
feed2exec Documentation

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Antoine Beaupré

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`feed2exec` is a simple program that runs custom actions on new RSS feed items (or whatever `feedparser` can read). It currently has support for writing into mailboxes ([Maildir](#) folders) or executing commands, but more actions can be easily implemented through plugins. Email are saved as multipart plain/HTML and can be sent to arbitrary folders.

CHAPTER 1

Example

The user interface is still a bit rough, but this should get you started:

```
feed2exec add "NASA breaking news" https://www.nasa.gov/rss/dyn/breaking_news.rss --  
↪ folder nasa  
feed2exec fetch
```

An equivalent configuration file which may be more descriptive in `~/.config/feed2exec/feed2exec.ini`:

```
[DEFAULT]  
output = feed2exec.plugins.maildir  
mailbox = '~/Maildir'  
  
[NASA breaking news]  
folder = nasa  
url = https://www.nasa.gov/rss/dyn/breaking_news.rss
```

Using a standard OPML file, you can also import multiple feeds using the *feed2exec import* command. See the complete [feed2exec manual page](#) for more information.

CHAPTER 2

Installation

This can be installed using the normal Python procedures:

```
pip install .
```

It can also be ran straight from the source, using:

```
python -m feed2exec
```

Important: Make sure you use Python 3. feed2exec is written to also support Python 2.7, but there may be performance or security issues in that older version. For example, Python 2.7 seems to suffer from a header injection flaw that currently makes tests fail.

CHAPTER 3

Why the name?

There are already `feed2tweet` and `feed2imap` out there so I figured I would just reuse the prefix and extend *both* programs at once.

Contents:

3.1 feed2exec manual page

3.1.1 Synopsis

`feed2exec` {add,ls,rm,fetch,import,export}

3.1.2 Description

This command will take a configured set of feeds and fire specific plugin for every new item found in the feed.

3.1.3 Options

--version	Show the version and exit.
--loglevel	show only warning messages
-v, --verbose	be more verbose
-d, --debug	even more verbose
--config TEXT	configuration directory
-h, --help	Show this message and exit.

3.1.4 Examples

Saving feed items to a Maildir folder:

```
feed2exec add "NASA breaking news" https://www.nasa.gov/rss/dyn/breaking_news.rss
feed2exec fetch
```

Show feed contents:

```
feed2exec add "NASA breaking news" https://www.nasa.gov/rss/dyn/breaking_news.rss --
→output feed2exec.plugins.echo --args "%(title)s %(link)s"
feed2exec fetch
```

3.1.5 Commands

- fetch:

```
fetch [--parallel | -p | --jobs N | -j N] [--force | -f] [pattern]
```

The fetch command iterates through all the configured feeds or those matching the `pattern` substring if provided.

- | | |
|-----------------|---|
| --force | skip reading and writing the cache and will consider all entries as new |
| | —parallel run parsing in the background to improve performance |
| --jobs N | run N tasks in parallel maximum. implies <code>--parallel</code> which defaults to the number of CPUs detected on the machine |

- add:

```
add [--output PLUGIN [--args ARG [ARG [...]]] [--filter PLUGIN] NAME URL
```

The add command adds the given feed `NAME` that will be fetched from the provided URL.

- | | |
|------------------------|--|
| --output PLUGIN | use <code>PLUGIN</code> as an output module. defaults to <code>feed2exec.plugins.maildir</code> to store in a mailbox. use <code>feed2exec.plugins.null</code> to just fetch the feed without fetching anything. |
| | —args <code>ARGS</code> pass arguments <code>ARGS</code> to the output module. supports interpolation of feed parameters using, for example <code>%(title)s</code> |
| --filter PLUGIN | filter feed items through the <code>PLUGIN</code> filter plugin |
| | —mailbox <code>PATH</code> folder to store email into, defaults to <code>~/Maildir</code> . |
| --folder PATH | subfolder to store the email into |

Those parameters are documented more extensively in their equivalent settings in the configuration file, see below.

- ls:

The `ls` command lists all configured feeds as JSON packets.

- rm:

```
rm NAME
```

Remove the feed named `NAME` from the configuration.

- **import:**

```
import PATH
```

Import feeds from the file named `PATH`. The file is expected to have `outline` elements and only the `title` and `xmlUrl` elements are imported, as `NAME` and `URL` parameters, respectively.

- **export:**

```
export PATH
```

Export feeds into the file named `PATH`. The file will use the feed `NAME` elements as `title` and the `URL` as `xmlUrl`.

3.1.6 Files

Configuration file

Any files used by `feed2exec` is stored in the config directory, in `~/.config/feed2exec/` or `$XDG_CONFIG_HOME/feed2exec`. It can also be specified with the `--config` commandline parameter. The main configuration file is in called `feed2exec.ini`. The above commandline will yield the following configuration:

```
[NASA breaking news]
url = https://www.nasa.gov/rss/dyn/breaking_news.rss
output = feed2exec.plugins.echo
args = %(title)s %(link)s
```

Naturally, those settings can be changed directly in the config file. Note that there is a `[DEFAULT]` section that can be used to apply settings to all feeds. For example, this will make all feeds store new items in a maildir subfolder:

```
[DEFAULT]
output = feed2exec.plugins.maildir
folder = feeds
```

This way individual feeds do not need to be individually configured.

The following configuration parameters are supported:

- name** Human readable name for the feed. Equivalent to the `NAME` argument in the `add` command.
- url** Address to fetch the feed from. Can be `HTTP` or `HTTPS`, but also `file://` resources for test purposes.
- output** Output plugin to use. Equivalent to the `--output` option in the `add` command.
- args** Arguments to pass to the output plugin. Equivalent to the `--args` option in the `add` command.
- filter** Filter plugin to use. Equivalent to the `--filter` option in the `add` command.
- mailbox** Store emails in that mailbox prefix. Defaults to `~/Maildir`.
- folder** Subfolder to use when writing to a mailbox. By default, a *slugified* version of the feed name (where spaces and special character are replaced by `-`) is used. For example, the feed named “NASA breaking news” would be stored in `~/Maildir/nasa-breaking-news/`.

Cache database

The feeds cache is stored in a `feed2exec.sqlite` file. It is a normal SQLite database and can be inspected using the normal sqlite tools. It is used to keep track of which feed items have been processed. To clear the cache, you can simply remove the file, which will make the program process all feeds items from scratch again. In this case, you may want to use the `null` output plugin to avoid doing any sort of processing to catchup with the feeds.

3.1.7 See also

`feed2imap(1)`, `rss2email(1)`

3.2 Design

This is a quick prototype that turned out to be quite usable. The design is minimal: some home-made ORM for the feed storage, crude parallelism with the `multiprocessing` module and a simple plugin API using `importlib`.

The threading design, in particular, may be a little clunky and is certainly less tested, which is why it is disabled by default (use `--parallel` to use it). I had multiple design in minds: the current one (`multiprocessing.Pool` and `pool.apply_async`) vs `aiohttp` (on the `asyncio` branch) vs `pool.map` (on the `threadpoolmap` branch). The `aiohttp` design was very hard to diagnose and debug, which made me abandon the whole thing. After reading up on [Curio](#) and [Trio](#), I'm tempted to give `async/await` a try again, but that would mean completely dropping 2.7 compatibility. The `pool.map` design is just badly adapted, as it would load all the feed's datastructure in memory before processing them.

3.2.1 Comparison

`feed2exec` is a fairly new and minimal program, so features you may expect from another feed reader may not be present. I chose to write a new program because, when I started, both existing alternatives were in a questionable state: `feed2imap` was mostly abandoned and `rss2email`'s maintainer was also unresponsive. Both were missing the features I was looking for, which was to unify my feed parsers in a single program: i needed something that could deliver mail, run commands and send tweets. The latter isn't done yet, but I am hoping to complete this eventually.

The program may not be for everyone, however, so I made those comparison tables to clarify what `feed2exec` does compared to the alternatives.

General information:

Program	Version	Date	SLOC	Language
feed2exec	0.1	2017	1177	Python
feed2imap	2.5	2015	3348	Ruby
rss2email	3.9	2014	1754	Python

- version: the version analysed
- date: the date of that release
- SLOC: Source Lines of Codes as counted by `sloccount`
- Language: primary programming language

Delivery options:

Program	Maildir	IMAP	SMTP	sendmail
feed2exec	✓			
feed2imap	✓	✓		
rss2email		✓	✓	✓

Features:

Program	Pause	OPML	Retry	Images	Filter	Exec	Reply	Digest
feed2exec		✓			✓	✓	✓	
feed2imap		✓	✓	✓	✓			
rss2email	✓	✓	✓				✓	✓

- pause: feed reading can be disabled temporarily by user
- retry: tolerate temporary errors. For example, `feed2imap` will report errors only after 10 failures.
- images: download images found in feed. `feed2imap` can download images and attach them to the email.
- filter: if we can apply arbitrary filters to the feed output. `feed2imap` can apply filters to the unparsed dump of the feed.
- exec: if users can configure arbitrary commands to run on new entries. `feed2imap` has a `execurl` parameter to execute commands, but it receives an unparsed dump of the feed instead of individual entries
- reply: if the generated email 'from' header is usable to make a reply. `rss2email` has a `use-publisher-email` setting (off by default) for this, for example. `feed2exec` does this by default.
- digest: possibility of sending a single email per run instead of one per entry

Note: `feed2imap` supports only importing OPML feeds, exporting is supported by a third-party plugin.

3.2.2 Known issues

This is an early prototype and may break in your setup, as the `feedparser` library isn't as solid as I expected. In particular, I had issues with feeds without dates and without guid.

Unit test coverage is incomplete, but still pretty decent, above 80%.

The `exec` plugin itself is not well tested and may have serious security issues.

API, commandline interface, configuration file syntax and database format can be changed at any moment.

The program is written mainly targeting Python 3.5 and should work in 3.6 but hasn't been explicitly tested there. Tests fail on Python 2.7 and the maildir handler may specifically be vulnerable to header injections.

3.3 API documentation

This is the API documentation of the program. It should explain how to create new plugins and navigate the code.

3.3.1 Feeds module

This is the core modules that processes all feeds and takes care of the storage. It's where most of the logic lies. `fast` feed parser that offloads tasks to plugins and commands

`feed2exec.feeds.fetch(url)`

fetch the given URL

exceptions should be handled by the caller

Todo this should be moved to a plugin so it can be overridden,
but so far I haven't found a use case for this.

Parameters `url (str)` – the URL to fetch

Return bytes, tuple the body of the URL and the modification timestamp

`feed2exec.feeds.parse(body, feed, lock=None, force=False)`

parse the body of the feed

this calls the filter and output plugins and updates the cache with the found items.

Todo this could be moved to a plugin, but then we'd need to take
out the cache checking logic, which would remove most of the code here...

Parameters

- **body (bytes)** – the body of the feed, as returned by `:func:fetch`
- **feed (dict)** – a feed object used to pass to plugins and debugging

Return dict the parsed data

`feed2exec.feeds.safe_serial(obj)`

JSON serializer for objects not serializable by default json code

3.3.2 Main entry point

The main entry point of the program is in the `feed2exec.__main__` module. This is to make it possible to call the program directly from the source code through the Python interpreter with:

```
python -m feed2exec
```

All this code is here rather than in `__init__.py` to avoid requiring too many dependencies in the base module, which contains useful metadata for `setup.py`.

This uses the `click` module to define the base command and options. fast feed parser that offloads tasks to plugins and commands

```
feed2exec.__main__.main()
```

3.3.3 Plugins

Plugin interface

In this context, a “plugin” is simply a Python module with a defined interface.

`feed2exec.plugins.output(feed, item, lock=None)`

load and run the given plugin with the given arguments

an “output plugin” is a simple Python module with an `output` callable defined which will process arguments and should output them somewhere, for example by email or through another command. the plugin is called when a new item is found, unless cache is flushed or ignored.

The “callable” can be a class, in which case only the constructor is called or a function. The `*args` and `**kwargs` parameter SHOULD be used in the function definition for forward-compatibility (ie. to make sure new parameters added do not cause a regression).

Plugins should also expect to be called in parallel and should use the provided `lock` (a `multiprocessing.Lock` object) to acquire and release locks around contentious resources.

The following keywords are usually replaced in the arguments:

- `%(link)s`
- `%(title)s`
- `%(description)s`
- `%(published)s`
- `%(updated)s`
- `%(guid)s`

The full list of such parameters is determined by the `:module:feedparser` module.

Caution: None of those parameters are sanitized in any way other than what `feedparser` does, so plugins writing files, executing code or talking to the network should be careful to sanitize the input appropriately.

The feed and items are also passed to the plugin as keyword arguments.

Parameters

- **feed** (*dict*) – the feed metadata
- **item** (*dict*) – the updated item

Return object the loaded plugin

`feed2exec.plugins.filter` (*feed, item, lock=None*)
common code with `output()` should be factored out, but `output()` takes arguments...

Echo

class `feed2exec.plugins.echo.output` (**args, **kwargs*)

This plugin outputs, to standard output, the arguments it receives. It can be useful to test your configuration. It also creates a side effect for the test suite to determine if the plugin was called.

This plugin does a similar thing when acting as a filter.

`feed2exec.plugins.echo.filter`

This filter just keeps the feed unmodified. It is just there for testing purposes.

alias of `output`

Error

`feed2exec.plugins.error.output` (**args, **kwargs*)

The error plugin is a simple plugin which raises an exception when called. It is designed for use in the test suite and should generally not be used elsewhere.

Exec

`feed2exec.plugins.exec.output` (*command*, *args, **kwargs)

The exec plugin is the ultimate security disaster. It simply executes whatever you feed it without any sort of sanitization.

Danger: do not use.

Html2text

class `feed2exec.plugins.html2text.filter` (*args, feed=None, entry=None, **kwargs)

This filter plugin takes a given feed item and replaces the `content` with its HTML parsed as text.

static parse (*html=None*)

parse html to text according to our preferences. this is where subclasses can override the HTML2Text settings or use a completely different parser

Maildir

`feed2exec.plugins.maildir.make_message` (*feed*, *entry*, *to_addr=None*, *cls=<class 'email.message.Message'>*)

generate a message from the feed

Todo

figure out a way to render multi-element Atom feeds.

Todo

should be moved to utils?

class `feed2exec.plugins.maildir.output` (*to_addr=None*, *feed=None*, *entry=None*, *lock=None*, *args, **kwargs)

The maildir plugin will save a feed item into a Maildir folder.

The configuration is a little clunky, but it should be safe against hostile feeds.

Parameters

- **to_addr** (*str*) – the email to use as “to” (defaults to `USER@localdomain`)
- **feed** (*dict*) – the feed
- **item** (*dict*) – the updated item

Null

`feed2exec.plugins.null.output` (*args, **kwargs)

This plugin does nothing. It can be useful in cases where you want to catchup with imported feeds.

`feed2exec.plugins.null.filter` (*entry=None*, *args, **kwargs)

The null filter removes all elements from a feed item

3.3.4 Utilities

Those are various utilities reused in multiple modules that did not fit anywhere else. various reusable utilities

`feed2exec.utils.slug(text)`

Make a URL-safe, human-readable version of the given text

This will do the following:

1. decode unicode characters into ASCII
2. shift everything to lowercase
3. strip whitespace
4. replace other non-word characters with dashes
5. strip extra dashes

This somewhat duplicates the `Google.slugify()` function but `slugify` is not as generic as this one, which can be reused elsewhere.

```
>>> slug('test')
'test'
>>> slug('Mørdag')
'mordag'
>>> slug("l'été c'est fait pour jouer")
'l-ete-c-est-fait-pour-jouer'
>>> slug(u"çafe au lait (boisson)")
'cafe-au-lait-boisson'
>>> slug(u"Multiple spaces -- and symbols! -- merged")
'multiple-spaces-and-symbols-merged'
```

This is a simpler, one-liner version of the `slugify` module.

`feed2exec.utils.make_dirs_helper(path)`

Create the directory if it does not exist

Return True if the directory was created, false if it was already present, throw an `OSError` exception if it cannot be created

3.4 Contributor's guide

This document outlines how to contribute to this project. It details a code of conduct, how to submit issues, bug reports and patches.

3.4.1 Contributor Covenant Code of Conduct

Our Pledge

In the interest of fostering an open and welcoming environment, we as contributors and maintainers pledge to making participation in our project and our community a harassment-free experience for everyone, regardless of age, body size, disability, ethnicity, gender identity and expression, level of experience, nationality, personal appearance, race, religion, or sexual identity and orientation.

Our Standards

Examples of behavior that contributes to creating a positive environment include:

- Using welcoming and inclusive language
- Being respectful of differing viewpoints and experiences
- Gracefully accepting constructive criticism
- Focusing on what is best for the community
- Showing empathy towards other community members

Examples of unacceptable behavior by participants include:

- The use of sexualized language or imagery and unwelcome sexual attention or advances
- Trolling, insulting/derogatory comments, and personal or political attacks
- Public or private harassment
- Publishing others' private information, such as a physical or electronic address, without explicit permission
- Other conduct which could reasonably be considered inappropriate in a professional setting

Our Responsibilities

Project maintainers are responsible for clarifying the standards of acceptable behavior and are expected to take appropriate and fair corrective action in response to any instances of unacceptable behavior.

Project maintainers have the right and responsibility to remove, edit, or reject comments, commits, code, wiki edits, issues, and other contributions that are not aligned to this Code of Conduct, or to ban temporarily or permanently any contributor for other behaviors that they deem inappropriate, threatening, offensive, or harmful.

Scope

This Code of Conduct applies both within project spaces and in public spaces when an individual is representing the project or its community. Examples of representing a project or community include using an official project e-mail address, posting via an official social media account, or acting as an appointed representative at an online or offline event. Representation of a project may be further defined and clarified by project maintainers.

Enforcement

Instances of abusive, harassing, or otherwise unacceptable behavior may be reported by contacting one of the persons listed below. All complaints will be reviewed and investigated and will result in a response that is deemed necessary and appropriate to the circumstances. The project maintainers is obligated to maintain confidentiality with regard to the reporter of an incident. Further details of specific enforcement policies may be posted separately.

Project maintainers who do not follow or enforce the Code of Conduct in good faith may face temporary or permanent repercussions as determined by other members of the project's leadership.

Project maintainers are encouraged to follow the spirit of the [Django Code of Conduct Enforcement Manual](#) when receiving reports.

Contacts

The following people have volunteered to be available to respond to Code of Conduct reports. They have reviewed existing literature and agree to follow the aforementioned process in good faith. They also accept OpenPGP-encrypted email:

- Antoine Beaupré anarcat@debian.org

Attribution

This Code of Conduct is adapted from the [Contributor Covenant](http://contributor-covenant.org/version/1/4), version 1.4, available at <http://contributor-covenant.org/version/1/4>.

Changes

The Code of Conduct was modified to refer to *project maintainers* instead of *project team* and small paragraph was added to refer to the Django enforcement manual.

Note: We have so far determined that writing an explicit enforcement policy is not necessary, considering the available literature already available online and the relatively small size of the community. This may change in the future if the community grows larger.

3.4.2 Patches

Patches can be submitted through [merge requests](#) on the [GitLab project](#).

Some guidelines for patches:

- A patch should be a minimal and accurate answer to exactly one identified and agreed problem.
- A patch must compile cleanly and pass project self-tests on all target platforms.
- A patch commit message must consist of a single short (less than 50 characters) line stating a summary of the change, followed by a blank line and then a description of the problem being solved and its solution, or a reason for the change. Write more information, not less, in the commit log.
- Patches should be reviewed by at least one maintainer before being merged.

Project maintainers should merge their own patches only when they have been approved by other maintainers, unless there is no response within a reasonable timeframe (roughly one week) or there is an urgent change to be done (e.g. security or data loss issue).

As an exception to this rule, this specific document cannot be changed without the consensus of all administrators of the project.

Note: Those guidelines were inspired by the [Collective Code Construct Contract](#). The document was found to be a little too complex and hard to read and wasn't adopted in its entirety. See this [discussion](#) for more information.

Patch triage

You can also review existing pull requests, by cloning the contributor's repository and testing it. If the tests do not pass (either locally or in the online Continuous Integration (CI) system), if the patch is incomplete or otherwise does not respect the above guidelines, submit a review with "changes requested" with reasoning.

3.4.3 Documentation

We love documentation!

The documentation mostly in the README file and can be [edited online](#) once you register.

3.4.4 Issues and bug reports

We want you to report issues you find in the software. It is a recognized and important part of contributing to this project. All issues will be read and replied to politely and professionally. Issues and bug reports should be filed on the [issue tracker](#).

3.4.5 Issue triage

Issue triage is a useful contribution as well. You can review the [issues](#) in the GitHub project and, for each issue:

- try to reproduce the issue, if it is not reproducible, label it with `more-info` and explain the steps taken to reproduce
- if information is missing, label it with `more-info` and request specific information
- if the feature request is not within the scope of the project or should be refused for other reasons, use the `wontfix` label and close the issue
- mark feature requests with the `enhancement` label, bugs with `bug`, duplicates with `duplicate` and so on...

Note that some of those operations are available only to project maintainers, see below for the different statuses.

3.4.6 Membership

There are three levels of membership in the project, Administrator (also known as “Owner” in GitHub or GitLab), Maintainer (also known as “Member” on GitHub or “Developer” on GitLab), or regular users (everyone with or without an account). Anyone is welcome to contribute to the project within the guidelines outlined in this document, regardless of their status, and that includes regular users.

Maintainers can:

- do everything regular users can
- review, push and merge pull requests
- edit and close issues

Administrators can:

- do everything maintainers can
- add new maintainers
- promote maintainers to administrators

Regular users can be promoted to maintainers if they contribute to the project, either by participating in issues, documentation or pull requests.

Maintainers can be promoted to administrators when they have given significant contributions for a sustained time-frame, by consensus of the current administrators. This process should be open and decided as any other issue.

3.4.7 Release process

To make a release:

1. generate release notes with:

```
gbp dch
```

the file header will need to be moved back up to the beginning of the file. also make sure to add a summary and choose a proper version according to [Semantic Versioning](#)

2. tag the release according to [Semantic Versioning](#) rules:

```
git tag -s x.y.z
```

3. build and test the Python package:

```
python setup.py bdist_wheel
sudo pip install dist/*.whl
feed2exec --version
# check your emails and the logfile
sudo pip uninstall feed2exec
```

4. build and test the debian package:

```
git-buildpackage
sudo dpkg -i ../feed2exec*.deb
feed2exec --version
sudo dpkg --remove feed2exec
```

5. push changes:

```
git push
git push --tags
twine upload dist/*
dput ../feed2exec*.changes
```

6. edit the [tag on Gitlab](#), copy-paste the changelog entry and attach the signed binaries

3.5 License

3.5.1 GNU AFFERO GENERAL PUBLIC LICENSE

Version 3, 19 November 2007

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

3.5.2 Preamble

The GNU Affero General Public License is a free, copyleft license for software and other kinds of works, specifically designed to ensure cooperation with the community in the case of network server software.

The licenses for most software and other practical works are designed to take away your freedom to share and change the works. By contrast, our General Public Licenses are intended to guarantee your freedom to share and change all versions of a program—to make sure it remains free software for all its users.

When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for them if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs, and that you know you can do these things.

Developers that use our General Public Licenses protect your rights with two steps: (1) assert copyright on the software, and (2) offer you this License which gives you legal permission to copy, distribute and/or modify the software.

A secondary benefit of defending all users' freedom is that improvements made in alternate versions of the program, if they receive widespread use, become available for other developers to incorporate. Many developers of free software are heartened and encouraged by the resulting cooperation. However, in the case of software used on network servers, this result may fail to come about. The GNU General Public License permits making a modified version and letting the public access it on a server without ever releasing its source code to the public.

The GNU Affero General Public License is designed specifically to ensure that, in such cases, the modified source code becomes available to the community. It requires the operator of a network server to provide the source code of the modified version running there to the users of that server. Therefore, public use of a modified version, on a publicly accessible server, gives the public access to the source code of the modified version.

An older license, called the Affero General Public License and published by Affero, was designed to accomplish similar goals. This is a different license, not a version of the Affero GPL, but Affero has released a new version of the Affero GPL which permits relicensing under this license.

The precise terms and conditions for copying, distribution and modification follow.

3.5.3 TERMS AND CONDITIONS

0. Definitions.

“This License” refers to version 3 of the GNU Affero General Public License.

“Copyright” also means copyright-like laws that apply to other kinds of works, such as semiconductor masks.

“The Program” refers to any copyrightable work licensed under this License. Each licensee is addressed as “you”. “Licensees” and “recipients” may be individuals or organizations.

To “modify” a work means to copy from or adapt all or part of the work in a fashion requiring copyright permission, other than the making of an exact copy. The resulting work is called a “modified version” of the earlier work or a work “based on” the earlier work.

A “covered work” means either the unmodified Program or a work based on the Program.

To “propagate” a work means to do anything with it that, without permission, would make you directly or secondarily liable for infringement under applicable copyright law, except executing it on a computer or modifying a private copy. Propagation includes copying, distribution (with or without modification), making available to the public, and in some countries other activities as well.

To “convey” a work means any kind of propagation that enables other parties to make or receive copies. Mere interaction with a user through a computer network, with no transfer of a copy, is not conveying.

An interactive user interface displays “Appropriate Legal Notices” to the extent that it includes a convenient and prominently visible feature that (1) displays an appropriate copyright notice, and (2) tells the user that there is no warranty for the work (except to the extent that warranties are provided), that licensees may convey the work under this License, and how to view a copy of this License. If the interface presents a list of user commands or options, such as a menu, a prominent item in the list meets this criterion.

1. Source Code.

The “source code” for a work means the preferred form of the work for making modifications to it. “Object code” means any non-source form of a work.

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