



GOOGLE CLOUD EKM (EXTERNAL KEY MANAGER)

Integration Guide

Applicable Devices:

KMES Series 3

Applicable Versions:

6.3.1.x



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[1] OVERVIEW OF THE GOOGLE CLOUD EKM / KMES SERIES 3 INTEGRATION

[1.1] ABOUT GOOGLE CLOUD EKM

Within Google Cloud KMS (Key Management Service), there are several different sub offerings, and Google Cloud EKM (External Key Manager) is one of them. With Google Cloud EKM, you can use keys that you manage within a supported external key management partner (i.e., KMES Series 3) to protect data within Google Cloud. You can protect data at rest in Google's BigQuery or Compute Engine persistent storage services, or by calling the Cloud Key Management Service API directly.

[1.2] KEY BENEFITS OF THE INTEGRATION

The Google Cloud EKM / KMES Series 3 integration provides several benefits:

- **Key provenance:** You control the location and distribution of your externally-managed keys. Externally-managed keys are never cached or stored within Google Cloud. Instead, Cloud EKM communicates directly with the KMES Series 3 for each request.
- **Access control:** You manage access to your externally-managed keys. Before you can use an externally-managed key to encrypt or decrypt data in Google Cloud, you must grant the Google Cloud project access to use the key. You can revoke this access at any time.
- **Centralized key management:** You can manage your keys and access policies from a single location and user interface, whether the data they protect resides in the cloud or on your premises.

In all cases, the key resides on the KMES Series 3, and is never sent to Google.

[2] INITIAL SETUP IN THE GOOGLE KMS DASHBOARD

[2.1] NAVIGATE TO THE CLOUD KMS DASHBOARD

From the main GCP dashboard, type "Key Management Service", into the search bar at the top of the page. Then, click on "Cryptographic Keys".

[2.2] CREATE A NEW KEY RING

From the "Cryptographic Keys" dashboard, click on the "Create Key Ring" button at the top of the page, as shown below.

The screenshot shows the Google Cloud Platform interface for Cryptographic Keys. The top navigation bar includes the Google Cloud Platform logo, the project name 'futurex-ekms-test', and a search bar. The left sidebar lists various security services, with 'Cryptographic Keys' selected. The main content area is titled 'Cryptographic keys' and features a '+ CREATE KEY RING' button, which is highlighted with a red arrow. Below this, there is a 'Key rings' section with a description and a 'Filter table' button. A table lists several key rings with columns for Name, Location, Keys, and Actions. The table includes rows for 'final_test', 'final_test3', 'finaltest', 'gcpdemo', 'mgrecoQA', 'test', 'test_aft', 'test_new1', 'test-10', 'test-new', and 'useast1'. The right sidebar shows a 'Choose a key ring' section with tabs for 'PERMISSIONS' and 'ACTIVITY', and a message: 'Please select at least one resource.'

Name	Location	Keys	Actions
final_test	us-east1	test-final	⋮
final_test3	us-east1	final_test3	⋮
finaltest	us-east1	finaltest	⋮
gcpdemo	us-east1	gcpdemo	⋮
mgrecoQA	us-central1	bbGCP, mgGC...	⋮
test	us-central1	est123123, te...	⋮
test_aft	us-east1	test_aft	⋮
test_new1	us-east1	test1-3, test2-3	⋮
test-10	us-east1	baseTest, test-10	⋮
test-new	us-east1	test-new-3	⋮
useast1	us-east1	useast1	⋮

This will pull up the "Create key ring" wizard.

Google Cloud Platform | futurex-ekms-test | Search products and resources

Security

- Security Command Center
- reCAPTCHA Enterprise
- Threat Detection
- Context-Aware Access
- Identity-Aware Proxy
- Access Context Manager
- VPC Service Controls
- Binary Authorization
- Data Loss Prevention
- Cryptographic Keys**
- Secret Manager
- Access Approval
- Web Security Scanner
- Managed Microsoft AD

Create key ring

Key rings group keys together to keep them organized. In the next step, you'll create keys that are in this key ring. [Learn more](#)

Project name
futurex-ekms-test

Key ring name *
Demo-Key-Ring

Key ring location *
us-central1

CREATE **CANCEL**

Set the desired name for the key ring (**NOTE:** Key ring names can contain letters, numbers, underscores (_), and hyphens (-). Key rings can't be renamed or deleted).

Select the key ring location.

Note the following regarding the key ring location:

- Cloud EKM needs to be able to reach your keys quickly to avoid an error. When creating a Cloud EKM key, choose a Google Cloud location that is geographically near the location of the KMES Series 3 key.
- You can use Cloud EKM in any Google Cloud location supported for Cloud KMS, except for **global**.

[2.3] NOTE THE SERVICE ACCOUNT EMAIL FOR THE EXTERNALLY MANAGED KEY

After the Key Ring is created, the browser redirects to the key creation wizard. Select the "Externally managed key" option and scroll down to the bottom of the page.

The screenshot shows the Google Cloud Platform interface for creating a new key. The left sidebar lists various security services, with 'Cryptographic Keys' selected. The main content area is titled 'Create key' and shows the 'Externally managed key' option selected. Below this, there are three dropdown menus: 'Key name' (empty), 'Purpose' (set to 'Symmetric encrypt/decrypt'), and 'Key type and algorithm' (set to 'External symmetric key'). A section titled 'Link your external key' provides instructions and a warning about key availability. It lists three steps: 1. Create an external key in your external key manager. 2. Authorize the Google service account for this key permission to use the external key in your external key manager. The service account email 'service-54255661635@gcp-sa-ekms.iam.gserviceaccount.com' is highlighted in a red box. 3. Copy and paste the Key URI here. Below the instructions is a 'Key URI' input field. At the bottom, there is a 'Labels' section with an 'ADD LABEL' button, and 'CREATE' and 'CANCEL' buttons. A dark grey notification box at the bottom right states 'Key ring Demo-Key-Ring has been created'.

Google Cloud Platform | futurex-ekms-test | Search products and resources

Security

- Security Command Center
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- Threat Detection
- Context-Aware Access
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- Access Context Manager
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- Binary Authorization
- Data Loss Prevention
- Cryptographic Keys**
- Secret Manager
- Access Approval
- Web Security Scanner
- Managed Microsoft AD

← Create key

For importing your key material into GCP. [Learn more](#)

☒ **Externally managed key**
The key material will be stored in an external key manager. [Learn more](#)

Key name *

Purpose
Symmetric encrypt/decrypt

Key type and algorithm
External symmetric key

Link your external key
Please note, by using an external key manager, Google has no control over the availability of your key. Google can't recover your data if you lose keys you manage outside of GCP. [Learn more](#)

Complete the following steps to link your external key. [Learn more](#)

1. Create an external key in your external key manager.
2. Authorize the Google service account for this key permission to use the external key in your external key manager.
Service account: **service-54255661635@gcp-sa-ekms.iam.gserviceaccount.com**
3. Copy and paste the Key URI here.

Key URI *

Labels ?
[+ ADD LABEL](#)

[CREATE](#) [CANCEL](#)

Key ring Demo-Key-Ring has been created

Note the service account email address, because it will be used in the next section that covers various configurations that need to be made on the KMES Series 3.

[3] CONFIGURATION ON THE KMES SERIES 3

The instructions in this section will cover the configurations that must be made on the KMES Series 3 for Google EKMS to access externally managed keys.





For all of the following sections, you need to be logged in to the KMES application interface with the default Admin identities.

[3.1] ADD JWT IDENTITY PROVIDER

A JSON Web Token (JWT) must be configured to allow Google to authenticate against the KMES using Google's generated JWT.

1. Navigate to *Identity Management* -> *Identity Providers*, then right-click and select **Add** -> **Provider** -> **JSON Web Token**. This will open the *Identity Provider Editor* dialog.
2. Under the *Info* tab, specify a name for the Identity Provider and de-select **Enforce Dual Factor**.
3. Under the *JWT Options* tab, specify "https://accounts.google.com" as the issuer. Set leeway and max validity according to your requirements.
4. Under the *JWT Key* tab, select **JWKS** and then specify "https://www.googleapis.com/oauth2/v3/certs" in the JWKS URL field. Leave the TLS PKI field blank and click **OK** to save.
5. Right-click on the Identity Provider that was just created and select **Add** -> **Mechanism** -> **JSON Web Token**.
6. In the *Info* tab, specify a name for the authentication mechanism.
7. In the *Identifiers* tab, specify "email" as the Login field and **Username** as the User ID type. Leave Role field blank and click **OK** to save.

The newly added Identity Provider and authentication mechanism will be listed.

IDENTITY PROVIDERS		
Name	Type	Details
+  Futurex HSM	Futurex HSM	Internal
-  Google EKMS ID Provider	JWT	URL - https://accounts.google.com
 Google EKMS Auth Mechanism	JSON Web Token	
+  Local Application	Futurex Application	Any application

[3.2] CREATE AN IDENTITY FOR THE GOOGLE SERVICE ACCOUNT AND GRANT IT THE REQUIRED PERMISSIONS

Create a new role

1. Navigate to the *Identity Management* -> *Roles* menu and add a new role. This will open the *Role Editor* dialog.
2. Name the role "Google Key Management" and change the number of login required to 1. Leave all other fields set as the default values under the *Info* tab.
3. Under the *Permissions* tab, select the **Wrap** and **Unwrap** Cryptographic Operations permissions.
4. Click **OK** to save.

Create a new identity and assign it the Google Key Management role

1. Navigate to the *Identity Management* -> *Identities* menu. Right-click and select *Add* -> *Client Application* to add a new identity. This will open the *Identity Editor* dialog.
2. In the Name field, paste in the service account email address that Google EKM provided in the key creation wizard in the previous section.
3. Under the *Assigned Roles* tab, select the **Google Key Management** role.
4. Under the *Authentication* tab, click the **Add** button to add a new credential. In the *Configure Credential* dialog, select **JSON Web Token** as the credential type, and then select the provider and mechanism that was configured in the previous section and click **OK**.
5. Remove the default API Key mechanism, leaving only the JSON Web Token credential, and click **OK** to save.

[3.3] CREATE A NEW SYMMETRIC KEY

Create a new Key Group

1. Navigate to the *Key Management* -> *Keys* menu. In the key groups section, click the **Create** button.
2. For the key type, select **Symmetric**, and for the storage location, choose **HSM Trusted**, then click **OK**.
3. In the *Key Group Editor* dialog, specify a name for the key group. Then click the **Permissions** button, select "Show all roles and permissions", and set the **Use** permission for the **Google Key Management** role. Click **OK**.
4. Click **OK** to finish creating the key group.

Create a new symmetric key

1. Navigate to the *Key Management* -> *Keys* menu. Under the newly created key group, create a random symmetric Data Encryption or Data Decryption Key.

Generate HSM trusted symmetric key X

Key Options

Name: Demo-Key

UUID: {01B66E2E-3B59-0003-0006-ECC618758BB7}

Key Info

Key type: Data Encryption Key

Encrypting Key: PMK

Algorithm: AES

Key length: AES-256

Key Usage: Encrypt/Decrypt

Modifier: 0x02

Starting Valid Date: 2021-10-18 19:05:12

Ending Valid Date: 7999-12-31 00:00:00

< Back Next > Cancel

NOTE: Because we're setting the Key Usage to "Encrypt/Decrypt", Google EKM can use the same key for both encryption and decryption, therefore it does not matter if the key is created specifically as a Data Encryption or Data Decryption Key.

NOTE: The PMK must be used as the "Encrypting Key" or the Key Usage setting will not be available.

2. Click the **Next** button twice, which will bring you to a page confirming that the key has been created.
3. Click **Finish** to exit the key creation dialog.

[4] CREATING THE EXTERNALLY MANAGED KEY IN GOOGLE KMS

Return to the key creation wizard in Google KMS, where we left off at the end of section 2.

The screenshot shows the 'Create key' wizard in the Google Cloud Platform console. The left sidebar lists various security services, with 'Key Management' selected. The main panel is titled 'Create key' and shows the 'Externally managed key' option selected. The 'Key name' field is set to 'Demo-Key'. The 'Purpose' is 'Symmetric encrypt/decrypt' and the 'Key type and algorithm' is 'External symmetric key'. Below these fields, there is a section 'Link your external key' with instructions and a list of steps. The 'Key URI' field is populated with 'https://10.0.8.20:8081/kmes/v7/key-encrypt/external/Demo-Key'. At the bottom, there are 'Optional settings' (collapsed), a 'Labels' section with an '+ ADD LABEL' button, and 'CREATE' and 'CANCEL' buttons.

Select the "Externally managed key" option, and then specify a name for the key.

NOTE: The key name that is specified here does *not* have to match the name of the key that is created on the KMES Series 3.

In the *Key URI* field, the unique identifying string for the external key that was created on the KMES Series 3 needs to be specified.

Format: `https://<server ip>:<port>/kmes/v7/key-encrypt/external/<key name>`

Example: `https://10.0.8.20:8081/kmes/v7/key-encrypt/external/Demo-Key`

The two fields that need to be configured specifically to your use case are the `<server ip>` and `<key name>` fields.

In the `<key name>` field, the name of the key that was created on the KMES needs to be specified.

In the `<server ip>` field, the IP address of the KMES Series 3 device needs to be specified.

The `<port>` field needs to be set to the RA Web port on the KMES. By default, the RA Web port is 8081.

IMPORTANT: In addition to the steps above, Google must whitelist the domain specified in the *Key URI* field for your specific GCP account.

Click "CREATE" to create the externally managed key.

[5] TESTING ENCRYPTION AND DECRYPTION WITH EXTERNALLY MANAGED KEY

[5.1] DOWNLOAD AND INSTALL GOOGLE CLOUD SDK

Please follow the instructions here to download, install, and configure Google Cloud SDK:

<https://cloud.google.com/sdk/docs/install>

[5.2] ENCRYPT A TEST FILE USING THE EXTERNALLY MANAGED KEY

NOTE: Before proceeding with next two steps, ensure the GCP user that is calling the encrypt and decrypt methods has the `cloudkms.cryptoKeyVersions.useToEncrypt` and `cloudkms.cryptoKeyVersions.useToDecrypt` permissions on the key used to encrypt or decrypt. One way to permit a user to encrypt or decrypt is to add the user to the `roles/cloudkms.cryptoKeyEncrypter`, `roles/cloudkms.cryptoKeyDecrypter`, or `roles/cloudkms.cryptoKeyEncrypterDecrypter` IAM roles for that key. For more information, see [Permissions and Roles](#).

Run the following **gcloud kms** command to encrypt a test file using the externally managed key.

```
gcloud kms encrypt \
  --key [key] \
  --keyring [key-ring] \
  --location [location] \
  --plaintext-file [file-with-data-to-encrypt] \
  --ciphertext-file [file-to-store-encrypted-data]
```

Replace `[key]` with the name of the key to use for encryption. Replace `[key-ring]` with the name of the key ring where the key is located. Replace `[location]` with the Cloud KMS location for the key ring. Replace `[file-with-data-to-encrypt]` and `[file-to-store-encrypted-data]` with the local file paths for reading the plaintext data and saving the encrypted output.

If the command is successful it will return no output.

[5.3] DECRYPT A TEST FILE USING THE EXTERNALLY MANAGED KEY

Run the following **gcloud kms** command to decrypt the file that was encrypted in the previous step, using the externally managed key.

```
gcloud kms decrypt \
  --key [key] \
  --keyring [key-ring] \
  --location [location] \
  --ciphertext-file [file-path-with-encrypted-data] \
  --plaintext-file [file-path-to-store-plaintext]
```

Replace `[key]` with the name of the key to use for decryption. Replace `[key-ring]` with the name of the key ring where the key is located. Replace `[location]` with the Cloud KMS location for the key ring. Replace `[file-path-with-encrypted-data]` and `[file-path-to-store-plaintext]` with the local file paths for reading the encrypted data and saving the decrypted output.

If the command is successful it will return no output.

View the contents of the plaintext file that was output from this decryption command and confirm that it is identical to the original file that was encrypted. If the two files are identical then it confirms that the externally managed key is successfully performing encryption and decryption operations.

APPENDIX A: XCEPTIONAL SUPPORT



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