



# Proxmox Offline Mirror Documentation

*Release <devbuild>*

**Proxmox Support Team**

**Friday, 16 June 2023**

# TABLE OF CONTENTS

<b>1</b>	<b>Introduction</b>	<b>2</b>
1.1	What is Proxmox Offline Mirror?	2
1.2	Terminology	2
1.3	Technical Overview	3
1.4	Getting Help	3
1.4.1	Enterprise Support	3
1.4.2	Community Support Forum	3
1.4.3	Mailing Lists	3
1.4.4	Bug Tracker	4
1.5	License	4
<b>2</b>	<b>Installation</b>	<b>5</b>
2.1	System Requirements	5
2.2	Installation via APT	5
2.2.1	Debian Package Repositories	5
2.2.2	SecureApt	6
2.2.3	Set up the Repository on non Proxmox based systems	6
<b>3</b>	<b>Offline Subscription Keys</b>	<b>7</b>
3.1	Minimum Versions for Offline Activation	7
3.2	Setup Offline Mirror Key	7
3.3	Gather Server IDs	8
3.4	Register & Refresh Keys	8
3.5	Deploy Keys	8
<b>4</b>	<b>Offline Repository Mirrors</b>	<b>9</b>
4.1	Setting Up a Mirror	9
4.2	Syncing a Mirror	10
4.3	Reducing Mirror Scope	10
4.4	Space Management	10
4.5	Environment Variables	11
<b>5</b>	<b>Offline Media</b>	<b>12</b>
5.1	Setting Up a Medium	12
5.2	Syncing a Medium	12
5.3	Using a Medium	12
5.3.1	Example: Local Mount Point	13
5.3.2	Example: Local HTTP Server	13
5.4	Activating an Subscription Key	14
<b>A</b>	<b>Command Syntax</b>	<b>15</b>
A.1	proxmox-offline-mirror	15
A.2	proxmox-offline-mirror-helper	23
<b>B</b>	<b>Configuration Files</b>	<b>25</b>

B.1	proxmox-offline-mirror.cfg . . . . .	25
B.1.1	Options . . . . .	25
C	<b>GNU Free Documentation License</b>	<b>27</b>

Copyright (C) 2022, Proxmox Server Solutions GmbH  
Version <devbuild> -- Friday, 16 June 2023

Permission is granted to copy, distribute and/or modify this document under the terms of the GNU Free Documentation License, Version 1.3 or any later version published by the Free Software Foundation; with no Invariant Sections, no Front-Cover Texts, and no Back-Cover Texts. A copy of the license is included in the section entitled "GNU Free Documentation License".

## 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](mailto: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

Copyright (C) 2022, Proxmox Server Solutions GmbH

This software is written by Proxmox Server Solutions GmbH <[support@proxmox.com](mailto:support@proxmox.com)>

Proxmox Offline Mirror is free and open source software: you can use it, redistribute it, and/or modify it under the terms of the GNU Affero General Public License as published by the Free Software Foundation, either version 3 of the License, or (at your option) any later version.

This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU Affero General Public License for more details.

You should have received a copy of the GNU Affero General Public License along with this program. If not, see [AGPL3](#).

## 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 Minimum Versions for Offline Activation

Offline activation of subscription keys requires support from the respective Proxmox solution. The following table shows in which version this support has been added.

Solution	Package	Minimum Version
Proxmox VE	pve-manager	7.2-11
Proxmox Backup Server	proxmox-backup-server	2.2.6-1
Proxmox Mail Gateway	pmg-api	7.1-7

### 3.2 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.

---

### 3.3 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

### 3.4 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 setup` or `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`.

### 3.5 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.

---

---

**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 (see [Setup Offline Mirror Key](#))

---

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 Reducing Mirror Scope

There are different mechanisms for reducing a mirror's scope (and correspondingly, the amount of traffic and disk space required to keep it synced):

- architecture filters
- components (as part of the *repository* specification)
- package name and section filters

By default, only packages for the architectures *all* (see note above) and *amd64* are mirrored.

Optionally, it's possible to setup filters for downloaded binary or source packages via the `--skip-packages` and `--skip-sections` options. The package filters support globbing, for example *linux-image-\** will skip all packages with a name starting with *linux-image-*. The section filters match the full value, or the value prefixed with the package's component (for example, *games* will match both the section *games*, as well as *non-free/games* in a packages index of the *non-free* component).

Some examples for packages and section filters:

- `--skip-packages 'linux-image-*` - filter Debian linux kernel image packages
- `--skip-sections 'games'` - filter sections containing game packages
- `--skip-sections 'debug'` - filter sections containing debug information

Please refer to <https://packages.debian.org/bullseye/> for a list of Debian archive sections and their contents.

## 4.4 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.

## 4.5 Environment Variables

### ALL\_PROXY

When set, the client uses the specified HTTP proxy for all connections to the backup server. Currently only HTTP proxies are supported. Valid proxy configurations have the following format: *[http://][user:password@]<host>[:port]*. Default *port* is 1080, if not otherwise specified.

---

**Note:** The proxy server must allow HTTP CONNECT for all ports that are used to connect to mirrors (e.g. port 80 for HTTP mirrors). For Squid, the appropriate configuration parameter is `http_access allow CONNECT <acl>` ([http://www.squid-cache.org/Doc/config/http\\_access/](http://www.squid-cache.org/Doc/config/http_access/)). By default, Squid only allows HTTP CONNECT for port 443.

---

---

**Note:** Passwords must be valid UTF-8 and may not contain newlines. For your convenience, Proxmox Backup Server only uses the first line as password, so you can add arbitrary comments after the first newline.

---

## 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 you can make it accessible on the (offline) target system by either:

- unmounting it from the mirror host, plugging it into the target and mounting it there
- exposing it either directly (from the mirror host) or indirectly (from another host) via the local network (NFS, CIFS/SMB or HTTP)

After that you can upgrade the host as normally, either using the console or the web interface, as described in the respective project's documentation.

Once an upgrade is done you should disable, or remove, the snippet to avoid apt errors from automatic refresh. Note that you can disable and re-enable repositories simply via the web interface of Proxmox VE, Proxmox Backup Server or Proxmox Mail Gateway.

### 5.3.1 Example: Local Mount Point

Either option below assumes that you already mounted the medium on the target host.

#### Guided Setup

For a guided setup run `proxmox-offline-mirror-helper setup`. It will let you select the mirrors and snapshots and can then 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`.

#### Manual Setup

You can also just point `apt` directly at the synced snapshot folder(s) on the medium and then create an new repository entry in a `/etc/apt/sources.list.d` file, for example:

```
deb [check-valid-until=false] file:///mnt/mirror-path/<mirror-name>/<snapshot-timestamp>
↳<codename> <suite>
```

Where `<codename>` is normally the Debian one, for example `bullseye` or `bookworm` and `suite` is one or more of either the one of a Debian or Proxmox project, for example `pve-enterprise`, `pbtest` or `main`.

Now you should be able to upgrade like normally, and don't forget to disable the repository entry again until next time, once your done.

### 5.3.2 Example: Local HTTP Server

You can also configure an HTTP server to provide the snapshots in your internal network. A minimal sample configuration for `nginx`:

```
# with the correct dns setup and path this corresponds to a sources.lists entry
# deb [ check-valid-until=false ] http://proxmox-offline-mirror.domain.example/
↳<mirror-name>/<snapshot-timestamp> <codename> <suite>
server {
    listen 80 default_server;
    listen [::]:80 default_server;
    server_name proxmox-offline-mirror.domain.example;
    root /path/to/medium;
    disable_symlinks off;
    autoindex on;
    error_log /var/log/nginx/proxmox-offline-mirror.error.log;
    access_log /var/log/nginx/proxmox-offline-mirror.access.log;
    location / {
        try_files $uri $uri/ =404;
    }
}
```

The corresponding `/etc/apt/sources.list.d` file should contain

```
deb [ check-valid-until=false ] http://proxmox-offline-mirror.domain.example/<mirror-name>/
↳<snapshot-timestamp> <codename> <suite>
```

See [Manual Setup](#) above for examples about what `<codename>` or `<suite>` can be.

Now you should be able to upgrade like normally, and don't forget to disable the repository entry again until next time, once your done.



## 5.4 Activating an Subscription Key

To activate or update a subscription key offline, either use `proxmox-offline-mirror-helper offline-key` directly or follow the respective step when doing the guided setup via the `proxmox-offline-mirror-helper setup` command.

---

## COMMAND SYNTAX

### A.1 proxmox-offline-mirror

For supported environment variables please refer to [Environment Variables](#).

```
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 containing 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.

**--ignore-errors <boolean> (default=false)**

Whether to downgrade download errors to warnings

**--use-subscription pve|pbs|pmg|pom**

Product type

**--weak-crypto [[allow-sha1=<1|0>] [,min-dsa-key-size=<integer>]  
[,min-rsa-key-size=<integer>]]**

Whether to allow using weak cryptography algorithms or parameters, deviating from the default policy.

**--skip-packages <string>**

Packages which should be skipped, supports globbing Can be specified more than once.

**--skip-sections <string>**

Sections which should be skipped Can be specified more than once.

---

`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 containg mirrored repository pool. Can be shared by multiple mirrors.

**--ignore-errors <boolean> (default=false)**

Whether to downgrade download errors to warnings

**--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).

**--weak-crypto [[allow-sha1=<1|0>] [,min-dsa-key-size=<integer>]**

**[,min-rsa-key-size=<integer>]]**

Whether to allow using weak cryptography algorithms or parameters, deviating from the default policy.

**--skip-packages <string>**

Packages which should be skipped, supports globbing Can be specified more than once.

---

**--skip-sections <string>**

Sections which should be skipped Can be specified more than once.

---

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 diff <id> [OPTIONS]
```

Diff a medium

---

**<id>**

[<string>] Medium name.

Optional parameters:

**--config <string>**

Path to mirroring config file.

**--verbose <boolean> (default=false)**

Verbose output (print paths in addition to summary).

---

`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(s). If no *id* is specified, the pools of all configured mirrors will be GCed.

**<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.

**--dry-run <boolean> (default=false)**

Only fetch indices and print summary of missing package files, don't store anything.

---

`proxmox-offline-mirror mirror snapshot create-all [OPTIONS]`

Create a new repository snapshot for each configured mirror, fetching required/missing files from original repository.

Optional parameters:

**--config <string>**

Path to mirroring config file.

**--dry-run <boolean> (default=false)**

Only fetch indices and print summary of missing package files, don't store anything.

---

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

Print differences between two snapshots.

**<id>**

[<string>] Mirror name.

**<snapshot>**

[<string>] Mirror snapshot

**<other\_snapshot>**

[<string>] Mirror snapshot

Optional parameters:

**--config <string>**

Path to mirroring config file.

**--output-format text|json|json-pretty**

Output format.

---

`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 --mountpoint <string> --product pve|pbs|pmg|pom`

Configures and offline subscription key

**--mountpoint <string>**

Path to medium mountpoint

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

Product type

---

`proxmox-offline-mirror-helper setup`

Interactive setup wizard.

---

`proxmox-offline-mirror-helper status --mountpoint <string> [OPTIONS]`

Prints status of medium

**--mountpoint <string>**

Path to medium mountpoint

Optional parameters:

**--output-format text|json|json-pretty**

Output format.

## 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:*

**ignore-errors**

[<boolean> (default=false)] Whether to downgrade download errors to warnings

**use-subscription**

[pve|pbs|pmg|pom] Product type

**weak-crypto**

[[[allow-sha1=<1|0>] [,min-dsa-key-size=<integer>] [,min-rsa-key-size=<integer>]]] Whether to allow using weak cryptography algorithms or parameters, deviating from the default policy.

**allow-sha1 = <boolean> (default=false)**

Whether to allow SHA-1 based signatures

**min-dsa-key-size = <integer>**

Whether to lower the key size cutoff for DSA-based signatures

**min-rsa-key-size = <integer>**

Whether to lower the key size cutoff for RSA-based signatures

**skip-packages**

[<string>] Packages which should be skipped, supports globbing Can be specified more than once.

**skip-sections**

[<string>] Sections which should be skipped Can be specified more than once.

**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.

## GNU FREE DOCUMENTATION LICENSE

Version 1.3, 3 November 2008

Copyright (C) 2000, 2001, 2002, 2007, 2008 Free Software Foundation, Inc. <<https://fsf.org/>>

**Everyone is permitted to copy and distribute verbatim copies of this**  
license document, but changing it is not allowed.

### 0. PREAMBLE

The purpose of this License is to make a manual, textbook, or other functional and useful document “free” in the sense of freedom: to assure everyone the effective freedom to copy and redistribute it, with or without modifying it, either commercially or noncommercially. Secondly, this License preserves for the author and publisher a way to get credit for their work, while not being considered responsible for modifications made by others.

This License is a kind of “copyleft”, which means that derivative works of the document must themselves be free in the same sense. It complements the GNU General Public License, which is a copyleft license designed for free software.

We have designed this License in order to use it for manuals for free software, because free software needs free documentation: a free program should come with manuals providing the same freedoms that the software does. But this License is not limited to software manuals; it can be used for any textual work, regardless of subject matter or whether it is published as a printed book. We recommend this License principally for works whose purpose is instruction or reference.

### 1. APPLICABILITY AND DEFINITIONS

This License applies to any manual or other work, in any medium, that contains a notice placed by the copyright holder saying it can be distributed under the terms of this License. Such a notice grants a world-wide, royalty-free license, unlimited in duration, to use that work under the conditions stated herein. The “Document”, below, refers to any such manual or work. Any member of the public is a licensee, and is addressed as “you”. You accept the license if you copy, modify or distribute the work in a way requiring permission under copyright law.

A “Modified Version” of the Document means any work containing the Document or a portion of it, either copied verbatim, or with modifications and/or translated into another language.

A “Secondary Section” is a named appendix or a front-matter section of the Document that deals exclusively with the relationship of the publishers or authors of the Document to the Document’s overall subject (or to related matters) and contains nothing that could fall directly within that overall subject. (Thus, if the Document is in part a textbook of mathematics, a Secondary Section may not explain any mathematics.) The relationship could be a matter of historical connection with the subject or with related matters, or of legal, commercial, philosophical, ethical or political position regarding them.

The “Invariant Sections” are certain Secondary Sections whose titles are designated, as being those of Invariant Sections, in the notice that says that the Document is released under this License. If a section does not fit the above definition of Secondary then it is not allowed to be designated as Invariant. The Document may contain zero Invariant Sections. If the Document does not identify any Invariant Sections then there are none.

The “Cover Texts” are certain short passages of text that are listed, as Front-Cover Texts or Back-Cover Texts, in the notice that says that the Document is released under this License. A Front-Cover Text may be at most 5 words, and a Back-Cover Text may be at most 25 words.

A “Transparent” copy of the Document means a machine-readable copy, represented in a format whose specification is available to the general public, that is suitable for revising the document straightforwardly with generic text editors or (for images composed of pixels) generic paint programs or (for drawings) some widely available drawing editor, and that is suitable for input to text formatters or for automatic translation to a variety of formats suitable for input to text formatters. A copy made in an otherwise Transparent file format whose markup, or absence of markup, has been arranged to thwart or discourage subsequent modification by readers is not Transparent. An image format is not Transparent if used for any substantial amount of text. A copy that is not “Transparent” is called “Opaque”.

Examples of suitable formats for Transparent copies include plain ASCII without markup, Texinfo input format, LaTeX input format, SGML or XML using a publicly available DTD, and standard-conforming simple HTML, PostScript or PDF designed for human modification. Examples of transparent image formats include PNG, XCF and JPG. Opaque formats include proprietary formats that can be read and edited only by proprietary word processors, SGML or XML for which the DTD and/or processing tools are not generally available, and the machine-generated HTML, PostScript or PDF produced by some word processors for output purposes only.

The “Title Page” means, for a printed book, the title page itself, plus such following pages as are needed to hold, legibly, the material this License requires to appear in the title page. For works in formats which do not have any title page as such, “Title Page” means the text near the most prominent appearance of the work’s title, preceding the beginning of the body of the text.

The “publisher” means any person or entity that distributes copies of the Document to the public.

A section “Entitled XYZ” means a named subunit of the Document whose title either is precisely XYZ or contains XYZ in parentheses following text that translates XYZ in another language. (Here XYZ stands for a specific section name mentioned below, such as “Acknowledgements”, “Dedications”, “Endorsements”, or “History”.) To “Preserve the Title” of such a section when you modify the Document means that it remains a section “Entitled XYZ” according to this definition.

The Document may include Warranty Disclaimers next to the notice which states that this License applies to the Document. These Warranty Disclaimers are considered to be included by reference in this License, but only as regards disclaiming warranties: any other implication that these Warranty Disclaimers may have is void and has no effect on the meaning of this License.

## 2. VERBATIM COPYING

You may copy and distribute the Document in any medium, either commercially or noncommercially, provided that this License, the copyright notices, and the license notice saying this License applies to the Document are reproduced in all copies, and that you add no other conditions whatsoever to those of this License. You may not use technical measures to obstruct or control the reading or further copying of the copies you make or distribute. However, you may accept compensation in exchange for copies. If you distribute a large enough number of copies you must also follow the conditions in section 3.

You may also lend copies, under the same conditions stated above, and you may publicly display copies.

## 3. COPYING IN QUANTITY

If you publish printed copies (or copies in media that commonly have printed covers) of the Document, numbering more than 100, and the Document’s license notice requires Cover Texts, you must enclose the copies in covers that carry, clearly and legibly, all these Cover Texts: Front-Cover Texts on the front cover, and Back-Cover Texts on the back cover. Both covers must also clearly and legibly identify you as the publisher of these copies. The front cover must present the full title with all words of the title equally prominent and visible. You may add other material on the covers in addition. Copying with changes limited to the covers, as long as they preserve the title of the Document and satisfy these conditions, can be treated as verbatim copying in other respects.

If the required texts for either cover are too voluminous to fit legibly, you should put the first ones listed (as many as fit reasonably) on the actual cover, and continue the rest onto adjacent pages.

If you publish or distribute Opaque copies of the Document numbering more than 100, you must either include a machine-readable Transparent copy along with each Opaque copy, or state in or with each Opaque copy a computer-network location from which the general network-using public has access to download using public-standard network protocols a complete Transparent copy of the Document, free of added material. If you use the latter option, you must take reasonably prudent steps, when you begin distribution of Opaque copies in quantity, to ensure that this Transparent copy will remain thus accessible at the stated location until at least one year after the last time you distribute an Opaque copy (directly or through your agents or retailers) of that edition to the public.

It is requested, but not required, that you contact the authors of the Document well before redistributing any large number of copies, to give them a chance to provide you with an updated version of the Document.

#### 4. MODIFICATIONS

You may copy and distribute a Modified Version of the Document under the conditions of sections 2 and 3 above, provided that you release the Modified Version under precisely this License, with the Modified Version filling the role of the Document, thus licensing distribution and modification of the Modified Version to whoever possesses a copy of it. In addition, you must do these things in the Modified Version:

- A. Use in the Title Page (and on the covers, if any) a title distinct from that of the Document, and from those of previous versions (which should, if there were any, be listed in the History section of the Document). You may use the same title as a previous version if the original publisher of that version gives permission.
- B. List on the Title Page, as authors, one or more persons or entities responsible for authorship of the modifications in the Modified Version, together with at least five of the principal authors of the Document (all of its principal authors, if it has fewer than five), unless they release you from this requirement.
- C. State on the Title page the name of the publisher of the Modified Version, as the publisher.
- D. Preserve all the copyright notices of the Document.
- E. Add an appropriate copyright notice for your modifications adjacent to the other copyright notices.
- F. Include, immediately after the copyright notices, a license notice giving the public permission to use the Modified Version under the terms of this License, in the form shown in the Addendum below.
- G. Preserve in that license notice the full lists of Invariant Sections and required Cover Texts given in the Document's license notice.
- H. Include an unaltered copy of this License.
- I. Preserve the section Entitled "History", Preserve its Title, and add to it an item stating at least the title, year, new authors, and publisher of the Modified Version as given on the Title Page. If there is no section Entitled "History" in the Document, create one stating the title, year, authors, and publisher of the Document as given on its Title Page, then add an item describing the Modified Version as stated in the previous sentence.
- J. Preserve the network location, if any, given in the Document for public access to a Transparent copy of the Document, and likewise the network locations given in the Document for previous versions it was based on. These may be placed in the "History" section. You may omit a network location for a work that was published at least four years before the Document itself, or if the original publisher of the version it refers to gives permission.
- K. For any section Entitled "Acknowledgements" or "Dedications", Preserve the Title of the section, and preserve in the section all the substance and tone of each of the contributor acknowledgements and/or dedications given therein.



- L. Preserve all the Invariant Sections of the Document, unaltered in their text and in their titles. Section numbers or the equivalent are not considered part of the section titles.
- M. Delete any section Entitled "Endorsements". Such a section may not be included in the Modified Version.
- N. Do not retitle any existing section to be Entitled "Endorsements" or to conflict in title with any Invariant Section.
- O. Preserve any Warranty Disclaimers.

If the Modified Version includes new front-matter sections or appendices that qualify as Secondary Sections and contain no material copied from the Document, you may at your option designate some or all of these sections as invariant. To do this, add their titles to the list of Invariant Sections in the Modified Version's license notice. These titles must be distinct from any other section titles.

You may add a section Entitled "Endorsements", provided it contains nothing but endorsements of your Modified Version by various parties--for example, statements of peer review or that the text has been approved by an organization as the authoritative definition of a standard.

You may add a passage of up to five words as a Front-Cover Text, and a passage of up to 25 words as a Back-Cover Text, to the end of the list of Cover Texts in the Modified Version. Only one passage of Front-Cover Text and one of Back-Cover Text may be added by (or through arrangements made by) any one entity. If the Document already includes a cover text for the same cover, previously added by you or by arrangement made by the same entity you are acting on behalf of, you may not add another; but you may replace the old one, on explicit permission from the previous publisher that added the old one.

The author(s) and publisher(s) of the Document do not by this License give permission to use their names for publicity for or to assert or imply endorsement of any Modified Version.

## 5. COMBINING DOCUMENTS

You may combine the Document with other documents released under this License, under the terms defined in section 4 above for modified versions, provided that you include in the combination all of the Invariant Sections of all of the original documents, unmodified, and list them all as Invariant Sections of your combined work in its license notice, and that you preserve all their Warranty Disclaimers.

The combined work need only contain one copy of this License, and multiple identical Invariant Sections may be replaced with a single copy. If there are multiple Invariant Sections with the same name but different contents, make the title of each such section unique by adding at the end of it, in parentheses, the name of the original author or publisher of that section if known, or else a unique number. Make the same adjustment to the section titles in the list of Invariant Sections in the license notice of the combined work.

In the combination, you must combine any sections Entitled "History" in the various original documents, forming one section Entitled "History"; likewise combine any sections Entitled "Acknowledgements", and any sections Entitled "Dedications". You must delete all sections Entitled "Endorsements".

## 6. COLLECTIONS OF DOCUMENTS

You may make a collection consisting of the Document and other documents released under this License, and replace the individual copies of this License in the various documents with a single copy that is included in the collection, provided that you follow the rules of this License for verbatim copying of each of the documents in all other respects.

You may extract a single document from such a collection, and distribute it individually under this License, provided you insert a copy of this License into the extracted document, and follow this License in all other respects regarding verbatim copying of that document.

## 7. AGGREGATION WITH INDEPENDENT WORKS

A compilation of the Document or its derivatives with other separate and independent documents or works, in or on a volume of a storage or distribution medium, is called an "aggregate" if the

copyright resulting from the compilation is not used to limit the legal rights of the compilation's users beyond what the individual works permit. When the Document is included in an aggregate, this License does not apply to the other works in the aggregate which are not themselves derivative works of the Document.

If the Cover Text requirement of section 3 is applicable to these copies of the Document, then if the Document is less than one half of the entire aggregate, the Document's Cover Texts may be placed on covers that bracket the Document within the aggregate, or the electronic equivalent of covers if the Document is in electronic form. Otherwise they must appear on printed covers that bracket the whole aggregate.

## 8. TRANSLATION

Translation is considered a kind of modification, so you may distribute translations of the Document under the terms of section 4. Replacing Invariant Sections with translations requires special permission from their copyright holders, but you may include translations of some or all Invariant Sections in addition to the original versions of these Invariant Sections. You may include a translation of this License, and all the license notices in the Document, and any Warranty Disclaimers, provided that you also include the original English version of this License and the original versions of those notices and disclaimers. In case of a disagreement between the translation and the original version of this License or a notice or disclaimer, the original version will prevail.

If a section in the Document is Entitled "Acknowledgements", "Dedications", or "History", the requirement (section 4) to Preserve its Title (section 1) will typically require changing the actual title.

## 9. TERMINATION

You may not copy, modify, sublicense, or distribute the Document except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense, or distribute it is void, and will automatically terminate your rights under this License.

However, if you cease all violation of this License, then your license from a particular copyright holder is reinstated (a) provisionally, unless and until the copyright holder explicitly and finally terminates your license, and (b) permanently, if the copyright holder fails to notify you of the violation by some reasonable means prior to 60 days after the cessation.

Moreover, your license from a particular copyright holder is reinstated permanently if the copyright holder notifies you of the violation by some reasonable means, this is the first time you have received notice of violation of this License (for any work) from that copyright holder, and you cure the violation prior to 30 days after your receipt of the notice.

Termination of your rights under this section does not terminate the licenses of parties who have received copies or rights from you under this License. If your rights have been terminated and not permanently reinstated, receipt of a copy of some or all of the same material does not give you any rights to use it.

## 10. FUTURE REVISIONS OF THIS LICENSE

The Free Software Foundation may publish new, revised versions of the GNU Free Documentation License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns. See <https://www.gnu.org/licenses/>.

Each version of the License is given a distinguishing version number. If the Document specifies that a particular numbered version of this License "or any later version" applies to it, you have the option of following the terms and conditions either of that specified version or of any later version that has been published (not as a draft) by the Free Software Foundation. If the Document does not specify a version number of this License, you may choose any version ever published (not as a draft) by the Free Software Foundation. If the Document specifies that a proxy can decide which future versions of this License can be used, that proxy's public statement of acceptance of a version permanently authorizes you to choose that version for the Document.

## 11. RELICENSING

"Massive Multiauthor Collaboration Site" (or "MMC Site") means any World Wide Web server that publishes copyrightable works and also provides prominent facilities for anybody to edit those

works. A public wiki that anybody can edit is an example of such a server. A "Massive Multiauthor Collaboration" (or "MMC") contained in the site means any set of copyrightable works thus published on the MMC site.

"CC-BY-SA" means the Creative Commons Attribution-Share Alike 3.0 license published by Creative Commons Corporation, a not-for-profit corporation with a principal place of business in San Francisco, California, as well as future copyleft versions of that license published by that same organization.

"Incorporate" means to publish or republish a Document, in whole or in part, as part of another Document.

An MMC is "eligible for relicensing" if it is licensed under this License, and if all works that were first published under this License somewhere other than this MMC, and subsequently incorporated in whole or in part into the MMC, (1) had no cover texts or invariant sections, and (2) were thus incorporated prior to November 1, 2008.

The operator of an MMC Site may republish an MMC contained in the site under CC-BY-SA on the same site at any time before August 1, 2009, provided the MMC is eligible for relicensing.