
clg Documentation

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This module is a wrapper to the `argparse` module. It aims to generate a custom and advanced command-line by defining the configuration in a formatted dictionary. It is easy to export Python dictionaries to files (like YAML or JSON) so the idea is to outsource the command-line definition to a file instead of writing dozens or hundreds lines of code.

Almost everything possible with `argparse` can be done with this module. This include:

- parsers with both `options`, `arguments` and `subparsers`,
- no limit for the arborescence of subparsers,
- use of `groups` and `exclusive groups`,
- use of `builtins`,
- use of `custom types`,
- ...

There's also additionnals features that have been implemented like post checking the arguments (dependencies between arguments, checking the value of an argument match a pattern, ...), the possibilty to pass arguments to a function of a python file or module, paging help, ...

1.1 Installation and usage

1.1.1 Installation

This module is tested with python3.4 through python 3.10 (it should work for any python3 version). It is on [PyPi](#) so you can use the `pip` command for installing it. If you use YAML for your configuration file, you need to install the `pyyaml` module too. `json` module is a standard module since python2.7.

Note: When printing the help message, keeping the order of options/arguments /commands may be wanted. `json` module has a parameter (`object_pairs_hook`) for keeping the order of keys when loading a file. For YAML, it is possible to use the module [yamlordereddictloader](#) which provide a `Loader` allowing to keep order.

So, for installing it in a virtualenv with the use of an ordered YAML file:

```
$ virtualenv --env myenv --prompt '(myprog) '  
$ . ./myenv/bin/activate  
(myprog)$ pip install clg pyyaml yamlordereddictloader
```

Otherwise sources are on [github](#)

1.1.2 Usage

The main program is very simple. You need to import the necessities modules (`clg` and the modules for loading the configuration from a file). Then, you initialize the `CommandLine` object with the dictionary containing the configuration. Finally, like `argparse` module, you call the `parse` method for parsing the command-line.

The `parse` method returns in all case the arguments of the command-line but, if there is an `execute` section for the command, this will be executed first. The arguments are returned in a `Namespace` object inheriting from `argparse Namespace` object but with additional methods for making it iterable and allowing to access arguments with both attributes and list syntax.

With YAML

Configuration file:

```
options:
  foo:
    short: f
    help: Foo help.
  bar:
    short: b
    help: Bar help.
```

Python program:

```
import clg
import yaml
import yamlordereddictloader

cmd_conf = yaml.load(open('cmd.yml'), Loader=yamlordereddictloader.Loader)
cmd = clg.CommandLine(cmd_conf)
args = cmd.parse()

# From here, we treat the arguments.
print("Namespace object: %s" % args)
print("Namespace attributes: %s" % vars(args))
print("Iter arguments:")
for arg, value in args:
    print("  %s: %s" % (arg, value))
print("Access 'foo' option with attribute syntax: %s" % args.foo)
print("Access 'foo' option with list syntax: %s" % args['foo'])
```

Execution:

```
$ python prog.py --help
usage: prog.py [-h] [-f FOO] [-b BAR]

optional arguments:
  -h, --help            show this help message and exit
  -f FOO, --foo FOO     Foo help.
  -b BAR, --bar BAR     Bar help

$ python prog.py -f foo -b bar
Print Namespace object: Namespace(bar='bar', foo='foo')
Print Namespace attributes: {'foo': 'foo', 'bar': 'bar'}
Iter arguments:
  foo: foo
  bar: bar
Access 'foo' option with attribute syntax: foo
Access 'foo' option with list syntax: foo
```

With JSON

Configuration file:

```
{"options": {"foo": {"short": "f",
                    "help": "Foo help."},
```

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```
"bar": {"short": "b",
        "help": "Bar help."}}
```

Python program:

```
import clg
import json
from collections import OrderedDict

cmd_conf = json.load(open('cmd.json'), object_pairs_hook=OrderedDict)
cmd = clg.CommandLine(cmd_conf)
args = cmd.parse()
```

1.1.3 Completion

For completion (Bash and Zsh), there's the great project [argcomplete](#). It provides an extensible command-line tab completion for programs based on `argparse`.

The usage with `clg` looks like this:

```
import clg
import yaml
import yamllordereddictloader
import argcomplete

cmd_conf = yaml.load(open('cmd.yml'), Loader=yamllordereddictloader.Loader)
cmd = clg.CommandLine(cmd_conf)
argcomplete.autocomplete(cmd.parser)
args = cmd.parse()
```

1.2 Configuration

The configuration of the command-line is done with a dictionary that recursively defines commands. Each command is a mix of keywords from `argparse` and this module. Keywords for a command are:

- `prog` (`argparse`)
- `usage` (`argparse`)
- `description` (`argparse`)
- `epilog` (`argparse`)
- `formatter_class` (`argparse`)
- `argument_default` (`argparse`)
- `conflict_handler` (`argparse`)
- `add_help` (`argparse`)
- `page_help` (`clg`)
- `print_help` (`clg`)
- `add_help_cmd` (`clg`)
- `allow_abbrev` (`clg`)

- `negative_value (clg)`
- `anchors (clg)`
- `options (clg)`
- `args (clg)`
- `groups (clg)`
- `exclusive_groups (clg)`
- `subparsers (clg)`
- `execute (clg)`

1.2.1 prog

argparse link: <https://docs.python.org/dev/library/argparse.html#prog>

Set the name of the program (default: `sys.argv[0]`).

1.2.2 usage

argparse link: <https://docs.python.org/dev/library/argparse.html#usage>

The string describing the program usage (default: generated from arguments added to parser).

1.2.3 description

argparse link: <https://docs.python.org/dev/library/argparse.html#description>

Text to display before the argument help (default: none).

1.2.4 epilog

argparse link: <https://docs.python.org/dev/library/argparse.html#epilog>

Text to display after the argument help (default: none).

1.2.5 formatter_class

argparse link: <https://docs.python.org/dev/library/argparse.html#formatter-class>

A class for customizing the help output. It takes the name of one of the class defining in `argparse`:

```
formatter_class: RawTextHelpFormatter
```

1.2.6 argument_default

argparse link: <https://docs.python.org/dev/library/argparse.html#argument-default>

The global default value for arguments (default: *None*).

1.2.7 conflict_handler

argparse link: <https://docs.python.org/dev/library/argparse.html#conflict-handler>

The strategy for resolving conflicting optionals (usually unnecessary).

1.2.8 add_help

argparse link: <https://docs.python.org/dev/library/argparse.html#add-help>

Add a `-h/-help` option to the parser (default: *True*) that allows to print the help. You may need to have a better control on this option (for putting the option in a group, customizing the help message, removing the short option, ...). You can manually set this option by using theses values:

```
options:
    help:
        short: h
        action: help
        default: __SUPPRESS__
        help: My help message.
    ...
```

1.2.9 page_help

Boolean, that can only be set at the root of the configuration, indicating whether to page the help of commands (default: *False*). This is done by using the `pydoc.pager` method and by forcing the `$PAGER` environment variable to the `less -c` command.

1.2.10 print_help

Boolean that force the use of the `--help` option if no arguments are supplied for a (sub)command (default: *False*).

1.2.11 add_help_cmd

Add a `help` subcommand at the root of the parser that print the arborsence of commands with their description.

The command has a `--page` option allowing to page the output of the command (using `less -c` command).

1.2.12 allow_abbrev

Boolean indicating whether `abbreviations` are allowed (default: *False*).

Note: The default behavior of `argparse` is to allow abbreviation but `clg` module disable this “feature” by default.

1.2.13 negative_value

Regular expression indicating how to match negatives values.

To distinguish negatives values from options, `argparse` module use a regular expression (`^-d+$|^-d*.d+$` by default). This option allows to redefine, at a (sub)parser level, the regular expression used for matching negatives values.

For example, I had the problem in a script for managing backup's selections of a host. I wanted an option `--paths` to specify both (absolute) paths to add (by prefixing them by a '+') and to remove (by prefixing them by a '-'). For managing this, I just redefine the parameter `negative_value` for matching absolutes paths prefixed by a dash (I kept the parts for matching integers and floats):

YAML configuration:

```
negative_value: '^-\d+$|^-\d*\.\d+$|^-/.*$'
options:
  paths:
    nargs: '+'
    help: >
      Paths to add/remove for the host. Add paths by prefixing them
      by a '+' and remove path by prefixing them by a '-'.
args:
  host:
    help: Manage selection for this host.
```

Execution:

```
$ python selections.py myhost --paths +/etc -/tmp
Namespace(host='myhost', paths=['+/etc', '-/tmp'])
```

1.2.14 anchors

This section has been created for YAML files. You can defined any structure in here (like common options between commands) and use it anywhere through YAML anchors.

1.2.15 options

This section defines the options of the current command. It is a dictionnary whose keys are the name of the option and values a hash with the configuration of the option. In `argparse` module, `dest` keyword defines the keys in the resulted `Namespace`. It is not possible to overload this parameter as the name of the option in the configuration is used as destination.

Keywords:

- `short` (`clg`)
- `completer` (`clg`)
- `help` (`argparse`)
- `required` (`argparse`)
- `default` (`argparse`)
- `choices` (`argparse`)
- `action` (`argparse`)
- `version` (`argparse`)
- `nargs` (`argparse`)

- `const (argparse)`
- `metavar (argparse)`
- `type (argparse)`
- `need (clg)`
- `conflict (clg)`
- `match (clg)`

Note: Options with underscores and spaces in the configuration are replaced by dashes in the command (but not in the resulted Namespace). For example, an option `my_opt` in the configuration will be rendered as `--my-opt` in the command.

Some options (like `default`, `const`, ...) can use builtins values. For managing it, a special syntax is used: the builtin can be defined in uppercase, prefixed and sufixed by double underscores (`__BUILTIN__`). For example:

```
options:
  sum:
    action: store_const
    const: __SUM__
    default: __MAX__
    help: "sum the integers (default: find the max)"
```

In the same way, there are specials “builtins”:

- `__DEFAULT__`: this is replaced in the help message by the value of the `default` parameter.
- `__MATCH__`: this is replaced in the help message by the value of the `match` parameter.
- `__CHOICES__`: this is replace in the help message by the value of the `choices` parameter (choices are separated by commas).
- `__FILE__`: this “builtin” is replaced by the path of the main program (`sys.path[0]`). This allow to define file relatively to the main program (ex: `__FILE__/conf/someconf.yml`, `__FILE__/logs/`).
- `__SUPPRESS__`: identical to `argparse.SUPPRESS` (no attribute is added to the resulted Namespace if the command-line argument is not present).

short

This section must contain a single letter defining the short name (beginning with a single dash) of the current option.

completer

This parameters allows to use `argcomplete completers` for improving completion. Theses completers must be previously added to the `COMPLETERS` variable of the module.

For example, the `argcomplete` example for retrieving github members looks like this:

```
import clg
import requests
import argcomplete
from pprint import pprint

CMD = {'options':
```

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```

    {
        'organization': {'help': 'Github organization'},
        'member': {
            'help': 'Github member',
            'completer': 'github_org_members'
        }
    }
}

def github_org_members(prefix, parsed_args, **kwargs):
    resource = "https://api.github.com/orgs/{org}/members".format(org=parsed_args.
↪organization)
    return (member['login']
            for member in requests.get(resource).json()
            if member['login'].startswith(prefix))
clg.COMPLETERS.update(github_org_members=github_org_members)

cmd = clg.CommandLine(CMD)
argcomplete.autocomplete(cmd.parser)
args = cmd.parse()

pprint(requests.get("https://api.github.com/users/{m}".format(m=args.member)).json())

```

help

argparse link: <https://docs.python.org/dev/library/argparse.html#help>

A brief description of what the argument does.

required

argparse link: <https://docs.python.org/dev/library/argparse.html#required>

Whether or not the command-line option may be omitted.

type

argparse link: <https://docs.python.org/dev/library/argparse.html#type>

The type to which the command-line argument should be converted. As this is necessarily a builtin, this is not necessary to use the `__BULTIN__` syntax.

In some case, you may need to create custom types. For this, you just have to add your new type to the `TYPES` variable of the `clg` module. A type is just a function that takes the value of the option in parameter and returns what you want. For example, to add a custom `Date` type based on french date format (DD/MM/YYYY) and returning a `datetime` object:

Python program:

```

import clg
import yaml

def Date(value):
    from datetime import datetime

```

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```

    try:
        return datetime.strptime(value, '%d/%m/%Y')
    except Exception as err:
        raise clg.argparse.ArgumentTypeError(err)
clg.TYPES['Date'] = Date

command = clg.CommandLine(yaml.load(open('cmd.yml')))
args = command.parse()

```

YAML configuration:

```

...
options:
  date:
    short: d
    type: Date
    help: Date.
...

```

default

argparse link: <https://docs.python.org/dev/library/argparse.html#default>

The value produced if the argument is absent from the command line.

choices

argparse link: <https://docs.python.org/dev/library/argparse.html#choices>

A container of the allowable values for the argument.

action

argparse link: <https://docs.python.org/dev/library/argparse.html#action>

The basic type of action to be taken when this argument is encountered at the command line.

As for the types, you may need to defined some custom actions. The end of the `action` section of the `argparse` documentation shows how to build a custom action. For using it with `clg` you need to add it to the `ACTIONS` variable of the module.

For example, to add an action that page help (using the `less -c` command):

Python program:

```

import os
import clg
import yaml
import pydoc
import argparse

class HelpPager(argparse.Action):
    """Action allow to page help."""
    def __init__(self, option_strings, dest=argparse.SUPPRESS, default=argparse.
↳ SUPPRESS, help=None):

```

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```
    argparse.Action.__init__(self, option_strings=option_strings, dest=dest,
↪ default=default, nargs=0, help=help)

    def __call__(self, parser, namespace, values, option_string=None):
        os.environ['PAGER'] = 'less -c'
        pydoc.pager(parser.format_help())
        parser.exit()
clg.ACTIONS.update(page_help=HelpPager)

command = clg.CommandLine(yaml.load(open('cmd.yml')))
args = command.parse()
```

YAML configuration:

```
...
options:
  help:
    short: h
    action: page_help
    default: __SUPPRESS__
    help: My help message.
...
```

Note: The `page_help` action is implemented and added by default in the `clg` module so you can use it without redefining it.

Note: `argparse.BooleanOptionalAction` is added by default in `clg` and adds support for boolean actions such as `--foo` and `--no-foo`. It can be activated with `action: BooleanOptionalAction`. Requires Python3.9 or greater.

version

When using the `version` action, this argument is expected. `version` action allows to print the version information and exits.

The `argparse` example look like this:

```
>>> import argparse
>>> parser = argparse.ArgumentParser(prog='PROG')
>>> parser.add_argument('--version', action='version', version='%(prog)s 2.0')
>>> parser.parse_args(['--version'])
PROG 2.0
```

And the `clg` equivalent in YAML is this:

```
options:
  version:
    action: version
    version: "%(prog)s 2.0"
```

Note: Like the `--help` option, a default help message is set. But, like any other option, you can define the help you want with the `help` keyword.

nargs

argparse link: <https://docs.python.org/dev/library/argparse.html#nargs>

The number of command-line arguments that should be consumed.

const

argparse link: <https://docs.python.org/dev/library/argparse.html#const>

Value in the resulted Namespace if the option is not set in the command-line (*None* by default).

metavar

argparse link: <https://docs.python.org/dev/library/argparse.html#metavar>

A name for the argument in usage messages.

need

List of options needed with the current option.

conflict

List of options that must not be used with the current option.

match

Regular expression that the option's value must match.

1.2.16 args

This section define arguments of the current command. It is identical as the *options* section except that the `short`, `action` and `version` keywords are not available.

1.2.17 groups

This section is a list of groups. Groups are essentially used for organizing options and arguments in the help message. Each *group* can have theses keywords:

- `title` (argparse)
- `description` (argparse)
- `options` (clg)
- `args` (clg)

- `exclusive_groups (clg)`

Note: All `argparse` examples set `add_help` to *False*. If this is set, the `help` option is put in *optional arguments*. If you want to put the `help` option in a group, you need to set the help option *manually*.

Note: Behaviour of groups have changed. The previous versions (*1.**) just references previously defined options. Now, this section act like a parser, and *options* and *arguments* sections defines options and arguments of the group. **This break compatibility with previous versions of this module.**

title

Customize the help with a title.

description

Customize the help with a description.

options

Options in the group. This section is identical to the `options` section.

args

Arguments in the groups. This section is identical to the `args` section.

exclusive groups (of a group)

Exclusive groups in the group. This section is identical to the `exclusive groups` section.

1.2.18 exclusive groups

This section is a list of `exclusive groups`. Each group can have theses keywords:

- `required (argparse)`
- `options (clg)`

required

Boolean indicating if at least one of the arguments is required.

options

List with the options of the group. This section is identical to the `options` section.

1.2.19 subparsers

argparse link: https://docs.python.org/dev/library/argparse.html#argparse.ArgumentParser.add_subparsers

This allows to add subcommands to the current command.

Keywords:

- `help` (argparse)
- `title` (argparse)
- `description` (argparse)
- `prog` (argparse)
- `help` (argparse)
- `metavar` (argparse)
- `parsers` (clg)
- `required` (clg)

Note: It is possible to directly set subcommands configurations (the content of the `parsers` parameter). The module check for the presence of the `parsers` parameter and, if it is not present, consider this is the subcommands configurations. This prevent the use of the extra keyword `parsers` if none of the other parameters need to be set).

Note: When using subparsers and for being able to retrieve configuration of the used (sub)command, `dest` argument of `argparse.ArgumentParser.add_subparsers` method is used. It adds in the resulted `Namespace` an entry which the key is `dest` value and the value the used subparser. `dest` value is generated from the `keyword` argument (default: `command`) of the `CommandLine` object, incremented at each level of the arborescence. For example:

```
$ python prog.py list users
Namespace(command0='list', command1='users')
```

title

Customize the help with a title.

description

Customize the help with a description.

prog

usage information that will be displayed with sub-command help, by default the name of the program and any positional arguments before the subparser argument

help

Help for subparser group in help output.

metavar

String presenting available sub-commands in help

parsers

This is a dictionary whose keys are the name of subcommands and values the configuration of the command. The configuration of a command is the same configuration of a parser (`options`, `args`, `groups`, `subparsers`, ...).

required

Indicate whether a subcommand is required (default: *True*).

1.2.20 execute

This section indicates what must be done after the command is parsed. It allows to import a file or a module and launch a function in it. This function takes only one argument which is the `Namespace` containing the arguments.

Keywords:

- `module`
- `file`
- `function`

Note: `module` and `file` keywords can't be used simultaneously.

file

Path of the python file to load. The `__FILE__` builtin to can be used to define the file relatively to the main program.

module

Module to load (ex: *package.subpackage.module*). This recursively loads all intermediary packages until the module. As the directory of the main program is automatically in `sys.path`, that allows to import modules relatively to the main program.

For example, the directory structure of your program could be like this:

.	
├─ prog.py	=> Main program intializing clg
├─ conf/cmd.yml	=> Command-line configuration
├─ commands/	=> commands package directory
│ └─ __init__.py	
│ └─ list	=> commands.list subpackage directory
│ └─ __init__.py	
│ └─ users.py	=> users module in commands.list subpackage

And the configuration syntax is:

```
subparsers:
  list:
    subparsers:
      users:
        execute:
          module: commands.list.users
```

This will execute the `main` function if the file `commands/list/users.py`.

function

This is the function in the loaded file or module that will be executed (default: `main`).

1.3 Examples

All these examples (and more) are available in the `examples` directory of the [github repository](#). All examples describe here use a YAML file.

1.3.1 First argparse example

This is the first [argparse example](#). This shows a simple command with an option, an argument and the use of builtins.

Python program:

```
import clg
import yaml

cmd = clg.CommandLine(yaml.load(open('builtins.yml')))
args = cmd.parse()
print(args.sum(args.integers))
```

Configuration file:

```
description: Process some integers.

options:
  sum:
    action: store_const
    const: __SUM__
    default: __MAX__
    help: "sum the integers (default: find the max)."
```

args:

```
  integers:
    metavar: N
    type: int
    nargs: +
    help: an integer for the accumulator
```

Executions:

```
# python builtins.py -h
usage: builtins.py [-h] [--sum] N [N ...]

Process some integers.

positional arguments:
  N          an integer for the accumulator

optional arguments:
  -h, --help  show this help message and exit
  --sum       sum the integers (default: find the max).

# python builtins.py 1 2 3 4
4

# python builtins.py 1 2 3 4 --sum
10
```

1.3.2 Subparsers example

This is the same example that [argparse subparsers documentation](#).

The python program initialize clg and prints arguments:

```
import clg
import yaml

cmd = clg.CommandLine(yaml.load(open('subparsers.yml')))
print(cmd.parse())
```

Without custom help

We begin by a simple configuration without personalizing subparsers help. subparsers section just contains the configuration of commands.

Configuration file:

```
prog: PROG

options:
  foo:
    action: store_true
    help: foo help

subparsers:
  a:
    help: a help
    options:
      bar:
        type: int
        help: bar help
  b:
    help: b help
    options:
      baz:
```

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```

    choices: XYZ
    help: baz help

```

Executions:

```

# python subparsers.py --help
usage: PROG [-h] [--foo] {a,b} ...

positional arguments:
  {a,b}
    a          a help
    b          b help

optional arguments:
  -h, --help  show this help message and exit
  --foo       foo help

# python subparsers.py a 12
Namespace(bar=12, command0='a', foo=False)

# python subparsers.py --foo b --baz Z
Namespace(baz='Z', command0='b', foo=True)

```

With custom help

Now we customize the help. The configuration of commands is put in the `parsers` section and other keywords are used for customizing help.

Configuration file:

```

prog: PROG

options:
  foo:
    action: store_true
    help: foo help

subparsers:
  title: subcommands
  description: valid subcommands
  help: additional help
  prog: SUBCOMMANDS
  metavar: "{METAVAR}"
  parsers:
    a:
      help: a help
      options:
        bar:
          type: int
          help: bar help
    b:
      help: b help
      options:
        baz:
          choices: XYZ
          help: baz help

```

Executions:

```
# python subparsers.py --help
usage: PROG [-h] [--foo] {METAVAR} ...

optional arguments:
  -h, --help  show this help message and exit
  --foo      foo help

subcommands:
  valid subcommands

  {METAVAR}  additional help
    a        a help
    b        b help

# python subparsers.py a --help
usage: SUBCOMMANDS a [-h] bar

positional arguments:
  bar                bar help

optional arguments:
  -h, --help  show this help message and exit
```

1.3.3 Groups example

This is the same example that [argparse groups documentation](#) .

Configuration file:

```
groups:
- title: group
  description: group description
  options:
    foo:
      help: foo help
  args:
    bar:
      help: bar help
      nargs: "?"
```

Execution:

```
# python groups.py --help
usage: groups.py [-h] [--foo FOO] [bar]

optional arguments:
  -h, --help  show this help message and exit

group:
  group description

  --foo FOO  foo help
  bar        bar help
```

1.3.4 Exclusive groups example

This is the same example that `argparse` `excludes groups` documentation .

Configuration file:

```
prog: PROG

exclusive_groups:
  - options:
      foo:
        action: store_true
      bar:
        action: store_false
```

Executions:

```
# python exclusive_groups.py --bar
Namespace(bar=False, foo=False)

# python exclusive_groups.py --foo
Namespace(bar=True, foo=True)

# python exclusive_groups.py --foo --bar
usage: PROG [-h] [--foo | --bar]
PROG: error: argument --bar: not allowed with argument --foo
```

1.3.5 Utility for managing KVM virtuals machines

This example is a program I made for managing KVM guests. Actually, there is only two commands for deploying or migrating guests. Each command use an external module for implementing the logic. A `main` function, taking the command-line `Namespace` as argument, has been implemented. For the example, theses functions will only `pprint` the command-line arguments.

This example use:

- YAML anchors
- subparsers, options, arguments, groups and exclusives groups
- custom types
- special “builtins”,
- the root ‘help’ command
- specific formatter class
- ...

Directory structure:

```
.
├── commands
│   ├── deploy.py
│   ├── __init__.py
│   └── migrate.py
├── kvm.py
└── kvm.yml
```

kvm.py:

```
import clg
import yaml
import yamllordereddictloader
from os import path

CMD_FILE = path.abspath(path.join(path.dirname(__file__), 'kvm.yml'))

# Add custom command-line types.
from commands.deploy import InterfaceType, DiskType, FormatType
clg.TYPES.update({'Interface': InterfaceType, 'Disk': DiskType, 'Format': FormatType})

def main():
    cmd = clg.CommandLine(yaml.load(open('kvm.yml'),
                                     Loader=yamllordereddictloader.Loader))

    cmd.parse()

if __name__ == '__main__':
    main()
```

commands/deploy.py

```
from pprint import pprint

SELF = sys.modules[__name__]
first_interface = True

def InterfaceType(value):
    """Custom type for '--interfaces' option with an ugly hack for knowing
    whether this is the first interface."""
    int_conf = dict(inet='static')
    if SELF.first_interface:
        nettype, source, address, netmask, gateway = value.split(',')
        SELF.first_interface = False
        int_conf.update(address=address, netmask=netmask, gateway=gateway)
    else:
        nettype, source, address, netmask = value.split(',')
        int_conf.update(address=address, netmask=netmask)
    return dict(kvm=dict(type=nettype, source=source), conf=int_conf)

def DiskType(value):
    """Custom type for '--disks' option."""
    value = value.split(',')
    suffix, size = value[:2]
    try:
        fmt = value[2]
        options = {opt: value
                    for elt in value[3:]
                    for opt, value in [elt.split('=')]}
    except IndexError:
        fmt, options = locals().get('fmt', 'qcow2'), {}

    return dict(suffix=suffix, size=size, format=fmt, options=options)

def FormatType(value):
    """Custom type for '--format' option."""
    value = value.split(',')
    fmt = value.pop(0)
```

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```

if fmt not in ('qcow2', 'raw'):
    import argparse
    raise argparse.ArgumentTypeError("format must either 'qcow2' or 'raw'")
options = {opt: opt_val for elt in value for opt, opt_val in [elt.split('=')]}
return dict(type=fmt, options=options)

def main(args):
    pprint(vars(args))

```

Configuration file:

```

add_help_cmd: True
allow_abbrev: False
description: Utility for managing KVM hosts.

anchors:
    main: &MAIN
    help:
        short: h
        action: help
        default: __SUPPRESS__
        help: Show this help message and exit.
    conf_file:
        help: 'Configuration file (default: __DEFAULT__).'
        default: __FILE__/conf/conf.yml
    logdir:
        help: 'Log directory (default: __DEFAULT__).'
        default: __FILE__/logs
    loglevel:
        choices: [verbose, debug, info, warn, error, none]
        default: info
        help: 'Log level on console (default: __DEFAULT__).'

subparsers:
    deploy:
        help: Deploy a new guest on an hypervisor based on a model.
        description: Deploy a new guest on an hypervisor based on a model.
        add_help: False
        formatter_class: RawTextHelpFormatter
        execute:
            module: commands.deploy

    groups:
        - title: Common options
          options: *MAIN
        - title: Optional options
          options:
            cores:
                short: c
                type: int
                default: 2
                help: |
                    Number of cores assigned to the guest (default:
                    __DEFAULT__).
            memory:
                short: m

```

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```

    type: float
    default: 2
    help: |
        Memory in Gb assigned to the guest (default: __DEFAULT__).
format:
    type: Format
    metavar: FORMAT,OPT1=VALUE,OPT2=VALUE,...
    help: |
        Format of the main image. Each format has options
        that can be specified, separated by commas. By default
        models use qcow2 images without options.
resize:
    type: int
    help: |
        Resize (in fact, only increase) the main disk image.
        For linux system, it will allocate the new size on the
        root LVM Volume Group. This option only work on KVM
        hypervisors which have a version of qemu >= 0.15.0.
disks:
    nargs: '+'
    type: Disk
    metavar: DISK
    help: |
        Add new disk(s). Format of DISK is:
        SUFFIX,SIZE[,FORMAT,OPT1=VAL, OPT2=VAL,...]
        Where:
        * SUFFIX is used for generating the filename of
          the image. The filename is: NAME-SUFFIX.FORMAT
        * SIZE is the size in Gb
        * FORMAT is the format of the image (default is
          'qcow2')
        * OPT=VAL are the options of the format
force:
    action: store_true
    help: |
        If a guest or some images already exists on the
        destination, configuration and disk images are
        automatically backedup, then overwritten, without
        confirmation.
no_check:
    action: store_true
    help: |
        Ignore checking of resources (use with cautions as
        overloading an hypervisor could lead to bad
        performance!).
no_autostart:
    action: store_true
    help: Don't set autostart for the new guest.
...
- title: Arguments
  args:
    name:
      help: Name of the new guest.
    dst_host:
      help: Hypervisor on which deploy the new guest.
  model:
    metavar: MODEL

```

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```

choices:
    - ubuntu-lucid
    - ubuntu-precise
    - ubuntu-trusty
    - redhat-5.8
    - redhat-6.3
    - centos-5
    - w2003
    - w2008r2
help: |
    Model on which the new guest is based. Choices are:
        * ubuntu-precise
        * ubuntu-trusty
        * redhat-5.8
        * redhat-6.3
        * centos-5
        * w2003
        * w2008-r2

interfaces:
nargs: '+'
type: Interface
metavar: INTERFACE
help: |
    Network configuration. This is a list of network
    interfaces configurations. Each interface
    configuration is a list of parameters separated by
    commas. Parameters are:
        * the network type ('network' (NAT) or 'bridge'),
        * the source (network name for 'network' type
          or vlan number for 'bridge' type),
        * the IP address,
        * the netmask,
        * the gateway (only for the first interface)
    For example, for deploying a guest with an interface
    in the public network and an interface in the storage
    network:
        * bridge,br903,130.79.200.1,255.255.254.0,130.79.201.254,
↪801
        * bridge,br896,172.30.0.1,255.255.254.0,896
        * network,default,192.168.122.2,255.255.255.0,192.168.122.
↪1

migrate:
description: >
    Move a guest to an other hypervisor. This command manage
    both cold and live migration.
help: Move a guest to an other hypervisor.
add_help: False
execute:
    module: commands.migrate
groups:
    - title: Common options
      options: *MAIN
    - title: Optional options
      options:
        no_check:
          action: store_true

```

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```

    help: >
        Don't check for valid resources in the destination
        hypervisor.
    force:
        action: store_true
        help:
            If a guest or some images already exists on the
            destination, configuration and disk images are
            automatically backedup, then overwritten, without
            confirmation.
    remove:
        short: r
        action: store_true
        help: Remove guest on source hypervisor after migration.
- title: Migration type (exclusive and required)
    exclusive_groups:
        - required: True
        options:
            cold:
                short: c
                action: store_true
                help: Cold migration.
            live:
                short: l
                action: store_true
                help: Live migration.
- title: Arguments
    args:
        src_host:
            help: Hypervisor source.
        name:
            help: Name of the guest.
        dst_host:
            help: Hypervisor destination.

```

Executions:

```

# python kvm.py
usage: kvm.py [-h] {help,deploy,migrate} ...
kvm.py: error: too few arguments

# python kvm.py help
  -help          Print commands' tree with theirs descriptions.
  -deploy        Deploy a new guest on an hypervisor based on a model.
  -migrate       Move a guest to an other hypervisor.

# python kvm.py deploy --help
usage: kvm.py deploy [-h] [--conf-file CONF_FILE] [--logdir LOGDIR]
                    [--loglevel {verbose,debug,info,warn,error,none}]
                    [-c CORES] [-m MEMORY]
                    [--format FORMAT,OPT1=VALUE,OPT2=VALUE,...]
                    [--resize RESIZE] [--disks DISK [DISK ...]] [--force]
                    [--no-check] [--no-autostart] [--no-chef] [--nbd NBD]
                    [--vgroot VGROOT] [--lvroot LVROOT] [-s SRC_HOST]
                    [--src-disks SRC_DISKS] [--dst-conf DST_CONF]
                    [--dst-disks DST_DISKS]
                    name dst_host MODEL INTERFACE [INTERFACE ...]

```

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Deploy a new guest on an hypervisor based on a model.

Common options:

```
-h, --help           Show this help message and exit.
--conf-file CONF_FILE
                     Configuration file (default: /home/francois/dev/python-clg/
→examples/kvm/conf/conf.yml).
--logdir LOGDIR      Log directory (default: /home/francois/dev/python-clg/
→examples/kvm/logs).
--loglevel {verbose,debug,info,warn,error,none}
                     Log level on console (default: info).
```

Optional options:

```
-c CORES, --cores CORES
                     Number of cores assigned to the guest (default:
                     2).
-m MEMORY, --memory MEMORY
                     Memory in Gb assigned to the guest (default: 2).
--format FORMAT,OPT1=VALUE,OPT2=VALUE,...
                     Format of the main image. Each format has options
                     that can be specified, separated by commas. By default
                     models use qcow2 images without options.
--resize RESIZE      Resize (in fact, only increase) the main disk image.
                     For linux system, it will allocate the new size on the
                     root LVM Volume Group. This option only work on KVM
                     hypervisors which have a version of qemu >= 0.15.0.
--disks DISK [DISK ...]
                     Add new disk(s). Format of DISK is:
                     SUFFIX,SIZE[,FORMAT,OPT1=VAL, OPT2=VAL,...]
                     Where:
                     * SUFFIX is used for generating the filename of
                       the image. The filename is: NAME-SUFFIX.FORMAT
                     * SIZE is the size in Gb
                     * FORMAT is the format of the image (default is
                       'qcow2')
                     * OPT=VAL are the options of the format
--force              If a guest or some images already exists on the
                     destination, configuration and disk images are
                     automatically backedup, then overwritten, without
                     confirmation.
--no-check           Ignore checking of resources (use with cautions as
                     overloading an hypervisor could lead to bad
                     performance!).
--no-autostart       Don't set autostart for the new guest.
--no-chef            Don't update chef configuration.
--nbd NBD            NBD device (in /dev) to use (default: 'nbd0').
--vgroot VGROOT      Name of the LVM root Volume Group (default: 'sys').
--lvroot LVROOT       Name of the LVM root Logical Volume (default:
                     'root').
-s SRC_HOST, --src-host SRC_HOST
                     Host on which models are stored (default: 'bes1').
--src-disks SRC_DISKS
                     Path of images files on the source hypervisor (default:
                     '/vm/disk').
--dst-conf DST_CONF  Path of configurations files on the destination
                     hypervisor (default: '/vm/conf').
```

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```
--dst-disks DST_DISKS
                        Path of disks files on the destination hypervisor (default:
                        '/vm/disk')

Arguments:
  name                  Name of the new guest.
  dst_host              Hypervisor on which deploy the new guest.
  MODEL                Model on which the new guest is based. Choices are:
                        * ubuntu-precise
                        * ubuntu-trusty
                        * redhat-5.8
                        * redhat-6.3
                        * centos-5
                        * w2003
                        * w2008-r2
  INTERFACE            Network configuration. This is a list of network
                        interfaces configurations. Each interface
                        configuration is a list of parameters separated by
                        commas. Parameters are:
                        * the network type ('network' (NAT) or 'bridge'),
                        * the source (network name for 'network' type
                          or vlan number for 'bridge' type),
                        * the IP address,
                        * the netmask,
                        * the gateway (only for the first interface)
                        For example, for deploying a guest with an inteface
                        in the public network and an interface in the storage
                        network:
                        * bridge,br903,130.79.200.1,255.255.254.0,130.79.201.254,
↪801
                        * bridge,br896,172.30.0.1,255.255.254.0,896
                        * network,default,192.168.122.2,255.255.255.0,192.168.122.
↪1

# python kvm.py deploy
usage: kvm.py deploy [-h] [--conf-file CONF_FILE] [--logdir LOGDIR]
                    [--loglevel {verbose,debug,info,warn,error,none}]
                    [-c CORES] [-m MEMORY]
                    [--format FORMAT,OPT1=VALUE,OPT2=VALUE,...]
                    [--resize RESIZE] [--disks DISK [DISK ...]] [--force]
                    [--no-check] [--no-autostart] [--no-chef] [--nbd NBD]
                    [--vgroot VGROOT] [--lvroot LVROOT] [-s SRC_HOST]
                    [--src-disks SRC_DISKS] [--dst-conf DST_CONF]
                    [--dst-disks DST_DISKS]
                    name dst_host MODEL INTERFACE [INTERFACE ...]
kvm.py deploy: error: the following arguments are required: name, dst_host, MODEL, ↪
↪INTERFACE

# python kvm.py deploy guest1
usage: kvm.py deploy [-h] [--conf-file CONF_FILE] [--logdir LOGDIR]
                    [--loglevel {verbose,debug,info,warn,error,none}]
                    [-c CORES] [-m MEMORY]
                    [--format FORMAT,OPT1=VALUE,OPT2=VALUE,...]
                    [--resize RESIZE] [--disks DISK [DISK ...]] [--force]
                    [--no-check] [--no-autostart] [--no-chef] [--nbd NBD]
                    [--vgroot VGROOT] [--lvroot LVROOT] [-s SRC_HOST]
                    [--src-disks SRC_DISKS] [--dst-conf DST_CONF]
```

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```

        [--dst-disks DST_DISKS]
        name dst_host MODEL INTERFACE [INTERFACE ...]
kvm.py deploy: error: the following arguments are required: dst_host, MODEL, INTERFACE

# python kvm.py deploy guest1 hypervisors1 192.168.122.1,255.255.255.0,192.168.122.1,
↪500
usage: kvm.py deploy [-h] [--conf-file CONF_FILE] [--logdir LOGDIR]
        [--loglevel {verbose,debug,info,warn,error,none}]
        [-c CORES] [-m MEMORY]
        [--format FORMAT,OPT1=VALUE,OPT2=VALUE,...]
        [--resize RESIZE] [--disks DISK [DISK ...]] [--force]
        [--no-check] [--no-autostart] [--no-chef] [--nbd NBD]
        [--vgroot VGROOT] [--lvroot LVROOT] [-s SRC_HOST]
        [--src-disks SRC_DISKS] [--dst-conf DST_CONF]
        [--dst-disks DST_DISKS]
        name dst_host MODEL INTERFACE [INTERFACE ...]
kvm.py deploy: error: argument MODEL: invalid choice: '192.168.122.1,255.255.255.0,
↪192.168.122.1,500' (choose from 'ubuntu-lucid', 'ubuntu-precise', 'ubuntu-trusty',
↪'redhat-5.8', 'redhat-6.3', 'centos-5', 'w2003', 'w2008r2')

# python kvm.py deploy guest1 hypervisors1 ubuntu-trusty bridge,192.168.122.1,255.255.
↪255.0,192.168.122.1,500 -c 4 -m 4
{'command0': 'deploy',
 'conf_file': '/home/francois/dev/python-clg/examples/kvm/conf/conf.yml',
 'cores': 4,
 'disks': [],
 'dst_conf': '/vm/conf',
 'dst_disks': '/vm/disk',
 'dst_host': 'hypervisors1',
 'force': False,
 'format': None,
 'interfaces': [{'conf': {'address': '255.255.255.0',
                          'gateway': '500',
                          'inet': 'static',
                          'netmask': '192.168.122.1'}},
                {'kvm': {'source': '192.168.122.1', 'type': 'bridge'}}],
 'logdir': '/home/francois/dev/python-clg/examples/kvm/logs',
 'loglevel': 'info',
 'lvroot': 'root',
 'memory': 4,
 'model': 'ubuntu-trusty',
 'name': 'guest1',
 'nbd': 'nbd0',
 'no_autostart': False,
 'no_check': False,
 'no_chef': False,
 'resize': None,
 'src_disks': '/vm/disk',
 'src_host': 'bes1',
 'vgroot': 'sys'}

```