MySQL Foreign Data Wrapper Guide

Version 2.5.5

Built at 2021-05-13T09:56:13

1 What's New

The following features are added to create MySQL Foreign Data Wrapper `2.5.5`:

- Support for EDB Postgres Advanced Server 13.
- Support for Ubuntu 20.04 LTS platform.

2 Requirements Overview

Supported Versions

The MySQL Foreign Data Wrapper is certified with EDB Postgres Advanced Server 9.6 and above.

Supported Platforms

The MySQL Foreign Data Wrapper is supported on the following platforms:

Linux x86-64

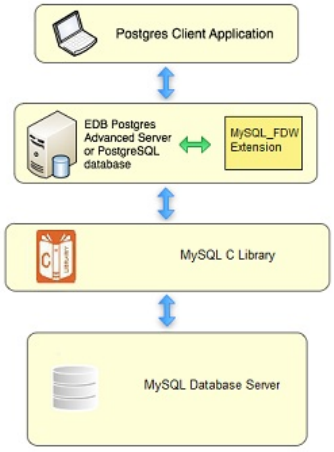
- RHEL 8.x/7.x
- CentOS 8.x/7.x
- OEL 8.x/7.x
- Ubuntu 20.04/18.04 LTS
- Debian 10.x/9.x

Linux on IBM Power8/9 (LE)

- RHEL 7.x

3 Architecture Overview

The MySQL data wrapper provides an interface between a MySQL server and a Postgres database. It transforms a Postgres statement (`SELECT`/`INSERT`/`DELETE`/`UPDATE`) into a query that is understood by the MySQL database.



4 Installing the MySQL Foreign Data Wrapper

The MySQL Foreign Data Wrapper can be installed with an RPM package. During the installation process, the installer will satisfy software prerequisites.

Installing the MySQL Foreign Data Wrapper using an RPM Package

You can install the MySQL Foreign Data Wrapper using an RPM package on the following platforms:

- RHEL 7
- RHEL 8
- CentOS 7
- CentOS 8

On RHEL 7

Before installing the MySQL Foreign Data Wrapper, you must install the following prerequisite packages, and request credentials from EDB:

Install the `epel-release` package:

```
yum -y install https://dl.fedoraproject.org/pub/epel/epel-release-latest-7.noarch.rpm
```

Enable the optional, extras, and HA repositories:

```
subscription-manager repos --enable "rhel-*-optional-rpms" --enable "rhel-*-extras-rpms"  --enable "rhel-ha-for-rhel-*-server-rpms"
```

You must also have credentials that allow access to the EDB repository. For information about requesting credentials, visit:

> https://info.enterprisedb.com/rs/069-ALB-339/images/Repository%20Access%2004-09-2019.pdf

After receiving your repository credentials you can:

1. Create the repository configuration file.
2. Modify the file, providing your user name and password.
3. Install the MySQL Foreign Data Wrapper.

Creating a Repository Configuration File

To create the repository configuration file, assume superuser privileges, and invoke the following command:

```
yum -y install https://yum.enterprisedb.com/edbrepos/edb-repo-latest.noarch.rpm
```

The repository configuration file is named `edb.repo`. The file resides in `/etc/yum.repos.d`.

Modifying the file, providing your user name and password

After creating the `edb.repo` file, use your choice of editor to ensure that the value of the `enabled` parameter is `1`, and replace the `username` and `password` placeholders in the `baseurl` specification with the name and password of a registered EDB user.

```
[edb]
name=EnterpriseDB RPMs $releasever - $basearch
baseurl=https://<username>:
<password>@yum.enterprisedb.com/edb/redhat/rhel-
$releasever-$basearch
enabled=1
gpgcheck=1
gpgkey=file:///etc/pki/rpm-gpg/ENTERPRISEDB-GPG-KEY
```

Installing MySQL Foreign Data Wrapper

After saving your changes to the configuration file, use the following command to install the MySQL Foreign Data Wrapper:

```
yum install edb-as<xx>-mysql<x>_fdw
```

where `xx` is the server version number, and `x` is the supported release version number of MySQL. For example, to install MySQL 5.0 on RHEL 7:

```
yum install edb-as<xx>-mysql5_fdw
```

!!! Note MySQL 8.0 and MySQL 5.0 RPMs are available for RHEL 7 platform.

When you install an RPM package that is signed by a source that is not recognized by your system, yum may ask for your permission to import the key to your local server. If prompted, and you are satisfied that the packages come from a trustworthy source, enter `y`, and press `Return` to continue.

During the installation, yum may encounter a dependency that it cannot resolve. If it does, it will provide a list of the required dependencies that you must manually resolve.

On RHEL 8

Before installing the MySQL Foreign Data Wrapper, you must install the following prerequisite packages, and request credentials from EDB:

Install the `epel-release` package:

```
dnf -y install https://dl.fedoraproject.org/pub/epel/epel-release-latest-8.noarch.rpm
```

Enable the `codeready-builder-for-rhel-8-\*-rpms` repository:

```
ARCH=$( /bin/arch )
subscription-manager repos --enable "codeready-builder-for-rhel-8-${ARCH}-rpms"
```

You must also have credentials that allow access to the EDB repository. For information about requesting credentials, visit:

> https://www.enterprisedb.com/user/login

After receiving your repository credentials you can:

1. Create the repository configuration file.
2. Modify the file, providing your user name and password.
3. Install the MySQL Foreign Data Wrapper.

Creating a Repository Configuration File

To create the repository configuration file, assume superuser privileges, and invoke the following command:

```
dnf -y https://yum.enterprisedb.com/edbrepos/edb-repo-latest.noarch.rpm
```

The repository configuration file is named `edb.repo`. The file resides in `/etc/yum.repos.d`.

Modifying the file, providing your user name and password

After creating the `edb.repo` file, use your choice of editor to ensure that the value of the `enabled` parameter is `1`, and replace the `username` and `password` placeholders in the `baseurl` specification with the name and password of a registered EDB user.

```
[edb]
name=EnterpriseDB RPMs $releasever - $basearch
```

```
baseurl=https://<username>:
<password>@yum.enterprisedb.com/edb/redhat/rhel-
$releasever-$basearch
enabled=1
gpgcheck=1
gpgkey=file:///etc/pki/rpm-gpg/ENTERPRISEDB-GPG-KEY
```

Installing MySQL Foreign Data Wrapper

After saving your changes to the configuration file, use the below command to install the MySQL Foreign Data Wrapper:

```
dnf install edb-as<xx>-mysql8_fdw
```

When you install an RPM package that is signed by a source that is not recognized by your system, yum may ask for your permission to import the key to your local server. If prompted, and you are satisfied that the packages come from a trustworthy source, enter `y`, and press `Return` to continue.

During the installation, yum may encounter a dependency that it cannot resolve. If it does, it will provide a list of the required dependencies that you must manually resolve.

On CentOS 7

Before installing the MySQL Foreign Data Wrapper, you must install the following prerequisite packages, and request credentials from EDB:

Install the `epel-release` package:

```
yum -y install https://dl.fedoraproject.org/pub/epel/epel-
release-latest-7.noarch.rpm
```

!!! Note You may need to enable the `[extras]` repository definition in the `CentOS-Base.repo` file (located in `/etc/yum.repos.d`).

You must also have credentials that allow access to the EDB repository. For information about requesting credentials, visit:

> https://info.enterprisedb.com/rs/069-ALB-339/images/Repository%20Access%2004-09-2019.pdf

After receiving your repository credentials you can:

1. Create the repository configuration file.
2. Modify the file, providing your user name and password.
3. Install the MySQL Foreign Data Wrapper.

Creating a Repository Configuration File

To create the repository configuration file, assume superuser privileges, and invoke the following command:

```
yum -y install https://yum.enterprisedb.com/edbrepos/edb-repo-latest.noarch.rpm
```

The repository configuration file is named `edb.repo`. The file resides in `/etc/yum.repos.d`.

Modifying the file, providing your user name and password

After creating the `edb.repo` file, use your choice of editor to ensure that the value of the `enabled` parameter is `1`, and replace the `username` and `password` placeholders in the `baseurl` specification with the name and password of a registered EDB user.

```
[edb]
name=EnterpriseDB RPMs $releasever - $basearch
baseurl=https://<username>:
<password>@yum.enterprisedb.com/edb/redhat/rhel-
$releasever-$basearch
enabled=1
gpgcheck=1
gpgkey=file:///etc/pki/rpm-gpg/ENTERPRISEDB-GPG-KEY
```

Installing MySQL Foreign Data Wrapper

After saving your changes to the configuration file, use the following command to install the MySQL Foreign Data Wrapper:

```
yum install edb-as<xx>-mysql<x>_fdw
```

where `xx` is the server version number, and `x` is the supported release version number of MySQL. For example, to install MySQL 5.0 on CentOS 7:

```
yum install edb-as<xx>-mysql5_fdw
```

!!! Note MySQL 8.0 and MySQL 5.0 RPMs are available for CentOS 7 platform.

When you install an RPM package that is signed by a source that is not recognized by your system, yum may ask for your permission to import the key to your local server. If prompted, and you are satisfied that the packages come from a trustworthy source, enter `y`, and press `Return` to continue.

During the installation, yum may encounter a dependency that it cannot resolve. If it does, it will provide a list of the required dependencies that you must manually resolve.

On CentOS 8

Before installing the MySQL Foreign Data Wrapper, you must install the following prerequisite packages, and request credentials from EDB:

Install the `epel-release` package:

```
dnf -y install https://dl.fedoraproject.org/pub/epel/epel-release-latest-8.noarch.rpm
```

Enable the `PowerTools` repository:

```
dnf config-manager --set-enabled PowerTools
```

You must also have credentials that allow access to the EDB repository. For information about requesting credentials, visit:

> https://info.enterprisedb.com/rs/069-ALB-339/images/Repository%20Access%2004-09-2019.pdf

After receiving your repository credentials you can:

1. Create the repository configuration file.
2. Modify the file, providing your user name and password.
3. Install the MySQL Foreign Data Wrapper.

Creating a Repository Configuration File

To create the repository configuration file, assume superuser privileges, and invoke the following command:

```
dnf -y install https://yum.enterprisedb.com/edbrepos/edb-repo-latest.noarch.rpm
```

The repository configuration file is named `edb.repo`. The file resides in `/etc/yum.repos.d`.

Modifying the file, providing your user name and password

After creating the `edb.repo` file, use your choice of editor to ensure that the value of the `enabled` parameter is `1`, and replace the `username` and `password` placeholders in the `baseurl` specification with the name and password of a registered EDB user.

```
[edb]
name=EnterpriseDB RPMs $releasever - $basearch
baseurl=https://<username>:
<password>@yum.enterprisedb.com/edb/redhat/rhel-
$releasever-$basearch
enabled=1
gpgcheck=1
gpgkey=file:///etc/pki/rpm-gpg/ENTERPRISEDB-GPG-KEY
```

Installing MySQL Foreign Data Wrapper

After saving your changes to the configuration file, use the following command to install the MySQL Foreign Data Wrapper:

```
dnf install edb-as<xx>-mysql8_fdw
```

where `xx` is the server version number.

When you install an RPM package that is signed by a source that is not recognized by your system, yum may ask for your permission to import the key to your local server. If prompted, and you are satisfied that the packages come from a trustworthy source, enter `y`, and press `Return` to continue.

During the installation, yum may encounter a dependency that it cannot resolve. If it does, it will provide a list of the required dependencies that you must manually resolve.

Installing the MySQL Foreign Data Wrapper on a Debian or Ubuntu Host

To install the MySQL Foreign Data Wrapper on a Debian or Ubuntu host, you must have credentials that allow access to the EDB repository. To request credentials for the repository, visit the EDB website.

The following steps will walk you through on using the EDB apt repository to install a DEB package. When using the commands, replace the `username` and `password` with the credentials provided by EDB.

1. Assume superuser privileges:

```
sudo su -
```

1. Configure the EnterpriseDB repository:

   On Debian 9:

   ```
   sh -c 'echo "deb
   https://username:password@apt.enterprisedb.com/$(lsb_releas
   e -cs)-edb/ $(lsb_release -cs) main" >
   /etc/apt/sources.list.d/edb-$(lsb_release -cs).list'
   ```

   On Debian 10:

   1. Set up the EDB repository:

   ```
   sh -c 'echo "deb [arch=amd64]
   https://apt.enterprisedb.com/$(lsb_release -cs)-edb/
   $(lsb_release -cs) main" > /etc/apt/sources.list.d/edb-
   $(lsb_release -cs).list'
   ```

   1. Substitute your EDB credentials for the `username` and `password` in the following command:

   ```
   sh -c 'echo "machine apt.enterprisedb.com login
   <username> password <password>" >
   /etc/apt/auth.conf.d/edb.conf'
   ```

2. Add support to your system for secure APT repositories:

```
apt-get install apt-transport-https
```

1. Add the EBD signing key:

```
wget -q -O - https://username:password
@apt.enterprisedb.com/edb-deb.gpg.key | apt-key add -
```

1. Update the repository metadata:

```
apt-get update
```

1. Install DEB package:

```
apt-get install edb-as<xx>-mysql-fdw
```

where `xx` is the server version number.

---

5 Updating the MySQL Foreign Data Wrapper

Updating an RPM Installation

If you have an existing RPM installation of MySQL Foreign Data Wrapper, you can use yum or dnf to upgrade your repository configuration file and update to a more recent product version. To update the `edb.repo` file, assume superuser privileges and enter:

- On RHEL or CentOS 7:

  ```
  yum upgrade edb-repo
  ```

- On RHEL or CentOS 8:

  ```
  dnf upgrade edb-repo
  ```

yum or dnf will update the `edb.repo` file to enable access to the current EDB repository, configured to connect with the credentials specified in your `edb.repo` file. Then, you can use yum or dnf to upgrade any installed packages:

- On RHEL or CentOS 7:

  ```
  yum upgrade edb-as<xx>-mysql<x>_fdw
  ```

  where `xx` is the server version number, and `x` is the supported release version number of MySQL. For example, to upgrade MySQL 5.0 on RHEL 7:

  ```
  yum upgrade edb-as<xx>-mysql5_fdw
  ```

- On RHEL or CentOS 8:

  ```
  dnf upgrade edb-as<xx>-mysql8_fdw
  ```

Updating MongoDB Foreign Data Wrapper on a Debian or Ubuntu Host

To update MySQL Foreign Data Wrapper on a Debian or Ubuntu Host, use the following command:

```
apt-get --only-upgrade install edb-as<xx>-mysql<x>_fdw
```

where `xx` is the server version number, and `x` is the supported release version number of MySQL.

---

6 Features of the MySQL Foreign Data Wrapper

The key features of the MySQL Foreign Data Wrapper are listed below:

Writable FDW

MySQL Foreign Data Wrapper provides the write capability. Users can insert, update and delete data in the remote MySQL tables by inserting, updating and deleting the data locally in the foreign tables. MySQL foreign data wrapper uses the Postgres type casting mechanism to provide opposite type casting between MySQL and Postgres data types.

!!! Note The first column of MySQL table must have unique/primary key for DML to work.

See also:

Example: Using the MySQL Foreign Data Wrapper

Data Type Mappings

Connection Pooling

MySQL_FDW establishes a connection to a foreign server during the first query that uses a foreign table associated with the foreign server. This connection is kept and reused for subsequent queries in the same session.

Where Clause Push-down

MySQL Foreign Data Wrapper allows the push-down of `WHERE` clause to the foreign server for execution. This fearure optimizes remote queries to reduce the number of rows transferred from foreign servers.

Column Push-down

MySQL Foreign Data Wrapper supports the column push-down. As a result, the query brings back only those columns that are a part of the select target list.

Prepared Statement

MySQL Foreign Data Wrapper supports Prepared Statement. The select queries uses prepared statements instead of simple query protocol.

Import Foreign Schema

MySQL Foreign Data Wrapper supports Import Foreign Schema which enables the local host to import table definitions on the EDB Postgres Advanced Server from the MySQL server. The new foreign tables are created with the corresponding column types and

same table name as that of remote tables in the existing local schema.

See also:

Example: Import Foreign Schema

Automated Cleanup

MySQL Foreign Data Wrappper allows the cleanup of foreign tables in a single operation using `DROP EXTENSION` command. This feature is specifically useful when a foreign table is set for a temporary purpose. The syntax:

```
DROP EXTENSION mysql_fdw CASCADE;
```

For more information, see DROP EXTENSION.

Join Push-down

MySQL Foreign Data Wrapper supports join push-down. It pushes the joins between two foreign tables from the same remote MySQL server to a remote server, thereby enhancing the performance.

!!! Note - Currently, joins involving only relational and arithmetic operators in join-clauses are pushed down to avoid any potential join failure. - Only the INNER and LEFT/RIGHT OUTER joins are supported.

See also:

Example: Join Push-down

---

7 Configuring the MySQL Foreign Data Wrapper

Before using the MySQL Foreign Data Wrapper, you must:

1. Use the CREATE EXTENSION command to create the MySQL Foreign Data Wrapper extension on the Postgres host.
2. Use the CREATE SERVER command to define a connection to the MySQL server.
3. Use the CREATE USER MAPPING command to define a mapping that associates a Postgres role with the server.
4. Use the CREATE FOREIGN TABLE command to define a single table in the Postgres database that corresponds to a table that resides on the MySQL server or use the IMPORT FOREIGN SCHEMA command to import multiple remote tables in the local schema.

CREATE EXTENSION

Use the `CREATE EXTENSION` command to create the `mysql_fdw` extension. To invoke the command, use your client of choice (for example, psql) to connect to the Postgres database from which you will be querying the MySQL server, and invoke the command:

```
CREATE EXTENSION [IF NOT EXISTS] mysql_fdw [WITH] [SCHEMA
schema_name];
```

Parameters

`IF NOT EXISTS`

> Include the `IF NOT EXISTS` clause to instruct the server to issue a notice instead of throwing an error if an extension with the same name already exists.

`schema_name`

> Optionally specify the name of the schema in which to install the extension's objects.

Example

The following command installs the MySQL foreign data wrapper:

```
CREATE EXTENSION mysql_fdw;
```

For more information about using the foreign data wrapper `CREATE EXTENSION` command, see:

> https://www.postgresql.org/docs/current/static/sql-createextension.html.

CREATE SERVER

Use the `CREATE SERVER` command to define a connection to a foreign server. The syntax is:

```
CREATE SERVER server_name FOREIGN DATA WRAPPER mysql_fdw
    [OPTIONS (option 'value' [, ...])]
```

The role that defines the server is the owner of the server; use the `ALTER SERVER` command to reassign ownership of a foreign server. To create a foreign server, you must have `USAGE` privilege on the foreign-data wrapper specified in the `CREATE SERVER` command.

Parameters

`server_name`

> Use `server_name` to specify a name for the foreign server. The server name must be unique within the database.

`FOREIGN_DATA_WRAPPER`

> Include the `FOREIGN_DATA_WRAPPER` clause to specify that the server should use the `mysql_fdw` foreign data wrapper when connecting to the cluster.

`OPTIONS`

> Use the `OPTIONS` clause of the `CREATE SERVER` command to specify connection information for the foreign server. You can include:

Option	Description
host	The address or hostname of the MySQL server. The default value is `127.0.0.1`.
port	The port number of the MySQL Server. The default is `3306`.
secure_auth	Use to enable or disable secure authentication. The default value is `true`.

Option	Description
init_command	The SQL statement to execute when connecting to the MySQL server.
ssl_key	The path name of the client private key file.
ssl_cert	The path name of the client public key certificate file.
ssl_ca	The path name of the Certificate Authority (CA) certificate file. This option, if used, must specify the same certificate used by the server.
ssl_capath	The path name of the directory that contains trusted SSL CA certificate files.
ssl_cipher	The list of permissible ciphers for SSL encryption.
use_remote_estimate	Include the use_remote_estimate to instruct the server to use EXPLAIN commands on the remote server when estimating processing costs. By default, use_remote_estimate is false.

Example

The following command creates a foreign server named `mysql_server` that uses the `mysql_fdw` foreign data wrapper to connect to a host with an IP address of `127.0.0.1`:

```
CREATE SERVER mysql_server FOREIGN DATA WRAPPER mysql_fdw
OPTIONS (host '127.0.0.1', port '3306');
```

The foreign server uses the default port (`3306`) for the connection to the client on the MySQL cluster.

For more information about using the `CREATE SERVER` command, see:

> https://www.postgresql.org/docs/current/static/sql-createserver.html

CREATE USER MAPPING

Use the `CREATE USER MAPPING` command to define a mapping that associates a Postgres role with a foreign server:

```
CREATE USER MAPPING FOR role_name SERVER server_name
```

```
      [OPTIONS (option 'value' [, ...])];
```

You must be the owner of the foreign server to create a user mapping for that server.

Parameters

`role_name`

> Use `role_name` to specify the role that will be associated with the foreign server.

`server_name`

> Use `server_name` to specify the name of the server that defines a connection to the MySQL cluster.

`OPTIONS`

> Use the `OPTIONS` clause to specify connection information for the foreign server.
>
> `username`: the name of the user on the MySQL server.
>
> `password`: the password associated with the username.

Example

The following command creates a user mapping for a role named `enterprisedb`; the mapping is associated with a server named `mysql_server`:

```
CREATE USER MAPPING FOR enterprisedb SERVER mysql_server;
```

If the database host uses secure authentication, provide connection credentials when creating the user mapping:

```
CREATE USER MAPPING FOR public SERVER mysql_server OPTIONS
(username 'foo', password 'bar');
```

The command creates a user mapping for a role named `public` that is associated with a server named `mysql_server`. When connecting to the MySQL server, the server will authenticate as `foo`, and provide a password of `bar`.

For detailed information about the `CREATE USER MAPPING` command, see:

> https://www.postgresql.org/docs/current/static/sql-createusermapping.html

CREATE FOREIGN TABLE

A foreign table is a pointer to a table that resides on the MySQL host. Before creating a foreign table definition on the Postgres server, connect to the MySQL server and create a table; the columns in the table will map to columns in a table on the Postgres server. Then, use the `CREATE FOREIGN TABLE` command to define a table on the Postgres server with columns that correspond to the table that resides on the MySQL host. The syntax is:

```
CREATE FOREIGN TABLE [ IF NOT EXISTS ] table_name ( [
  { column_name data_type [ OPTIONS ( option 'value' [, ... ]
) ] [ COLLATE collation ] [ column_constraint [ ... ] ]
    | table_constraint }
    [, ... ]
] )
[ INHERITS ( parent_table [, ... ] ) ]
  SERVER server_name [ OPTIONS ( option 'value' [, ... ] ) ]
```

where `column_constraint` is:

```
[ CONSTRAINT constraint_name ]
{ NOT NULL | NULL | CHECK (expr) [ NO INHERIT ] | DEFAULT
default_expr }
```

and `table_constraint` is:

```
[ CONSTRAINT constraint_name ] CHECK (expr) [ NO INHERIT ]
```

Parameters

`table_name`

> Specifies the name of the foreign table; include a schema name to specify the schema in which the foreign table should reside.

`IF NOT EXISTS`

> Include the `IF NOT EXISTS` clause to instruct the server to not throw an error if

a table with the same name already exists; if a table with the same name exists, the server will issue a notice.

`column_name`

Specifies the name of a column in the new table; each column should correspond to a column described on the MySQL server.

`data_type`

Specifies the data type of the column; when possible, specify the same data type for each column on the Postgres server and the MySQL server. If a data type with the same name is not available, the Postgres server will attempt to cast the data type to a type compatible with the MySQL server. If the server cannot identify a compatible data type, it will return an error.

`COLLATE collation`

Include the `COLLATE` clause to assign a collation to the column; if not specified, the column data type's default collation is used.

`INHERITS (parent_table [, ... ])`

Include the `INHERITS` clause to specify a list of tables from which the new foreign table automatically inherits all columns. Parent tables can be plain tables or foreign tables.

`CONSTRAINT constraint_name`

Specify an optional name for a column or table constraint; if not specified, the server will generate a constraint name.

`NOT NULL`

Include the `NOT NULL` keywords to indicate that the column is not allowed to contain null values.

`NULL`

Include the `NULL` keywords to indicate that the column is allowed to contain null values. This is the default.

`CHECK (expr) [NO INHERIT]`

> Use the `CHECK` clause to specify an expression that produces a Boolean result that each row in the table must satisfy. A check constraint specified as a column constraint should reference that column's value only, while an expression appearing in a table constraint can reference multiple columns.
>
> A `CHECK` expression cannot contain subqueries or refer to variables other than columns of the current row.
>
> Include the `NO INHERIT` keywords to specify that a constraint should not propagate to child tables.

`DEFAULT default_expr`

> Include the `DEFAULT` clause to specify a default data value for the column whose column definition it appears within. The data type of the default expression must match the data type of the column.

`SERVER server_name [OPTIONS (option 'value' [, ... ] ) ]`

> To create a foreign table that will allow you to query a table that resides on a MySQL file system, include the `SERVER` clause and specify the `server_name` of the foreign server that uses the MySQL data adapter.
>
> Use the `OPTIONS` clause to specify the following `options` and their corresponding values:

option	value
dbname	The name of the database on the MySQL server; the database name is required.
table_name	The name of the table on the MySQL server; the default is the name of the foreign table.
max_blob_size	The maximum blob size to read without truncation.

Example

To use data that is stored on MySQL server, you must create a table on the Postgres host that maps the columns of a MySQL table to the columns of a Postgres table. For example, for a MySQL table with the following definition:

```
CREATE TABLE warehouse (
 warehouse_id      INT PRIMARY KEY,
 warehouse_name    TEXT,
 warehouse_created TIMESTAMP);
```

You should execute a command on the Postgres server that creates a comparable table on the Postgres server:

```
CREATE FOREIGN TABLE warehouse
(
 warehouse_id      INT,
 warehouse_name    TEXT,
 warehouse_created TIMESTAMP
)
SERVER mysql_server
         OPTIONS (dbname 'db', table_name 'warehouse');
```

Include the `SERVER` clause to specify the name of the database stored on the MySQL server and the name of the table (`warehouse`) that corresponds to the table on the Postgres server.

For more information about using the `CREATE FOREIGN TABLE` command, see:

> https://www.postgresql.org/docs/current/static/sql-createforeigntable.html

!!! Note MySQL foreign data wrapper supports the write capability feature.

Data Type Mappings

When using the foreign data wrapper, you must create a table on the Postgres server that mirrors the table that resides on the MySQL server. The MySQL data wrapper will automatically convert the following MySQL data types to the target Postgres type:

MySQL	Postgres
BIGINT	BIGINT/INT8
BOOLEAN	SMALLINT
BLOB	BYTEA
CHAR	CHAR

MySQL	Postgres
DATE	DATE
DOUBLE	DOUBLE PRECISION/FLOAT8
FLOAT	FLOAT/FLOAT4
INT/INTEGER	INT/INTEGER/INT4
LONGTEXT	TEXT
SMALLINT	SMALLINT/INT2
TIMESTAMP	TIMESTAMP
VARCHAR()	VARCHAR()/CHARCTER VARYING()

!!! Note For `ENUM` data type:

```
MySQL accepts `enum` value in string form. You must create
exactly same `enum` listing on Advanced Server as that is
present on MySQL server. Any sort of inconsistency will
result in an error while fetching rows with values not known
on the local server.

Also, when the given `enum` value is not present at MySQL
side but present at Postgres/Advanced Server side, an empty
string (`''`) is inserted as a value at MySQL side for the
`enum` column. To select from such a table having enum value
as `''`, create an `enum` type at Postgres side with all
valid values and `''`.
```

IMPORT FOREIGN SCHEMA

Use the `IMPORT FOREIGN SCHEMA` command to import table definitions on the Postgres server from the MySQL server. The new foreign tables are created with the same column definitions as that of remote tables in the existing local schema. The syntax is:

```
IMPORT FOREIGN SCHEMA remote_schema
    [ { LIMIT TO | EXCEPT } ( table_name [, ...] ) ]
    FROM SERVER server_name
    INTO local_schema
    [ OPTIONS ( option 'value' [, ... ] ) ]
```

Parameters

`remote_schema`

> Specifies the remote schema (MySQL database) to import from.

`LIMIT TO ( table_name [, ...] )`

> By default, all views and tables existing in a particular database on the MySQL host are imported. Using this option, you can limit the list of tables to a specified subset.

`EXCEPT ( table_name [, ...] )`

> By default, all views and tables existing in a particular database on the MySQL host are imported. Using this option, you can exclude specified foreign tables from the import.

`SERVER server_name`

> Specify the name of server to import foreign tables from.

`local_schema`

> Specify the name of local schema where the imported foreign tables must be created.

`OPTIONS`

> Use the `OPTIONS` clause to specify the following `options` and their corresponding values:
>
> Y{0.6}|
>
> | Option | Description |
> | --- | --- |
> | import_default | Controls whether column `DEFAULT` expressions are included in the definitions of foreign tables imported from a foreign server. The default is `false`. |
> | import_not_null | Controls whether column `NOT NULL` constraints are included in the definitions of foreign tables imported from a foreign server. The default is `true`. |

Example

For a MySQL table created in the `edb` database with the following definition:

```
CREATE TABLE color(cid INT PRIMARY KEY, cname TEXT);
INSERT INTO color VALUES (1, 'Red');
INSERT INTO color VALUES (2, 'Green');
INSERT INTO color VALUES (3, 'Orange');

CREATE TABLE fruit(fid INT PRIMARY KEY, fname TEXT);
INSERT INTO fruit VALUES (1, 'Orange');
INSERT INTO fruit VALUES (2, 'Mango');
```

You should execute a command on the Postgres server that imports a comparable table on the Postgres server:

```
IMPORT FOREIGN SCHEMA edb FROM SERVER mysql_server INTO
public;

SELECT * FROM color;

 cid | cname
 -----+--------
   1 | Red
   2 | Green
   3 | Orange
 (3 rows)

SELECT * FROM fruit;

 fid | fname
 -----+--------
   1 | Orange
   2 | Mango
 (2 rows)
```

The command imports table definitions from a remote schema `edb` on server `mysql_server` and then creates the foreign tables in local schema `public`.

For more information about using the `IMPORT FOREIGN SCHEMA` command, see:

> https://www.postgresql.org/docs/current/static/sql-importforeignschema.html

DROP EXTENSION

Use the `DROP EXTENSION` command to remove an extension. To invoke the command, use your client of choice (for example, psql) to connect to the Postgres database from which you will be dropping the MySQL server, and run the command:

```
DROP EXTENSION [ IF EXISTS ] name [, ...] [ CASCADE |
RESTRICT ];
```

Parameters

`IF EXISTS`

> Include the `IF EXISTS` clause to instruct the server to issue a notice instead of throwing an error if an extension with the specified name doesn't exists.

`name`

> Specify the name of the installed extension. It is optional.
>
> `CASCADE`
>
> Automatically drop objects that depend on the extension. It drops all the other dependent objects too.
>
> `RESTRICT`
>
> Do not allow to drop extension if any objects, other than its member objects and extensions listed in the same DROP command are dependent on it.

Example

The following command removes the extension from the existing database:

```
DROP EXTENSION mysql_fdw;
```

For more information about using the foreign data wrapper `DROP EXTENSION` command, see:

> https://www.postgresql.org/docs/current/sql-dropextension.html.

DROP SERVER

Use the `DROP SERVER` command to remove a connection to a foreign server. The syntax is:

```
DROP SERVER [ IF EXISTS ] name [, ...] [ CASCADE | RESTRICT ]
```

The role that drops the server is the owner of the server; use the `ALTER SERVER` command to reassign ownership of a foreign server. To drop a foreign server, you must have `USAGE` privilege on the foreign-data wrapper specified in the `DROP SERVER` command.

Parameters

`IF EXISTS`

> Include the `IF EXISTS` clause to instruct the server to issue a notice instead of throwing an error if a server with the specified name doesn't exists.

`name`

> Specify the name of the installed server. It is optional.
>
> `CASCADE`
>
> Automatically drop objects that depend on the server. It should drop all the other dependent objects too.
>
> `RESTRICT`
>
> Do not allow to drop the server if any objects are dependent on it.

Example

The following command removes a foreign server named `mysql_server`:

```
DROP SERVER mysql_server;
```

For more information about using the `DROP SERVER` command, see:

> https://www.postgresql.org/docs/current/sql-dropserver.html

DROP USER MAPPING

Use the `DROP USER MAPPING` command to remove a mapping that associates a Postgres role with a foreign server. You must be the owner of the foreign server to remove a user mapping for that server.

```
DROP USER MAPPING [ IF EXISTS ] FOR { user_name | USER |
CURRENT_USER | PUBLIC } SERVER server_name;
```

Parameters

`IF EXISTS`

> Include the `IF EXISTS` clause to instruct the server to issue a notice instead of throwing an error if the user mapping doesn't exist.

`user_name`

> Specify the user name of the mapping.

`server_name`

> Specify the name of the server that defines a connection to the MySQL cluster.

Example

The following command drops a user mapping for a role named `enterprisedb`; the mapping is associated with a server named `mysql_server`:

```
DROP USER MAPPING FOR enterprisedb SERVER mysql_server;
```

For detailed information about the `DROP USER MAPPING` command, see:

> https://www.postgresql.org/docs/current/static/sql-dropusermapping.html

DROP FOREIGN TABLE

A foreign table is a pointer to a table that resides on the MySQL host. Use the `DROP FOREIGN TABLE` command to remove a foreign table. Only the owner of the foreign table can drop it.

```
DROP FOREIGN TABLE [ IF EXISTS ] name [, ...] [ CASCADE | RESTRICT ]
```

Parameters

`IF EXISTS`

> Include the `IF EXISTS` clause to instruct the server to issue a notice instead of throwing an error if the foreign table with the specified name doesn't exists.

`name`

> Specify the name of the foreign table.

`CASCADE`

> Automatically drop objects that depend on the foreign table. It should drop all the other dependent objects too.

`RESTRICT`

> Do not allow to drop foreign table if any objects are dependent on it.

Example

```
DROP FOREIGN TABLE warehouse;
```

For more information about using the `DROP FOREIGN TABLE` command, see:

> https://www.postgresql.org/docs/current/sql-dropforeigntable.html

8 Example: Using the MySQL Foreign Data Wrapper

Access data from Advanced Server and connect to psql. Once you are connected to psql, follow the below steps:

```
-- load extension first time after install
CREATE EXTENSION mysql_fdw;

-- create server object
CREATE SERVER mysql_server
         FOREIGN DATA WRAPPER mysql_fdw
         OPTIONS (host '127.0.0.1', port '3306');

-- create user mapping
CREATE USER MAPPING FOR enterprisedb
    SERVER mysql_server OPTIONS (username 'foo', password
'bar');

-- create foreign table
CREATE FOREIGN TABLE warehouse
(
 warehouse_id      INT,
 warehouse_name    TEXT,
 warehouse_created TIMESTAMP
)
SERVER mysql_server
         OPTIONS (dbname 'db', table_name 'warehouse');

-- insert new rows in table
INSERT INTO warehouse values (1, 'UPS', current_date);
INSERT INTO warehouse values (2, 'TV', current_date);
INSERT INTO warehouse values (3, 'Table', current_date);

-- select from table
SELECT * FROM warehouse ORDER BY 1;

warehouse_id | warehouse_name | warehouse_created
-------------+----------------+-------------------
           1 | UPS            | 10-JUL-20 00:00:00
           2 | TV             | 10-JUL-20 00:00:00
```

```
           3 | Table          | 10-JUL-20 00:00:00

-- delete row from table
DELETE FROM warehouse where warehouse_id = 3;

-- update a row of table
UPDATE warehouse set warehouse_name = 'UPS_NEW' where
warehouse_id = 1;

-- explain a table with verbose option
EXPLAIN VERBOSE SELECT warehouse_id, warehouse_name FROM
warehouse WHERE warehouse_name LIKE 'TV' limit 1;

                                                    QUERY PLAN
------------------------------------------------------------
------------------------------------------------
Limit  (cost=10.00..11.00 rows=1 width=36)
       Output: warehouse_id, warehouse_name
       ->  Foreign Scan on public.warehouse
(cost=10.00..1010.00 rows=1000 width=36)
              Output: warehouse_id, warehouse_name
              Local server startup cost: 10
              Remote query: SELECT `warehouse_id`,
`warehouse_name` FROM `db`.`warehouse` WHERE
((`warehouse_name` LIKE BINARY 'TV'))

-- drop foreign table
DROP FOREIGN TABLE warehouse;

-- drop user mapping
DROP USER MAPPING FOR enterprisedb SERVER mysql_server;

-- drop server
DROP SERVER mysql_server;
```

9 Example: Import Foreign Schema

Access data from Advanced Server and connect to psql. Once you are connected to psql, follow the below steps:

```
-- load extension first time after install
CREATE EXTENSION mysql_fdw;

-- create server object
CREATE SERVER mysql_server
         FOREIGN DATA WRAPPER mysql_fdw
         OPTIONS (host '127.0.0.1', port '3306');

-- create user mapping
CREATE USER MAPPING FOR postgres
    SERVER mysql_server OPTIONS (username 'foo', password
'bar');

-- import foreign schema
IMPORT FOREIGN SCHEMA edb FROM SERVER mysql_server INTO
public;

 SELECT * FROM color;
 cid | cname
-----+--------
   1 | Red
   2 | Green
   3 | Orange

SELECT * FROM fruit;
 fid | fname
-----+--------
   1 | Orange
   2 | Mango
```

10 Example: Join Push-down

The following example shows join push-down between a table on MySQL server and

Postgres server:

Table on MySQL server:

```
CREATE TABLE warehouse
(
warehouse_id      INT PRIMARY KEY,
warehouse_name    TEXT,
warehouse_created TIMESTAMP
);

CREATE TABLE sales_records
(
warehouse_id      INT PRIMARY KEY,
qty           INT
);
```

Table on Postgres server:

```
CREATE EXTENSION mysql_fdw;
CREATE SERVER mysql_server FOREIGN DATA WRAPPER mysql_fdw
OPTIONS (host '127.0.0.1', port '3306');
CREATE USER MAPPING FOR public SERVER mysql_server OPTIONS
(username 'edb', password 'edb');

CREATE FOREIGN TABLE warehouse
(
warehouse_id      INT,
warehouse_name    TEXT,
warehouse_created TIMESTAMP
)
SERVER mysql_server OPTIONS (dbname 'edb', table_name
'warehouse');
INSERT INTO warehouse values (1, 'UPS', current_date);
INSERT INTO warehouse values (2, 'TV', current_date);
INSERT INTO warehouse values (3, 'Table', current_date);

CREATE FOREIGN TABLE sales_records
(
warehouse_id      INT,
qty           INT
```

```
)
SERVER mysql_server OPTIONS (dbname 'edb', table_name
'sales_records');
INSERT INTO sales_records values (1, 100);
INSERT INTO sales_records values (2, 75);
INSERT INTO sales_records values (3, 200);
```

The output:

```
--inner join
edb=# EXPLAIN VERBOSE SELECT t1.warehouse_name, t2.qty FROM
warehouse t1 INNER JOIN sales_records t2 ON (t1.warehouse_id
= t2.warehouse_id);

QUERY PLAN
------------------------------------------------------------
------------------------------------------------------------
-----------------------------------------
 Foreign Scan  (cost=15.00..35.00 rows=5000 width=36)
   Output: t1.warehouse_name, t2.qty
   Relations: (edb.warehouse t1) INNER JOIN
(edb.sales_records t2)
   Local server startup cost: 10
   Remote query: SELECT r1.`warehouse_name`, r2.`qty` FROM
(`edb`.`warehouse` r1 INNER JOIN `edb`.`sales_records` r2 ON
(((r1.`warehouse_id` = r2.`warehouse_id`))))
(5 rows)

--left join
edb=# EXPLAIN VERBOSE SELECT t1.warehouse_name, t2.qty FROM
warehouse t1 LEFT JOIN sales_records t2 ON (t1.warehouse_id =
t2.warehouse_id);

QUERY PLAN
------------------------------------------------------------
------------------------------------------------------------
-----------------------------------------
 Foreign Scan  (cost=15.00..35.00 rows=5000 width=36)
   Output: t1.warehouse_name, t2.qty
   Relations: (edb.warehouse t1) LEFT JOIN (edb.sales_records
t2)
```

```
   Local server startup cost: 10
   Remote query: SELECT r1.`warehouse_name`, r2.`qty` FROM
(`edb`.`warehouse` r1 LEFT JOIN `edb`.`sales_records` r2 ON
(((r1.`warehouse_id` = r2.`warehouse_id`))))
(5 rows)

--right join
edb=# EXPLAIN VERBOSE SELECT t1.warehouse_name, t2.qty FROM
warehouse t1 RIGHT JOIN sales_records t2 ON (t1.warehouse_id
= t2.warehouse_id);

QUERY PLAN
------------------------------------------------------------
------------------------------------------------------------
-----------------------------------------
 Foreign Scan  (cost=15.00..35.00 rows=5000 width=36)
   Output: t1.warehouse_name, t2.qty
   Relations: (edb.sales_records t2) LEFT JOIN (edb.warehouse
t1)
   Local server startup cost: 10
   Remote query: SELECT r1.`warehouse_name`, r2.`qty` FROM
(`edb`.`sales_records` r2 LEFT JOIN `edb`.`warehouse` r1 ON
(((r1.`warehouse_id` = r2.`warehouse_id`))))
(5 rows)

--cross join
edb=# EXPLAIN SELECT t1.warehouse_name, t2.qty FROM warehouse
t1 CROSS JOIN sales_records t2;
                            QUERY PLAN
------------------------------------------------------------
------
 Foreign Scan  (cost=15.00..35.00 rows=1000000 width=36)
   Relations: (edb.warehouse t1) INNER JOIN
(edb.sales_records t2)
(2 rows)
```

11 Identifying the MySQL Foreign Data Wrapper Version

The MySQL Foreign Data Wrapper includes a function that you can use to identify the currently installed version of the `.so` file for the data wrapper. To use the function, connect to the Postgres server, and enter:

```
SELECT mysql_fdw_version();
```

The function returns the version number:

```
mysql_fdw_version
------------------
<xxxxx>
```

---

12 Uninstalling the MySQL Foreign Data Wrapper

Uninstalling an RPM Package

You can use the `yum remove` or `dnf remove` command to remove a package installed by `yum` or `dnf`. To remove a package, open a terminal window, assume superuser privileges, and enter the command:

- On RHEL or CentOS 7:

  ```
  yum remove edb-as<xx>-mysql<x>_fdw
  ```

  where `xx` is the server version number, and `x` is the supported release version number of MySQL. For example, to uninstall MySQL 5.0 on RHEL 7:

  ```
  yum remove edb-as<xx>-mysql5_fdw
  ```

- On RHEL or CentOS 8:

  ```
  dnf remove edb-as<xx>-mysql8_fdw
  ```

Where `xx` is the server version number.

Uninstalling MySQL Foreign Data Wrapper on a Debian or Ubuntu Host

- To uninstall MySQL Foreign Data Wrapper on a Debian or Ubuntu host, invoke the following command.

  ```
  apt-get remove edb-as<xx>-mysql-fdw
  ```

Where `xx` is the server version number.

---

13 Troubleshooting

In case you are experiencing issues with using MySQL 8 and MySQL_FDW, below is a list of solutions to some frequently seen issues:

Authentication plugin 'caching_sha2_password' Error

```
ERROR:  failed to connect to MySQL: Authentication plugin
'caching_sha2_password' cannot be loaded:
/usr/lib64/mysql/plugin/caching_sha2_password.so: cannot open
shared  object file: No such file or directory
```

Specify the authentication plugin as `mysql_native_password` and set a cleartext password value. The syntax:

```
ALTER USER 'username'@'host' IDENTIFIED WITH
mysql_native_password BY '<password>';
```

!!! Note Refer to MySQL 8 documentation for more details on the above error.