



Proxmox Offline Mirror Documentation

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Proxmox Support Team

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INTRODUCTION

1.1 What is Proxmox Offline Mirror?

With the Proxmox Offline Mirror tool, you can manage a local apt mirror for all package updates for Proxmox and Debian projects. From this local apt mirror you can create an external medium, for example a USB flash drive or a local network share, to update systems which cannot access the package repositories directly via the internet. Such systems might be restricted by policies to access the public internet or are completely air-gapped. Finally, you can also manage subscriptions for such restricted hosts.

This tool consists of two binaries:

proxmox-offline-mirror The mirror tool to create and manage mirrors and media containing repositories

proxmox-offline-mirror-helper The helper to use the external medium on offline Proxmox VE, Proxmox Mail Gateway or Proxmox Backup Server systems as well as managing subscriptions on these systems.

1.2 Terminology

There are three basic entity types available for configuration:

keys Subscription keys are either for the mirroring system itself, or for the offline systems.

They are configured with `proxmox-offline-mirror key ...`

mirrors A mirror consists of the metadata of an upstream repository and a local path where **snapshots** of the upstream repository are stored.

- configured with `proxmox-offline-mirror config mirror ...`
- used with `proxmox-offline-mirror mirror ...`

snapshots Point-in-time view of a mirror. Snapshots consist of hardlinks into the underlying storage pool to reduce the disk space requirements.

media A medium consisting of local mirrors and a path where the mirrors are synced to

- configured with `proxmox-offline-mirror config medium ...`
- used with `proxmox-offline-mirror medium ...`

1.3 Technical Overview

Behind the scenes, one or more *pools* consisting of

- a pool directory containing checksum files (e.g., `sha256/3dc7bc5f82cdcc4ea0f69dd30d5f6bb19e0ccc36f4a79c86`).
- a link directory containing directories and hardlinks to the checksum files inside the pool directory

are used to store the repository contents ("snapshots") of repository mirrors in a space-efficient way.

When adding a file, the following steps are done: first the checksum file(s) are added, then they are linked under one or more paths. A garbage collect operation will iterate over all files in the link directory and remove those, which are not (or no longer) a hardlink to any checksum files. It will also remove any checksum files which have no hardlinks outside of the pool's checksum file directories.

A pool directory can be shared by multiple mirrors in order to deduplicate stored files across the mirror boundary. For example, it is recommended to have a single pool directory (mirror base directory) for all mirrors of Proxmox repositories.

The default config path is `/etc/proxmox-offline-mirror.cfg`, but it can be overridden on a per command basis (for example, to allow operation as a non-root user). Use the `--config` CLI option or the `PROXMOX_OFFLINE_MIRROR_CONFIG` environment variable.

1.4 Getting Help

1.4.1 Enterprise Support

Users with a *Proxmox Offline Mirror* subscription have access to the [Proxmox Customer Portal](#) for offline mirroring/key handling related issues, provided the corresponding offline system has a valid subscription level higher than *Community*. The customer portal provides support with guaranteed response times from the Proxmox developers.

For more information or for volume discounts, please contact sales@proxmox.com.

1.4.2 Community Support Forum

We always encourage our users to discuss and share their knowledge using the [Proxmox Community Forum](#). The forum is moderated by the Proxmox support team. The large user base is spread out all over the world. Needless to say that such a large forum is a great place to get information.

1.4.3 Mailing Lists

Proxmox Offline Mirror is fully open-source and contributions are welcome! The Proxmox VE development mailing list acts as the primary communication channel for offline mirror developers:

Mailing list for developers [PVE Development List](#)

1.4.4 Bug Tracker

Proxmox runs a public bug tracker at <https://bugzilla.proxmox.com>. If an issue appears, file your report there. An issue can be a bug, as well as a request for a new feature or enhancement. The bug tracker helps to keep track of the issue and will send a notification once it has been solved.

1.5 License

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INSTALLATION

Proxmox Offline Mirror is released as standard Debian package and is available in the Proxmox VE, Proxmox Backup Server and Proxmox Mail Gateway package repositories.

2.1 System Requirements

- CPU: 64bit (x86-64 or AMD64), ideally 2+ Cores
- Debian based system (physical host, VM or container)
- Sufficient storage space for the local mirrors. For a basic Debian and Proxmox VE we recommend at least 150 GiB
- A file system supporting hard links for both, the local host and the external medium. Note that most Linux derived file systems support hard links, but Windows derived ones (for example, *FAT) do *not* support hard links.

2.2 Installation via APT

If the host you want to install the proxmox-offline-mirror tools on, already has a package repository from a Proxmox solution configured, you can simply install the offline mirror tool with apt:

```
# apt update
# apt install proxmox-offline-mirror
```

If you do not have any Proxmox VE, Proxmox Backup Server or Proxmox Mail Gateway repositories set up, see [SecureApt](#) and [Set up the Repository on non Proxmox based systems](#) for how to do so before using the commands above.

2.2.1 Debian Package Repositories

All Debian based systems use APT as a package management tool. The lists of repositories are defined in `/etc/apt/sources.list` and the `.list` files found in the `/etc/apt/sources.d/` directory. Updates can be installed directly with the apt command line tool, or via the GUI.

APT `sources.list` files list one package repository per line, with the most preferred source listed first. Empty lines are ignored, and a `#` character anywhere on a line marks the remainder of that line as a comment. The information available from the configured sources is acquired by `apt update`.

2.2.2 SecureApt

The *Release* files in the repositories are signed with GnuPG. APT is using these signatures to verify that all packages are from a trusted source.

Tip: If you install Proxmox Offline Mirror on an existing Proxmox VE, Proxmox Backup Server or Proxmox Mail Gateway, the verification key will already be present.

If you install Proxmox Offline Mirror on top of Debian Bullseye, download and install the key with the following commands:

```
# wget https://enterprise.proxmox.com/debian/proxmox-release-bullseye.gpg \
  -O /etc/apt/trusted.gpg.d/proxmox-release-bullseye.gpg
```

Verify the SHA512 checksum afterwards with the expected output below:

```
# sha512sum /etc/apt/trusted.gpg.d/proxmox-release-bullseye.gpg
7fb03ec8a1675723d2853b84aa4fdb49a46a3bb72b9951361488bfd19b29aab0a789a4f8c7406e71a69aabb727c936d3549731c4659f
↪ /etc/apt/trusted.gpg.d/proxmox-release-bullseye.gpg
```

or the md5sum, with the expected output below:

```
# md5sum /etc/apt/trusted.gpg.d/proxmox-release-bullseye.gpg
bcc35c7173e0845c0d6ad6470b70f50e /etc/apt/trusted.gpg.d/proxmox-release-bullseye.gpg
```

2.2.3 Set up the Repository on non Proxmox based systems

If you do not have an internet facing installation of a Proxmox solution, or want to set up a dedicated system for Proxmox Offline Mirror, you need to configure the repository first.

This should work on any Linux distribution using *apt* as package manager, such as Debian, Ubuntu or derivatives thereof.

To configure the repository, you first need to [set up the Proxmox release key](#). After that, add the repository URL to the APT sources lists.

We recommend re-using the `pbs-client` repository for installing the Proxmox Offline Mirror on non Proxmox systems.

Hint: While you could also use a Proxmox VE, Proxmox Backup Server or Proxmox Mail Gateway repository, those ship some updated packages from Debian native packages, which would get pulled in, even if not required for the offline mirroring.

Repository for Debian 11 (Bullseye) based releases

Here are the actual steps for a generic Debian 11 (Bullseye) based system.

First edit the file `/etc/apt/sources.list.d/pbs-client.list` and add the following snippet:

Listing 1: File: `/etc/apt/sources.list.d/pbs-client.list`

```
deb http://download.proxmox.com/debian/pbs-client bullseye main
```

Now you should be able to install the `proxmox-offline-mirror` package, see [Installation via APT](#).

OFFLINE SUBSCRIPTION KEYS

The `proxmox-offline-mirror` tool can be used to manage subscription keys for air-gapped systems or systems that cannot access the public internet. To use this functionality, you need a subscription key for Proxmox Offline Mirror itself.

The offline mirror tool will take care of registering the subscription keys in the Proxmox shop. If the key is valid, it will get a signed data blob in response. The signed response can then be exported to an offline medium to transfer and set the subscription key in a Proxmox solution, without any need for an internet connection on the host itself.

3.1 Setup Offline Mirror Key

First, add the `pom-<keyid>` mirror key using `proxmox-offline-mirror key add-mirror-key <key>`. This command will activate the subscription of the mirroring system.

Note: To purchase a subscription key for Proxmox Offline Mirror, please contact [<sales@proxmox.com>](mailto:sales@proxmox.com). If you already have a Standard or Premium subscription for the majority of your Proxmox VE, Proxmox Backup Server or Proxmox Mail Gateway hosts, you may be eligible for a free Offline Mirror subscription. In that case, please email [<sales@proxmox.com>](mailto:sales@proxmox.com) to get more details.

3.2 Gather Server IDs

Next, gather the server IDs of the systems that will be set up for offline keys. You can see the server ID in the subscription panel of each host, or by using the CLI with the following commands:

- `pvesubscription get` for Proxmox VE
- `proxmox-backup-manager subscription get` for Proxmox Backup server
- `pmgsubscription get` for Proxmox Mail Gateway

3.3 Register & Refresh Keys

Note: To be able to access and mirror a product's enterprise repository, `proxmox-offline-mirror` requires that both, an active product subscription key and a Proxmox Offline Mirror subscription is configured.

Register the hosts with their subscription keys and server IDs using `proxmox-offline-mirror key add`, for example:

```
proxmox-offline-mirror key add pve2p-12345... ABCDEF0123...
```

By default, this command will fetch the updated subscription information from the Proxmox subscription servers.

You can refresh the subscription information for a single (`--key XX`) or all configured keys using `proxmox-offline-mirror key refresh`.

3.4 Deploy Keys

The subscription information is transferred to a medium (see [Syncing a Medium](#)) and can then be activated on the offline system with either `proxmox-offline-mirror-helper offline-key` or `proxmox-offline-mirror-helper setup`. This process must be repeated at least once a year or before the next due date of the subscription key is reached, whichever comes first.

OFFLINE REPOSITORY MIRRORS

Offline repository mirrors are pointing to APT repositories, for example from Proxmox VE, Proxmox Backup Server or Debian. After the initial setup, you can mirror all the available packages locally. They are organized by creating point-in-time snapshots of the repositories. Those snapshots can then be exported to a configured medium.

4.1 Setting Up a Mirror

First, either run the setup wizard (`proxmox-offline-mirror setup`), or the `config mirror add` command.

Tip: The quickest way to set up all relevant repositories for a Proxmox solution is to use the setup wizard. Choose the product when adding a mirror and confirm the question regarding auto-adding the Debian base repos.

For example, to manually add a mirror entry for the Debian Bullseye security repository, the following command can be used:

```
proxmox-offline-mirror config mirror add \  
--id debian-bullseye-security \  
--architectures amd64 \  
--architectures all \  
--repository 'deb http://deb.debian.org/debian-security bullseye-security main contrib non-  
free' \  
--key-path /etc/apt/trusted.gpg.d/debian-archive-bullseye-security-automatic.gpg \  
--sync true \  
--verify true \  
--base-dir /path/to/mirror/base-dir
```

Note: The *base-dir* directory can be shared by mirrors for repositories that have common contents to avoid storing files more than once. For example, having a single base directory for all mirrors referencing Proxmox repositories is recommended.

Note: The *all* architecture is meant for architecture independent packages, not for all possible architectures. It is usually always sensible to add it in addition to the host-specific architecture.

4.2 Syncing a Mirror

To create the first (and subsequent) snapshots, the following command can be used:

```
proxmox-offline-mirror mirror snapshot create debian-bullseye-security
```

Note: Depending on the parameters used and the size of the original repository, creating a snapshot can take both time and require significant disk space. This is especially true for the initial snapshot, as subsequent ones will re-use unchanged package files and indices.

4.3 Space Management

After removing a snapshot with `proxmox-offline-mirror mirror snapshot remove`, a `proxmox-offline-mirror mirror gc` invocation is needed to trigger the garbage collection to actually remove any contents from the underlying hard link pool that are no longer needed.

OFFLINE MEDIA

A medium is a file system location on which mirrored repositories and subscription information can be saved at to make it available to the offline Proxmox systems. This can be an external portable disk (for example a USB pen drive) or a local network share.

5.1 Setting Up a Medium

Either run the `setup` wizard again, or use the `config medium add` command. For example, to define a new medium containing the *proxmox-ve-bullseye-no-subscription* and *debian-bullseye* mirrors, run the following command:

```
proxmox-offline-mirror config medium add \  
--id pve-bullseye \  
--mirrors proxmox-ve-bullseye-no-subscription \  
--mirrors debian-bullseye \  
--sync true \  
--verify true \  
--mountpoint /path/where/medium/is/mounted
```

5.2 Syncing a Medium

To sync the local mirrors to a medium, the following command can be used:

```
proxmox-offline-mirror medium sync --id pve-bullseye
```

This command will sync all mirrors linked with this medium to the medium's mount point. Additionally, it will sync all offline keys for further processing by `proxmox-offline-mirror-helper` on the target system.

5.3 Using a Medium

After syncing a medium, unmount it and make it accessible on the (offline) target system. Either point *apt* directly at the synced snapshots on the medium or run `proxmox-offline-mirror-helper setup`. The setup will let you select the mirrors and snapshots and can generate a *sources.list.d* snippet. This snippet can be saved to the `/etc/apt/sources.list.d` directory. The default file name is `offline-mirror.list`. Don't forget to remove the snippet after the upgrade is done.

To activate or update an offline subscription key, either use `proxmox-offline-mirror-helper offline-key` or `proxmox-offline-mirror-helper setup`.

COMMAND SYNTAX

A.1 proxmox-offline-mirror

```
proxmox-offline-mirror config media add --id <string> --mirrors <string>  
--mountpoint <string> --sync <boolean> --verify <boolean> [OPTIONS]
```

Create new medium config entry.

- id <string>** Medium name.
- mirrors <string>** List of [MirrorConfig] IDs which should be synced to medium. Can be specified more than once.
- mountpoint <string>** Mountpoint where medium is available on mirroring system.
- sync <boolean>** Whether to write new files using FSYNC.
- verify <boolean>** Whether to verify existing files or assume they are valid (IO-intensive).

Optional parameters:

- config <string>** Path to mirroring config file.
 - output-format text|json|json-pretty** Output format.
-

```
proxmox-offline-mirror config media list [OPTIONS]
```

List configured media.

Optional parameters:

- config <string>** Path to mirroring config file.
 - output-format text|json|json-pretty** Output format.
-

```
proxmox-offline-mirror config media remove --id <string> --remove-data  
<boolean> [OPTIONS]
```

Remove medium config entry.

- id <string>** Medium name.
- remove-data <boolean>** Remove ALL DATA on medium as well.

Optional parameters:

- config <string>** Path to mirroring config file.
 - output-format text|json|json-pretty** Output format.
-

```
proxmox-offline-mirror config media show --id <string> [OPTIONS]
```

Show full medium config entry.

--id <string> Medium name.

Optional parameters:

--config <string> Path to mirroring config file.

--output-format text|json|json-pretty Output format.

```
proxmox-offline-mirror config media update --id <string> [OPTIONS]
```

Update medium config entry.

--id <string> Medium name.

Optional parameters:

--config <string> Path to mirroring config file.

--mirrors <string> List of [MirrorConfig] IDs which should be synced to medium. Can be specified more than once.

--mountpoint <string> Mountpoint where medium is available on mirroring system.

--sync <boolean> Whether to write new files using FSYNC.

--verify <boolean> Whether to verify existing files or assume they are valid (IO-intensive).

```
proxmox-offline-mirror config mirror add --architectures <string>
```

```
--base-dir <string> --id <string> --key-path <string> --repository <string>
```

```
--sync <boolean> --verify <boolean> [OPTIONS]
```

Create new mirror config entry.

--architectures <string> List of architectures that should be mirrored. Can be specified more than once.

--base-dir <string> Path to directory containg mirrored repository pool. Can be shared by multiple mirrors.

--id <string> Mirror name.

--key-path <string> Path to public key file for verifying repository integrity.

--repository <string> Single repository definition in sources.list format.

--sync <boolean> Whether to write new files using FSYNC.

--verify <boolean> Whether to verify existing files or assume they are valid (IO-intensive).

Optional parameters:

--config <string> Path to mirroring config file.

--output-format text|json|json-pretty Output format.

--use-subscription pve|pbs|pmg|pom Product type

```
proxmox-offline-mirror config mirror list [OPTIONS]
```

List configured mirrors

Optional parameters:

--config <string> Path to mirroring config file.

--output-format text|json|json-pretty Output format.

`proxmox-offline-mirror config mirror remove --id <string> --remove-data <boolean> [OPTIONS]`

Remove mirror config entry.

--id <string> Mirror name.

--remove-data <boolean> Remove mirror data as well.

Optional parameters:

--config <string> Path to mirroring config file.

--output-format text|json|json-pretty Output format.

`proxmox-offline-mirror config mirror show --id <string> [OPTIONS]`

Show full mirror config

--id <string> Mirror name.

Optional parameters:

--config <string> Path to mirroring config file.

--output-format text|json|json-pretty Output format.

`proxmox-offline-mirror config mirror update --id <string> [OPTIONS]`

Update mirror config entry.

--id <string> Mirror name.

Optional parameters:

--config <string> Path to mirroring config file.

--architectures <string> List of architectures that should be mirrored. Can be specified more than once.

--base-dir <string> Path to directory containing mirrored repository pool. Can be shared by multiple mirrors.

--key-path <string> Path to public key file for verifying repository integrity.

--repository <string> Single repository definition in sources.list format.

--sync <boolean> Whether to write new files using FSYNC.

--use-subscription pve|pbs|pmg|pom Product type

--verify <boolean> Whether to verify existing files or assume they are valid (IO-intensive).

`proxmox-offline-mirror help [{<command>}] [OPTIONS]`

Get help about specified command (or sub-command).

<command> [**<string>**] Command. This may be a list in order to specify nested sub-commands. Can be specified more than once.

Optional parameters:

--verbose <boolean> Verbose help.

```
proxmox-offline-mirror key add <key> <server-id> [OPTIONS]
```

List subscription keys and their status

<key> [<string>] Subscription key.

<server-id> [<string>] Server ID.

Optional parameters:

--config <string> Path to mirroring config file.

--refresh <boolean> (default=true) Whether to refresh the subscription info upon adding.

--description <string> Description, e.g. which system this key is deployed on

--info <string> base64 encoded subscription info - update with 'refresh' command.

```
proxmox-offline-mirror key add-mirror-key <key> [OPTIONS]
```

Add offline mirror key

<key> [<string>] Subscription key.

Optional parameters:

--config <string> Path to mirroring config file.

```
proxmox-offline-mirror key list [OPTIONS]
```

List subscription keys and their status

Optional parameters:

--config <string> Path to mirroring config file.

--output-format text|json|json-pretty Output format.

```
proxmox-offline-mirror key refresh [OPTIONS]
```

Refresh subscription key status.

Optional parameters:

--config <string> Path to mirroring config file.

--key <string> Subscription key.

```
proxmox-offline-mirror key remove <key> [OPTIONS]
```

Remove subscription key config entry.

<key> [<string>] Subscription key.

Optional parameters:

--config <string> Path to mirroring config file.

--output-format text|json|json-pretty Output format.

```
proxmox-offline-mirror key show <key> [OPTIONS]
```

Show (decoded) subscription config entry.

<key> [<string>] Subscription key.

Optional parameters:

- config <string>** Path to mirroring config file.
 - output-format text|json|json-pretty** Output format.
-

proxmox-offline-mirror key update <key> [OPTIONS]

Update subscription config entry.

<key> [<string>] Subscription key.

Optional parameters:

- config <string>** Path to mirroring config file.
- description <string>** Description, e.g. which system this key is deployed on
- server-id <string>** Server ID.

proxmox-offline-mirror medium gc <id> [OPTIONS]

Garbage collect all mirrors on a medium.

<id> [<string>] Medium name.

Optional parameters:

- config <string>** Path to mirroring config file.
 - output-format text|json|json-pretty** Output format.
-

proxmox-offline-mirror medium status <id> [OPTIONS]

Print status of a medium

<id> [<string>] Medium name.

Optional parameters:

- config <string>** Path to mirroring config file.
 - output-format text|json|json-pretty** Output format.
-

proxmox-offline-mirror medium sync <id> [OPTIONS]

Sync a medium

<id> [<string>] Medium name.

Optional parameters:

- config <string>** Path to mirroring config file.
- keys-only <boolean> (default=false)** Only sync offline subscription keys, skip repository contents

proxmox-offline-mirror mirror gc <id> [OPTIONS]

Run Garbage Collection on pool

<id> [<string>] Mirror name.

Optional parameters:

- config <string>** Path to mirroring config file.
- output-format text|json|json-pretty** Output format.

```
proxmox-offline-mirror mirror snapshot create <id> [OPTIONS]
```

Create a new repository snapshot, fetching required/missing files from original repository.

<id> [<string>] Mirror name.

Optional parameters:

--config <string> Path to mirroring config file.

```
proxmox-offline-mirror mirror snapshot list <id> [OPTIONS]
```

List existing repository snapshots.

<id> [<string>] Mirror name.

Optional parameters:

--config <string> Path to mirroring config file.

--output-format text|json|json-pretty Output format.

```
proxmox-offline-mirror mirror snapshot remove <id> <snapshot> [OPTIONS]
```

Remove a single snapshot dir from a mirror. To actually removed the referenced data a garbage collection is required.

<id> [<string>] Mirror name.

<snapshot> [<string>] Mirror snapshot

Optional parameters:

--config <string> Path to mirroring config file.

--output-format text|json|json-pretty Output format.

```
proxmox-offline-mirror setup [OPTIONS]
```

Interactive setup wizard.

Optional parameters:

--config <string> Path to mirroring config file.

A.2 proxmox-offline-mirror-helper

```
proxmox-offline-mirror-helper help [{<command>}] [OPTIONS]
```

Get help about specified command (or sub-command).

<command> [<string>] Command. This may be a list in order to specify nested sub-commands.
Can be specified more than once.

Optional parameters:

--verbose <boolean> Verbose help.

```
proxmox-offline-mirror-helper offline-key --product pve|pbs|pmg|pom  
[OPTIONS]
```

Configures and offline subscription key

--product *pve|pbs|pmg|pom* Product type

Optional parameters:

--mountpoint *<string>* Path to medium mountpoint - defaults to *proxmox-offline-mirror-helper* containing directory.

`proxmox-offline-mirror-helper setup`

Interactive setup wizard.

CONFIGURATION FILES

The Proxmox Offline Mirror configuration file is stored at `/etc/proxmox-offline-mirror.cfg` by default. Its location can be overridden for any given command using the `--config` parameter.

Note that you can use the `--config <file>` switch on most commands or the `PROXMOX_OFFLINE_MIRROR_CONFIG` environment variable to override the default config location.

B.1 proxmox-offline-mirror.cfg

B.1.1 Options

Section type 'medium': Configuration entry for an external medium.

Required properties:

mirrors [<string>] List of [MirrorConfig] IDs which should be synced to medium. Can be specified more than once.

mountpoint [<string>] Mountpoint where medium is available on mirroring system.

sync [<boolean>] Whether to write new files using FSYNC.

verify [<boolean>] Whether to verify existing files or assume they are valid (IO-intensive).

Section type 'mirror': Configuration entry for a mirrored repository.

Required properties:

architectures [<string>] List of architectures that should be mirrored. Can be specified more than once.

base-dir [<string>] Path to directory containing mirrored repository pool. Can be shared by multiple mirrors.

key-path [<string>] Path to public key file for verifying repository integrity.

repository [<string>] Single repository definition in sources.list format.

sync [<boolean>] Whether to write new files using FSYNC.

verify [<boolean>] Whether to verify existing files or assume they are valid (IO-intensive).

Optional properties:

use-subscription [pve|pbs|pmg|pom] Product type

Section type 'subscription': Subscription key used for accessing enterprise repositories and for offline subscription activation/renewal.

Required properties:

server-id [<string>] Server ID.

Optional properties:

description [<string>] Description, e.g. which system this key is deployed on

info [<string>] base64 encoded subscription info - update with 'refresh' command.

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