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# Lago Documentation

*Release 0.3*

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## Getting started

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Check out the awesome README!



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## Releases

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### 2.1 Release process

#### 2.1.1 Versioning

For Iago we use a similar approach to semantic versioning, that is:

```
X.Y.Z
```

For example:

```
0.1.0
1.2.123
2.0.0
2.0.1
```

Where:

- Z changes for each patch (number of patches since X.Y tag)
- Y changes from time to time, with milestones (arbitrary bump), only for backwards compatible changes
- X changes if it's a non-backwards compatible change or arbitrarily (we don't like Y getting too high, or big milestone reached, ...)

The source tree has tags with the X.Y versions, that's where the packaging process gets them from.

On each X or Y change a new tag is created.

For now we have only one branch (master) and we will try to keep it that way as long as possible, if at some point we have to support old versions, then we will create a branch for each X version in the form:

```
vX
```

For example:

```
v0
v1
```

There's a helper script to resolve the current version, based on the last tag and the compatibility breaking commits since then, to get the version for the current repo run:

```
$ scripts/version_manager.py . version
```

## 2.1.2 RPM Versioning

The rpm versions differ from the generic version in that they have the `-1` suffix, where the `-1` is the release for that rpm (usually will never change, only when repackaging without any code change, something that is not so easy for us but if there's any external packagers is helpful for them)

## 2.1.3 Repository layout

Tree schema of the repository:

```
lago
-- stable <-- subdirs for each major version to avoid accidental
| |             non-backwards compatible upgrade
| |
| | -- 0.0 <-- Contains any 0.* release for lago
| |   -- ChangeLog_0.0.txt
| |   -- rpm
| |     -- el6
| |     -- el7
| |     -- fc22
| |     -- fc23
| |   -- sources
| -- 1.0
|   -- ChangeLog_1.0.txt
|   -- rpm
|     -- el6
|     -- el7
|     -- fc22
|     -- fc23
|   -- sources
| -- 2.0
|   -- ChangeLog_2.0.txt
|   -- rpm
|     -- el6
|     -- el7
|     -- fc22
|     -- fc23
|   -- sources
-- unstable <-- Multiple subdirs are needed only if branching
  -- 0.0 <-- Contains 0.* builds that might or might not have
  | |             been released
  | -- latest <-- keeps the latest build from merged, static
  | |             url
  | -- snapshot-lago_0.0_pipeline_1
  | -- snapshot-lago_0.0_pipeline_2
  | |             ^ contains the rpms created on the pipeline build
  | |             number 2 for the 0.0 version, this is needed to
  | |             ease the automated testing of the rpms
  | |
  | -- ... <-- this is cleaned up from time to time to avoid
  | |             using too much space
  -- 1.0
  | -- latest
  | -- snapshot-lago_1.0_pipeline_1
  | -- snapshot-lago_pipeline_2
  | -- ...
  -- 2.0
```



```
-- latest
-- snapshot-lago_2.0_pipeline_1
-- snapshot-lago_2.0_pipeline_2
-- ...
```

### 2.1.4 Promotion of artifacts to stable, aka. releasing

The goal is to have an automated set of tests, that check in depth lago, and run them in a timely fashion, and if passed, deploy to stable. As right now that's not yet possible, so for now the tests and deploy is done manually.

The promotion of the artifacts is done in these cases:

- New major version bump ( $X+1.0$ , for example  $1.0 \rightarrow 2.0$ )
- New minor version bump ( $X.Y+1$ , for example  $1.1 \rightarrow 1.2$ )
- If it passed certain time since the last  $X$  or  $Y$  version bumps ( $X.Y.Z+n$ , for example  $1.0.1 \rightarrow 1.0.2$ )
- If there are blocking/important bugfixes ( $X.Y.Z+n$ )
- If there are important new features ( $X.Y+1$  or  $X.Y.Z+n$ )

### 2.1.5 How to mark a major version

Whenever there's a commit that breaks the backwards compatibility, you should add to it the pseudo-header:

```
Sem-Ver: api-breaking
```

And that will force a major version bump for any package built from it, that is done so in the moment when you submit the commit in Gerrit, the packages that are build from it have the correct version.

After that, make sure that you tag that commit too, so it will be easy to look for it in the future.

### 2.1.6 The release procedure on the maintainer side

1. Select the snapshot repo you want to release
2. **Test the rpms, for now we only have the tests from projects that use it:**
  - Run all the [ovirt tests](#) on it, make sure it does not break anything, if there are issues -> [open bug](#)
  - **Run [vdsm functional tests](#), make sure it does not break anything, if** there are issues -> [open bug](#)
3. **On non-major version bump  $X.Y+1$  or  $X.Y.Z+n$** 
  - [Create a changelog](#) since the base of the tag and keep it aside
4. **On Major version bump  $X+1.0$** 
  - [Create a changelog](#) since the previous  $.0$  tag ( $X.0$ ) and keep it aside
5. Deploy the rpms from snapshot to dest repo and copy the `ChangeLog` from the tarball to `ChangeLog_X.0.txt` in the base of the `stable/X.0/` dir
6. Send email to [lago-devel](#) with the announcement and the changelog since the previous tag that you kept aside, feel free to change the body to your liking:

Subject: [day-month-year] New lago release - X.Y.Z

Hi everyone! There's a new lago release with version X.Y.Z ready for you to upgrade!

Here are the changes:

<CHANGELOG HERE>

Enjoy!

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## Developing

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### 3.1 CI Process

Here is described the usual workflow of going through the CI process from starting a new branch to getting it merged and released in the [unstable repo](#).

#### 3.1.1 Starting a branch

First of all, when starting to work on a new feature or fix, you have to start a new branch (in your fork if you don't have push rights to the main repo). Make sure that your branch is up to date with the project's master:

```
git checkout -b my_fancy_feature
# in case that origin is already lago-project/lago
git reset --hard origin/master
```

Then, once you can just start working, doing commits to that branch, and pushing to the remote from time to time as a backup.

Once you are ready to run the ci tests, you can create a pull request to master branch, if you have [hub](#) installed you can do so from command line, if not use the ui:

```
$ hub pull-request
```

That will automatically trigger a test run on ci, you'll see the status of the run in the pull request page. At that point, you can keep working on your branch, probably just rebasing on master regularly and maybe amending/squashing commits so they are logically meaningful.

#### 3.1.2 A clean commit history

An example of not good pull request history:

- Added right\_now parameter to virt.VM.start function
- Merged master into my\_fancy\_feature
- Added tests for the new parameter case
- Renamed right\_now parameter to sudo\_right\_now
- Merged master into my\_fancy\_feature
- Adapted test to the rename

This history can be greatly improved if you squashed a few commits:

- Added `sudo_right_now` parameter to `virt.VM.start` function
- Added tests for the new parameter case
- Merged master into `my_fancy_feature`
- Merged master into `my_fancy_feature`

And even more if instead of merging master, you just rebased:

- Added `sudo_right_now` parameter to `virt.VM.start` function
- Added tests for the new parameter case

That looks like a meaningful history :)

### 3.1.3 Rerunning the tests

While working on your branch, you might want to rerun the tests at some point, to do so, you just have to add a new comment to the pull request with one of the following as content:

- `ci test please`
- `ci :+1:`
- `ci :thumbsup:`

### 3.1.4 Asking for reviews

If at any point, you see that you are not getting reviews, please add the label ‘needs review’ to flag that pull request as ready for review.

### 3.1.5 Getting the pull request merged

Once the pull request has been reviewed and passes all the tests, an admin can start the merge process by adding a comment with one of the following as content:

- `ci merge please`
- `ci :shipit:`

That will trigger the merge pipeline, that will run the tests on the merge commit and deploy the artifacts to the [unstable repo](#) on success.

## 3.2 Environment setup

Here are some guidelines on how to set up your development of the lago project.

### 3.2.1 Requirements

You’ll need some extra packages to get started with the code for lago, assuming you are running Fedora:

```
> sudo dnf install git mock libvirt-daemon qemu-kvm autotools
```

And you'll need also a few Python libs, which you can install from the repos or use venv or similar, for the sake of this example we will use the repos ones:

```
> sudo dnf install python-flake8 python-nose python-dulwich yapf
```

Yapf is not available on older Fedoras or CentOS, you can get it from the [official yapf repo](#) or try on [copr](#).

Now you are ready to get the code:

```
> git clone git@github.com:lago-project/lago.git
```

From now on all the commands will be based from the root of the cloned repo:

```
> cd lago
```

### 3.2.2 Style formatting

We will accept only patches that pass pep8 and that are formatted with yapf. More specifically, only patches that pass the local tests:

```
> make check-local
```

It's recommended that you setup your editor to check automatically for pep8 issues. For the yapf formatting, if you don't want to forget about it, you can install the pre-commit git hook that comes with the project code:

```
> ln -s scripts/pre-commit.style .git/pre-commit
```

Now each time that you run `git commit` it will automatically reformat the code you changed with yapf so you don't have any issues when submitting a patch.

### 3.2.3 Testing your changes

Once you do some changes, you should make sure they pass the checks, there's no need to run on each edition but before submitting a patch for review you should do it.

You can run them on your local machine, but the tests themselves will install packages and do some changes to the os, so it's really recommended that you use a vm, or as we do on the CI server, use mock chroots. If you don't want to setup mock, skip the next section.

Hopefully in a close future we can use lago for that ;)

#### Setting up mock\_runner.sh with mock (fedora)

For now we are using a script developed by the *oVirt* devels to generate chroots and run tests inside them, it's not packaged yet, so we must get the code itself:

```
> cd ..
> git clone git://gerrit.ovirt.org/jenkins
```

As an alternative, you can just download the script and install them in your `$PATH`:

```
> wget https://gerrit.ovirt.org/gitweb?p=jenkins.git;a=blob_plain;f=mock_configs/mock_runner.sh;hb=r
```

We will need some extra packages:

```
> sudo dnf install mock
```

And, if not running as root (you shouldn't!) you have to add your user to the newly created mock group, and make sure the current session is in that group:

```
> sudo usermod -a -G mock $USER
> newgrp mock
> id # check that mock is listed
```

### Running the tests inside mock

Now we have all the setup we needed, so we can go back to the lago repo and run the tests, the first time you run them, it will take a while to download all the required packages and install them in the chroot, but on consecutive runs it will reuse all the cached chroots.

The *mock\_runner.sh* script allows us to test also different distributions, any that is supported by mock, for example, to run the tests for fedora 23 you can run:

```
> ../jenkins/mock_runner.sh -p fc23
```

That will run all the *check-patch.sh* (the *-p* option) tests inside a chroot, with a minimal fedora 23 installation. It will leave any logs under the *logs* directory and any generated artifacts under *exported-artifacts*.

## 3.3 Getting started developing

Everyone is welcome to send patches to lago, but we know that not everybody knows everything, so here's a reference list of technologies and methodologies that lago uses for reference.

### 3.3.1 Python!

Lago is written in python 2.7 (for now), so you should get yourself used to basic-to-medium python constructs and technics like:

- Basic python: Built-in types, flow control, pythonisms (import this)
- Object oriented programming (OOP) in python: Magic methods, class inheritance

Some useful resources:

- Base docs: <https://docs.python.org/2.7/>
- Built-in types: <https://docs.python.org/2.7/library/stdtypes.html>
- About classes: <https://docs.python.org/2.7/reference/datamodel.html#new-style-and-classic-classes>
- The Zen of Python:

```
> python -c "import this"

The Zen of Python, by Tim Peters

Beautiful is better than ugly.
Explicit is better than implicit.
Simple is better than complex.
Complex is better than complicated.
Flat is better than nested.
Sparse is better than dense.
```

```

Readability counts.
Special cases aren't special enough to break the rules.
Although practicality beats purity.
Errors should never pass silently.
Unless explicitly silenced.
In the face of ambiguity, refuse the temptation to guess.
There should be one-- and preferably only one --obvious way to do it.
Although that way may not be obvious at first unless you're Dutch.
Now is better than never.
Although never is often better than *right* now.
If the implementation is hard to explain, it's a bad idea.
If the implementation is easy to explain, it may be a good idea.
Namespaces are one honking great idea -- let's do more of those!

```

### 3.3.2 Bash

Even though there is not much bash code, the functional tests and some support scripts use it, so better to get some basics on it. We will try to follow the same standards for it than the [oVirt project](#) has.

### 3.3.3 Libvirt + qemu/kvm

As we are using intensively libvirt and qemu/kvm, it's a good idea to get yourself familiar with the main commands and services:

- libvirt: <http://libvirt.org>
- virsh client: <http://libvirt.org/virshcmdref.html>
- qemu (qemu-img is useful to deal with vm disk images): <https://en.wikibooks.org/wiki/QEMU/Images>

Also, there's a library and a set of tools from the [libguestfs](#) project that we use to prepare templates and are very useful when debugging, make sure you play at least with virt-builder, virt-customize, virt-sparsify and guestmount.

### 3.3.4 Git + Github

We use git as code version system, and we host it on Github right now, so if you are not familiar with any of those tools, you should get started with them, specially you should be able to:

- Clone a repo from github
- Fork a repo from github
- Create/delete/move to branches (git checkout)
- Move to different points in git history (git reset)
- Create/delete tags (git tag)
- See the history (git log)
- Create/amend commits (git commit)
- Retrieve changes from the upstream repository (git fetch)
- Apply your changes on top of the retrieved ones (git rebase)
- Apply your changes as a merge commit (git merge)
- Squash/reorder existing commits (git rebase --interactive)

- Send your changes to the upstream (git push)
- Create a pull request

You can always go to [the git docs](#) though there is a lot of good literature on it too.

### 3.3.5 Unit tests with py.test

Lately we decided to use [py.test](#) for the unit tests, and all the current unit tests were migrated to it. We encourage adding unit tests to any pull requests you send.

### 3.3.6 Functional tests with bats

For the functional tests, we decided to use [bats framework](#). It's completely written in bash, and if you are modifying or adding any functionality, you should add/modify those tests accordingly. It has a couple of custom constructs, so take a look to the [bats docs](#) while reading/writing tests.

### 3.3.7 Packaging

Our preferred distribution vector is through packages. Right now we are only building for rpm-based system, so right now you can just take a peek on [how to build rpms](#). Keep in mind also that we try to move as much of the packaging logic as possible to the [python packaging system](#) itself too, worth getting used to it too.

### 3.3.8 Where to go next

You can continue setting up your environment and try running the examples in the readme to get used to lago. Once you get familiar with it, you can pick any of the [existing issues](#) and send a pull request to fix it, so you get used to the ci process we use to get stuff developed flawlessly and quickly, welcome!



## 4.1 lagoon package

### 4.1.1 Subpackages

#### lagoon.plugins package

`lagoon.plugins.PLUGIN_ENTRY_POINTS = {'cli': 'lagoon.plugins.cli', 'out': 'lagoon.plugins.output'}`  
Map of plugin type string -> setuptools entry point

**class** `lagoon.plugins.Plugin`

Bases: `object`

Base class for all the plugins

`lagoon.plugins.load_plugins(namespace)`

Loads all the plugins for the given namespace

**Parameters** `namespace` (*str*) – Namespace string, as in the setuptools entry\_points

**Returns** Returns the list of loaded plugins already instantiated

**Return type** dict of str, object

#### Submodules

#### lagoon.plugins.cli module

##### About CLIPlugins

A CLIPlugin is a subcommand of the `lagocli` command, it's ment to group actions together in a logical sense, for example grouping all the actions done to templates.

To create a new subcommand for `testenvcli` you just have to subclass the CLIPlugin abstract class and declare it in the setuptools as an entry\_point, see this module's `setup.py/setup.cfg` for an example:

```
class NoopCLIPlugin(CLIPlugin):
    init_args = {
        'help': 'dummy help string',
    }

    def populate_parser(self, parser):
```

```
parser.addArgument('--dummy-flag', action='store_true')

def do_run(self, args):
    if args.dummy_flag:
        print "Dummy flag passed to noop subcommand!"
    else:
        print "Dummy flag not passed to noop subcommand!"
```

You can also use decorators instead, an equivalent is:

```
@cli_plugin_add_argument('--dummy-flag', action='store_true')
@cli_plugin(help='dummy help string')
def my_fancy_plugin_func(dummy_flag, **kwargs):
    if dummy_flag:
        print "Dummy flag passed to noop subcommand!"
    else:
        print "Dummy flag not passed to noop subcommand!"
```

Or:

```
@cli_plugin_add_argument('--dummy-flag', action='store_true')
def my_fancy_plugin_func(dummy_flag, **kwargs):
    "dummy help string"
    if dummy_flag:
        print "Dummy flag passed to noop subcommand!"
    else:
        print "Dummy flag not passed to noop subcommand!"
```

Then you will need to add an entry\_points section in your setup.py like:

```
setup(
    ...
    entry_points={
        'lago.plugins.cli': [
            'noop=noop_module:my_fancy_plugin_func',
        ],
    }
    ...
)
```

Or in your setup.cfg like:

```
[entry_points]
lago.plugins.cli =
    noop=noop_module:my_fancy_plugin_func
```

Any of those will add a new subcommand to the lagocli command that can be run as:

```
$ lagocli noop
Dummy flag not passed to noop subcommand!
```

TODO: Allow per-plugin namespacing to get rid of the *\*\*kwargs* parameter

```
class lago.plugins.cli.CLIPlugin
    Bases: lago.plugins.Plugin
    _abc_cache = <_weakrefset.WeakSet object>
    _abc_negative_cache = <_weakrefset.WeakSet object>
    _abc_negative_cache_version = 25
```

**`_abc_registry`** = `<_weakrefset.WeakSet object>`

**`do_run`** (*args*)

Execute any actions given the arguments

**Parameters** **`args`** (*Namespace*) – with the arguments

**Returns** None

**`init_args`**

Dictionary with the argument to initialize the cli parser (for example, the help argument)

**`populate_parser`** (*parser*)

Add any required arguments to the parser

**Parameters** **`parser`** (*ArgumentParser*) – parser to add the arguments to

**Returns** None

**class** `lago.plugins.cli.CLIPuginFuncWrapper` (*do\_run=None, init\_args=None*)

Bases: `lago.plugins.cli.CLIPugin`

Special class to handle decorated cli plugins, take into account that the decorated functions have some limitations on what arguments can they define actually, if you need something complicated, used the abstract class `CLIPugin` instead.

Keep in mind that right now the decorated function must use `**kwargs` as param, as it will be passed all the members of the parser, not just whatever it defined

**`__call__`** (*\*args, \*\*kwargs*)

Keep the original function interface, so it can be used elsewhere

**`_abc_cache`** = `<_weakrefset.WeakSet object>`

**`_abc_negative_cache`** = `<_weakrefset.WeakSet object>`

**`_abc_negative_cache_version`** = 25

**`_abc_registry`** = `<_weakrefset.WeakSet object>`

**`add_argument`** (*\*argument\_args, \*\*argument\_kwargs*)

**`do_run`** (*args*)

**`init_args`**

**`populate_parser`** (*parser*)

**`set_help`** (*help=None*)

**`set_init_args`** (*init\_args*)

**lago.plugins.cli.cli\_plugin** (*func=None, \*\*kwargs*)

Decorator that wraps the given function in a `CLIPugin`

**Parameters**

- **`func`** (*callable*) – function/class to decorate
- **`**kwargs`** – Any other arg to use when initializing the parser (like help, or prefix\_chars)

**Returns** cli plugin that handles that method

**Return type** `CLIPugin`

## Notes

It can be used as a decorator or as a decorator generator, if used as a decorator generator don't pass any parameters

## Examples

```
>>> @cli_plugin
... def test(**kwargs):
...     print 'test'
...
>>> print test.__class__
<class 'cli.CLIPluginFuncWrapper'>
```

```
>>> @cli_plugin()
... def test(**kwargs):
...     print 'test'
>>> print test.__class__
<class 'cli.CLIPluginFuncWrapper'>
```

```
>>> @cli_plugin(help='dummy help')
... def test(**kwargs):
...     print 'test'
>>> print test.__class__
<class 'cli.CLIPluginFuncWrapper'>
>>> print test.init_args['help']
'dummy help'
```

lago.plugins.cli.**cli\_plugin\_add\_argument** (\*args, \*\*kwargs)

Decorator generator that adds an argument to the cli plugin based on the decorated function

### Parameters

- **\*args** – Any args to be passed to `argparse.ArgumentParser.add_argument()`
- **\*\*kwargs** – Any keyword args to be passed to `argparse.ArgumentParser.add_argument()`

**Returns** Decorator that builds or extends the cliplugin for the decorated function, adding the given argument definition

**Return type** function

## Examples

```
>>> @cli_plugin_add_argument('-m', '--mogambo', action='store_true')
... def test(**kwargs):
...     print 'test'
...
>>> print test.__class__
<class 'cli.CLIPluginFuncWrapper'>
>>> print test._parser_args
[('-m', '--mogambo'), {'action': 'store_true'}]
```

```
>>> @cli_plugin_add_argument('-m', '--mogambo', action='store_true')
... @cli_plugin_add_argument('-b', '--bogabmo', action='store_false')
```

```

... @cli_plugin
... def test(**kwargs):
...     print 'test'
...
>>> print test.__class__
<class 'cli.CLIPluginFuncWrapper'>
>>> print test._parser_args
[('-', '--bogabmo'), {'action': 'store_false'}],
[('-', '--mogambo'), {'action': 'store_true'}]]

```

`lago.plugins.cli.cli_plugin_add_help` (*help*)

Decorator generator that adds the cli help to the cli plugin based on the decorated function

**Parameters** `help` (*str*) – help string for the cli plugin

**Returns** Decorator that builds or extends the cliplugin for the decorated function, setting the given help

**Return type** function

### Examples

```

>>> @cli_plugin_add_help('my help string')
... def test(**kwargs):
...     print 'test'
...
>>> print test.__class__
<class 'cli.CLIPluginFuncWrapper'>
>>> print test.help
my help string

```

```

>>> @cli_plugin_add_help('my help string')
... @cli_plugin()
... def test(**kwargs):
...     print 'test'
>>> print test.__class__
<class 'cli.CLIPluginFuncWrapper'>
>>> print test.help
my help string

```

## `lago.plugins.output` module

### About OutFormatPlugins

An OutFormatPlugin is used to format the output of the commands that extract information from the prefixes, like status.

**class** `lago.plugins.output.DefaultOutFormatPlugin`

Bases: `lago.plugins.output.OutFormatPlugin`

`_abc_cache` = `<_weakrefset.WeakSet object>`

`_abc_negative_cache` = `<_weakrefset.WeakSet object>`

`_abc_negative_cache_version` = 25

`_abc_registry` = `<_weakrefset.WeakSet object>`

```
format (info_obj, indent='')
indent_unit = ''

class lago.plugins.output.JSONOutFormatPlugin
Bases: lago.plugins.output.OutFormatPlugin
    _abc_cache = <_weakrefset.WeakSet object>
    _abc_negative_cache = <_weakrefset.WeakSet object>
    _abc_negative_cache_version = 25
    _abc_registry = <_weakrefset.WeakSet object>
    format (info_dict)

class lago.plugins.output.OutFormatPlugin
Bases: lago.plugins.Plugin
    _abc_cache = <_weakrefset.WeakSet object>
    _abc_negative_cache = <_weakrefset.WeakSet object>
    _abc_negative_cache_version = 25
    _abc_registry = <_weakrefset.WeakSet object>
    format (info_dict)
        Execute any actions given the arguments

        Parameters info_dict (dict) – information to reformat

        Returns String representing the formatted info

        Return type str

class lago.plugins.output.YAMLOutFormatPlugin
Bases: lago.plugins.output.OutFormatPlugin
    _abc_cache = <_weakrefset.WeakSet object>
    _abc_negative_cache = <_weakrefset.WeakSet object>
    _abc_negative_cache_version = 25
    _abc_registry = <_weakrefset.WeakSet object>
    format (info_dict)
```

## 4.1.2 Submodules

### 4.1.3 lago.brctl module

```
lago.brctl._brctl (command, *args)
lago.brctl._set_link (name, state)
lago.brctl.create (name, stp=True)
lago.brctl.destroy (name)
lago.brctl.exists (name)
```

#### 4.1.4 lago.cmd module

```
lago.cmd.check_group_membership()
lago.cmd.create_parser(cli_plugins, out_plugins)
lago.cmd.main()
```

#### 4.1.5 lago.config module

```
lago.config._get_environ()
lago.config._get_from_dir(path, key)
lago.config._get_from_env(key)
lago.config._get_from_files(paths, key)
lago.config._get_providers()
lago.config.get(key, default=<object object>)
```

#### 4.1.6 lago.constants module

#### 4.1.7 lago.dirlock module

```
lago.dirlock._lock_path(path)
lago.dirlock.lock(path, excl, key_path)
    Waits until the given directory can be locked
```

##### Parameters

- **path** (*str*) – Path of the directory to lock
- **excl** (*bool*) – If the lock should be exclusive
- **key\_path** (*str*) – path to the file that contains the uid to use when locking

##### Returns

None

```
lago.dirlock.trylock(path, excl, key_path)
    Tries once to get a lock to the given dir
```

##### Parameters

- **path** (*str*) – path to the directory to lock
- **excl** (*bool*) – If the lock should be exclusive
- **key\_path** (*str*) – path to the file that contains the uid to use when locking

##### Returns

True if it did get a lock, False otherwise

##### Return type

*bool*

```
lago.dirlock.unlock(path, key_path)
    Removes the lock of the uid in the given key file
```

##### Parameters

- **path** (*str*) – Path of the directory to lock
- **key\_path** (*str*) – path to the file that contains the uid to remove the lock of

**Returns** None

### 4.1.8 lago.libvirt\_utils module

Utilities to help deal with the libvirt python bindings

**class** `lago.libvirt_utils.Domain`

Bases: `object`

Class to namespace libvirt domain related helpers

**static** `resolve_state(state_number)`

Get a nice description from a domain state number

**Parameters** `state_number` (*list of int*) – State number as returned by

:param libvirt.virtDomain.state:

**Returns** small human readable description of the domain state, unknown if the state is not in the known list

**Return type** `str`

### 4.1.9 lago.log\_utils module

This module defines the special logging tools that lago uses

`lago.log_utils.ALWAYS_SHOW_REG = <_sre.SRE_Pattern object>`

Regexp that will match the above template

`lago.log_utils.ALWAYS_SHOW_TRIGGER_MSG = 'force-show:%s'`

Message template that will always show the message

**class** `lago.log_utils.ColorFormatter` (*fmt=None, datefmt=None*)

Bases: `logging.Formatter`

Formatter to add colors to log records

**CRITICAL** = `'\x1b[31m'`

**CYAN** = `'\x1b[36m'`

**DEBUG** = `''`

**DEFAULT** = `'\x1b[0m'`

**ERROR** = `'\x1b[31m'`

**GREEN** = `'\x1b[32m'`

**INFO** = `'\x1b[36m'`

**NONE** = `''`

**RED** = `'\x1b[31m'`

**WARNING** = `'\x1b[33m'`

**WHITE** = `'\x1b[37m'`

**YELLOW** = `'\x1b[33m'`

**classmethod** `colored` (*color, message*)

Small function to wrap a string around a color



**Parameters**

- **color** (*str*) – name of the color to wrap the string with, must be one of the class properties
- **message** (*str*) – String to wrap with the color

**Returns** the colored string

**Return type** *str*

**format** (*record*)

Adds colors to a log record and formats it with the default

**Parameters** **record** (*logging.LogRecord*) – log record to format

**Returns** The colored and formatted record string

**Return type** *str*

**class** *lago.log\_utils.ContextLock*

Bases: *object*

Context manager to thread lock a block of code

*lago.log\_utils.END\_TASK\_MSG* = 'Success'

Message to be shown when a task is ended

*lago.log\_utils.END\_TASK\_REG* = <\_sre.SRE\_Pattern object>

Regexp that will match the above template

*lago.log\_utils.END\_TASK\_TRIGGER\_MSG* = 'end task %s'

Message template that will trigger a task end

**class** *lago.log\_utils.LogTask* (*task*, *logger*=<module 'logging' from  
'usr/lib/python2.7/logging/\_\_init\_\_.pyc'>, *level*='info')

Bases: *object*

Context manager for a log task

**Example**

```
>>> with LogTask('mytask'):
...     pass
```

*lago.log\_utils.START\_TASK\_MSG* = '  
Message to be shown when a task is started

*lago.log\_utils.START\_TASK\_REG* = <\_sre.SRE\_Pattern object>  
Regexp that will match the above template

*lago.log\_utils.START\_TASK\_TRIGGER\_MSG* = 'start task %s'  
Message template that will trigger a task

**class** *lago.log\_utils.Task* (*name*, \**args*, \*\**kwargs*)  
Bases: *collections.deque*

Small wrapper around deque to add the failed status and name to a task

**name**  
*str*

name for this task

**failed**  
*bool*

If this task has failed or not (if there was any error log shown during it's execution)

**force\_show**  
*bool*

If set, will show any log records generated inside this task even if it's out of nested depth limit

**elapsed\_time()**

```
class lago.log_utils.TaskHandler(initial_depth=0, task_tree_depth=-1, buffer_size=2000,
                                dump_level=40, level=0, formatter=<class
                                'lago.log_utils.ColorFormatter'>)
```

Bases: `logging.StreamHandler`

This log handler will use the concept of tasks, to hide logs, and will show all the logs for the current task if there's a logged error while running that task.

It will hide any logs that belong to nested tasks that have more than `task_tree_depth` parent levels, and for the ones that are above that level, it will show only the logs that have a loglevel above `level`.

You can force showing a log record immediately if you use the `log_always()` function bypassing all the filters.

If there's a log record with log level higher than `dump_level` it will be considered a failure, and all the logs for the current task that have a log level above `level` will be shown no matter at which depth the task belongs to. Also, all the parent tasks will be tagged as error.

**formatter**  
*logging.LogFormatter*  
formatter to use

**initial\_depth**  
*int*

Initial depth to account for, in case this handler was created in a subtask

**tasks\_by\_thread (dict of str**  
OrderedDict of str: Task): List of thread names, and their currently open tasks with their latest log records

**dump\_level**  
*int*

log level from which to consider a log record as error

**buffer\_size**  
*int*

Size of the log record deque for each task, the bigger, the more records it can show in case of error but the more memory it will use

**task\_tree\_depth**  
*int*

number of the nested level to show start/end task logs for, if -1 will show always

**level**  
*int*

Log level to show logs from if the depth limit is not reached

**main\_failed**

*bool*

used to flag from a child thread that the main should fail any current task

**\_tasks\_lock**

*ContextLock*

Lock for the tasks\_by\_thread dict

**\_main\_thread\_lock**

*ContextLock*

Lock for the main\_failed bool

**TASK\_INDICATORS** = ['@', '#', '\*', '-', '~']

List of chars to show as task prefix, to ease distinguishing them

**am\_i\_main\_thread**

**Returns** if the current thread is the main thread

**Return type** *bool*

**close\_children\_tasks** (*parent\_task\_name*)

Closes all the children tasks that were open

**Parameters** **parent\_task\_name** (*str*) – Name of the parent task

**Returns** None

**cur\_depth\_level**

**Returns** depth level for the current task

**Return type** *int*

**cur\_task**

**Returns** the current active task

**Return type** *str*

**cur\_thread**

**Returns** Name of the current thread

**Return type** *str*

**emit** (*record*)

Handle the given record, this is the entry point from the python logging facility

**Params:** record (logging.LogRecord): log record to handle

**Returns** None

**get\_task\_indicator** (*task\_level=None*)

**Parameters** **task\_level** (*int* or *None*) – task depth level to get the indicator for, if None, will use the current tasks depth

**Returns** char to prepend to the task logs to indicate it's level

**Return type** *str*

**get\_tasks** (*thread\_name*)

**Parameters** **thread\_name** (*str*) – name of the thread to get the tasks for

**Returns** list of task names and log records for each for the given thread

**Return type** OrderedDict of str, Task

**handle\_closed\_task** (*task\_name*, *record*)

Do everything needed when a task is closed

**Params:** *task\_name* (str): name of the task that is finishing record (logging.LogRecord): log record with all the info

**Returns** None

**handle\_error** ()

Handles an error log record that should be shown

**Returns** None

**handle\_new\_task** (*task\_name*, *record*)

Do everything needed when a task is starting

**Params:** *task\_name* (str): name of the task that is starting record (logging.LogRecord): log record with all the info

**Returns** None

**mark\_main\_tasks\_as\_failed** ()

Flags to the main thread that all it's tasks sholud fail

**Returns** None

**mark\_parent\_tasks\_as\_failed** (*task\_name*, *flush\_logs=False*)

Marks all the parent tasks as failed

**Parameters**

- **task\_name** (*str*) – Name of the child task
- **flush\_logs** (*bool*) – If True will discard all the logs form parent tasks

**Returns** None

**pretty\_emit** (*record*, *is\_header=False*, *task\_level=None*)

Wrapper around the `logging.StreamHandler` emit method to add some decoration stuff to the message

**Parameters**

- **record** (*logging.LogRecord*) – log record to emit
- **is\_header** (*bool*) – if this record is a header, usually, a start or end task message
- **task\_level** (*int*) – If passed, will take that as the current nested task level instead of calculating it from the current tasks

**Returns** None

**should\_show\_by\_depth** (*cur\_level=None*)

**Parameters** *cur\_level* (*int*) – depth level to take into account

**Returns** True if the given depth level should show messages (not taking into account the log level)

**Return type** bool

**should\_show\_by\_level** (*record\_level*, *base\_level=None*)

**Parameters**

- **record\_level** (*int*) – log level of the record to check
- **base\_level** (*int or None*) – log level to check against, will use the object's *dump\_level* if None is passed

**Returns** True if the given log record should be shown according to the log level

**Return type** *bool*

**tasks**

**Returns** list of task names and log records for each for the current thread

**Return type** *OrderedDict* of *str*, *Task*

```
lago.log_utils.end_log_task(task, logger=<module 'logging' from
                           '/usr/lib/python2.7/logging/__init__.pyc'>, level='info')
```

Ends a log task

**Parameters**

- **task** (*str*) – name of the log task to end
- **logger** (*logging.Logger*) – logger to use
- **level** (*str*) – log level to use

**Returns** *None*

```
lago.log_utils.hide_paramiko_logs()
```

```
lago.log_utils.log_always(message)
```

Wraps the given message with a tag that will make it be always logged by the task logger

**Parameters** **message** (*str*) – message to wrap with the tag

**Returns** tagged message that will get it shown immediately by the task logger

**Return type** *str*

```
lago.log_utils.log_task(task, logger=<module 'logging' from
                           '/usr/lib/python2.7/logging/__init__.pyc'>, level='info')
```

Parameterized decorator to wrap a function in a log task

**Example**

```
>>> @log_task('mytask')
... def do_something():
...     pass
```

```
lago.log_utils.setup_prefix_logging(logdir)
```

Sets up a file logger that will create a log in the given logdir (usually a lago prefix)

**Parameters** **logdir** (*str*) – path to create the log into, will be created if it does not exist

**Returns** *None*

```
lago.log_utils.start_log_task(task, logger=<module 'logging' from
                              '/usr/lib/python2.7/logging/__init__.pyc'>, level='info')
```

Starts a log task

**Parameters**

- **task** (*str*) – name of the log task to start
- **logger** (*logging.Logger*) – logger to use
- **level** (*str*) – log level to use

**Returns** None

#### 4.1.10 lago.paths module

```
class lago.paths.Paths (prefix)
    Bases: object
    images (*path)
    logs ()
    metadata ()
    prefix_lagofile ()
        This file represents a prefix that's initialized
    prefixed (*args)
    ssh_id_rsa ()
    ssh_id_rsa_pub ()
    uuid ()
    virt (*path)
```

#### 4.1.11 lago.prefix module

```
class lago.prefix.Prefix (prefix)
    Bases: object

    A prefix is a directory that will contain all the data needed to setup the environment.

    _prefix
        str
        Path to the directory of this prefix

    _paths
        lago.path.Paths
        Path handler class

    _virt_env
        lago.virt.VirtEnv
        Lazily loaded virtual env handler

    _metadata
        dict
        Lazily loaded metadata

    _add_nic_to_mapping (net, dom, nic)
        Populates the given net spec mapping entry with the nicks of the given domain

    Parameters
```

- **net** (*dict*) – Network spec to populate
- **dom** (*dict*) – libvirt domain specification
- **nic** (*str*) – Name of the interface to add to the net mapping from the domain

**Returns** None

**\_allocate\_ips\_to\_nics** (*conf*)

For all the nics of all the domains in the conf that have dynamic ip, allocate one and addit to the network mapping

**Parameters** **conf** (*dict*) – Configuration spec to extract the domains from

**Returns** None

**\_allocate\_subnets** (*conf*)

Allocate all the subnets needed by the given configuration spec

**Parameters** **conf** (*dict*) – Configuration spec where to get the nets definitions from

**Returns** allocated subnets

**Return type** list

**\_check\_predefined\_subnets** (*conf*)

Checks if all of the nets defined in the config are inside the allowed range, throws exception if not

**Parameters** **conf** (*dict*) – Configuration spec where to get the nets definitions from

**Returns** None

**Raises** `RuntimeError` – If there are any subnets out of the allowed range

**\_config\_net\_topology** (*conf*)

Initialize and populate all the network related elements, like reserving ips and populating network specs of the given configuration spec

**Parameters** **conf** (*dict*) – Configuration spec to initialize

**Returns** None

**\_create\_disk** (*name, spec, template\_repo=None, template\_store=None*)

Creates a disk with the given name from the given repo or store.

**Parameters**

- **name** (*str*) – Name of the domain to create the disk for
- **spec** (*dict*) – Specification of the disk to create
- **template\_repo** (*TemplateRepository or None*) – template repo instance to use
- **template\_store** (*TemplateStore or None*) – template store instance to use

**Returns** **Tuple** – Path with the disk and metadata

**Return type** str, dict

**Raises** `RuntimeError` – If the type of the disk is not supported or failed to create the disk

**\_create\_ssh\_keys** ()

Generate a pair of ssh keys for this prefix

**Returns** None

**Raises** `RuntimeError` – if it fails to create the keys

**`_create_virt_env()`**

Create a new virt env from this prefix

**Returns** virt env created from this prefix

**Return type** *lago.virt.VirtEnv*

**`_get_metadata()`**

Retrieve the metadata info for this prefix

**Returns** metadata info

**Return type** *dict*

**`_init_net_specs(conf)`**

Given a configuration specification, initializes all the net definitions in it so they can be used comfortably

**Parameters** **conf** (*dict*) – Configuration specification

**Returns** None

**`_ova_to_spec(filename)`**

Retrieve the given ova and makes a template of it. Creates a disk from network provided ova. Calculates the needed memory from the ovf. The disk will be cached in the template repo

**Parameters** **filename** (*str*) – the url to retrieve the data from

**TODO:**

- Add hash checking against the server for faster download and latest version
- Add config script running on host - other place
- Add cloud init support - by using cdroms in other place
- Handle cpu in some way - some other place need to pick it up
- Handle the memory units properly - we just assume MegaBytes

**Returns** list with the disk specification int: VM memory, None if none defined int: Number of virtual cpus, None if none defined

**Return type** list of dict

**Raises**

- *RuntimeError* – If the ova format is not supported
- *TypeError* – If the memory units in the ova are not supported (currently only 'MegaBytes')

**`_register_preallocated_ips(conf)`**

Parse all the domains in the given conf and preallocate all their ips into the networks mappings, raising exception on duplicated ips or ips out of the allowed ranges

**See also:**

*lago.subnet\_lease*

**Parameters** **conf** (*dict*) – Configuration spec to parse

**Returns** None

**Raises** *RuntimeError* – if there are any duplicated ips or any ip out of the allowed range



**`_save_metadata()`**

Write this prefix metadata to disk

**Returns** None

**`_use_prototype(spec, conf)`**

Populates the given spec with the values of it's declared prototype

**Parameters**

- **spec** (*dict*) – spec to update
- **conf** (*dict*) – Configuration spec containing the prototypes

**Returns** updated spec

**Return type** *dict*

**`cleanup(*args, **kwargs)`**

Stops any running entities in the prefix and uninitialized it, usually you want to do this if you are going to remove the prefix afterwards

**Returns** None

**`create_snapshots(name)`**

Creates one snapshot on all the domains with the given name

**Parameters** **name** (*str*) – Name of the snapshots to create

**Returns** None

**`destroy()`**

Destroy this prefix, running any cleanups and removing any files inside it.

**`fetch_url(url)`**

Retrieves the given url to the prefix

**Parameters** **url** (*str*) – Url to retrieve

**Returns** path to the downloaded file

**Return type** *str*

**`get_nets()`**

Retrieve info on all the nets from all the domains

**Returns** **dict of str->list** – dictionary with net\_name -> net list

**Return type** *str*

**`get_snapshots()`**

Retrieve info on all the snapshots from all the domains

**Returns** list(str): dictionary with vm\_name -> snapshot list

**Return type** dict of str

**`get_vms()`**

Retrieve info on all the vms

**Returns** **dict of str->list** – dictionary with vm\_name -> vm list

**Return type** *str*

**`initialize(*args, **kwargs)`**

Initialize this prefix, this includes creating the destination path, and creating the uuid for the prefix, for any other actions see *Prefix.virt\_conf()*

Will safely roll back if any of those steps fail

**Returns** None

**Raises** `RuntimeError` – If it fails to create the prefix dir

**classmethod** `is_prefix(path)`

Check if a path is a valid prefix

**Parameters** `path(str)` – path to be checked

**Returns** True if the given path is a prefix

**Return type** `bool`

**classmethod** `resolve_prefix_path(start_path=None)`

Look for an existing prefix in the given path, in a path/.lago dir, or in a .lago dir under any of it's parent directories

**Parameters** `start_path(str)` – path to start the search from, if None passed, it will use the current dir

**Returns** path to the found prefix

**Return type** `str`

**Raises** `RuntimeError` – if no prefix was found

**revert\_snapshots(name)**

Revert all the snapshots with the given name from all the domains

**Parameters** `name(str)` – Name of the snapshots to revert

**Returns** None

**save()**

Save this prefix to persistent storage

**Returns** None

**start(vm\_names=None)**

Start this prefix

**Parameters** `vm_names(list of str)` – List of the vms to start

**Returns** None

**stop(vm\_names=None)**

Stop this prefix

**Parameters** `vm_names(list of str)` – List of the vms to stop

**Returns** None

**virt\_conf(conf, template\_repo=None, template\_store=None)**

Initializes all the virt infrastructure of the prefix, creating the domains disks, doing any network leases and creating all the virt related files and dirs inside this prefix.

**Parameters**

- **conf(dict)** – Configuration spec
- **template\_repo(Repository)** – template repository instance
- **template\_store(Store)** – template store instance

**Returns** None

**virt\_conf\_from\_stream** (*conf\_fd*, *template\_repo=None*, *template\_store=None*)

Initializes all the virt infrastructure of the prefix, creating the domains disks, doing any network leases and creating all the virt related files and dirs inside this prefix.

**Parameters**

- **conf\_fd** (*File*) – File like object to read the config from
- **template\_repo** (*TemplateRepository*) – template repository instance
- **template\_store** (*TemplateStore*) – template store instance

**Returns** None

**virt\_env**

Getter for this instance's virt env, creates it if needed

**Returns** virt env instance used by this prefix

**Return type** *lago.virt.VirtEnv*

**lago.prefix.\_create\_ip** (*subnet*, *index*)

Given a subnet or an ip and an index returns the ip with that lower index from the subnet (255.255.255.0 mask only subnets)

**Parameters**

- **subnet** (*str*) – Strign containing the three first elements of the decimal representation of a subnet (X.Y.Z) or a full ip (X.Y.Z.A)
- **index** (*int or str*) – Last element of a decimal ip representation, for example, 123 for the ip 1.2.3.123

**Returns** The dotted decimal representation of the ip

**Return type** *str*

**lago.prefix.\_ip\_in\_subnet** (*subnet*, *ip*)

Checks if an ip is included in a subnet.

---

**Note:** only 255.255.255.0 masks allowed

---

**Parameters**

- **subnet** (*str*) – Strign containing the three first elements of the decimal representation of a subnet (X.Y.Z) or a full ip (X.Y.Z.A)
- **ip** (*str or int*) – Decimal ip representation

**Returns** True if ip is in subnet, False otherwise

**Return type** *bool*

## 4.1.12 lago.subnet\_lease module

Module that handles the leases for the subnets of the virtual network interfaces.

---

**Note:** Currently only /24 ranges are handled, and all of them under the 192.168.MIN\_SUBNET to 192.168.MAX\_SUBNET ranges

---

The leases are stored under `LEASE_DIR` as json files with the form:

```
[
    "/path/to/prefix/uuid/file",
    "uuid_hash",
]
```

Where the `uuid_hash` is the 32 char uuid of the prefix (the contents of the uuid file at the time of doing the lease)

`lago.subnet_lease.LEASE_DIR = '/var/lib/lago/subnets/'`

Path to the directory where the net leases are stored

`lago.subnet_lease.LOCK_FILE = '/var/lib/lago/subnets/leases.lock'`

Path to the net leases lock

`lago.subnet_lease.MAX_SUBNET = 209`

Upper range for the allowed subnets

`lago.subnet_lease.MIN_SUBNET = 200`

Lower range for the allowed subnets

`lago.subnet_lease._acquire(*args, **kwargs)`

Lease a free network for the given uuid path

**Parameters** `uuid_path (str)` – Path to the uuid file of a `lago.Prefix`

**Returns** the third element of the dotted ip of the leased network or `None` if no lease was available

**Return type** `int` or `None`

---

### Todo

Raise exception or something instead of returning `None` so the caller can handle the failure case

---

`lago.subnet_lease._lease_owned(path, current_uuid_path)`

Checks if the given lease is owned by the prefix whose uuid is in the given path

---

**Note:** The prefix must be also in the same path it was when it took the lease

---

### Parameters

- `path (str)` – Path to the lease
- `current_uuid_path (str)` – Path to the uuid to check ownership of

**Returns** `True` if the given lease is owned by the prefix, `False` otherwise

**Return type** `bool`

`lago.subnet_lease._lease_valid(path)`

Checks if the given lease still has a prefix that owns it

**Parameters** `path (str)` – Path to the lease

**Returns** `True` if the uuid path in the lease still exists and is the same as the one in the lease

**Return type** `bool`

`lago.subnet_lease._locked(func)`

Decorator that will make sure that you have the exclusive lock for the leases

`lago.subnet_lease._release(*args, **kwargs)`

Free the lease of the given subnet index

**Parameters** `index` (*int*) – Third element of a dotted ip representation of the subnet, for example, for 1.2.3.4 it would be 3

**Returns** None

`lago.subnet_lease._take_lease(path, uuid_path)`

Persist to the given leases path the prefix uuid that's in the uuid path passed

**Parameters**

- `path` (*str*) – Path to the leases file
- `uuid_path` (*str*) – Path to the prefix uuid

**Returns** None

`lago.subnet_lease._validate_lease_dir_present(func)`

Decorator that will ensure that the lease dir exists, creating it if necessary

`lago.subnet_lease.acquire(uuid_path)`

Lease a free network for the given uuid path

**Parameters** `uuid_path` (*str*) – Path to the uuid file of a `lago.Prefix`

**Returns** the dotted ip of the gateway for the leased net

**Return type** *str*

---

#### Todo

`_acquire` might return None, this will throw a `TypeError`

---

`lago.subnet_lease.is_leasable_subnet(subnet)`

Checks if a given subnet is inside the defined provisionable range

**Parameters** `subnet` (*str*) – Subnet or ip in dotted decimal format

**Returns** True if subnet is inside the range, False otherwise

**Return type** *bool*

`lago.subnet_lease.release(subnet)`

Free the lease of the given subnet

**Parameters** `subnet` (*str*) – dotted ip or network to free the lease of

**Returns** None

### 4.1.13 lago.sysprep module

`lago.sysprep._config_net_interface(iface, **kwargs)`

`lago.sysprep._upload_file(local_path, remote_path)`

`lago.sysprep._write_file(path, content)`

`lago.sysprep.add_ssh_key(key, with_restorecon_fix=False)`

`lago.sysprep.config_net_interface_dhcp(iface, hwaddr)`

`lago.sysprep.set_hostname(hostname)`

```
lago.sysprep.set_iscsi_initiator_name(name)
lago.sysprep.set_root_password(password)
lago.sysprep.set_selinux_mode(mode)
lago.sysprep.sysprep(disk, mods, backend='direct')
```

#### 4.1.14 lago.templates module

This module contains any disk template related classes and functions, including the repository store manager classes and template providers, some useful definitions:

- **Template repositories:** Repository where to fetch templates from, as an http server
- **Template store:** Local store to cache templates
- **Template:** Uninitialized disk image to use as base for other disk images
- **Template version:** Specific version of a template, to allow getting updates without having to change the template name everywhere

```
class lago.templates.FileSystemTemplateProvider(root)
    Handles file type templates, that is, getting a disk template from the host's filesystem
```

```
    _prefixed(*path)
```

Join all the given paths prefixed with this provider's base root path

**Parameters** *\*path* (*str*) – sections of the path to join, passed as positional arguments

**Returns** Joined paths prepended with the provider root path

**Return type** *str*

```
    download_image(handle, dest)
```

Copies over the handle to the destination

**Parameters**

- **handle** (*str*) – path to copy over
- **dest** (*str*) – path to copy to

**Returns** None

```
    get_hash(handle)
```

Returns the associated hash for the given handle, the hash file must exist (handle + '.hash').

**Parameters** **handle** (*str*) – Path to the template to get the hash from

**Returns** Hash for the given handle

**Return type** *str*

```
    get_metadata(handle)
```

Returns the associated metadata info for the given handle, the metadata file must exist (handle + '.metadata').

**Parameters** **handle** (*str*) – Path to the template to get the metadata from

**Returns** Metadata for the given handle

**Return type** *dict*

```
class lago.templates.HttpTemplateProvider(baseurl)
```

This provider allows the usage of http urls for templates

**download\_image** (*handle*, *dest*)

Downloads the image from the http server

**Parameters**

- **handle** (*str*) – url from the *self.baseurl* to the remote template
- **dest** (*str*) – Path to store the downloaded url to, must be a file path

**Returns** None

**static extract\_if\_needed** (*path*)

**get\_hash** (*handle*)

Get the associated hash for the given handle, the hash file must exist (*handle* + ' .hash').

**Parameters** **handle** (*str*) – Path to the template to get the hash from

**Returns** Hash for the given handle

**Return type** *str*

**get\_metadata** (*handle*)

Returns the associated metadata info for the given handle, the metadata file must exist (*handle* + ' .metadata'). If the given handle has an .xz extension, it will get removed when calculating the handle metadata path

**Parameters** **handle** (*str*) – Path to the template to get the metadata from

**Returns** Metadata for the given handle

**Return type** *dict*

**open\_url** (*url*, *suffix*='', *dest*=None)

Opens the given url, trying the compressed version first. The compressed version url is generated adding the .xz extension to the *url* and adding the given suffix **after** that .xz extension. If *dest* passed, it will download the data to that path if able

**Parameters**

- **url** (*str*) – relative url from the *self.baseurl* to retrieve
- **suffix** (*str*) – optional suffix to append to the url after adding the compressed extension to the path
- **dest** (*str* or *None*) – Path to save the data to

**Returns** response object to read from (lazy read), closed if no *dest* passed

**Return type** *urllib.addinfourl*

**Raises** *RuntimeError* – if the url gave http error when retrieving it

**class** *lago.templates.Template* (*name*, *versions*)

Disk image template class

**name**

*str*

Name of this template

**\_versions** (*dict* (*str*

*TemplateVersion*)): versions for this template

**get\_latest\_version** ()

Retrieves the latest version for this template, the latest being the one with the newest timestamp

**Returns** `TemplateVersion`

**get\_version** (*ver\_name=None*)

Get the given version for this template, or the latest

**Parameters** **ver\_name** (*str* or *None*) – Version to retrieve, *None* for the latest

**Returns** The version matching the given name or the latest one

**Return type** *TemplateVersion*

**class** `lago.templates.TemplateRepository` (*dom*)

A template repository is a single source for templates, that uses different providers to actually retrieve them. That means for example that the ‘ovirt’ template repository, could support the ‘http’ and a theoretical ‘gluster’ template providers.

**\_dom**

*dict*

Specification of the template

**\_providers**

*dict*

Providers instances for any source in the spec

**\_get\_provider** (*spec*)

Get the provider for the given template spec

**Parameters** **spec** (*dict*) – Template spec

**Returns** A provider instance for that spec

**Return type** `HttpTemplateProvider` or `FileSystemTemplateProvider`

**classmethod** **from\_url** (*path*)

Instantiate a *TemplateRepository* instance from the data in a file or url

**Parameters** **path** (*str*) – Path or url to the json file to load

**Returns** A new instance

**Return type** *TemplateRepository*

**get\_by\_name** (*name*)

Retrieve a template by its name

**Parameters** **name** (*str*) – Name of the template to retrieve

**Raises** `KeyError` – if no template is found

**name**

Getter for the template repo name

**Returns** the name of this template repo

**Return type** *str*

**class** `lago.templates.TemplateStore` (*path*)

Local cache to store templates

The store uses various files to keep track of the templates cached, access and versions. An example template store looks like:



```
$ tree /var/lib/lago/store/
/var/lib/lago/store/
-- in_office_repo:centos6_engine:v2.tmp
-- in_office_repo:centos7_engine:v5.tmp
-- in_office_repo:fedora22_host:v2.tmp
-- phx_repo:centos6_engine:v2
-- phx_repo:centos6_engine:v2.hash
-- phx_repo:centos6_engine:v2.metadata
-- phx_repo:centos6_engine:v2.users
-- phx_repo:centos7_engine:v4.tmp
-- phx_repo:centos7_host:v4.tmp
-- phx_repo:storage-nfs:v1.tmp
```

There you can see the files:

- **\*.tmp** Temporary file created while downloading the template from the repository (depends on the provider)
- **\${repo\_name}:\${template\_name}:\${template\_version}** This file is the actual disk image template
- **\*.hash** Cached hash for the template disk image
- **\*.metadata** Metadata for this template image in json format, usually this includes the *distro* and *root-password*

**\_\_contains\_\_** (*temp\_ver*)

Checks if a given version is in this store

**Parameters** **temp\_ver** (*TemplateVersion*) – Version to look for

**Returns** `True` if the version is in this store

**Return type** `bool`

**\_init\_users** (*temp\_ver*)

Initializes the user access registry

**Parameters** **temp\_ver** (*TemplateVersion*) – template version to update registry for

**Returns** `None`

**\_prefixed** (*\*path*)

Join the given paths and prepend this stores path

**Parameters** **\*path** (*str*) – list of paths to join, as positional arguments

**Returns** all the paths joined and prepended with the store path

**Return type** `str`

**download** (*temp\_ver, store\_metadata=True*)

Retrieve the given template version

**Parameters**

- **temp\_ver** (*TemplateVersion*) – template version to retrieve
- **store\_metadata** (*bool*) – If set to `False`, will not refresh the local metadata with the retrieved one

**Returns** `None`

**get\_path** (*temp\_ver*)

Get the path of the given version in this store

**Parameters** **TemplateVersion** (*temp\_ver*) – version to look for

**Returns** The path to the template version inside the store

**Return type** `str`

**Raises** `RuntimeError` – if the template is not in the store

**get\_stored\_hash** (*temp\_ver*)

Retrieves the hash for the given template version from the store

**Parameters** **temp\_ver** (`TemplateVersion`) – template version to retrieve the hash for

**Returns** hash of the given template version

**Return type** `str`

**get\_stored\_metadata** (*temp\_ver*)

Retrieves the metadata for the given template version from the store

**Parameters** **temp\_ver** (`TemplateVersion`) – template version to retrieve the metadata for

**Returns** the metadata of the given template version

**Return type** `dict`

**mark\_used** (*temp\_ver*, *key\_path*)

Adds or updates the user entry in the user access log for the given template version

**Parameters**

- **temp\_ver** (`TemplateVersion`) – template version to add the entry for
- **key\_path** (`str`) – Path to the prefix uuid file to set the mark for

**class** `lago.templates.TemplateVersion` (*name*, *source*, *handle*, *timestamp*)

Each template can have multiple versions, each of those is actually a different disk template file representation, under the same base name.

**download** (*destination*)

Retrieves this template to the destination file

**Parameters** **destination** (`str`) – file path to write this template to

**Returns** `None`

**get\_hash** ()

Returns the associated hash for this template version

**Returns** Hash for this version

**Return type** `str`

**get\_metadata** ()

Returns the associated metadata info for this template version

**Returns** Metadata for this version

**Return type** `dict`

**timestamp** ()

Getter for the timestamp

`lago.templates._locked` (*func*)

Decorator that ensures that the decorated function has the lock of the repo while running, meant to decorate only bound functions for classes that have `lock_path` method.

`lago.templates.find_repo_by_name(name, repo_dir=None)`

Searches the given repo name inside the repo\_dir (will use the config value 'template\_repos' if no repo dir passed), will rise an exception if not found

**Parameters**

- **name** (*str*) – Name of the repo to search
- **repo\_dir** (*str*) – Directory where to search the repo

**Returns** path to the repo

**Return type** *str*

**Raises** `RuntimeError` – if not found

## 4.1.15 lago.utils module

**class** `lago.utils.CommandStatus`

Bases: `lago.utils.CommandStatus`

**class** `lago.utils.EggTimer(timeout)`

**elapsed()**

**class** `lago.utils.RollbackContext(*args)`

Bases: `object`

A context manager for recording and playing rollback. The first exception will be remembered and re-raised after rollback

Sample usage: > with RollbackContext() as rollback: > step1() > rollback.prependDefer(lambda: undo step1) > def undoStep2(arg): pass > step2() > rollback.prependDefer(undoStep2, arg)

More examples see tests/utilsTests.py @ vdsms code

**\_\_exit\_\_** (*exc\_type, exc\_value, traceback*)

If this function doesn't return True (or raises a different exception), python re-raises the original exception once this function is finished.

**clear()**

**defer** (*func, \*args, \*\*kwargs*)

**prependDefer** (*func, \*args, \*\*kwargs*)

**class** `lago.utils.VectorThread(targets)`

**join\_all** (*raise\_exceptions=True*)

**start\_all()**

`lago.utils._CommandStatus`

alias of `CommandStatus`

`lago.utils._read_nonblocking(f)`

`lago.utils._ret_via_queue(func, queue)`

`lago.utils._run_command(command, input_data=None, stdin=None, out_pipe=-1, err_pipe=-1, env=None, **kwargs)`

Runs a command

**Parameters**

- **command** (*list of str*) – args of the command to execute, including the command itself as `command[0]` as `['ls', '-l']`
- **input\_data** (*str*) – If passed, will feed that data to the subprocess through stdin
- **out\_pipe** (*int or file*) – File descriptor as passed to :ref:subprocess.Popen to use as stdout
- **stdin** (*int or file*) – File descriptor as passed to :ref:subprocess.Popen to use as stdin
- **err\_pipe** (*int or file*) – File descriptor as passed to :ref:subprocess.Popen to use as stderr
- **of str** (*env(dict)* – *str*): If set, will use the given dict as env for the subprocess
- **\*\*kwargs** – Any other keyword args passed will be passed to the :ref:subprocess.Popen call

**Returns** result of the interactive execution

**Return type** *lago.utils.CommandStatus*

`lago.utils.deepcopy` (*original\_obj*)

Creates a deep copy of an object with no crossed referenced lists or dicts, useful when loading from yaml as anchors generate those cross-referenced dicts and lists

**Parameters** **original\_obj** (*object*) – Object to deep copy

**Returns** deep copy of the object

**Return type** *object*

`lago.utils.drain_ssh_channel` (*chan, stdin=None, stdout=<open file '<stdout>', mode 'w'>, stderr=<open file '<stderr>', mode 'w'>*)

`lago.utils.func_vector` (*target, args\_sequence*)

`lago.utils.in_prefix` (*prefix\_class, workdir\_class*)

`lago.utils.interactive_ssh_channel` (*chan, command=None, stdin=<open file '<stdin>', mode 'r'>*)

`lago.utils.invoke_in_parallel` (*func, \*args\_sequences*)

`lago.utils.json_dump` (*obj, f*)

`lago.utils.load_virt_stream` (*virt\_fd*)

Loads the given conf stream into a dict, trying different formats if needed

**Parameters** **virt\_fd** (*str*) – file like object with the virt config to load

**Returns** Loaded virt config

**Return type** *dict*

`lago.utils.run_command` (*command, input\_data=None, out\_pipe=-1, err\_pipe=-1, env=None, \*\*kwargs*)

Runs a command non-interactively

**Parameters**

- **command** (*list of str*) – args of the command to execute, including the command itself as `command[0]` as `['ls', '-l']`
- **input\_data** (*str*) – If passed, will feed that data to the subprocess through stdin

- **out\_pipe** (*int or file*) – File descriptor as passed to :ref:subprocess.Popen to use as stdout
- **err\_pipe** (*int or file*) – File descriptor as passed to :ref:subprocess.Popen to use as stderr
- **of\_str** (*env(dict) – str*): If set, will use the given dict as env for the subprocess
- **\*\*kwargs** – Any other keyword args passed will be passed to the :ref:subprocess.Popen call

**Returns** result of the interactive execution

**Return type** *lago.utils.CommandStatus*

`lago.utils.run_interactive_command(command, env=None, **kwargs)`

Runs a command interactively, reusing the current stdin, stdout and stderr

**Parameters**

- **command** (*list of str*) – args of the command to execute, including the command itself as command[0] as ['ls', '-l']
- **of\_str** (*env(dict) – str*): If set, will use the given dict as env for the subprocess
- **\*\*kwargs** – Any other keyword args passed will be passed to the :ref:subprocess.Popen call

**Returns** result of the interactive execution

**Return type** *lago.utils.CommandStatus*

`lago.utils.service_is_enabled(name)`

`lago.utils.with_logging(func)`

#### 4.1.16 lago.virt module

**class** `lago.virt.BridgeNetwork(env, spec)`

Bases: *lago.virt.Network*

`_libvirt_xml()`

`start()`

`stop()`

`lago.virt.LIBVIRT_URL = 'qemu:///system'`

Url to the libvirt daemon

**class** `lago.virt.NATNetwork(env, spec)`

Bases: *lago.virt.Network*

`_libvirt_xml()`

**class** `lago.virt.Network(env, spec)`

Bases: *object*

`_libvirt_name()`

`add_mapping(name, ip, save=True)`

`add_mappings(mappings)`

`alive()`

```
    gw()
    is_management()
    name()
    resolve(name)
    save()
    start()
    stop()
class lago.virt.ServiceState

    ACTIVE = 2
    INACTIVE = 1
    MISSING = 0
class lago.virt.VM(env, spec)
    Bases: object
    VM properties: * name * cpus * memory * disks * metadata * network/mac addr
    _check_alive(func)
    _create_dead_snapshot(name)
    _create_live_snapshot(name)
    _detect_service_manager()
    _get_ssh_client(*args, **kwargs)
    _libvirt_name()
    _libvirt_xml()
    classmethod _normalize_spec(spec)
    _open_ssh_client()
    _reclaim_disk(path)
    _reclaim_disks()
    _scp(*args, **kws)
    _template_metadata()
    alive()
    bootstrap()
    copy_from(remote_path, local_path)
    copy_to(local_path, remote_path)
    create_snapshot(name)
    distro()
    extract_paths(paths)
    guest_agent()
```

**interactive\_console** (\*args, \*\*kwargs)

Opens an interactive console

**Returns** result of the virsh command execution

**Return type** *lago.utils.CommandStatus*

**interactive\_ssh** (\*args, \*\*kwargs)

**ip** ()

**iscsi\_name** ()

**metadata**

**name** ()

**nets** ()

**nics** ()

**revert\_snapshot** (name)

**root\_password** ()

**save** (path=None)

**service** (\*args, \*\*kwargs)

**ssh** (command, data=None, show\_output=True)

**ssh\_script** (path, show\_output=True)

**start** ()

**state** ()

Return a small description of the current status of the domain

**Returns** small description of the domain status, 'down' if it's not defined at all.

**Return type** *str*

**stop** ()

**virt\_env** ()

**vnc\_port** (\*args, \*\*kwargs)

**wait\_for\_ssh** ()

**class** *lago.virt.VirtEnv* (prefix, vm\_specs, net\_specs)

Bases: *object*

Env properties: \* prefix \* vms \* net

•libvirt\_con

**\_create\_net** (net\_spec)

**\_create\_vm** (vm\_spec)

**bootstrap** ()

**create\_snapshots** (\*args, \*\*kwargs)

**classmethod from\_prefix** (prefix)

**get\_net** (name=None)

**get\_nets** ()

**get\_snapshots** (*domains=None*)

Get the list of snapshots for each domain

**Parameters**

- **domains** (*list of str*) – list of the domains to get the snapshots
- **all will be returned if none or empty list passed** (*for*,) –

**Returns** dict of str -> list – with the domain names and the list of snapshots for each

**Return type** str

**get\_vm** (*name*)

**get\_vms** ()

**libvirt\_con**

**prefixed\_name** (*unprefixed\_name, max\_length=0*)

Returns a uuid prefixed identifier

**Parameters**

- **unprefixed\_name** (*str*) – Name to add a prefix to
- **max\_length** (*int*) – maximum length of the resultant prefixed name, will adapt the given name and the length of the uuid to fit it

**Returns** prefixed identifier for the given unprefixed name

**Return type** str

**revert\_snapshots** (*\*args, \*\*kwargs*)

**save** (*\*args, \*\*kwargs*)

**start** (*vm\_names=None*)

**stop** (*vm\_names=None*)

**virt\_path** (*\*args*)

**class** lago.virt.\_Service (*vm, name*)

**alive** ()

**exists** ()

**classmethod** **is\_supported** (*vm*)

**start** ()

**stop** ()

**class** lago.virt.\_SysVInitService (*vm, name*)

Bases: *lago.virt.\_Service*

**BIN\_PATH** = '/sbin/service'

**\_request\_start** ()

**\_request\_stop** ()

**state** ()

**class** lago.virt.\_SystemdContainerService (*vm, name*)

Bases: *lago.virt.\_Service*



```

    BIN_PATH = '/usr/bin/docker'
    HOST_BIN_PATH = '/usr/bin/systemctl'
    _request_start()
    _request_stop()
    state()

class lago.virt._SystemdService(vm, name)
    Bases: lago.virt._Service
    BIN_PATH = '/usr/bin/systemctl'
    _request_start()
    _request_stop()
    state()

lago.virt._gen_ssh_command_id()
lago.virt._guestfs_copy_path(g, guest_path, host_path)
lago.virt._ip_to_mac(ip)
lago.virt._path_to_xml(basename)

```

#### 4.1.17 lago.workdir module

A workdir is the base directory where lago will store all the files it needs and that are unique (not shared between workdirs).

It's basic structure is a directory with one soft link and multiple directories, one per prefix. Where the link points to the default prefix to use.

```

exception lago.workdir.MalformedWorkdir
    Bases: lago.workdir.WorkdirError

exception lago.workdir.PrefixAlreadyExists
    Bases: lago.workdir.WorkdirError

exception lago.workdir.PrefixNotFound
    Bases: lago.workdir.WorkdirError

class lago.workdir.Workdir(path, prefix_class=<class 'lago.prefix.Prefix'>)
    Bases: object

```

This class represents a base workdir, where you can store multiple prefixes

**Properties:** path(str): Path to the workdir prefixes(dict of str->self.prefix\_class): dict with the prefixes in the workdir, by name current(str): Name of the current prefix prefix\_class(type): Class to use when creating prefixes

```

_set_current(new_current)
    Change the current default prefix, for internal usage

    Parameters new_current (str) – Name of the new current prefix, it must already exist

    Returns None

    Raises PrefixNotFound – if the given prefix name does not exist in the workdir

_update_current()
    Makes sure that a current is set

```

**add\_prefix** (*workdir*, \*args, \*\*kwargs)

Adds a new prefix to the workdir.

**Parameters**

- **name** (*str*) – Name of the new prefix to add
- **\*args** – args to pass along to the prefix constructor
- **\*kwargs** – kwargs to pass along to the prefix constructor

**Returns** The newly created prefix

**Raises** *PrefixAlreadyExists* – if the prefix name already exists in the workdir

**destroy** (*workdir*, \*args, \*\*kwargs)

Destroy all the given prefixes and remove any left files if no more prefixes are left

**Parameters**

- **prefix\_names** (*list of str*) – list of prefix names to destroy, if None
- **passed** (*default*) –

**get\_prefix** (*workdir*, \*args, \*\*kwargs)

Retrieve a prefix, resolving the current one if needed

**Parameters** **name** (*str*) – name of the prefix to retrieve, or current to get the current one

**Returns** instance of the prefix with the given name

**Return type** self.prefix\_class

**initialize** (*prefix\_name='default'*, \*args, \*\*kwargs)

Initializes a workdir by adding a new prefix to the workdir.

**Parameters**

- **prefix\_name** (*str*) – Name of the new prefix to add
- **\*args** – args to pass along to the prefix constructor
- **\*kwargs** – kwargs to pass along to the prefix constructor

**Returns** The newly created prefix

**Raises** *PrefixAlreadyExists* – if the prefix name already exists in the workdir

**classmethod is\_workdir** (*path*)

Check if the given path is a workdir

**Parameters** **path** (*str*) – Path to check

**Returns** True if the given path is a workdir

**Return type** bool

**join** (\*args)

Gets a joined path prefixed with the workdir path

**Parameters** **\*args** (*str*) – path sections to join

**Returns** Joined path prefixed with the workdir path

**Return type** str

**load** ()

Loads the prefixes that are available is the workdir

**Returns** None

**Raises** *MalformedWorkdir* – if the wordir is malformed

**classmethod** `resolve_workdir_path` (*start\_path*='.')

Look for an existing workdir in the given path, in a path/.lago dir, or in a .lago dir under any of it's parent directories

**Parameters** `start_path` (*str*) – path to start the search from, if None passed, it will use the current dir

**Returns** path to the found prefix

**Return type** *str*

**Raises** *RuntimeError* – if no prefix was found

**set\_current** (*workdir*, \**args*, \*\**kwargs*)

Change the current default prefix

**Parameters** `new_current` (*str*) – Name of the new current prefix, it must already exist

**Returns** None

**Raises** *PrefixNotFound* – if the given prefix name does not exist in the workdir

**exception** `lago.workdir.WorkdirError`

Bases: `exceptions.RuntimeError`

Base exception for workdir errors, catch this one to catch any workdir error

`lago.workdir.workdir_loaded` (*func*)

Decorator to make sure that the workdir is loaded when calling the decorated function

## 4.2 lago\_template\_repo package

**class** `lago_template_repo.TemplateRepoCLI`

Bases: `lago.plugins.cli.CLIPugin`

`_abc_cache` = <\_weakrefset.WeakSet object>

`_abc_negative_cache` = <\_weakrefset.WeakSet object>

`_abc_negative_cache_version` = 25

`_abc_registry` = <\_weakrefset.WeakSet object>

`do_run` (*args*)

`init_args` = {'help': 'Utility for system testing template management'}

`populate_parser` (*parser*)

**class** `lago_template_repo.Verbs`

`ADD` = 'add'

`UPDATE` = 'update'

`lago_template_repo.do_add` (*args*)

`lago_template_repo.do_update` (*args*)

## 4.3 ovirtlago package

### 4.3.1 Submodules

### 4.3.2 ovirtlago.cmd module

### 4.3.3 ovirtlago.constants module

### 4.3.4 ovirtlago.merge\_repos module

### 4.3.5 ovirtlago.paths module

### 4.3.6 ovirtlago.repoverify module

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### 4.3.8 ovirtlago.utils module

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