Microsoft SQL Server TDE and Entrust CSP Key Management Vault

Integration Guide

2026-04-22

Member of
Microsoft Intelligent Security Association

Microsoft Security

Table of Contents

Chapter 1. Introduction

This document describes the procedure for integrating the Entrust Cryptographic Security Platform (CSP) Vault with Microsoft SQL Server. The Entrust CSP Vault becomes the Extensible Key Management (EKM) provider for Microsoft SQL Server TDE.

1.1. Product configurations

Entrust has successfully tested the Microsoft SQL Server TDE integration with the Entrust CSP Vault in the following configurations:

Product	Version
Microsoft SQL Server	Enterprise Edition 2025
SQL Server Management Studio	22.4.1
Entrust CSP Vault	10.5.1
Operating System	Windows Server 2025

1.2. Requirements

Access to the Entrust TrustedCare Portal. This portal is available to customers under maintenance. To request an account, contact nshield.support@entrust.com.

Familiarize yourself with the following documentation:

- CSP Compliance Manager 10.5.1 documentation.
- Cryptographic Security Platform Vault v10.5.1 Online Documentation Set documentation.

Chapter 2. Test setup

The test setup consisted of four virtual machines:

- Entrust CSP Compliance Manager server.
- Entrust CSP Vault server (two nodes).
- Windows Server hosting the SQL database server and management tools.

The Entrust CSP Compliance Manager server was deployed and configured as described in CSP Compliance Manager 10.5.1 - Installation and Administration.

The Entrust CSP Vault was implemented as a 2-node cluster. The cluster was deployed and configured as described in Cryptographic Security Platform Vault v 10.5.1 Online Documentation Set.

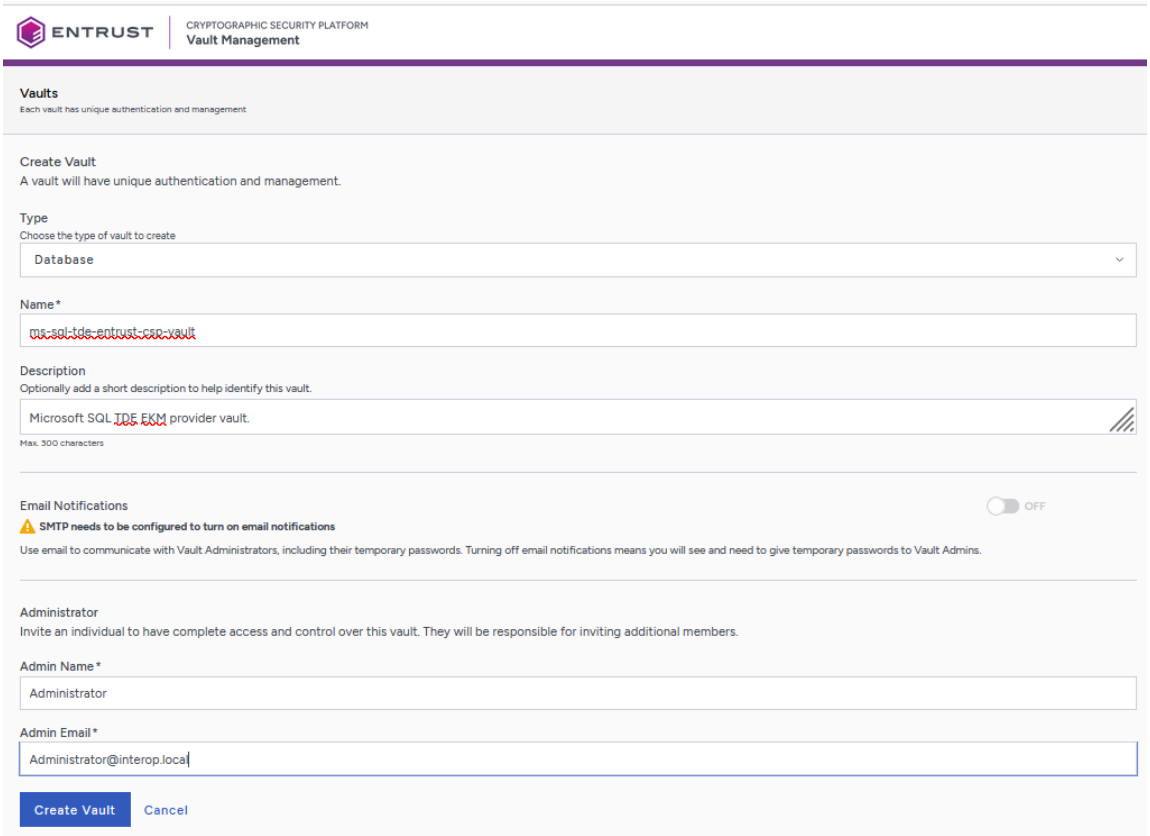
The Microsoft SQL Server was deployed as a stand-alone instance on a single machine. A database named TestDatabase was created for the purpose of this integration.

Chapter 3. Configure the Entrust CSP Vault

To create and configure a vault.

1. Sign in to the Entrust CSP Vault management web GUI.
2. Select the **+ Create Vault** icon.
3. For **Type**, select **Database** from the drop-down menu.
4. Enter a vault name and description, an administrator name and email, and then select **Create Vault**.

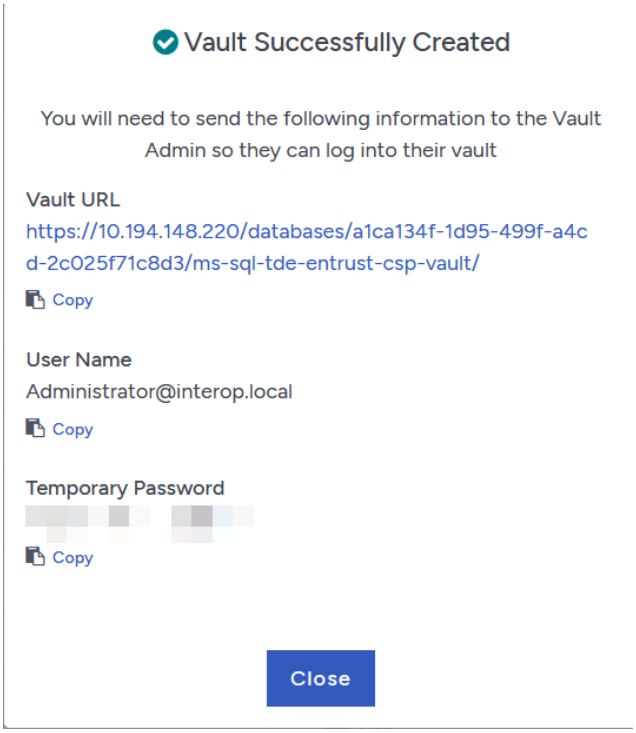
   For example:



   This creates the vault.

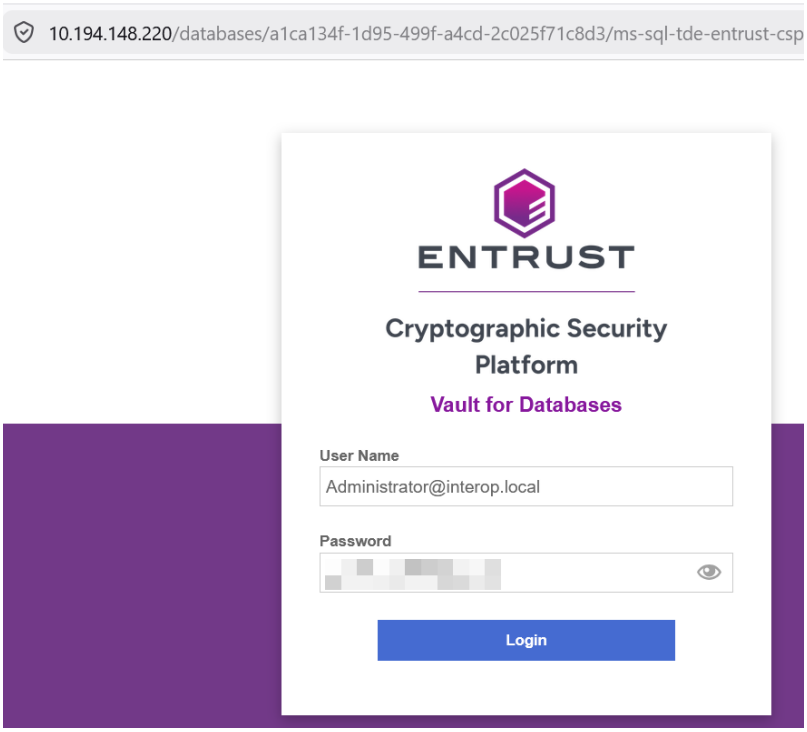
5. Copy and save the **Vault URL** and **Temporary Password**.

   For example:



6. Bookmark your vault URL in the browser on the MS SQL Server host.
7. Sign in to your vault for the first time with your temporary administrator credentials.

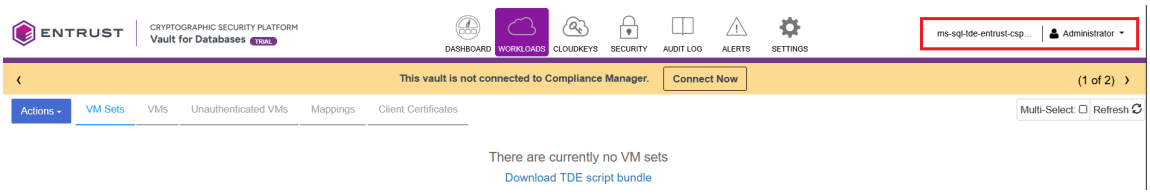
   For example:



8. Enter the new administrator password. Then select **Close**.
9. Sign in again with your new password.

The vault name appears at the top of the screen.

For example:



Chapter 4. Integrate the MS SQL Server with the Entrust CSP Vault

For reference, see Microsoft SQL Server Manual Installation and Configuration.

1. Get the vault information
2. Install the policy agent client on the MS SQL Server host
3. Register the MS SQL Server with your vault
4. Enable TDE on the MS SQL Server
5. Create a TDE database keyset to hold the cloud keys
6. Create the database connector
7. Load the EKM provider on Microsoft SQL Server
8. Create a master key in the Entrust CSP vault
9. Create the TDE key and login on Microsoft SQL Server

4.1. Get the vault information

1. Sign in to the MS SQL Server host.
2. From the MS SQL Server host, sign in to your vault web GUI.
3. In the top left, under **Administrator**, select **About** from the drop-down menu.

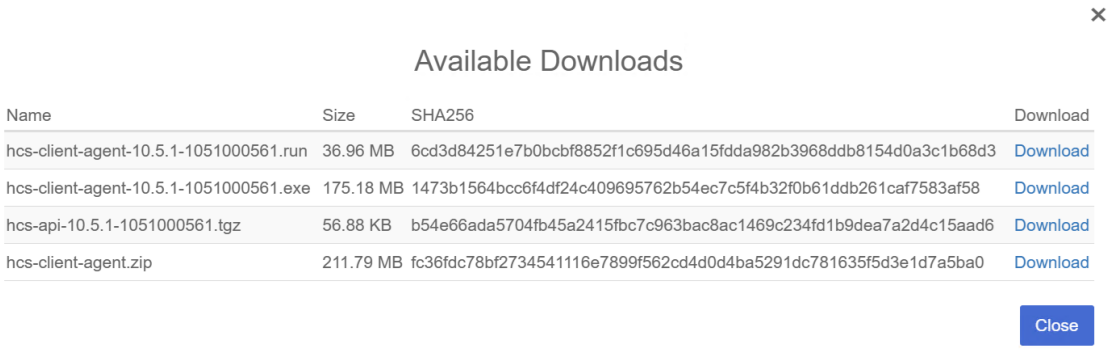
   For example:

4. Make a note of the **Vault ID**.

4.2. Install the policy agent client on the MS SQL Server host

1. Sign in to the MS SQL Server host.
2. From the MS SQL Server host, sign in to your vault web GUI.
3. In the toolbar select **WORKLOADS**.
4. Select **Actions**, then select **Download Policy Agent** from the drop-down menu.

   For example:



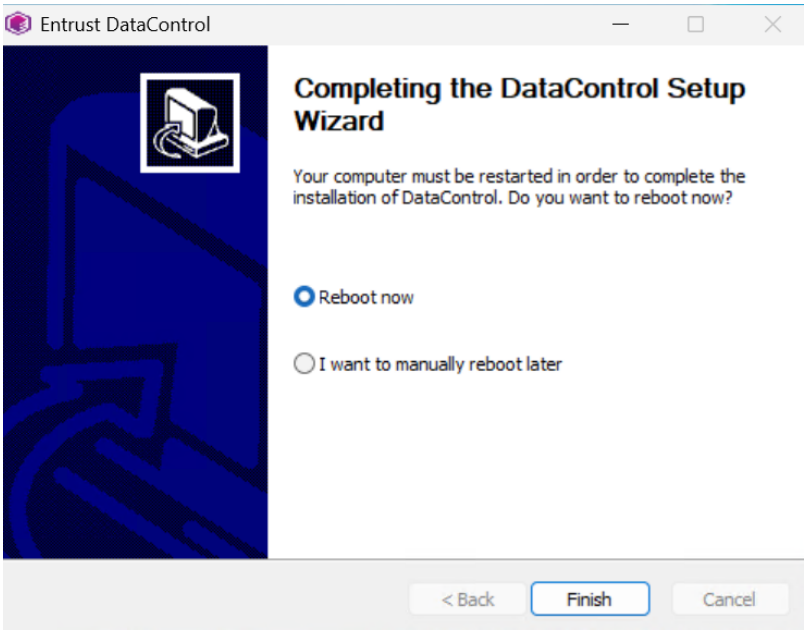
5. Select **Download** next to the `hcs-client-agent-<version>.exe` file.

   Alternatively, download the `hcs-client-agent.zip` file and then extract the Windows executable.

6. Select **Close**.
7. Run the downloaded file, `hcs-client-agent-<version>.exe`.

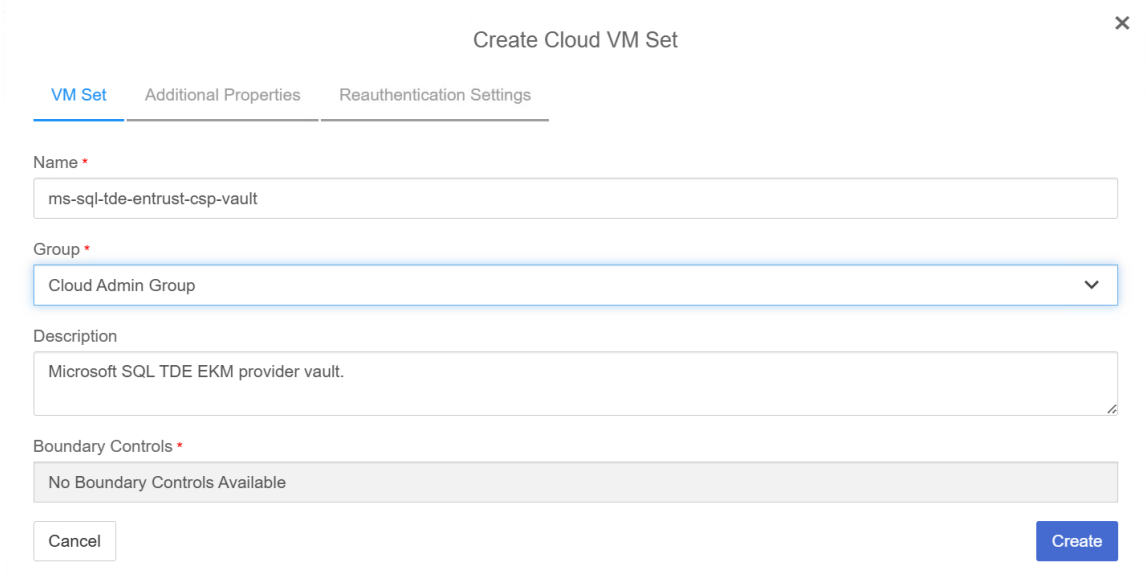
   Alternatively, open the `ZIP` file and navigate to the `hcs-client-agent\windows` folder and then run the executable.

8. Complete the install process using the default options.
9. Upon completion, select **Reboot now**, then select **Finish**.

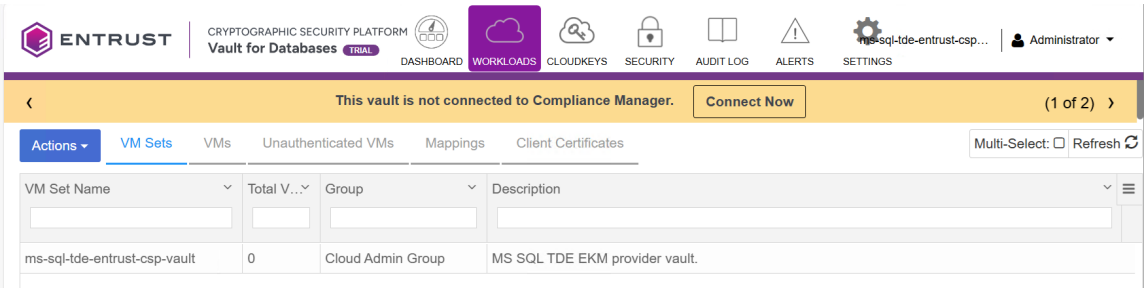


4.3. Register the MS SQL Server with your vault

1. On the MS SQL Server host, sign in to your vault web GUI.
2. In the toolbar, select **WORKLOADS**.
3. Select **Actions**, then select **Create New Cloud VM Set** from the drop-down menu.
4. In the **Create Cloud VM set** window, enter a **Name** and **Description**, then select **Create** and **Close**.



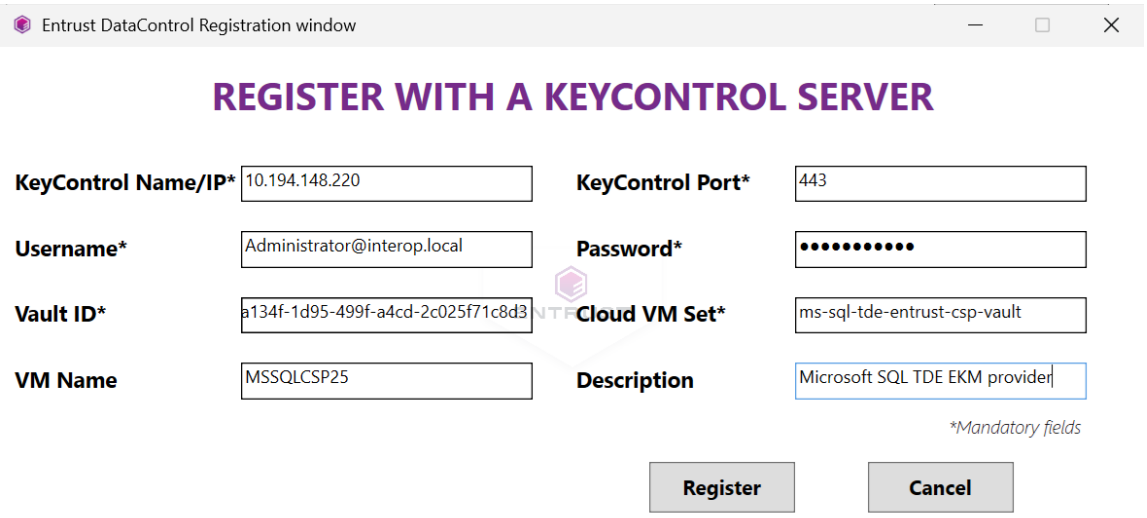
The new cloud VM set appears.



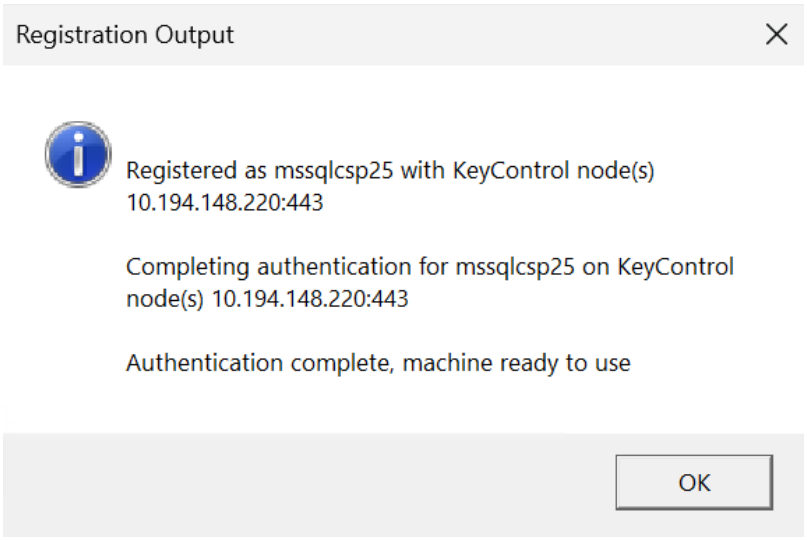
5. Select the **Start** menu in the MS SQL Server host and navigate to **Entrust DataControl**.
6. Select **Register**.
7. In the **Register** window, enter the information as follows, then select **Register** and **OK**.

   For example:

Parameter	Value
Name / IP	First node of the Entrust CSP Vault cluster
Username	User created in Configure the Entrust CSP Vault
Password	User created in Configure the Entrust CSP Vault
Vault ID	See Get the vault information
Cloud VM set	Name of cloud VM set created above

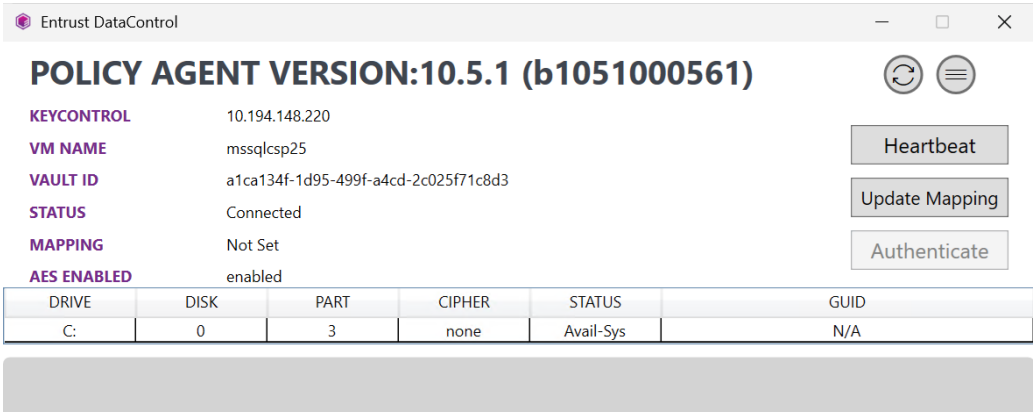


8. After registration succeeds, select **OK**.



The Entrust DataControl window now shows **STATUS Connected**.

9. Close the window.



4.4. Enable TDE on the MS SQL Server

1. On the MS SQL Server host, open a command window as an administrator.
2. Run the following command to enable TDE on the server:

```
C:\Users\Administrator.INTEROP>hcl tde status

TDE is not enabled on this VM

C:\Users\Administrator.INTEROP>hcl tde enable
Enabling tde will change permissions of some Files.
Do you want to proceed? (y/n) y

If you are enabling TDE for an Oracle database, follow the steps mentioned below from the Administritor
Guide.
"Administration Guide > KeyControl Vault for Databases > KeyControl with Oracle TDE > Configuring the
Oracle Server Database"

C:\Users\Administrator.INTEROP>hcl tde status
```

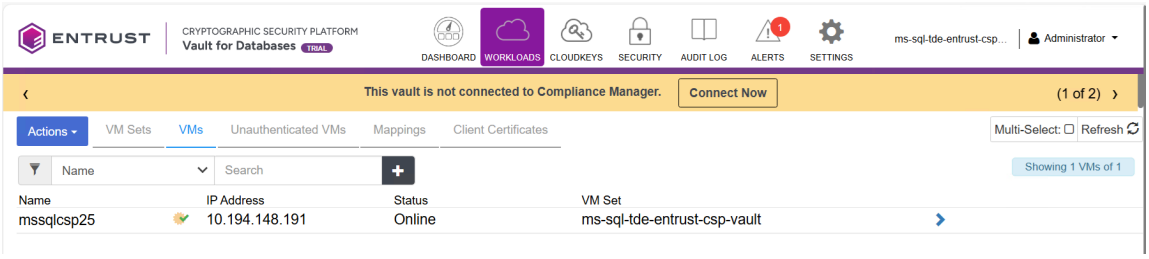
```
TDE is enabled on this VM

C:\Users\Administrator.INTEROP>hcl status

Summary
--------------------------------------------------------------------------------
KeyControl: 10.194.148.220:443
KeyControl list: 10.194.148.220:443
Vault ID: a1ca134f-1d95-499f-a4cd-2c025f71c8d3
Status: Connected
Last heartbeat: Mon Apr  6 11:11:05 2026 (successful)
Certificate Expiration: Apr  6 14:42:47 2027 GMT
```

3. Sign in to your vault web GUI.
4. In the toolbar select **WORKLOADS**, then select the **VM** tab.

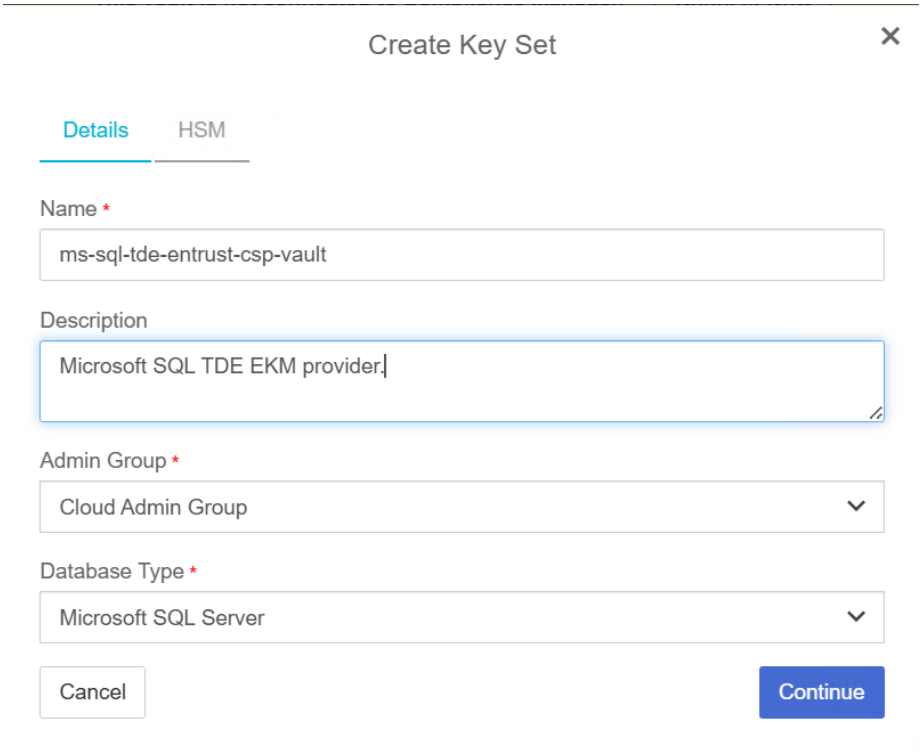
   The Microsoft SQL Server host now appears.



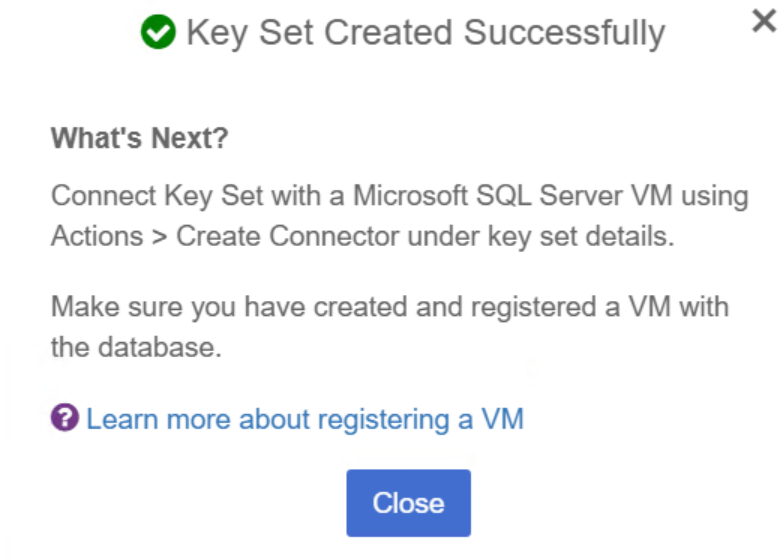
4.5. Create a TDE database keyset to hold the cloud keys

1. On the MS SQL Server host, sign in to your vault web GUI.
2. In the toolbar select **CLOUDKEYS**.
3. Select **Actions**, then select **Create Key Set** from the drop-down menu.
4. In the **Create Key Set** window, on the **Details** tab, enter the details as follows, then select **Continue**.

   For example:



5. Enter the HSM information, if provisioned, then select **Apply**.
6. After the keyset is successfully created, select **Close**.

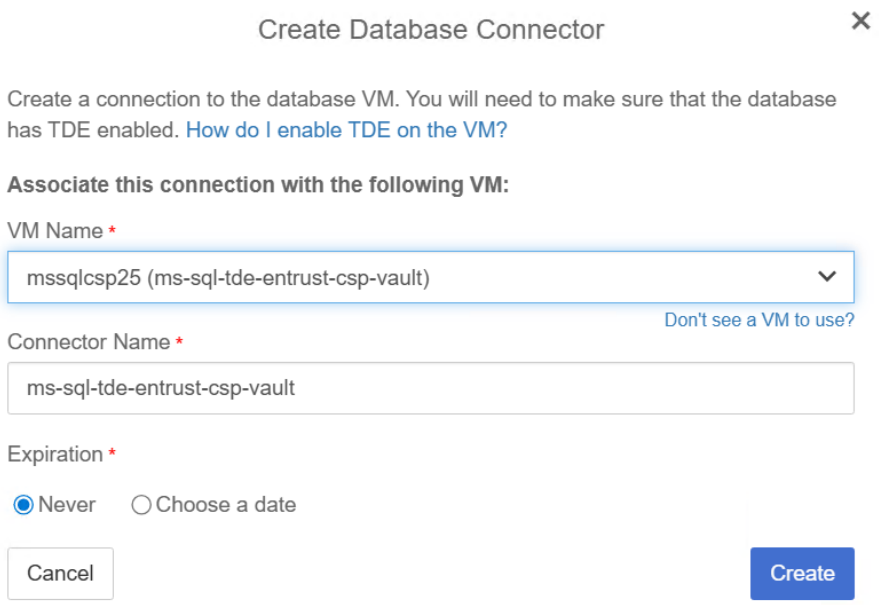


4.6. Create the database connector

1. On the MS SQL Server host sign in to your vault web GUI.
2. In the toolbar, select **CLOUDKEYS**, then select the **Key Sets** tab.
3. Select your keyset created in Create a TDE database keyset to hold the cloud keys.

4. Scroll down and select the **Database Connectors** tab.
5. Select **Create Connector Now**.
6. In the **Create Database Connector** window, select your Microsoft SQL Server host from the drop-down menu.
7. Enter a name and select the expiration, then select **Create**. In this integration, we configure the connector to never expire.

   For example:

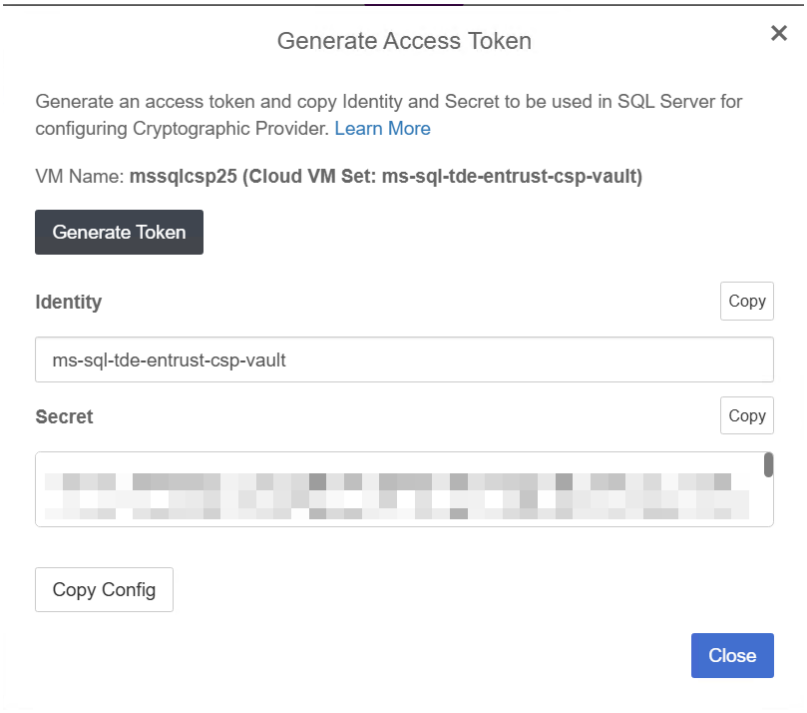


8. Check the box next to the Database Connector created, then, from the **Actions** drop-down menu, select **Generate Access Token**.
9. In the **Generate Access Token** window, select **Generate Token**.

   The access token is generated.

10. Copy and save the **Identity** and **Secret**.

    For example:



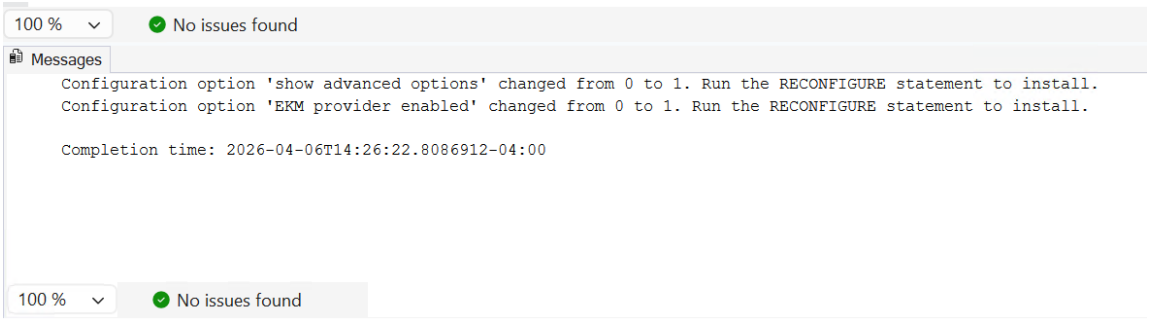
4.7. Load the EKM provider on Microsoft SQL Server

1. Launch Microsoft SQL Server Management Studio and connect to the SQL Server.
2. Run the following query to enable the EKM provider:

```
USE master
GO

-- Enable EKM provider
sp_configure 'show advanced options', 1 ;
GO
RECONFIGURE;
GO

sp_configure 'EKM provider enabled', 1 ;
GO
RECONFIGURE;
GO
```



3. Run the following query to load the EKM provider library:

```
-- Load cryptographic provider
CREATE CRYPTOGRAPHIC PROVIDER Entrust_CSP_Vault
FROM FILE = 'C:\Program Files\hcs\bin\htsqlekm_provider.dll';
GO
```

4. Using the **Identity** and **Secret** from section Create the database connector, create a credential file in JSON format. Place this file where it is accessible to the SQL Server, for example `C:\Users\Administrator\sqlcred.conf`.

```
{
    "identity" : "ms-sql-tde-entrust-csp-vault",
    "secret"   :
"WsZdrsP0mpbrTVtZSLGs6sUOZylq0cB0FmpyNl7nNwiuN3PbjSThQj59eACZCg3IYZo/dtFn5Acr6FceJ+a/NAAhqS7keQ0T5cgXswjHVZ
z4gYrkqTPfMeUI8vM6z79E6qvVp/Fyr840nlhzle1nSKiVohD85Dmued40dRvOqFy4iKuNWEwBEk9bs35P1La1iYz1ANDm31QH0akhT6+C9
sONOTsHSzs1JoZphNnPDN2PULJVIXkdo+yhbF+xBfW3P6N4JaQWK1aL09qIin/dX+Y/nBmeXbknKyiBJendO5jjSrRFMvkhZBNjEAlKdUuc
IaPBpoe2m6~NRT3gkHo/jSJ6dgKy9GpvcylgufDLzfz8jEfZuLKenfhSp5E75mJMfYqApuhBK56GfqpH+sp2NmhSdXyMcixE+6u+HLy/3VN
Tnf9HezmrFMPNq1NF6NZBB9dQyz6KBfZ9zjPpNu6H2kJFbH3jwkzYkfvnKBM9vC+ki25RTWNMOTQchf43LC3vaxup3QGNcBfUWqXFWxsmTS
kSY04K3B+oDXVr77IoOGT59Fi6LhHv4ncEMr5w1dK2svRyf8W8iRebi0d1VsKbtgPg4KwoWdMp7U/VRxon16BeXvZgJ3YUFdsaCZL3eghjN
FEWOHP/v33Sx8EtzL53oT/5xCJprze1U="
}
```

5. Run the following query to create login credentials for the administrator:

```
-- Create credential for system administrator
CREATE CREDENTIAL sa_entrust_csp_vault
WITH IDENTITY = 'file:C:\Users\Administrator\sqlcred.conf',
SECRET = 'ignore'
FOR CRYPTOGRAPHIC PROVIDER Entrust_CSP_Vault;
GO

-- Add this credential to the system administrator login
ALTER LOGIN [INTEROP\Administrator]
ADD CREDENTIAL "sa_entrust_csp_vault";
GO
```

We recommend pointing to the `sqlcred.conf` file in the query instead of simply listing the actual identity and secret. The former is required for SQL Server clusters.

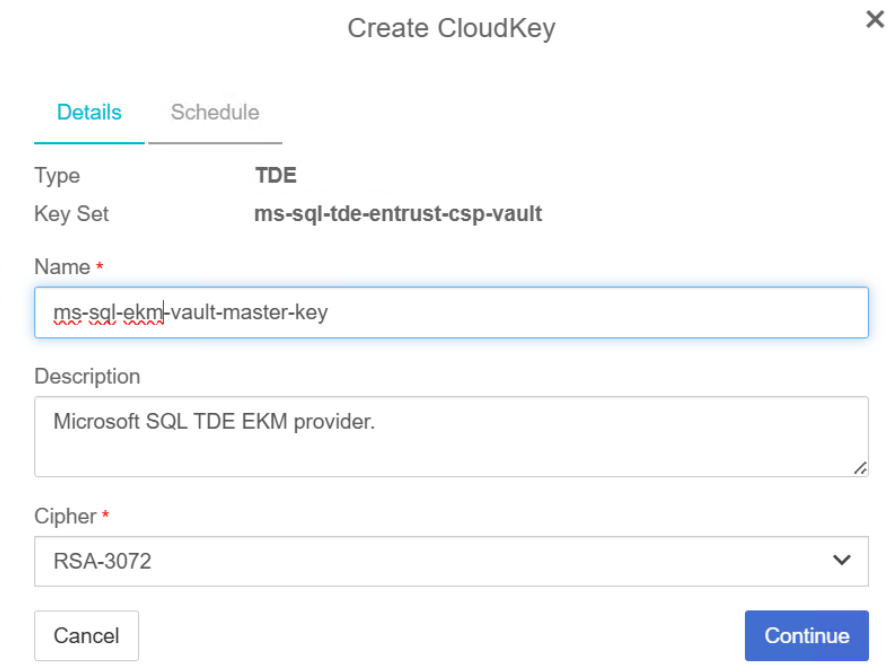
4.8. Create a master key in the Entrust CSP vault

1. On the MS SQL Server host, sign in to your vault web GUI.
2. In the toolbar select **CLOUDKEYS**, then select the **Cloud Keys** tab.
3. In the **Key Set** drop-down menu, select your keyset created in Create a TDE database keyset to hold the cloud keys.
4. Select **Actions > Create CloudKey**.
5. In the **Create CloudKey** window **Details** tab, enter a **Name** and **Description**.

6. Select the **Cypher** per your application requirements, then select **Continue**.

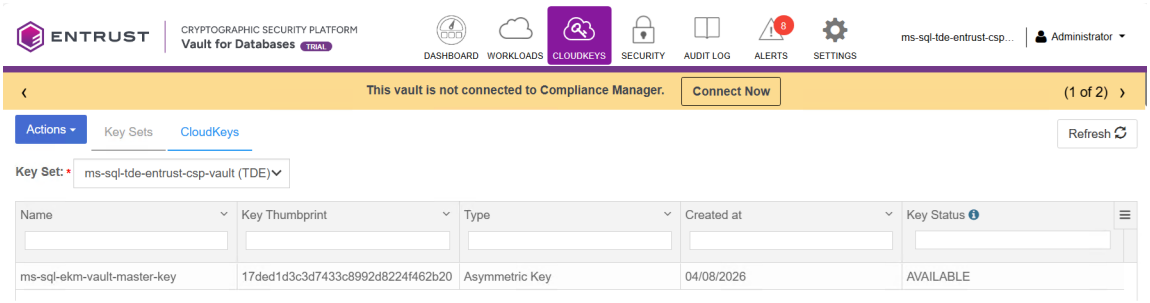
   SQL Server supports a maximum of 3072 bits for the **Cypher**.

   For example:



7. In the **Schedule** tab, select the required options, then select **Apply** and **Close**.

   The master key is created.



4.9. Create the TDE key and login on Microsoft SQL Server

1. Launch Microsoft SQL Server Management Studio and connect to the SQL Server.
2. Run the following query to create a TDE key protected by the EKM provider vault master key created in Create a master key in the Entrust CSP vault.

```
USE master;
CREATE ASYMMETRIC KEY TDE_Key
FROM PROVIDER Entrust_CSP_Vault WITH
```

```
PROVIDER_KEY_NAME = 'ms-sql-ekm-vault-master-key',
CREATION_DISPOSITION = OPEN_EXISTING;
GO
```

3. Run the following query to create a login for the TDE user:

```
-- Create login for TDE user
CREATE LOGIN TDE_Login
FROM ASYMMETRIC KEY TDE_Key ;
GO
```

4. Run the following query to create a credential for the TDE login:

```
-- Create credential for the TDE user
CREATE CREDENTIAL tde_entrust_csp_vault
WITH IDENTITY = 'file:C:\Users\Administrator\sqlcred.conf',
SECRET = 'ignore'
FOR CRYPTOGRAPHIC PROVIDER Entrust_CSP_Vault;
GO

-- Add this credential to the TDE user login
ALTER LOGIN TDE_Login
ADD CREDENTIAL "tde_entrust_csp_vault";
GO
```

Chapter 5. Test the integration

1. Test the database encryption
2. Rotate the key manually in the Entrust CSP Vault
3. Shut down encryption on the database and remove credentials

5.1. Test the database encryption

The following queries test encryption on a database named `TestDatabase` created in section Test setup.

1. Launch Microsoft SQL Server Management Studio and connect to the SQL Server.
2. Run the following query to create a database encryption key (DEK) wrapped with the TDE key named TDE_Key created in Create the TDE key and login on Microsoft SQL Server.

```
USE TestDatabase
GO

CREATE DATABASE ENCRYPTION KEY
WITH ALGORITHM  = AES_256
ENCRYPTION BY SERVER ASYMMETRIC KEY TDE_Key;
GO
```

3. Run the following query to enable encryption on TestDatabase:

```
ALTER DATABASE TestDatabase
SET ENCRYPTION ON;
GO
```

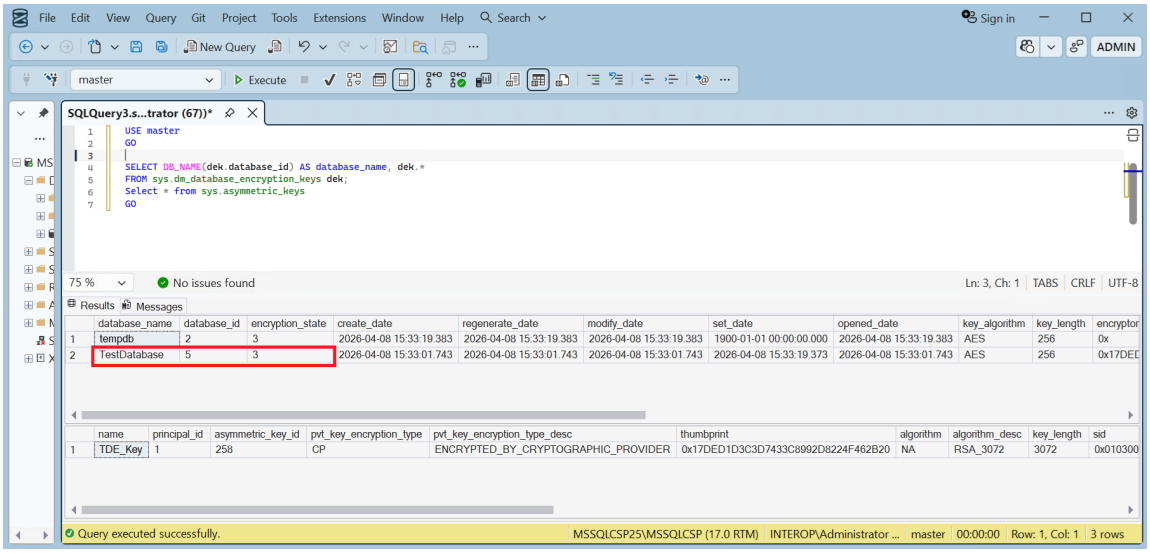
4. Check the state of keys and encryption.

   The thumbprints should be matching for each query. The **encryption_state** of **3** signifies "encrypted". See sys.dm_database_encryption_keys (Transact-SQL) for reference.

   For example:

```
USE master
GO

SELECT DB_NAME(dek.database_id) AS database_name, dek.*
FROM sys.dm_database_encryption_keys dek;
Select * from sys.asymmetric_keys
GO
```

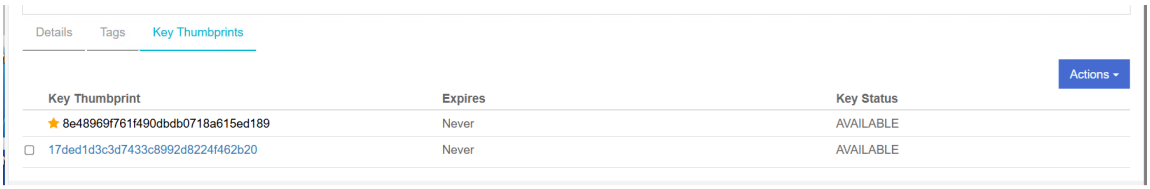


5.2. Rotate the key manually in the Entrust CSP Vault

The Entrust CSP Vault v10.5.1 supports reusing the same key name upon a key rotation. The asymmetric key object continues to resolve to the new cloud key after a key rotation. It is sufficient to rotate the cloud key in the Entrust CSP Vault. No action is needed in the Microsoft SQL Server.

1. (Recommended) Back up your database before performaing key rotation.
2. Sign in to your vault web GUI.
3. In the toolbar select **CLOUDKEYS**, then select the **Cloud Keys** tab.
4. In the **Key Set** drop-down menu, select your keyset created in Create a TDE database keyset to hold the cloud keys.
5. Select your key created in Create a master key in the Entrust CSP vault.
6. Scroll down and select **Rotate Now**.

   A new version of the key is created. You can see this new version in the **Key Thumbprints** tab, marked with a star in front of it.



5.3. Shut down encryption on the database and remove credentials

1. Launch Microsoft SQL Server Management Studio and connect to the SQL Server.
2. Run the following query to shut down encryption.

```
ALTER DATABASE TestDatabase
SET ENCRYPTION OFF;
GO

USE TestDatabase
DROP DATABASE ENCRYPTION KEY
GO

USE master
GO

DROP ASYMMETRIC KEY TDE_Key
GO

ALTER LOGIN TDE_Login
DROP CREDENTIAL tde_ekm_cred
GO

DROP LOGIN TDE_Login
DROP CREDENTIAL tde_ekm_cred
GO
```

3. Run the following query to remove the credential from the admin login:

```
ALTER LOGIN [INTEROP\Administrator]
DROP CREDENTIAL sa_entrust_csp_vault;
GO

DROP credential sa_ekm_tde_cred
GO
```

Chapter 6. Additional resources and related products

6.1. Entrust CSP Key Manager

6.2. Entrust products

6.3. nShield product documentation