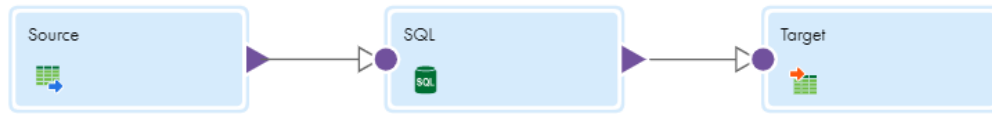
Note: Specify only a single query. You cannot specify multiple SQL queries. The saved query type is not applicable.

For more information about SQL queries and stored procedures, see *Transformations* in the Data Integration help.

Configuring a stored procedure

You can configure a SQL transformation to process a stored procedure on the **SQL** tab of the SQL transformation.

Add a SQL transformation in an Amazon Redshift mapping.



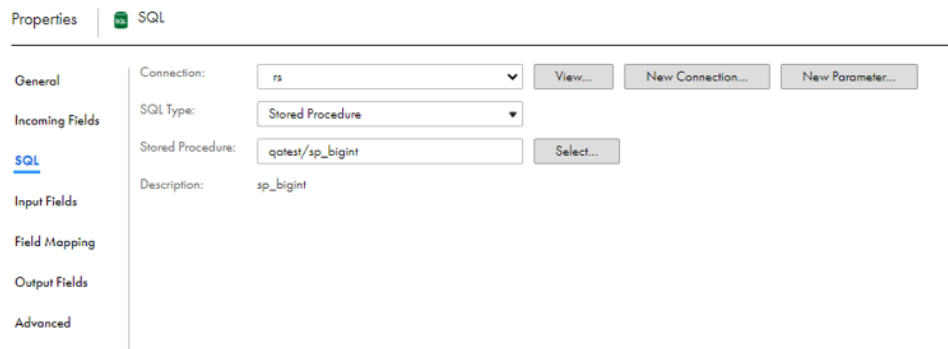
Perform the following tasks in the SQL transformation:

1. Enter a name and description for the SQL transformation.
2. In the **Incoming Fields** tab, define field rules that determine the data to include in the transformation.
3. In the **Properties** panel of the SQL transformation, click the **SQL** tab.
4. On the **SQL** tab, perform the following tasks:
 - a. Select the connection to the database.
You can select the connection or use a parameter.
 - b. Set the SQL type to **Stored Procedure**.
 - c. Click **Select** to select the stored procedure from the database, or enter the exact name of the stored procedure to call.

The stored procedure name is case-sensitive.

Note: If you add a new stored procedure to the database while you have the mapping open, the new stored procedure does not appear in the list of available stored procedures. To refresh the list, close and reopen the mapping.

The following image shows the configured SQL transformation properties:



5. On the **Field Mapping** tab, specify how to map incoming fields to the input fields of the selected stored procedure.
6. Define advanced properties for the transformation according to your requirement.

Rules and guidelines for stored procedures

Consider the following rules and guidelines for stored procedures:

- When you use the same column names in the source table as in the table used in the stored procedure, the mapping task fails.

- When you specify the numeric data type, for example, `numeric(10,2)` for a column in a stored procedure, the mapping task fails.
- When you create a stored procedure in a mapping, the output port must not include the refcursor data type.
- You cannot read from multiple stored procedures that have the same name even if the input parameters that you specify for the stored procedures are different.

Dynamic schema handling for mappings

You can choose how Data Integration handles changes that you make to the data object schemas. To refresh the schema every time the mapping task runs, you can enable dynamic schema handling in the task.

A schema change includes one or more of the following changes to the data object:

- Fields added.
- Fields updated for data type or scale.

Configure schema change handling on the **Schedule** page when you configure the task.

The following table describes the schema change handling options:

Option	Description
Asynchronous	Default. Data Integration refreshes the schema when you edit the mapping or mapping task, and when Informatica Intelligent Cloud Services is upgraded.
Dynamic	<p>Data Integration refreshes the schema every time the task runs.</p> <p>You can choose from the following options to refresh the schema:</p> <ul style="list-style-type: none"> - Alter and Apply Changes. Data Integration alters the target schema and adds the new fields from the source. - Drop Current and Recreate. Drops the existing target table and then recreates the target table at runtime using all the incoming metadata fields from the source. - Don't Apply DDL Changes. Data Integration does not apply the schema changes to the target.

For more information, see the "Schema change handling" topic in *Tasks* in the Data Integration help.

Rules and guidelines for dynamic schema handling for mappings

Consider the following rules and guidelines when you enable dynamic schema change handling:

- Updates to the data types and scale are not applicable.
- When you use special characters in a target table column and select **Alter and Apply Changes**, the mapping task fails with an error.
- When you use a completely parameterized filter in a field mapping in a Source transformation and select the **Dynamic** option, the **Schedule** page does not display the options to refresh the schema.
- When you use an SQL override in a Source transformation and select **Alter and Apply Changes**, the mapping task fails with an error.
- When you add a field in the source as a primary key and select **Alter and Apply Changes**, the mapping task runs successfully and the field is propagated to target. However, the primary key is not considered.
- When you override the source table name or schema name and select the **Alter and Apply Changes** schema change handling option, and if new fields are added to the overridden source table, the mapping runs successfully. However, the Secure Agent does not fetch the newly added fields from the overridden source table.

Bulk processing for write operations

You can enable bulk processing to write large amounts of data to Amazon Redshift. Bulk processing utilizes minimal number of API calls and enhances performance of the write operation.

To enable bulk processing, specify the property `-DENABLE_WRITER_BULK_PROCESSING=true` in the Secure Agent properties:

Perform the following steps to configure bulk processing before you run a mapping:

1. In Administrator, select the Secure Agent listed on the **Runtime Environments** tab.
2. Click **Edit**.
3. In the **System Configuration Details** section, select **Data Integration Service** as the service and **DTM** as the type.
4. Edit the **JVMOption1** property, and enter `-DENABLE_WRITER_BULK_PROCESSING=true`.
5. Click **Save**.

Note: Not applicable to mapping tasks configured with pushdown optimization.

CHAPTER 5

Amazon Redshift pushdown optimization

You can use pushdown optimization to push the transformation logic to the target databases. The amount of transformation logic that you can push to the database depends on the database, transformation logic, and task configuration. The Secure Agent processes all transformation logic that it cannot push to a database. Full pushdown optimization is enabled by default in mapping tasks.

Pushdown optimization types

When you apply pushdown optimization, the task pushes transformation logic to the source or target database based on the optimization type you specify in the task properties. Data Integration translates the transformation logic into SQL queries or Amazon Redshift commands to the Amazon Redshift database. The database runs the SQL queries or Amazon Redshift commands to process the transformations.

You can configure the following types of pushdown optimization in a mapping:

None

The task does not push down the transformation logic to the Amazon Redshift database.

Full

The task pushes as much of the transformation logic as possible to process in the target database. When a transformation is not supported in the mapping, the task partially pushes down the mapping logic to the point where the transformation is supported for pushdown optimization.

Source

The task pushes down as much as the transformation logic as possible to process in the source database. When you select source pushdown optimization, the task pushes the transformation logic for all the configured transformations downstream in the mapping until it reaches the Target transformation. It leaves out the target transformation logic and pushes down the rest of the mapping logic to the source database.

Data Integration behavior with source and full pushdown optimization

When you select full or source pushdown optimization for a mapping that reads from or writes to Amazon Redshift, Data Integration analyzes the mapping from the source to the target or until it reaches a downstream transformation to determine whether to push down only partial or the entire mapping logic for processing to the database.

If all the transformations in the mapping are supported for pushdown optimization, the task pushes down the entire mapping logic to the database.

When a transformation is not supported in the mapping, the task partially pushes down the mapping logic to the point where the transformation is supported for pushdown optimization. Data Integration generates and executes a SELECT statement for the transformation logic that needs to be pushed down. Then, it reads the results of this SQL query and processes the remaining transformations in the mapping.

Pushdown optimization scenarios

You can configure pushdown optimization using the Amazon Redshift V2 Connector or the Amazon Redshift ODBC Connector in mappings.

You can use configure pushdown optimization for the following scenarios when you use Amazon Redshift V2 Connector in mappings:

Source and target endpoints	Supported pushdown scenarios in mappings	Pushdown optimization type
Amazon S3 source Amazon Redshift target	Reads from Amazon S3 and writes to Amazon Redshift using the Amazon Redshift V2 connection. When data is read from the source to the target, this connection uses the AWS commands.	Full
Amazon Redshift source Amazon Redshift target	Reads from Amazon Redshift and writes to Amazon Redshift using the Amazon Redshift V2 connection. The source and target can be in the same or different cluster regions.	Source, Full Note: The Secure Agent pushes the entire mapping logic or only the partial mapping logic, as applicable, for processing to Amazon Redshift.
Amazon Redshift source	Reads from Amazon Redshift using the Amazon Redshift V2 connection and writes to other targets.	Source
Note: You can use the Secure Agent or the Hosted Agent to run mappings enabled with pushdown optimization.		

Note: You can configure pushdown for a mapping that uses an Amazon Redshift ODBC connection to read from and write to Amazon Redshift. Informatica recommends that you use the Amazon Redshift V2 connection in mappings to configure pushdown optimization. If you cannot push down specific transformation logic using the Amazon Redshift V2 connection, you can explore configuring pushdown optimization using the Amazon Redshift ODBC connection. The Amazon Redshift ODBC connection uses the Amazon ODBC 64-bit drivers on Windows and Linux systems. For more information, see the How-To Library article, [Configuring pushdown optimization for Amazon Redshift using the ODBC Connector](#).

Configuring optimization for an Amazon Redshift V2 mapping task

Perform the following steps to configure pushdown optimization for an Amazon Redshift V2 mapping task:

1. Create a mapping based on your requirement:
 - To read from Amazon S3 and write to Amazon Redshift, use the Amazon S3 V2 connection in the Source transformation and Amazon Redshift V2 connection in the Target transformation.
 - To read from or write to Amazon Redshift, use the Amazon Redshift V2 connection in the Source and target transformations.
2. Create a mapping task.
 - a. Select the configured mapping.
 - b. In the **Pushdown Optimization** section on the **Schedule** tab, set the pushdown optimization value to **Full** or **To Source**.

You can use Source pushdown optimization only when you read from an Amazon Redshift source.

Note: The Optimization context type option is not applicable for an Amazon Redshift V2 mapping task.
 - c. Save the task and click **Finish**.

When you run the mapping task, the transformation logic is pushed to the Amazon Redshift database. To verify that the pushdown optimization has taken place, you can check the session log for the job. You can monitor the jobs that you initiated on the **My Jobs** page.

Pushdown optimization using an Amazon Redshift V2 connection

You can configure pushdown optimization for a mapping that contains an Amazon Redshift V2 connection. Pushdown optimization enhances the mapping performance.

When you run a task configured for pushdown optimization, the task converts the transformation logic to Amazon Redshift queries. The task sends the queries to Amazon Redshift and the mapping logic is processed in the Amazon Redshift database.

When you can configure pushdown optimization in a mapping to read from Amazon Redshift using an Amazon Redshift V2 connection, you can read data from tables, external tables, views, and materialized views.

Example

You work for a rapidly growing data science organization. Your organization develops software products to analyze financials, building financial graphs connecting people profiles, companies, jobs, advertisers, and publishers. The organization uses infrastructure based on Amazon Web Services and stores its data in Amazon S3. The organization plans to implement a business intelligence service to build visualization and perform real-time analysis. You can load data from Amazon S3 to Amazon Redshift by configuring the transformations using the AWS commands, to support the adequate data warehouse model and the consuming requirements.

Create an Amazon S3 V2 connection to read data from the Amazon S3 source. Create an Amazon Redshift V2 connection and use pushdown optimization to write data to the Amazon Redshift target. Using the

Amazon Redshift V2 connection with pushdown optimization enhances the performances and reduces the cost involved.

Pushdown compatibility

You can configure the task to push transformations, functions, and operators to the database.

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

Functions with Amazon Redshift V2

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

The following table summarizes the availability of pushdown functions in an Amazon Redshift database. Columns marked with an X indicate that the function can be pushed to the Amazon Redshift database. Columns marked with a dash (-) symbol indicate that the function cannot be pushed to the database.

Function	Pushdown	Function	Pushdown	Function	Pushdown
ABORT()	-	INITCAP()	X	REG_MATCH()	-
ABS()	X	INSTR()	X	REG_REPLACE	-
ADD_TO_DATE()	X	IS_DATE()	-	REPLACECHR()	X
AES_DECRYPT()	-	IS_NUMBER()	X	REPLACESTR()	X
AES_ENCRYPT()	-	IS_SPACES()	X	REVERSE()	-
ASCII()	-	ISNULL()	-	ROUND(DATE)	-
AVG()	X	LAST()	-	ROUND(NUMBER)	X
CEIL()	X	LAST_DAY()	X	RPAD()	X
CHOOSE()	-	LEAST()	-	RTRIM()	X
CHR()	X	LENGTH()	X	SET_DATE_PART()	-
CHRCODE()	-	LN()	X	SIGN()	X
COMPRESS()	-	LOG()	X	SIN()	X
CONCAT()	X	LOOKUP()	X	SINH()	-
COS()	X	LOWER()	X	SOUNDEX()	-
COSH()	-	LPAD()	X	SQRT()	X
COUNT()	X	LTRIM()	X	STDDEV()	X
CRC32()	-	MAKE_DATE_TIME()	-	SUBSTR()	X

Function	Pushdown	Function	Pushdown	Function	Pushdown
CUME()	-	MAX()	X	SUM()	X
DATE_COMPARE()	X	MD5()	X	SYSTIMESTAMP()	X
DATE_DIFF()	X	MEDIAN()	X	TAN()	X
DECODE()	X	METAPHONE()	-	TANH()	-
DECODE_BASE64()	-	MIN()	X	TO_BIGINT	X
DECOMPRESS()	-	MOD()	X	TO_CHAR(DATE)	X
ENCODE_BASE64()	-	MOVINGAVG()	-	TO_CHAR(NUMBER)	X
EXP()	X	MOVINGSUM()	-	TO_DATE()	X
FIRST()	-	NPER()	-	TO_DECIMAL()	X
FLOOR()	X	PERCENTILE()	-	TO_FLOAT()	X
FV()	-	PMT()	-	TO_INTEGER()	X
GET_DATE_PART()	X	POWER()	X	TRUNC(DATE)	X
GREATEST()	-	PV()	-	TRUNC(NUMBER)	X
IIF()	X	RAND()	-	UPPER()	X
IN()	X	RATE()	-	VARIANCE()	X
INDEXOF()	-	REG_EXTRACT()	-		

Operators with Amazon Redshift V2

When you use pushdown optimization, Data Integration converts the expression in the transformation by determining equivalent operators in the database. If there is no equivalent operator, the Data Integration processes the transformation logic.

These operator can be pushed to the Amazon Redshift database by using full pushdown optimization.

The following table lists the pushdown operators that can be used in an Amazon Redshift database:

Operator	Operator
+	>=
-	<=
*	!=
/	AND
%	OR

Operator	Operator
	NOT
>	
<	
=	

Transformations for Amazon Redshift V2 mappings

When you configure pushdown optimization, the Secure Agent tries to push the configured transformation to Amazon Redshift.

The following list summarizes the availability of transformations that you can push down to Amazon Redshift.

- Aggregator
- Expression
- Filter
- Joiner
- Lookup
- Sorter
- SQL
- Router
- Union

Aggregator transformation

You can configure full pushdown optimization to push an Aggregator transformation to process in Amazon Redshift.

Aggregate calculations

You can perform the following aggregate calculations:

- AVG
- COUNT
- MAX
- MIN
- MEDIAN
- SUM
- VARIANCE

Incoming fields

When you configure an Aggregator transformation and the incoming field is not used in an aggregate function or in a group by field, the output is not deterministic as the ANY_VALUE() function returns any value from the field.

Expression transformation

You can configure full pushdown optimization to push an Expression transformation to process in Amazon Redshift.

You can add an Expression transformation to each of the sources in the mapping, followed by a join downstream in the mapping. Additionally, you can add multiple Expression transformations that branch out from a transformation and then branch in into a transformation downstream in the mapping.

When you configure an Expression transformation, consider the following rules to include variables in the expression:

- You cannot use variables where you are using the value assigned while processing a previous row for calculations in the current row. If you do, the mapping runs without pushdown optimization.
- The variables can be nested, but you cannot refer to a variable before it is defined in the expression. If the variables are not defined in that order, the mapping runs without pushdown optimization.

For example,

```
var: AGEPLUS2 = AGEPLUS1 + 1
var: AGEPLUS1 = AGE + 1
out: NEXTAGE = AGEPLUS2 + 1
```

Here, AGE + 1 is defined later. AGEPLUS2 in the first variable refers to AGEPLUS1 and remains unresolved.

To resolve this, specify the variables in the following order:

```
var: AGEPLUS1 = AGE + 1
var: AGEPLUS2 = AGEPLUS1 + 1
out: NEXTAGE = AGEPLUS2 + 1
```

- The variables cannot have an expression that is cyclic or refers to itself:

For example,

```
var: AGEPLUS1 = AGEPLUS2 + 1
var: AGEPLUS2 = AGEPLUS1 + 1
out: NEXTAGE = AGEPLUS2
```

Here, AGEPLUS1 refers to AGEPLUS2 and remains unresolved.

Joiner transformation

You can configure a Joiner transformation between two Amazon S3 sources or two Amazon Redshift sources.

Lookup transformation

You can configure full pushdown optimization to push a Lookup transformation to process in Amazon Redshift. You can push both a connected and an unconnected lookup.

Consider the following rules when you configure a lookup in a mapping:

- You can configure a lookup to Amazon S3 only when the source used is Amazon S3.
- You can configure a lookup to Amazon Redshift when the source used is Amazon S3 or Amazon Redshift.

You can nest the unconnected lookup function with other expression functions. For more information on specific rules for lookups, see [Rules and guidelines for Lookup transformations](#).

Sorter transformation

You can configure full pushdown optimization to push a Sorter transformation to process in Amazon Redshift.

When you configure a Sorter transformation, only the following sorter advanced properties are applicable:

- **Distinct.** You can remove the duplicate rows and create a distinct query.
- **Null Treated Low.** You can sort the columns in a query based on the columns having null values. You can sort the columns only in a query. The sort order is not honored on the Redshift target.

SQL transformation

You can use an SQL transformation to push Redshift supported scalar functions to Amazon Redshift.

When you configure pushdown optimization for a mapping, you can use SQL user-defined functions (UDFs) in a SQL transformation and run queries with the Amazon Redshift target endpoint.

You can use only the SELECT clause SQL statement to push down a function. The following snippet demonstrates the syntax of a simple select SQL query:

```
SELECT <function_name1>(~Arg~), <function_name2> (~Arg~)...
```

You must provide the corresponding query in the following format:

```
select <Redshift_supported_scalar_function1> (~Arg~),  
<Redshift_supported_scalar_function2> (~Arg~)
```

You can push a SQL transformation with the following restrictions:

- You can configure only a SQL query in the SQL transformation. You cannot enable a stored procedure when you push down to Amazon Redshift.
- The SQL query must be a simple SELECT statement without 'FROM' and 'WHERE' arguments. The SQL transformation only supports functions with Simple SELECT statement.
- When you specify a SELECT query, you must also specify the column name and number of columns based on the functions. For example, when you specify the query `select square(~AGE~), sqrt(~SNAME~)`, you must specify two output columns for AGE and SNAME functions each, otherwise the mapping fails.
- You can only use a SQL transformation when the SELECT statement is present in the query property. Even if an entire query containing the SELECT statement comes from a parameterized input port, the pushdown optimization fails.
- If any SQL error occurs, the error is added to the `SQLException` field by default. However, when mapping runs in PDO mode, the `SQLException` field will remain as Null.
- The `NumRowsAffected` field number records the number of rows affected while computing the output buffer. However, for SQL transformation, the `NumRowsAffected` will be 0 since the query runs for all records in a single go and not for each row.
- Amazon Redshift offers only passive behavior of SQL transformations where the support for dynamic queries are limited.

Router transformation

When you configure a Router transformation, you must connect or map only one output group to the target transformation.

Features

You can configure pushdown optimization for a mapping that reads from the following sources and writes to an Amazon Redshift target:

- Amazon Redshift V2 source
- Amazon S3 V2 source

When you configure a mapping, some parameters are not supported for a mapping enabled for pushdown optimization. You can refer to the list of parameters that each source supports.

Amazon Redshift V2 sources, targets, and lookups

You can configure an Amazon Redshift V2 connection in the source transformation with basic, IAM, and assume role authentication and enable pushdown optimization in the mapping task.

Connection properties

When you configure pushdown optimization, you can use the following advanced properties for an Amazon Redshift V2 source in the Amazon Redshift V2 connection:

- User name
- Password
- Access key and secret key
- JDBC URL
- Region
- Master symmetric key
- Customer master key ID

Source properties

When you configure pushdown optimization, you can use the following properties for an Amazon Redshift V2 source in the Source transformation:

- Source connection- Parameter, Allow parameter to be overridden at run time
- Source type - Single object, multiple objects, query, and parameter
- Filter
- S3 bucket name
- Enable compression
- Unload options
- Encryption type - SSE-S3, SSE-KMS, SSE-SMK

Note: You must specify the same master symmetric key in the target properties.

- Schema name
- Source table name
- Pre-SQL
- Post-SQL
- SQL query
- Select distinct

Target properties

When you configure pushdown optimization, you can use the following properties for an Amazon Redshift V2 target:

- Target connection- Parameter, Allow parameter to be overridden at run time
- Target type- Single object, parameter
- Allow parameter to be overridden at run time
- Target object- Existing target, Create new at runtime
- Operation- Insert, update, upsert, delete, or data driven
- Analyze target table
- Assume Role
- COPY command
 - Region
 - Truncatecolumn
 - AWS_IAM_Role, only for Parquet and ORC files
- Pre-SQL
- Post-SQL
- Require null value for Char and Varchar
- Schema name
- Target table name
- Truncate target table before data upload
- Vacuum table
- Override Target Query
- Treat Source Rows As (Insert, Update, Upsert, Delete, and None). Select None when you use data driven operation.
- Max Errors per Upload Batch for INSERT

Note: If you configure source and target advanced properties that are not applicable, the mappings run in the Informatica runtime environment.

Lookup properties

When you configure pushdown optimization, you can use the following properties for Amazon Redshift V2 lookups:

- Lookup connection- Parameter, Allow parameter to be overridden at run time
- Source type - Single object, query, parameter
- Multiple matches - Report error. Applicable for unconnected lookups.
- Multiple matches- Return all rows. Applicable for connected lookups.
- S3 Bucket Name
- Enable Compression
- Unload Options
- Encryption Type
- Schema Name

- Source Table Name
- Pre-SQL
- Post-SQL
- SQL Query
- Select Distinct

Note: You can specify a parameter file in the mapping task to override the Amazon Redshift V2 source, lookup, and target connections and objects in a mapping.

Amazon S3 V2 source

You must configure an Amazon S3 V2 connection with basic, assume role, and IAM authentication when you enable pushdown optimization in a mapping task.

Source properties

When you configure pushdown optimization, you can use the following properties for an Amazon S3 V2 source in a mapping:

- Source connection
- Source type- Single object, parameter
- Parameter
- Encryption type- Client-side encryption (applicable to flat files), Server-side encryption, Server-side encryption with KMS
- Data compression- Gzip (applicable to flat and Parquet files), Deflate (applicable to Avro files), Snappy (applicable to Avro, Parquet, and ORC files), and Zlib (applicable to ORC files)
- File format
 - Delimiter
 - Qualifier
 - Code Page
 - Header Line Number
 - First Data Row
 - Source Type
 - Folder Path
- File source type
- File name
- Format type
 - Avro
 - Parquet
 - ORC
 - JSON
 - Delimited

Optimizing full pushdown for multiple targets

You can add multiple Amazon Redshift V2 targets in a mapping.

When you configure a mapping to write to multiple Amazon Redshift V2 targets, you can further optimize the write operation when you configure full pushdown optimization.

To optimize, you can choose to configure an insert, update, upsert, delete, or data driven operation for multiple targets individually.

You can select the same or different Amazon Redshift V2 target table in multiple Target transformations and perform different operations for each of the Target transformations to run independent of each other.

Rules and guidelines

Consider the following rules and guidelines when you optimize full pushdown for multiple targets:

- When you run a mapping and use the same target table in all the targets, the row count is different from the row count of the mapping that runs without pushdown optimization. Applicable when you use an Amazon S3 source and perform an upsert operation on multiple Redshift V2 targets.
- When you run a mapping and use the same target table in all the targets, the Secure Agent writes a different set of data to the target than the data of the mapping that runs without pushdown optimization. Applicable when you use an Amazon S3 source, perform an insert operation on multiple Redshift V2 targets, and enable the **Truncate Target Table Before Data Load** advanced target property.

Previewing pushdown optimization

Before you can run a mapping task configured for pushdown optimization, you can preview if pushdown optimization is possible when you create the mapping. You can preview pushdown optimization from the **Pushdown Optimization** panel in the Mapping Designer.

After you select the required pushdown optimization options and run the preview, Data Integration creates and runs a temporary pushdown preview mapping task. When the job completes, Data Integration displays the SQL queries to be executed and any warnings in the **Pushdown Optimization** panel. The warning messages help you understand which transformations in the configured mapping are not applicable for pushdown optimization. If pushdown optimization fails, Data Integration lists any queries generated up to the point of failure. You can edit the mapping and fix the required transformations before you run the mapping for pushdown optimization.

You can also view the temporary job created under **My Jobs** and download the session log to view the queries generated.

For more information about how to preview pushdown optimization, see the topic "Pushdown optimization preview" in *Mappings* in the Data Integration help.

Configuring optimization for an Amazon Redshift V2 mapping task

Perform the following steps to configure pushdown optimization for an Amazon Redshift V2 mapping task:

1. Create a mapping based on your requirement:
 - To read from Amazon S3 and write to Amazon Redshift, use the Amazon S3 V2 connection in the Source transformation and Amazon Redshift V2 connection in the Target transformation.
 - To read from or write to Amazon Redshift, use the Amazon Redshift V2 connection in the Source and target transformations.

2. Create a mapping task.
 - a. Select the configured mapping.
 - b. In the **Pushdown Optimization** section on the **Schedule** tab, set the pushdown optimization value to **Full** or **To Source**.

Note: The Optimization context type option is not applicable for an Amazon Redshift V2 mapping task.
 - c. Save the task and click **Finish**.

When you run the mapping task, the transformation logic is pushed to the Amazon Redshift database. To verify that the pushdown optimization has taken place, you can check the session log for the job. You can monitor the jobs that you initiated on the **My Jobs** page.

Clean stop a pushdown optimization job

When a task enabled for pushdown optimization is running, you can clean stop the job to terminate all the issued statements and processes spawned by the job.

Use the **Clean Stop** option on the My Jobs page in Data Integration and the All Jobs and Running Jobs page in Monitor.

See the following exceptions before you clean stop a pushdown optimization task:

- When you clean stop a task enabled for pushdown optimization and the target or source properties in the mapping contains SQL statements, all the SQL statements in progress are attempted to be reverted. All SQL statements that are committed cannot be reverted.
- When you run a mapping configured to create a new target at runtime and clean stop the job immediately, Data Integration creates the target table even if the job is terminated.

Rules and guidelines for pushdown optimization

Use the following rules and guidelines when configuring pushdown optimization for an Amazon Redshift database:

- To copy data from Amazon S3 to Amazon Redshift, you must use multiple data files by splitting large files. For more information, see the [Amazon documentation](#).
- When you use an upper case in the column name of a JSON file and configure pushdown optimization, the mapping fails with the following error:

```
Error Reason: Invalid JSONPath format: Member is not an object.
```
- When you configure a mapping with pushdown optimization and define an ORC source with date/time values, the Secure Agent might not write a few values correctly to the Redshift target.
- When you define a Parquet source with decimal values having precision greater than 19,0 and use **COPY** command to write to a Redshift target, the mapping fails with pushdown optimization.
- When the data in delimited, Avro, or JSON files has values that are greater than the precision values, specify the attribute **TRUNCATECOLUMNS=ON**.
- For the ORC and Parquet file types, specify **AWS_IAM_ROLE** in the COPY command, to enable full pushdown optimization.
- You cannot use the assume role when the source has a Parquet or ORC file format and enable full pushdown optimization for the mapping task.
- You cannot enable full pushdown optimization for a mapping task when the task contains a mapping with a single transformation connected to multiple transformations downstream and vice-versa.

- You cannot enable full pushdown optimization for an Avro source with Date, Decimal, and Timestamp data types.
- When you read data from an Amazon S3 flat file with Shift-JIS encoding, write to an Amazon Redshift target, and enable full pushdown optimization, the mapping fails.
- When you configure a mapping that reads an Amazon S3 Avro source with column names in uppercase letters and uses an Amazon Redshift V2 connection to write data to an Amazon Redshift target, the COPY command writes blank rows to the target.
- When you configure an update operation for data that contains the Time column for a mapping enabled with full pushdown optimization and you override the target query using the value specified in the Override Target Query field from the advanced target properties, the task runs but data is not processed.
- If the Amazon S3 bucket region and the Amazon Redshift region are different, specify the **REGION** attribute in the **COPY** command to enable full pushdown optimization. Applies to delimited, Avro, and JSON files.
- When you perform an update, upsert, or delete operation, ensure that you specify a primary key or an update column for the target table.
- When you perform an upsert operation and set the JVM option `-DuseDeleteForUpsert=true`, the target statistics of processed rows shows an additional row as compared to the case when you do not set the JVM option. The number of rows in the target table are the same in both the cases.
- When you perform an update, upsert, or delete operation on an Amazon Redshift target and specify the update column as a Date/Time data type in a different time zone, data is not written to the target. However, the task runs successfully. The issue occurs when you use an Amazon S3 Parquet source.
- When you perform an update operation, you cannot map an id column of a target table in the field mapping.
- Even if you configure a condition using a DD_INSERT, DD_UPDATE, or DD_DELETE data driven operation on a target object, the log contains queries for the remaining data driven operations as well. The mapping runs successfully.
- When the data driven condition contains only the DD_REJECT operation, the mapping runs without generating a query.
- When you parameterize a transformation in a mapping enabled for full pushdown optimization and configure a parameter file to override the input parameters, the Secure Agent ignores the overridden parameters.
- If the Union transformation has inputs from a few source columns and you do not map the rest of the columns to the target, the columns that you do not map show null data in target.
- If the input fields contain a decimal field and you do not map the decimal field to the target in a Union transformation, the mapping that runs with full pushdown optimization and uses an Amazon Redshift V2 connection fails with an error.
- If the mapping enabled for pushdown optimization contains Union and Aggregator transformations, include the incoming field from the aggregate function or group by field in the field mapping, or remove the field from the aggregate function or group by field altogether. Otherwise, the mapping fails.
- A mapping fails if the column of the Date or Datetime data type is not of the YYYY-DD-MM format.
- You must map all the fields from the SQL query to the target for the mappings enabled for pushdown optimization to run successfully.
- If the custom query contains duplicate columns, the mapping runs without pushdown optimization.
- When you run a mapping enabled for pushdown optimization that uses an Amazon Redshift V2 connection to update data with the float or integer data types in an Amazon Redshift target, the mapping might fail.

- When you parameterize an Expression transformation in a mapping task and configure a parameter file to override the parameters, the Secure Agent does not read the overridden parameters. The issue occurs when you configure full pushdown optimization for a mapping that uses an Amazon Redshift V2 connection.
- A mapping fails at runtime when you specify an advanced native filter in the following format: `schema_name.table_name.column_name`. While defining the advance filter, the condition should not have table name qualified with a schema name.
- When you use the query source type to read from Amazon Redshift, you can choose to retain the field metadata and save the mapping. Even if you edit the query and run the mapping, the field metadata specified at design time is retained.

Rules for full pushdown optimization in mappings that read from and write to Amazon Redshift

Consider the following guidelines when you configure full pushdown for mappings that read from or write to Amazon Redshift:

- When the Amazon Redshift source and target are in the same cluster, the Secure Agent does not use the UNLOAD and COPY commands to stage the data on Amazon S3 and then write to Amazon Redshift. The Secure Agent directly performs an insert, update, upsert, delete, or data driven operation to write the data to Amazon Redshift and the performance of the task is improved.
- When you configure an update operation for data that contains the Time column for a mapping enabled with full pushdown optimization and you override the target query using the value specified in the **Override Target Query** field from the advanced target properties, the task runs but data is not processed.
- When you assume an IAM role and run mappings enabled with source or full pushdown optimization to read data from Redshift, the assume role is not honored.
To honor the assume role and run mappings successfully, you must specify the AWS_IAM_ROLE property and set its value in the **Unload Options** field of the Source transformation.
For example, `AWS_IAM_ROLE=arn:aws:iam::0093:role/redshift_role`
- If the source and target objects in a mapping point to Amazon S3 buckets in different regions, specify the **REGION** attribute in the **COPY** command to set the Amazon S3 bucket for target in the same region as Amazon S3 bucket for source.
- If the data that you read contains delimiters (|), quotes ("), and escape (\) characters and you set the **Unload Options** field in the Source transformation to `ADDQUOTES;DELIMITER = \174;`, the mapping fails.
To avoid this error, set the following properties in the **Copy Options** field in the Target transformation:
`ESCAPE;REMOVEQUOTES;CSV=OFF;QUOTE=OFF;DELIMITER = \174;`
- When you read data from a single column table of Bigint, Datetime, and Boolean data type that contains NULL values, the null values are not written to the target.
To avoid this error, you must set `IGNOREBLANKLINES` in the **Copy Options** field of the Target transformation.
- When you configure a Source transformation in a mapping to read data and you set `ESCAPE=OFF` or `ON` and the `ADDQUOTES` in the **Unload Options** field to add escape characters and quotes in the data, null values are written to the target.
To avoid this, you must add `QUOTE=\042` in the **Copy Options** field of the Target transformation and then run the mapping.
- If the data contains an escape (\) character when you read data, you must specify `ESCAPE=OFF` in the **Unload Options** field of the Source transformation. If you do not set the property, the escape character gets duplicated in the target. For example, the data output 12\12\2012 appears as 12\\12\\2012.

- When you read from and write data that contains float4 or double values, the float values show a slight change in the target.
- When you specify a user defined function in a transformation, the function name is not displayed correctly in the session log.
- If the mapping contains a Sequence Generator transformation, ensure that you map the NEXTVAL output field to the target. Do not map the CURRVAL output field to the target. Else, the mapping task does not partially push down the mapping logic to the point where the transformation is supported and runs without pushdown optimization.
- When you configure a mapping with multiple objects at source where the table name and column name are the same or the table name is substring of the column name, the mapping fails.

Rules for source pushdown optimization in mappings that read from Amazon Redshift

Consider the following guidelines when you configure source pushdown for mappings that read from Amazon Redshift:

- You can configure an SQL query or custom query in the advanced source property to push the mapping to Amazon Redshift.
- When you use a custom query as a source or an SQL override, the table name alias is not generated as expected. The name starts with "INF" in the pushdown optimization query.
- When you run a mapping by overriding the SQL query in full pushdown optimization, where the source column names are aliased, the mapping fails. Ensure that the alias names and the source column names are the same.
- You cannot push a Router transformation with multiple output groups to the Amazon Redshift source.
- When you use the query source type to read from Amazon Redshift, you can choose to retain the field metadata and save the mapping. Even if you edit the query and run the mapping, the field metadata specified at design time is retained.

Rules and guidelines for adding multiple source objects

Consider the following rules and guidelines when you add multiple source objects:

- You must specify double quotes for the table name when you use a reserved word for the table name and the column name.
- You cannot use a self join when you add multiple source objects.
- When you use special characters in column names for an advanced relationship, the query formed is not correct and the mapping task fails.
- You can use the full outer-join condition only with the =, , and AND operators.
- When you override the schema name and configure an advanced filter on a related source object, the Secure Agent applies the advanced filter only on the parent object and not on the related source object.
- When you select parent and child objects that have a primary key and foreign key relationship, and the foreign key of the related object is also a primary key in the table, the mapping task fails when you create a target.
- When you select the Multiple Objects source type, add a source object, for example, emp, and define a primary key and foreign key relationship on different columns, for example, emp.id and dept.d_id, the mapping fails with the following error:

```
[FATAL] Unload/Copy command failed with error: Invalid operation: column emp.d_id does not exist.
```

The Select Related Objects list shows the join condition for the dept related object asembly.d_id=dept.d_id, even though the emp table does not have d_id column.

- When you select the Multiple Objects source type, you cannot use a period(.) in the table name.

Rules and guidelines for functions

Use the following rules and guidelines when pushing functions to an Amazon Redshift database:

- To push `TO_DATE()` and `TO_CHAR()` to Amazon Redshift, you must define the string and format arguments.
- If you use the NS format as part of the `ADD_TO_DATE()` function, the agent does not push the function to Amazon Redshift.
- If you use any of the following formats as part of the `TO_CHAR()` and `TO_DATE()` functions, the agent does not push the function to Amazon Redshift:
 - - NS
 - - SSSS
 - - SSSSS
 - - RR
- To push `TRUNC(DATE)`, `GET_DATE_PART()`, and `DATE_DIFF()` to Amazon Redshift, you must use the following formats:
 - - D
 - - DDD
 - - HH24
 - - MI
 - - MM
 - - MS
 - - SS
 - - US
 - - YYYY
- You can use **REPLACESTR()** only to replace a single string value with a new string value.
Syntax


```
REPLACESTR (CaseFlag, InputString, OldString, NewString).
```
- To push **SUBSTR()** to Amazon Redshift, you must define an integer value for the length argument.
- When you push `MD5()` to Amazon Redshift, the Secure Agent returns all the MD5 fields in the lower case. However, when you run a mapping without pushdown optimization, the Secure Agent returns the MD5 fields in the upper case.
- When you use the `IS_NUMBER` function in a transformation and the input data contains d or D, for example in formats such as +3.45d+32 or +3.45D-32, the function returns False or 0.
- When you use the `IN` function in an expression, you must not include the `CaseFlag` attribute.
- When you use the `IN` function and the arguments contain date and timestamp values, you must include the `TO_DATE` function in the expression.

Rules and guidelines for aggregate functions

Use the following rules and guidelines when pushing aggregate functions to an Amazon Redshift database:

- You cannot use conditional clauses in the aggregate expression functions.
- You can use non-aggregate functions in aggregate expressions.

- You cannot use nested aggregate functions directly. For example, you cannot specify `SUM(AVG(col1))` in the aggregate expression function columns. Use nested aggregations by adding multiple aggregate transformations in the mapping.
- You can parameterize the `GROUP BY` fields and aggregate functions in a mapping task.
- When you use `STDDEV` or `VARIANCE` functions for an expression that consists of a single value and run the mapping, the result of the function is `NULL`. When you run the mapping without pushing it down, the result of the function is 0.
- During the field mapping, you must map only the fields that you added in the `GROUP BY` port. Else, the mapping runs in the non-PDO mode with an error message.
- When you do not specify a port from an Amazon S3 flat file source in the `GROUP BY` clause of the aggregate function and map the port to a Redshift target, the mapping task runs successfully in the non-PDO mode with the following message:
Pushdown optimization to the source stops before transformation [Aggregator] because [f_varchar] is a non-group by passthrough port, which is not allowed.
The mapping fails when you push down a mapping with an Amazon S3 Avro or Parquet source.

Rules and guidelines for Router transformations

Consider the following rules and guidelines for a Router transformation:

- For a source field, do not edit the metadata for an id column from `string` to `int`.
- When the source has a field of the binary data type, the mapping fails with the following error:
[Full Pushdown Optimization Failed Due To PARQUET : Not Supported data type binary.]
- When you create conditions for router groups and connect the router groups to target tables, and one of the condition fails, the mapping does not process the rest of the conditions as well. The mapping runs without pushdown optimization.

Rules and guidelines for Lookup transformations

When you configure a Lookup transformation, adhere to the following guidelines:

- You cannot configure dynamic lookup cache and persistent cache.
- You cannot configure the advanced lookup properties for connected and unconnected lookups.
- Even if you select an advanced lookup property for a Lookup transformation, the Secure Agent ignores the advanced property. An error message does not appear in the logs.
- If you add the `ADDQUOTE` option in the Unload command for an Amazon Redshift lookup, you must also add the `QUOTE` option as `QUOTE="` in the Copy command for the Amazon Redshift target.
- If the source and target in a mapping point to Amazon S3 buckets in different regions, specify the **REGION** attribute in the **COPY** command to set the Amazon S3 bucket for target in the same region as Amazon S3 bucket for source.
- If you configure the CSE-SMK encryption type for an Amazon Redshift source or lookup object, ensure that you specify a master symmetric key in the target properties.
- You can only specify the `=` operator in a completely parameterized lookup condition. If you specify the operators such as `<`, `<=`, `>`, `>=`, and `!=` in a complex condition, the mapping fails.
- When you configure a lookup for an Amazon S3 source, remove the `FileName` field from both the Amazon S3 source and lookup object. The `FileName` field is not applicable.

Connected lookups

Consider the following rules and guidelines for a connected Lookup transformation:

- In a connected lookup, you can set the **Multiple Matches** option to **Return all rows** or **Report Error**. When you set the **Multiple Matches** option to **Report Error**, you can set the custom flag `Lkp_apdo_allow_report_error=Yes` under the advanced session properties of the mapping task to determine how Data Integration handles multiple matches. The following image shows how you can set the custom flag to run the job with full pushdown optimization:



- When you set the custom property, if there are multiple matches in the data, the multiple match policy is ignored and the job runs successfully with pushdown optimization.
- When you do not set the custom property, and if there are multiple matches in the data, Data Integration considers the policy and displays a warning message. Pushdown optimization is ignored and the task fails.
- When an Amazon S3 location contains source files having the same prefix, for example, `abc.txt.1` and `abc.txt.2`, the COPY command tries to load both the files to an Amazon Redshift target and the mapping might fail.

Unconnected lookups

Consider the following rules and guidelines for an unconnected Lookup transformation:

- In an unconnected lookup, ensure that you always select the **Multiple Matches** option to **Report Error**. When you look up data and the lookup condition finds multiple matches, all the matching rows are selected and the task runs with pushdown optimization. If you enabled **Multiple Matches** to any option other than **Report Error**, the mapping runs without pushdown optimization.
- If you select the **Return Any** property, the mapping task runs without pushdown optimization.
- You cannot use operators for unconnected lookups in a lookup expression. Use an additional expression transformation to include the operator.
- When you use the same column names in the source and unconnected lookup tables, and enable full pushdown optimization, the mapping fails with a duplicate column error. To run the mapping successfully, rename the incoming fields using a prefix or postfix and use the fields in the lookup expression.

Rules and guidelines for SQL transformations

Consider the following rules and guidelines for a SQL transformation:

- When you configure a SQL transformation in a mapping enabled for pushdown optimization and use the `DATE_PART` function in a query, the task fails. You can only configure a SQL transformation using the simple `SELECT` statement for any Redshift supported scalar function with the prescribed format.
- When you configure a SQL transformation in a mapping with user-defined functions that have date, decimal, or smallint data types, the mapping fails. As a workaround, configure user-defined functions in Redshift only with the corresponding transformation data types supported in Amazon Redshift.
- When you run a mapping with SQL transformation, and define user-defined functions (UDFs) with Unicode or special characters, enclose the schema and UDF in double quotes.

- When you run a mapping with SQL transformation having multiple select queries, the mapping fails. Amazon Redshift only supports SQL transformations with a single simple select query.
- When you use user-defined functions and scalar functions together in the same query to partially push down a mapping logic, the mapping fails if the target data type does not match with the source type. As a workaround, you can enable full pushdown optimization or define only scalar functions in the query.

CHAPTER 6

Data type reference

Data Integration uses the following data types in mappings and mapping tasks with Amazon Redshift:

Amazon Redshift native data types

Amazon Redshift data types appear in the source and target 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. When Data Integration writes to a target, it converts the transformation data types to the comparable native data types.

Amazon Redshift and transformation data types

The following table lists the Amazon Redshift data types that Data Integration supports and the corresponding transformation data types:

Amazon Redshift Data Type	Transformation Data Type	Description and Range
Bigint	Bigint	Signed eight-byte integer -9223372036854775808 to 9223372036854775807
Boolean	Small Integer	Logical Boolean (true/false)
Char	String	Fixed-length character string Max value 4096 bytes
Date	Timestamp	Calendar date (year, month, day) 4713 BC to 294276 AD
Decimal	Decimal	Exact numeric of selectable precision Max precision is 38, scale is 37

Amazon Redshift Data Type	Transformation Data Type	Description and Range
Double Precision	Double	Double precision floating-point number 15 significant digits of precision
Integer	Integer	Signed four-byte integer -2147483648 to +2147483647
Real	Double	Single precision floating-point number 6 significant digits of precision
Smallint	Small Integer	Signed two-byte integer -32768 to +32767
Time	Timestamp	Time (without time zone) 00:00:00.000000 to 23:59:59.999999
Timestamp	Timestamp	Date and time (without time zone) 4713 BC to 294276 AD (with up to a maximum of six digits of precision for fractional seconds)
Varchar	String	Variable-length character string with a user-defined limit Max value 65535 bytes

Rules and guidelines for data types

Consider the following rules and guidelines for data types:

- For the decimal data type, the numeric value for the precision (38, 37) is rounded off after the 16th precision. The remaining digits are replaced with zeroes.
For example, the value 2.3121356348957890888898699898989999990 in source is rounded off to 2.31213563489578900000000000000000000000 in target.
To resolve the issue, specify the precision as less than or equal to 28.
When you run a mapping using the Time data type, the task runs successfully, but the decimal values are truncated from the output. For the time data type, the SQL query `CallableStatement .setTime(java.sql.Time)` has precision support till seconds only.
- When you create a mapping for data that contains a Time column and you edit the data type from Time to Timestamp, the mapping fails at run time.
- When you read data that contains columns of the Decimal data type, any scale changes that you configure for the Decimal data type columns is considered by default. If you do not want to consider the changes in scale, you can set the JVM option `-honorDecimalScaleRedshift` value to `false` in the Secure Agent properties. By default, this property is set to true.
- When you read from or write to Amazon Redshift, the Time data type appears appended with dummy values in the data preview for all the transformations in the mapping. All the downstream transformations also receive the appended dummy date values. However, the Time values appear correctly only in an existing Amazon Redshift target.

- When you create a target at runtime and the incoming values contain Time columns, the Time column is converted to the Timestamp data type in the target. If a time column is added to the source and you dynamically refresh the schema, the column is created with the Timestamp data type in the target.
- If you configure an SQL transformation to call a stored procedure from Amazon Redshift, and you specify the Time data type with fractional seconds as a parameter in the SQL transformation, the precision is truncated.
- When you specify `SESSSTARTTIME` variable in a query in a mapping task to return the Datetime values, specify the query in the following format:

```
:select to_timestamp('$$$SESSSTARTTIME','YYYY-MM-DD HH24:MI:SS.MS')::TIMESTAMP as xz;
```

You must set the **DateTime Format String** in the Advanced session properties to `YYYY-MM-DD HH24:MI:SS.MS`.

If you want to use the default format `MM/DD/YYYY` for `SESSIONSTARTTIME` in the mapping task, you must use the following format in the query:

```
select to_timestamp('$$$SESSSTARTTIME','MM/DD/YYYY HH24:MI:SS.MS')::TIMESTAMP as xz;
```

- When you use a Filter transformation to apply a filter to the date, timestamp, or time column, use the `to_date()` expression in following format. For example, `to_date('1970-01-01 23:05:06.123457','YYYY-MM-DD HH24:MI:SS.US')`. The source string format and the format string must match. Change the fractional part of the string based on the source values. For more information on the `TO_DATE` format strings, see the Transformation Language Reference Guide.
- When you write to an Amazon Redshift V2 target with DTM staging enabled for staging performance, and the source values have data of float data type, the decimal values in the target get truncated and rounded off to the nearest integer. To avoid this issue, in the system configuration details section, select the Type as DTM for the Data Integration service, and set the value for `DisableInfDoubleHandlingForStaging` as yes.
- When you read from an Amazon Redshift source using a simple filter on the time data type column and run a mapping, the task fails at runtime with the following error: `Operation failed: Invalid expression string for filter condition []`.

As a workaround, use the advance filter to read from an Amazon Redshift source.

CHAPTER 7

Troubleshooting

Use the following sections to troubleshoot errors in Amazon Redshift V2 Connector.

Troubleshooting for Amazon Redshift V2 Connector

Using the JVM option for upsert operation

For an upsert operation, you can set the JVM option `-DuseDeleteForUpsert=true` and connect all the fields of the target table. Use the following rules when you set the JVM option:

- When you set the JVM option, the Secure Agent deletes the records of the target table based on the primary key match between the source table and the target table. All the records of the source table are inserted into the target table. When you do not set the JVM option, the Secure Agent updates existing rows and inserts other rows as if marked for insert.
- When you use a target table that has all the columns forming a composite key and you do not set an update column in the target, the mapping might fail with a warning. When you set the JVM option, the mapping task runs successfully.
- When you use a target table that has duplicate values in an update column, the target table has lesser number rows after you run the mapping. When you do not set the JVM option, the target table does not have lesser number of rows.
- When you use a source table that has duplicate values in a column and select the column as an update column on the target, an additional row is added to the target. When you do not set the JVM option, an additional row is not added to the target.
- For an upsert operation, when you use a table with column names that contain special characters and do not set the JVM option, the mapping fails.

Amazon S3 bucket does not exist or the user does not have permission to access the bucket

Do not modify the time on the machine that hosts the Secure Agent. The time on the Secure Agent must be correct as per the time zone. Otherwise, the mapping fails with an exception.

NOT NULL columns with default values

Even when you do not map the NOT NULL columns that have default values in an Amazon Redshift target table, the insert, update, or upsert operation is successful and the default values for NOT NULL columns are used.

If you set the JVM option `-DRetainUnmappedNotNullColumnValidation` value to `true` in the Secure Agent properties, the operation is not successful and the default values for NOT NULL columns are not used.

How to implement the upsert operation using Amazon Redshift V2 Connector?

For information about implementing the upsert operation, see
[Implementing the upsert operation using Amazon Redshift V2 Connector.](#)

How to configure AWS IAM authentication for Amazon Redshift V2 Connector?

For information about configuring AWS IAM authentication, see
[Configuring AWS IAM Authentication for Amazon Redshift and Amazon Redshift V2 Connectors.](#)

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