Cryptomator Documentation

Release 1.7.0

Cryptobot

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DESKTOP

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Cryptomator encrypts your data quickly and easily, so you can safely upload it to your favourite cloud service.

If you're a first time user, you will probably want to follow *this guide on how to get started*.

If you are interested in the security of Cryptomator, have a look at our *security section*.

CHAPTER

ONE

SETUP

You can start using Cryptomator by simply downloading it for free from our downloads page. Please choose the appropriate download for your operating system and check the minimum system requirements.

Note: You can find older releases as well as detailed changelogs in the GitHub releases section.

After downloading, the installation process depends on your operating system.

1.1 Windows

Launch the downloaded `.exe` file and follow the setup as usual. We recommend also installing *Dokany*, which is included in the installer.

Note: If you are updating Cryptomator by installing a new version and additionally want to update Dokany, you need to remove the old Dokany version first, restart the PC, and then execute the Cryptomator installer.

1.2 macOS

Open the downloaded `.dmg` file, accept the license, and drag & drop Cryptomator onto the Applications folder. We recommend also installing *FUSE for macOS*, which is linked from inside the `.dmg` file.

Note: In case the application is blocked by Gatekeeper, you need to change your Gatekeeper settings.

1.3 Linux

The primary option of using Cryptomator on Linux is via the AppImage. After you've downloaded the `.appimage` file, you simple need to make it executable and you can then run it.

If you are familiar with `Flatpak`, `PPA` or `AUR`, you can choose one of these options to install Cryptomator. The coordinates are available on our download page.

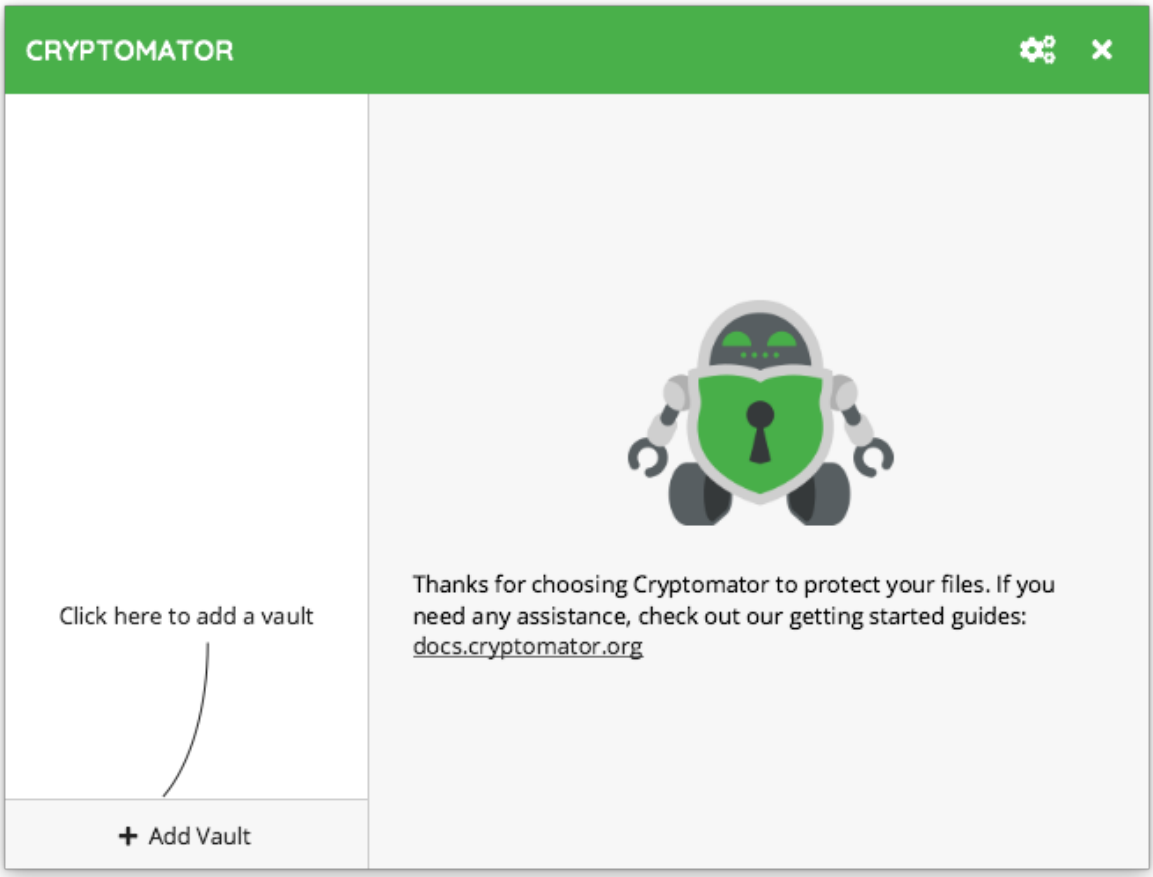
CHAPTER

TWO

GETTING STARTED

With Cryptomator you can create encrypted *vaults*. Each vault is protected by a password and can contain as many files and folders as you like.

When you're a first-time user of Cryptomator, you obviously don't have any vaults yet. If you start the application, you will be greeted with the following screen:



By clicking on the `AddVault` button in the lower left corner of the window, you can create a new vault.

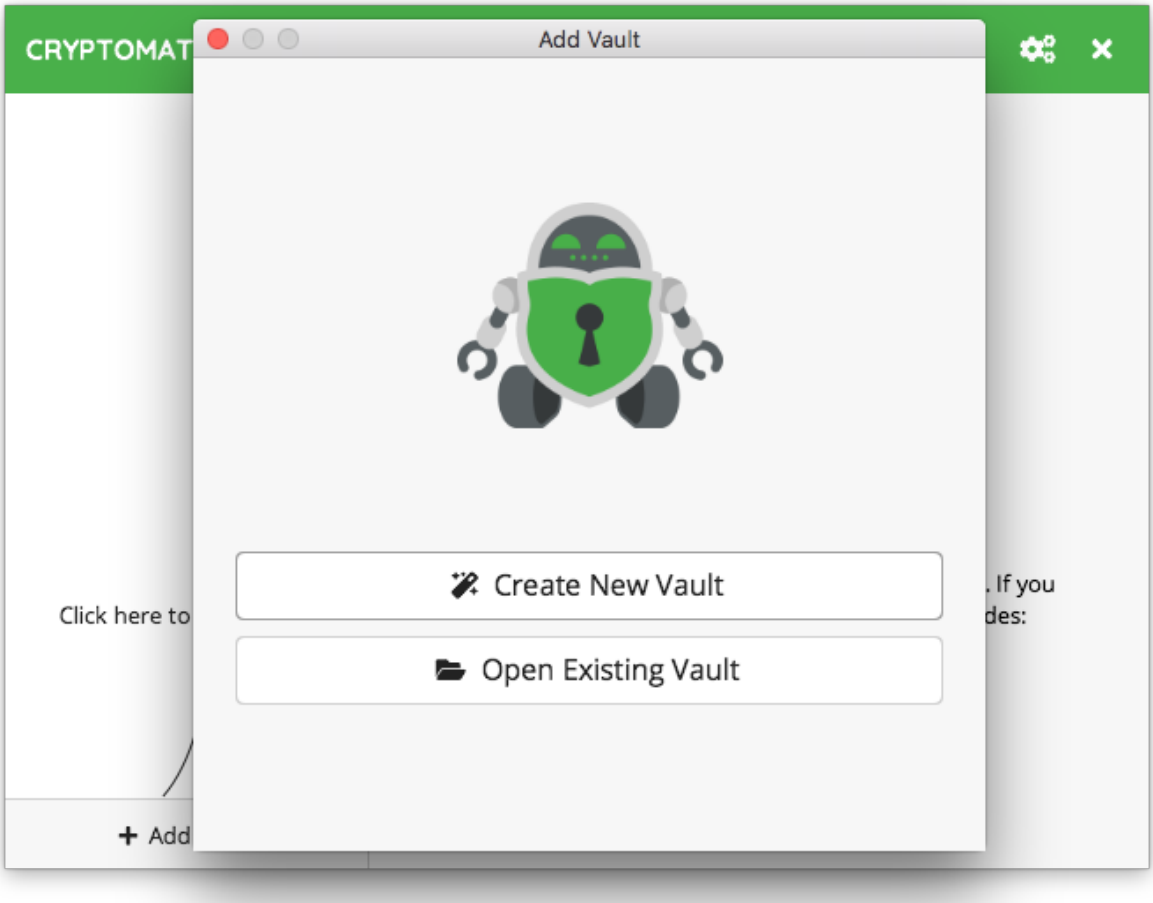
CHAPTER

THREE

ADDING VAULTS

If you want to add a new vault, you have essentially two options:

1. If you want to create a vault yourself, choose `Create New Vault`.
2. If you already have a vault, for example because someone shared a vault with you via a cloud storage service, you can instead choose `Open Existing Vault`.

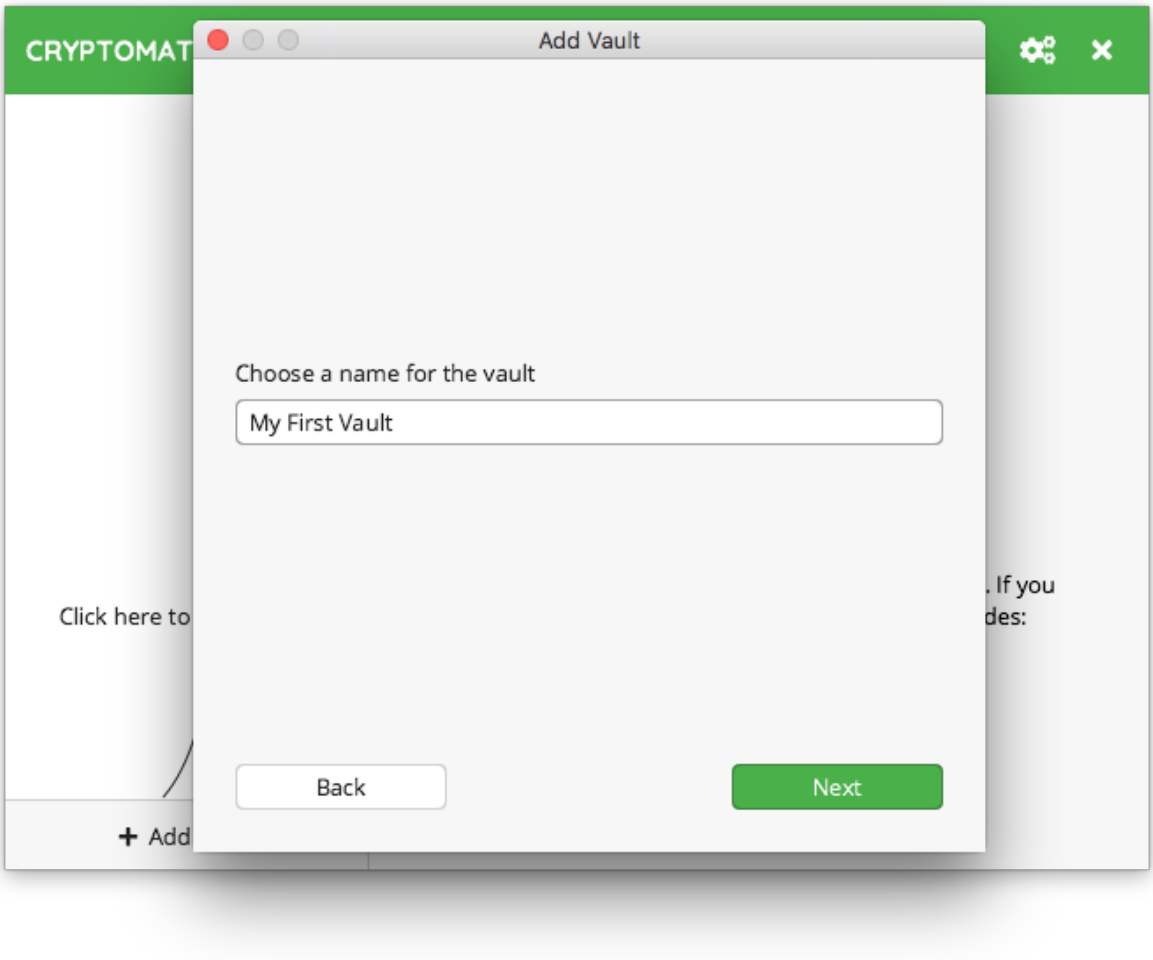


3.1 Create a New Vault

If you chose to create a new vault, the wizard will now guide you through the vault creation process.

3.1.1 1. Choose a Name

You start by simply choosing a name for your vault.



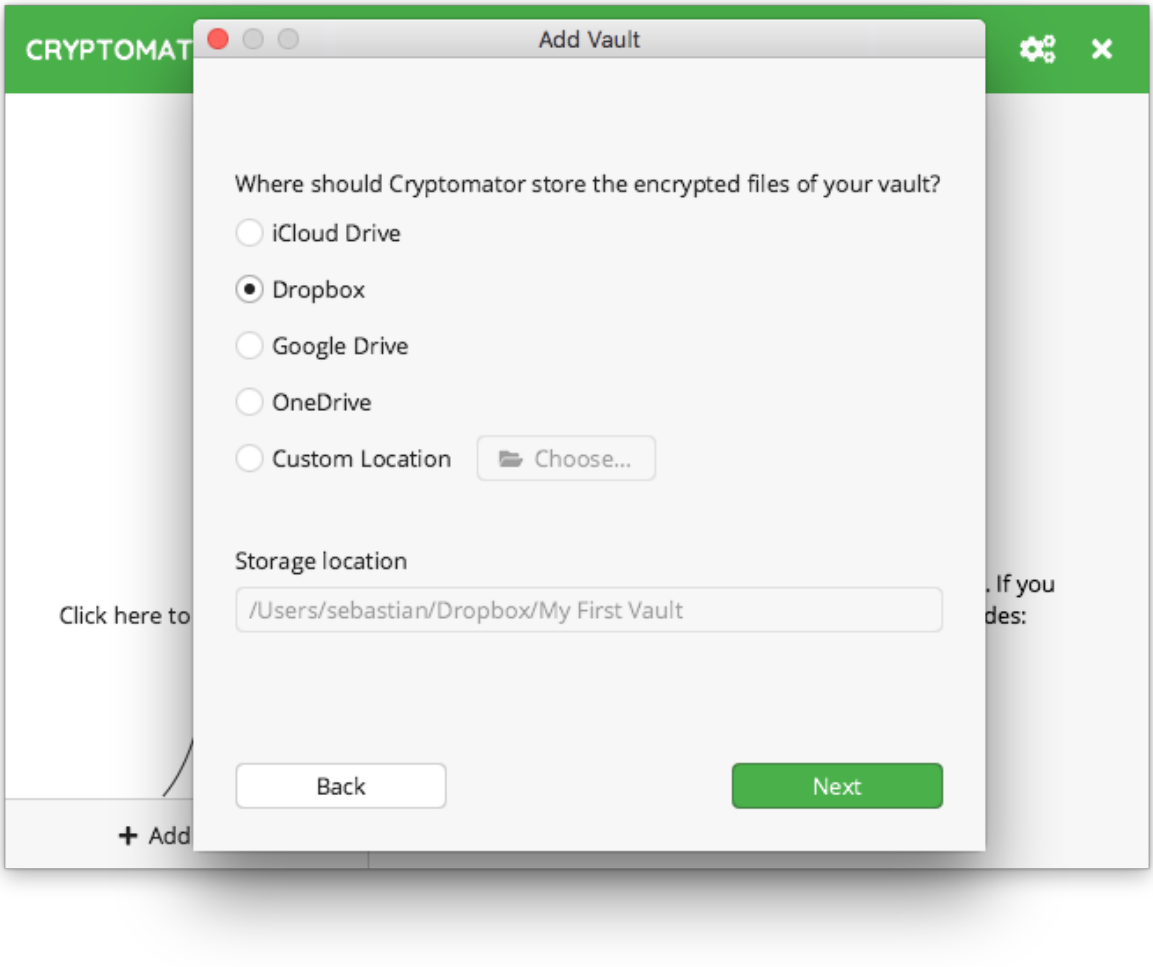
Note: Your vault name will be used as a directory name on your file system. Make sure not to use any characters that might cause problems with your setup. Especially if you want to share the vault via the cloud with other users, keep in mind that these users might use different software or operating systems that might not cope well with special characters.

3.1.2 2. Choose a Storage Location

Next, choose where you want to save your vault. Since a vault is just a directory containing encrypted files, you need to store it somewhere. Usually this would be inside your cloud-synced directory. But you can choose any storage location, you like.

Keep in mind that Cryptomator is not a sync tool. You still need the software from your favourite cloud storage service.

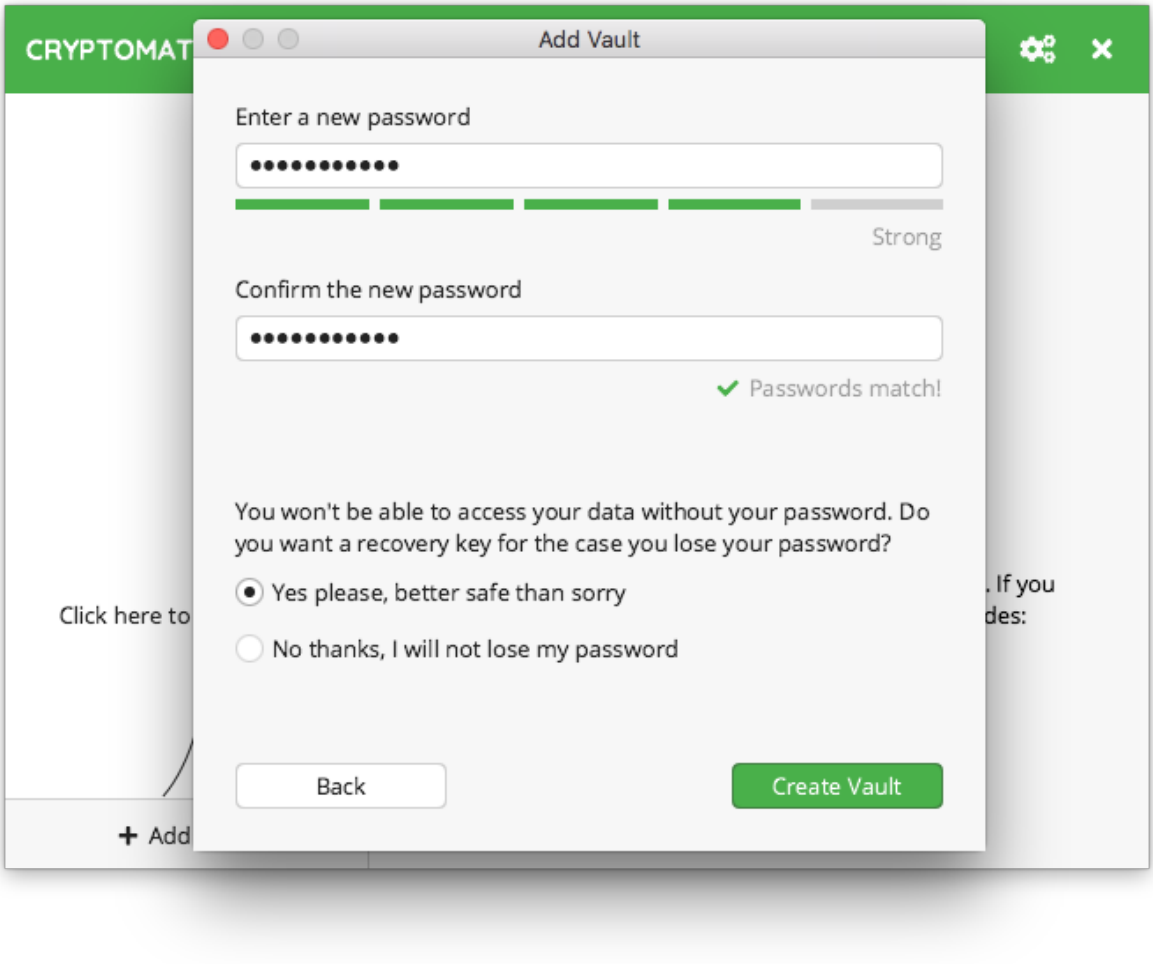
In this example I want to encrypt files that get synchronized via Dropbox.



Note: You might not see all the above options, depending on what cloud services you have installed on your PC. Cryptomator tries to detect some well-known locations. You can always choose `Custom Location` and navigate to your cloud storage directory manually.

3.1.3 3. Choose a Password

Now it is time to choose a *good password* for your vault. Cryptomator requires at least 8 characters but we recommend you to use a longer phrases such as pass-sentences. The bar below the password field estimates the strength of your password.



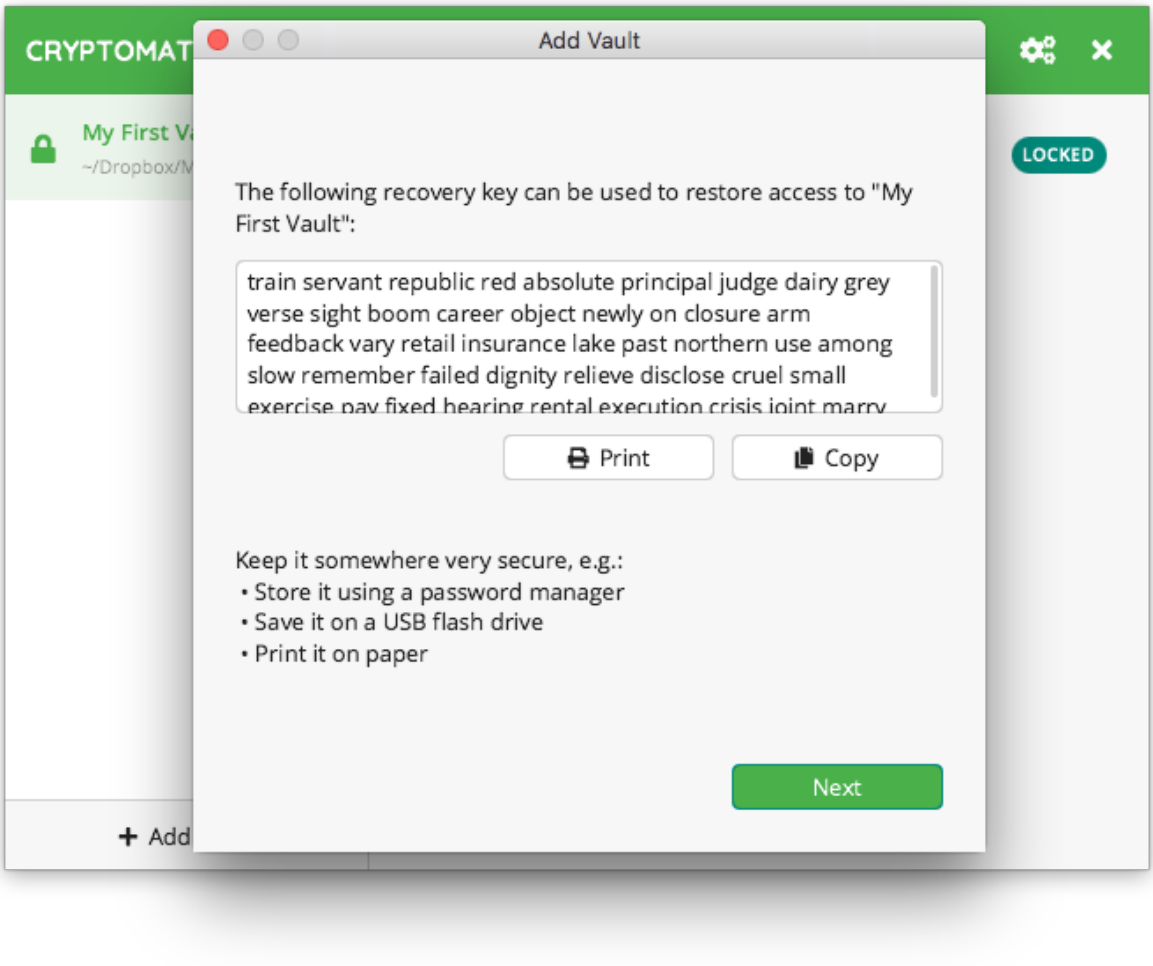
Warning: Nobody except for yourself knows this password and other than you might know it from online services, nobody can "reset" your password for you.

Note: If you plan to share this vault with a different person, you will both need to know the password. In this case, choose a password that is different from anything you tend to only use yourself. To share the password, use an encrypted messenger or any other secure means of communication.

Since we can not reset your password, we recommend you to create an additional *recovery key*.

3.1.4 4. Show Recovery Key (optional step)

If you chose to create a recovery key in the previous step, it will now be displayed. Make sure not to lose it. Ideally make a hard copy of it.



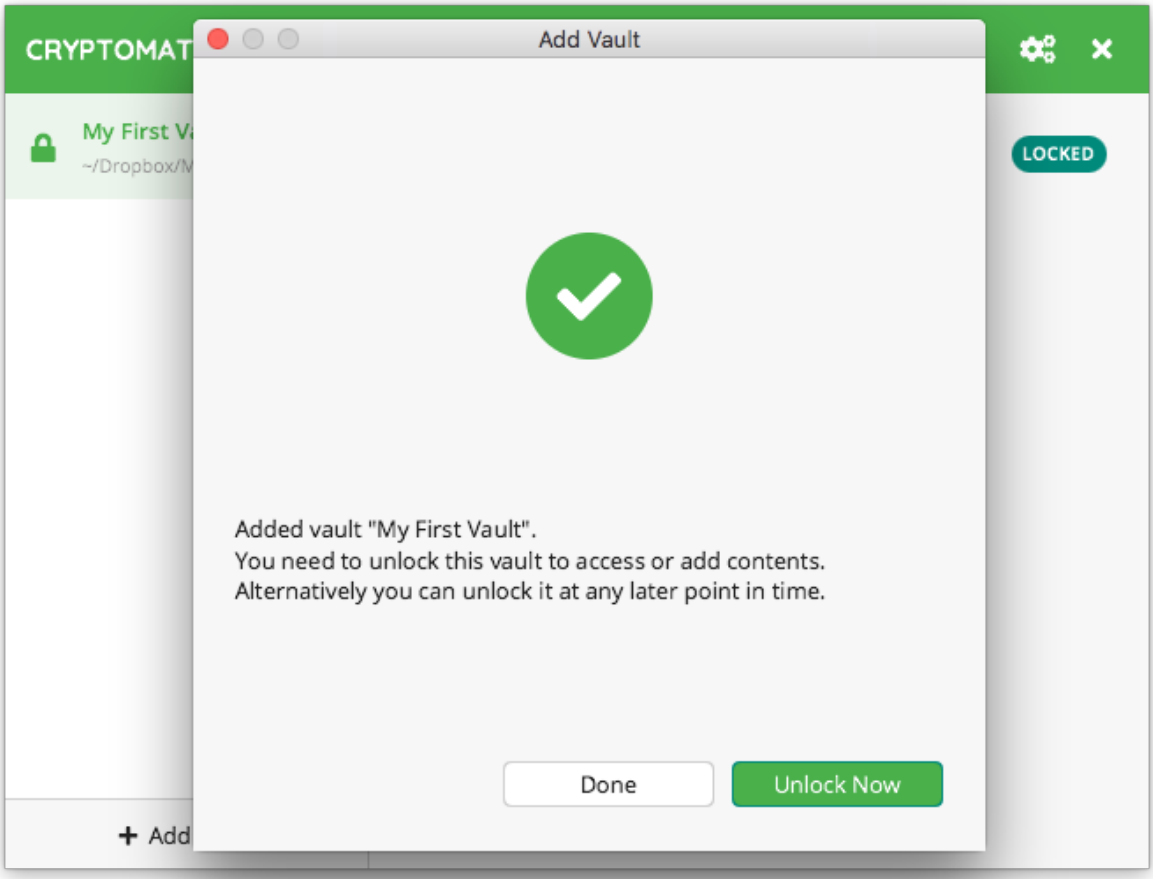
Warning: Keep the recovery key secret. Remember, just like your password, its purpose is to gain access to your vault!

For more details, take a look at our chapter about *how to use a recovery key*.

3.1.5 5. Done

That's it. You have successfully created a new vault.

You can now unlock this vault using your password and start adding sensitive files to it.



3.2 Open an Existing Vault

If you chose to open an existing vault, all you need to do is to locate the `masterkey.cryptomator` file of the vault you want to open.

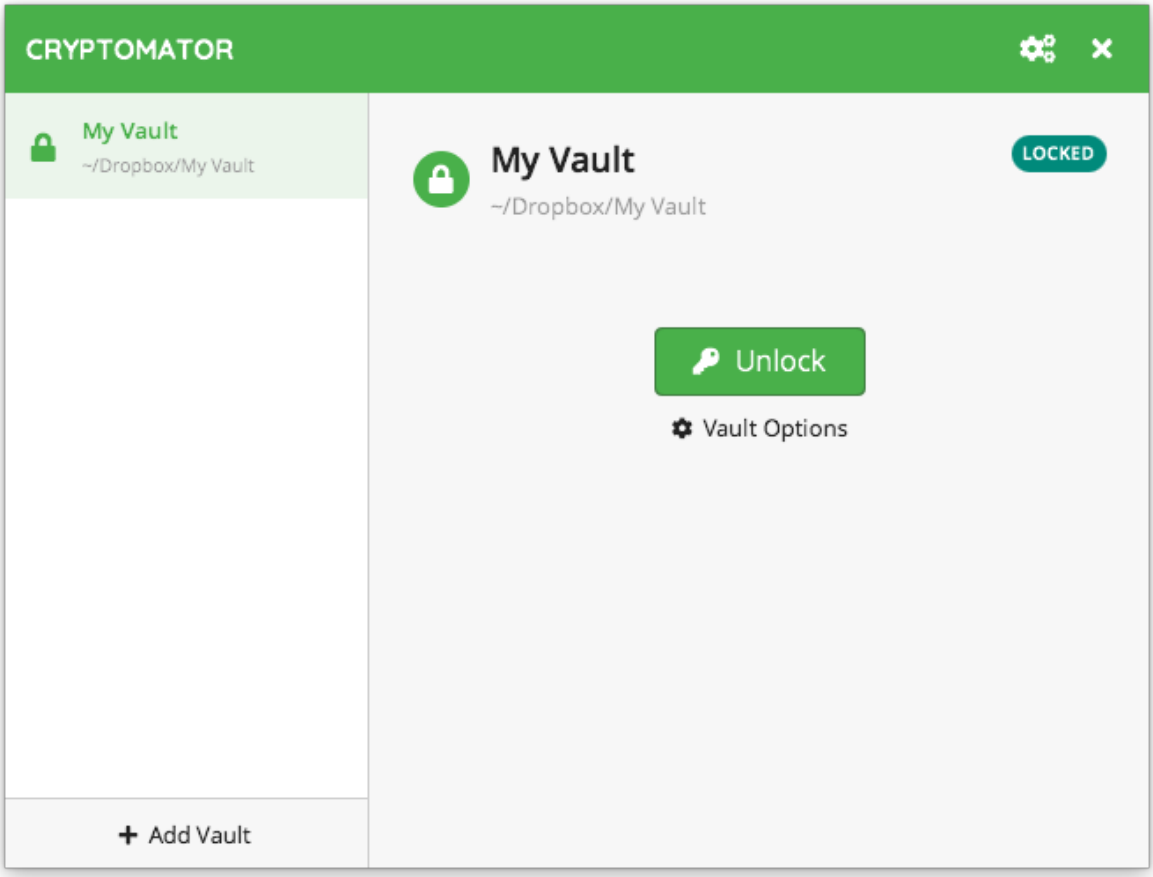
Note: If you created the vault on another device and cannot find it or its masterkey file, make sure that the directory containing the vault is properly synchronized and fully accessible on your device.

CHAPTER

FOUR

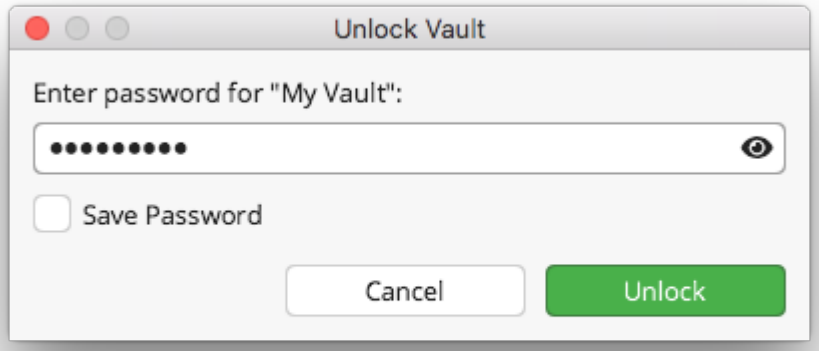
ACCESSING VAULTS

Once you have added a vault to Cryptomator, you will probably want to unlock it, so you can start adding files.



4.1 Unlocking a Vault

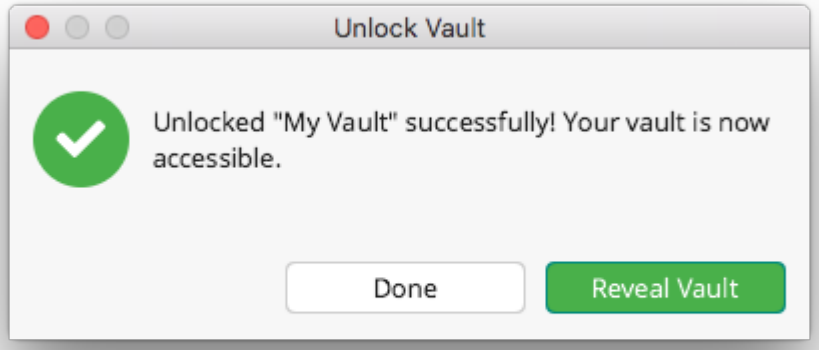
To unlock the selected vault, click on the large `Unlock` button in the center of Cryptomator window. You will then be prompted for your vault's password:



Note: By checking the "Save Password" checkbox, the password will be stored in your operating system's keychain. There is also a plug-in for Cryptomator available, that allows to store Cryptomator vault passwords in a KeePassXC database.

Warning: Only store your password on trusted devices. Anyone with access to this computer will be able to access your vault, if the password is stored in the system keychain.

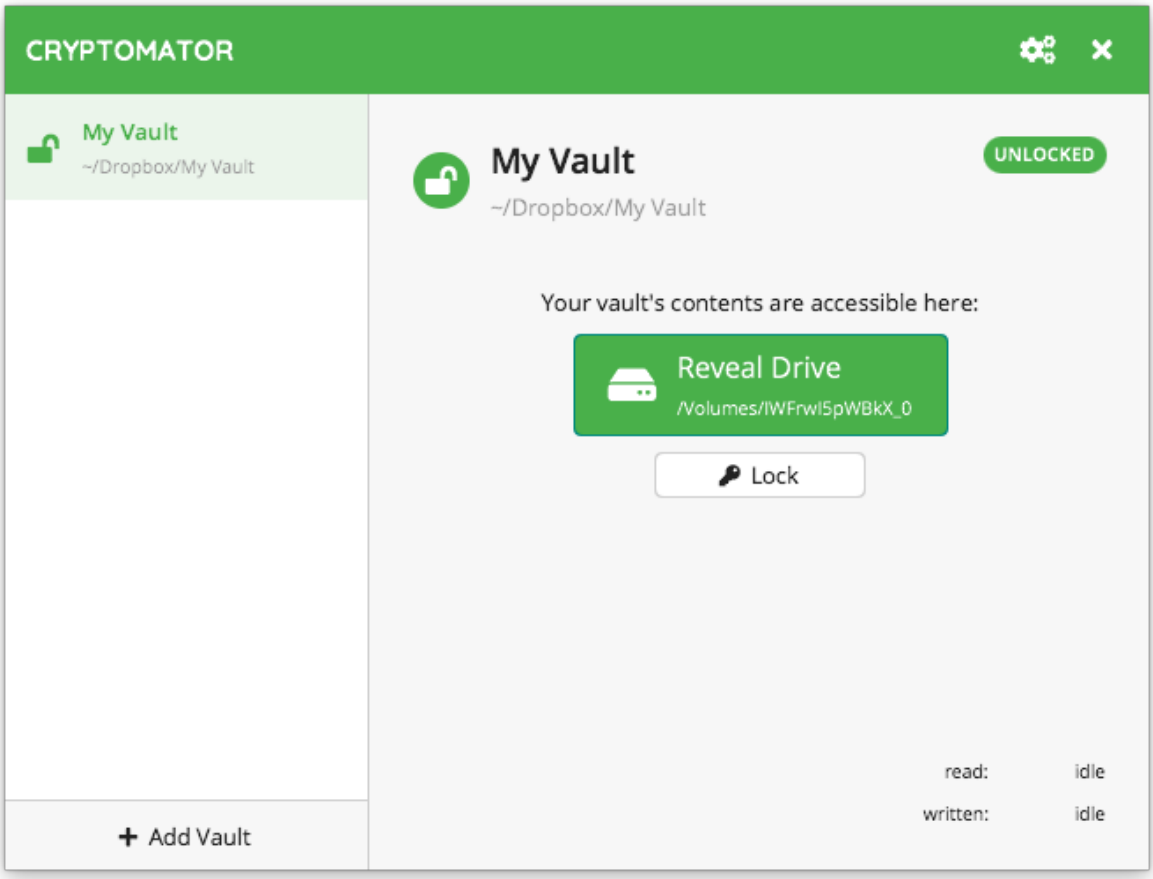
If your password is correct a confirmation is displayed. You can either just close this Window by clicking `Done` or click `Reveal Vault` in order to show your unlocked vault in your file manager.



4.2 Working with the Unlocked Vault

After unlocking, your vault's contents will become available as a virtual drive on your PC. This means, that you interact with your confidential files in the same way as with any other hard drive or USB thumb drive.

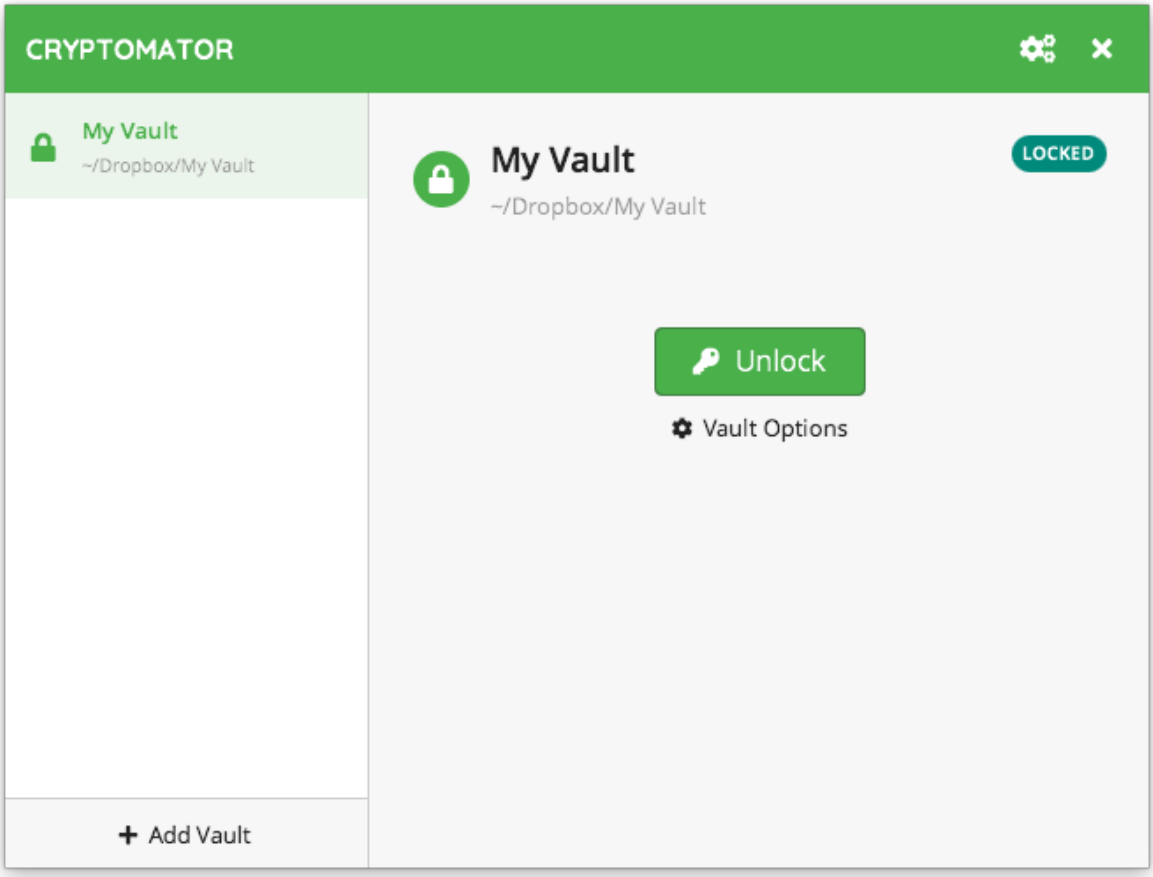
If you can not find the unlocked vault in your systems file manager (Windows Explorer, Finder, ...), you can always click on `Reveal Drive` in your Cryptomator window:



Note: On Windows, you can choose the drive letter of the virtual drive for each vault via the advanced vault options.

4.3 Locking a vault

To lock your vault again simply click Lock and your data will be protected and encrypted again.



CHAPTER

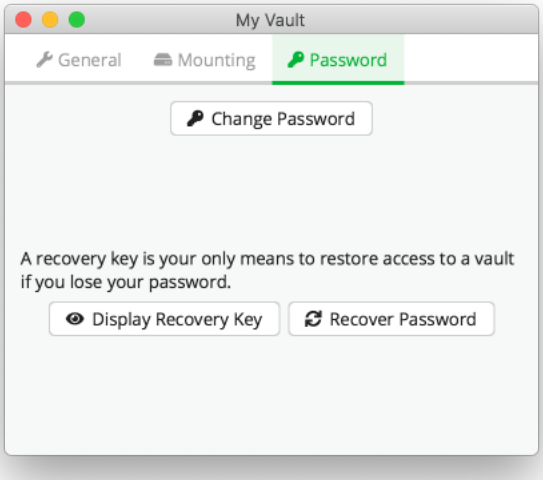
FIVE

PASSWORD AND RECOVERY KEY

Each Cryptomator vault is secured by a password. The security of your vault depends directly on the strength of its password, so *choosing a strong password* is key.

Additionally for each vault a unique *recovery key* can be derived. This key ensures that if you forget your password, you are able to create a new one. It is a human readable form of your decrypted *masterkey* and therefore independent of the current vault password and highly confidential.

This section explains how to change a password for a vault, show its recovery key and reset the password to a new one. All actions are done in the `Password` tab of the vault options. You can access it over the main window by selecting the vault in question, lock it if necessary and then open its `Vault Options`.



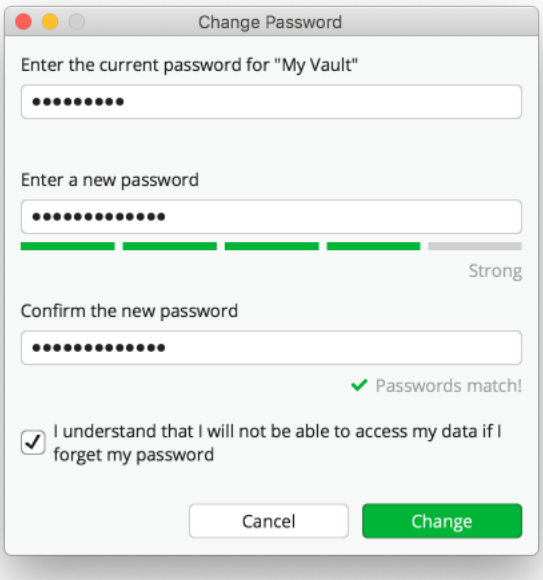
5.1 Change Password

You can change the password of an already existing vault. The only thing you need is to remember the current one.

Note: The password is used to derive a KEK, which is then used to encrypt further keys. The KEK changes, but the keys encrypted with the KEK will stay the same. The actual files will not get re-encrypted, meaning you can not upgrade a weak passphrase to a stronger one once the data has been synced to a service that allows recovery of older versions of the masterkey file.

If you like to encrypt your vault files with a new, stronger password, you need to create a new vault and drag the data from the old to the new one. Make sure to wipe all backups of the old vault afterwards.

To do so, click on the `Change Password` button in the `Password` tab of the vault options. In the opened window, you see three text input fields:



1. In the first you need to enter the current password of the vault.
2. The second one takes the new password in and as already said, we suggest to follow the creation rules for *good passwords*.
3. In the third for confirmation you need to enter the new password again.

In order to proceed, you need to confirm what you are doing by selecting the checkbox.

To finish the workflow and really change the password, click now on the `Change` button.

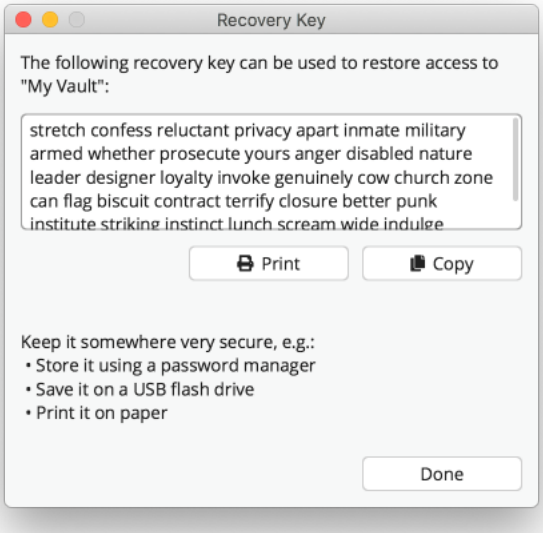
Note: Only if the second and third text input fields match *and* the checkbox is selected, the `Change` button is activated.

5.2 Show Recovery Key

It is not a problem, if you missed to display the recovery key during vault creation. You are still able to derive it and view it at a later point in time. To increase security, Cryptomator does not store it on your hard drive and always derives it on the fly.

> **Warning:** Bear in mind that due to the ability of the recovery key to reset the current password, it is highly confidential. Ensure that only trusted persons have access to it and keep it at a safe spot.

To do so, click on the `Display Recovery Key` in the `Password` tab of the `Vault Options` and enter your password. A new window will open. It shows a sequence of words inside a text field. This sequence is the recovery key of the vault.



You can copy it to your clipboard or print it to paper. If you are finished, close the window with the `Done` button.

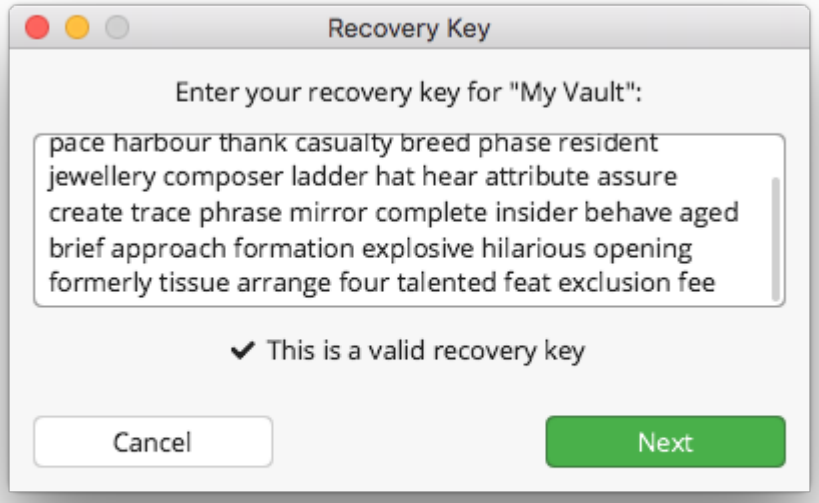
5.3 Reset Password

If you forgot the password for a vault, but saved the recovery key somewhere external, you are able to define a new password and gain access to the vault again.

Navigate to the `Password` tab in the vault options and click the `Recover Password` button. A new prompt is opened, asking to insert your recovery key into the shown text box. Enter it there by copying it from a file or typing.

Note: If you printed your recovery key on paper or stored it somewhere where you cannot copy it, Cryptomator offers you an auto completion feature for insertion. Type a letter and see if the shown word matches your key part. If so, you can press tab or right arrow key to auto complete the word. Otherwise enter more letters, the suggestion will change accordingly.

If the recovery key is valid, Cryptomator indicates this by a small message and activates the `Next` button



Warning: By design of the recovery mechanism, *any* valid recovery key is accepted. But only the one derived from the vault resets the vault password in a way such that the your data is accessible afterwards. **If you use a different recovery key, the data already stored in the vault will be inaccessible.** It can be made accessible again by re-running the recovery mechanism with the original and correct recovery key.

In the last step you need to assign a new password to your vault. It is the same as during *vault creation* except that no new recovery key is generated. As already noted there, read the suggestion for choosing a *good password*.

Finish the dialog by entering the same password again and clicking the `Done` button. You can unlock your vault

now with the new password.

Note: Since the recovery key stays the same, don't discard it and put it to a safe location again.

CHAPTER

SIX

VAULT MOUNTING

After a vault is unlocked, it must be integrated into the system to be accessible for you. Cryptomator uses three different technologies (called *adapters*) for this integration:

1. *WebDAV* - a standardized protocol to manage directories and resources
2. *Dokany* - a windows specific driver for a deeper system integration
3. *FUSE* - a linux specific kernel module for a deeper system integration, also available for macOS

Each combination of operating system and adapter has its own set of settings and its benefits & drawbacks.

6.1 General Adapter Selection

Cryptomator only uses one adapter type to serve all your unlocked vaults. If you want to change it or only want to know which one is currently used, open the `Preferences` by clicking the gears symbol in the upper right corner of the main window and change to the `Virtual Drive` tab.

You can choose between WebDAV and, depending on your system, Dokany (Windows) or FUSE (linux, macOS).

Note: Dokany/FUSE may not be visible for selection. This means that Cryptomator is unable to detect a valid installation of them.

WebDAV has additional options for configuration:

1. `WebDAV Port` - Always present, it shows the port over which the WebDAV adapter communicates with itself.
2. `WebDAV scheme` - TODO

6.2 Options applicable to all Systems and Adapters

In this section mount options are described which are present on all operating systems and with all adapter types.

Currently there is only on option, namely opening a vault in `Read-Only` mode. If the checkbox is set, you can unlock the vault, browse through its content and read or copy its files, but you cannot change or modify anything inside the vault.

6.3 WebDAV-specific options

WebDAV is a communication protocol to perform operations between a client (you) and a server (your computer) on directories and resources. Even thou this protocol was designed for remote access, Cryptomator uses it *only locally* to display your files and allows you to work with them.

6.3.1 Windows

6.3.2 MacOS

6.3.3 Linux

6.4 Dokany-specific options

In order to add and retrieve files to your vault, Cryptomator mounts a file system on your machine, that allows to work with your files. In general, when you want to create a new file system on Windows, that can be mounted by Cryptomator, you need to develop a file system driver.

Developing a device driver (other than FAT or NTFS) that works in kernel mode on Windows is extremely technical. By using Dokan, you can create your own file systems very easily without writing device drivers. Cryptomator takes care of all this. Dokany is a fork of Dokan 0.6.0 with bug fixes, clean change history and updated to build with latest tools.

You might want to apply Dokany-specific options to the Dokany file system driver on unlocking and opening your vault. You can do so by adding them to the `VaultOptions` of your vault. Check the `CustomMountOptions` on the `Mounting` tab.

6.4.1 Windows

Because these options are part of third party libraries, they are not listed here. Info about these Dokany options can be found in the Javadoc of our dokany-nio-adapter and the Dokany API documentation.

6.5 FUSE-specific options

Filesystem in USErspace (FUSE) is a software interface for Unix and Unix-like computer operating systems that lets non-privileged users create their own file systems without editing kernel code. Cryptomator mounts a file system on your machine using FUSE and allows to display your files and work with them.

If you want to apply FUSE-specific options on unlocking and opening your vault, you can add them to the `VaultOptions` of your vault. Check the `CustomMountOptions` on the `Mounting` tab.

6.5.1 MacOS

Because these options are part of third party libraries, they are not listed here. Info about these FUSE options on Mac can be found in the wiki of the osxfuse project.

6.5.2 Linux

As before, these options are not listed here, because they are part of third party libraries. Info about these FUSE options on Linux can be found in the man page for mount.fuse.

Note: The options `allow_root` and `allow_other` cannot be applied to the `VaultOptions` without a change to the **/etc/fuse.conf** configuration file for FUSE on your machine. Witin this file, the `user_allow_other` option needs to be enabled / uncommented.

CHAPTER

SEVEN

VAULT MANAGEMENT

A *vault* is the fundamental object in Cryptomator. Like the term suggests, it represents the single location where all files inside this vault are stored encrypted. From the perspective of your operating system it is a normal directory containing at least two files and one directory:

7.1 Remove Vaults

You can remove a vault from the vault list by right clicking on the list entry. This is only possible while the vault is locked.

Note: By removing a vault from this list, it is **not** deleted from your filesystem. To irrevocably get rid of the vault, you can simply delete the vault directory (which contains your `masterkey.cryptomator` and the `d` directory) using your normal file manager.

7.2 Reorder Vaults

You can change the order of your vaults by dragging them to the desired position.

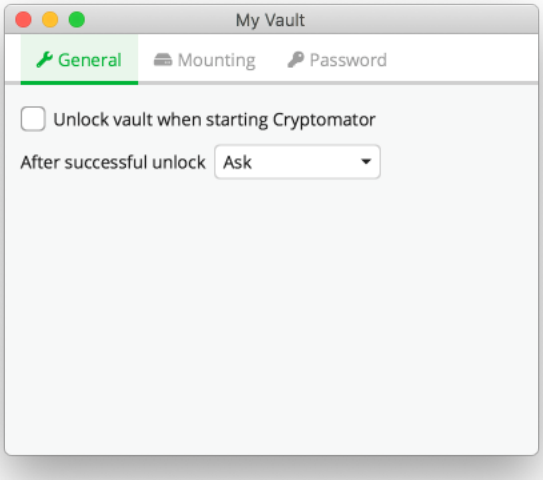
7.3 Vault Options

Each vault has an own set of settings which can be viewed and customized in the vault options window. To open it, select in the main window the *locked* vault in question and click the `Vault Options` button with the gear.

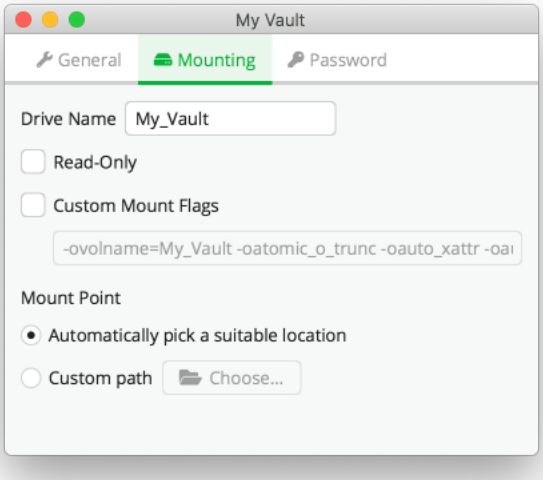
The options are divided in three categories:

1. General - Options not fitting into another category

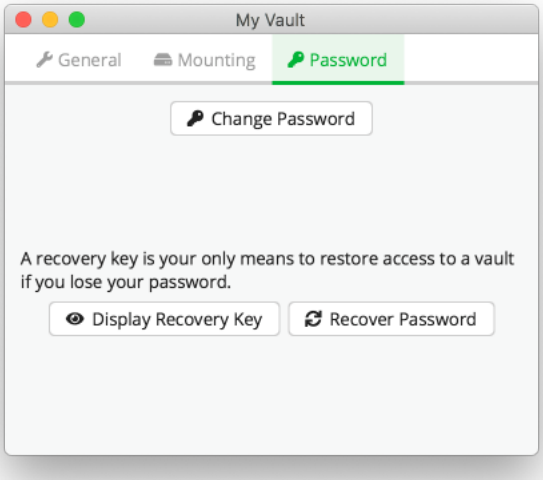
You can select here if the vault is unlocked as soon as Cryptomator starts.



2. Mounting - All options about where and how you can access your unlocked vault



3. Password - Options and actions regarding your vault password and the recovery key



For `Mounting` and `Password` we refer to the regarding sections.

CHAPTER

EIGHT

SETUP

You can get Cryptomator for Android on

- Google Play
- APK Store
- F-Droid repository

As for the functionality of Cryptomator, the application does not differ using Google Play or the APK Store as installation type. Google Drive is excluded from the F-Droid version because Google Drive needs proprietary dependencies which doesn't fit to the spirit of F-Droid.

The APK Store and F-Droid variant of Cryptomator was created to serve users who do not have Google PlayStore installed on their Android device. If you have a Google PlayStore on your device, we recommend using the PlayStore version of Cryptomator.

8.1 Google PlayStore

If you have installed Cryptomator via the Google PlayStore, you will receive updates as usual via the Google PlayStore.

After buying the app using Google PlayStore, it can be used with any number of devices that you have linked to the google account from your purchase. Furthermore it supports the "Google Play Family Library" function which means that the app can be used by up to 5 people in a family without having to buy it again. The conditions and how to create a "Google Play Family" can be found here: https://support.google.com/googleplay/answer/7007852?hl=en

Sometimes the Google PlayStore has problems to recognize that the app was already bought and asks you to buy again the app, see this topic to recover from this problem: On how many devices can the app be installed using Google Play Store?

8.2 APK Store

The APK store version can be installed from our website https://cryptomator.org/android/. Please verify the *SHA256 Signature* after downloading the APK before installing. The download is a so-called *APK* (Android application package), which is an installation archive. Install the app by simply clicking on the APK. It is possible that the app in which you clicked on the APK is asking for "Install from Unknown Sources" permission, this is normal and must be activated for a short time (it is recommended to remove the permission afterwards).

This version does include an automatic updater that periodically checks if there is a newer version of this app, and if so, it can be downloaded and installed directly from within the app. Using the *Update Check Interval* in the Cryptomator settings, you can specify how often the update check is executed.

As this version wasn't bought using Google's PlayStore you need to buy a license key from our website https://cryptomator.org/android/. After Cryptomator is installed, you have to enter this key. This can be done by copy-

ing and pasting the license into the field when asked for it or by clicking on the link starting with *cryptomator://license/YOUR_LICENSE_KEY*.

8.3 F-Droid repository

The F-Droid version can be installed after adding our F-Droid repository to the F-Droid app by opening this link on the device or scanning the following QR-Code:

As well as using the APK Store variant because this app version wasn't bought using Google's PlayStore you need to buy a license key from our website https://cryptomator.org/android/. After Cryptomator is installed, you have to enter this key. This can be done by copying and pasting the license into the field when asked for it or by clicking on the link starting with *cryptomator://license/YOUR_LICENSE_KEY*.

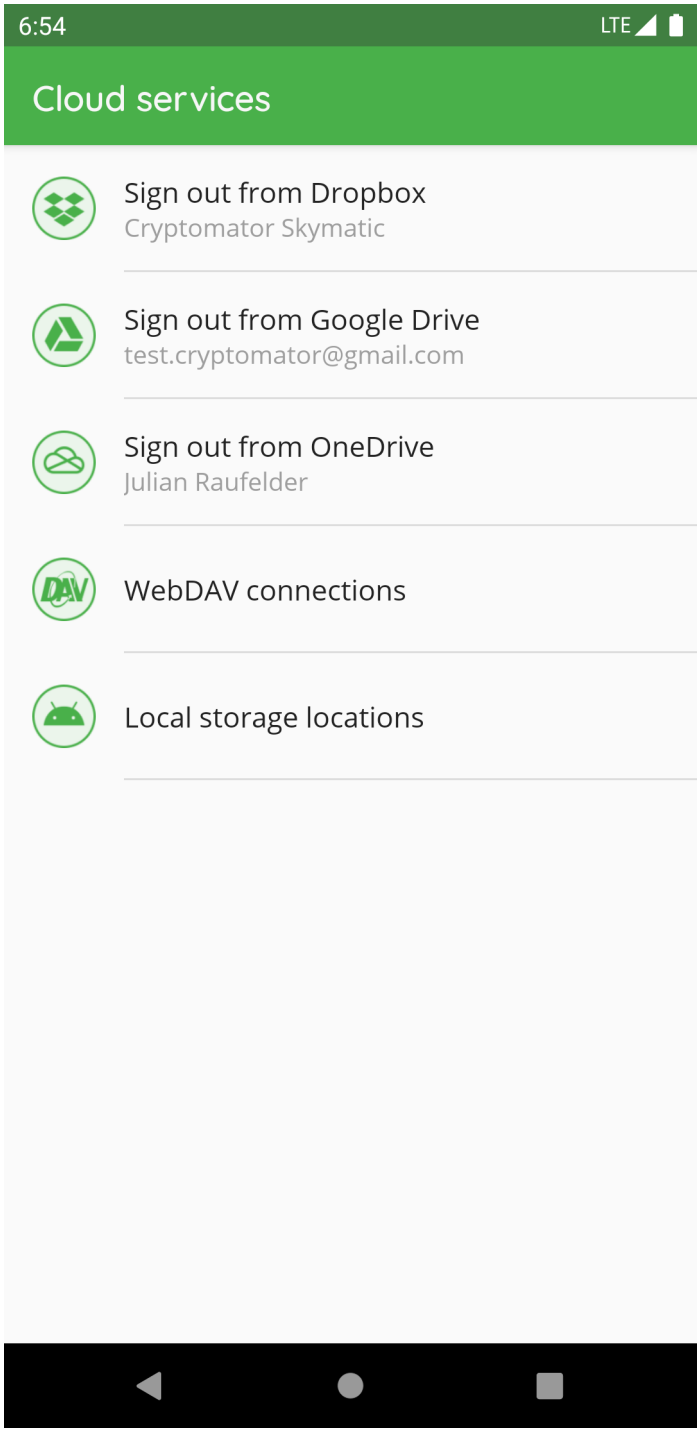
8.4 Requirements

Requires Android 8.0 or later.

CHAPTER

NINE

CLOUD MANAGEMENT



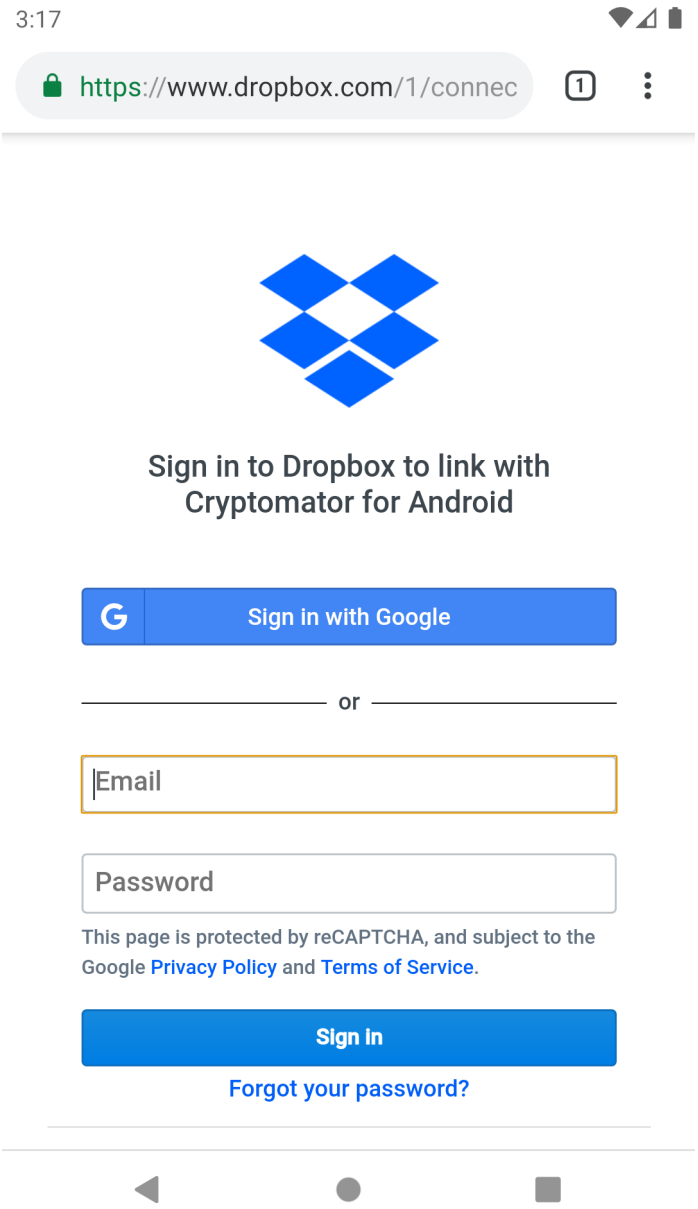
In “Cloud Services”, you can create or edit the connection between the Cryptomator app and your storage provider accounts.

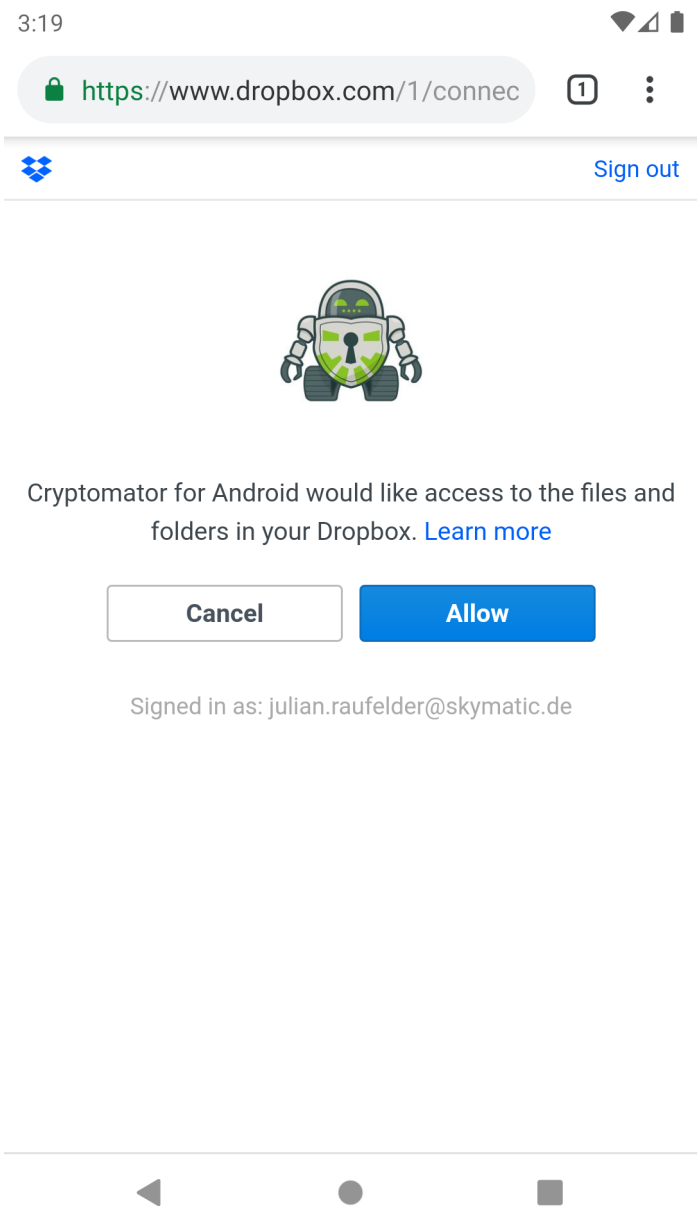
Please enter the credentials for your provider account or in case of Google Drive choose your account. If your authentication was successful, some of the providers might ask you to grant Cryptomator access permission to your online files. Please allow this permission.

In Google Drive, OneDrive and Dropox you can only create one connection between your cloud storage account and the Cryptomator app. You can’t connect to (for example) two different *Dropbox* accounts.

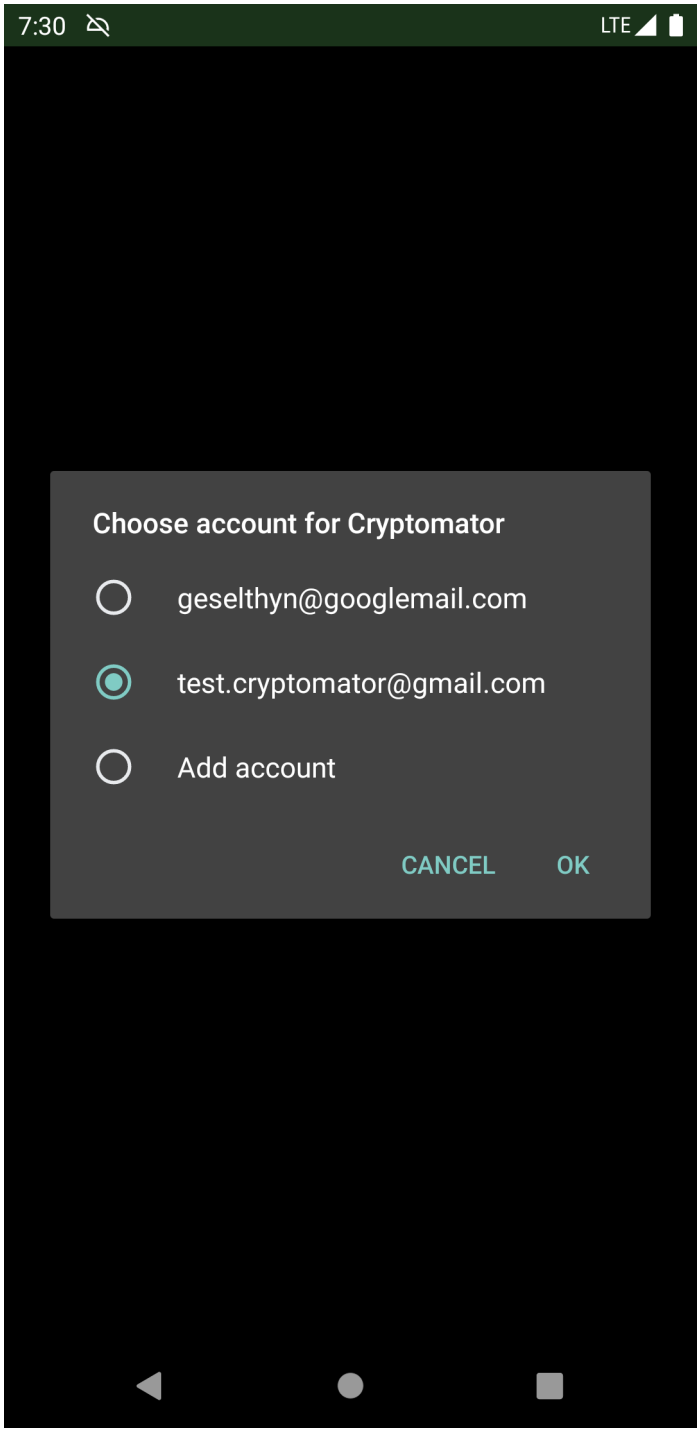
If the provider requested permission to access your online files you can remove Cryptomator permissions from your online storage account at any time. Please keep in mind that Cryptomator then cannot connect to your vault anymore.

9.1 Login Dropbox

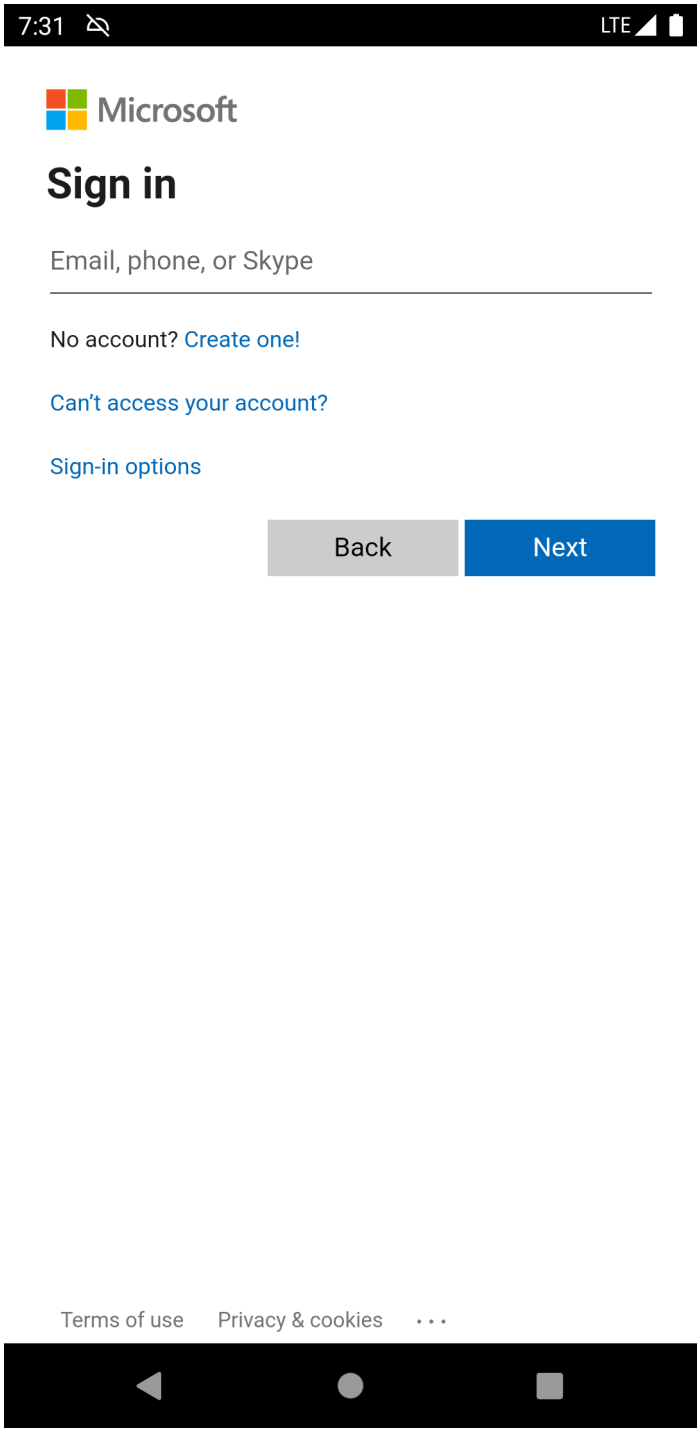


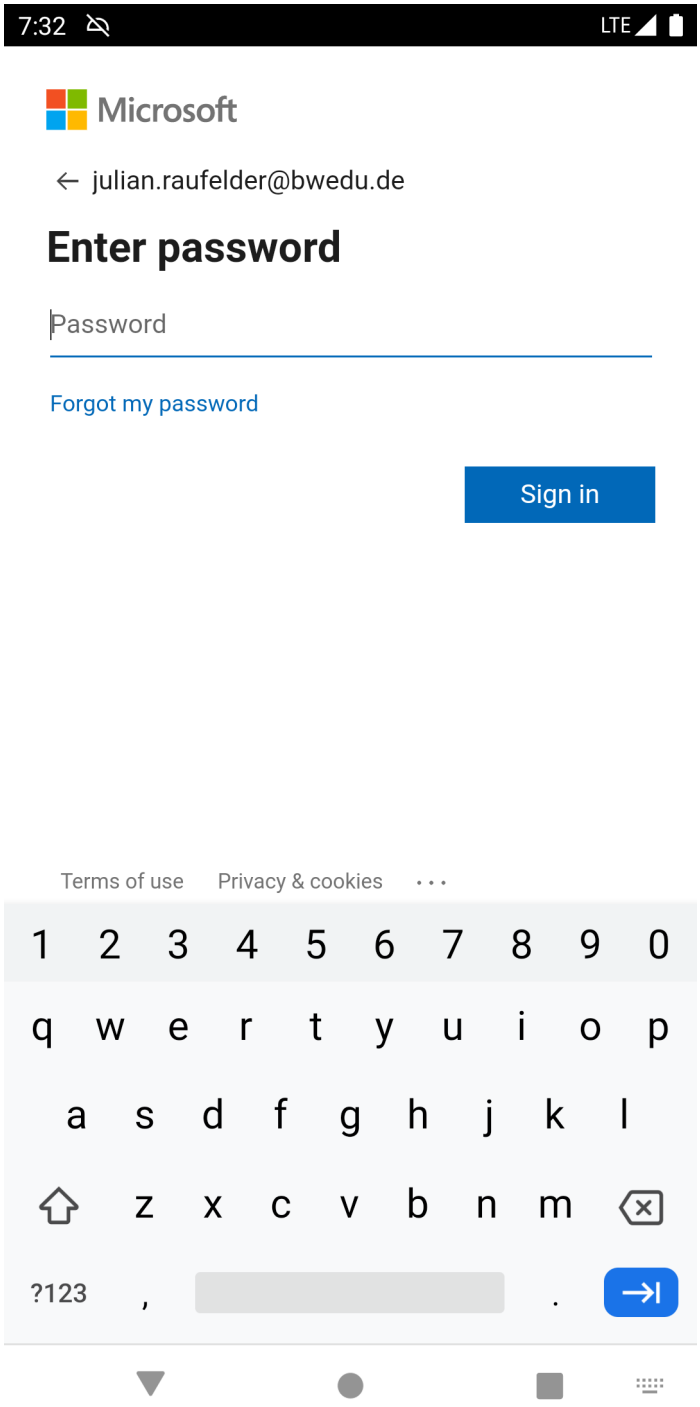

3:19
https://www.dropbox.com/1/connec
Sign out
Cryptomator for Android would like access to the files and folders in your Dropbox. Learn more
Cancel
Allow
Signed in as: julian.raufelder@skymatic.de

9.2 Login Google Drive



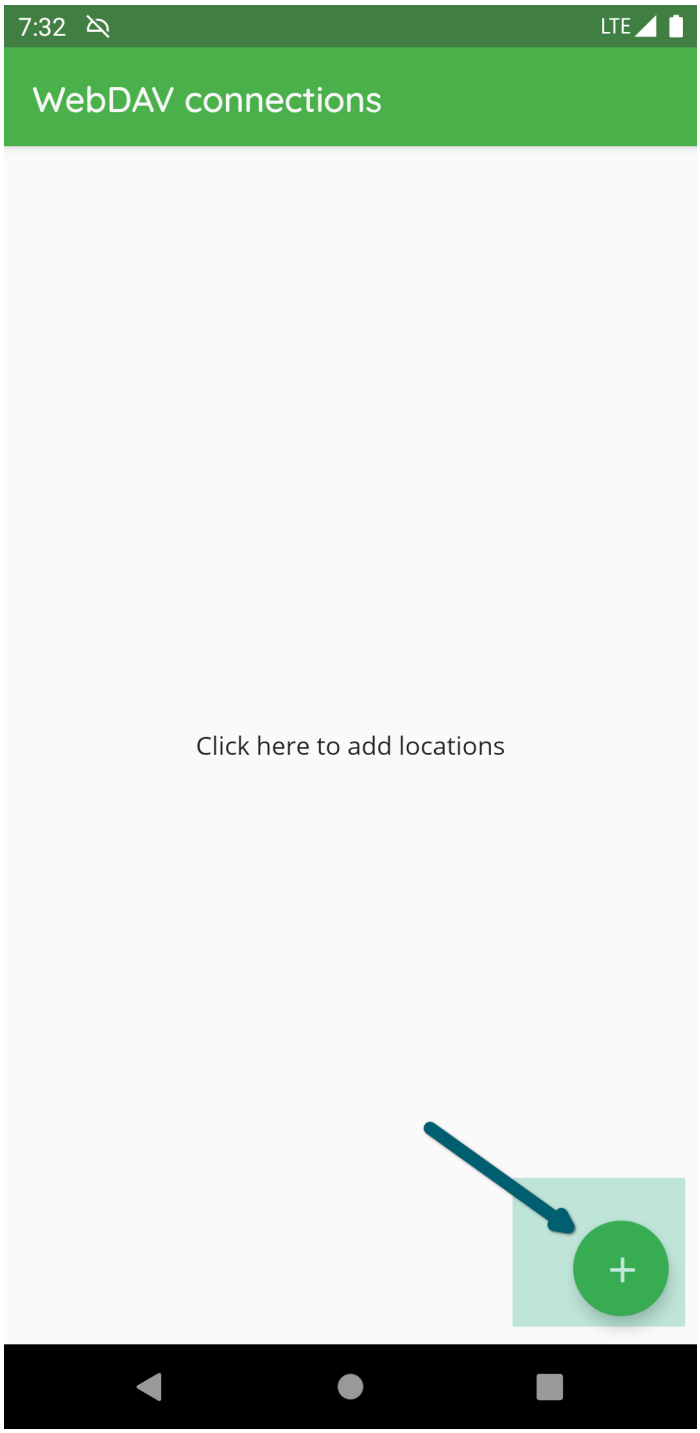
9.3 Login OneDrive

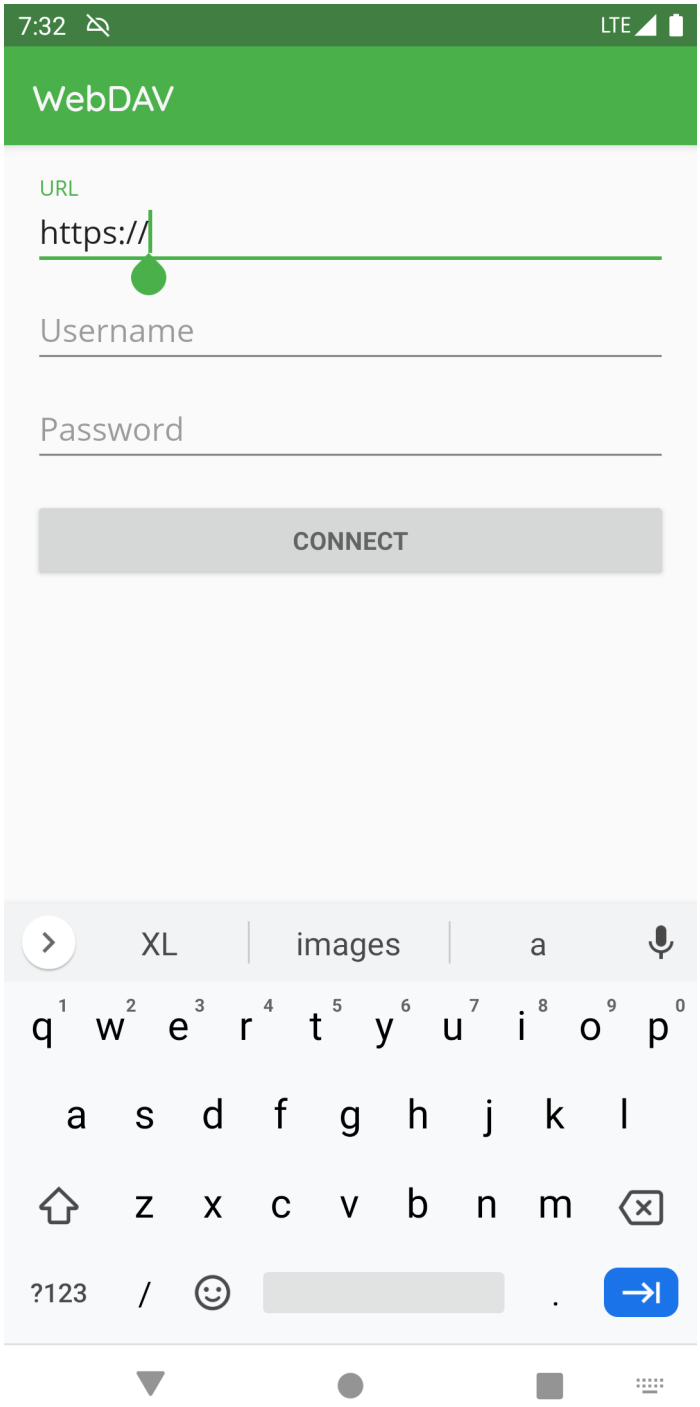


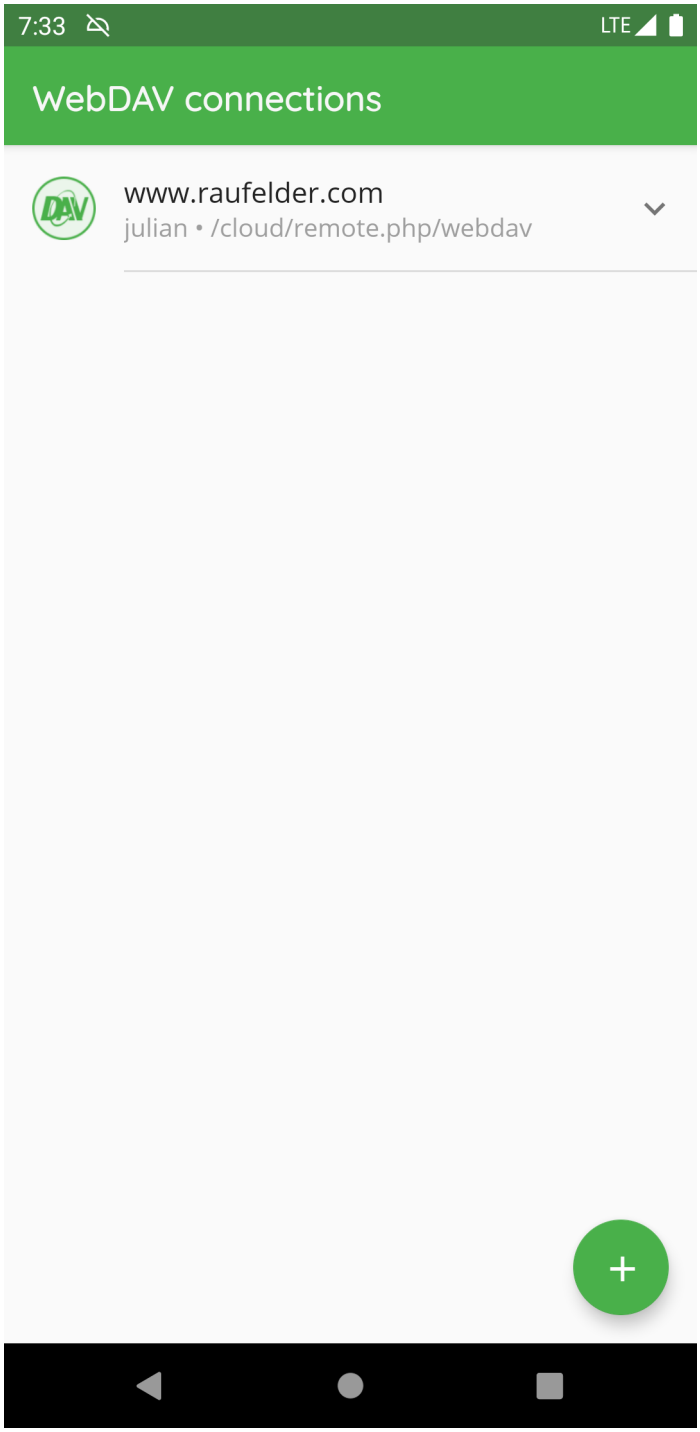

7:32
LTE
Microsoft
julian.raufelder@bwedu.de
Enter password
Password
Forgot my password
Sign in
Terms of use
Privacy & cookies
1 2 3 4 5 6 7 8 9 0
q w e r t y u i o p
a s d f g h j k l
z x c v b n m
?123
,
.

9.4 Login WebDAV

You can find here a list of the most common WebDAV URLs.



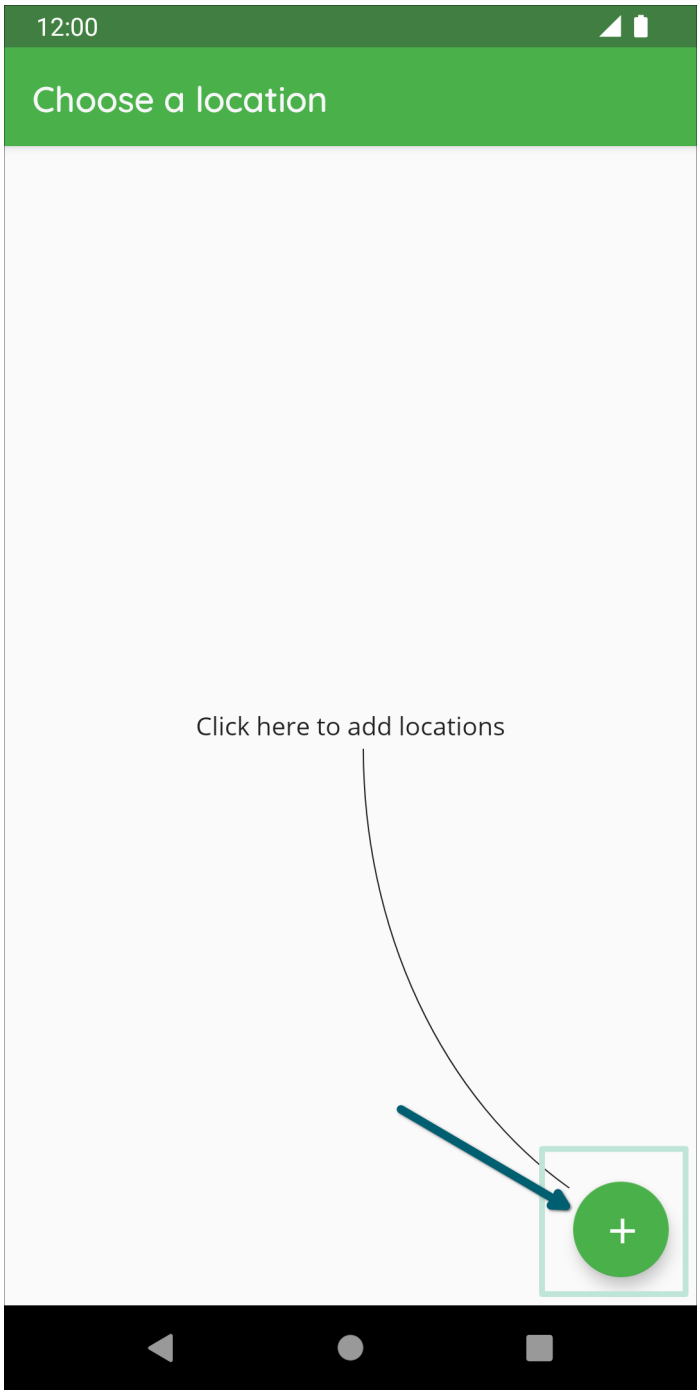

7:32
LTE
WebDAV
URL
https://
Username
Password
CONNECT
XL
images
a
q w e r t y u i o p
a s d f g h j k l
z x c v b n m
?123
/
.

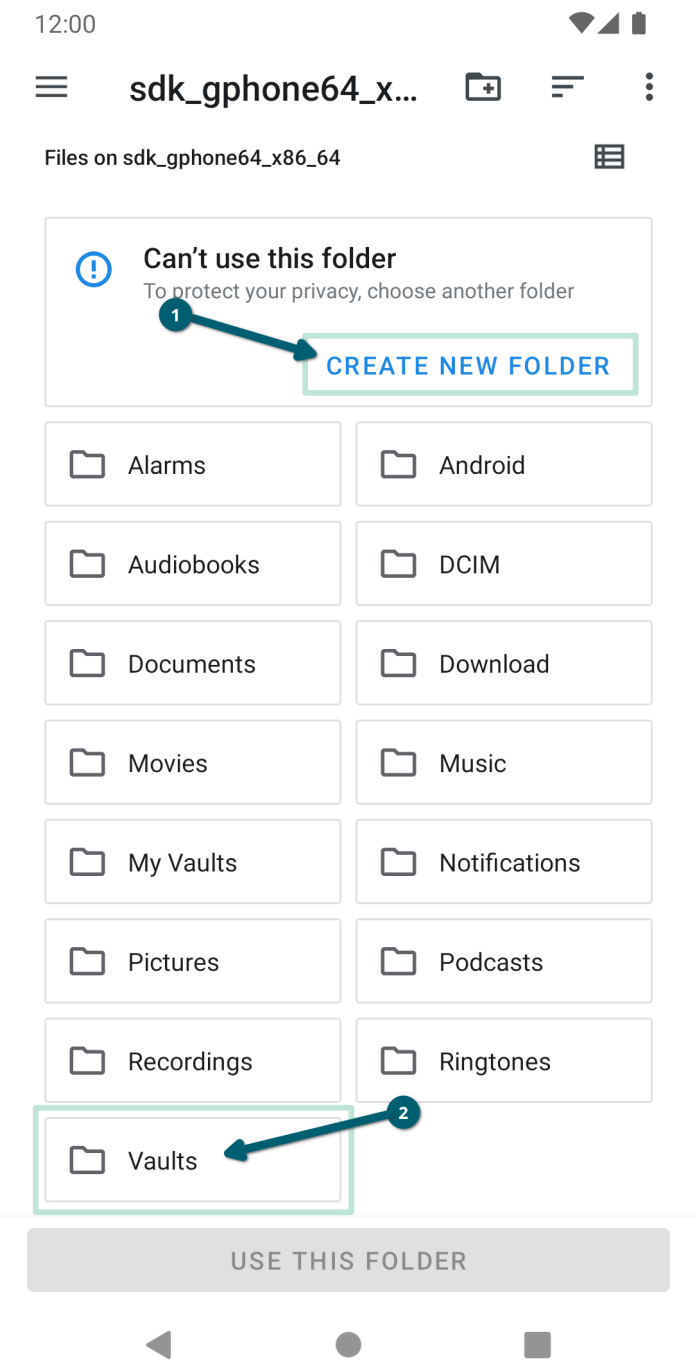


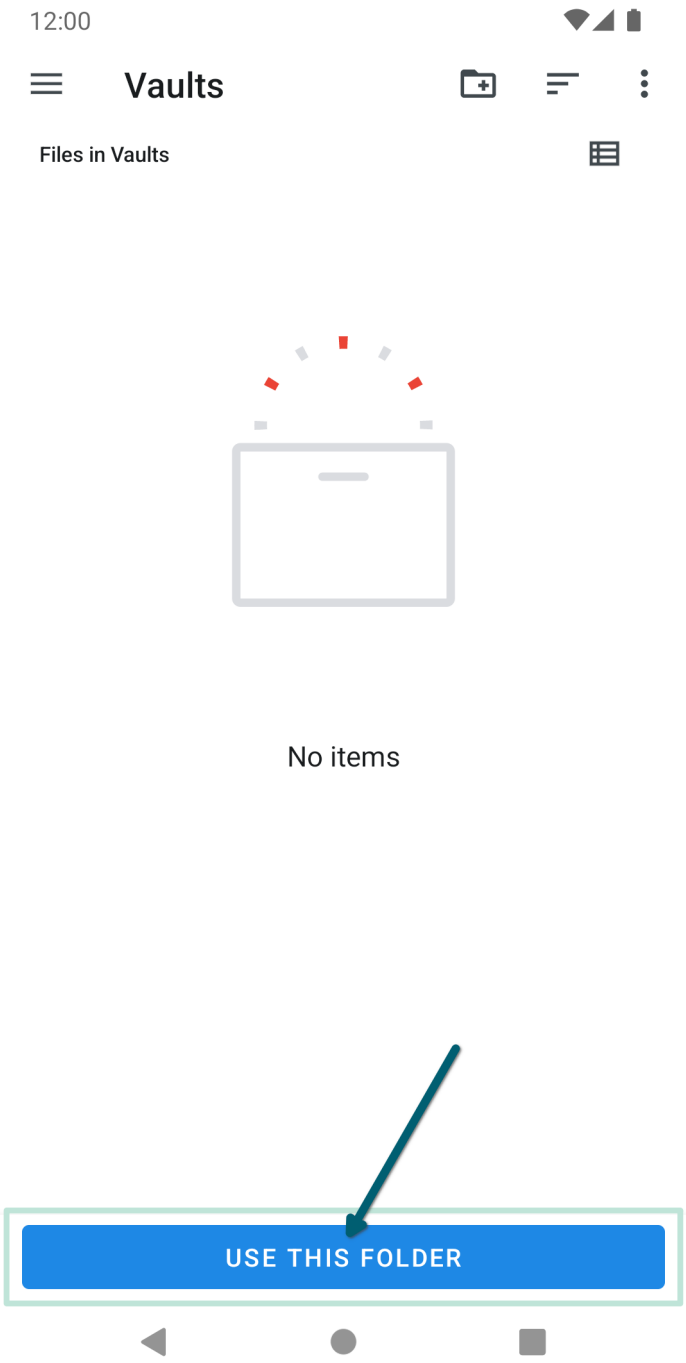
Note: While creating the WebDAV connection, please make sure to add the root of the accessible stroge and don't navigate directly into the vault.

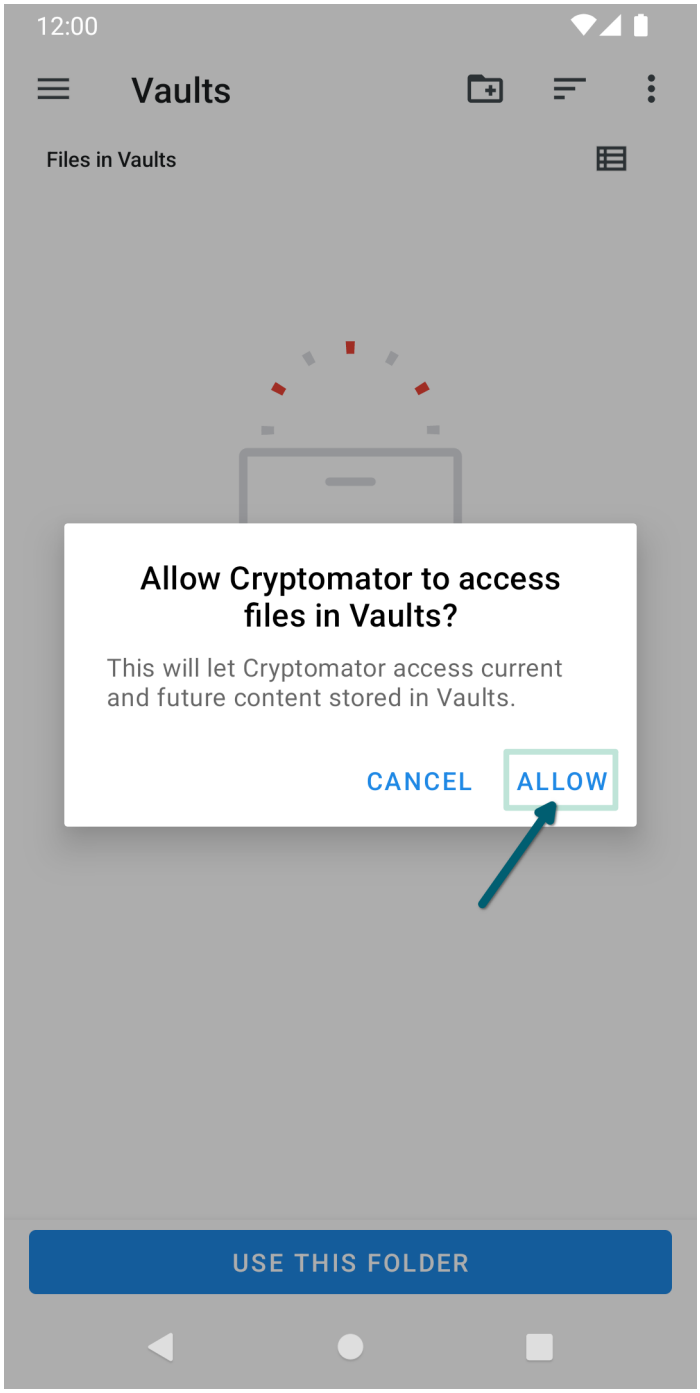
9.5 Login Local Storage

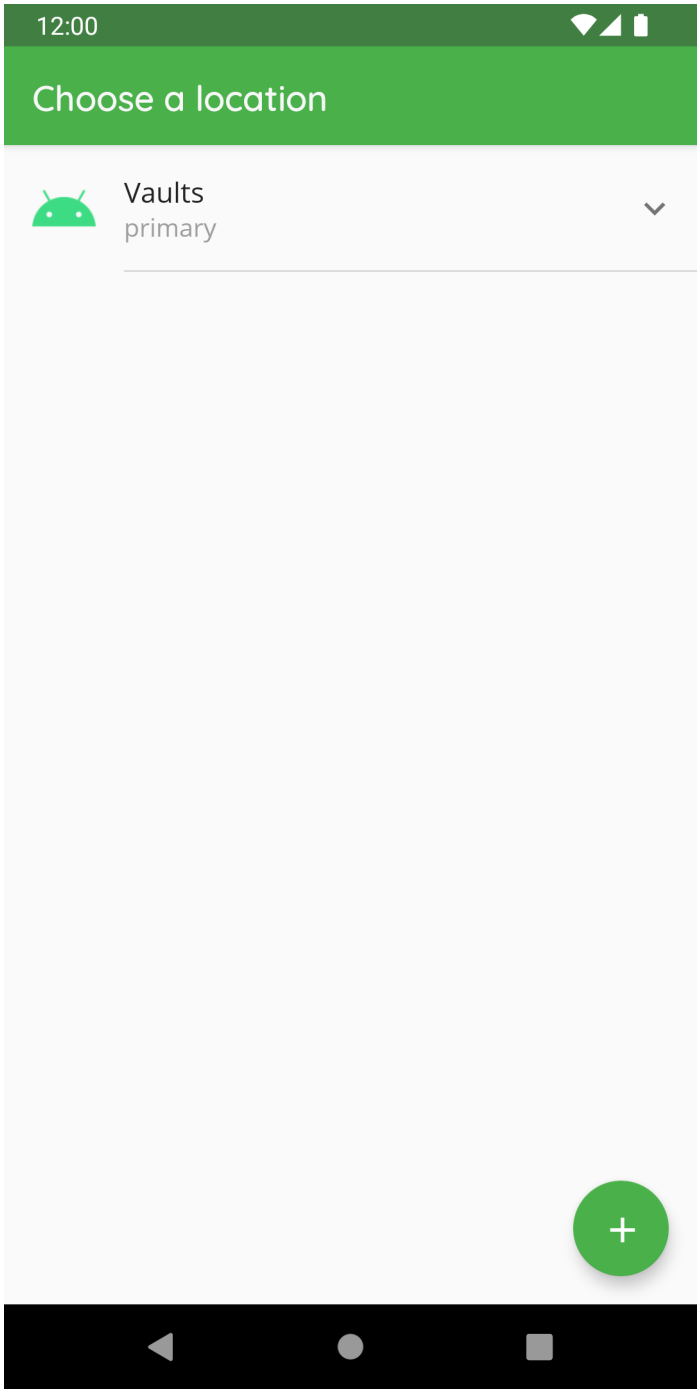
The following pictures describes how to setup a location to access vaults stored on the internal storage of the device (the same applies for vaults located e.g. on a SD card):




12:00
sdk_gphone64_x...
Files on sdk_gphone64_x86_64
Can't use this folder
To protect your privacy, choose another folder
1
CREATE NEW FOLDER
Alarms
Android
Audiobooks
DCIM
Documents
Download
Movies
Music
My Vaults
Notifications
Pictures
Podcasts
Recordings
Ringtones
2
Vaults
USE THIS FOLDER


12:00
Vaults
Files in Vaults
No items
USE THIS FOLDER


12:00
Vaults
Files in Vaults
Allow Cryptomator to access files in Vaults?
This will let Cryptomator access current and future content stored in Vaults.
CANCEL
ALLOW
USE THIS FOLDER



After creating the location, you can access it by clicking on the name of the location to add a vault or create a new vault.

Note: If you use a custom location please make sure to add the root folder of the storage like described in the pictures and don't navigate directly into the vault.

CHAPTER

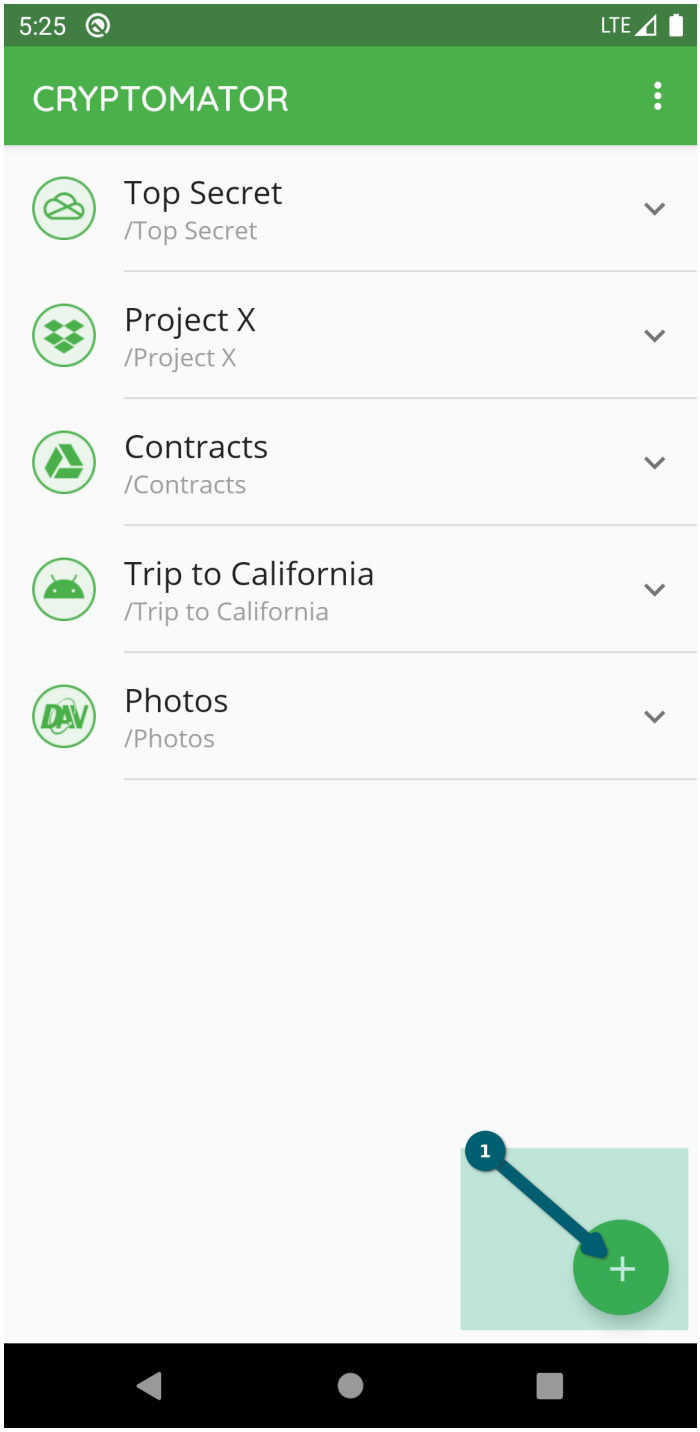
TEN

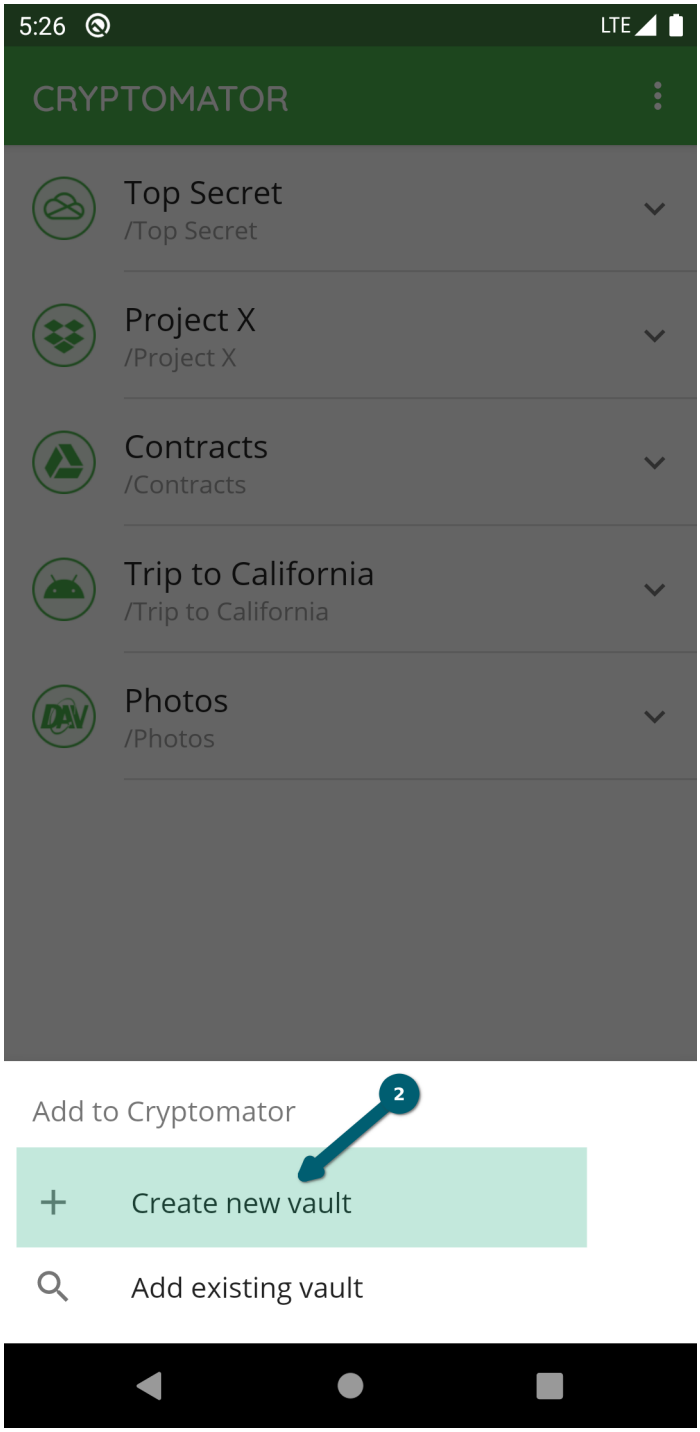
VAULT MANAGEMENT

TODO.

10.1 Create a New Vault

To create a new vault, click on the plus sign and choose *Create new vault* in the next screen.


5:25
LTE
CRYPTOMATOR
Top Secret
/Top Secret
Project X
/Project X
Contracts
/Contracts
Trip to California
/Trip to California
Photos
/Photos
1

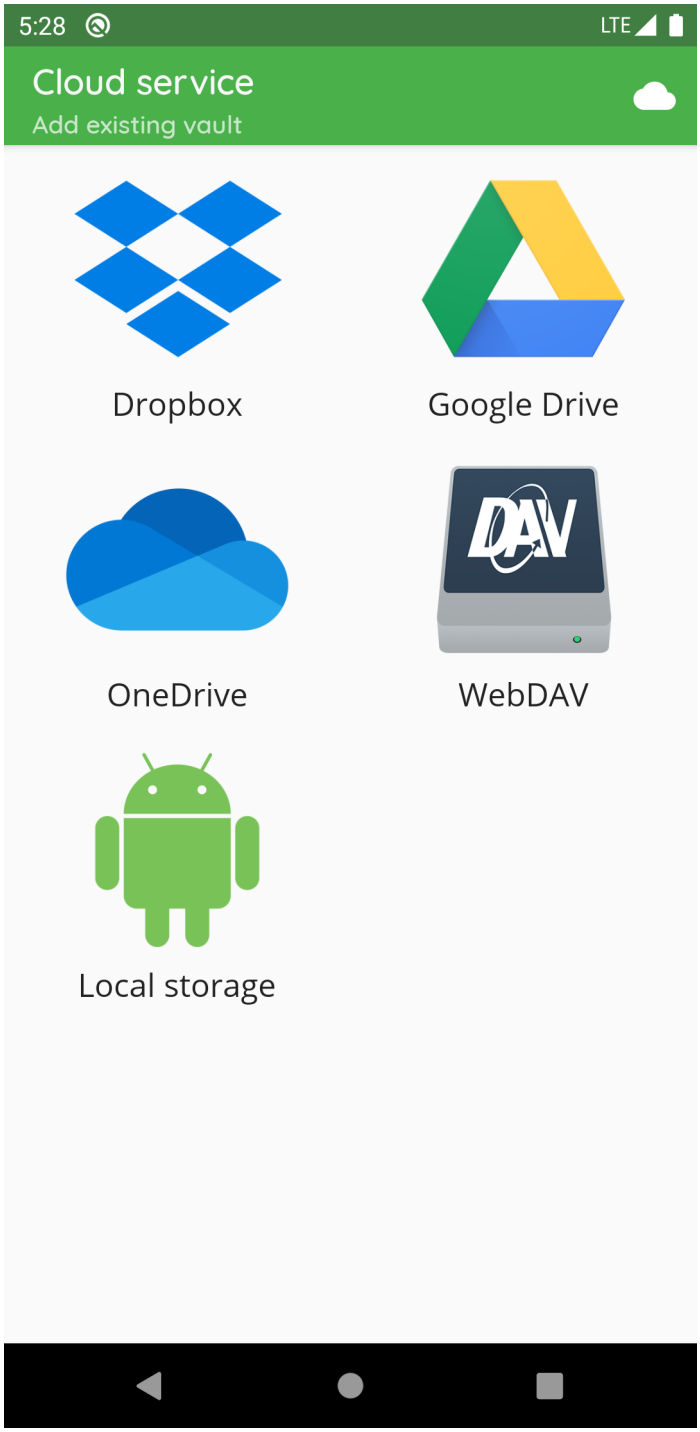


Note: If you already have a vault created with the desktop app and just want to add this vault to your mobile app, please select go to chapter `Add Existing Vaults`.

You will now be prompted to select the cloud provider where you want to store your vault.

Choose between *Dropbox*, *Google Drive*, *OneDrive* (works also with *OneDrive for Business*) or *Local storage* (which means your local device with all attached devices).

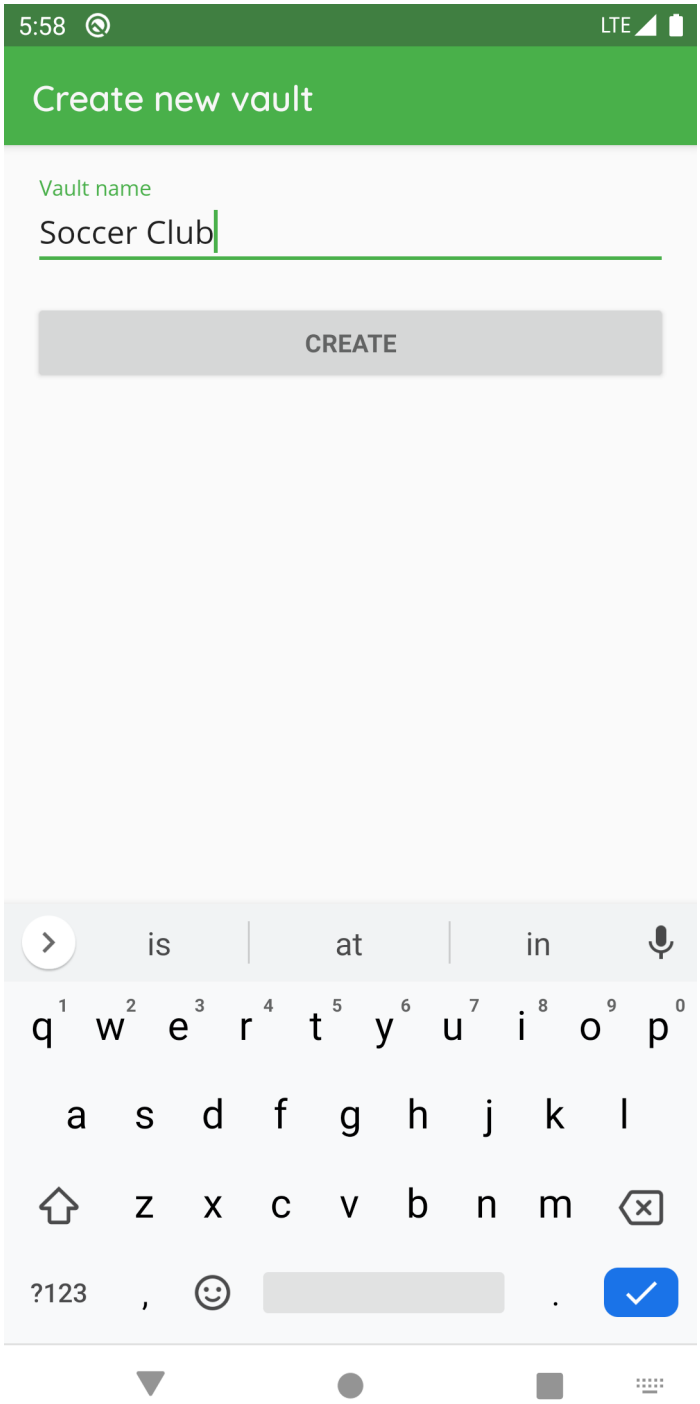
If your desired provider is not listed and offers WebDAV access, please select *WebDAV* as the storage location of your vault. Here you can find WebDAV URLs of Common Cloud Storage Services.



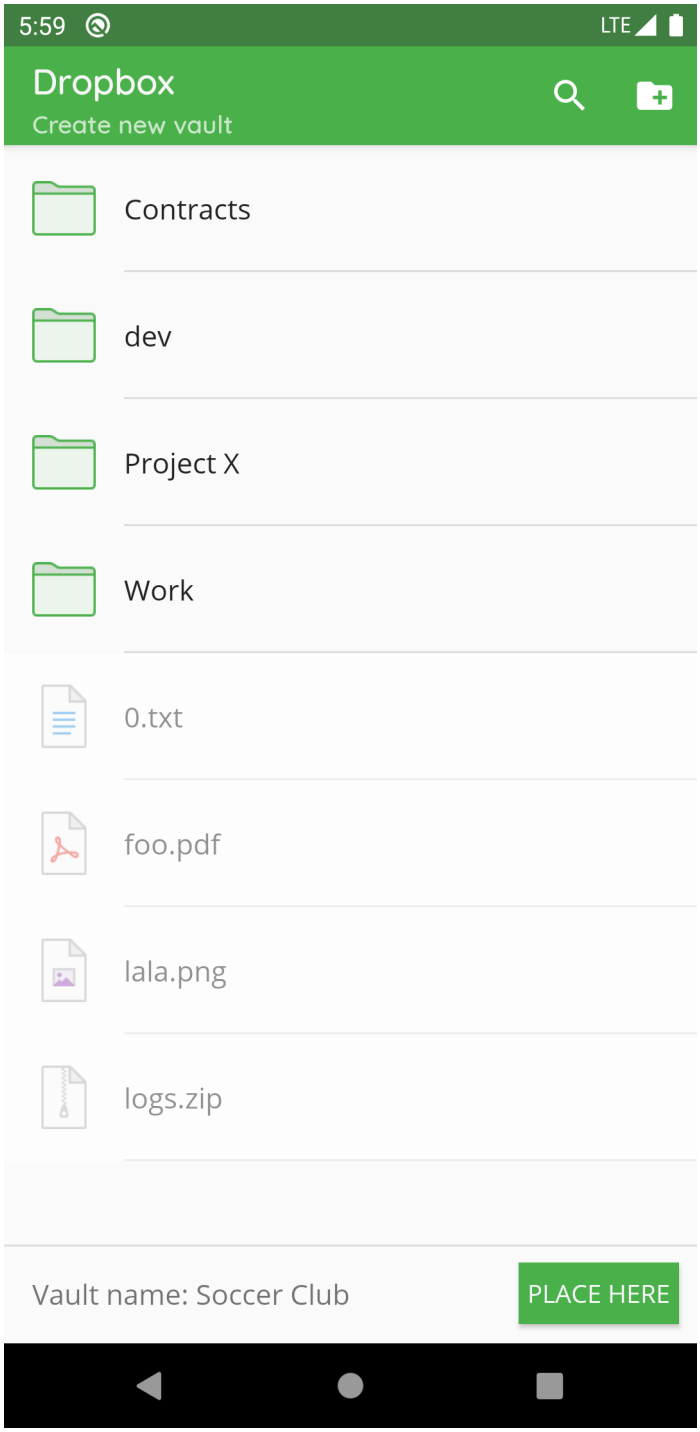
If not already done, you have to create the connection between the Cryptomator app and your storage provider account. Please follow the instructions in the *Cloud Management* chapter and contiune later here.

Now that you've established a connection, you'll add the existing vault.

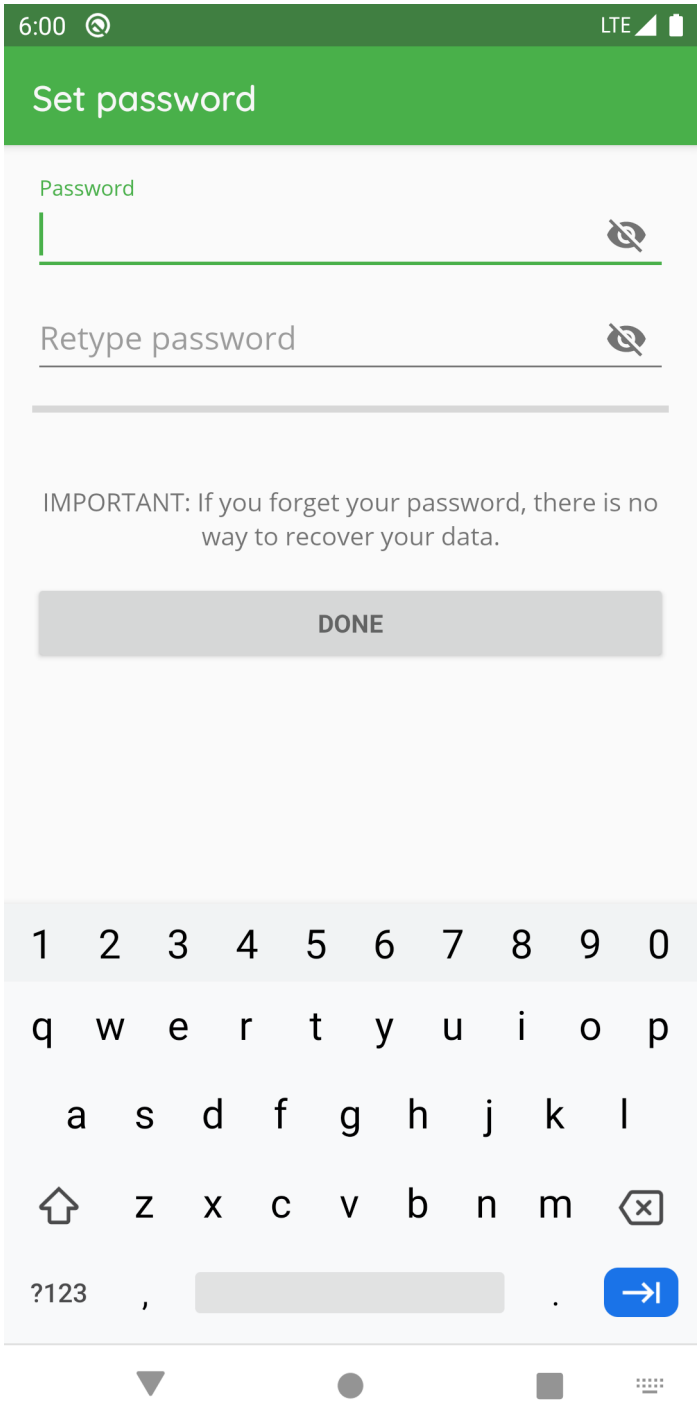
In the first step, please enter a name for your new vault. This name will also be the folder name of your vault files in your online storage.



Then choose the location on your cloud storage where you want to have your encrypted vault files stored.

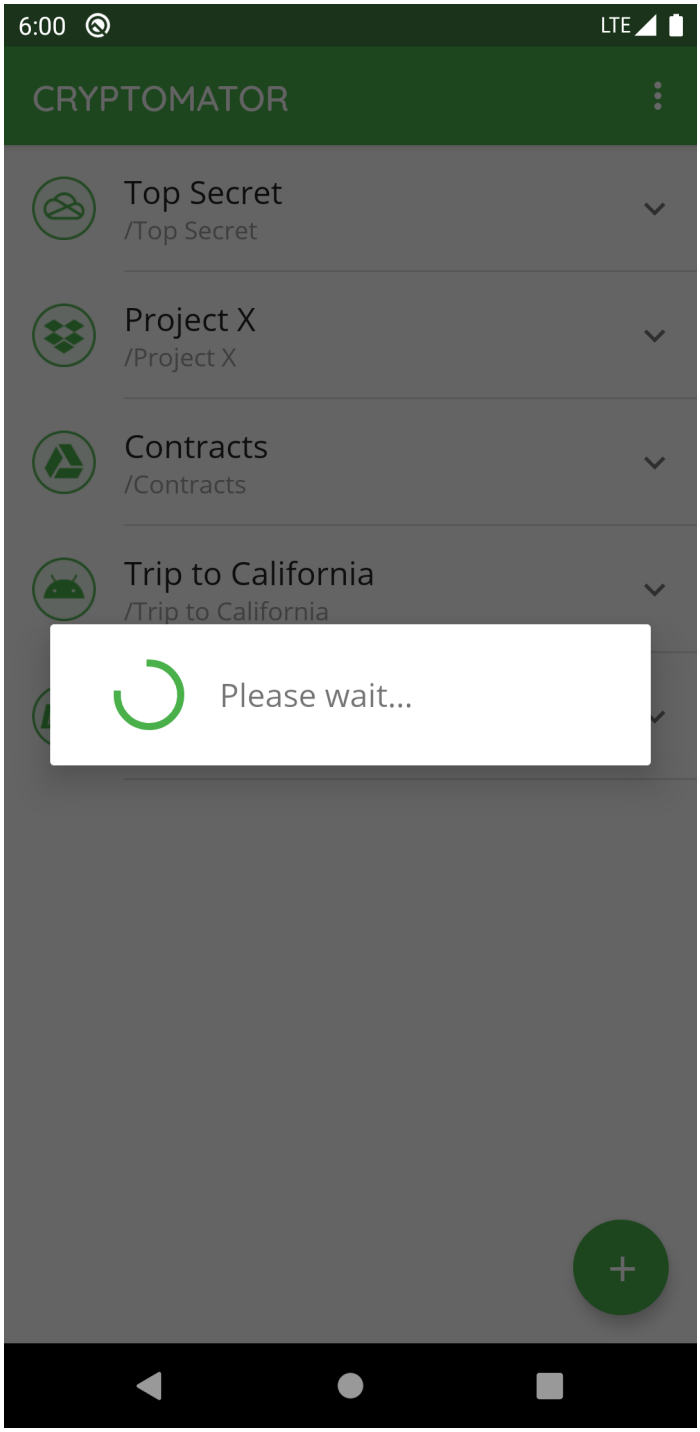


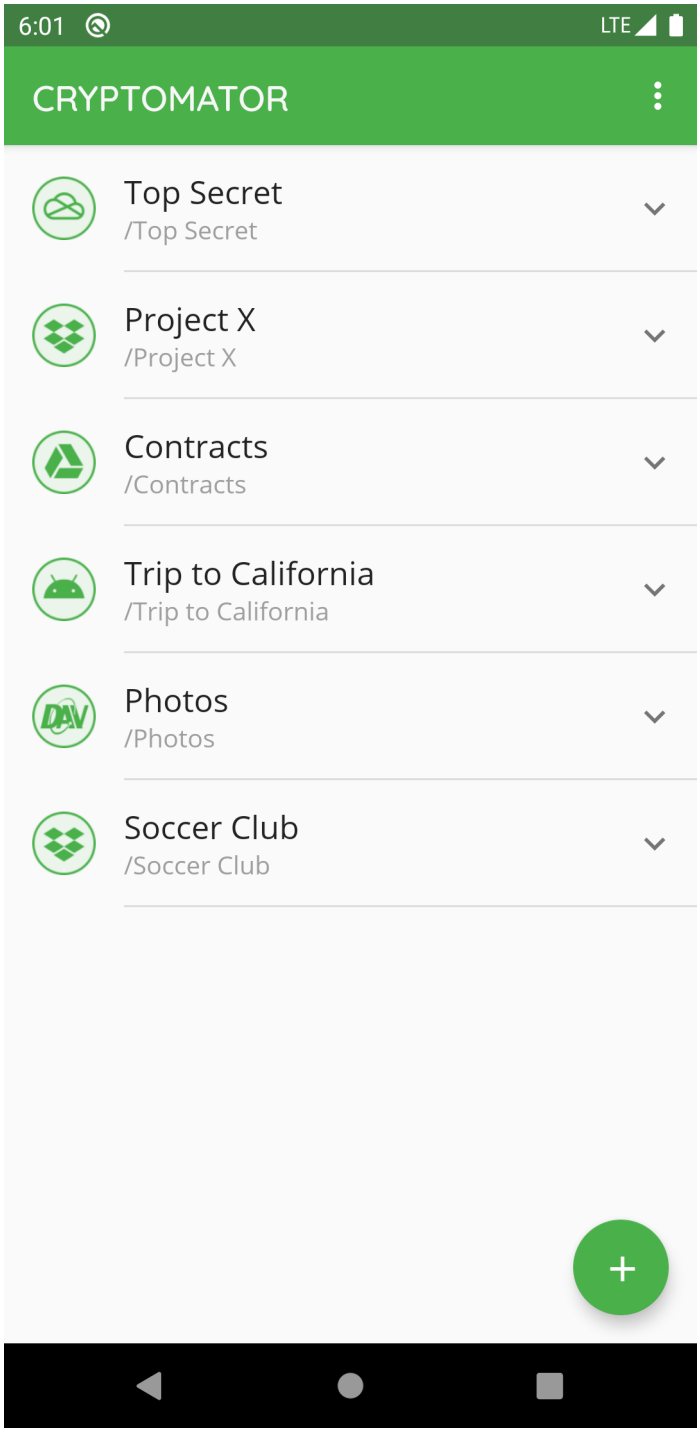
And last but not least, create a **secure** password for your vault. Basically, you have the whole Unicode for choosing a password including non-printable characters.



Warning: You have to remember this password at all times because there is **no way to access your data if you forget your password**. Choose a *good password* to make your data secure.

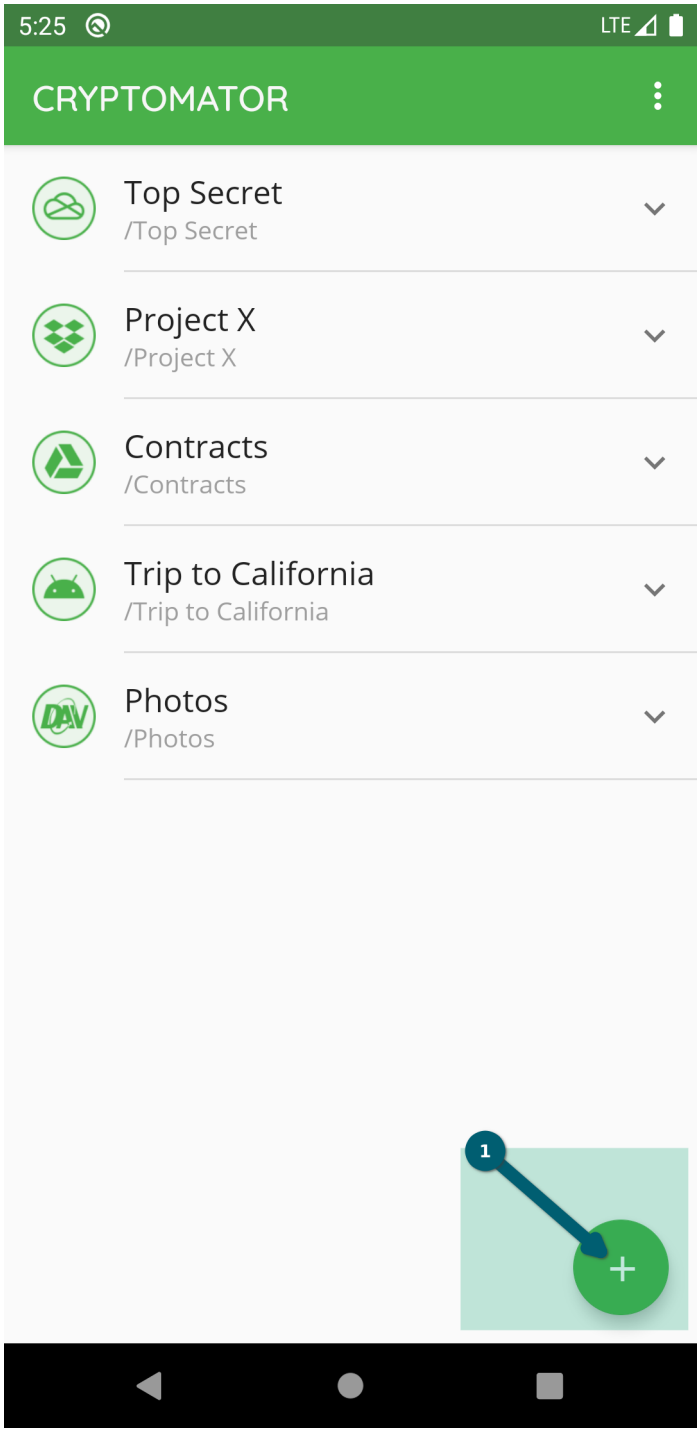
After you have confirmed your password, the vault is created. You will find it now on the start page of your Cryptomator app, where you can open your vault and optionally change settings. [documentation will follow]

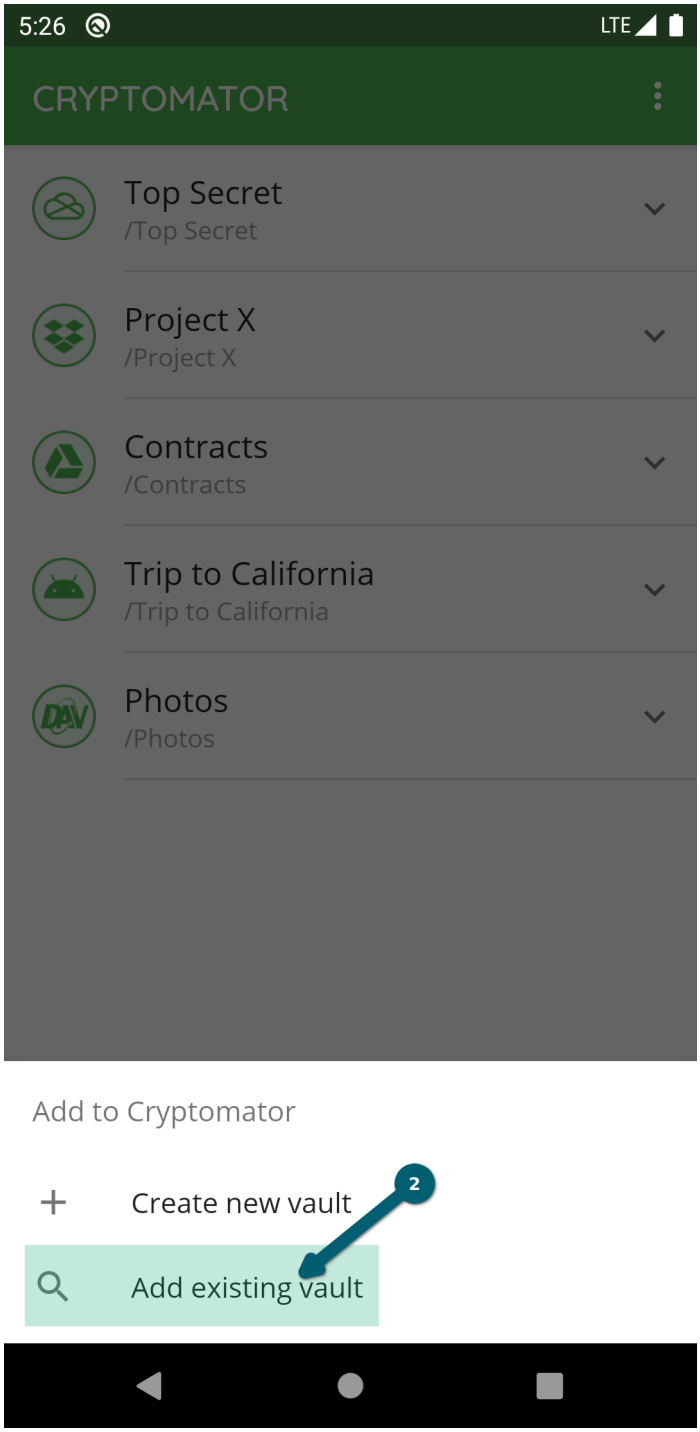

6:00
LTE
CRYPTOMATOR
Top Secret
/Top Secret
Project X
/Project X
Contracts
/Contracts
Trip to California
/Trip to California
Please wait...


6:01
LTE
CRYPTOMATOR
Top Secret
/Top Secret
Project X
/Project X
Contracts
/Contracts
Trip to California
/Trip to California
Photos
/Photos
Soccer Club
/Soccer Club

10.2 Add Existing Vaults

To add an existing vault, click on the plus sign and choose *Add existing vault* in the next screen.

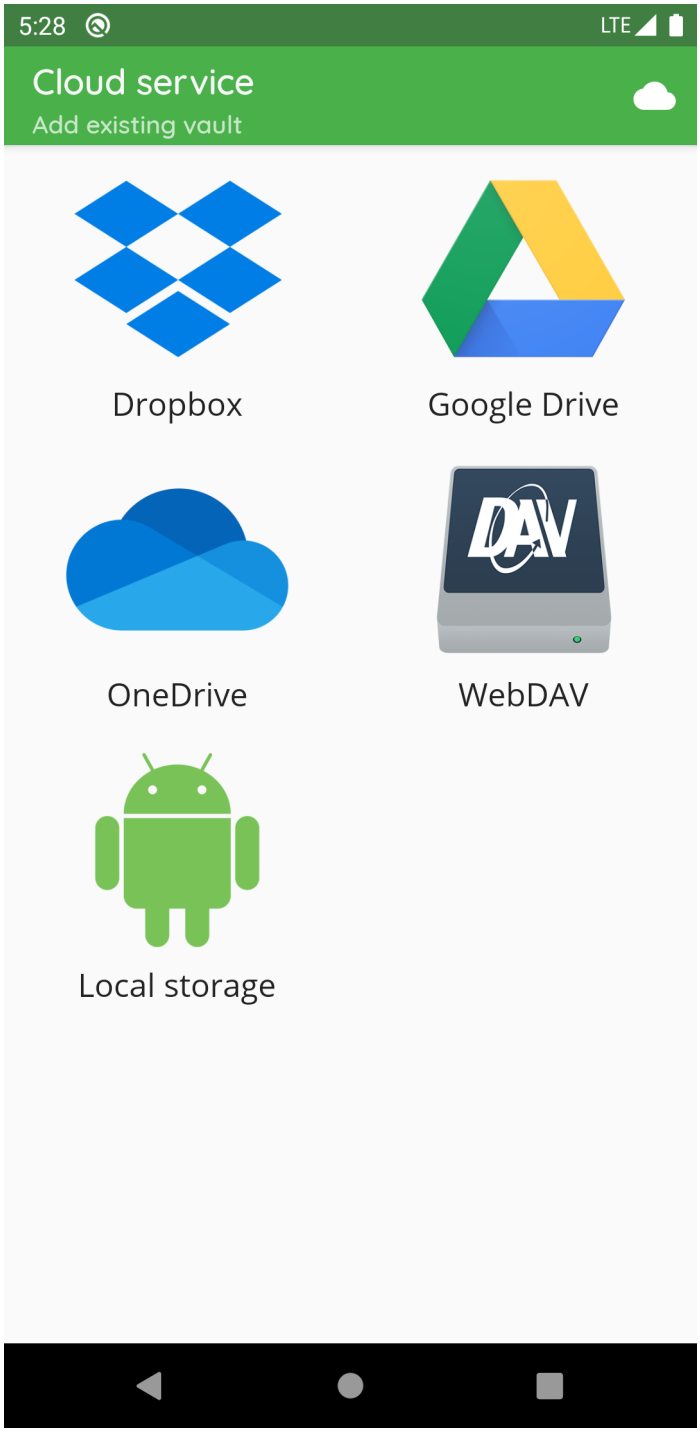




You will now be prompted to select the cloud provider where the vault is located.

Choose between *Dropbox*, *Google Drive*, *OneDrive* (works also with *OneDrive for Business*) or *Local storage* (which means your local device with all attached devices).

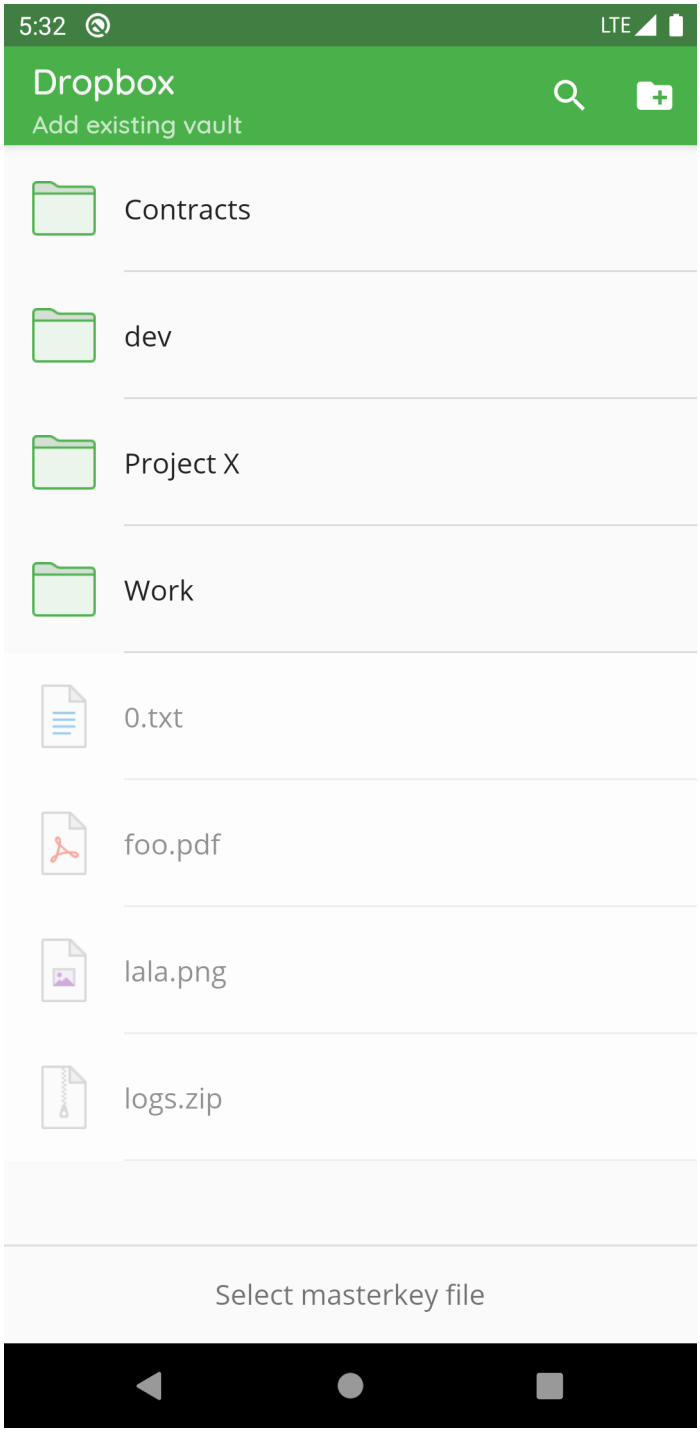
If your desired provider is not listed and offers WebDAV access, please select *WebDAV* as the storage location of your vault. Here you can find WebDAV URLs of Common Cloud Storage Services.



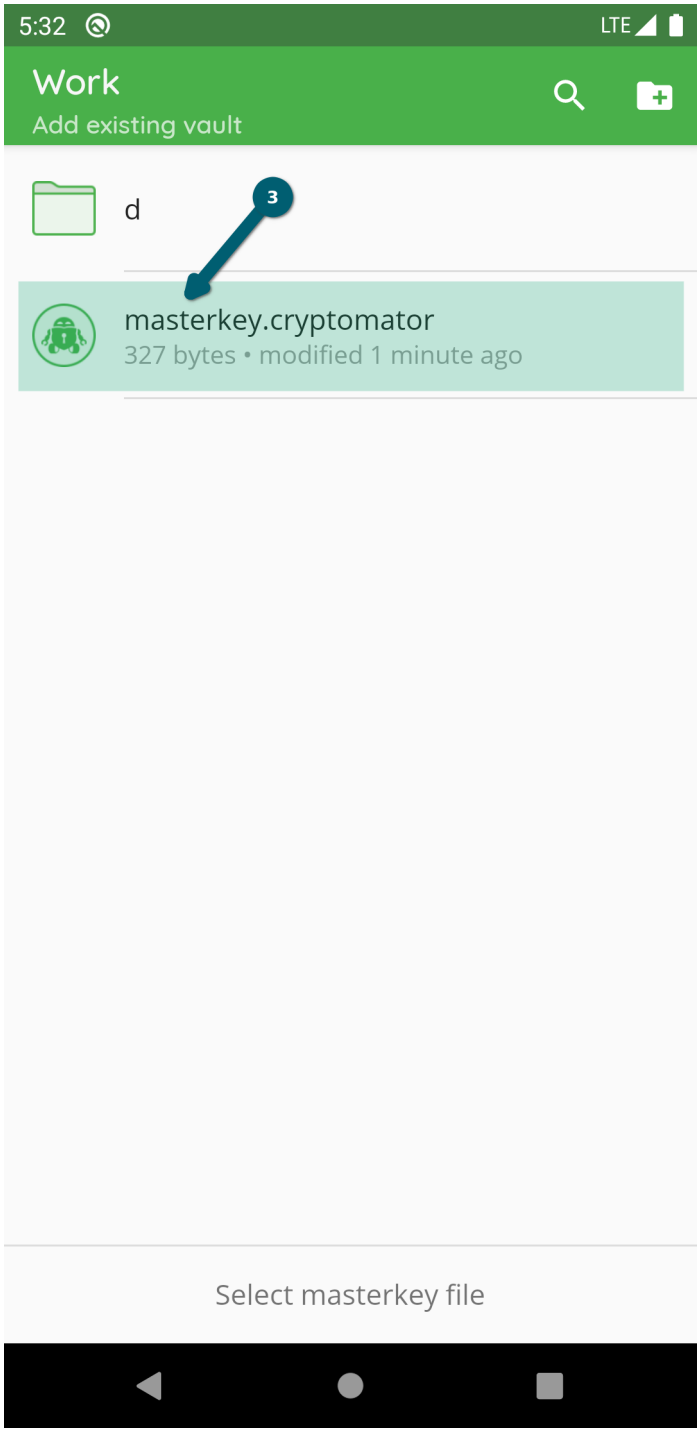
If not already done, you have to create the connection between the Cryptomator app and your storage provider account. Please follow the instructions in the *Cloud Management* chapter and contiune later here.

Now that you've established a connection, you'll add the existing vault.

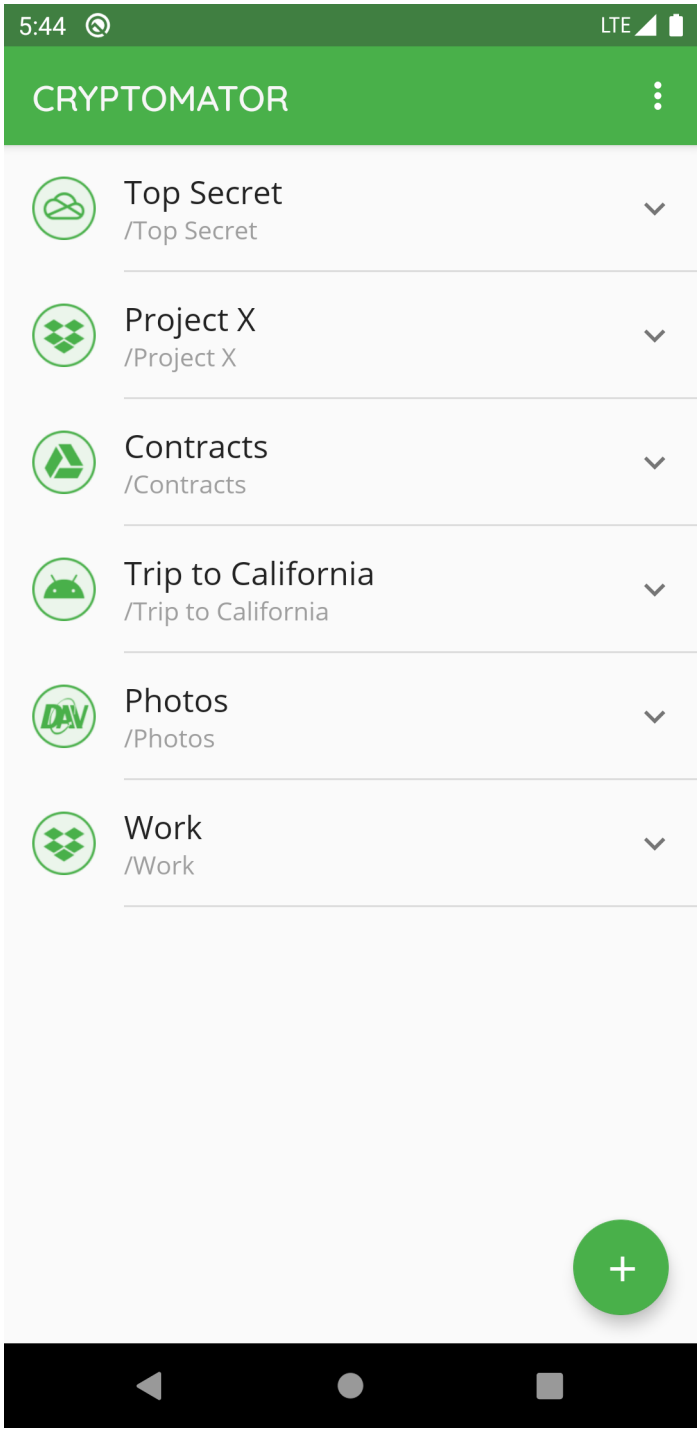
In the first step, please choose the folder in which the vault is located. This folder name is the same as the vault name (in this example, our vault name is *test vault* so we select this folder).



Then choose the `masterkey.cryptomator` file.

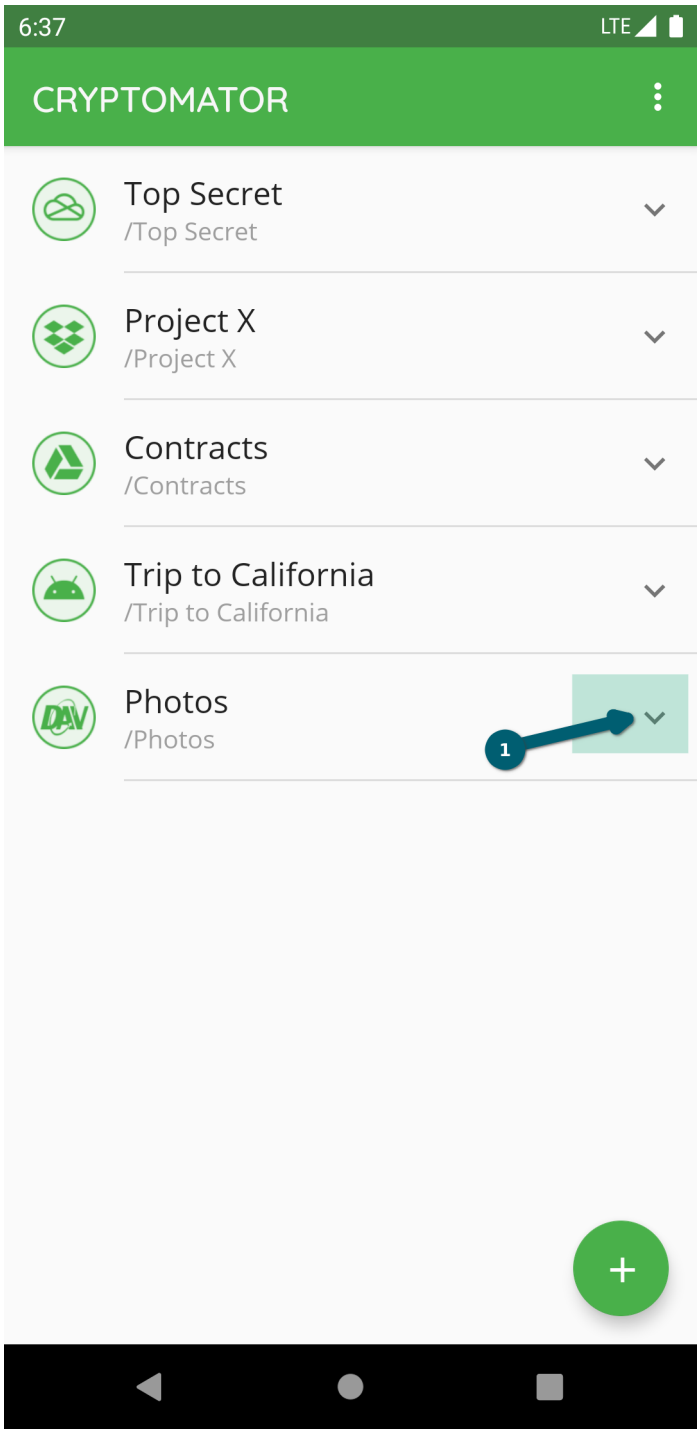


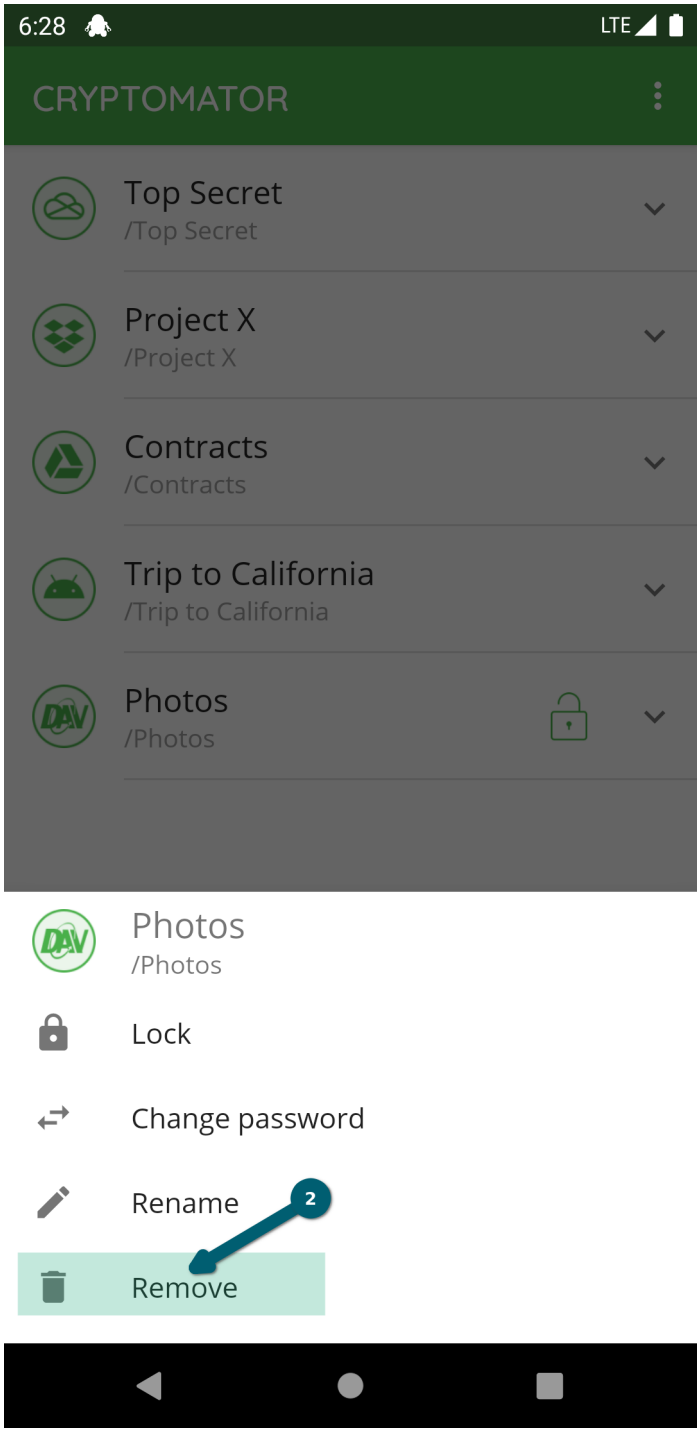
Now the vault is added to the list of vaults. You will find it now on the start page of your Cryptomator app, where you can open your vault and optionally change settings. [documentation will follow]


5:44
LTE
CRYPTOMATOR
Top Secret
/Top Secret
Project X
/Project X
Contracts
/Contracts
Trip to California
/Trip to California
Photos
/Photos
Work
/Work

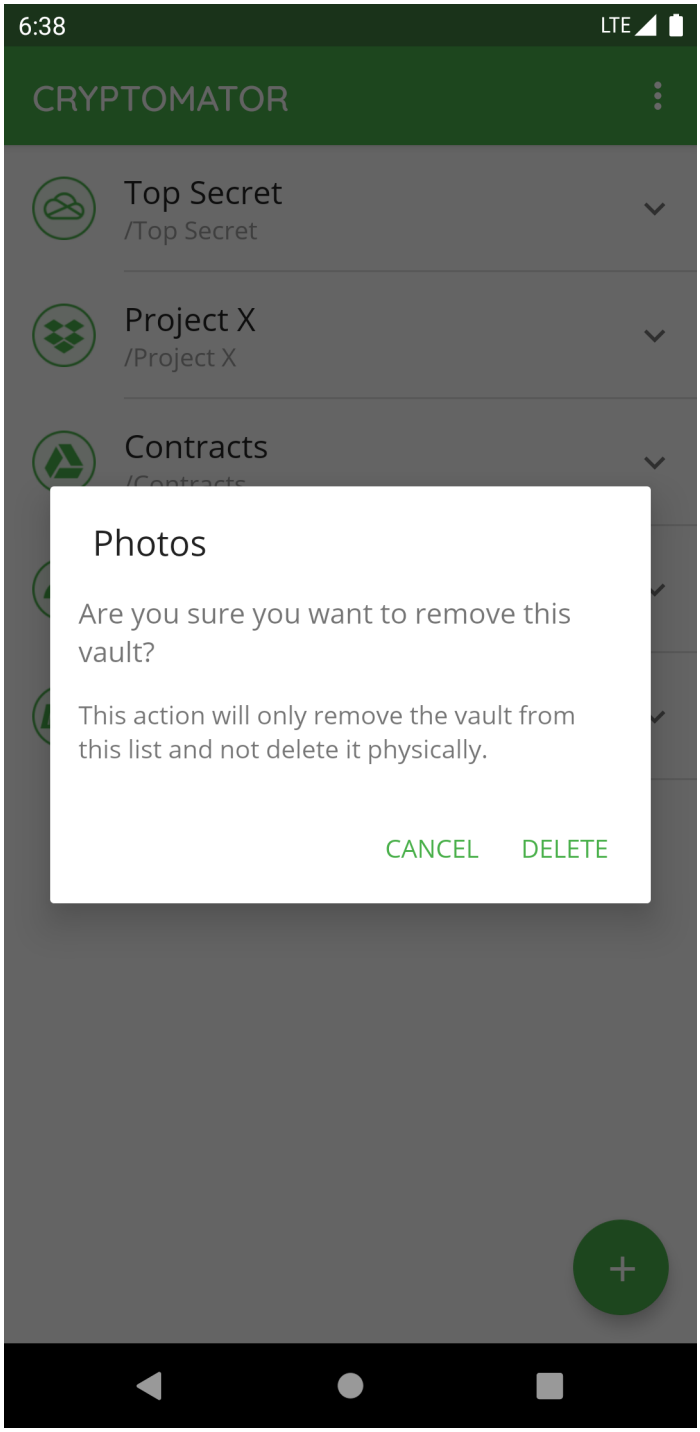
10.3 Remove Vaults

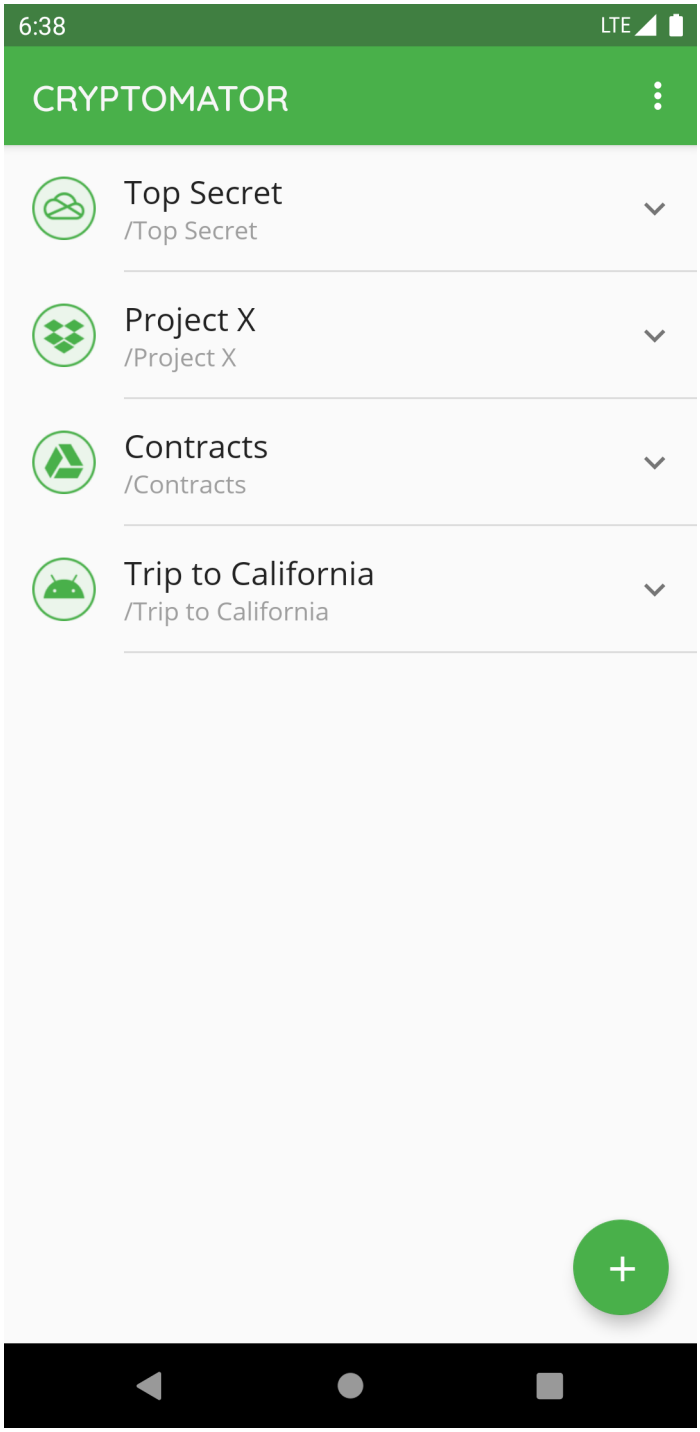
If you want a specific vault to stop being displayed in Cryptomator, you select the `V` next to the vault and choose *Remove* .





Confirm the deletion process using the `Delete` button.

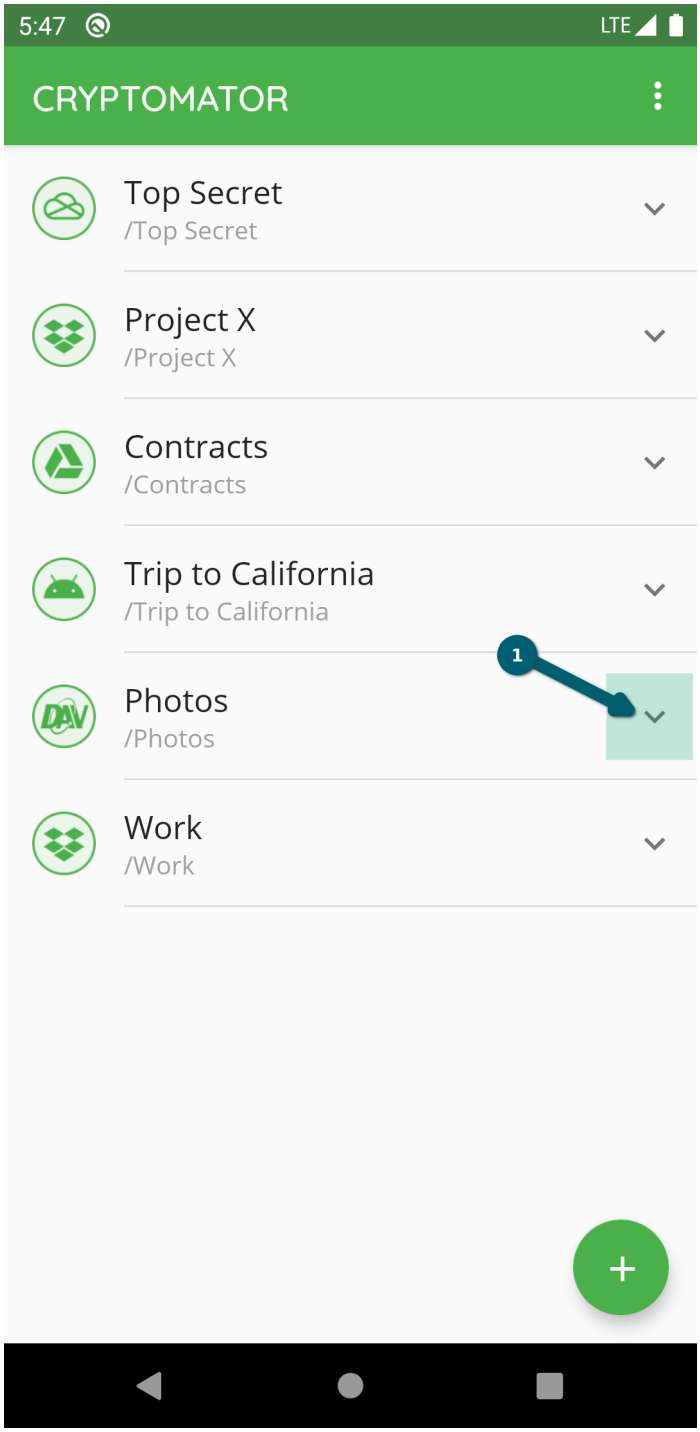

6:38
LTE
CRYPTOMATOR
Top Secret
/Top Secret
Project X
/Project X
Contracts
Photos
Are you sure you want to remove this vault?
This action will only remove the vault from this list and not delete it physically.
CANCEL
DELETE

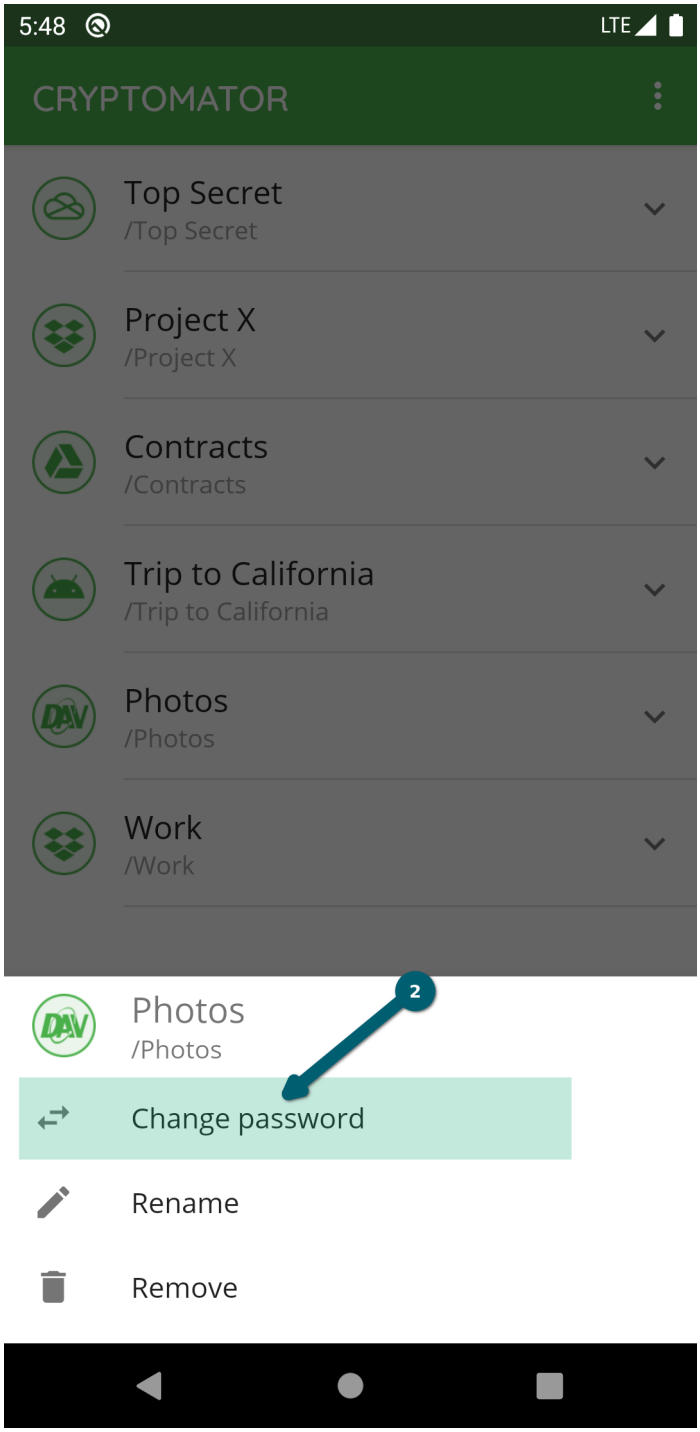


Note: By removing a vault, it is only removed from the list but not deleted in the cloud. You can re-add the vault afterwards.

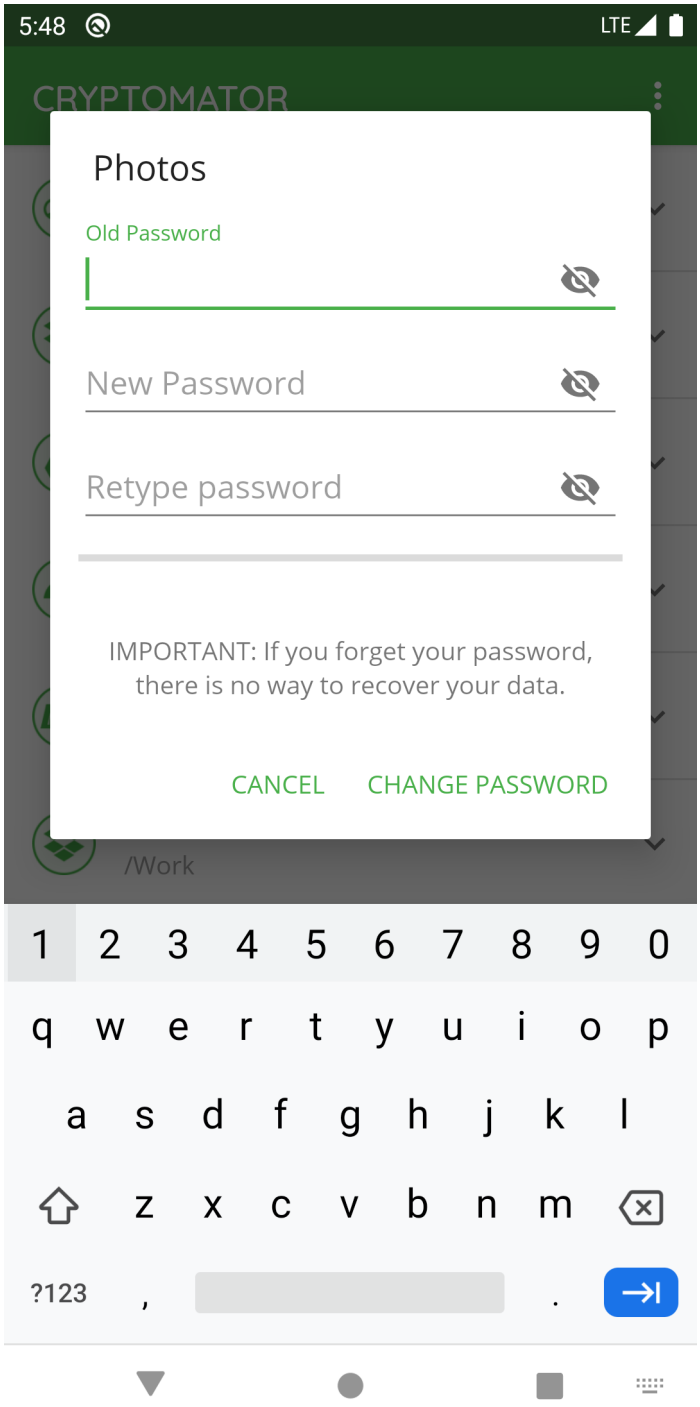
10.4 Change Vault Password

If you want change the password of a specific vault in Cryptomator, you select the `V` next to the vault and choose *Change password* .



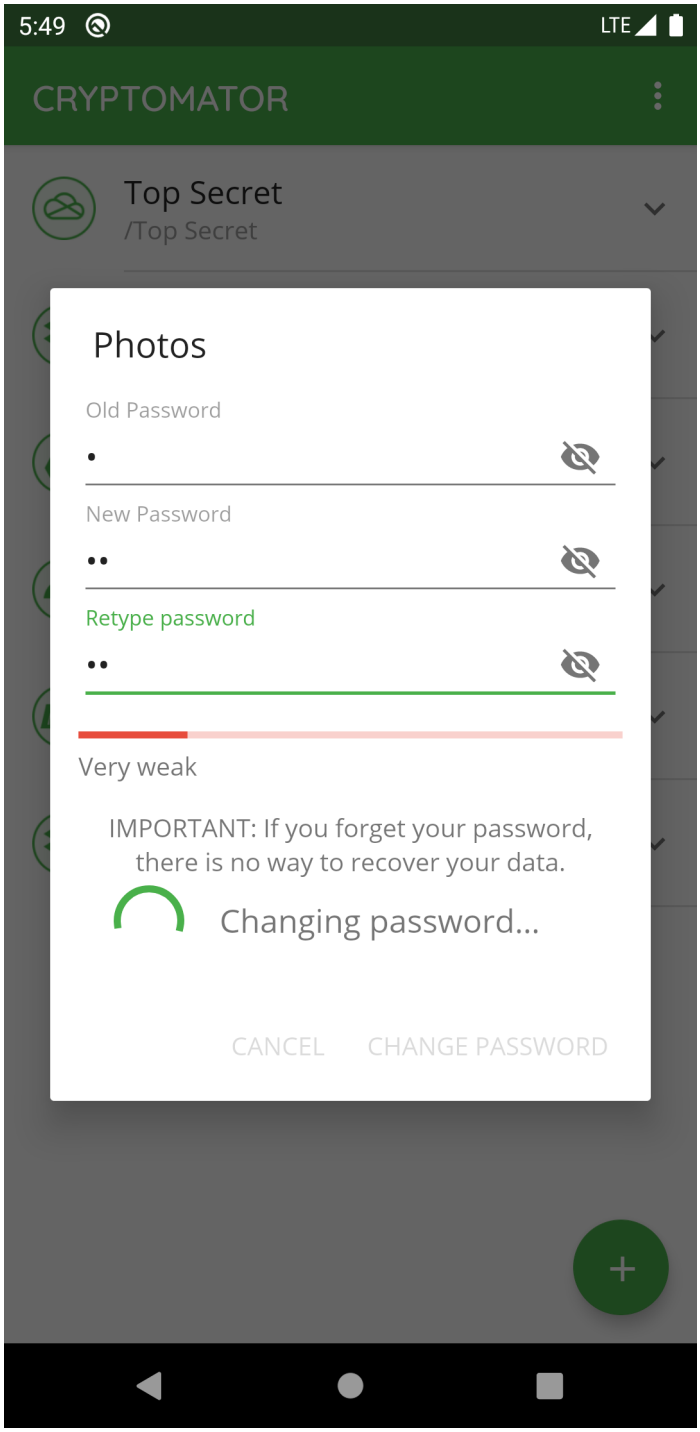


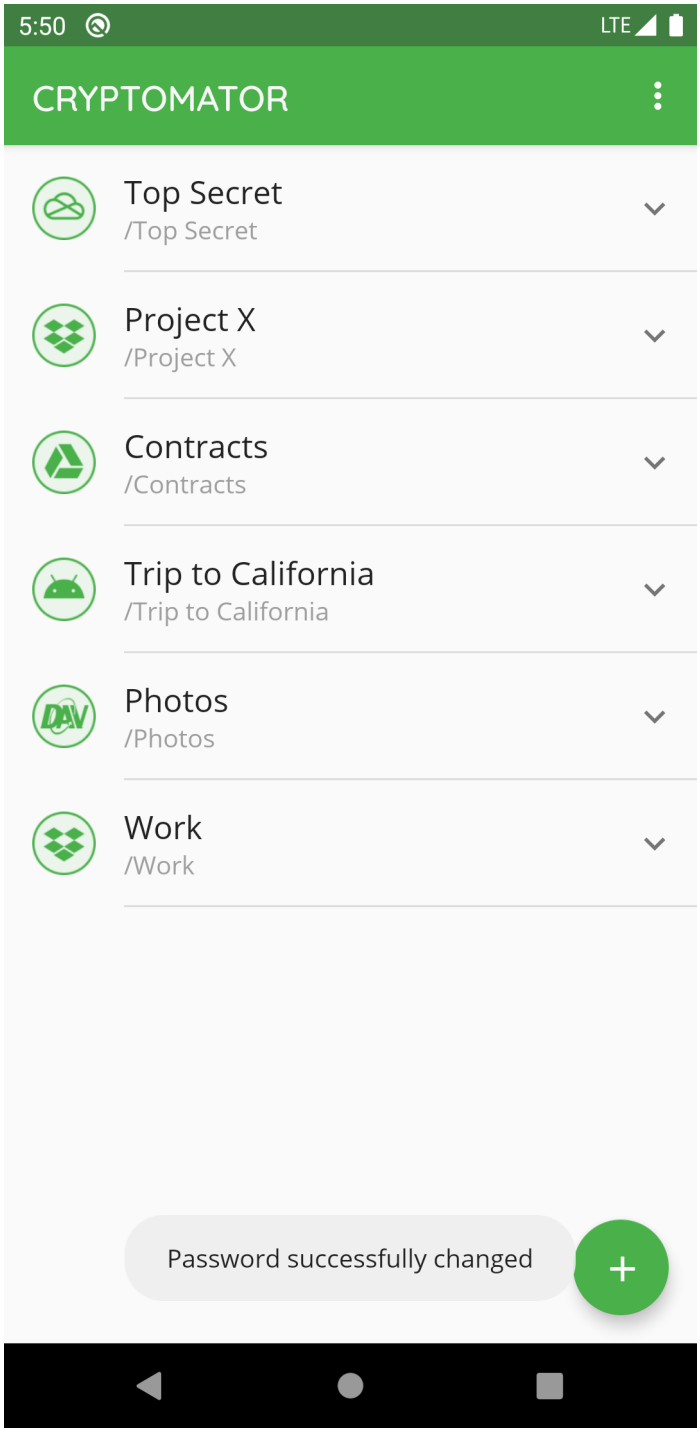
Enter the old password and choose a **secure** new one. Basically, you have the whole Unicode for choosing a password including non-printable characters.



Warning: You have to remember this password at all times because there is **no way to access your data if you forget your password**. Choose a *good password* to make your data secure.

Start the process using the `CHANGE PASSWORD` button.


5:49
LTE
CRYPTOMATOR
Top Secret
/Top Secret
Photos
Old Password
New Password
Retype password
Very weak
IMPORTANT: If you forget your password, there is no way to recover your data.
Changing password...
CANCEL
CHANGE PASSWORD

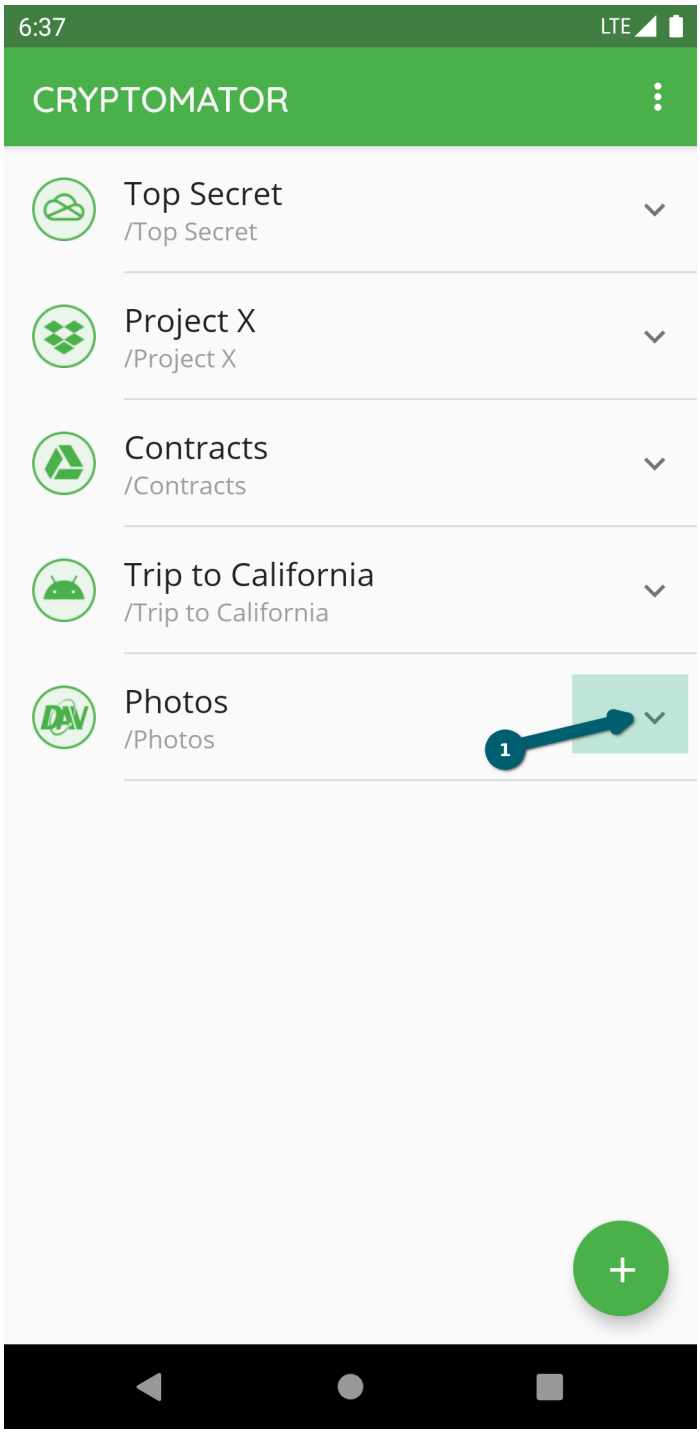


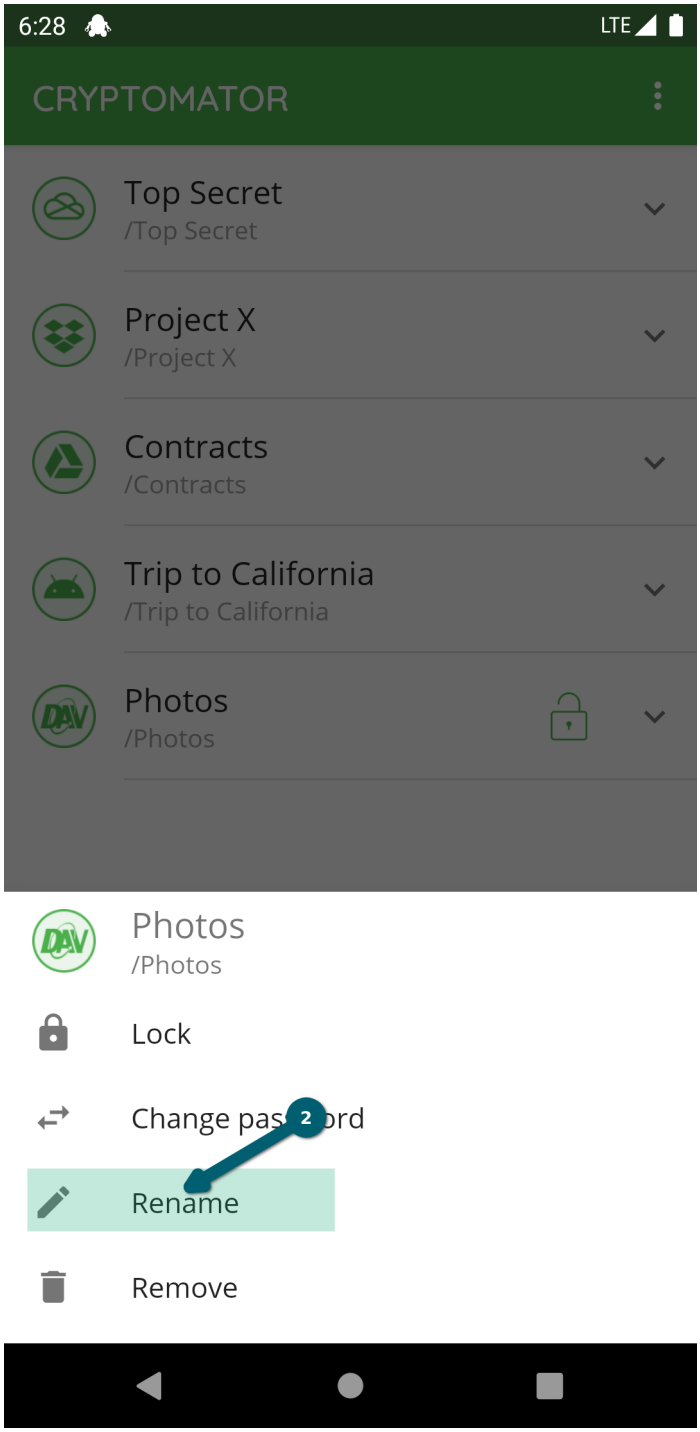
Note: The password is used to derive a KEK, which is then used to encrypt futher keys. The KEK changes, but the keys encrypted with the KEK will stay the same. The actual files will not get re-encrypted, meaning you can not upgrade a weak passphrase to a stronger one once the data has been synced to a service that allows recovery of older versions of the masterkey file.

If you like to encrypt your vault files with a new, stronger password, you need to create a new vault and copy the data from the old to the new one. Make sure to wipe all backups of the old vault afterwards.

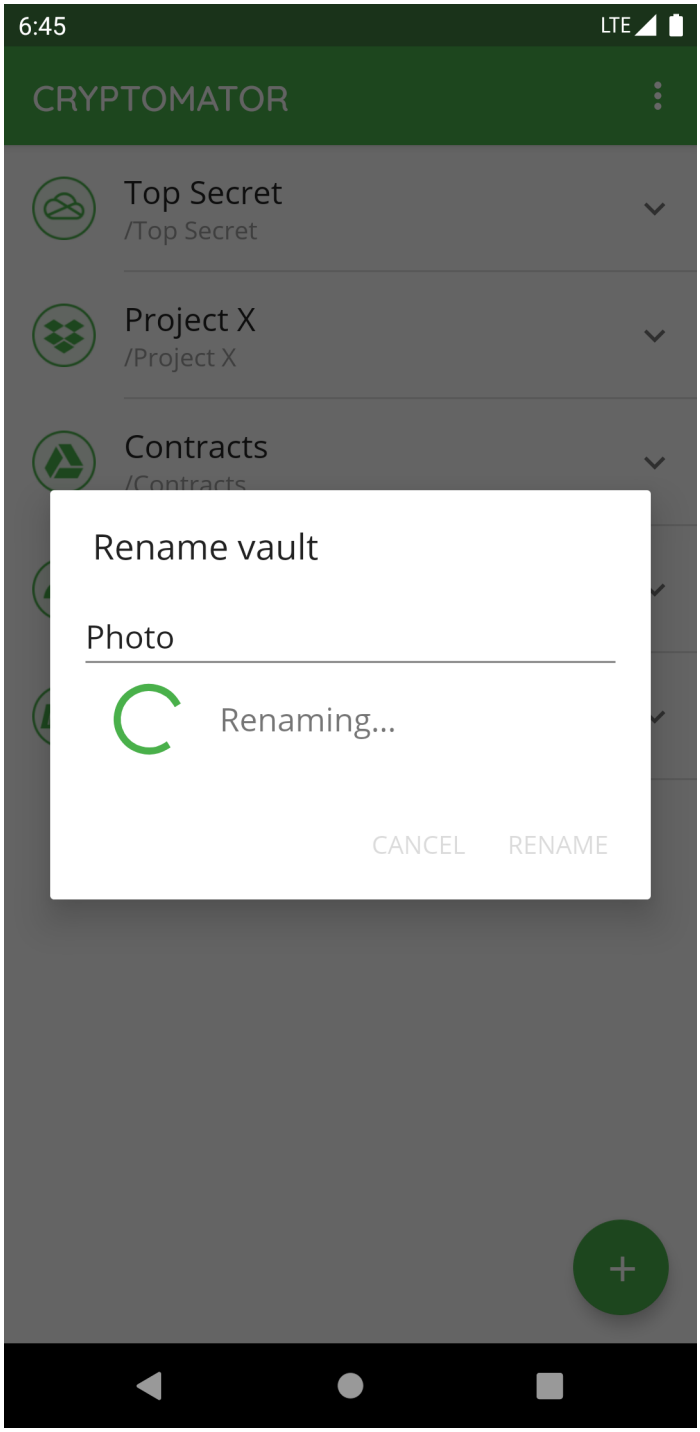
10.5 Rename Vault

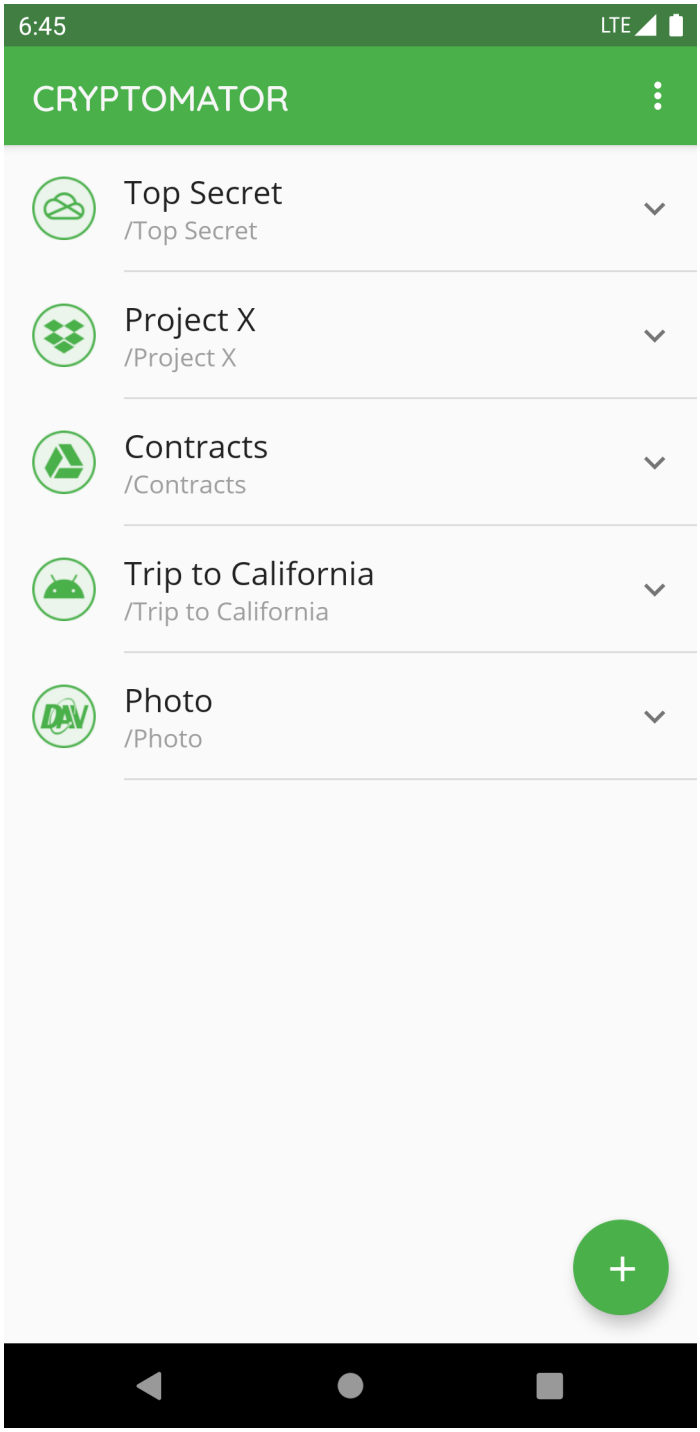
If you want to change the name of a specific vault in Cryptomator, you select the `V` next to the vault and choose *Rename* .





Choose a new name and confirm using the `RENAME` button.


6:45
LTE
CRYPTOMATOR
Top Secret
/Top Secret
Project X
/Project X
Contracts
Rename vault
Photo
Renaming...
CANCEL
RENAME



10.6 Change Vault Position

If you want to change the position of a specific vault in the vault list in Cryptomator, long-press on the vault and drag it to the desired position in the pressed state:

CHAPTER

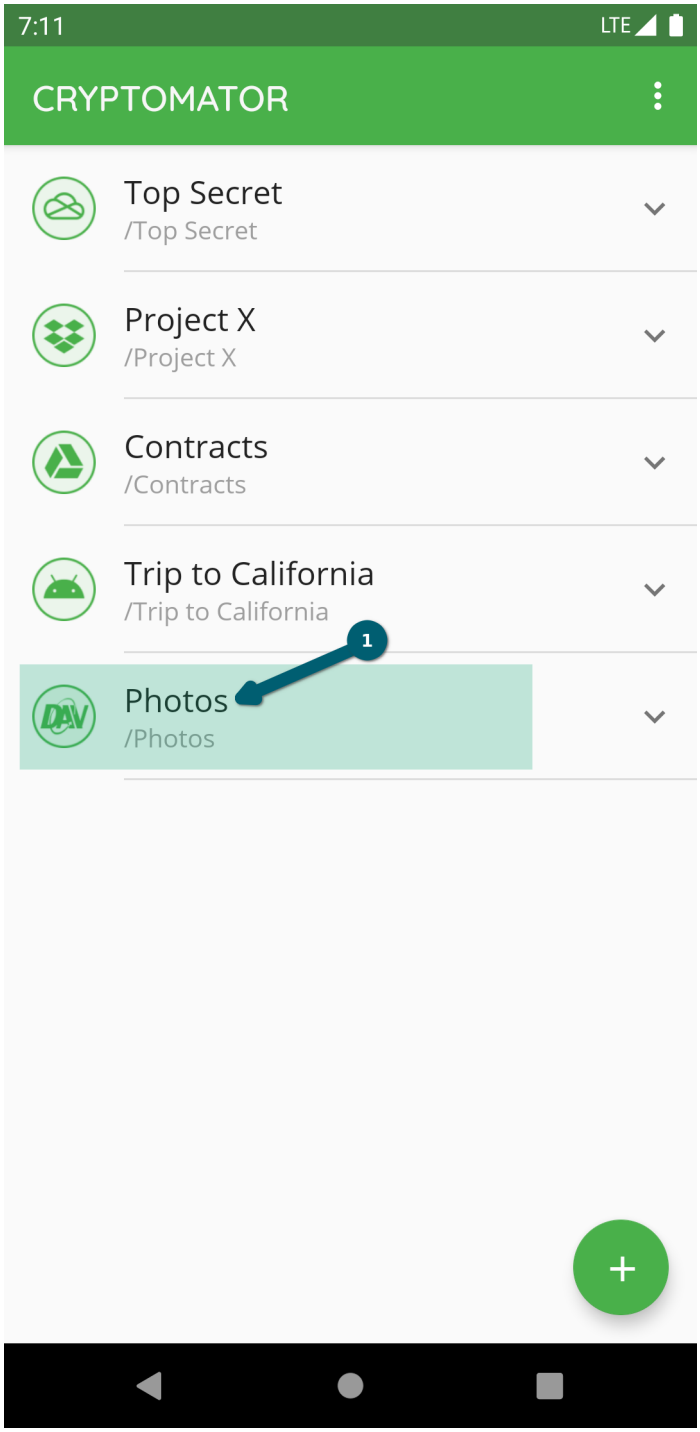
ELEVEN

WORKING WITH VAULTS

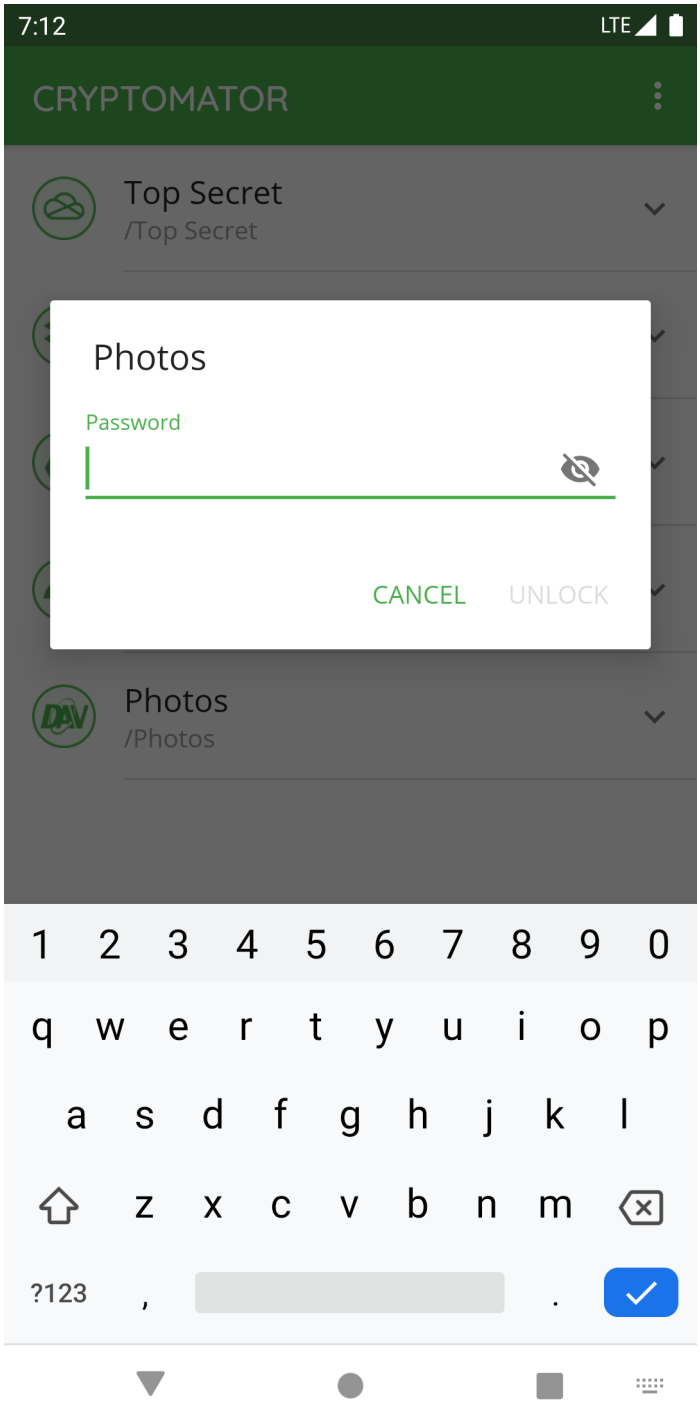
This section shows you how to work with a vault like view its content, move files or access it with other applications.

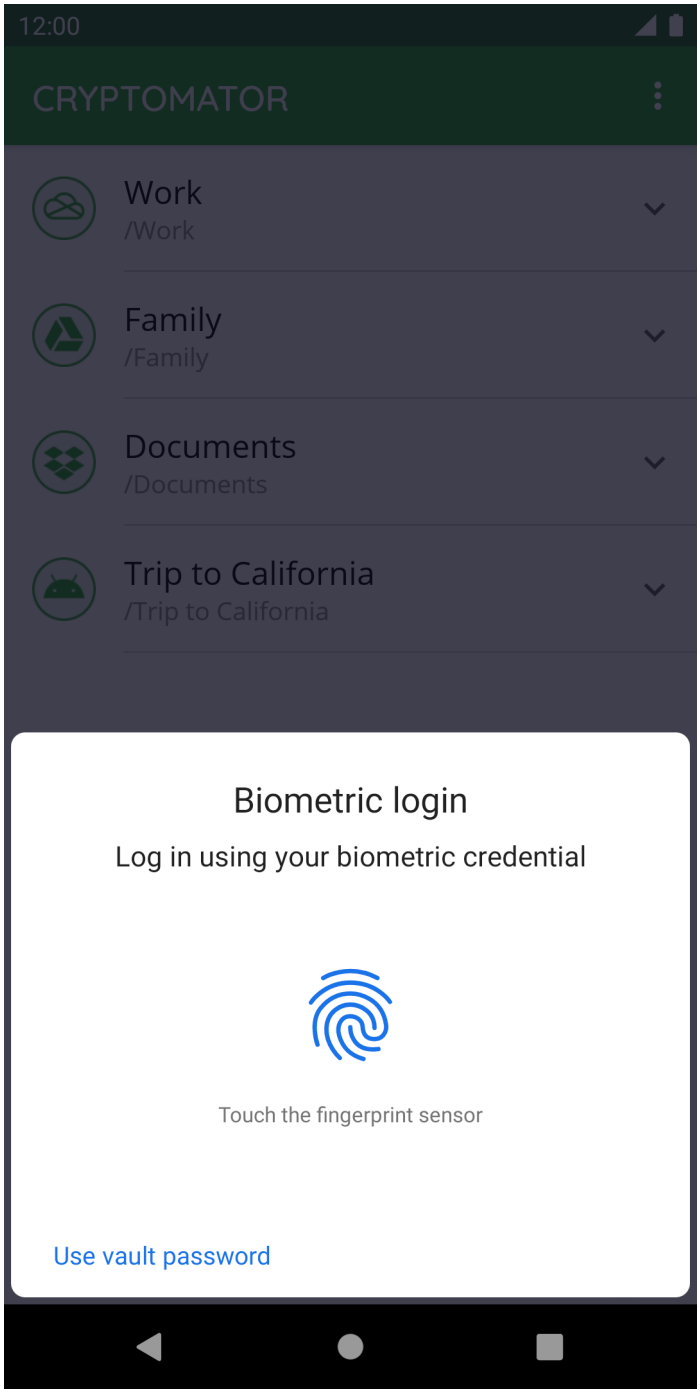
11.1 Unlock Vault

If you want to access the data inside a vault, you have to unlock it by selecting it.

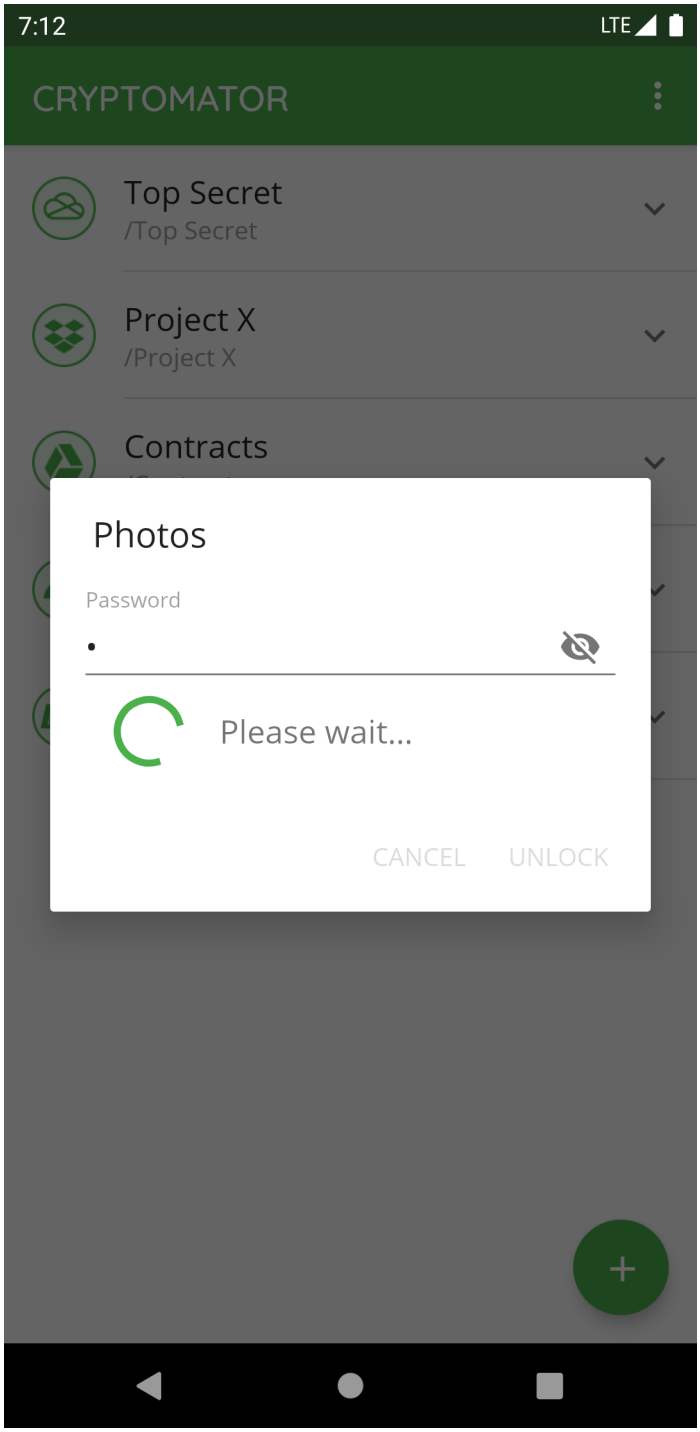


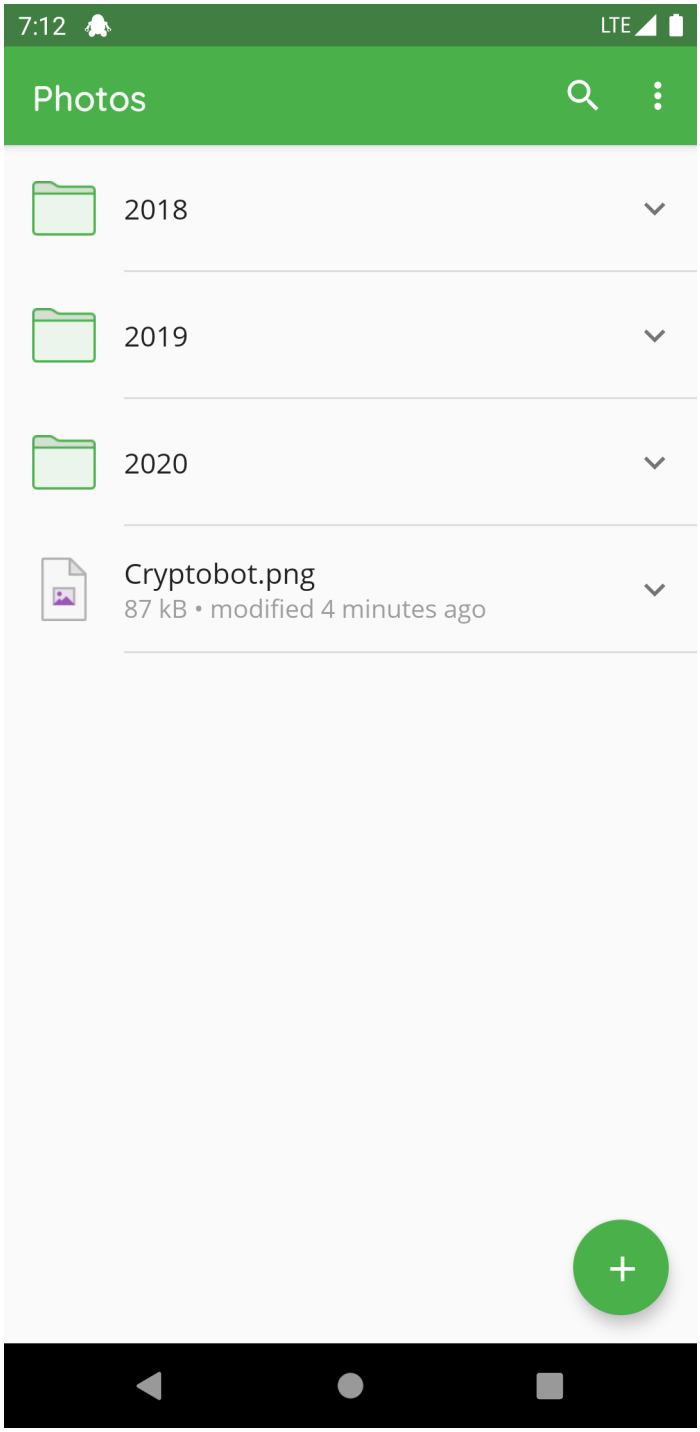
In the next step, you have to unlock the vault using the password. If the device supports fingerprint authentication and you've activated it in the settings for this vault, you will be prompted to unlock using fingerprint. How to setup fingerprint authentication will be documented in a separate chapter.


7:12
LTE
CRYPTOMATOR
Top Secret
/Top Secret
Photos
Password
CANCEL
UNLOCK
Photos
/Photos
1 2 3 4 5 6 7 8 9 0
q w e r t y u i o p
a s d f g h j k l
z x c v b n m
?123
,
.



After providing the credentials, the vault gets unlocked and opened.


7:12
LTE
CRYPTOMATOR
Top Secret
/Top Secret
Project X
/Project X
Contracts
Photos
Password
Please wait...
CANCEL
UNLOCK

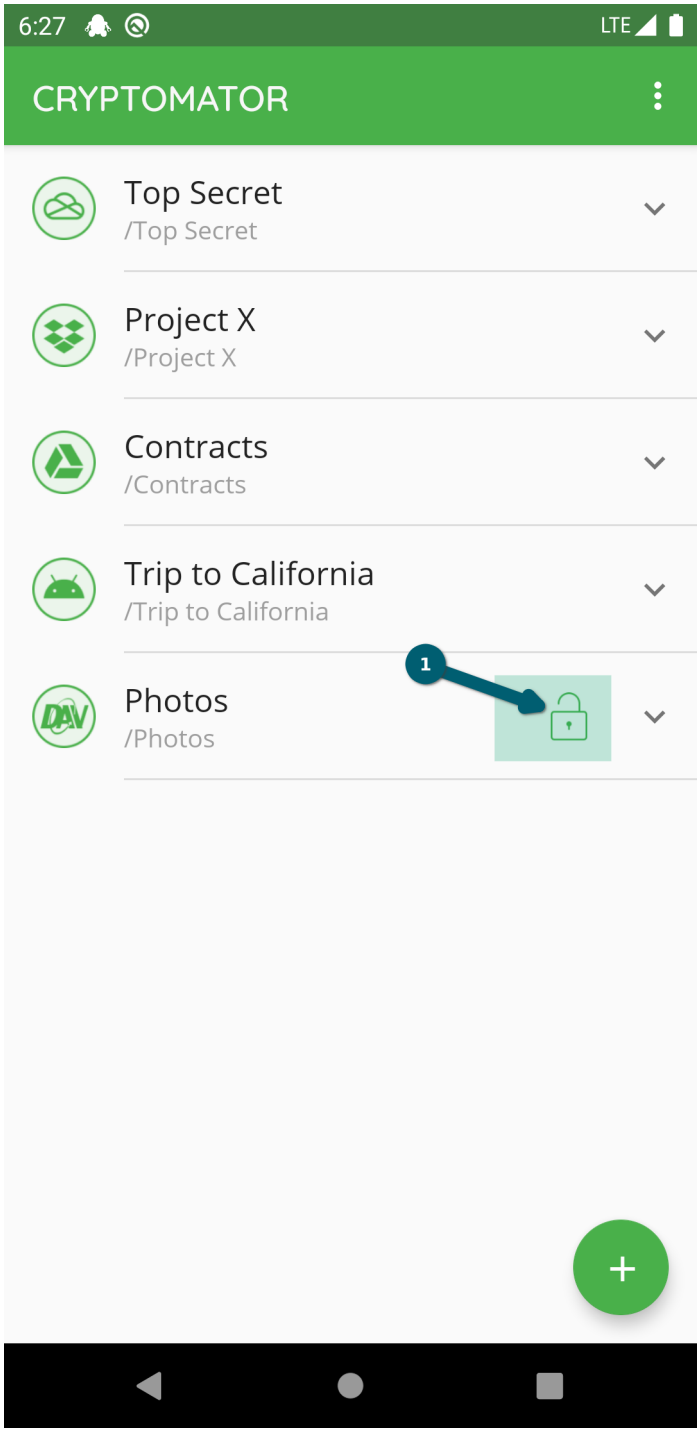


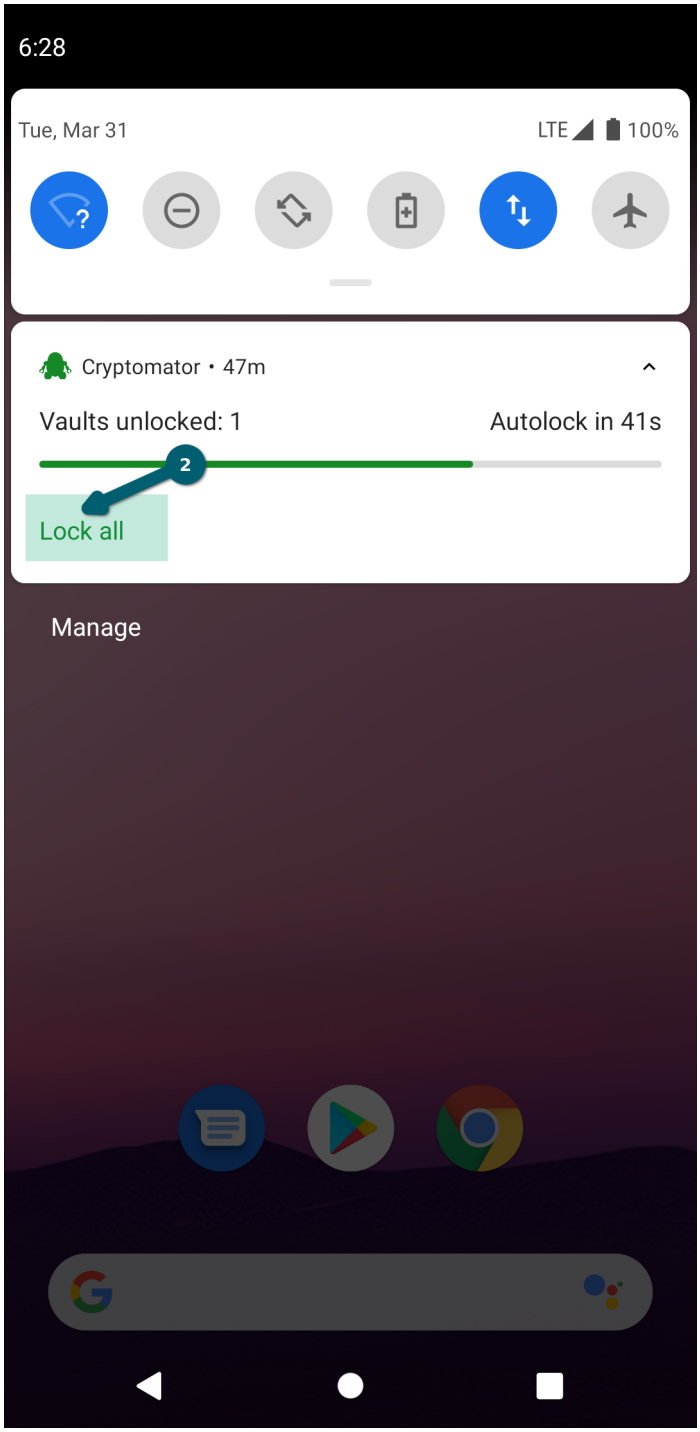
You're now able to edit the content of the vault.

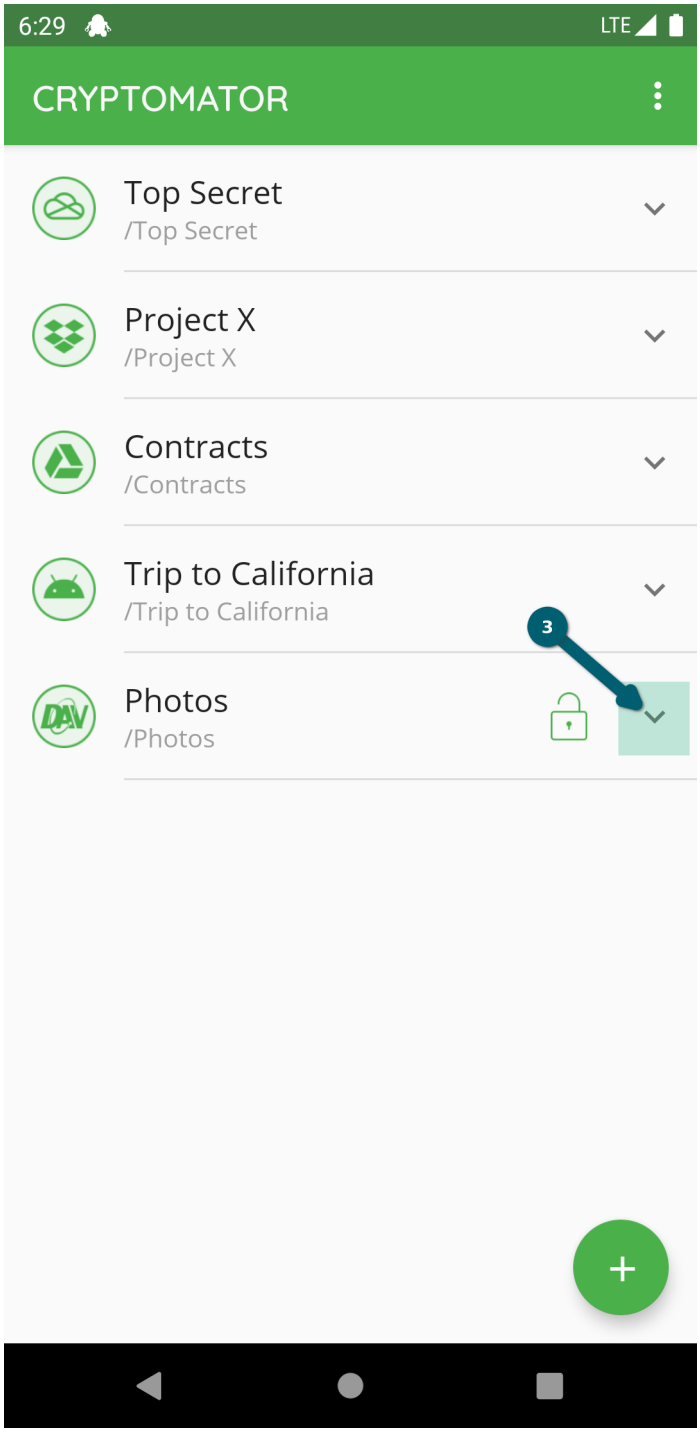
11.2 Lock Vault

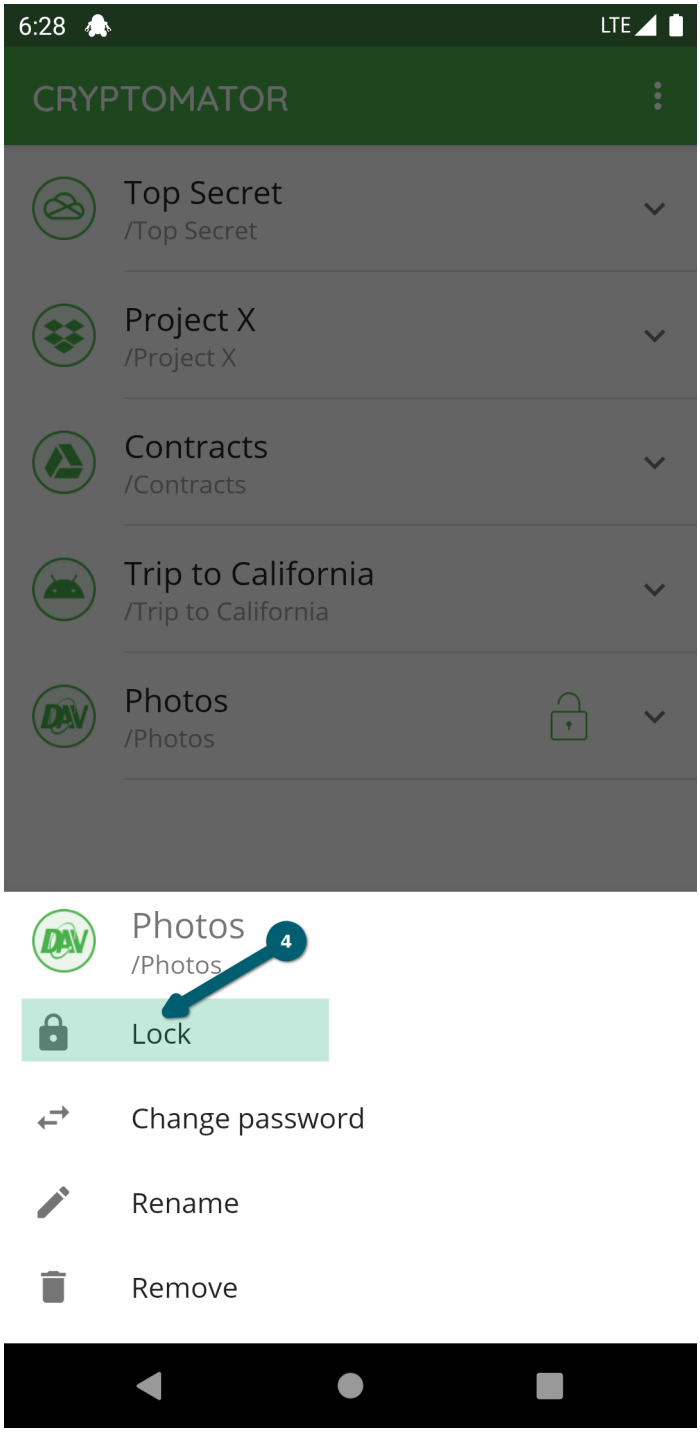
To lock an unlocked vault, there are several ways to do this:

- use the lock button in the vault list
- use the lock button in the notification
- use the lock button in the vault actions and

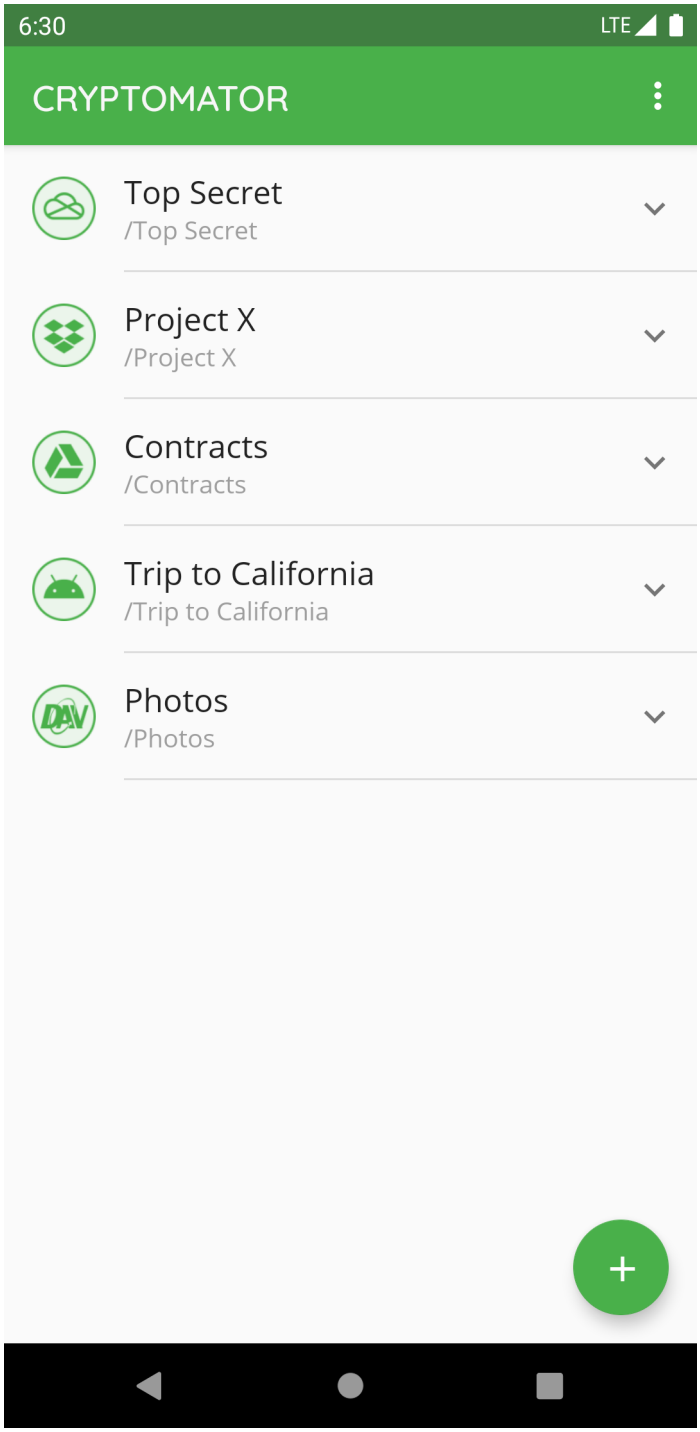



6:28
Tue, Mar 31
LTE 100%
Cryptomator • 47m
Vaults unlocked: 1
Autolock in 41s
2
Lock all
Manage


6:29
LTE
CRYPTOMATOR
Top Secret
/Top Secret
Project X
/Project X
Contracts
/Contracts
Trip to California
/Trip to California
3
Photos
/Photos



All of the possibilities will result in the locked vault.



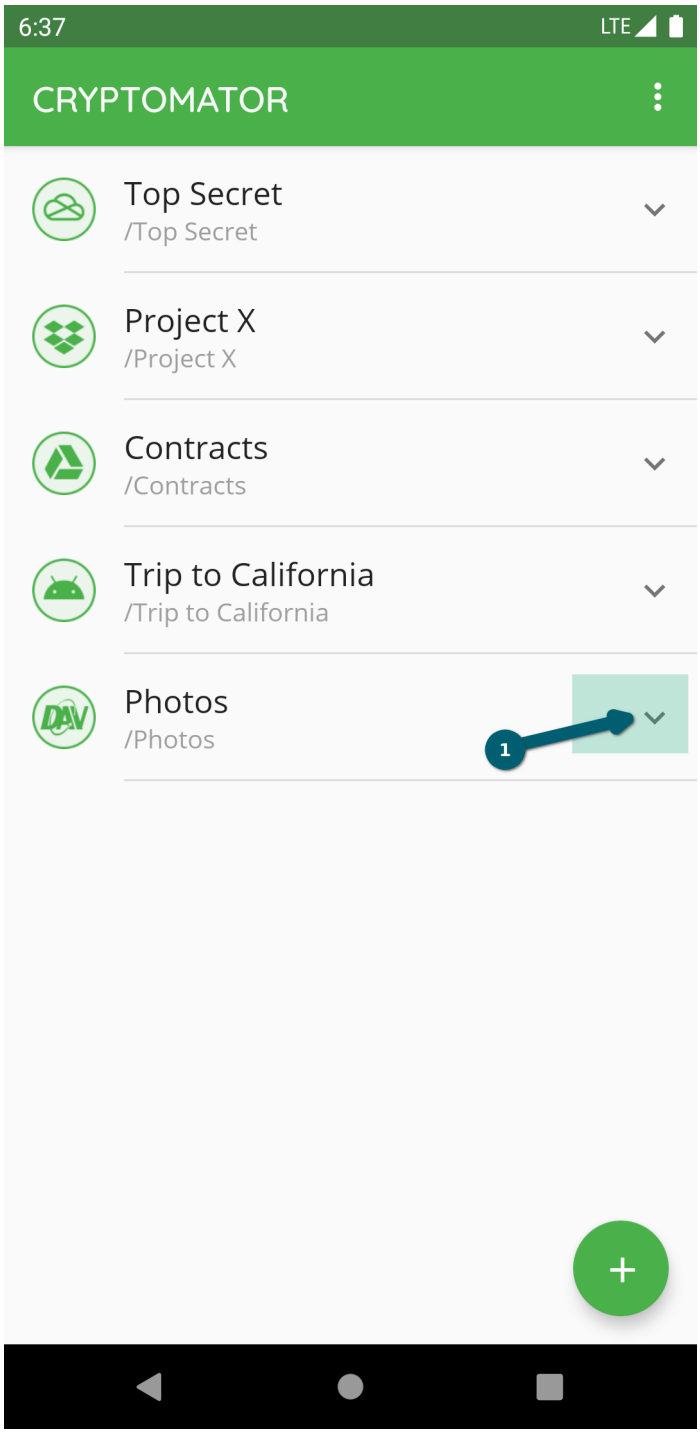
Note: The auto-lock timeout specified in the settings will lock the vault if Cryptomator is in background. Furthermore if not changed in settings, the vault gets locked if the screen turns off.

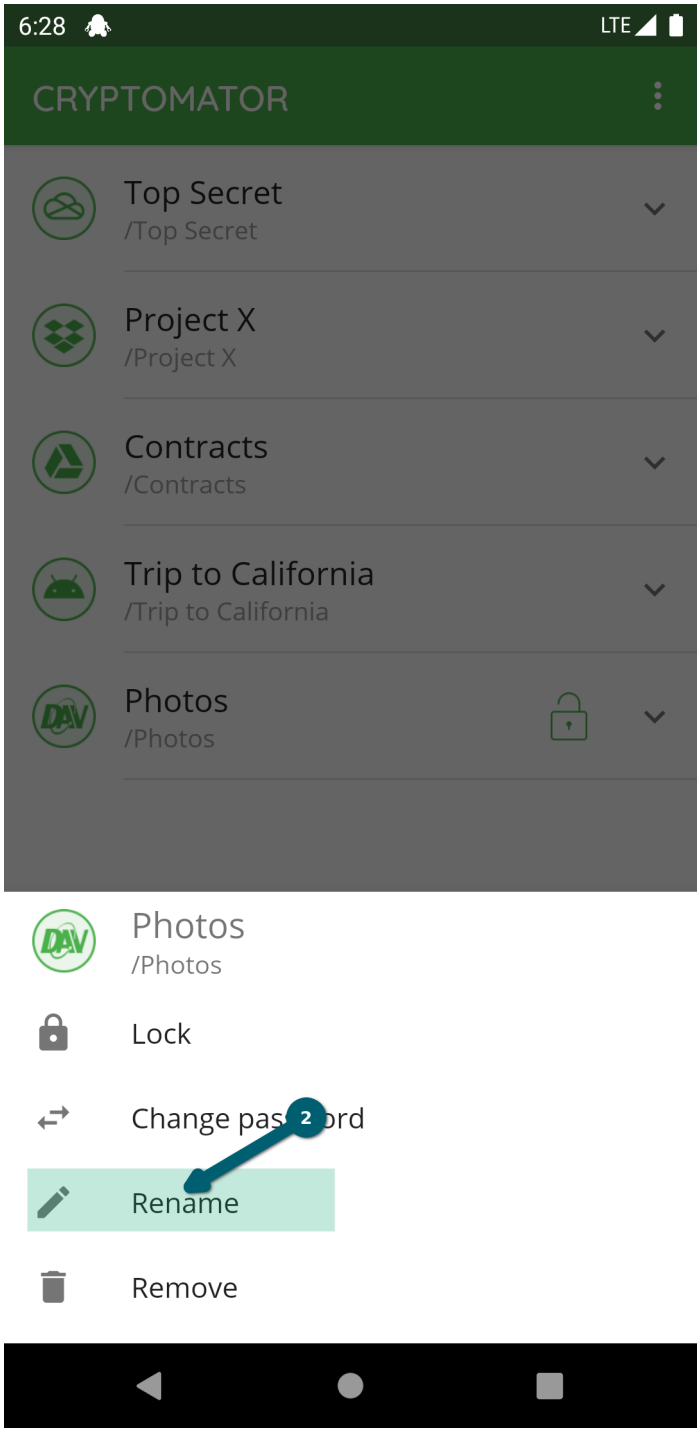
11.3 View and Edit File

Start the view and edit process by clicking on a file. Finish the editing or viewing using the back button of the device until you're back in Cryptomator. If the content has changed, the upload process starts.

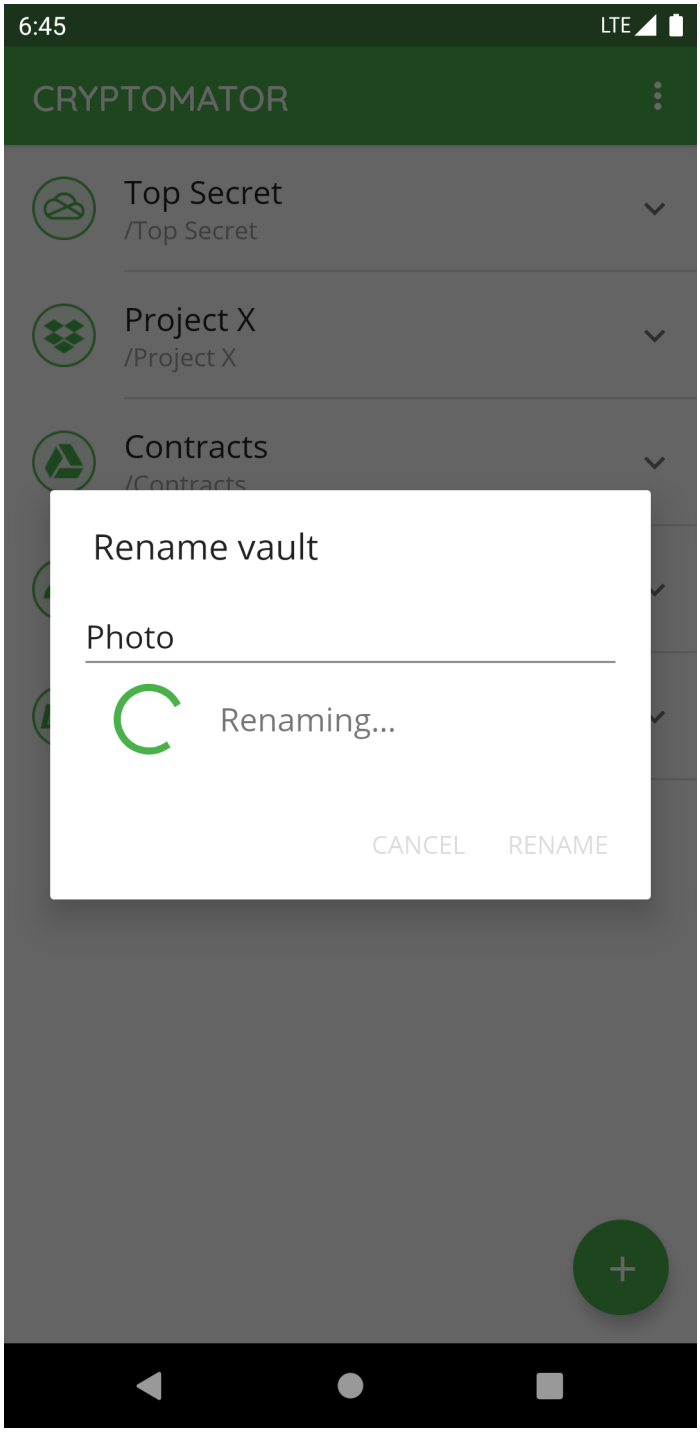
11.4 Rename File or Folder

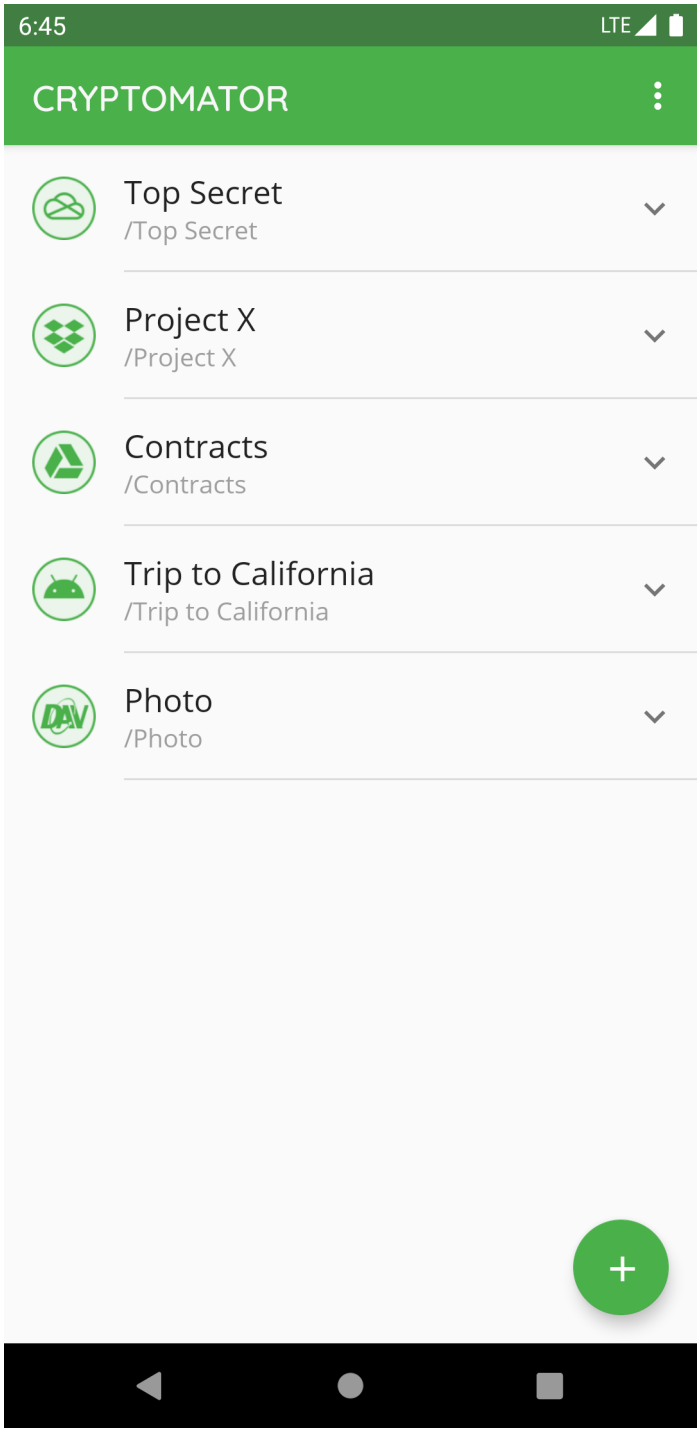
To change the name of a specific file or folder in Cryptomator, you select the `V` next to the file or folder and choose *Rename* .





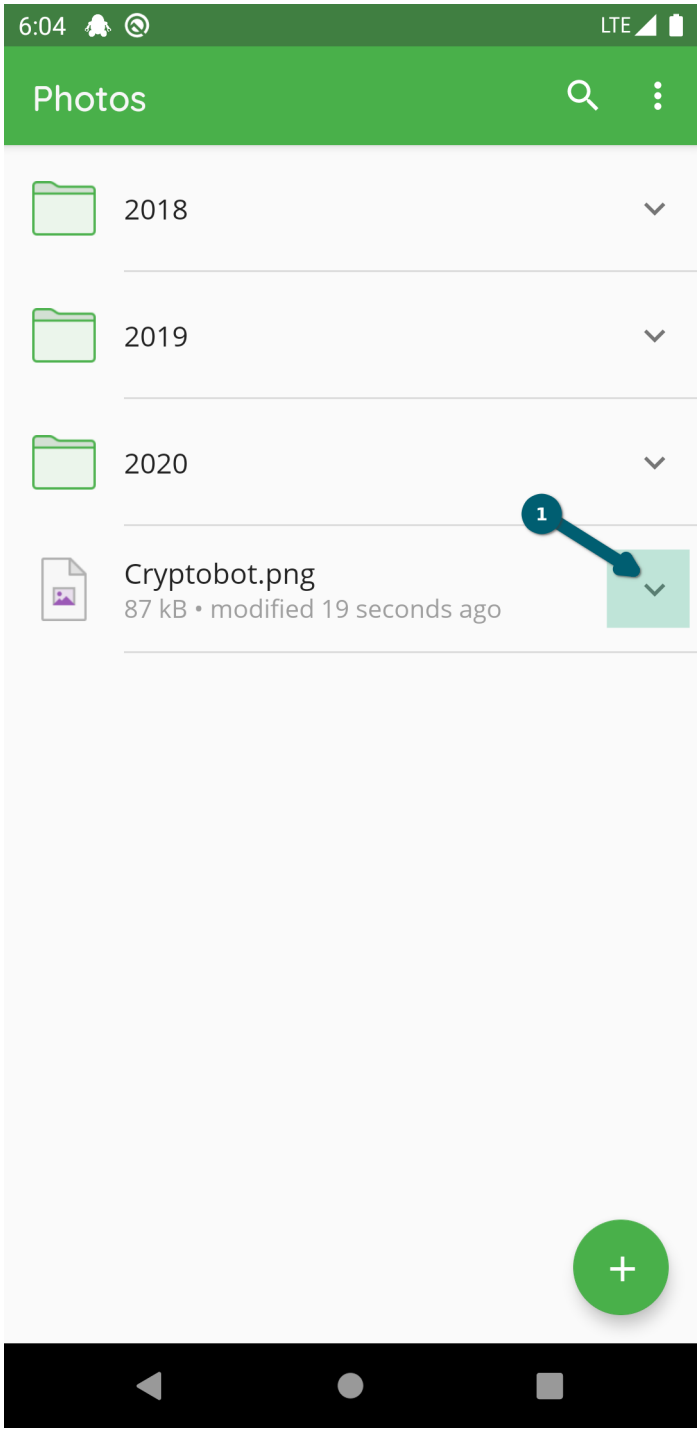
Choose a new name and confirm using the `RENAME` button.

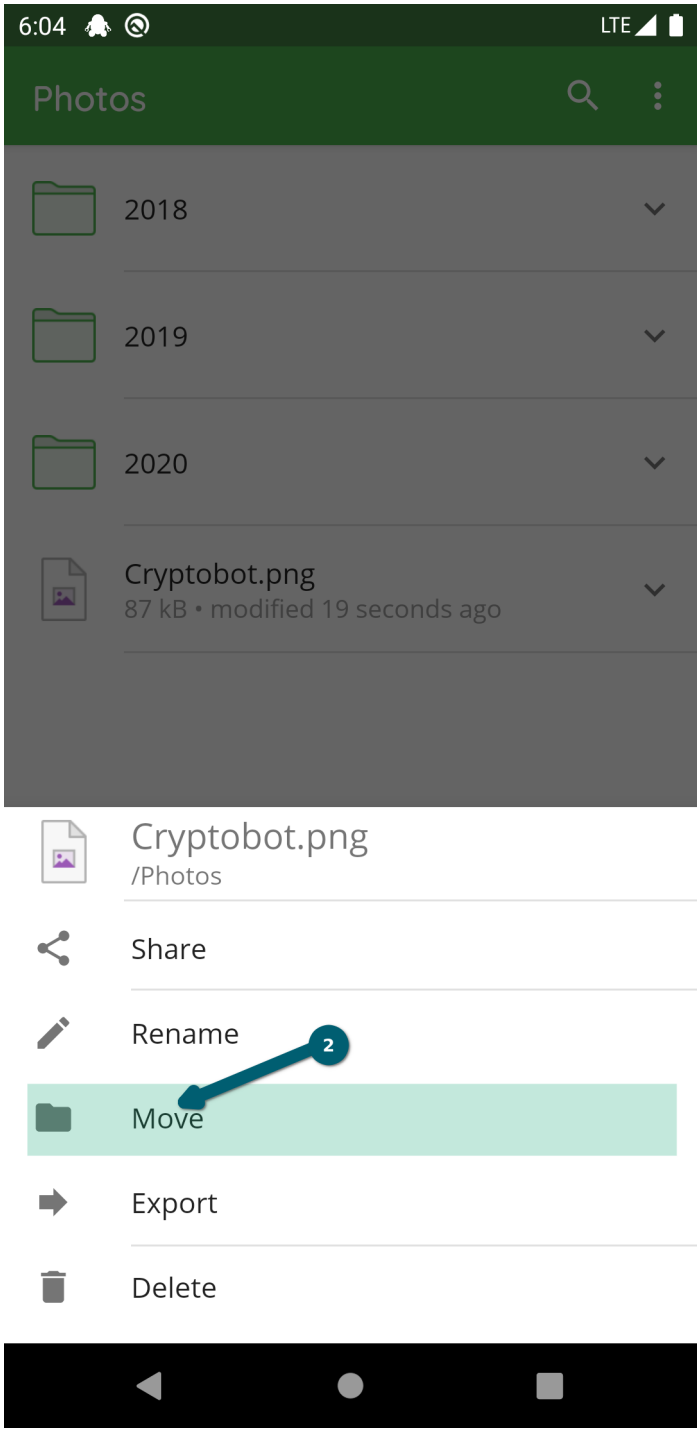

6:45
LTE
CRYPTOMATOR
Top Secret
/Top Secret
Project X
/Project X
Contracts
Rename vault
Photo
Renaming...
CANCEL
RENAME


6:45
LTE
CRYPTOMATOR
Top Secret
/Top Secret
Project X
/Project X
Contracts
/Contracts
Trip to California
/Trip to California
Photo
/Photo

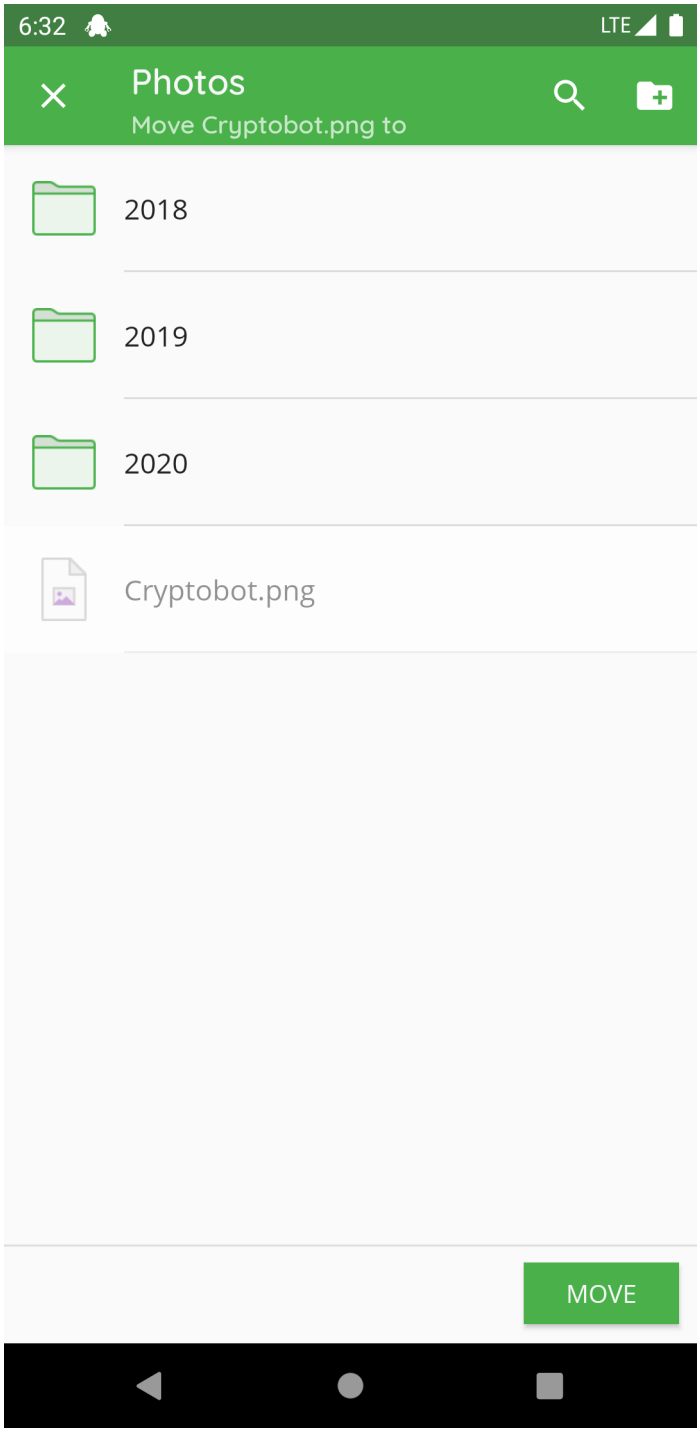
11.5 Move File or Folder

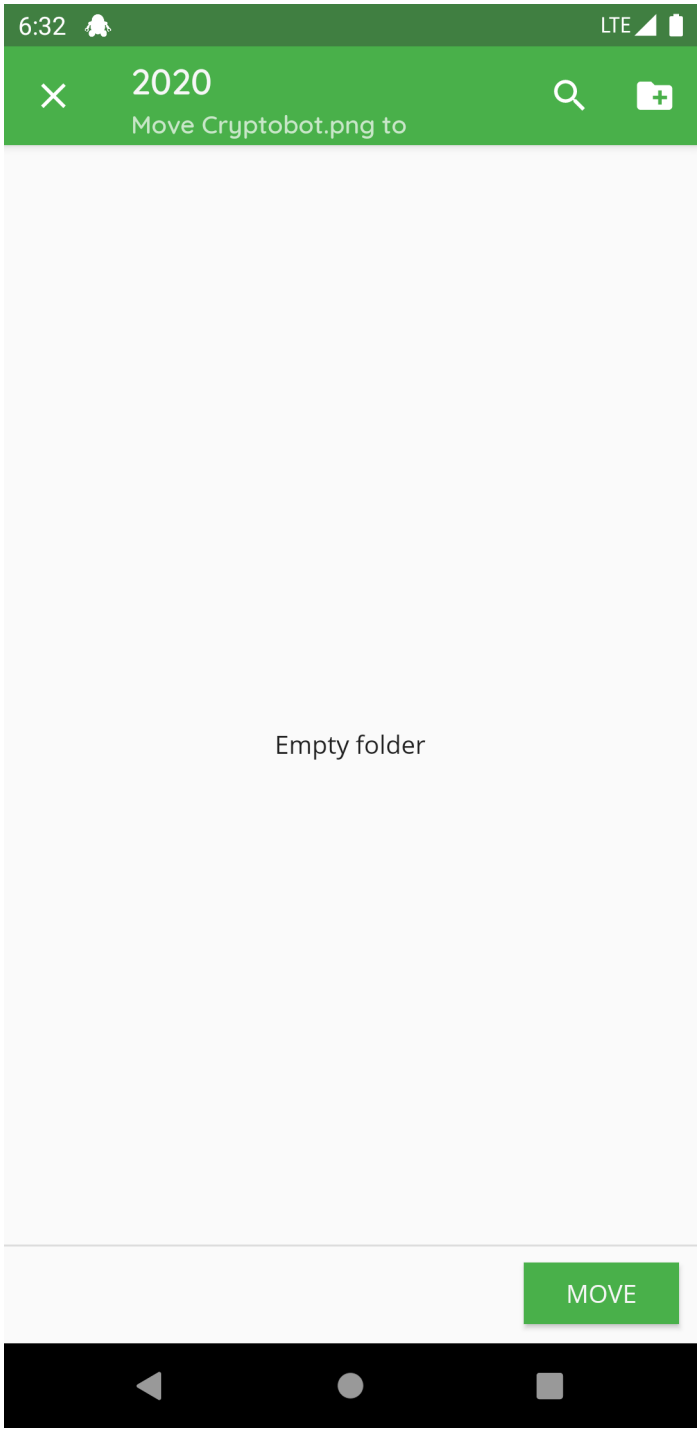
To move a file or a folder into another folder, you select the `V` next to the file or folder and choose *Move* .



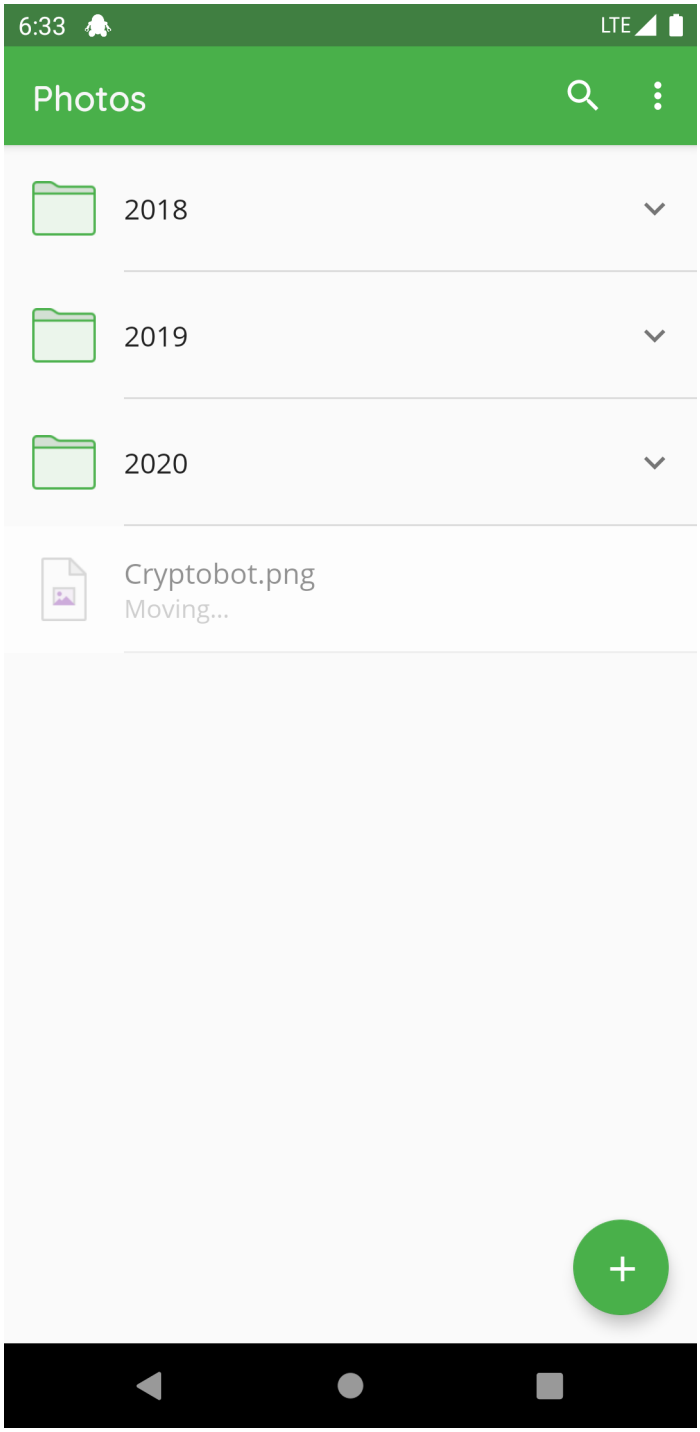


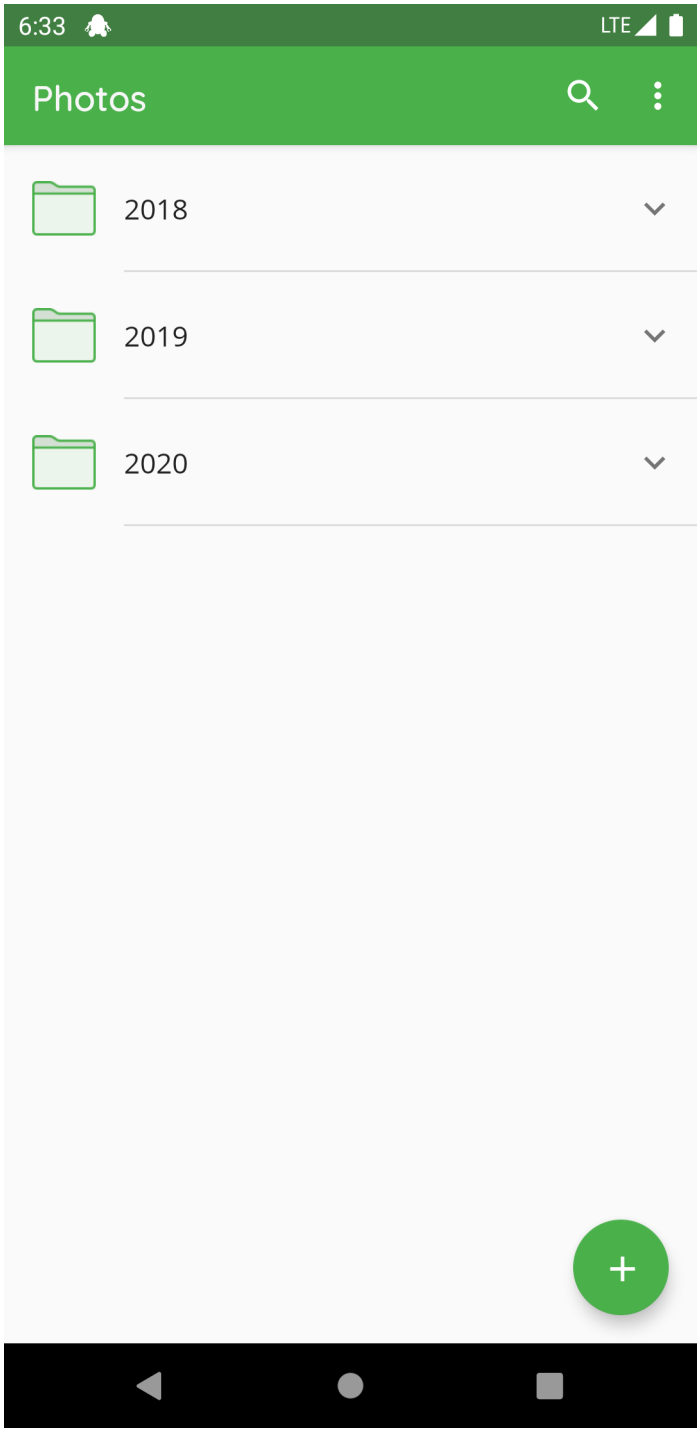
Choose a new location by selecting a folder or by pressing the back button of your phone to navigate to the parent folder.


6:32
LTE
Photos
Move Cryptobot.png to
2018
2019
2020
Cryptobot.png
MOVE

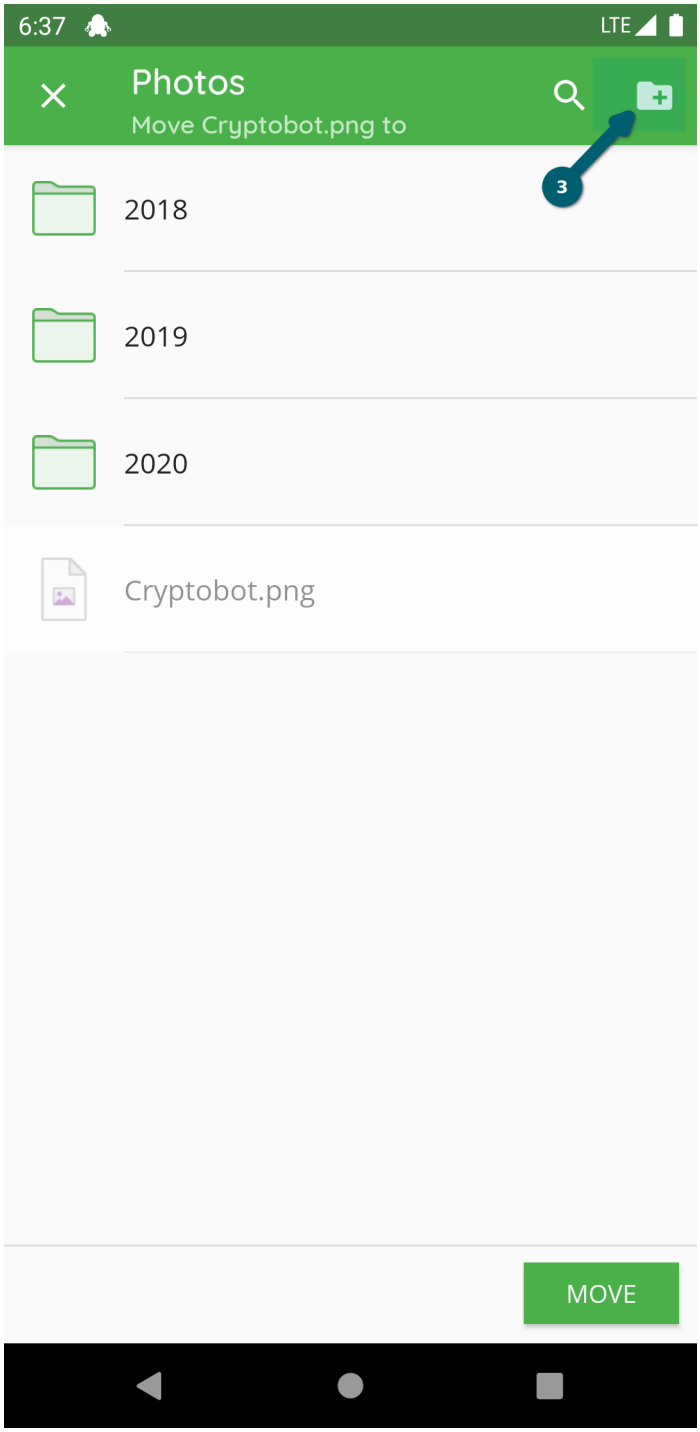


Confirm using the `MOVE` button.


6:33
LTE
Photos
2018
2019
2020
Cryptobot.png
Moving...

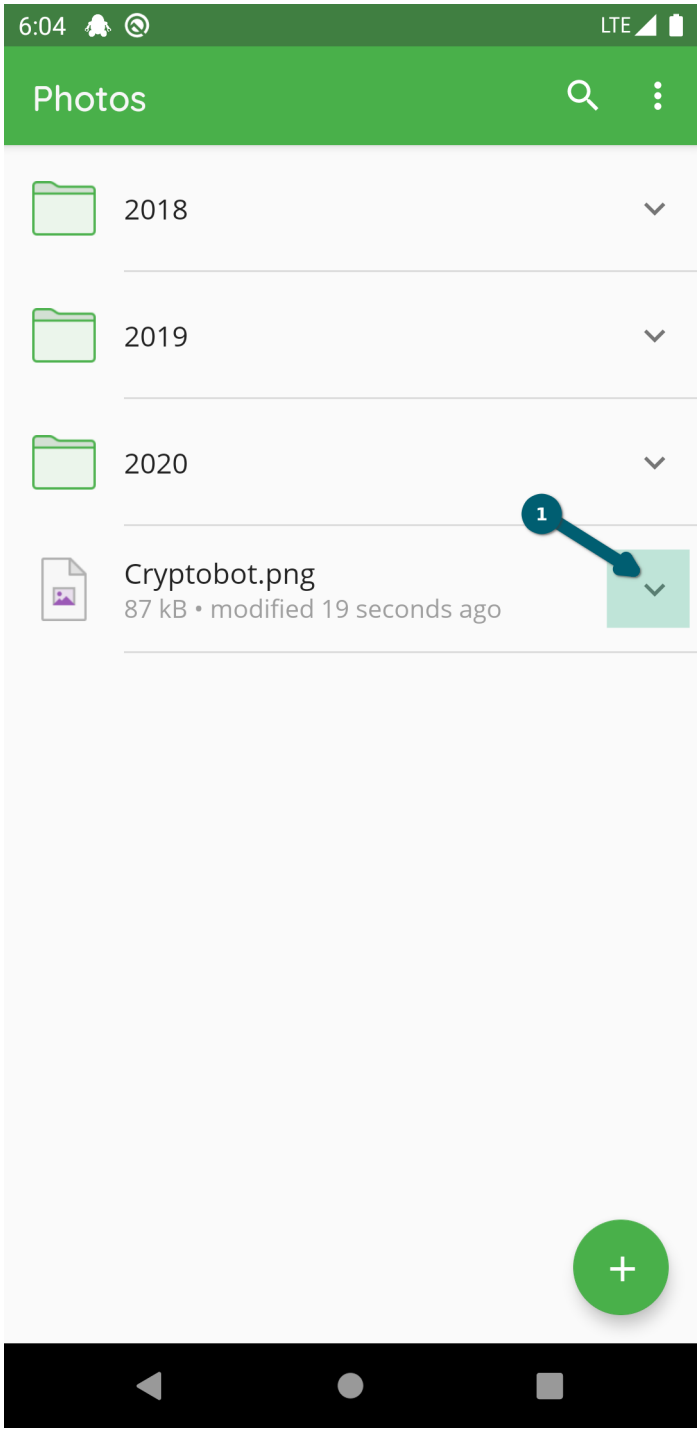


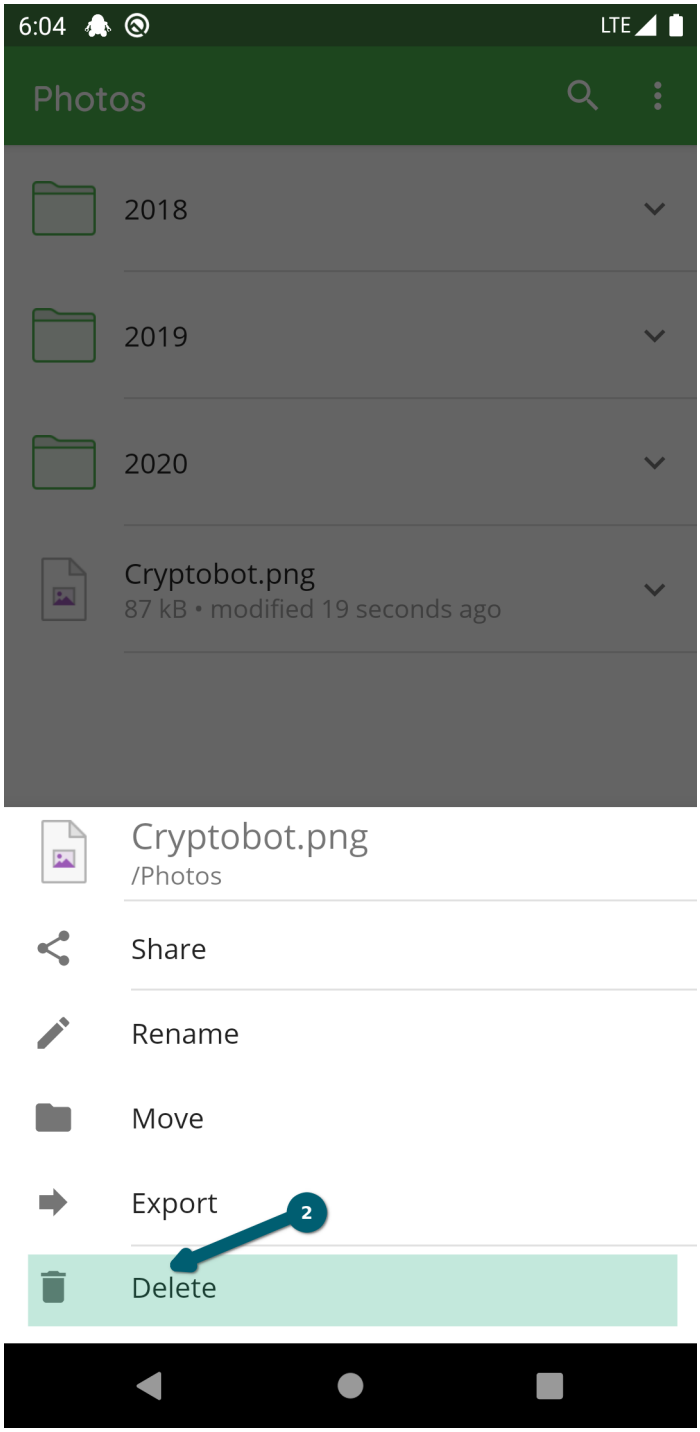
While moving, you can use the button to create a new folder in the current folder.


6:37
LTE
Photos
Move Cryptobot.png to
3
2018
2019
2020
Cryptobot.png
MOVE

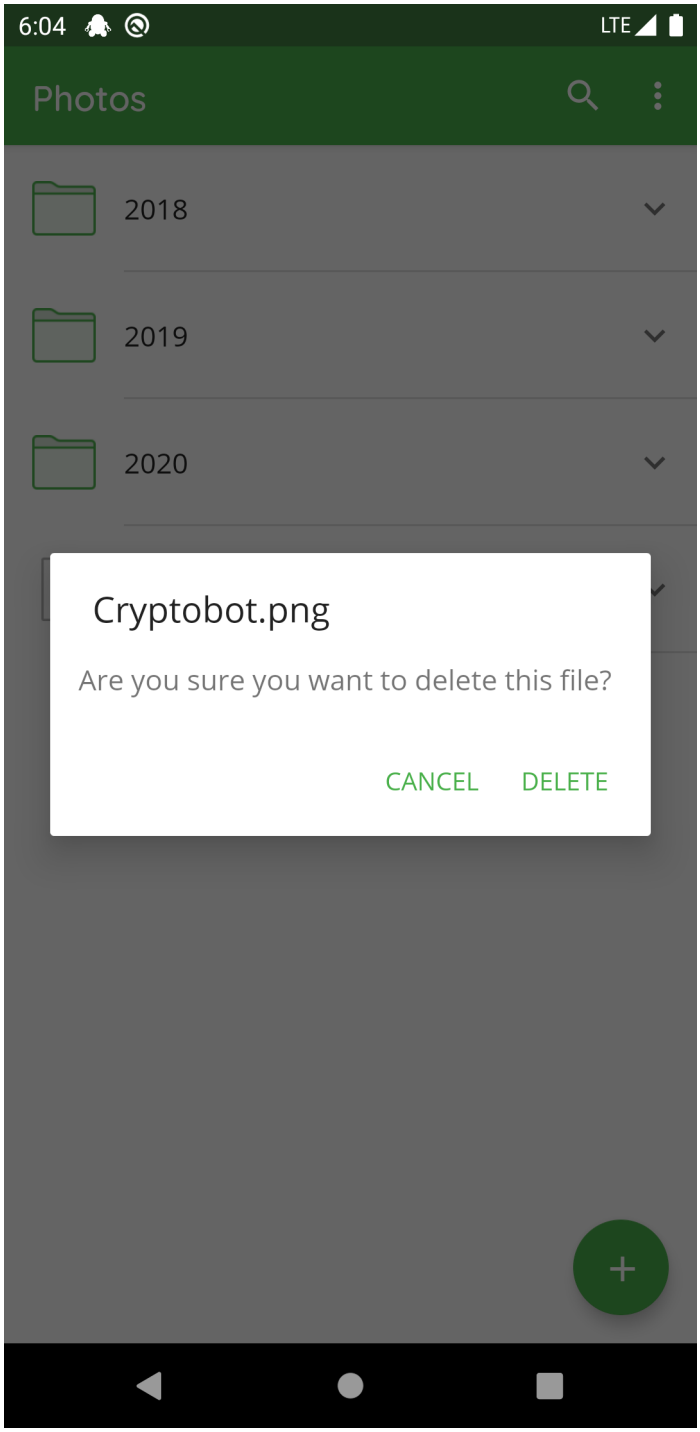
11.6 Delete File or Folder

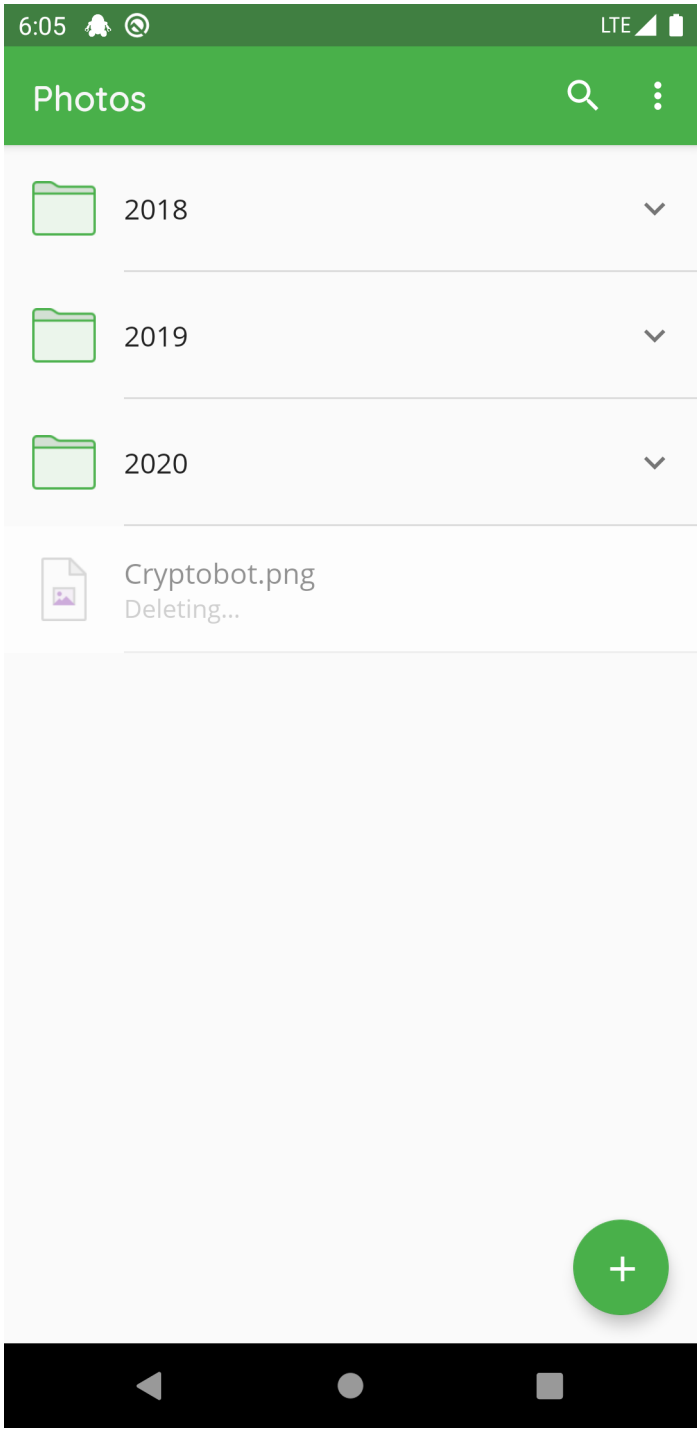
To delete a specific file or folder in Cryptomator, you select the `V` next to the file or folder and choose *Delete* .

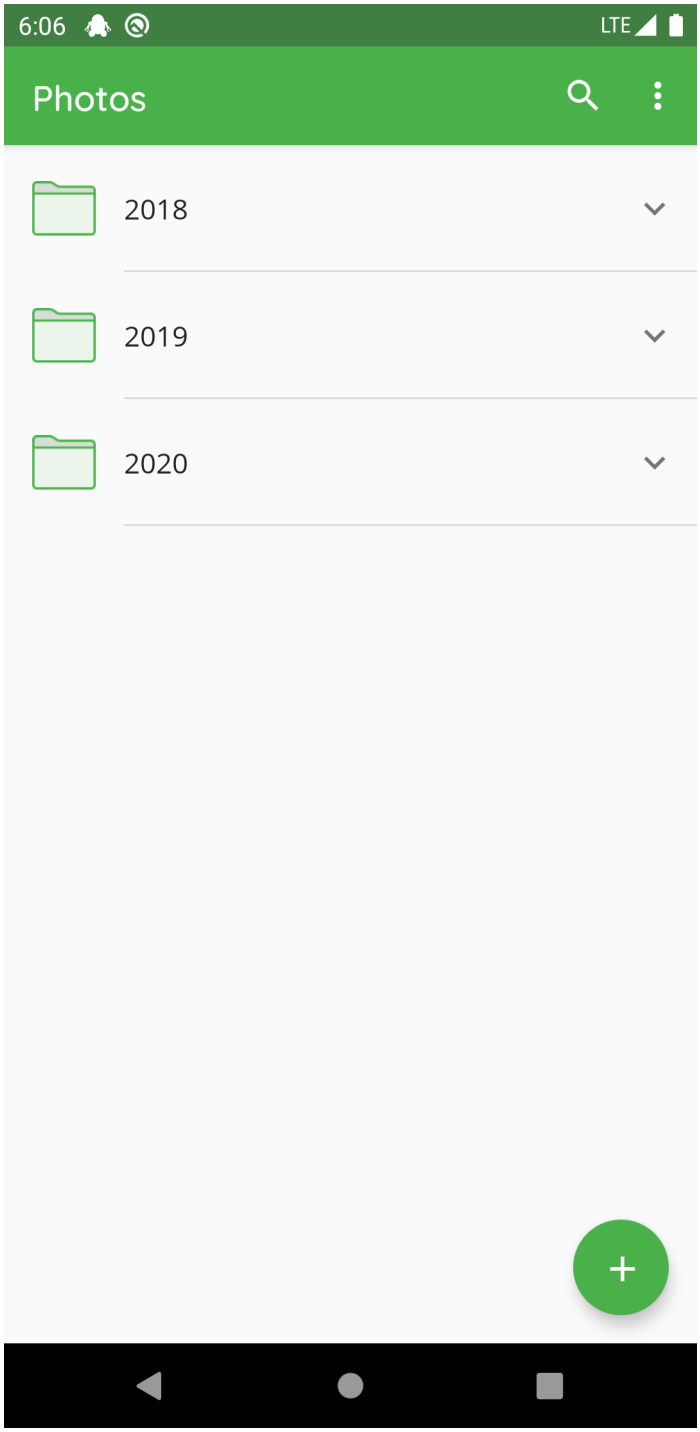




Confirm the deletion process using the DELETE button.


6:04
LTE
Photos
2018
2019
2020
Cryptobot.png
Are you sure you want to delete this file?
CANCEL
DELETE

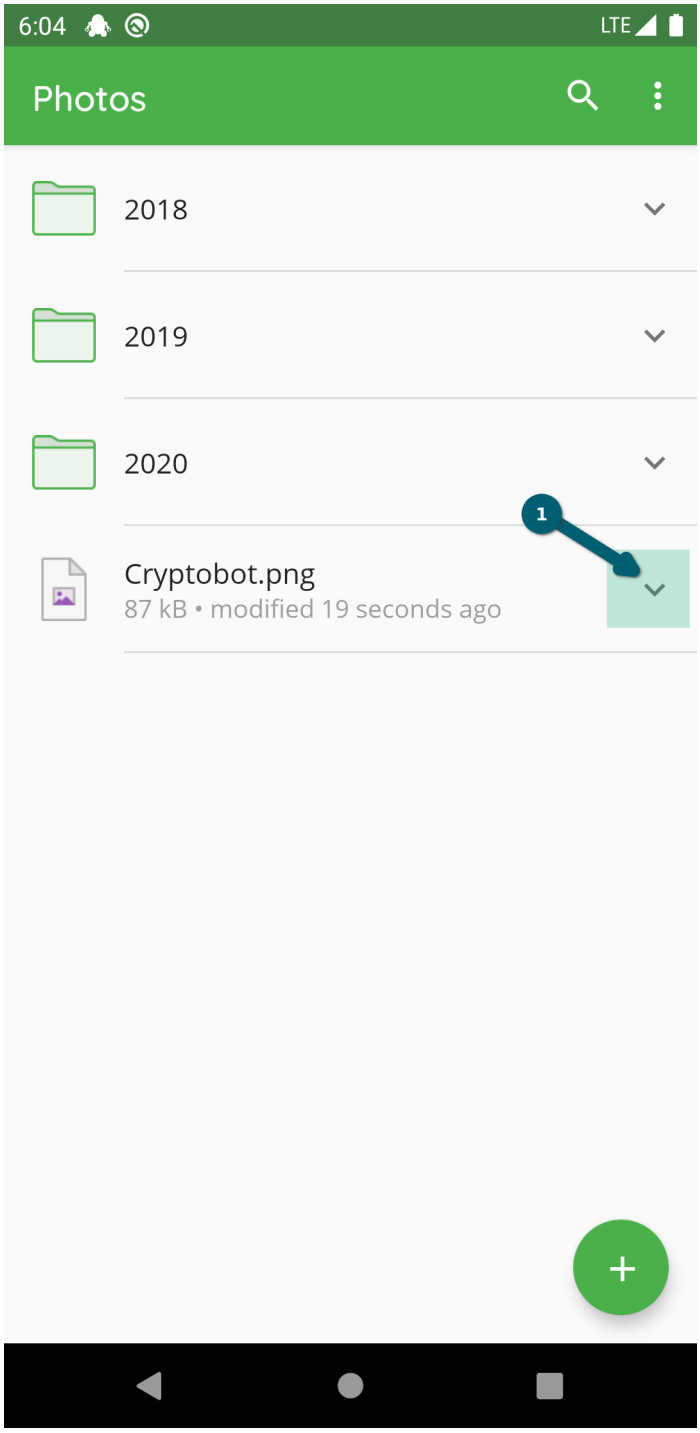

6:05
LTE
Photos
2018
2019
2020
Cryptobot.png
Deleting...

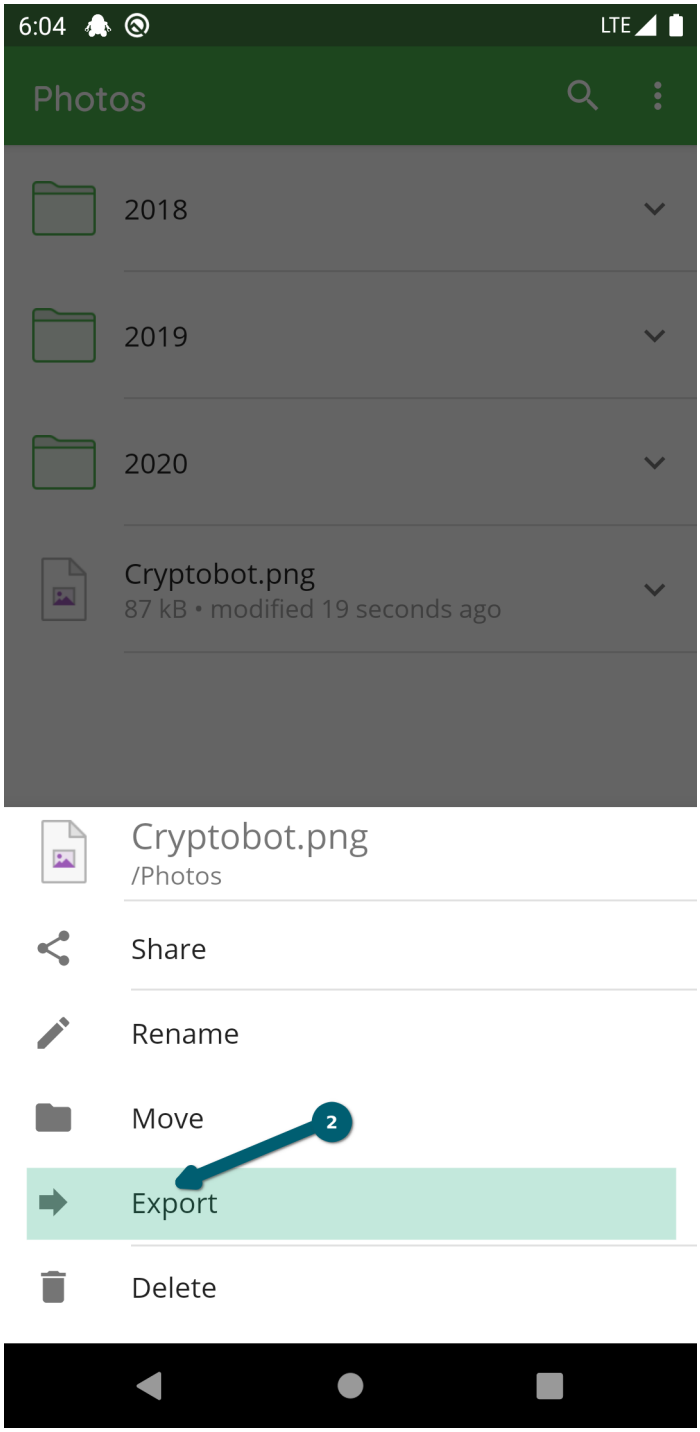


Note: By deleting a folder, all subfolders and files inside are deleted recursively.

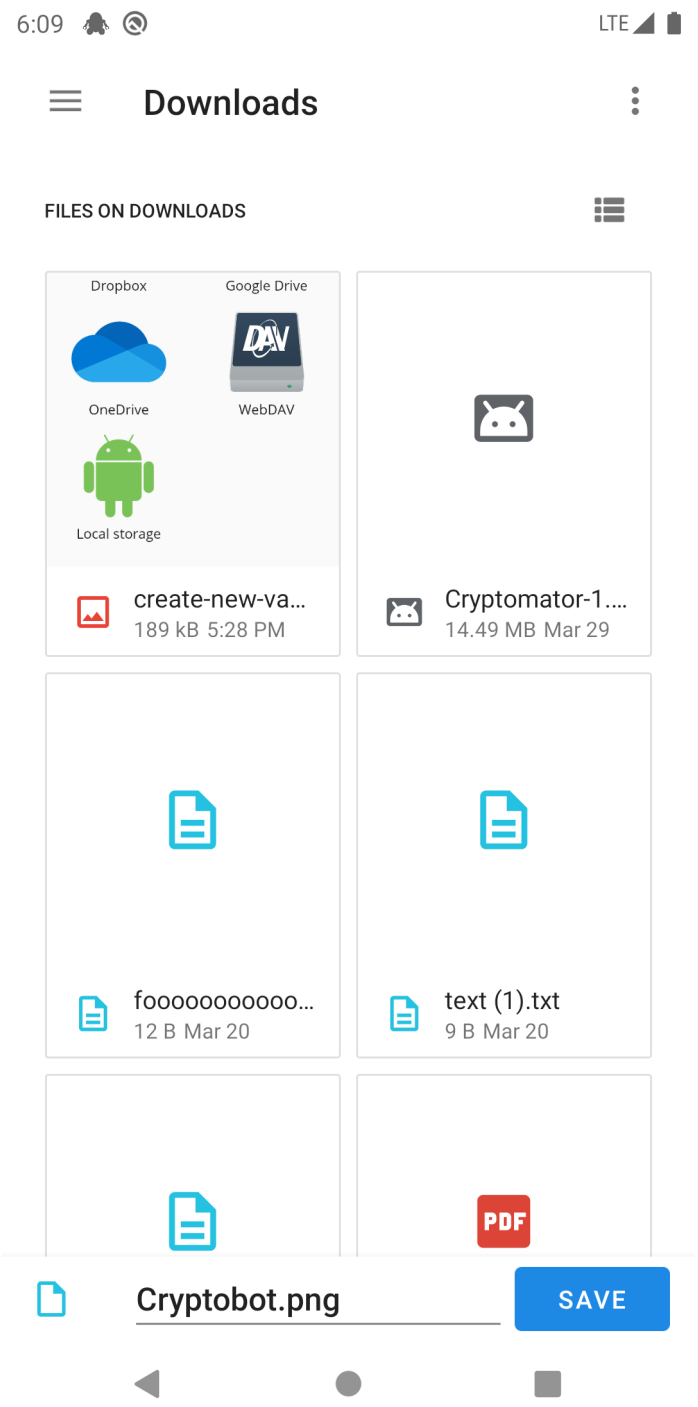
11.7 Export File or Folder

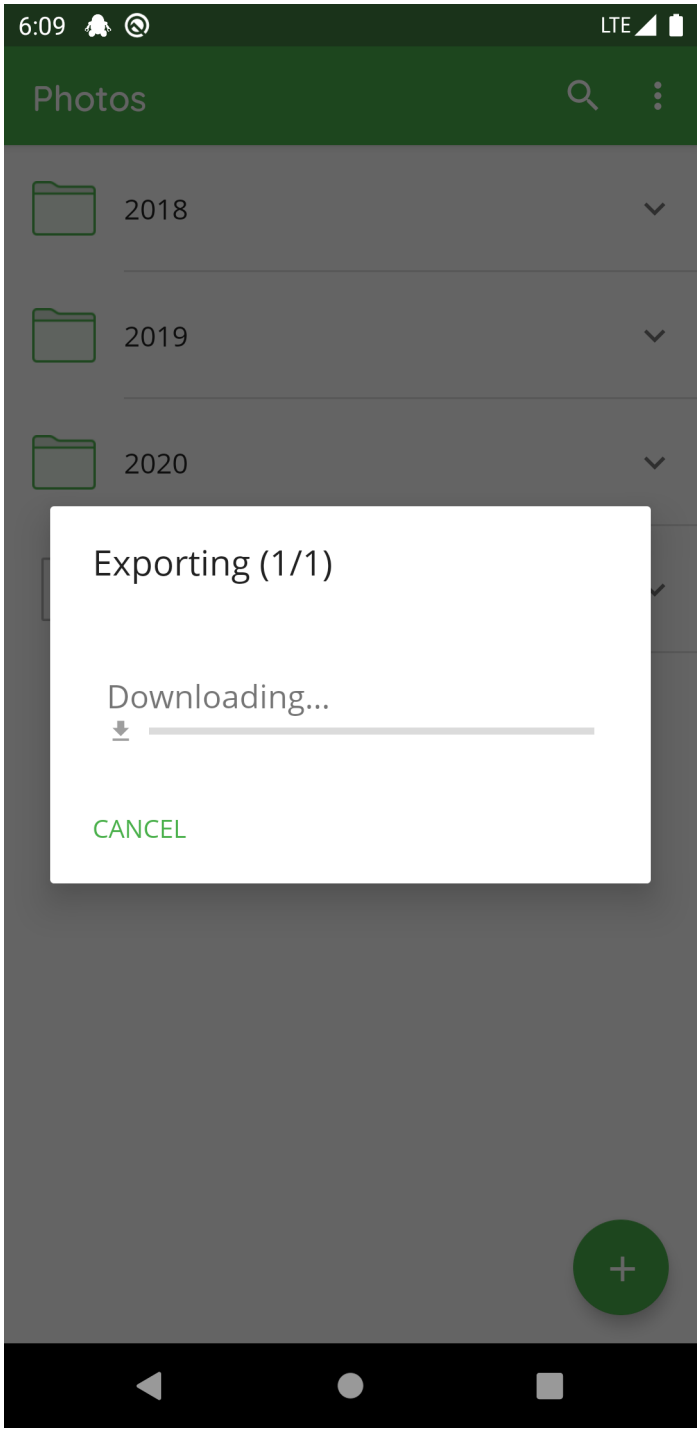
To export a specific file or folder in Cryptomator, you select the ⋁ next to the file or folder and choose *Export* .

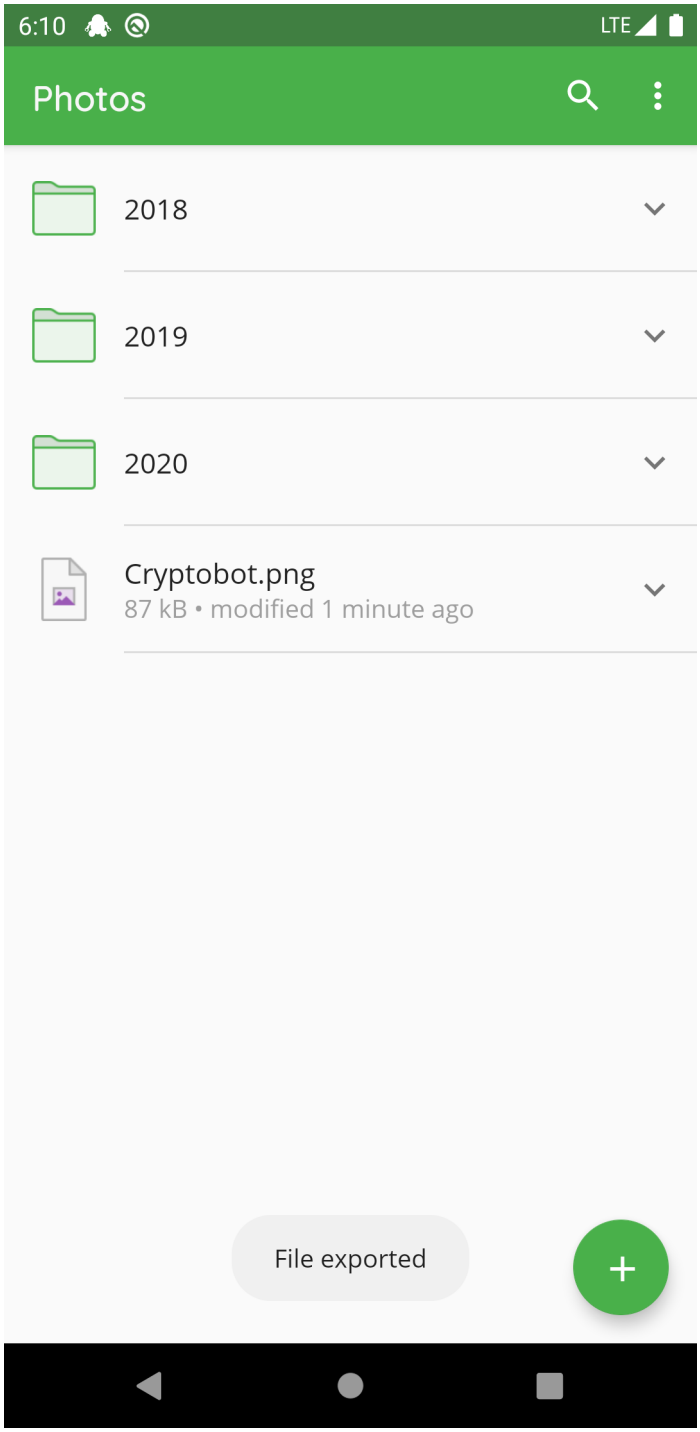




Chose the target location where the file or folder should be exported to.

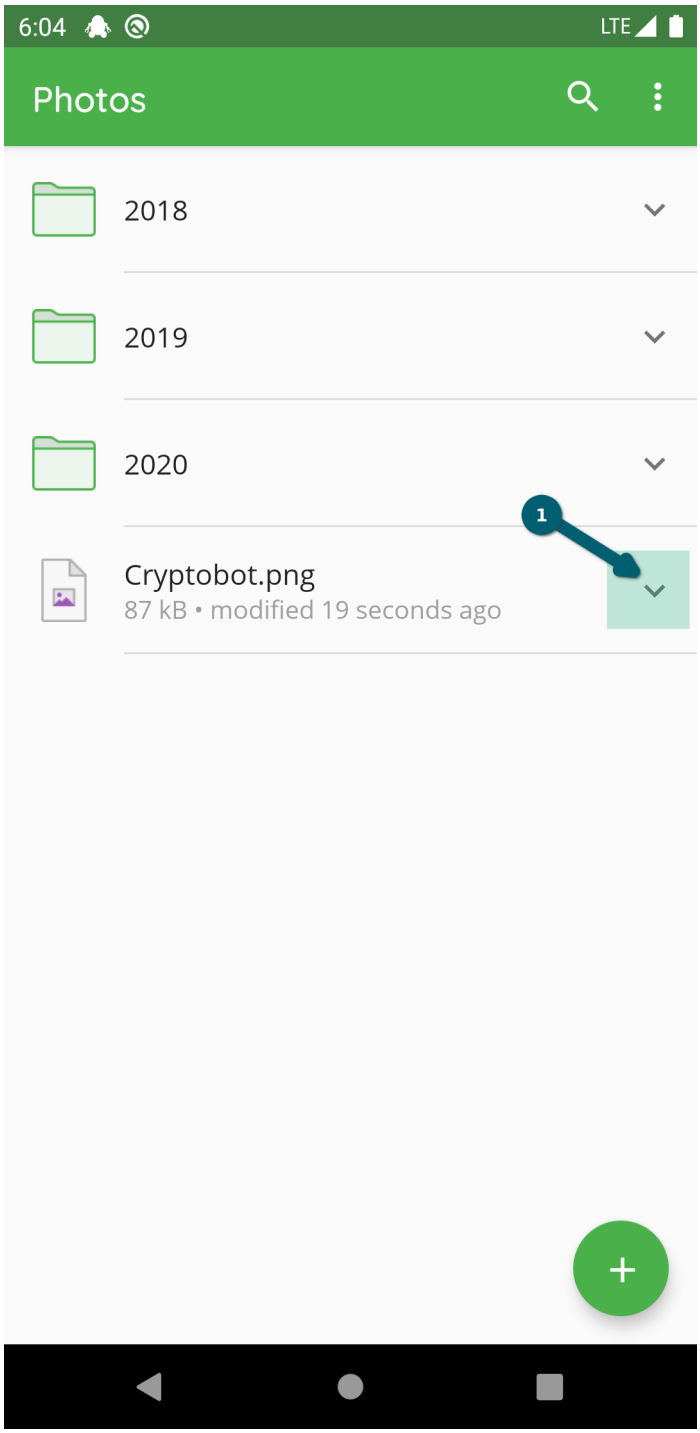

6:09
LTE
Downloads
FILES ON DOWNLOADS
Dropbox
Google Drive
OneDrive
WebDAV
Local storage
create-new-va...
189 kB 5:28 PM
Cryptomator-1....
14.49 MB Mar 29
fooooooooooo...
12 B Mar 20
text (1).txt
9 B Mar 20
PDF
Cryptobot.png
SAVE

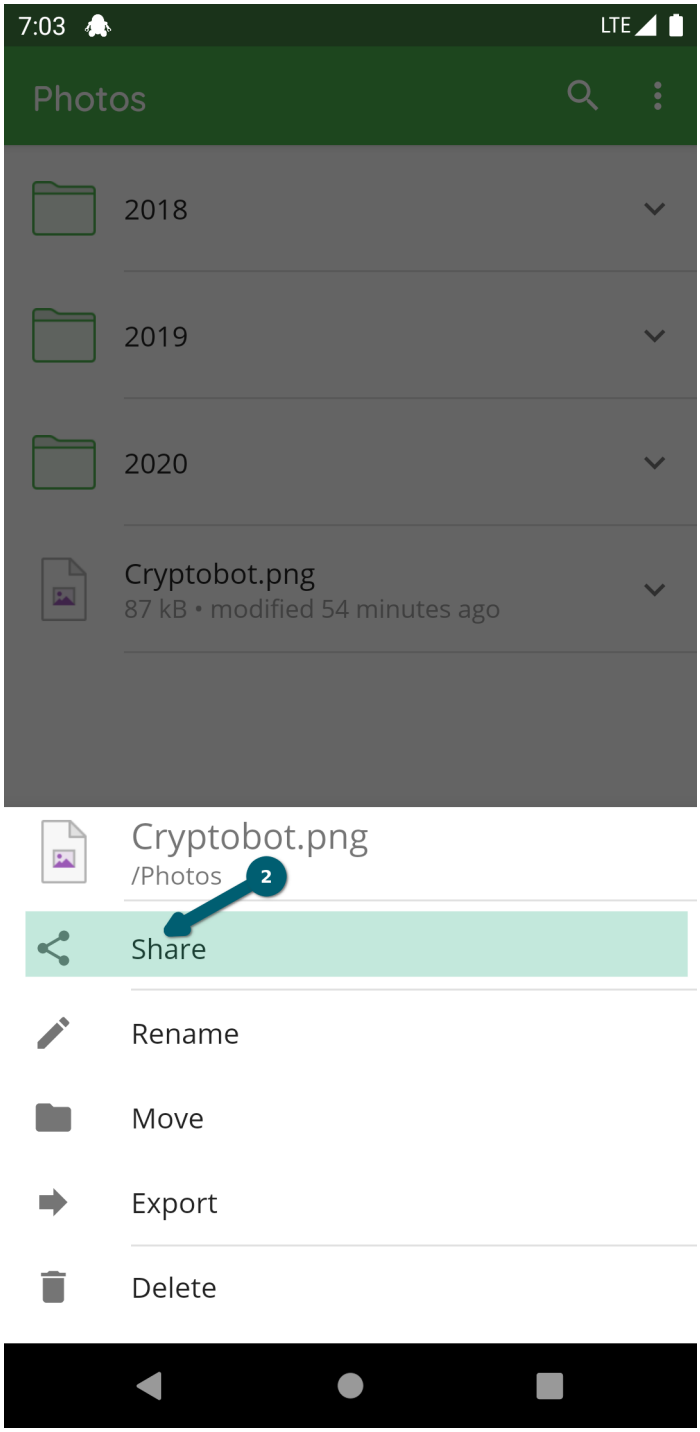

6:09
LTE
Photos
2018
2019
2020
Exporting (1/1)
Downloading...
CANCEL


6:10
LTE
Photos
2018
2019
2020
Cryptobot.png
87 kB • modified 1 minute ago
File exported

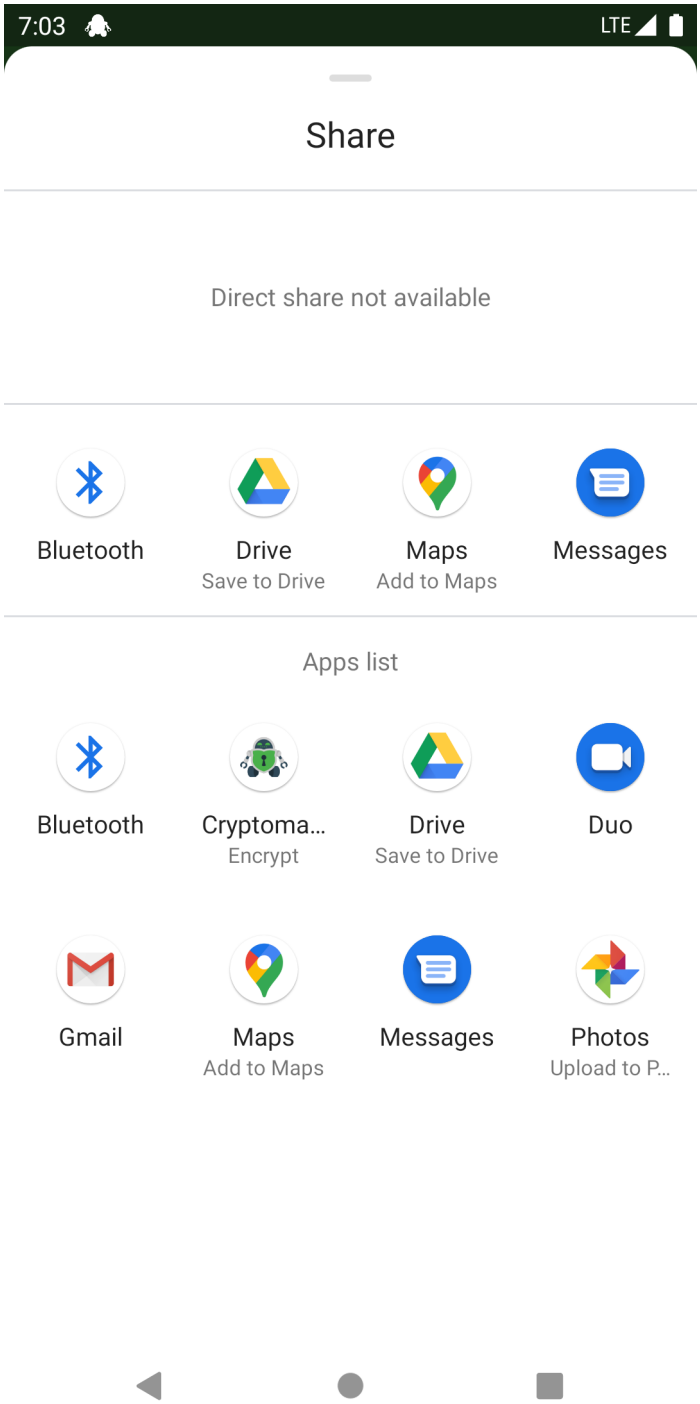
11.8 Share File with Other App

To share a specific file or folder in Cryptomator with another app, you select the ⋁ next to the file or folder and choose Share .





Choose the target app in which you will use the file or folder.

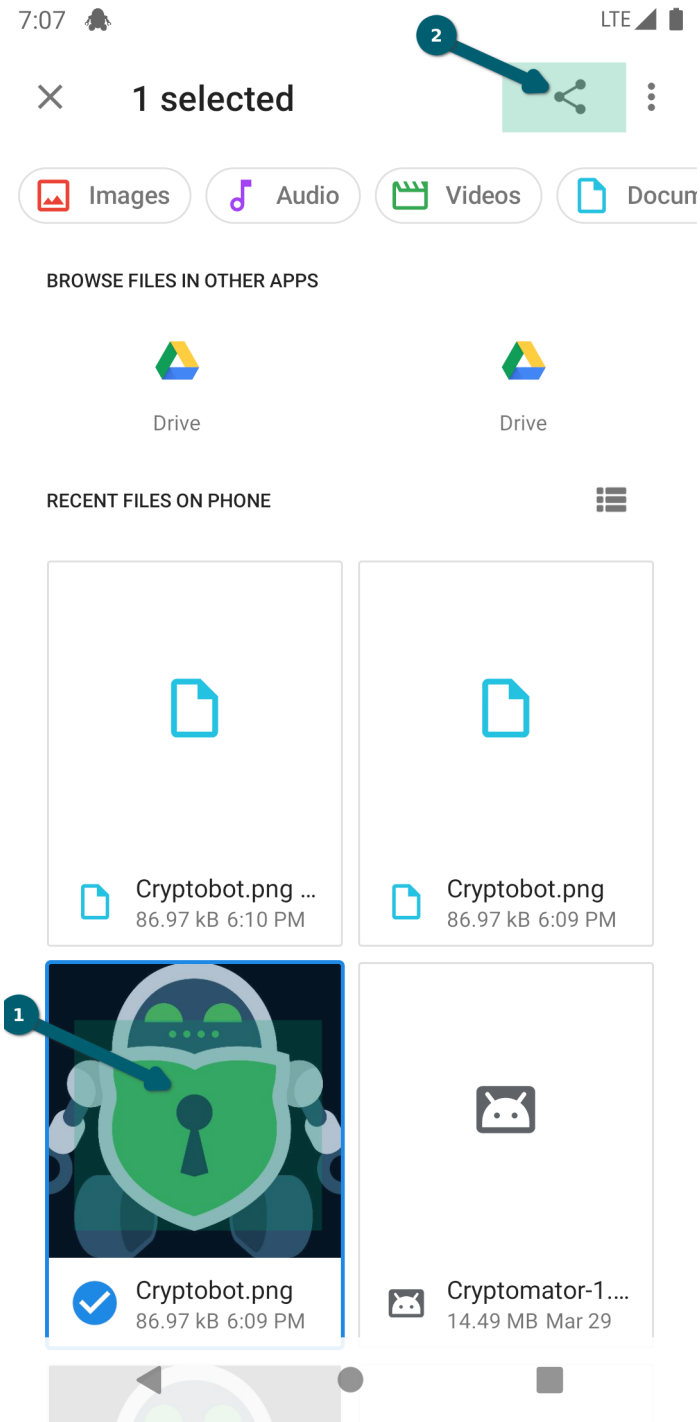


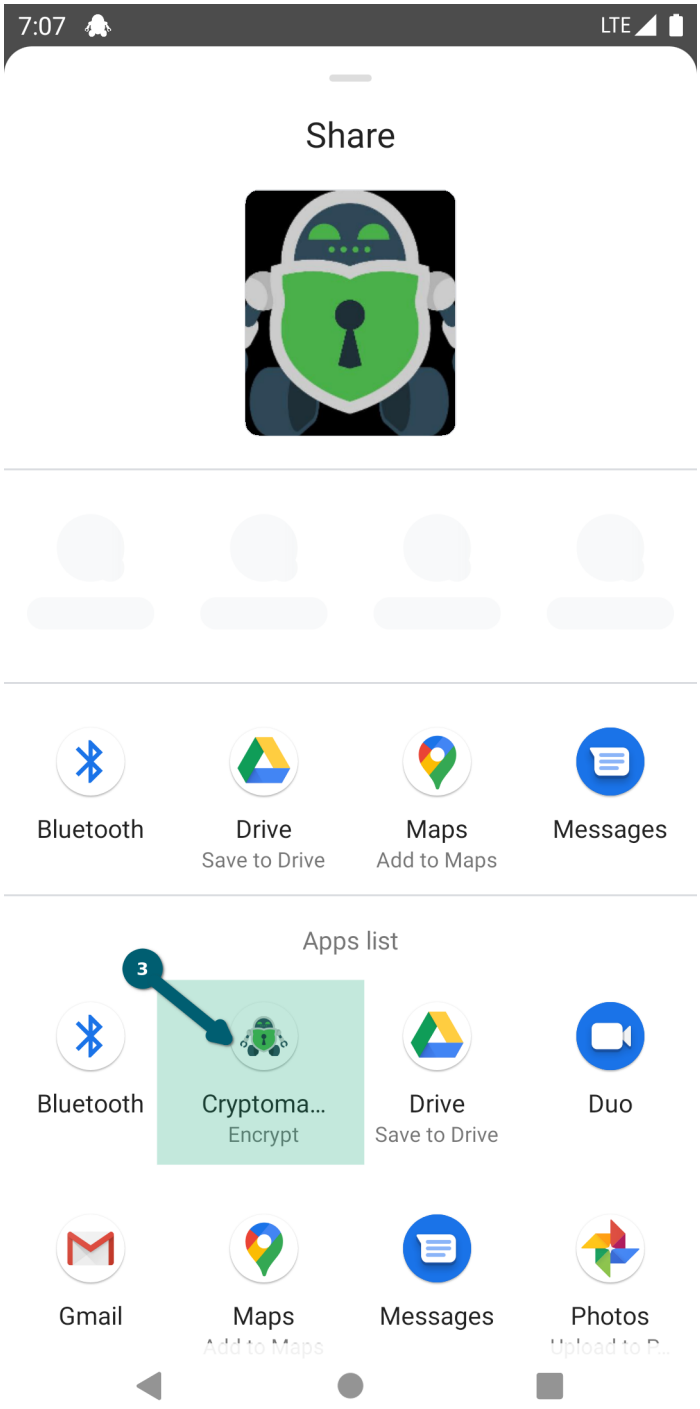
Note: By sharing a file or folder from Cryptomator with Cryptomator, you can copy content from one vault to another one.

11.9 Share File with Cryptomator

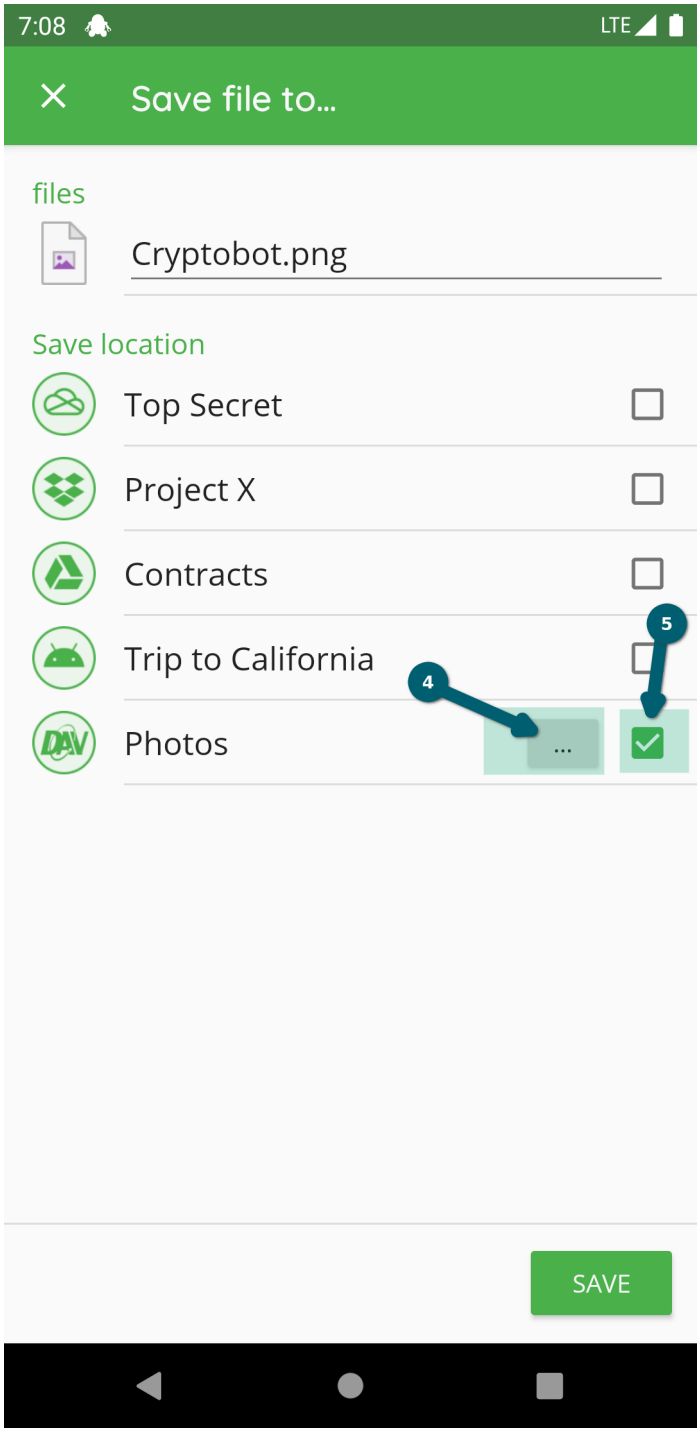
You can share files from another app with Cryptomator. We use as example the Files app from Android.

You select the file(s) to share by long clicking on it . Press the share button to choose to share these file(s) and select *Cryptomator* .

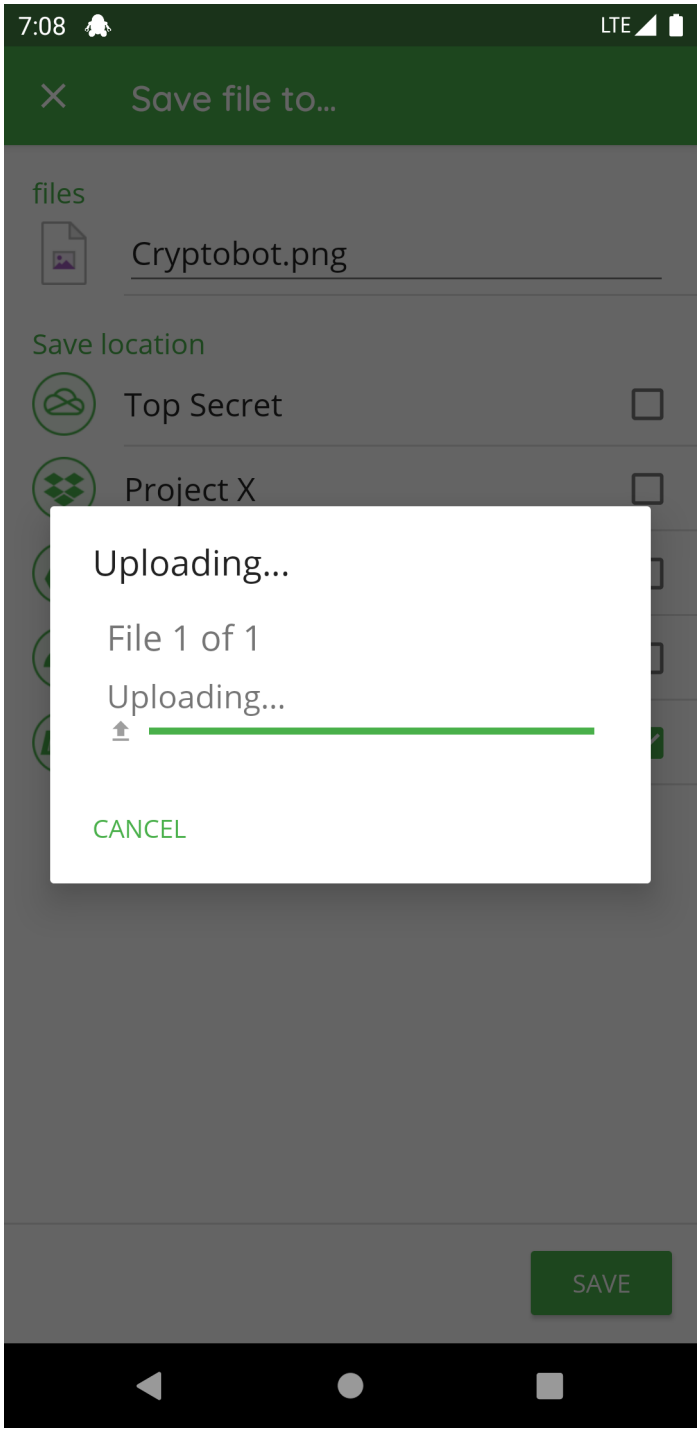


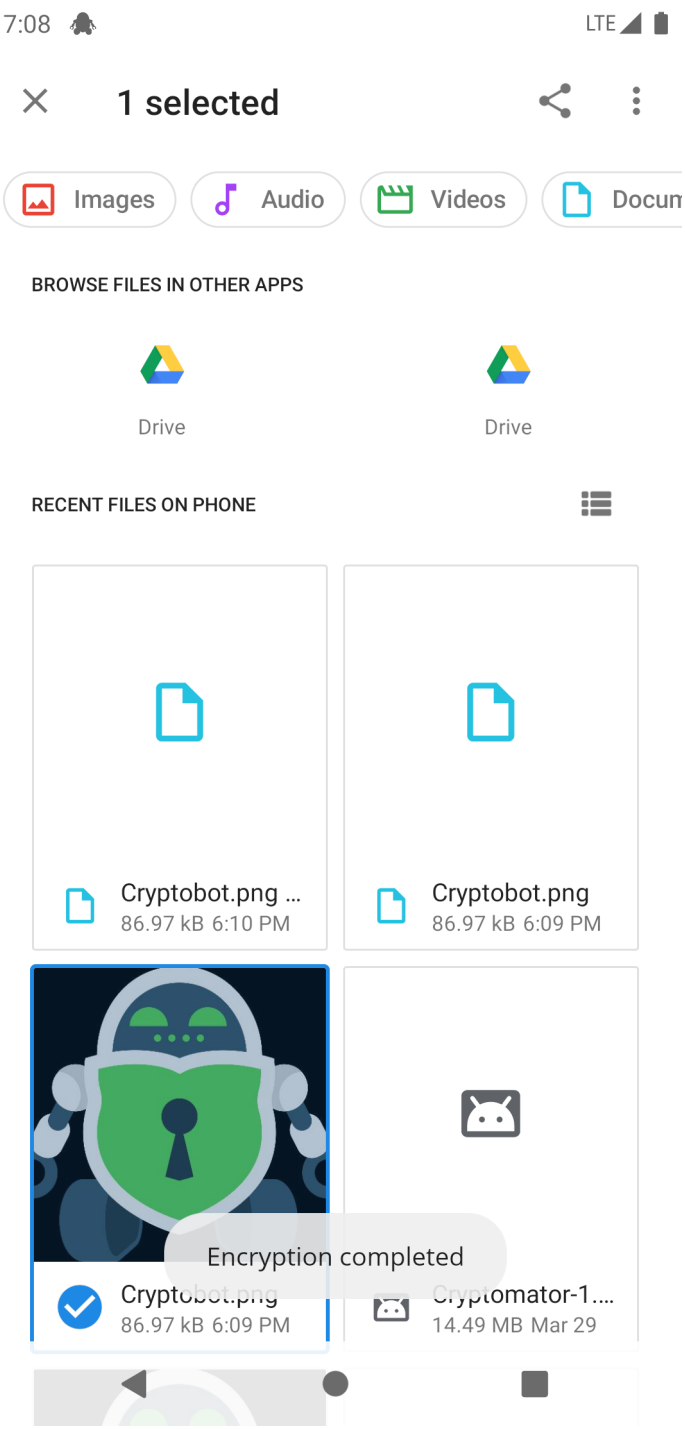


Choose the vault and optionally specify the target folder in the vault (default is the root).



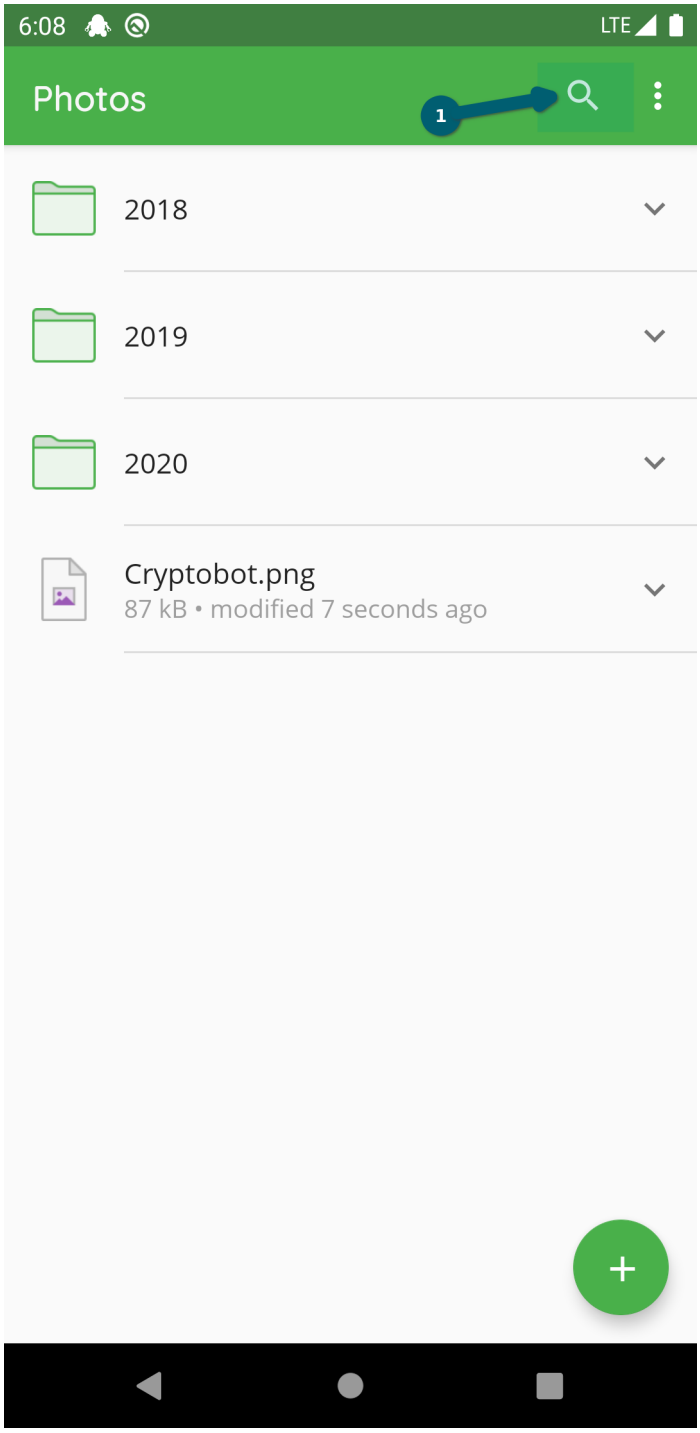
Then the encryption and upload starts.


7:08
LTE
Save file to...
files
Cryptobot.png
Save location
Top Secret
Project X
Uploading...
File 1 of 1
Uploading...
CANCEL
SAVE

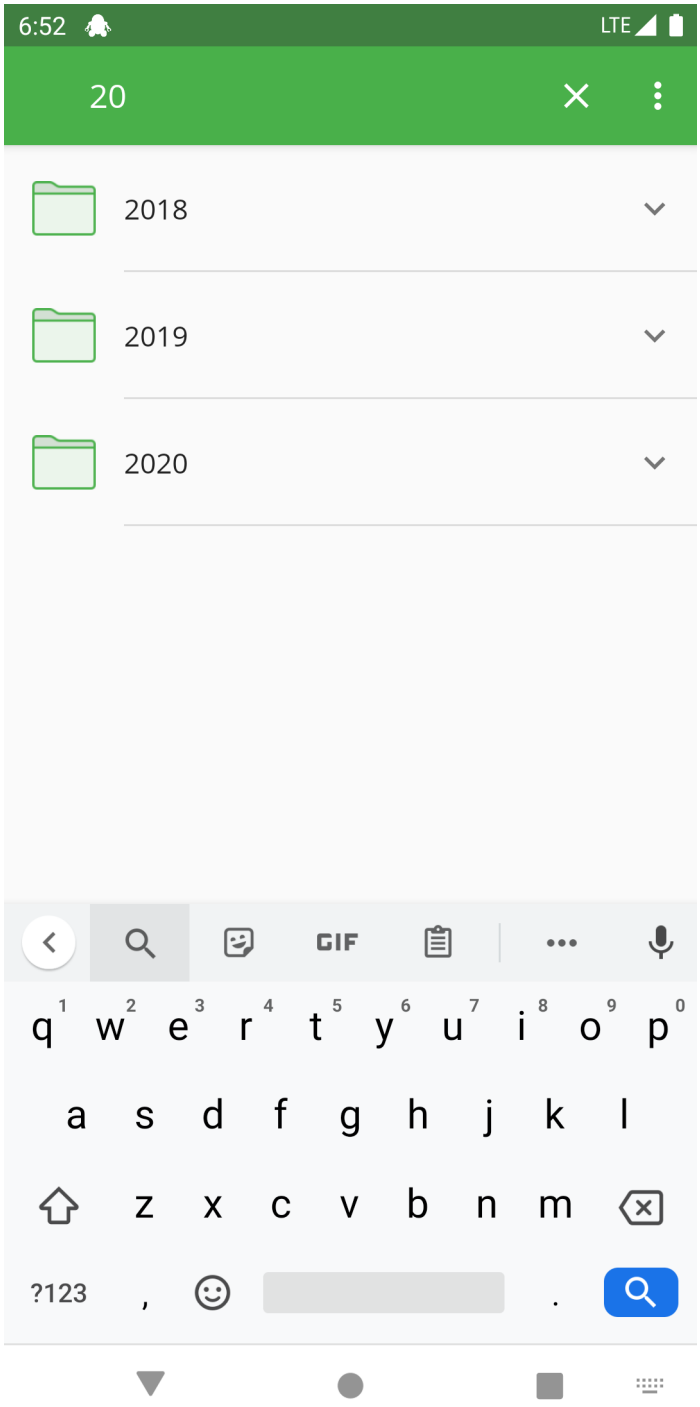

7:08
LTE
1 selected
Images
Audio
Videos
Docun
BROWSE FILES IN OTHER APPS
Drive
Drive
RECENT FILES ON PHONE
Cryptobot.png ...
86.97 kB 6:10 PM
Cryptobot.png
86.97 kB 6:09 PM
Encryption completed
Cryptobot.png
86.97 kB 6:09 PM
Cryptomator-1....
14.49 MB Mar 29

11.10 Search in Folder

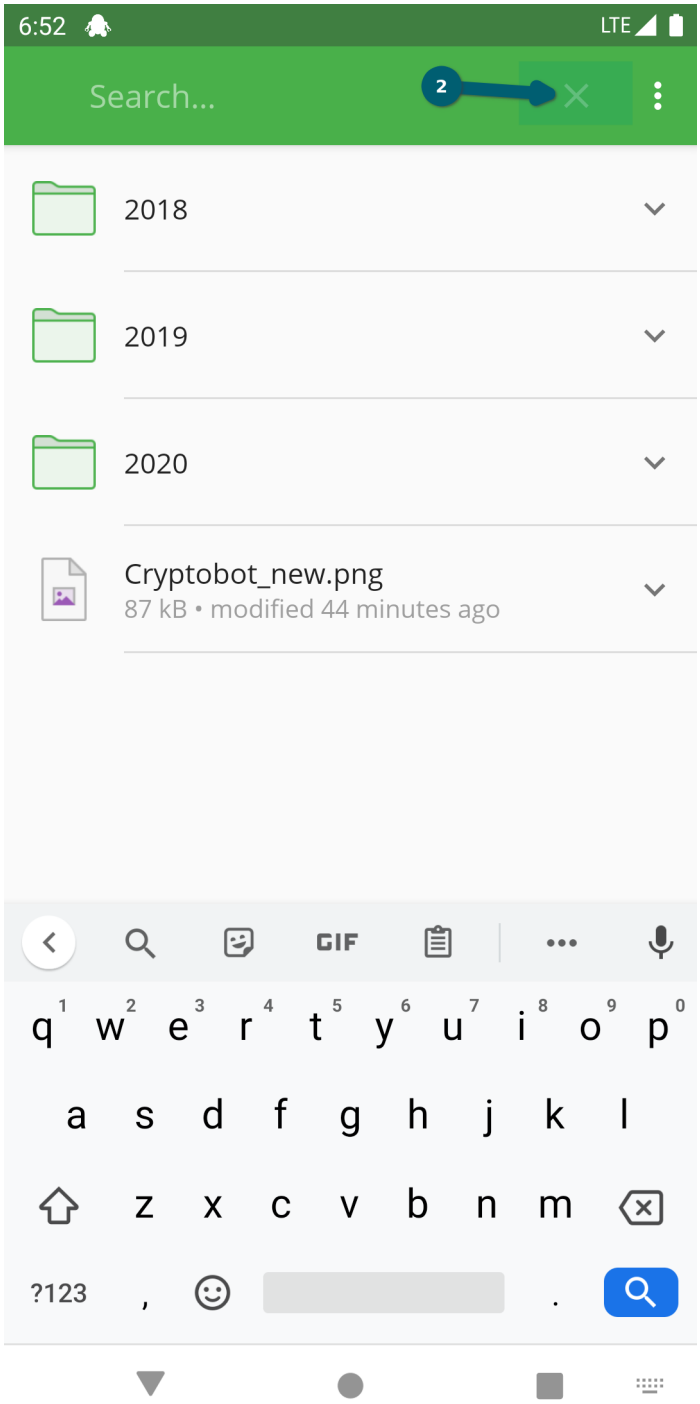
Search for files or folders within the same folder using the magnifier .



Now you can enter the pattern after which you want to search in this folder.



Using the *X* you can clear the pattern and after pressing it again, the filter mode is finished.



In the settings there are two options that influence the behavior of the search:

- Live search (disbaled by default)
- Search using glob pattern matching (disbaled by default)

For more information, see the Settings chapter.

11.11 Sort Folder by...

11.12 Fast scroll

If the folder contents are sorted by file size, the preview will show the file sizes accordingly. The same applies to the modification date.

CHAPTER

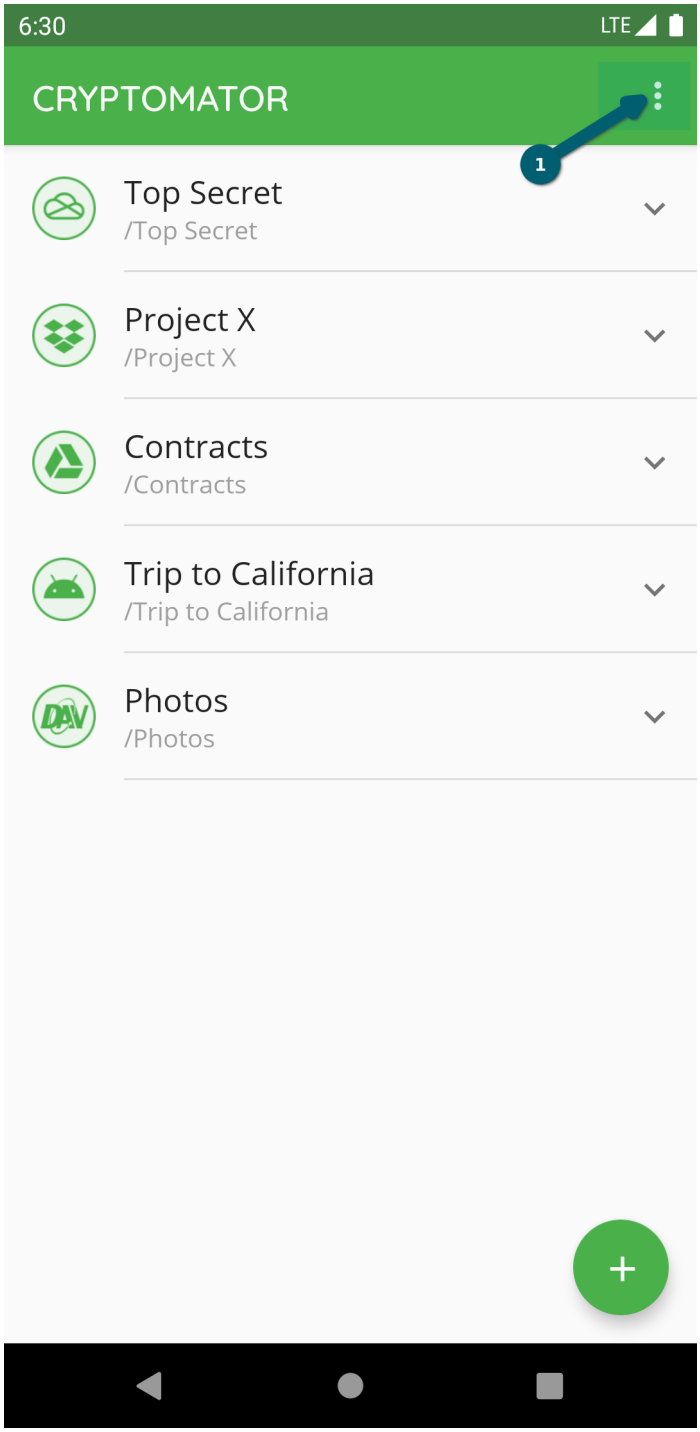
TWELVE

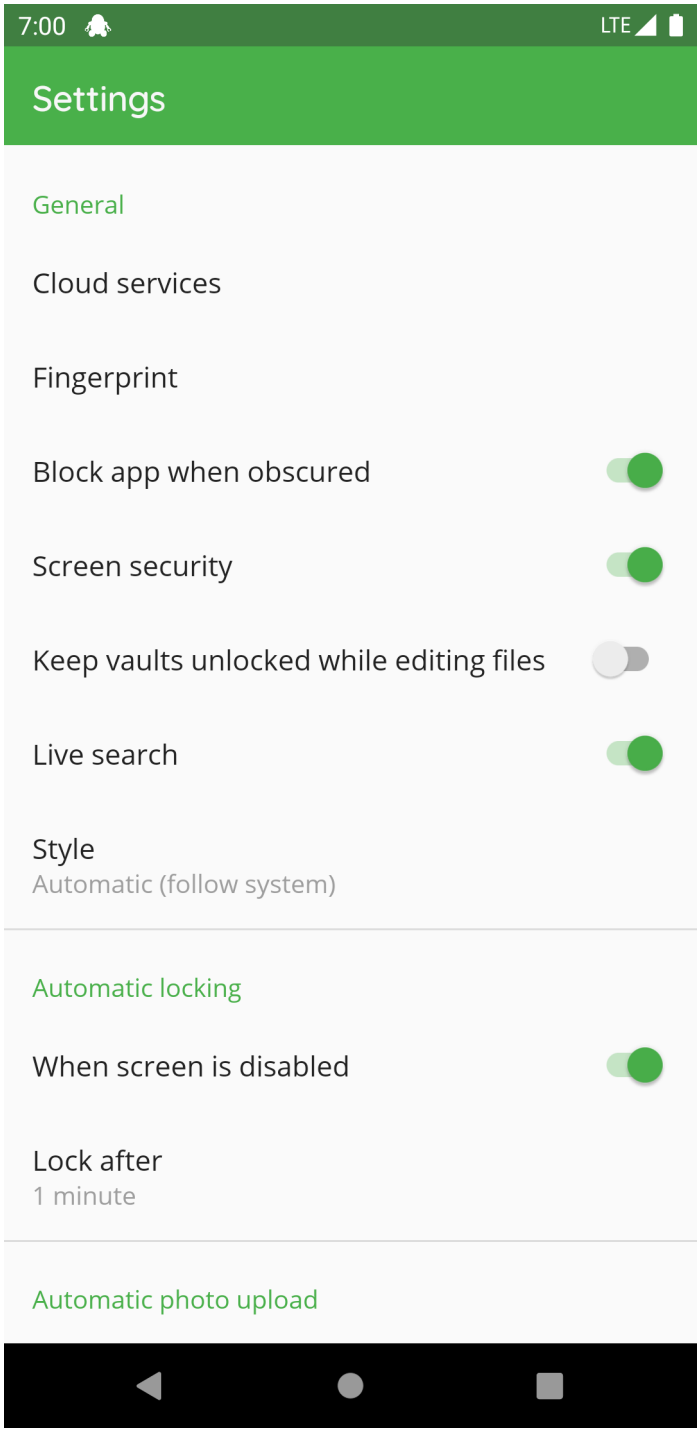
SETTINGS

You can configure Cryptomator to your needs. This section provides an overview of the different settings.

12.1 General Settings

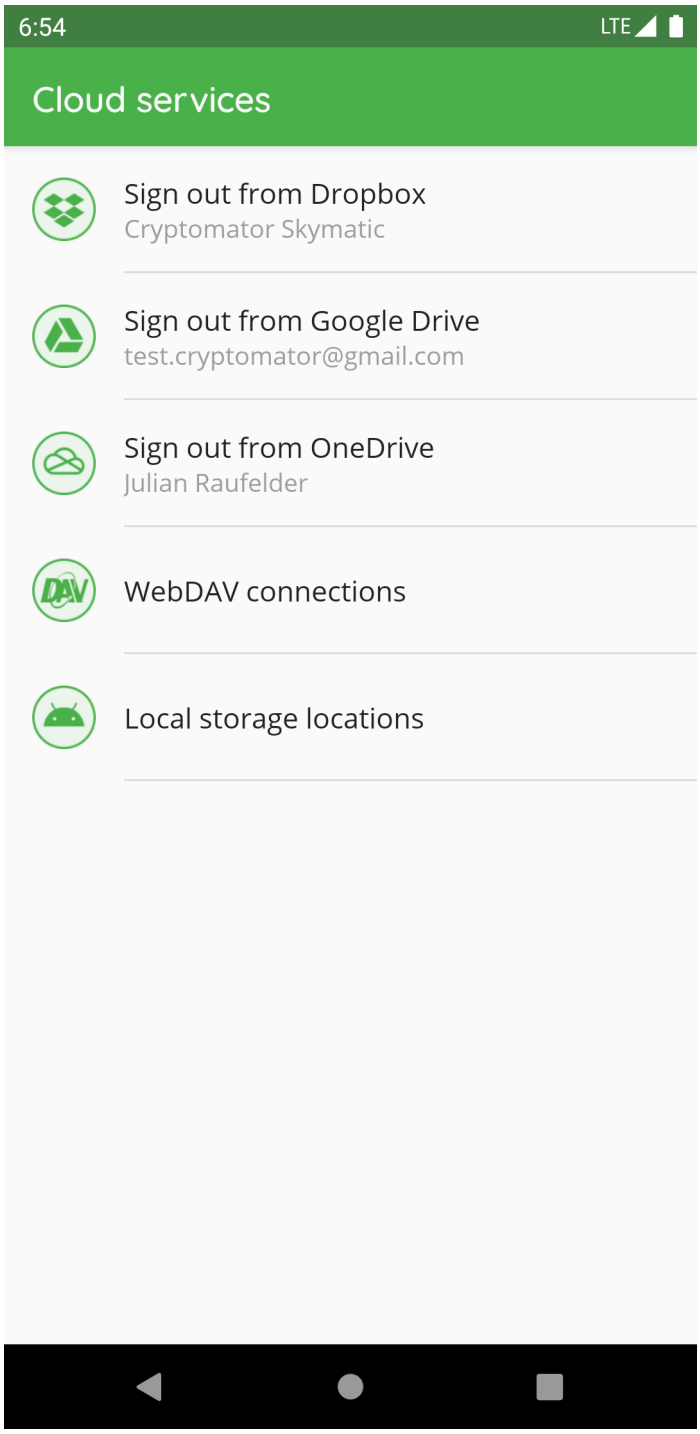
After pressing the three dots and clicking on `Settings`, you will find options to customize Cryptomator.


6:30
LTE
CRYPTOMATOR
1
Top Secret
/Top Secret
Project X
/Project X
Contracts
/Contracts
Trip to California
/Trip to California
Photos
/Photos


7:00
LTE
Settings
General
Cloud services
Fingerprint
Block app when obscured
Screen security
Keep vaults unlocked while editing files
Live search
Style
Automatic (follow system)
Automatic locking
When screen is disabled
Lock after
1 minute
Automatic photo upload

12.1.1 Cloud Services

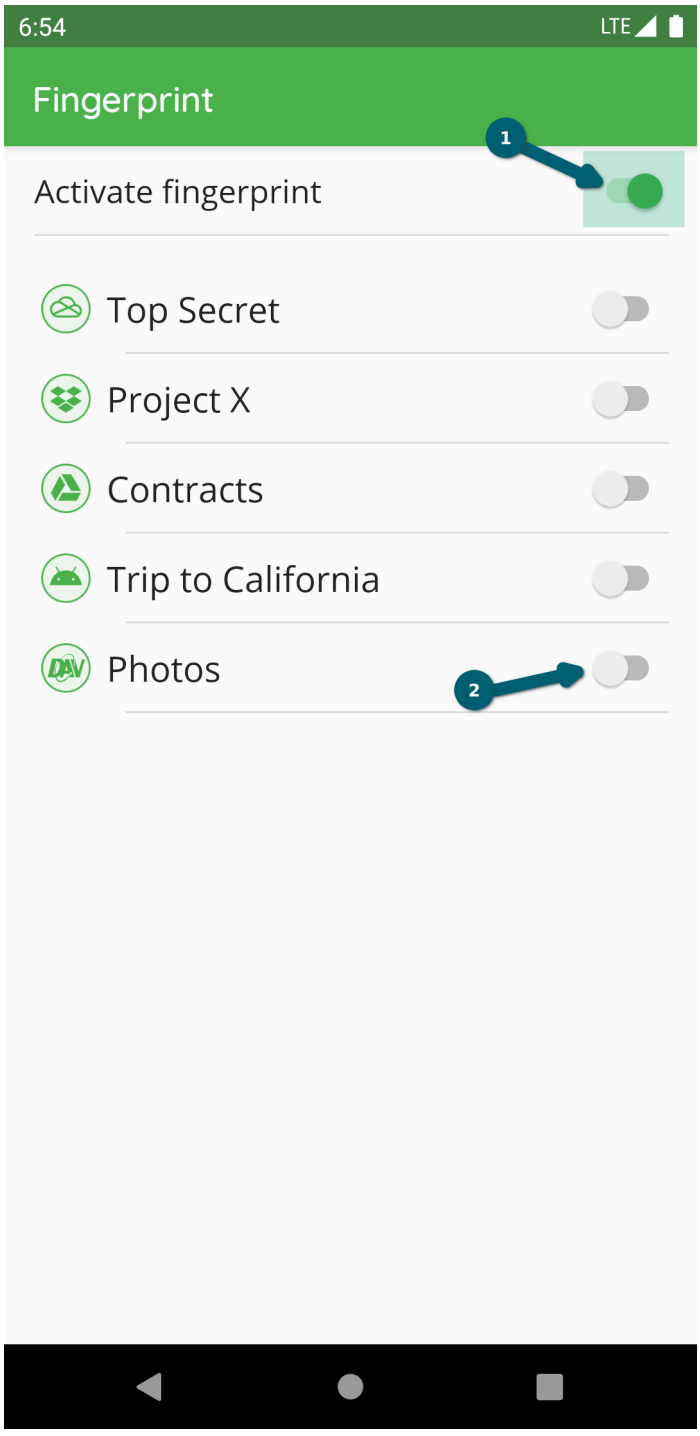
This setting lists all cloud services. When pressing on a service, the authentication starts or if you're already authenticated, you will be logged out.

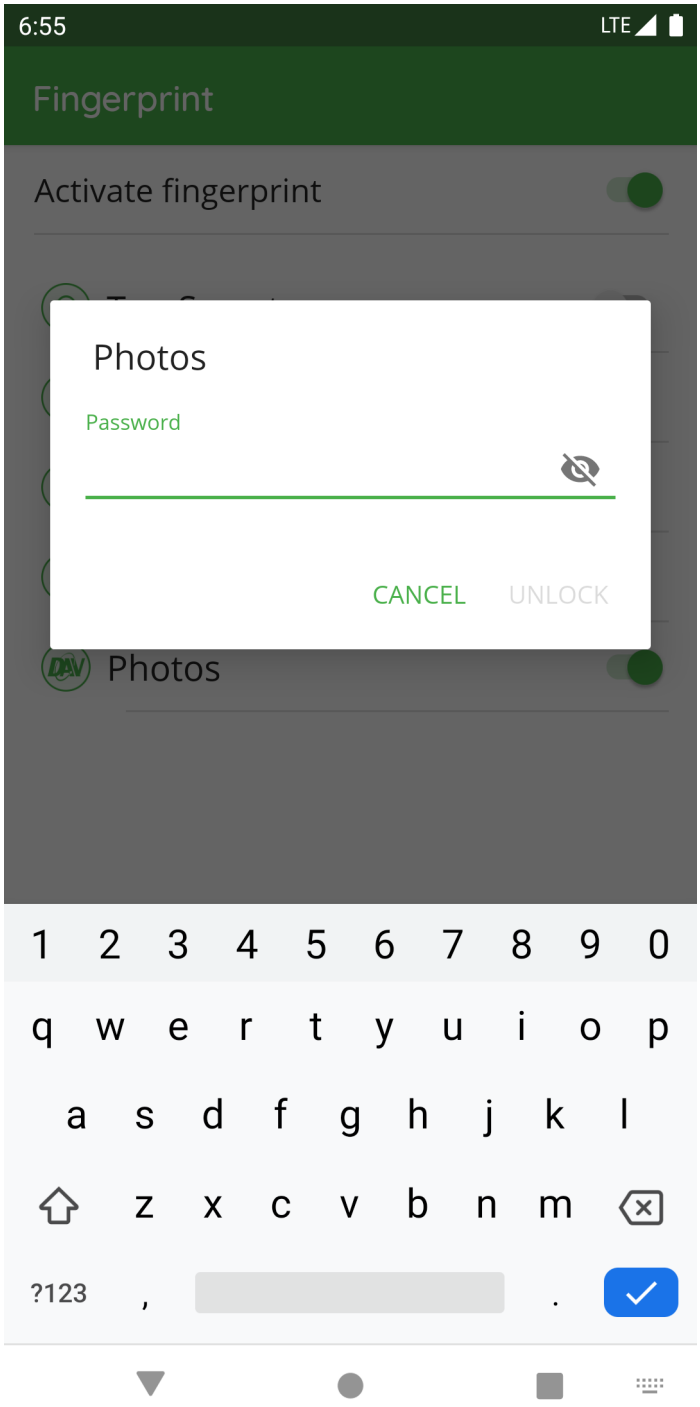


12.1.2 Fingerprint

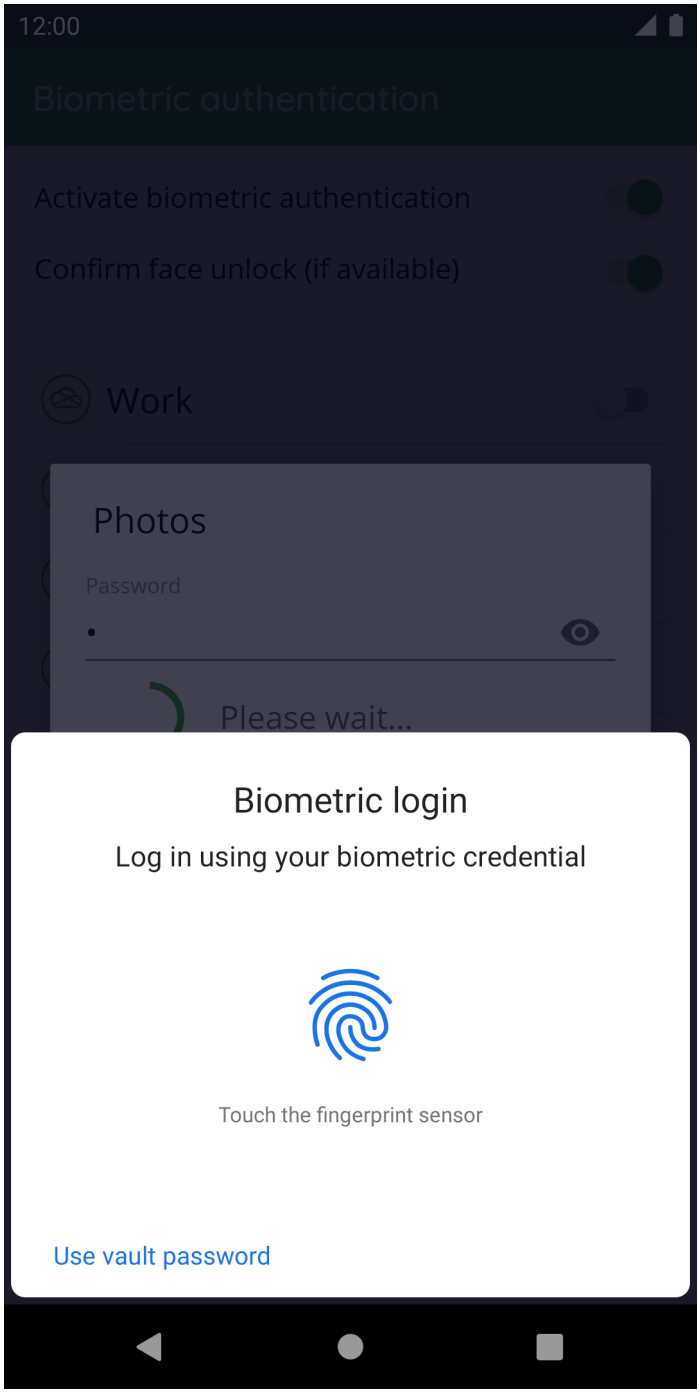
Note: This setting is only available if your device supports the fingerprint authentication.

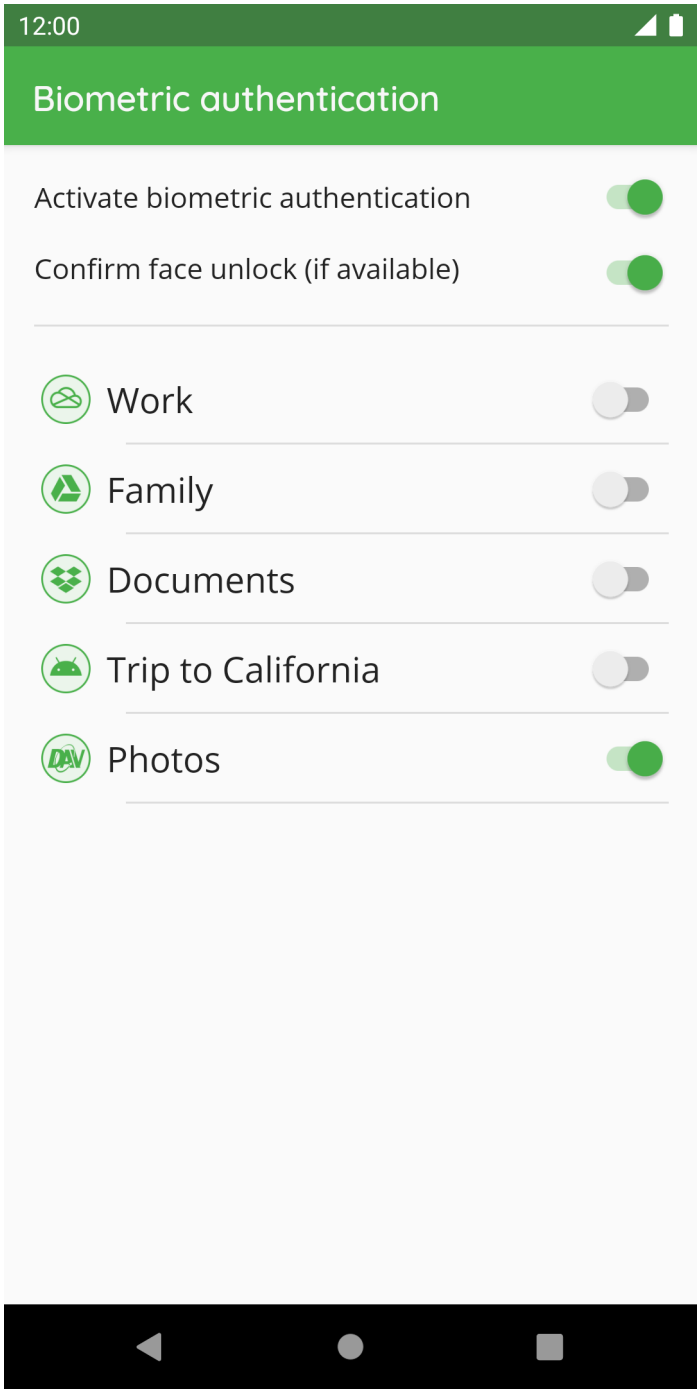
With the toggle button in the right upper corner , the fingerprint will be generally enabled/disabled. Using the toggle button next to the vault, it will be enabled/disabled for this vault .





After enabling, you have to unlock the vault using the password.


12:00
Biometric authentication
Activate biometric authentication
Confirm face unlock (if available)
Work
Photos
Password
Please wait...
Biometric login
Log in using your biometric credential
Touch the fingerprint sensor
Use vault password



To have access to the key stored in the keystore, you have to authenticate against the system using the fingerprint.

12.1.3 Block App When Obscured

Under certain circumstances, Cryptomator for Android may not respond to touches.

This is most often caused by apps which apply a color filter to the device. Examples are the apps Twilight or Blue Light Filter. When disabling or uninstalling such apps, Cryptomator will work again.

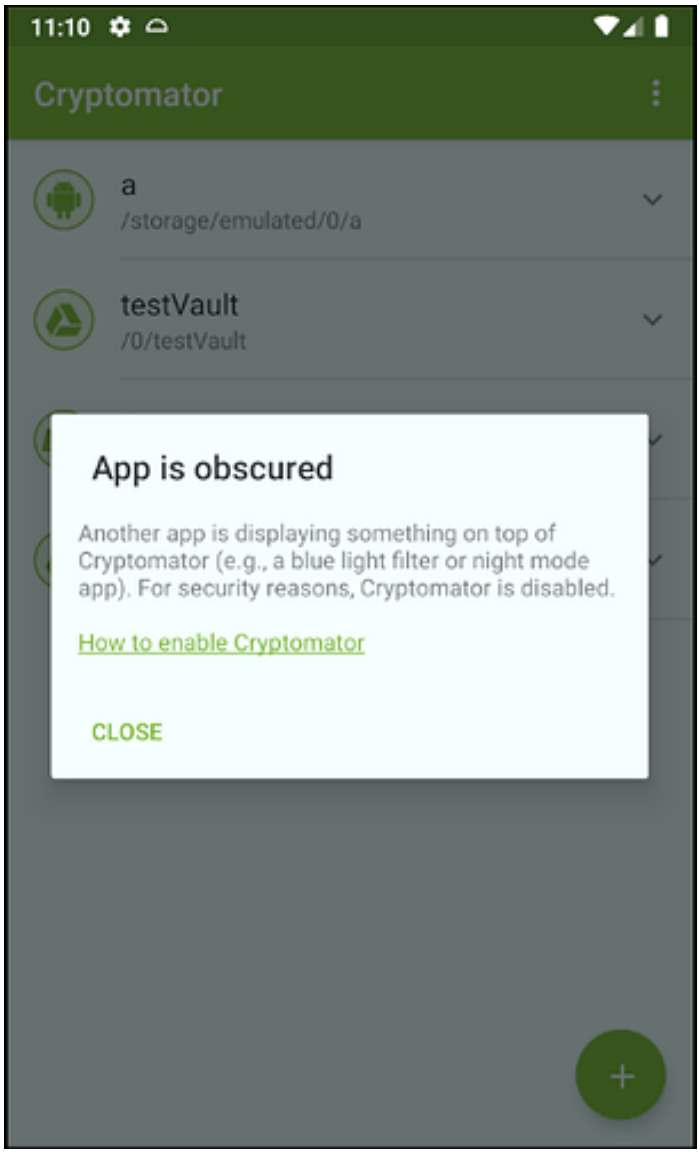
The reason for Cryptomator not working is that the user interface of Cryptomator is obscured. Whenever another app obscures Cryptomator, it could intercept the input done to Cryptomator or display a false UI tricking the user into doing stuff he does not want to do. For security reasons, Cryptomator is disabled by default when obscured. The Android documentation contains some more details.

Starting from version 1.3.0, this protection can be disabled in the settings. We rather recommend to use the app without a blue light filter because this is more secure.

If you want to disable protection, the blue light filter or any app obscuring Cryptomator has to be disabled one time. Afterwards, the settings can be opened and the option “Disable app when obscured” can be disabled. And then the relevant apps can be reenabled again.

To identify apps which could cause this, open the Android settings and navigate to **Settings - Apps - Advanced (gear icon) - Draw over other apps**. This will list the installed Apps and will show you which ones are allowed to draw over other apps. You can disable this for most apps (but not for system apps like the keyboard but this should not cause any problems).

If you see this dialog, some app is able to draw over Cryptomator:



12.1.4 Screen Security

Android provides the possibility to prevent the system and other apps from doing screenshots, screen recordings etc. while Cryptomator is active. This feature is very important because it prevents other apps from reading data across the screen.

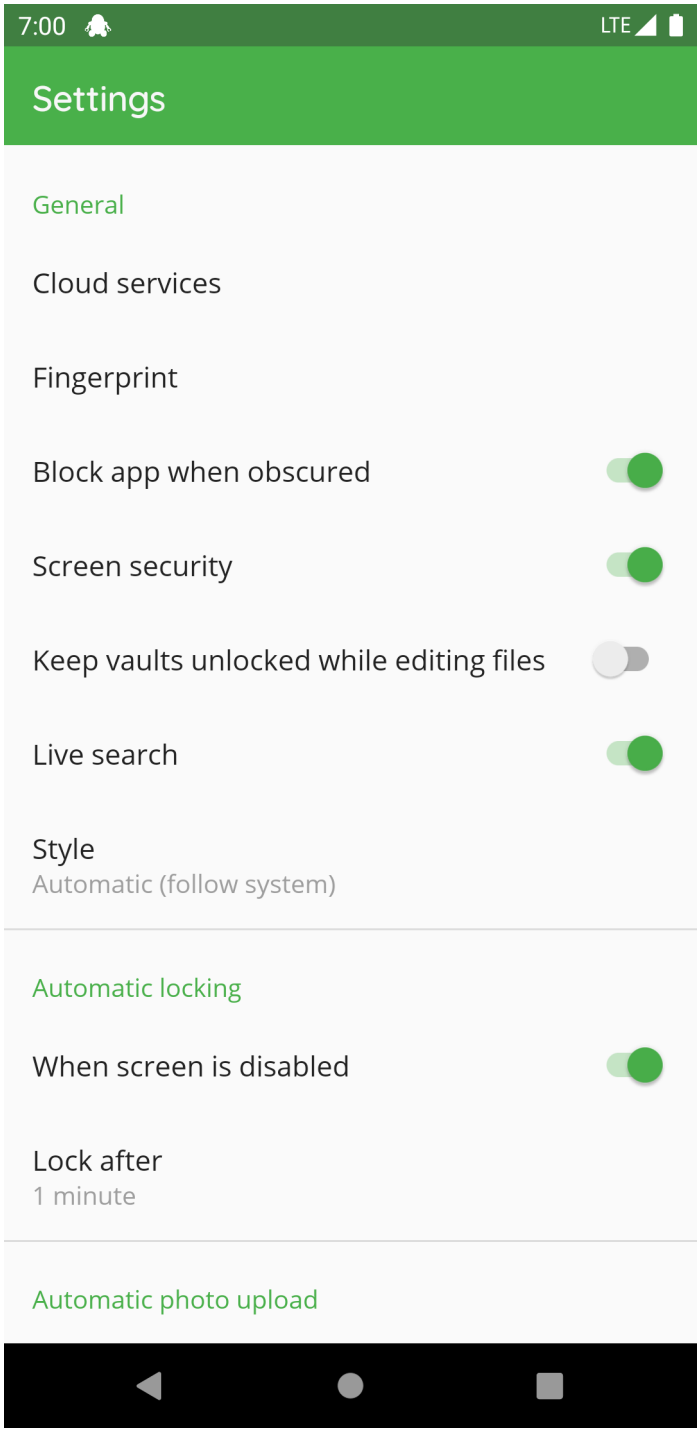
This feature is enabled for all our views. For some devices, e.g. a Chromebook with a second display or to create a screenshot and disable it again, we made this option since the 1.3.9 configurable.

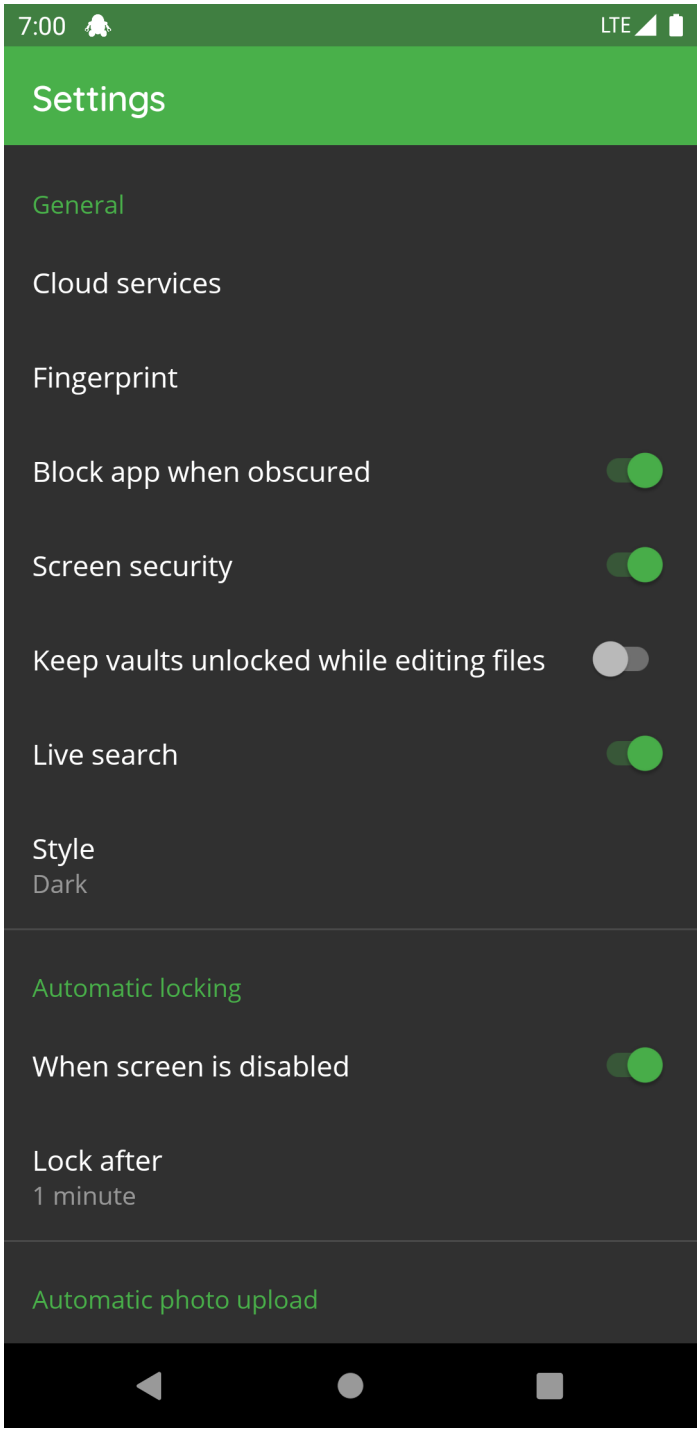
Read more: FLAG*SECURE

12.1.5 Style

You can choose between the following three styles:

- Automatic (follow system): Follows the system specified in the Android settings
- Light: App shows in light mode
- Dark: App shows in dark mode


7:00
LTE
Settings
General
Cloud services
Fingerprint
Block app when obscured
Screen security
Keep vaults unlocked while editing files
Live search
Style
Automatic (follow system)
Automatic locking
When screen is disabled
Lock after
1 minute
Automatic photo upload



12.2 Search

You can use the magnifier inside the cloud node list to search for specific nodes. Thereby there are two settings:

- Live search (disabled by default)
- Search using glob pattern matching (disabled by default)

both are described in the following chapters.

12.2.1 Live Search

If this setting is enabled, the search mode is `live`. That means, the search starts immediately after entering the search pattern.

If it is disabled, you have to use the magnifier or the enter button in your keyboard to start the search.

12.2.2 Search using glob pattern matching

If this setting is enabled, you have to enter a glob pattern into the search bar.

If it is disabled, the beginning of the cloud node names must match the entered text. Upper and lower case is not relevant in this option.

12.3 Automatic Locking

If a vault is unlocked and Cryptomator isn't active, the automatic locking timeout is counting down. After the timeout expires, all vaults get locked. You can choose between:

- 1 minute
- 2 minutes
- 5 minutes
- 10 minutes
- Never

`When screen is disabled` can be deactivated so that the vaults don't get locked when the screen locks.

12.4 Automatic Photo Upload

If the `Automatic photo upload` is enabled, all photos taken will be marked for upload and after the specified vault gets unlocked again, the upload starts.

Under the setting `Choose vault for upload`, you can specify the target vault and folder in the vault where the images will be placed.

Which pictures will be tracked, depends on the Android version on your phone:

- Nougat (API level 24 or 7.x) and later: All images which Android adds to the gallery will be uploaded to the vault
- Pre-Nougat: Only the images created with the camera will be uploaded to the vault

12.5 Cache

Introduced in version 1.5.0, if enbaled, all downloaded files will be cached (encrypted) on the file system. Further downloads will only verify with the server, that the cached file is still the latest version. If so it will not be downloaded again but directly retrieved from the file system. The cache is implemented using a least recently used mechanism, that means, the oldest entry will be overwritten if the max cache size is reached.

12.5.1 Cache Size Per Cloud

Using this setting, you can specify the total max cache size per cloud provider.

You can choose between the following options:

- 50 MB
- 100 MB
- 250 MB
- 500 MB
- 1 GB
- 5 GB

Note: The more memory is given to caching, the greater the convenience factor. However, this memory can be used up to the maximum on the system and is then no longer available.

12.5.2 Clear Cache

This setting will flush all cached files.

12.6 Support

If you have problems with the app you can enable the `Debug mode`. After reproducing the problem, you can disable the `Debug mode` again and `Send log file`.

12.7 Version

This setting displays the current version of this app.

The following sub settings are only available, if you're using the APK-Store version of Cryptomator and not the PlayStore one.

12.7.1 Update Check Interval

Using the specified interval below, the app checks if the latest version is installed.

You can choose between the following options:

- Once a day
- Once a week
- Once a month
- Never

12.7.2 Check For Updates

This setting displays the timestamp of the latest update check. You can click on this setting to trigger a update check.

CHAPTER

THIRTEEN

SETUP

You can get Cryptomator for iOS on the App Store.

13.1 Requirements

Requires iOS 13.0 or later. Compatible with iPhone, iPad, and iPod touch.

CHAPTER

FOURTEEN

CLOUD MANAGEMENT

14.1 Other File Provider

This option allows you to add a vault from any supported file provider. Default implementations by Apple are iCloud Drive and On My iPhone/iPad. Inside the Files app, you can also add custom connections to SMB-compatible servers.

If you have a lot of apps installed that include a file provider, you may notice that most of them are grayed out. This is because third-party file providers usually don't support "picking folders". To our best of knowledge, this is unsupported by Apple. You can find a technical discussion here.

CHAPTER

FIFTEEN

VAULT MANAGEMENT

15.1 Unlock Duration

With the vault setting “Unlock Duration”, you can specify for how long you want your vault to stay unlocked when idle. The following options are:

- Let iOS Decide Automatically
- 5 Minutes
- 10 Minutes
- 30 Minutes
- 1 Hour
- Indefinite

The default option is “Let iOS Decide Automatically”. Accessing Cryptomator via the Files app is possible via a so-called File Provider Extension. This extension has limited capabilities, e.g., it has a lower memory limit than regular apps. To free up memory, iOS may terminate Cryptomator at any time, which is basically the same as locking the vault since the key is held in memory.

This option has two consequences:

- There is no guarantee for how long your vault stays unlocked. Of course, while you’re accessing your vault, it’s highly unlikely that Cryptomator gets terminated.
- You’re responsible for locking your vault manually. Or if that’s not a concern of yours, you can just let iOS decide when Cryptomator is getting terminated.

In order to have a guarantee that your vault stays unlocked for a certain amount of time, the other options are available. By using one of these options, a copy of your key needs to be stored in the iOS keychain, as long as your vault is unlocked.

E.g., if you choose “1 Hour” and Cryptomator gets terminated by iOS within that time frame, your vault can automatically be unlocked again using the key from the iOS keychain. If the selected time frame has passed, the key will be removed from the iOS keychain and your vault will get automatically locked.

If you choose the “Indefinite” option, your vault will be kept unlocked until you have manually locked it.

CHAPTER

SIXTEEN

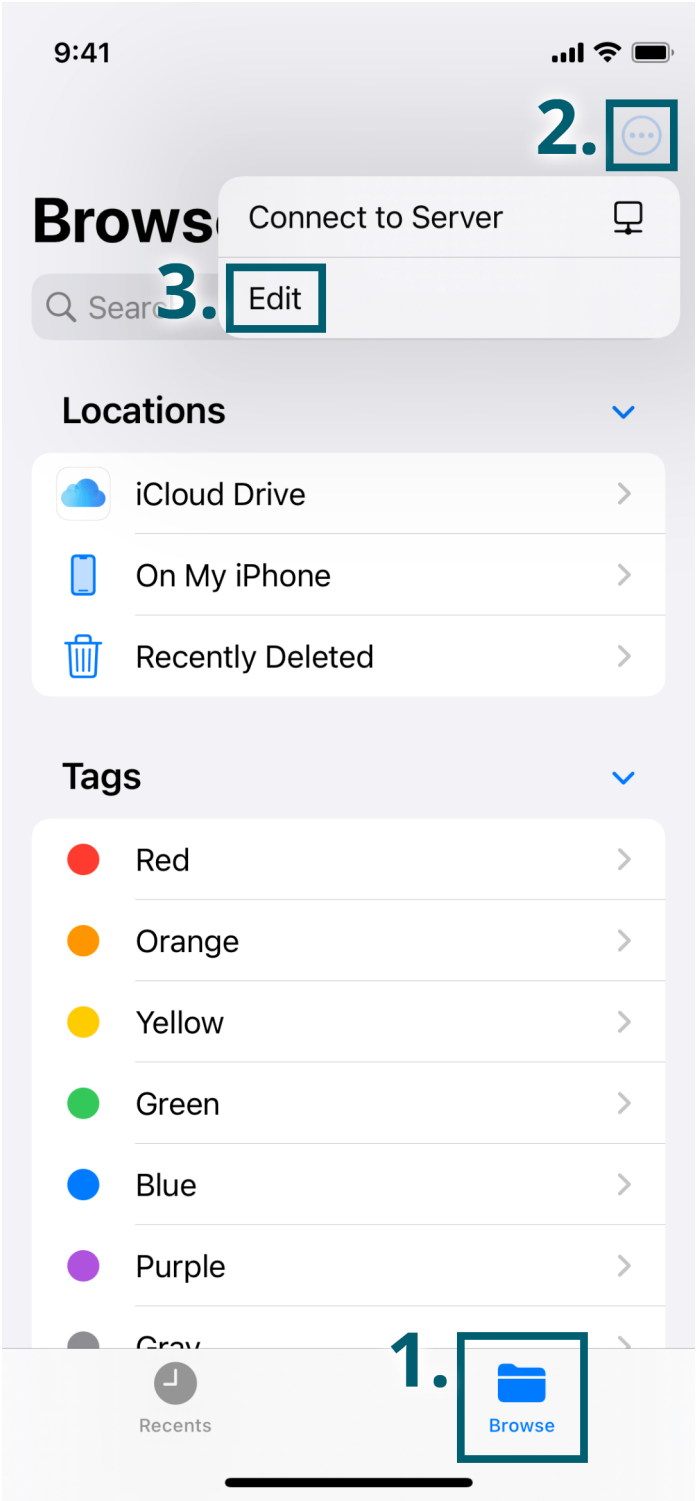
WORKING WITH VAULTS

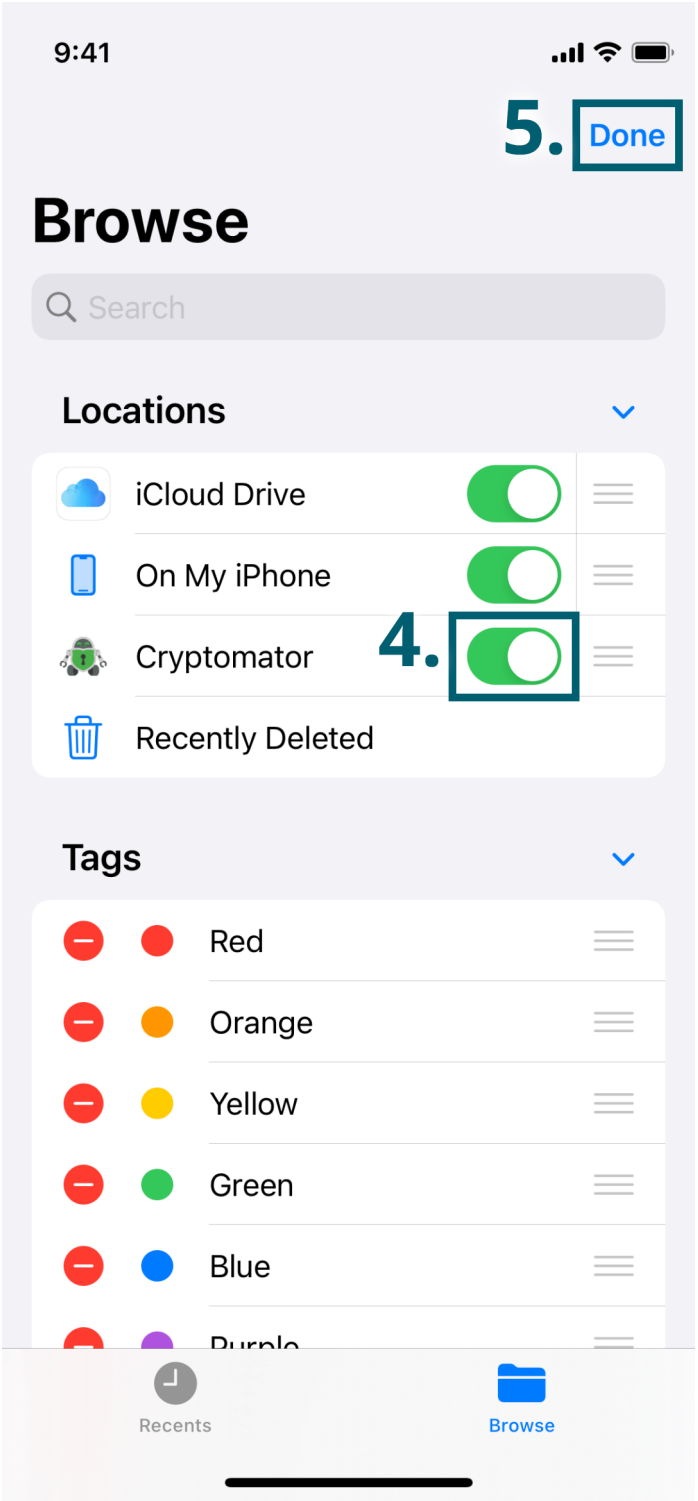
Cryptomator for iOS is fully integrated into the Files app of iOS. In order to access your encrypted data, you have to use the Files app.

16.1 Enable Cryptomator in Files App

In order for Cryptomator to be listed in the Files app under “Locations”, you may have to enable Cryptomator first. Open the Files app and then:

1. Tap on the **Browse** tab in the lower right corner.
2. Tap on the **(...)** button in the upper right corner.
3. Tap on **Edit**.
4. Enable **Cryptomator**.
5. Tap on **Done** in the upper right corner.


9:41
2.
Brows
Connect to Server
3.
Edit
Locations
iCloud Drive
On My iPhone
Recently Deleted
Tags
Red
Orange
Yellow
Green
Blue
Purple
1.
Recents
Browse


9:41
5.
Done
Browse
Search
Locations
iCloud Drive
On My iPhone
4.
Cryptomator
Recently Deleted
Tags
Red
Orange
Yellow
Green
Blue
Recents
Browse

CHAPTER

SEVENTEEN

SETTINGS

You can configure Cryptomator to your needs. Access the settings by tapping the gear icon in the top left corner.

17.1 Support

If you have problems with the app, you can enable `Debug Mode`. After reproducing the problem, you should disable `Debug Mode` again and then `Send Log File`.

CHAPTER

EIGHTEEN

SHORTCUTS GUIDE

The Shortcuts integration of Cryptomator allows you to build different automations in the Shortcuts app. With that, you can automate recurring tasks quickly and easily.

For a shortcut to run smoothly, the vault must be unlocked during the execution of the shortcut. For automations, you should set the unlock duration to "Indefinite" in the *settings of your vault*.

In addition, you should know that some Cryptomator shortcut actions build on each other. For example, the "Save File" action requires a folder inside a vault as an input, which can be obtained using the "Get Folder" action.

18.1 Automatic Photo Upload

With Cryptomator's integration in Shortcuts, you can build an action to automatically upload your photos to a Cryptomator vault. You can either follow these step-by-step instructions or use the following shortcut to get started:

https://www.icloud.com/shortcuts/90ae0e36dda44da3a39c9070ae097a92

Step 1: Create new shortcut

- Open the Shortcuts app on your iOS device.
- Tap on the "+" at the top right to create a new shortcut.

If the Shortcuts app is not installed, download it from the App Store.

Step 2: Add "Find Photos" action

- Select the search field at the bottom to add an action.
- Under the tab "Apps", select "Photos".
- Select the action "Find Photos".

You can customize this action to your needs by adding various filters or to limit the number of photos to be selected.

Step 3: Add "Get Folder" action

- Add the "Get Folder" action from Cryptomator.
- Specify the vault and the path of the folder where your photos should be stored.

Important: It will check if the folder exists in your vault. If it doesn't exist, the action will fail and no photos will be uploaded.

Step 4: Add "Save File" action

We're going to add the "Save File" action from Cryptomator. But since this action only saves a single file (or in this case, photo), we need to add wrap this action around a different action first.

- Add the "Repeat with Each" action, which you can find under the "Categories" tab and then under "Scripting".
- Add the "Save File" action from Cryptomator.

- Make sure that the two variables are correctly set: The image you want to save and the folder from the "Get Folder" action in step 3.

In order to set these variables, you may have to tap on the "File" field, then "Select Magic Variable", and tap on "Repeat Item".

Congratulations, you have just created your first shortcut with Cryptomator actions!

Hints:

1. To fully automate your photo upload, you should run a shortcut using an automation. To do this, create a new automation in the Shortcuts app. You don't have to create the whole shortcut again. You can just add the action "Execute Shortcut" and select the previously created shortcut.
2. Executing a shortcut with a lot of photos (>1,000) can take much longer than executing it with 2x500 photos. To our knowledge, this seems to be a limitation of the Shortcuts app. Therefore, try to limit the number of photos using the available filters. One possible filter is to consider only the photos of the last 2-7 days for a shortcut that is executed daily.

18.2 Photo to PDF (Advanced Example)

Another example, inspired by community member JB, is to convert the latest photo to a PDF and save it in a vault under a chosen path. This example is a bit more advanced, but it shows how you can combine different actions to create a more complex automation. You can either follow these step-by-step instructions or use the following shortcut to get started:

https://www.icloud.com/shortcuts/3d8e20cbfe26452486f3629a2f104c94

We assume that you have already installed Shortcuts, see step 1 of the previous example.

Step 1: Add "Is Vault Unlocked" action

- Add the "Is Vault Unlocked" action from Cryptomator.
- Specify the vault you want to use.
- Add the "If" action from the "Scripting" category.
- Set the condition to "is" and the number to "0".

This makes sure that your vault is unlocked. If it is not, the shortcut will ask you to unlock it, see step 2.

Step 2: Add "Open Vault" action

- Add the "Open Vault" action from Cryptomator.
- Drag this action below the "If" action (and above "Otherwise").
- Specify the same vault you used before.
- Add the "Show Alert" action from the "Scripting" category.
- Drag this action below the "Open Vault" action (and above "Otherwise").
- Replace the informational message with something like "Unlock this vault and run this shortcut again".

This completes the "If" block. Now we can be certain that the vault is unlocked for the "Otherwise" block.

Step 3: Add "List" action

If you only want to save the PDF in one specific path, you can skip this step and go to step 4. Otherwise, you can add a list of paths to choose from.

- Add the "List" action from the "Scripting" category.
- Drag this action below the "Otherise" action (and above "End If").
- Customize this list to your needs by specifying paths of the folders where your PDFs could potentially be stored, something like a "favorites" list.

- Add the “Choose from List” action from the “Scripting” category.

Don’t worry about dragging these actions inside the “Otherwise” block of the “If” action, we’ll do that in the very end.

Step 4: Add “Get Latest Photos” + “Make PDF” actions

- Add the “Get Latest Photos” action from the “Media” category.
- Add the “Make PDF” action from the “Documents” category.

This is just an example. Shortcuts offer you many other ways to get the file or media that you could use as an input for encryption.

Step 5: Add “Get Folder” action

- Add the “Get Folder” action from Cryptomator.
- Select the variable “Chosen Item” for the path (or enter a specific path if you skipped step 3) and specify the same vault you used before.

Important: It will check if the folder exists in your vault. If it doesn’t exist, the action will fail and no PDF will be uploaded.

Step 6: Add “Save File” action

- Add the “Save File” action from Cryptomator.
- Make sure that the two variables are correctly set: The PDF you want to save and the folder from the “Get Folder” action in step 5.

Step 7: Finish “Otherwise” block

- Drag the “End If” action to the very bottom, which will enclose all actions that you have created between the steps 3 and 6 into the “Otherwise” block.

Congratulations, you have just created a more advanced shortcut with Cryptomator actions!

CHAPTER

NINETEEN

SETUP

Cryptomator Hub is a zero-knowledge key management solution that allows you to manage access to your vaults from a central component deployed on your own infrastructure.

19.1 Quickstart

1. Decide, on which web addresses you want to deploy Hub and Keycloak (and set up DNS and TLS termination, if required)
2. Use the Setup Wizard to generate a deployment descriptor template
3. Customize the template if needed (e.g., adjust the Ingress settings) and deploy the software stack to your cluster
4. Log in to Keycloak to
   - adjust authentication settings
   - set up users/groups or LDAP/AD
5. Log in to Cryptomator Hub and start creating Hub-managed vaults

19.2 More Details

To get started, use the Setup Wizard to generate the necessary configuration files.

Cryptomator Hub depends on Keycloak, an open-source identity and access management solution. That means, Hub manages access to your vaults whereas Keycloak manages users, groups, and authentication. In the Setup Wizard, you will have the option to choose between deploying Keycloak alongside Hub or specifying an URL to an existing Keycloak installation.

19.3 Reverse Proxy

Cryptomator Hub must be used behind a reverse proxy such as Traefik or Nginx. In the Setup Wizard you can already add rules for some reverse proxies like Traefik. As mentioned there, you will still need a running Traefik deployment.

If you don't have a running Traefik deployment and want to use Docker Compose to run Hub, you can use the following as starting point:

```
networks:
  srv:
    name: srv

services:
```

(continues on next page)

(continued from previous page)

```
  traefik:
    image: traefik:v2.9
    command:
      # Provider
      - '--providers.docker'
      - '--providers.docker.exposedbydefault=false'
      - '--providers.docker.network=srv'
      # Entrypoints
      - '--entrypoints.web.address=:80'
      - '--entrypoints.web.http.redirections.entrypoint.to=websecure'
      - '--entrypoints.websecure.address=:443'
      # Let's Encrypt
      - '--certificatesresolvers.myresolver.acme.email=TODO' # TODO change
      - '--certificatesresolvers.myresolver.acme.httpchallenge.entrypoint=web'
      - '--certificatesresolvers.myresolver.acme.httpchallenge=true'
      - '--certificatesresolvers.myresolver.acme.storage=/letsencrypt/acme.json'
      # Uncomment to use staging for testing
      # - '--certificatesresolvers.myresolver.acme.caserver=https://acme-staging-v02.
↪api.letsencrypt.org/directory'
      - '--entrypoints.websecure.http.tls.certresolver=myresolver'
      # Logs
      - '--accesslog.filepath=/logs/access.log'
      - '--accesslog.format=json'
      - '--log.filepath=/logs/traefik.log'
      - '--log.format=json'
      - '--log.level=ERROR'
      # Misc
      - '--api.dashboard=false'
      - '--global.checknewversion=false'
      - '--global.sendanonymoususage=false'
      - '--ping'
    ports:
      - '80:80'
      - '443:443'
    networks:
      - 'srv'
    restart: always
    healthcheck:
      test: ['CMD', 'traefik', 'healthcheck', '--ping']
      interval: 10s
      timeout: 10s
      retries: 5
    volumes:
      - '/var/run/docker.sock:/var/run/docker.sock'
      - './logs:/logs'
      - './letsencrypt:/letsencrypt'
    labels:
      - 'traefik.enable=false'
```

Some remarks

1. There are a lot of other features of Traefik like Prometheus metrics generation, API frontend, … but we wanted to keep the deployment as simple as possible
2. This deployment uses Let's encrypt in HTTP challenge mode to create and update a TLS certificate for Hub/Keycloak. There are other methods available such as DNS or TCP challenge, see https://doc.traefik.io/traefik/https/overview/ for more information

3. Make sure you add `logs/access.log` to your log rotation, otherwise this file can grow very quickly

Before running this deployment

1. You must set a valid email address in `TODO`
2. You must have ports 80 and 443 open on the host machine
3. You need to create for Hub and optionally Keycloak DNS entries (`CNAME`, or `A` record) for the domain entered in the Setup Wizard of Hub
4. Create a Hub deployment using the Setup Wizard with `include Traeffik` selected and merge the content with this file:

1. Copy the `hub-internal: {}` section of the Setup Wizard to this `networks`
2. Copy all services of the Setup Wizard under the `services` section to this `services`
3. Copy the `volumes` from the Setup Wizard to this file

Troubleshooting: If you encounter problems, check the log files in `logs/traffik.log` and `logs/access.log`. Make sure you entered `srv` as `Public Network` in the Setup Wizard of Hub.

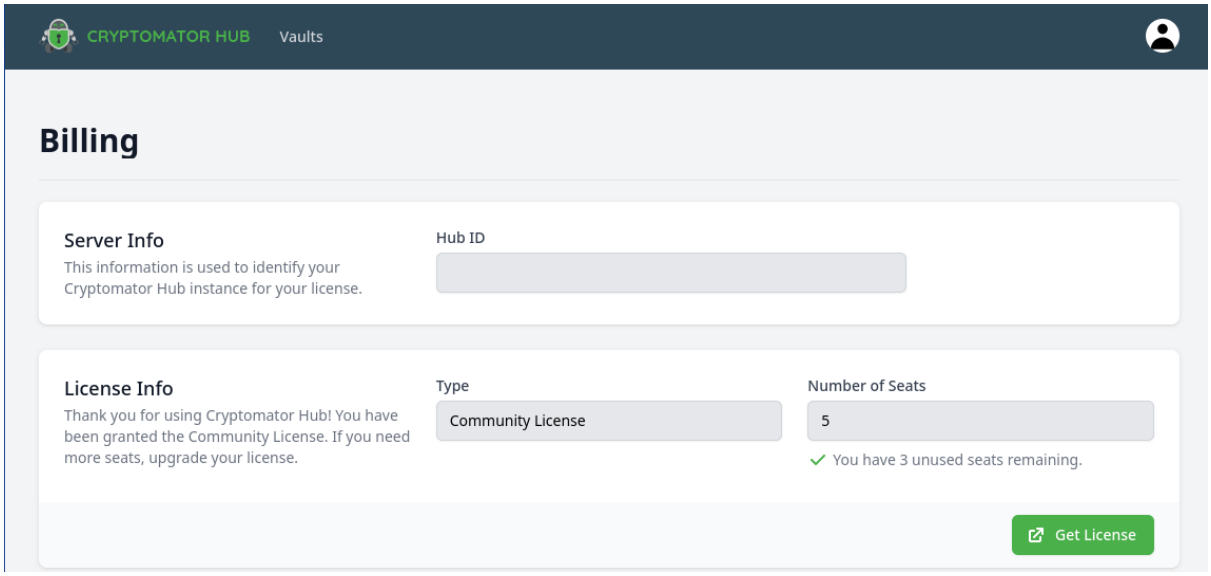
19.4 Keycloak Administration

Using Keycloak, you can create users, delete users, manage groups, and optionally also synchronize users/groups to Keycloak using LDAP or other identity providers to whom you can then give access to vaults in Hub.

Note: Subgroups are not supported at this time.

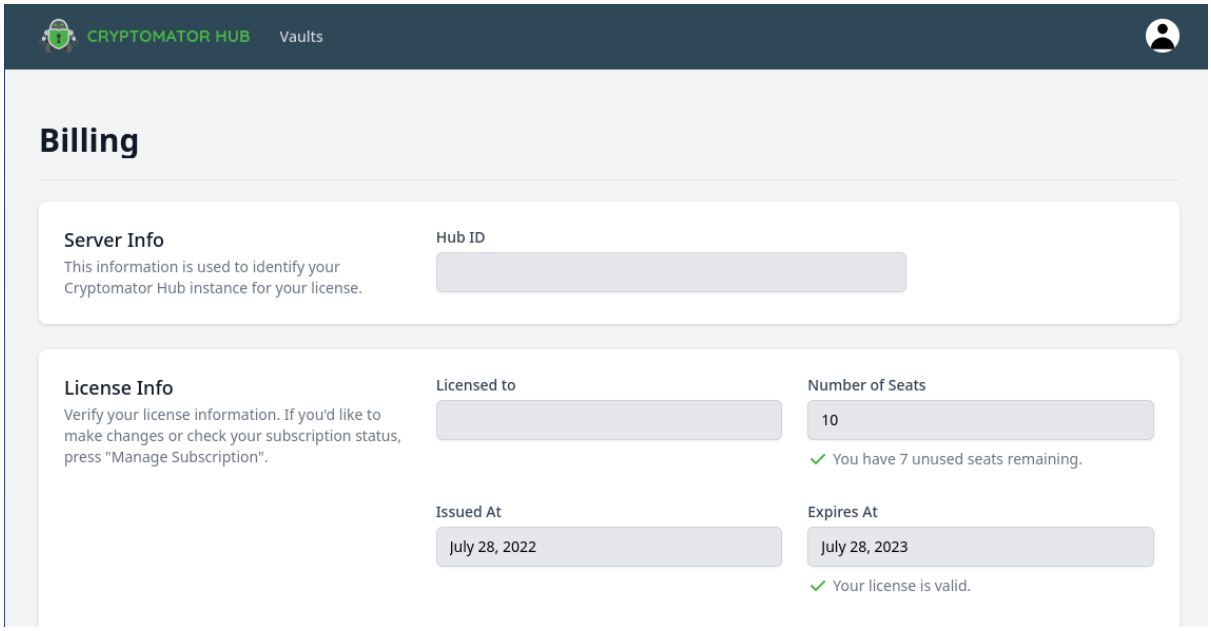
19.5 Billing

When Cryptomator Hub is freshly installed, it comes with a community license.



This license is valid for 5 seats. Only users assigned to a vault will occupy a seat.

The `Get License` button will direct you to an external website at cryptomator.org where you can buy a license for this instance. If successful, you will be automatically redirected back to your Hub instance.



19.6 Requirements

Currently, we are evaluating the system requirements for Cryptomator Hub. If you can provide data, please send us an email to hub-beta@cryptomator.org.

19.7 Backup

Cryptomator Hub and Keycloak both write to the connected Postgres database. So the best and easiest way is to backup it cyclically using e.g. a Cron Job. Depending on your deployment, here is a sample command that you can run on the host system to backup the entire databases to a file using the Postgres container, which you than could import in a similar way:

```
Docker:
docker exec -u postgres -it postgres /bin/bash -c /usr/local/bin/pg_dumpall \
    > "$(date +%F)-hub-backup"

Kubernetes:
kubectl exec -it deployments/postgres -n NAMESPACE \
    -- /usr/local/bin/pg_dumpall -U postgres > "$(date +%F)-hub-backup"
```

See https://www.postgresql.org/docs/current/app-pg-dumpall.html for more information on the *pg_dumpall* command. The command will create a file on the host with a name like “2023-02-06-hub-backup”.

Besides *pg_dumpall* Postgres offers with *psql -f PATH_TO_FILE* a command to restore the database from this file and a new system is completely at the state of this file.

If you also back up the deployment script, you can restore the entire solution to production in minutes.

Note: Make sure this backup is moved to another secure location.

CHAPTER

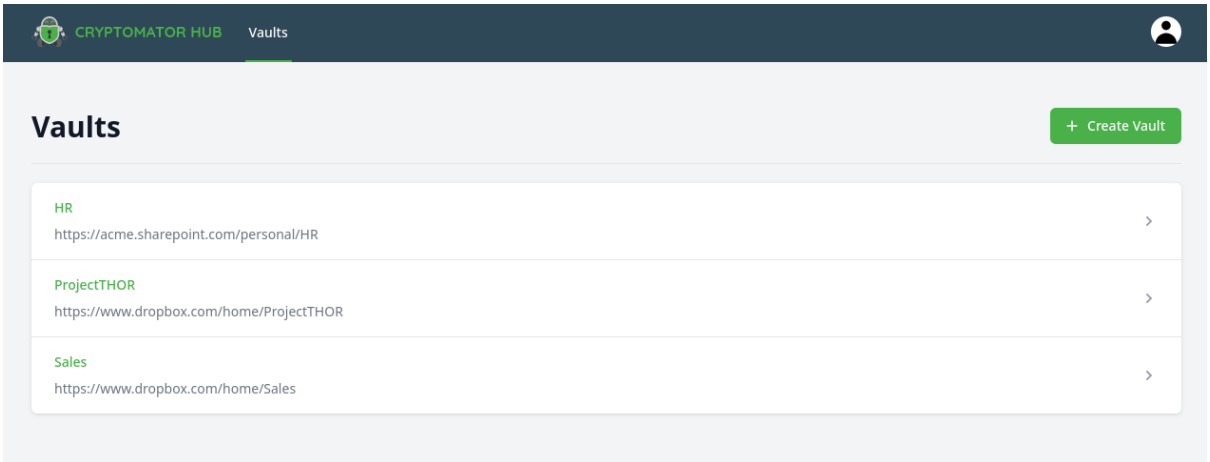
TWENTY

VAULT MANAGEMENT

This section contains instructions to manage vaults in Cryptomator Hub.

20.1 Vault List

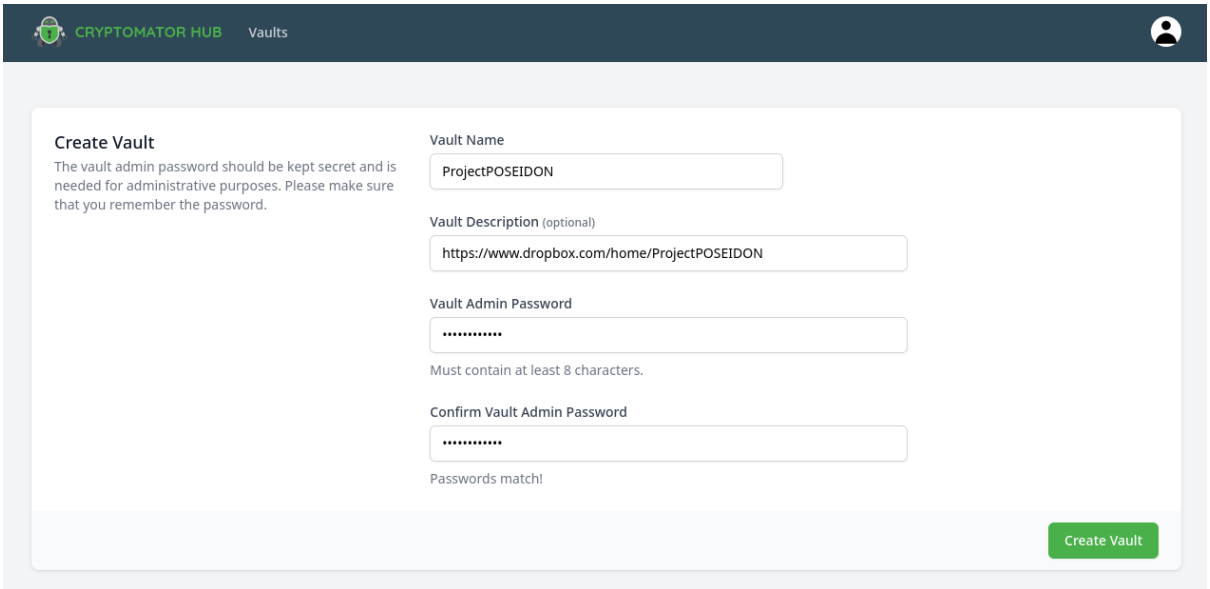
The vault list is the main page of Cryptomator Hub. Here, all vaults which are shared with you, are listed. After signing in, Hub redirects you to this list. Alternatively, you can also access the list by clicking on the `Vaults` tab in the navigation bar.



Note: Even if you are an administrator of the Hub instance, only vaults which are shared with you are listed.

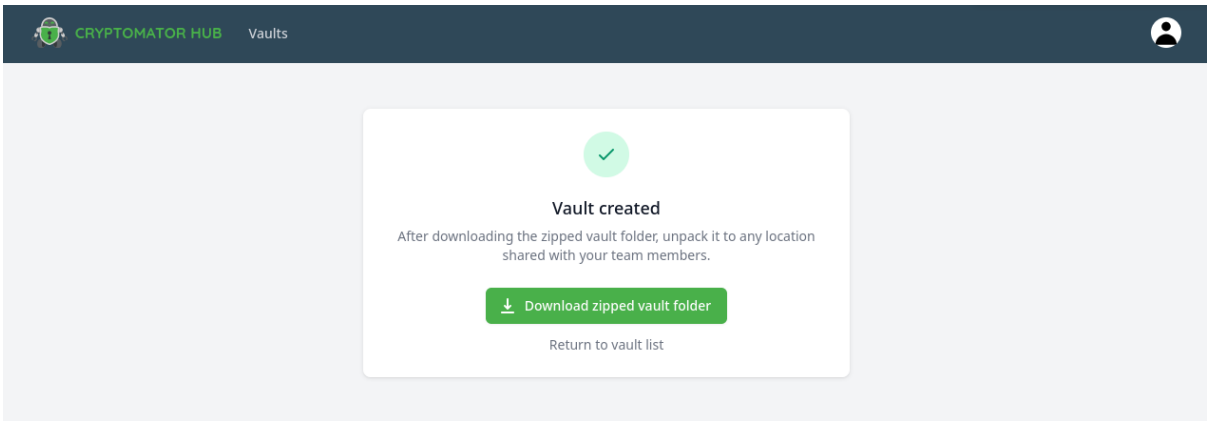
20.2 Create a Vault

To create a vault in Hub, navigate to the vault list and click on the `Create Vault` button in the top right corner. Fill out the form and complete the setup by clicking the `Create Vault` button in the right corner.



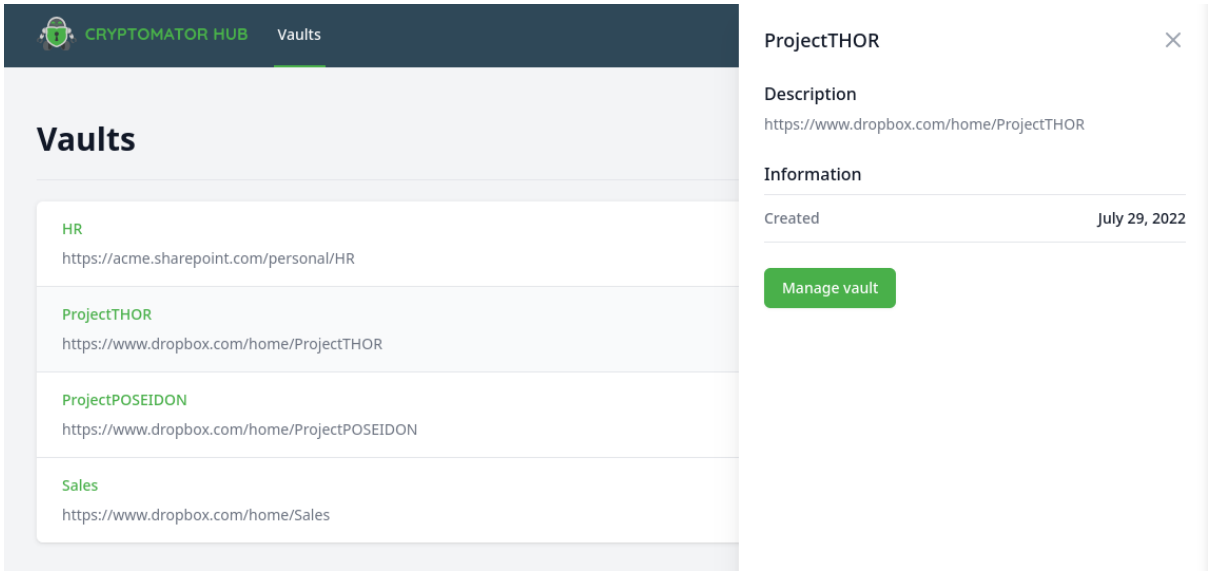
Note: The vault password is needed to grant or revoke access to the vault. It is not used to unlock the vault in Cryptomator apps.

When the setup is finished, you have the opportunity to download the initial vault template and place it in your desired cloud storage location. If you skip this step, you can download the template *later*.



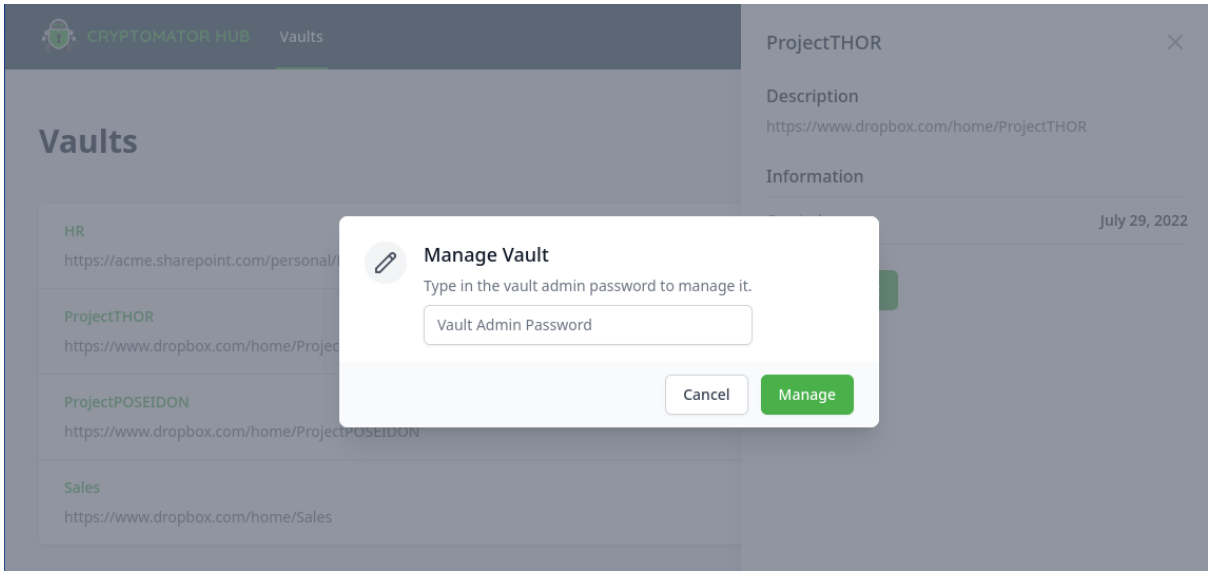
20.3 Vault Details

The vault details page shows metadata of a vault (e.g. creation date) and contains the management section of the vault (e.g. grant a user access). To open it, navigate to the vault list and click on entry in the list. The details are displayed on the right side.



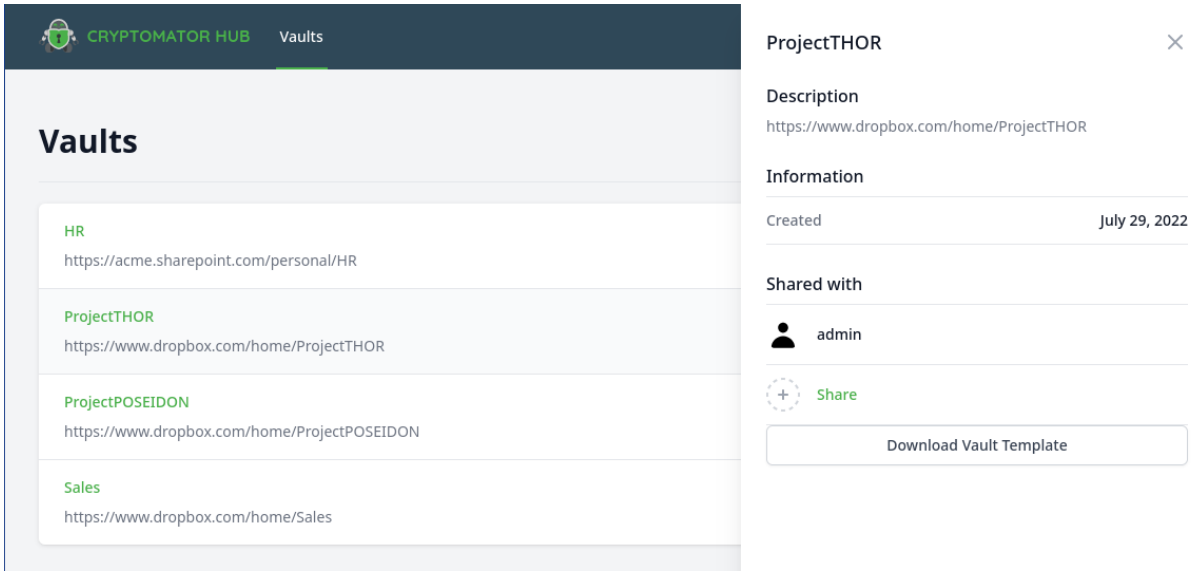
20.3.1 Manage Vault

To add a user, grant devices access, or view the members list, you have to enable the management section in the vault details. Open the vault details and click the `Manage Vault` button. In the dialog, enter the vault admin password.



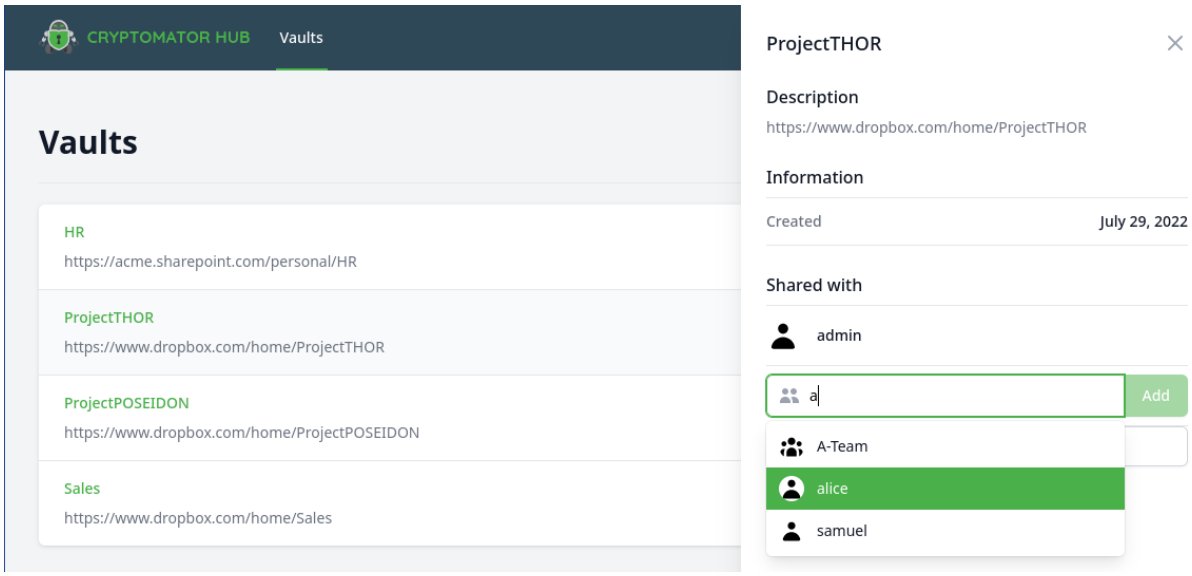
If the password is correct, the vault details view is enriched with more elements:

- `Shared with` members list
- `Download Vault Template` button
- `Update Permissions` button (only shown if necessary)



Add a User

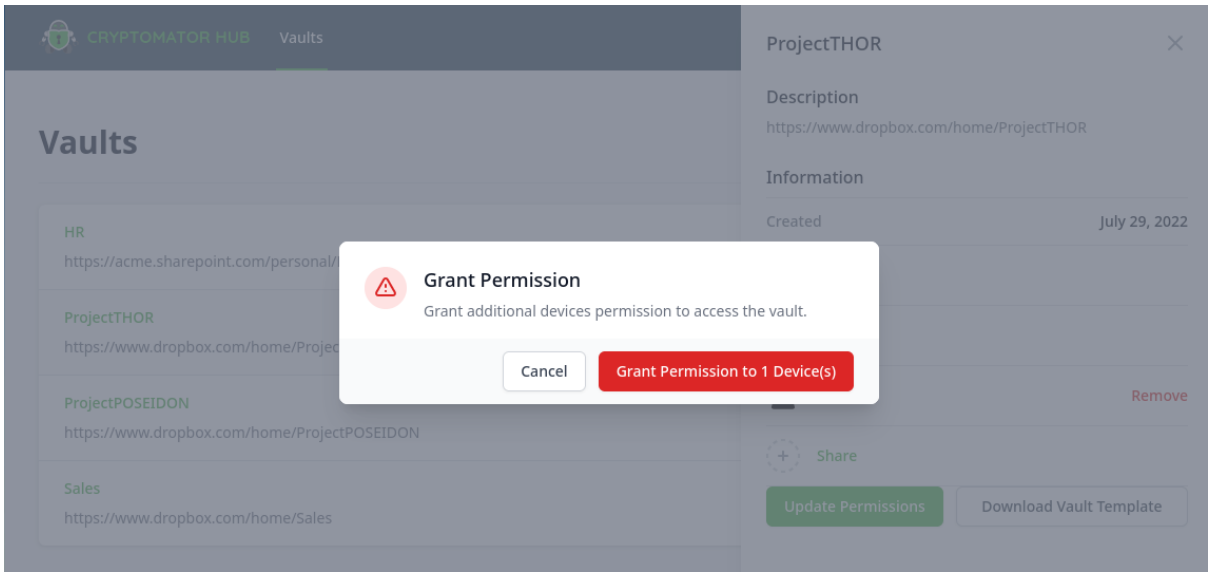
If a user should have access to this vault, you need to share it with the user. Click on the `Share` button in the `Shared with` list. A search field opens up where you can search for users and groups.



To add a user or group, select it from the results list and click the `Add` button.

Update Permissions

If a member of this vault registers a new device or still has unauthorized devices, an admin of the vault has to grant access to these devices explicitly. Only then, the user can unlock the vault with the device. As a vault admin, you can see that an update is necessary when an `Update Permissions` button appears.



CHAPTER

TWENTYONE

WORKING WITH VAULTS

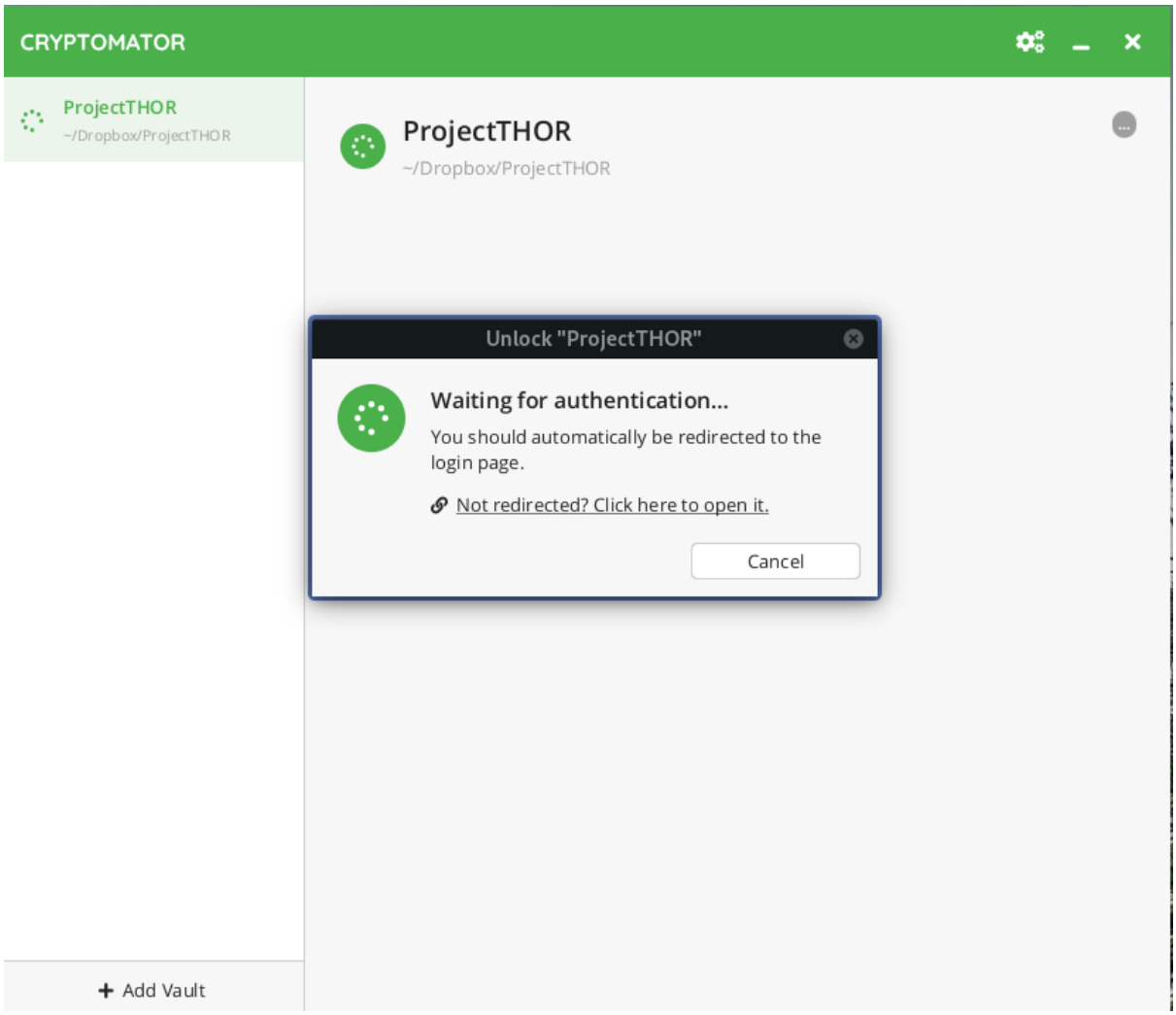
This section describes exemplarily how to unlock a vault in the Desktop app. Android and iOS work analogously.

As described in *open an existing vault*, you should have already added the vault to the vault list, e.g., by selecting the *vault.cryptomator* file.

21.1 Unlocking a Vault

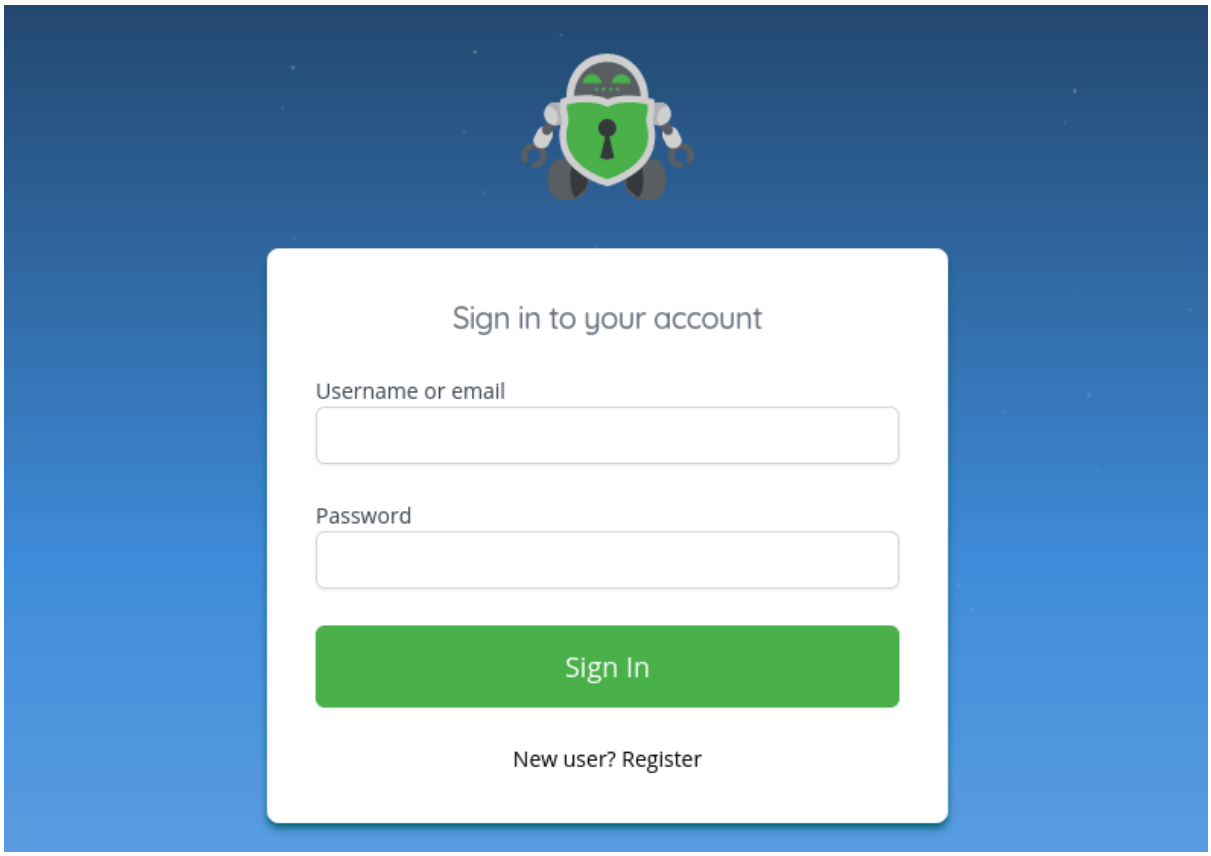
21.1.1 1. Click Unlock

To unlock the vault, click on the large `Unlock` button in the center of Cryptomator's main window.



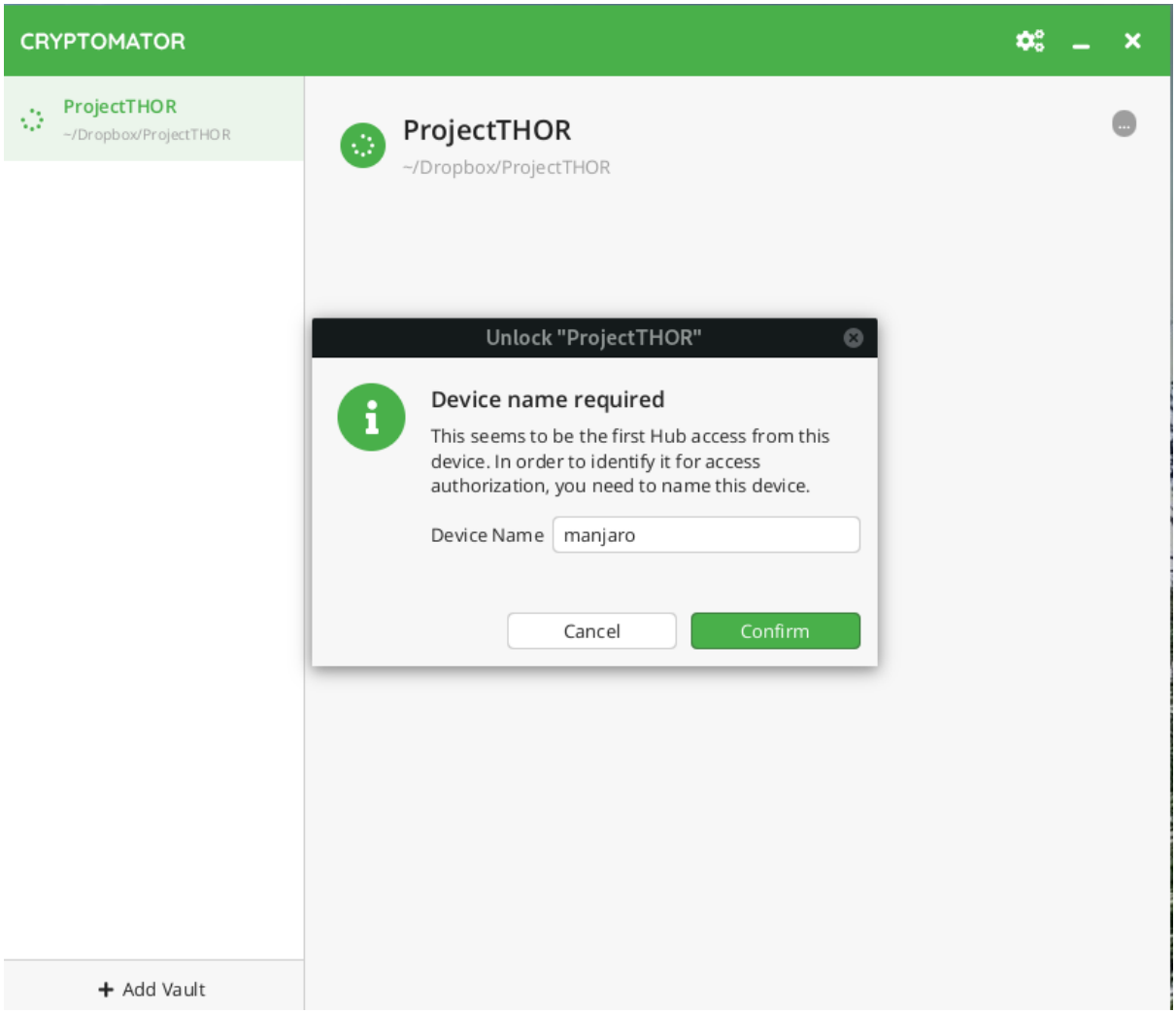
21.1.2 2. Authenticate

Cryptomator should open your default browser for authentication. If you're not already logged in, you need to provide your user credentials, e.g., by entering your username and password or by inserting your key when WebAuthn is enabled.

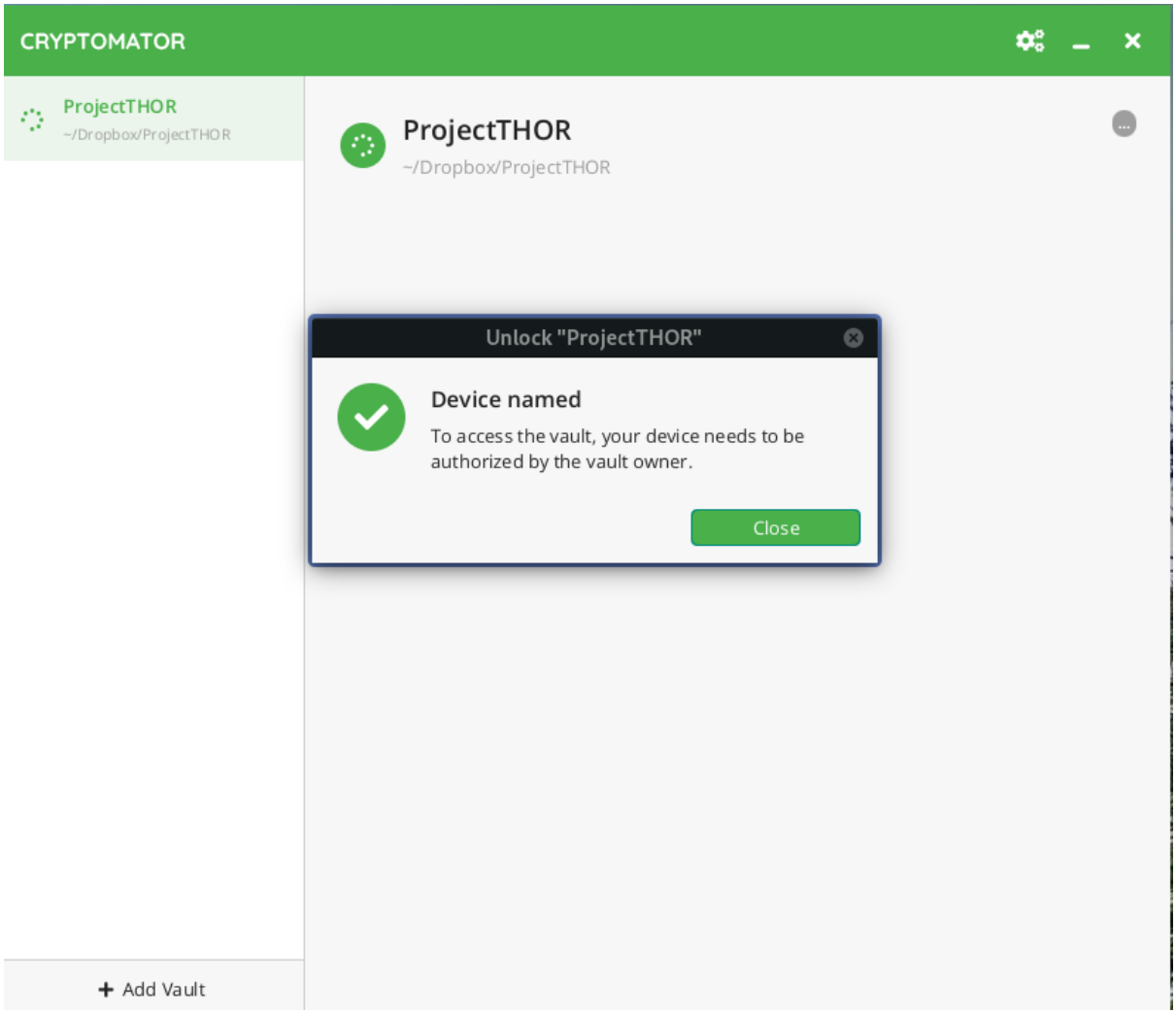


21.1.3 3. Register Device

If you connect to Hub with this device for the first time, you need to enter a unique name for this device.

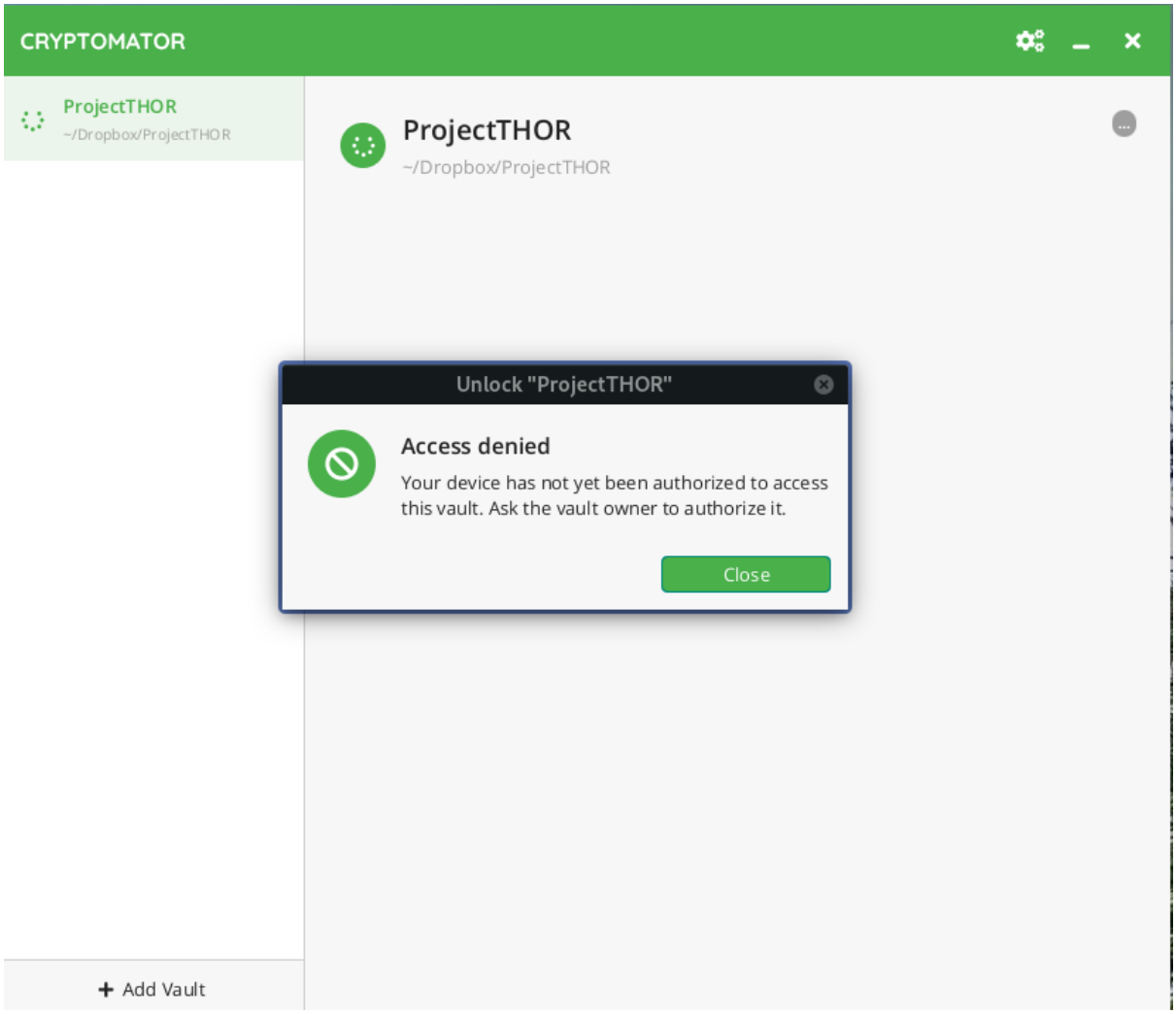


After that, you will see the following confirmation dialog.

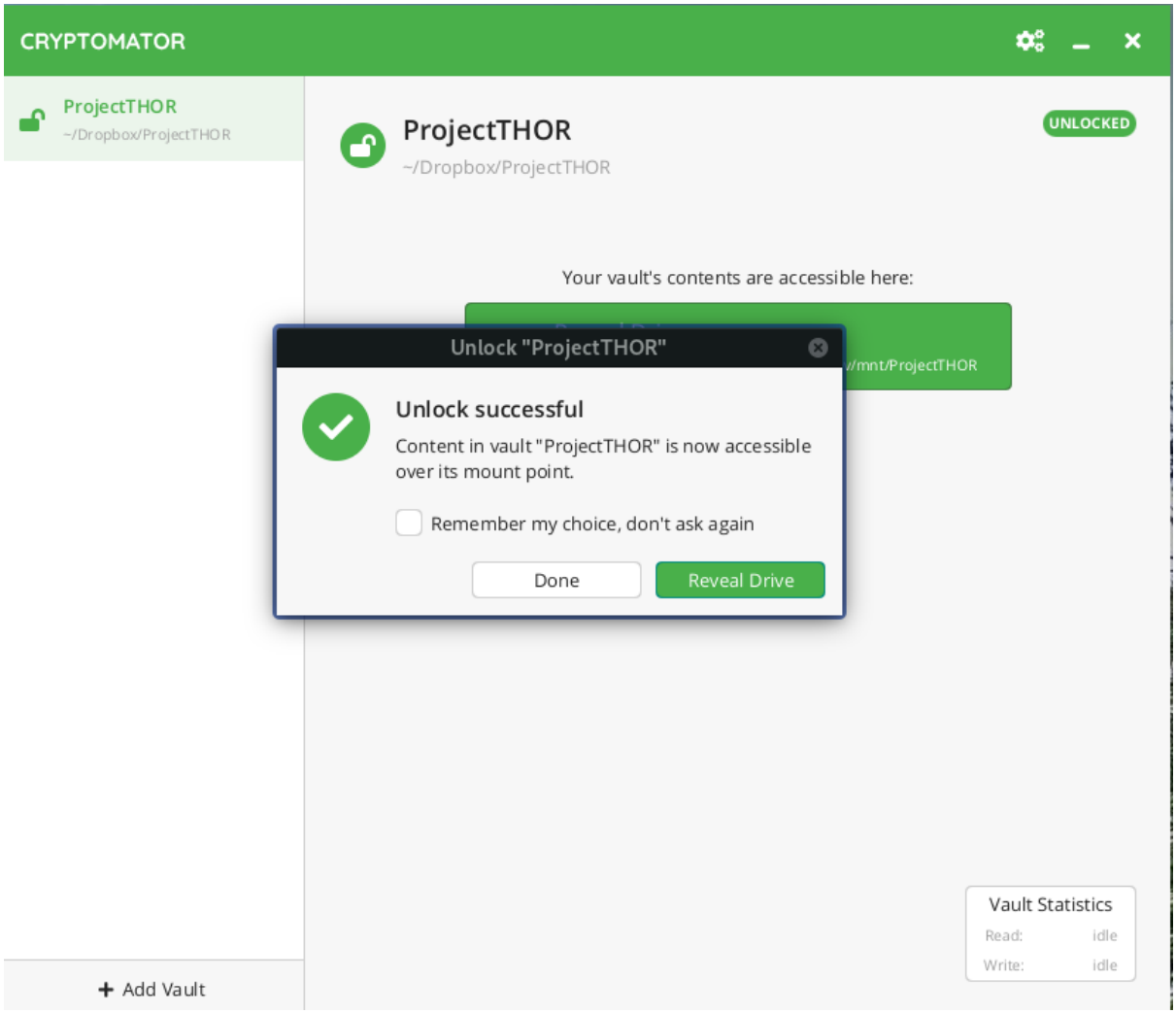


21.1.4 4. Vault Unlocked

If you just registered the new device, a vault administrator needs to grant you access explicitly for the requested vault as described *here*, otherwise you will see the following dialog.



After a vault administrator has granted you access, you are all set up and an unlock should be successful from now on. You can then reveal the vault's contents as usual.

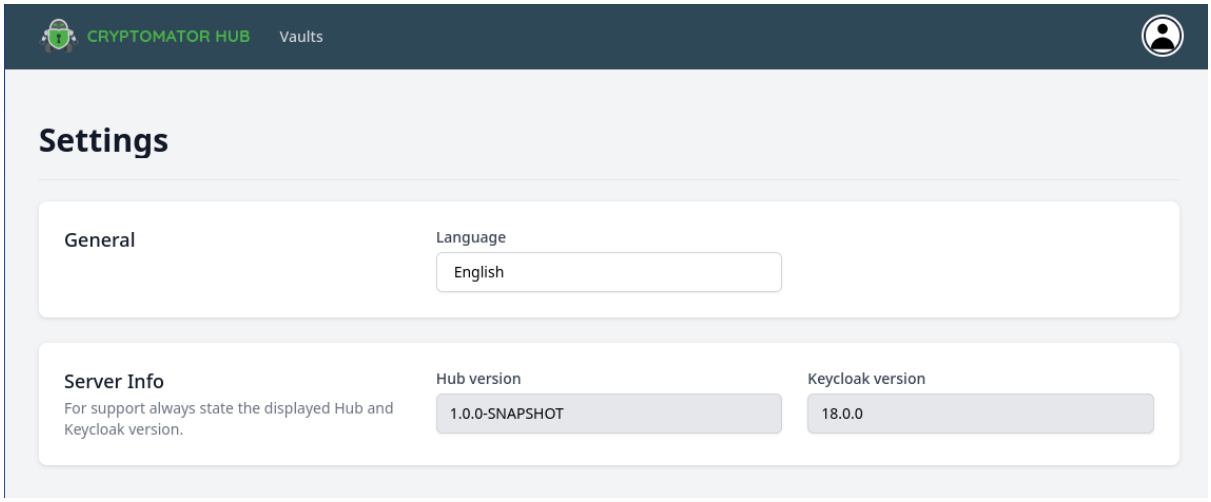

CRYPTOMATOR
ProjectTHOR
~/Dropbox/ProjectTHOR
+ Add Vault
ProjectTHOR
~/Dropbox/ProjectTHOR
UNLOCKED
Your vault's contents are accessible here:
/mnt/ProjectTHOR
Unlock "ProjectTHOR"
Unlock successful
Content in vault "ProjectTHOR" is now accessible over its mount point.
Remember my choice, don't ask again
Done
Reveal Drive
Vault Statistics
Read: idle
Write: idle

CHAPTER

TWENTYTWO

SETTINGS

Access the settings of Cryptomator Hub by tapping the profile icon in the top right corner.



22.1 Version

The section `Server Info` shows the current running Hub and Keycloak version. Providing those values is required when you ask for support.

The following versions are compatible with each other:

Hub	Keycloak	Cryptomator Desktop	Cryptomator Android	Cryptomator iOS
1.0.0	18, 19, 20	1.6.11	N/A	N/A

CHAPTER

TWENTYTHREE

SECURITY TARGET

Cryptomator was designed to solve privacy issues when saving files to cloud storages.

The risk that the cloud provider or third parties access the data stored in the cloud without permission is mitigated. Only people who know the vault password are able to read the files in the vault or change the file contents undetected. This is true for file contents as well as for filenames.

To allow a working synchronization with the cloud, there are some meta information that Cryptomator does not encrypt. These are:

- access, modification, and creation timestamp of files and folders,
- number of files and folders in a vault and in the folders, and
- size of the stored files.

In addition, you have to keep in mind what Cryptomator is not. Protection of the files on the local computer is not the focus of Cryptomator. Cryptomator is not a complete replacement for other encryption tools based on container files if the aforementioned meta information should be encrypted. Cryptomator does not provide protection if programs create backup copies of the encrypted files when working with them. Such files are not detected by Cryptomator and may remain on the computer even after unlocking a vault. Cryptomator cannot provide protection if the local computer is infected with malware which reads entered passwords and file contents (e.g., files in an unlocked vault).

To protect against such risks, other methods, like complete disk encryption, immediate installation of system and software updates, and the use of applicable antivirus software, is required.

CHAPTER

TWENTYFOUR

SECURITY ARCHITECTURE

24.1 Virtual Filesystem

Cryptomator provides a virtual drive. Add, edit, remove files as you're used to with just any disk drive.

Files are transparently en- and decrypted. There are no unencrypted copies on your hard disk drive. With every access on your files inside the virtual drive, Cryptomator will en- and decrypt these files on-the-fly.

Currently Dokany or WinFsp (on Windows) and FUSE (on macOS and Linux) are our frontends of choice. If they're not available on your system, Cryptomator will fall back on WebDAV, as it is supported on every major operating system. WebDAV is an HTTP-based protocol and Cryptomator acts as a WebDAV server accepting so-called loopback connections on your local machine only.

Whenever your file manager accesses files through this virtual drive, Cryptomator will process this request via the following layers.

24.2 Vault Configuration

Every vault must have a vault configuration file named `vault.cryptomator` in the root directory of the vault. It is a JWT containing basic information about the vault and specification what key to use. The JWT is signed using the 512 bit raw masterkey.

This is an example of an encoded vault configuration file:

```
eyJraWQiOiJtYXN0ZXJrZXlmaWxlOm1hc3RlcmtleS5jcnlwdG9tYXRvciIsInR5cCI6IkpXVCIsImFsZyI6IkhTMjU2In0.
↪eyJmb3JtYXQiOjgsInNob3J0ZW5pbmdUaHJlc2hvbGQiOjIyMCwianRpIjoiY2U5NzZmN2EtN2I5Mi00Y2MwLWI0YzEtYzc0YT
↪IJlu4dHb3fqB2fAk9lf8G8zyEXc7OLB-5m9aNxOEXIQ
```

The decoded header:

```
{
  "kid": "masterkeyfile:masterkey.cryptomator", /* URI of where to get the key */
  "typ": "JWT",
  "alg": "HS256" /* current implementations also support HS384 and HS512 */
}
```

The decoded payload:

```
{
  "format": 8, /* vault format for checking software compatibility */
  "shorteningThreshold": 220, /* how many characters in ciphertext filenames before␣
↪shortening */
  "jti": "ce976f7a-7b92-4cc0-b4c1-c74a6aa17cf5", /* random UUID to uniquely identify␣
↪the vault */
  "cipherCombo": "SIV_CTRMAC" /* currently only SIV_CTRMAC is supported */
}
```

When opening a vault, the following steps have to be followed:

1. Decode `vault.cryptomator` without verification.
2. Read `kid` header and, depending on its value, retrieve the masterkey from the specified location.
3. Verify the JWT signature using the masterkey.
4. Make sure `format` and `cipherCombo` are supported.

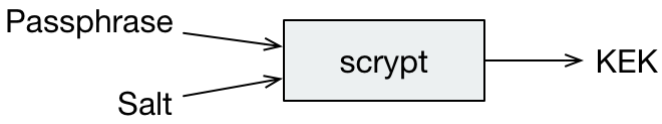
24.3 Masterkey Derivation

Each vault has its own 256 bit encryption as well as MAC masterkey used for encryption of file specific keys and file authentication, respectively.

These keys are random sequences generated by a CSPRNG (Cryptographically secure pseudorandom number generator). We use SecureRandom with SHA1PRNG, seeded with 440 bits from `SecureRandom.getInstanceStrong()`.

Both keys are encrypted using RFC 3394 key wrapping with a KEK (Key-encryption key) derived from the user's password using scrypt.

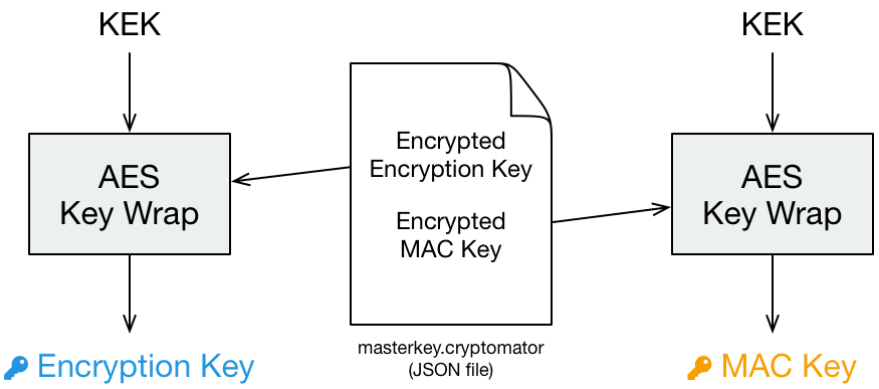
```
encryptionMasterKey := createRandomBytes(32)
macMasterKey := createRandomBytes(32)
kek := scrypt(password, scryptSalt, scryptCostParam, scryptBlockSize)
wrappedEncryptionMasterKey := aesKeyWrap(encryptionMasterKey, kek)
wrappedMacMasterKey := aesKeyWrap(macMasterKey, kek)
```



The wrapped keys and the parameters needed to derive the KEK are then stored as integers or Base64-encoded strings in a JSON file named `masterkey.cryptomator`, which is located in the root directory of the vault.

```
{
    "version": 999, /* deprecated, vault format is now specified in the vault␣
↪configuration */
    "scryptSalt": "QGk...jY=",
    "scryptCostParam": 16384,
    "scryptBlockSize": 8,
    "primaryMasterKey": "QDi...Q==", /* wrappedEncryptionMasterKey */
    "hmacMasterKey": "L83...Q==", /* wrappedMacMasterKey */
    "versionMac": "3/U...9Q=" /* HMAC-256 of vault version to prevent undetected␣
↪downgrade attacks */
}
```

When unlocking a vault the KEK is used to unwrap (i.e. decrypt) the stored masterkeys.



24.4 File Header Encryption

The file header stores certain metadata, which is needed for file content encryption. It consists of 88 bytes.

- 16 bytes nonce used during header payload encryption.
- 40 bytes AES-CTR encrypted payload consisting of:
  - 8 bytes filled with 1 for future use (formerly used for file size) and
  - 32 bytes file content key.
- 32 bytes header MAC of the previous 56 bytes.

```
headerNonce := createRandomBytes(16)
contentKey := createRandomBytes(32)
cleartextPayload := 0xFFFFFFFFFFFFFFFF . contentKey
ciphertextPayload := aesCtr(cleartextPayload, encryptionMasterKey, headerNonce)
mac := hmacSha256(headerNonce . ciphertextPayload, macMasterKey)
```

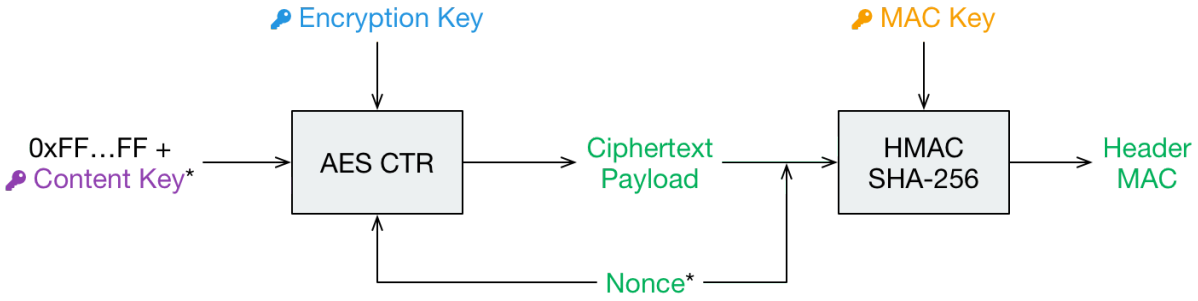


Fig. 1: *Random per file change

24.5 File Content Encryption

This is where your actual file contents get encrypted.

The cleartext is broken down into multiple chunks, each up to 32 KiB + 48 bytes consisting of:

- 16 bytes nonce,
- up to 32 KiB encrypted payload using AES-CTR with the file content key, and
- 32 bytes MAC consisting of:

- file header nonce (to bind this chunk to the file header),
- chunk number as 8 byte big endian integer (to prevent undetected reordering),
- nonce, and
- encrypted payload.

Afterwards, the encrypted chunks are joined preserving the order of the cleartext chunks. The payload of the last chunk may be smaller than 32 KiB.

```
cleartextChunks[] := split(cleartext, 32KiB)
for (int i = 0; i < length(cleartextChunks); i++) {
    chunkNonce := createRandomBytes(16)
    ciphertextPayload := aesCtr(cleartextChunks[i], contentKey, chunkNonce)
    mac := hmacSha256(headerNonce . bigEndian(i) . chunkNonce . ciphertextPayload,␣
↪macMasterKey)
    ciphertextChunks[i] := chunkNonce . ciphertextPayload . mac
}
ciphertextFileContent := join(ciphertextChunks[])
```

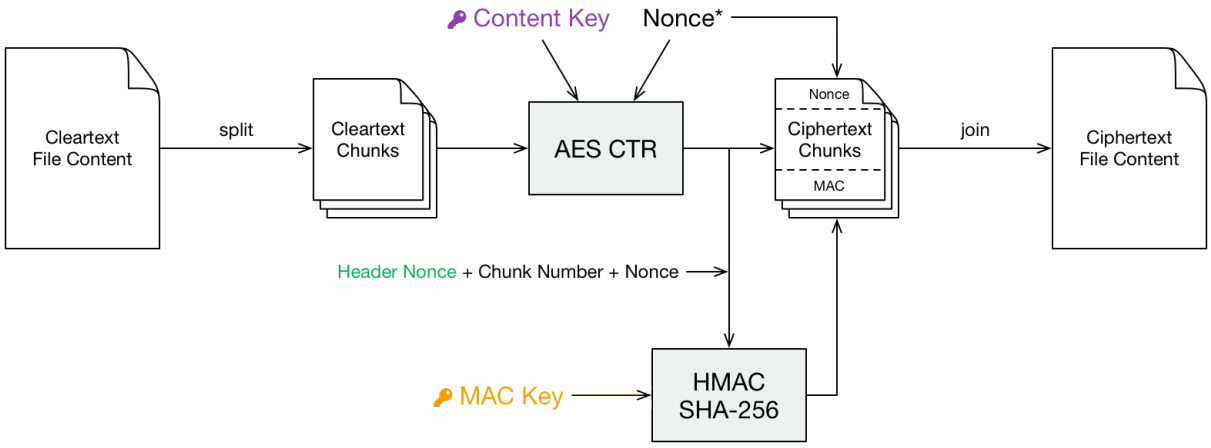


Fig. 2: *Random per chunk change

24.6 Directory IDs

Each directory has a unique ID that is required during filename encryption. For historical reasons, the directory ID is a string, even though any byte sequence would do the job.

The directory ID for the root directory is the empty string. For all other directories, it is a random sequence of at most 36 ASCII chars. We recommend using random UUID (Universally unique identifier).

```
dirId := createUuid()
```

When traversing directories, the directory ID of a given subdirectory is processed in four steps to determine the storage path inside the vault:

1. Encrypting the directory ID using AES-SIV in order to encrypt directory hierarchies.
2. Creating a SHA1 hash of the encrypted directory ID in order to get a uniform length.
3. Encoding the hash with Base32 to get a string of printable chars.
4. Constructing the directory path out of the Base32-encoded hash.

```
dirIdHash := base32(sha1(aesSiv(dirId, null, encryptionMasterKey, macMasterKey)))
dirPath := vaultRoot + '/d/' + substr(dirIdHash, 0, 2) + '/' + substr(dirIdHash, 2,␣
↪30)
```

Regardless of the hierarchy of cleartext paths, ciphertext directories are always stored in a flattened structure. All directories will therefore effectively be siblings (or cousins, to be precise).

24.7 Filename Encryption

The cleartext name of a file gets encoded using UTF-8 in Normalization Form C to get a unique binary representation.

Cryptomator uses AES-SIV to encrypt names. The directory ID of the parent folder is passed as associated data. This prevents undetected movement of files between directories.

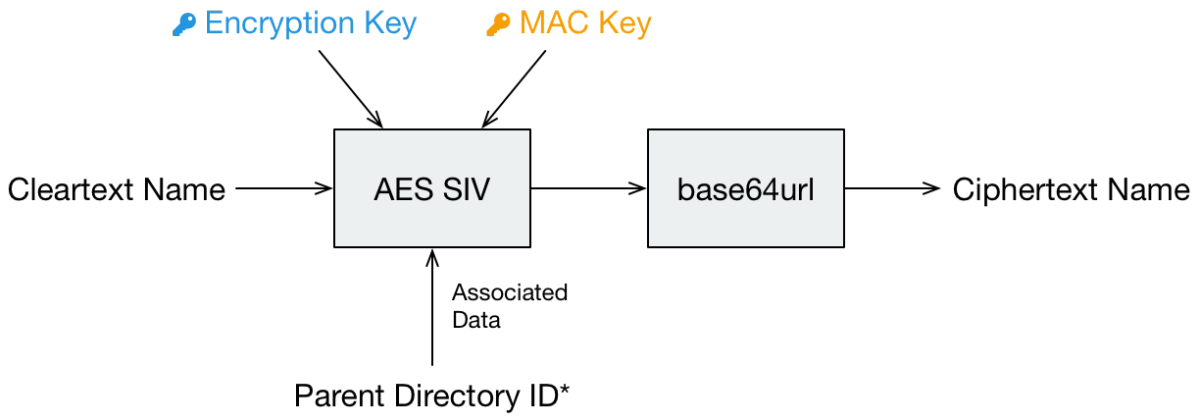


Fig. 3: *Unencrypted directory ID of the partent dir as described above

```
ciphertextName := base64url(aesSiv(cleartextName, parentDirId, encryptionMasterKey,␣
↪macMasterKey)) + '.c9r'
```

Depending on the kind of node, the encrypted name is then either used to create a file or a directory.

- Files are stored as files.
- Non-files are stored as directories. The type of the node then depends on the directory content.
  - Directories are denoted by a file called `dir.c9r` containing aforementioned directory ID.
  - Symlinks are denoted by a file called `symlink.c9r` containing the encrypted link target.
  - Further types may be appended in future releases.

Thus, a cleartext directory structure like this:

```
.
├─ File.txt
├─ SymlinkToFile.txt
├─ Subdirectory
│  └─ ...
└─ ...
```

Becomes a ciphertext directory structure like this:

```
.
├─ d
│  ├─ BZ
│  │  └─ R4VZSS5PEF7TU3PMFIMON5GJRNBDWA
│  │     ├─ 5TyvCyF255sRtfrIv**83ucADQ==.c9r  # File.txt
│  │     ├─ FHTa55bH*sUfVDbEb0gTL9hZ8nho.c9r  # Subdirectory
│  │     │  └─ dir.c9r  # contains dirId
│  │     └─ gLeOGMCN358*UBf2Qk9cWCQl.c9r  # SymlinkToFile.txt
│  │        └─ symlink.c9r  # contains link target
│  └─ FC
│     └─ ZKZRLZUODUUYTYA4457CSBPZXB5A77  # contains contents of Subdirectory
│        └─ ...
├─ masterkey.cryptomator
├─ masterkey.cryptomator.DFD9B248.bkup
└─ vault.cryptomator
```

24.8 Name Shortening

Note: This layer doesn't provide any additional security. Its sole purpose is to maximize compatibility.

To maximize compatibility, we need to make sure the ciphertext names don't exceed a length of 255 chars. As some cloud sync services might want to add a suffix to a file in case of conflicts, we decided to use at most 220 chars.

If an encrypted name (including its `.c9r` extension) exceeds these 220 chars, we will instead create a directory named after its much shorter SHA-1 hash and the `.c9s` extension. Additionally we will create a reverse-mapping file named `name.c9s` containing the original file inside of this directory.

```
if (length(ciphertextName) > 220) {
    deflatedName := base64url(sha1(ciphertextName)) + '.c9s'
    inflatedNameFilePath := deflatedName + '/name.c9s'
    fileContentsPath := deflatedName + '/contents.c9r'
    symlinkFilePath := deflatedName + '/symlink.c9r'
    dirIdFilePath := deflatedName + '/dir.c9r'
}
```

Again, we have to distinguish the kind of a node.

- Non-files (such as symlinks or directories) are stored as a directory anyway. Nothing changes for them.
- Files, on the other hand, need a different place to store their contents. Therefore, we introduce the `contents.c9r` file inside the `.c9s` directory.

A vault containing several nodes with very long names might result in a ciphertext structure like this:

```
.
├─ d
│  ├─ BZ
│  │  └─ R4VZSS5PEF7TU3PMFIMON5GJRNBDWA
│  │     ├─ 5TyvCyF255sRtfrIv**83ucADQ==.c9r
│  │     ├─ FHTa55bH*sUfVDbEb0gTL9hZ8nho.c9r
│  │     │  └─ dir.c9r
│  │     ├─ gLeOGMCN358*UBf2Qk9cWCQl.c9r
│  │     │  └─ symlink.c9r
│  │     ├─ IjTsXtReTy6bAAuxzLPV9T0k2vg=.c9s  # shortened name...
│  │     │  ├─ contents.c9r  # ...node is a regular file
```

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```
│   │       │   └─ name.c9s  # ...mapping to this full name
│   │       ├─ q2nx5XeNCenHyQvkFD4mxYNrWpQ=.c9s  # shortened name...
│   │       │   ├─ dir.c9r  # ...node is a directory
│   │       │   └─ name.c9s  # ...mapping to this full name
│   │       └─ u*JJCJE-T4IH-EBYASUp1u3p7mA=.c9s  # shortened name...
│   │           ├─ name.c9s  # ...mapping to this full name
│   │           └─ symlink.c9r  # ...node is a symlink
│   └─ FC
│       └─ ZKZRLZUODUUYTYA4457CSBPZXB5A77
│           └─ ...
├─ masterkey.cryptomator
├─ masterkey.cryptomator.DFD9B248.bkup
└─ vault.cryptomator
```

24.9 Backup Directory IDs

Note: This layer is optional and not required for a complete implementation of the Cryptomator Encryption Scheme. It doesn't provide any additional security. Its sole purpose is to increase data recoverability in case of missing or damaged directory files.

By obfuscating the hierarchy of cleartext paths using `dir.c9r` files, which contain *directory IDs*, the directory structure is more vulnerable to problems like incomplete synchronization or bit rotting.

When a directory file is missing or damaged, the `dirPath` cannot be computed, which effectively makes the directory content inaccessible in the *virtual filesystem*. In theory, the contents of the encrypted content of these files can be recovered. But since the *filename encryption* is dependent on the directory ID of the parent folder, which is only stored in the directory file, names of all items (files, directories, or symlinks) are lost.

To alleviate this issue, a backup directory file will be stored during the creation of a directory. Inside the ciphertext directory, a file named `dirid.c9r` will be created, which contains the directory ID of its parent folder. It is *encrypted* like a regular ciphertext file.

CHAPTER

TWENTYFIVE

BEST PRACTICES

25.1 Sharing of Vaults

Always be careful when sharing your vault with other people.

In general, keep your vault password secret. Nobody except yourself should know the vault password. Only when you use a vault together with other people, they may know your vault password. Keep in mind that other people could pass on – with or without intent – the vault password. Only share your vaults with people you trust.

If you share a vault with others, do not communicate the vault password on an insecure channel. Tell the password in person, use encrypted email or messengers or other similar secure means.

25.2 Good Passwords

Bad passwords can be cracked easily when using computers. Plenty of recommendations exist for secure passwords. Some of these are:

- A password should not contain public or personal information like the name of your pet, date of birth, or username.
- A password should be long.
- A password should not be an existing word or a combination of few words. It should be a combination of characters or words that is as random as possible.
- For each purpose, a unique password without similarities to other passwords should be used.

If you fulfill these requirements, you quickly reach a point where remembering the passwords gets impossible. Thus, we recommend to use a password manager to generate and store the passwords. By doing so, you only have to remember a few or a single secure password. Otherwise, we recommend to use at least 10 characters, ideally use sentences instead of words.

CHAPTER

TWENTYSIX

MANUAL MIGRATION

Under some circumstances, Cryptomator refuses to automatically migrate a vault to a newer format. In this case, your vault will remain untouched, so you can continue using it with the previous version.

To upgrade to the latest version, you can perform a migration manually:

1. Unlock the vault with the previous version of Cryptomator that you have used. You can find downloads of older versions on our GitHub site.
2. Copy all files from this vault onto a temporary storage location on your computer. Be aware that these files are decrypted.
3. Once finished, lock your vault and quit Cryptomator. Now install the latest version of Cryptomator.
4. Create new vault with the latest version of Cryptomator and unlock it.
5. Copy all files from step 2 into the new vault.

Note: One reason why automatic migration is impossible might be the fact that your vault is stored in a location that limits filename or path lengths, such as:

- Network drives on Windows, such as WebDAV mounts
- eCryptfs-encrypted volumes on Linux

In this case, during step 5, you may encounter warnings indicating that you can not encrypt files due to such length limitations. Feel free to simply change the name of any affected files.

CHAPTER

TWENTYSEVEN

CONTRIBUTE

27.1 How Can You Help Us?

Cryptomator is an open source project and wouldn't be possible without contributions from users who support the idea.

There are several ways you can help us:

- By reporting bugs or feature requests on GitHub,
- By discussing solutions in our community,
- By contributing patches or features via pull requests,
- By helping us with the localization of Cryptomator,
- By improving this documentation,
- By becoming a sponsor,
- Or by donating to the maintainers.

27.2 Before You Start

If you plan to help, please stick to our Code of Conduct.

Our code is licensed under GPLv3 and this documentation under CC-BY-SA 4.0. If you contribute either, your grant us the rights to publish your contributions under those licenses. Also you have to digitally sign a Contributor License Agreement (CLA). This is required to protect the maintainers of Cryptomator from legal problems with patent or copyright infringement. The CLA signature process is triggered by your first pull request automatically. You will be asked to authenticate with your GitHub account and your username will be stored even if you revoke any activity on GitHub.

CHAPTER

TWENTYEIGHT

VAULT FORMAT HISTORY

Cryptomator vaults need to adhere to a structure and format (as described in *Security Architecture*) that may change over time. In order to identify the correct format, the masterkey file contains a version number, which represents the vault format.

28.1 Format 8

Introduced in Cryptomator 1.6.0 on 2021-10-19. The following changes are:

- Decoupled vault configuration from key derivation by introducing new vault configuration file named `vault.cryptomator`. It is a JWT containing basic information about the vault and specification what key to use.
- `version` inside `masterkey.cryptomator` is now deprecated.

28.2 Format 7

Introduced in Cryptomator 1.5.0 on 2020-04-16. The following changes are:

- Added file extension (`*.c9r` and `*.c9s`) to all encrypted files and directories. Certain cloud storage services have issues with files without an extension.
- Encrypted directories are now actually directories. Directory file is now inside of that with the fixed name `dir.c9r`.
- Encrypted symlinks are now directories. Symlink file is now inside of that with the fixed name `symlink.c9r`.
- Files and directories with shortened filenames are now directories (identifiable by the `.c9s` suffix). Mapping file with the long filename is now inside of that with the fixed name `name.c9s`. If it's a regular file, the content file has the fixed name `contents.c9r`.
- Removed directory `m` because mapping files for shortened filenames are now in `d` as well.
- Filenames are encoded with base64url so that name shortenings are less likely.
- Increased ciphertext filename threshold to 220 characters.

This is an example of the vault structure:

```
.
├─ d
│  ├─ BZ
│  │  └─ R4VZSS5PEF7TU3PMFIMON5GJRNBDWA
│  │     ├─ 5TyvCyF255sRtfrIv__83ucADQ==.c9r  # regular file
│  │     ├─ FHTa55bH_sUfVDbEb0gTL9hZ8nho.c9r  # irregular file...
│  │     │  └─ dir.c9r  # ...which is a directory
```

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```
│   │       ├─ gLeOGMCN358_UBf2Qk9cWCQl.c9r  # irregular file...
│   │       │  └─ symlink.c9r  # ...which is a symlink
│   │       ├─ IjTsXtReTy6bAAuxzLPV9T0k2vg=.c9s  # shortened name...
│   │       │  ├─ contents.c9r  # ...which is a regular file
│   │       │  └─ name.c9s  # ...mapping to this full name
│   │       ├─ q2nx5XeNCenHyQvkFD4mxYNrWpQ=.c9s  # shortened name...
│   │       │  ├─ dir.c9r  # ...which is a directory
│   │       │  └─ name.c9s  # ...mapping to this full name
│   │       ├─ u_JJCJE-T4IH-EBYASUp1u3p7mA=.c9s  # shortened name...
│   │       │  ├─ name.c9s  # ...mapping to this full name
│   │       │  └─ symlink.c9r  # ...which is a symlink
│   │       └─ ...
│   └─ FC
│      └─ ZKZRLZUODUUYTYA4457CSBPZXB5A77
│         └─ ...
├─ masterkey.cryptomator
└─ masterkey.cryptomator.DFD9B248.bkup
```

28.3 Format 6

Introduced in Cryptomator 1.3.0 on 2017-07-01. The following changes are:

- Password is normalized in NFC.

28.4 Format 5

Introduced in Cryptomator 1.2.0 on 2016-09-19. The following changes are:

- Dropped file size obfuscation support.

File sizes can be determined in `O(1)` instead of having to read and decrypt the file header. This allows showing file sizes in the directory listing without having to download each file first. The file size in the header is now unused and filled with `0xFFFFFFFFFFFFFFFF`.

28.5 Format 4

Introduced in Cryptomator 1.1.1 on 2016-07-08. The following changes are:

- Directories now have `0` (zero) prefix instead of a `_` (underscore) suffix.

Directories are now stored with different names to avoid conflicts with the naming scheme of certain cloud storage services in case of synchronization conflicts.

This is an example of the vault structure:

```
.
├─ d
│  ├─ BZ
│  │  └─ R4VZSS5PEF7TU3PMFIMON5GJRNBDWA
│  │     ├─ 0USJ7VD36K7YU2RARYJMEFTABZOGN6LUH63VRH5MADVOZ433VZ7EPSM2PLJPHTBL6
│  │     ├─ 0YWVRCCROEC3ZECD2UTJR7BGYERU3LG6R7QODBGMZ7EQ3BXGY24======
│  │     ├─ ...
│  │     ├─ YWBBP7RC6FFX6ZN4YBLN4WXD6IIBTMKXHFFDQEZNYTQLNZWOGDT22EY=
│  │     └─ ZTNHMICOWU6ZSNIR72ESLQSGDMLQYQ42XEKGOWSYYX5II===
```

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```
│  └─ FC
│     └─ ZKZRLZUODUUYTYA4457CSBPZXB5A77
│        └─ ...
├─ m
│  └─ ...
├─ masterkey.cryptomator
└─ masterkey.cryptomator.bkup
```

28.6 Format 3

Introduced in Cryptomator 1.0.0 on 2016-03-09.

Vault format 3 is basically the official "first" version. To be exact, it was actually introduced in Cryptomator Beta 0.11 on 2016-03-03. Vault formats 1 and 2 were only used in beta versions of Cryptomator.

This is an example of the vault structure:

```
.
├─ d
│  ├─ BZ
│  │  └─ R4VZSS5PEF7TU3PMFIMON5GJRNBDWA
│  │     ├─ USJ7VD36K7YU2RARYJMEFTABZOGN6LUH63VRH5MADVOZ433VZ7EPSM2PLJPHTBL6_
│  │     ├─ YWBBP7RC6FFX6ZN4YBLN4WXD6IIBTMKXHFFDQEZNYTQLNZWOGDT22EY=
│  │     ├─ ...
│  │     ├─ YWVRCCROEC3ZECD2UTJR7BGYERU3LG6R7QODBGMZ7EQ3BXGY24======_
│  │     └─ ZTNHMICOWU6ZSNIR72ESLQSGDMLQYQ42XEKGOWSYYX5II===
│  └─ FC
│     └─ ZKZRLZUODUUYTYA4457CSBPZXB5A77
│        └─ ...
├─ m
│  └─ ...
├─ masterkey.cryptomator
└─ masterkey.cryptomator.bkup
```