compapp Documentation

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CHAPTER 1

What is compapp?

1.1 Automatic data directory naming, creation and management

When writing programs for numerical simulations and data analysis, managing directories to store resulting data (called *datastore* in this document) is hard.

Computer & *Executable* subclasses	*datastore* property	Behavior
Computer	*DirectoryDataStore*	Simulation is run with a specified data directory in which simulation parameters and results are saved. *Nested classes* such as *Plotter* and other nested *Computer*s may use sub-paths.
nested Computer	*DirectoryDataStore*	If a *Computer* subclass nests in some *owner app*, *DirectoryDataStore* automatically allocates sub-directory under the directory used by the *owner app*.
Plotter, *Loader*	*SubDataStore*	Use files under the directory of the *owner app*.
Memoizer	*HashDataStore*	Data analysis is run with a data directory automatically allocated depending on the parameter values (including data files). The rationale here is that data analysis has to yield the same result given parameters. Thus, if the datastore already exists when this application is run, it loads the results rather than re-computing them. In other words, combinations of *Memoizer* act as build dependencies defined by Makefile and similar build tools. Since generated datastore path is not human friendly (it is based on hash), compapp provides command line interface to help house-keeping.

1.2 Parameter management

Simulations and data analysis require various parameters for each run. Those parameters often have nested sub-parameters reflecting sub-simulations and sub-analysis. compapp naturally supports such nested parameters using

nested class. See `Parametric`.

When parameters have deeply nested structure, it is hard to run a simulation or analysis with slightly different parameters. `Computer.cli` provides a CLI to set such "deep parameters" on the fly.

1.3 Automatic type-check and value-check for properties (traits)

Simulations and data analysis require certain type of parameters but checking them manually is hard and letting an error to happen at the very end of long-running computations is not an option. compapp provides a very easy way to configure such type checks. The main idea implemented in `Parametric` is that, for simple Python data types, the default values define required data type:

```
>>> from compapp import Parametric
>>> class MyParametric(Parametric):
...     i = 1
...     x = 2.0
>>> MyParametric(i=1.0)
Traceback (most recent call last):
    ...
ValueError: Value 1.0 (type: float) cannot be assigned to the variable
MyParametric.i (default: 1) which only accepts one of the following types:
int, int16, ...
>>> MyParametric(x='2.0')
Traceback (most recent call last):
    ...
ValueError: Value '2.0' (type: str) cannot be assigned to the variable
MyParametric.x (default: 2.0) which only accepts one of the following types:
float, float16, ...
```

For more complex control, there are descriptors such as `Instance`, `Required`, `Optional`, etc. Collection-type descriptors such as `List` and `Dict` restricts data types of its component (e.g., dict key has to be a string and the value has to be int) and other traits such as maximal length. The descriptor `Choice` restricts the *value* of properties, rather than the type. The descriptor `Or` defines a property that must satisfy one of defined restrictions.

1.4 Linking properties

compapp prefers *composition over inheritance*. However, using composition makes it hard to share properties between objects whereas in inheritance it is easy (or too easy[1]) to share properties between parent and sub classes. compapp provides various *linking properties* (`Link`, `Delegate`, etc.) which can refer to properties of other objects.

1.5 Hooks

`Executable` defines various methods *to be extended* where user's simulation and data analysis classes can hook some computations. User should at least extend the `run` method to implement some computations. Although methods `save` and `load` can also be extended, `AutoDump` plugin can handle saving and loading results and parameters automatically. There are `prepare` and `finish` methods to be called always, not depending on whether the executable class is `run` or `load`ed.

See also: API Reference

[1] In other words, sharing properties is opt-in for composition approach and forced for inheritance approach.

1.6 Plugins

Executable (hence *Computer*) provides various hooks so that it is easy to "inject" some useful functions via plugins. In fact, the main aim of compapp is to provide well-defined set of hooks and a system for easily coordinating different components by *linking properties*.

Here is the list of plugins provided by *compapp.plugins*:

recorders.DumpResults	Automatically save owner's results.
recorders.DumpParameters	Dump parameters used for its owner.
timing.RecordTiming	Record timing information.
vcs.RecordVCS	Record VCS revision automatically.
misc.Logger	Interface to pre-configured `logging.Logger`.
misc.Debug	Debug helper plugin.
misc.Figure	A wrapper around `matplotlib.pyplot.figure`.
datastores.DirectoryDataStore	Data-store using a directory.
datastores.SubDataStore	Data-store using sub-paths of parent data-store.
datastores.HashDataStore	Automatically allocated data-store based on hash of parameter.

CHAPTER 2

Tutorial

```
>>> import os
>>> import numpy
>>> from compapp import Computer
```

```
>>> class Sine(Computer):
...     steps = 100
...     freq = 50.0
...     phase = 0.0
...
...     def run(self):
...         ts = numpy.arange(self.steps) / self.freq + self.phase
...         self.results.xs = numpy.sin(2 * numpy.pi * ts)
```

Call *execute* (*not* *run*) to run the computation:

```
>>> app = Sine()
>>> app.execute()
>>> app.results.xs
array([...])
```

Any attributes assigned to *results* are going to be saved in *datastore.dir* if it is specified:

```
>>> app = Sine()
>>> app.datastore.dir = 'out'
>>> app.execute()
>>> npz = numpy.load('out/results.npz')
>>> numpy.testing.assert_equal(app.results.xs, npz['xs'])
```

You can also pass (nested) dictionary to the class:

```
>>> app = Sine({'datastore': {'dir': 'another-dir'}})
>>> app.datastore.dir
'another-dir'
```

2.1 Plotting

The *figure* attribute of *Computer* is a simple wrapper of `matplotlib.pyplot`.

```
>>> class MyApp(Computer):
...     sine = Sine
...
...     def run(self):
...         self.sine.execute()
...         _, ax = self.figure.subplots()  # calls pyplot.subplots()
...         ax.plot(self.sine.results.xs)
```

```
>>> app = MyApp()
>>> app.datastore.dir = 'out'
>>> app.execute()
```

The plot is automatically saved to a file in the *datastore* directory:

```
>>> os.path.isfile('out/figure-0.png')
True
```

In interactive environments, the figures are also shown via default matplotlib backend (e.g., as inline figures in Jupyter/IPython notebook), provided that *setup_interactive* is called first.

2.2 Composition of computations

Since `MyApp` is built on top of `Sine`, the result of `Sine` is also saved in the datastore of `MyApp`.

```
>>> os.path.isfile('out/sine/results.npz')
True
```

The parameter passed to the root class is passed to nested class:

```
>>> app = MyApp({'sine': {'phase': 0.5}})
>>> app.sine.phase
0.5
```

Decomposing parameters and computations in reusable building blocks makes code simple.

For example, suppose you want to try many combinations of frequencies and phases. You can use `numpy.linspace` for this purpose. Naive implementation would be like this:

```
class NaiveMultiSine(Computer):
    steps = 100

    freq_start = 10.0
    freq_stop = 100.0
    freq_num = 50

    phase_start = 0.0
    phase_stop = 1.0
    phase_num = 50

    def run(self):
```

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```
        freqs = numpy.linspace(
            self.freq_start, self.freq_stop, self.freq_num)
        phases = numpy.linspace(
            self.phase_start, self.phase_stop, self.phase_num)
        ...
```

A better way is to use *Parametric* and make a composable part:

```
>>> from compapp import Parametric
>>> class LinearSpace(Parametric):
...     start = 0.0
...     stop = 1.0
...     num = 50
...
...     @property
...     def array(self):
...         return numpy.linspace(self.start, self.stop, self.num)
```

Then `LinearSpace` can be used as attributes:

```
>>> class MultiSine(Computer):
...     steps = 100
...     phases = LinearSpace
...
...     class freqs(LinearSpace):  # subclass to change default start/stop
...         start = 10.0
...         stop = 100.0
...
...     def run(self):
...         freqs = self.freqs.array
...         phases = self.phases.array
...
...         ts = numpy.arange(self.steps)
...         xs = numpy.zeros((len(freqs), len(phases), self.steps))
...         for i, f in enumerate(freqs):
...             for j, p in enumerate(phases):
...                 xs[i, j] = numpy.sin(2 * numpy.pi * (ts / f + p))
...         self.results.xs = xs
...
>>> app = MultiSine()
>>> app.freqs.num = 10
>>> app.phases.num = 20
>>> app.execute()
>>> app.results.xs.shape
(10, 20, 100)
```

2.3 Dynamic loading

You can switch a part of computation at execution time:

```
>>> class Cosine(Sine):
...     def run(self):
...         ts = numpy.arange(self.steps) / self.freq + self.phase
...         self.results.xs = numpy.cos(2 * numpy.pi * ts)
```

```
>>> from compapp import dynamic_class
>>> class MyApp2(Computer):
...     signal, signal_class = dynamic_class('.Sine', __name__)
...
...     def run(self):
...         self.signal.execute()
...         _, ax = self.figure.subplots()
...         ax.plot(self.signal.results.xs)
...
>>> assert isinstance(MyApp2().signal, Sine)
>>> assert isinstance(MyApp2({'signal_class': '.Cosine'}).signal, Cosine)
```

2.4 Trying out multiple parameters (in parallel)

To vary parameters of a computation, you can use the CLI bundled with compapp:

```
capp mrun DOTTED.PATH.TO.A.CLASS -- \
    '--builder.ranges["PATH.TO.A.PARAM"]:leval=(START,[ STOP[, STEP]])' \
    '--builder.linspaces["PATH.TO.A.PARAM"]:leval=(START,[ STOP[, STEP]])' \
    '--builder.logspaces["PATH.TO.A.PARAM"]:leval=(START,[ STOP[, STEP]])' \
    ...
```

You can also use the same functionality in Python code:

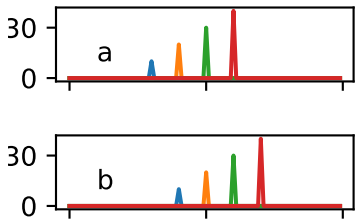
```
>>> from compapp import Variator
>>> class MyVariator(Variator):
...     base, classpath = dynamic_class('.MyApp', __name__)
...
...     class builder:
...         linspaces = {
...             'sine.freq': (10.0, 100.0, 50),
...             'sine.phase': (0.0, 1.0, 50),
...         }
...
>>> app = MyVariator()
>>> app.builder.linspaces['sine.freq'] = (10.0, 100.0, 3)  # num = 3
>>> app.builder.linspaces['sine.phase'] = (0.0, 1.0, 2)  # num = 2
>>> app.execute()
>>> len(app.variants)  # = 3 * 2
6
>>> assert isinstance(app.variants[0], MyApp)
```

CHAPTER 3

Examples

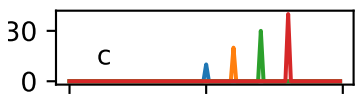
3.1 Example: `compapp.samples.named_figure`

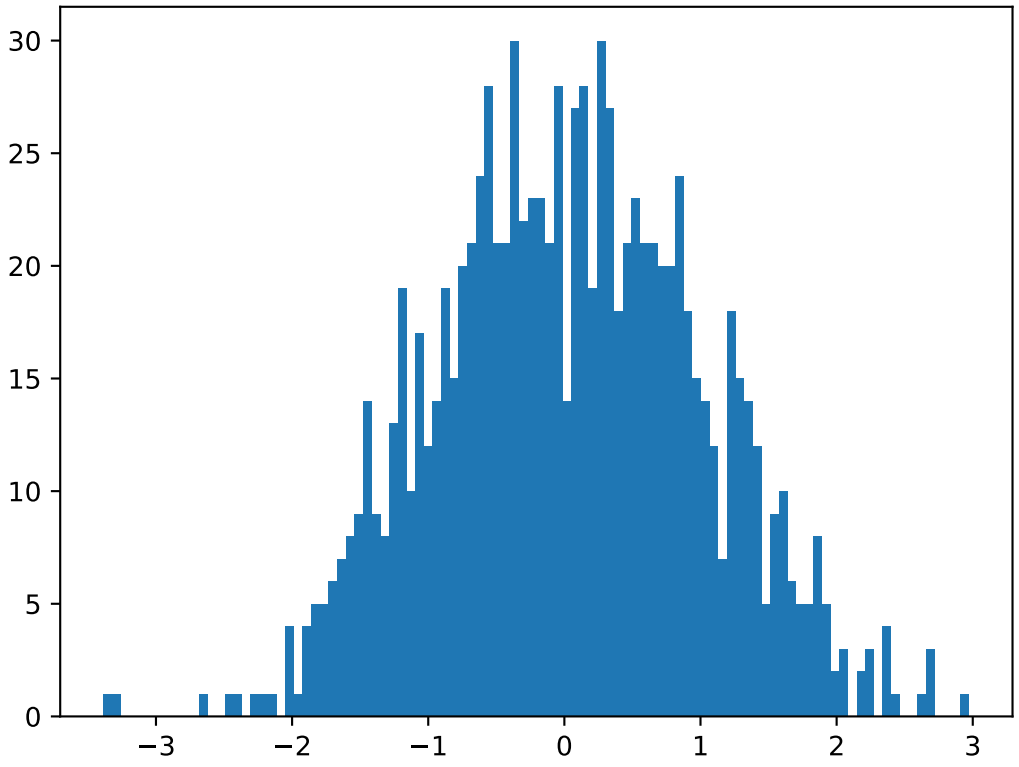
```
import numpy

from compapp.apps import Computer


class MyApp(Computer):

    def run(self):
        names = ['a', 'b', 'c']

        for name in names:
            fig = self.figure(figsize=(2, 0.5), name=name)
            fig.add_subplot(111)

        for j in range(1, 5):
            for i, name in enumerate(names):
                x = numpy.zeros(100)
                x[(i + j) * 10 + 20] = j * 10
                self.figure[name].axes[0].plot(x)

        for name in names:
            ax = self.figure[name].axes[0]
            ax.set_yticks([0, 30])
            ax.text(10, 10, name)


if __name__ == '__main__':
    MyApp().execute()
```



3.2 Example: compapp.samples.pluggable_plotter_exec

```
import numpy

from compapp import Computer, Plotter


class HistPlotter(Plotter):
    bins = 100

    def run(self, x):
        _, ax = self.figure.subplots()
        ax.hist(x, **self.params())


class CumHistPlotter(HistPlotter):
    cumulative = True


class MySimulator(Computer):
    samples = 1000

    def run(self):
        self.results.data = numpy.random.randn(self.samples)


class MyApp(Computer):
    sim = MySimulator
    density = HistPlotter
    cumdist = CumHistPlotter

    def run(self):
        self.sim.execute()
        self.density.execute(self.sim.results.data)
        self.cumdist.execute(self.sim.results.data)


if __name__ == '__main__':
    MyApp().execute()
```




30
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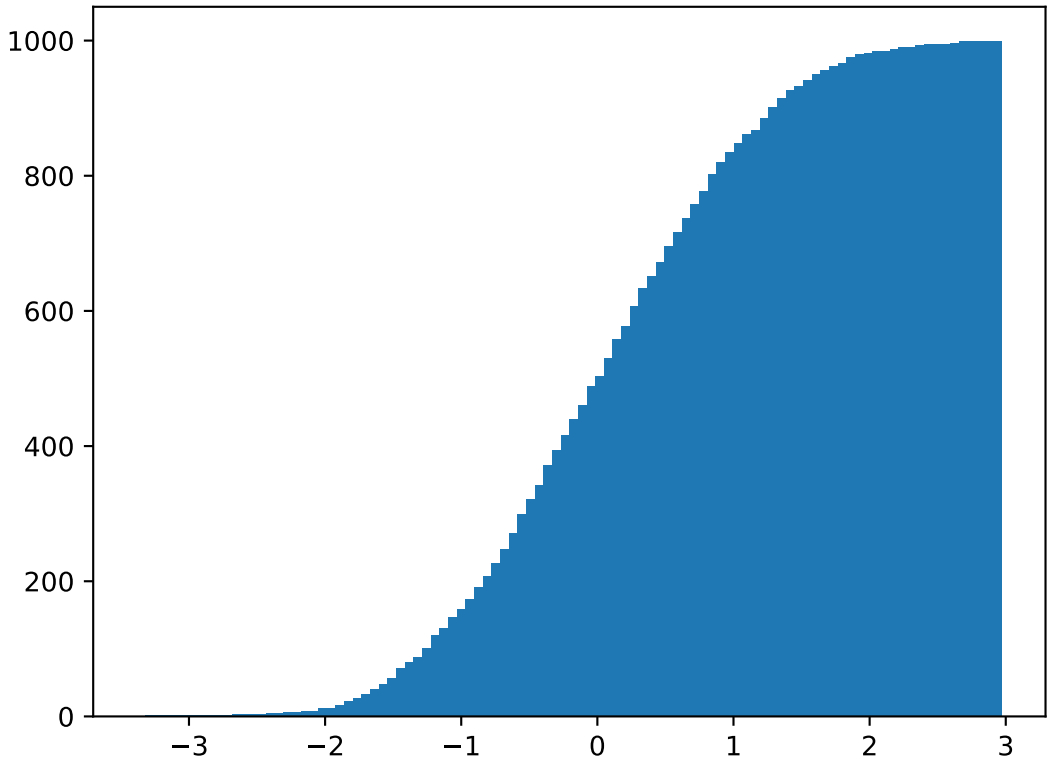
3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−1
0
1
2
3

3.3 Example: compapp.samples.pluggable_plotter_link

```
import numpy

from compapp import Computer, Plotter, Link, AutoUpstreams


class HistPlotter(Plotter):
    bins = 100
    data = Link('..sim.results.data')

    def run(self):
        _, ax = self.figure.subplots()
        ax.hist(self.data, **self.params())


class CumHistPlotter(HistPlotter):
    cumulative = True


class MySimulator(Computer):
    samples = 1000

    def run(self):
        self.results.data = numpy.random.randn(self.samples)


class MyApp(Computer):
    autoupstreams = AutoUpstreams
    sim = MySimulator
    density = HistPlotter
    cumdist = CumHistPlotter


if __name__ == '__main__':
    MyApp().execute()
```

3.4 Example: compapp.samples.simple_plots

```
from compapp.apps import Computer


class MyApp(Computer):

    def run(self):
        fig1 = self.figure()
        ax1 = fig1.add_subplot(111)
        ax1.plot([x ** 2 for x in range(100)])

        fig2, (ax21, ax22) = self.figure.subplots(2)
        ax21.plot([0, 2, 1, 3, 5])
        ax22.plot([0, 1, 5, 3, 0])
```

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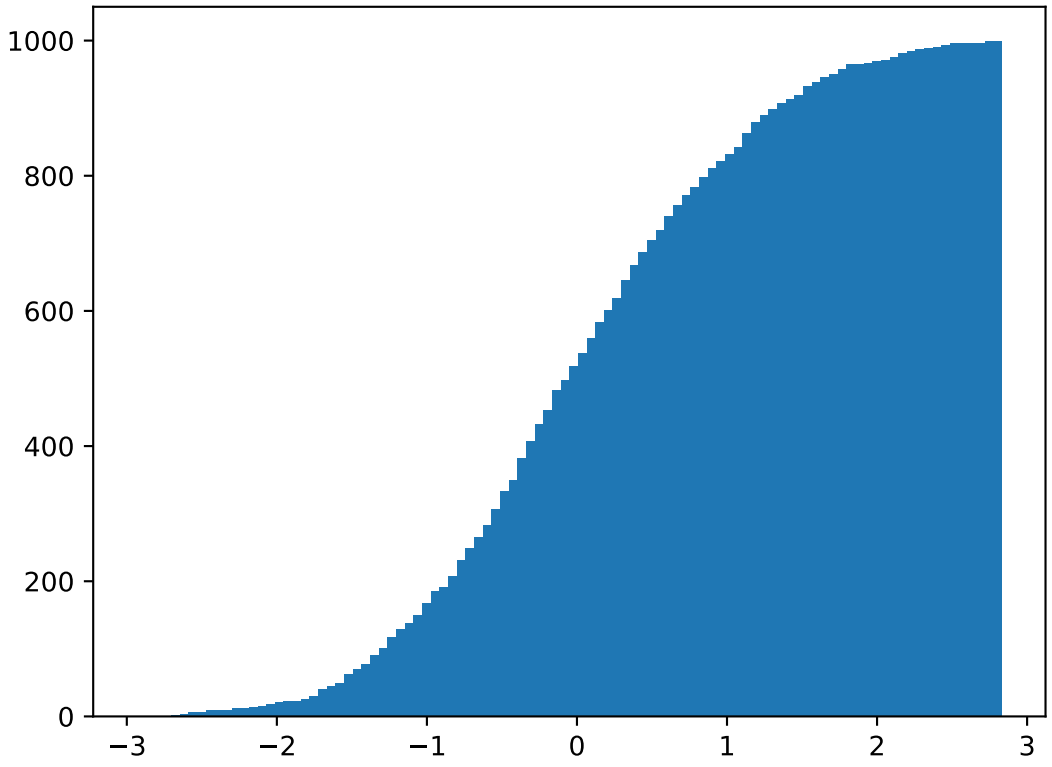
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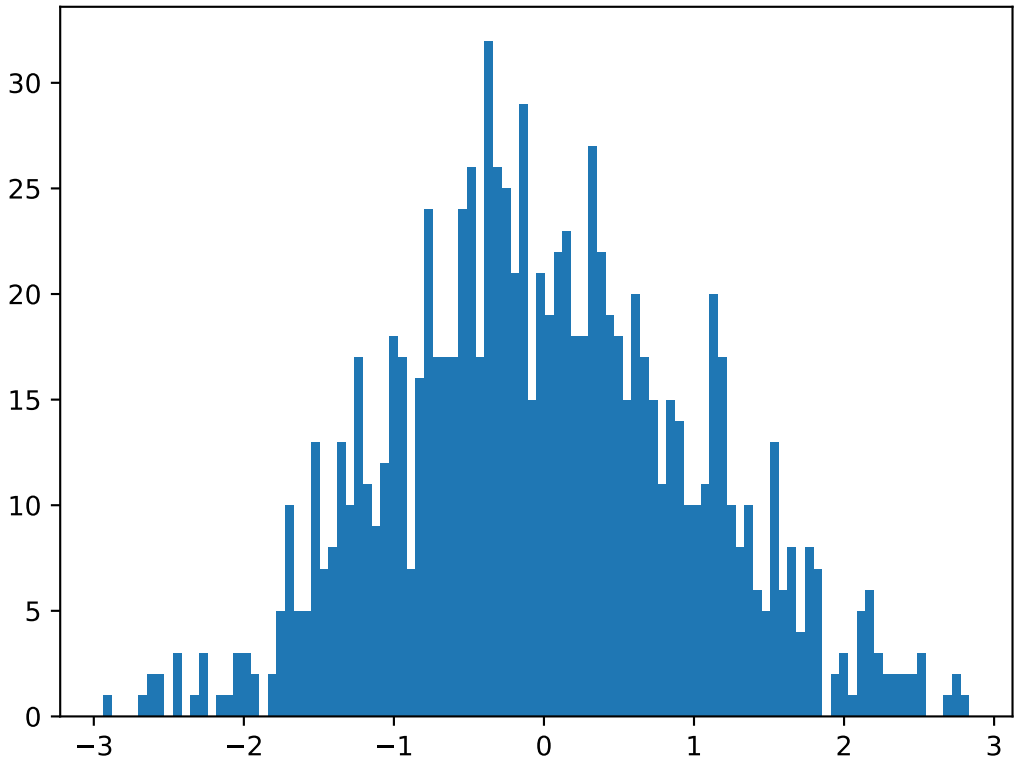
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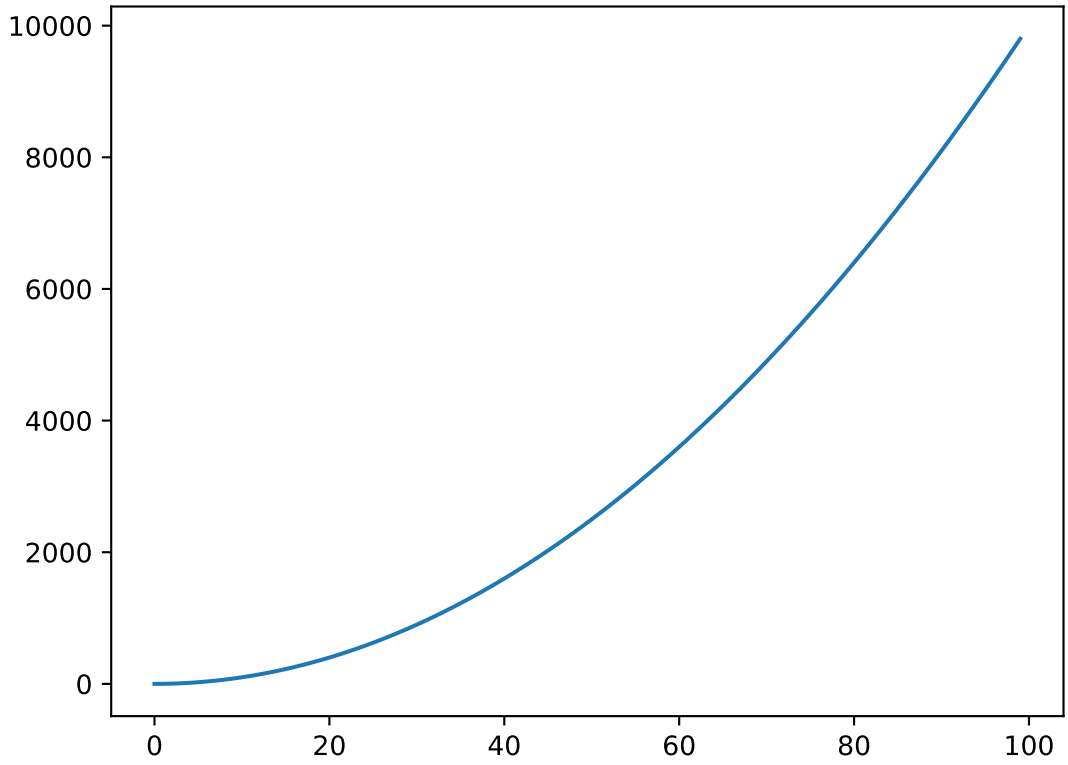
```
if __name__ == '__main__':
    app = MyApp()
    app.cli()
```



3.5 Old examples

3.5.1 Simple example

```
from compapp import Computer


class SimpleApp(Computer):

    x = 1.0
    y = 2.0

    def run(self):
        self.results.sum = self.x + self.y
```

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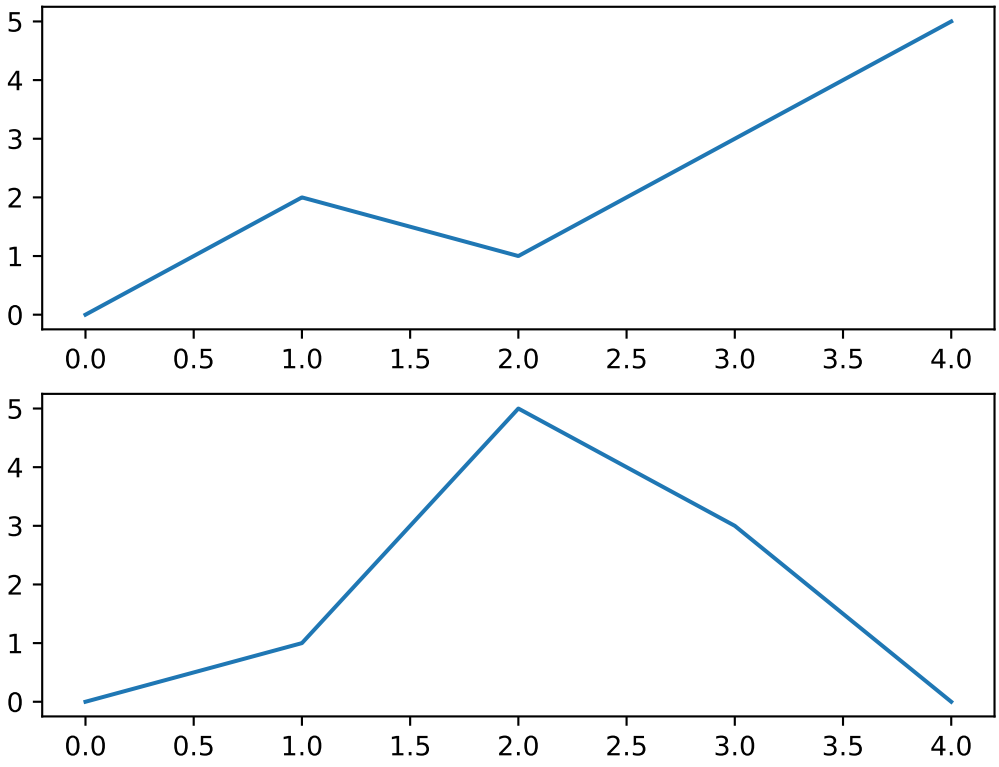
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1
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0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0

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```
if __name__ == '__main__':
    app = SimpleApp.cli()
```

Run:

```
python simple.py --datastore.dir OUT
```

Result:

```
OUT/results.json
```

3.5.2 Simple plotting example

```
from compapp import Computer


class PlottingApp(Computer):

    def run(self):
        fig = self.figure()
        ax = fig.add_axes(111)
        ax.plot([1, 2, -1, 5])


if __name__ == '__main__':
    app = PlottingApp.cli()
```

Run:

```
python simple_plotting.py --datastore.dir OUT
```

Result:

```
OUT/figure-0.png
```

CHAPTER 4

Executables

4.1 Kinds of computation

data source Executable classes *not* requiring any other resources other than the parameters are called the *data source*. That is to say, an Executable class is a data source if its `run` method overriding *`Executable.run`* does *not* taking any arguments. Example:

`Loader`(*args, **kwds)	*Data source* loaded from disk.

data sink Executable classes requiring other resource are called the *data sink*. That is to say, an Executable class is a data sink if its `run` method overriding *`Executable.run`* takes *at least one* argument. Example:

`Plotter`(*args, **kwds)	An *`Assembler`* subclass specialized for plotting.

app

application Executable classes which orchestrate other executable classes are called *application* or *app*. Note that an *app* is also a *data source* since it does not require additional data source. *`compapp.apps`* defines a few base classes for this purpose:

`Computer`(*args, **kwds)	Application base class.
`Memoizer`(*args, **kwds)	*`Computer`* with *`HashDataStore`*.

4.2 Taxonomy of executables

Various *`Executable`* subclasses provided by compapp can be understood well when kind of computations, the type of `datastore` and used plugins are compared.

Executables with *`SubDataStore`* require parent executable. It fits well with *`Loader`* since just loading data is useless. It also fits well with *`Plotter`* since it is a data sink, i.e., it needs data for plotting. Since *`Plotter`* needs

some external *data source*, it makes sense that it is not a subclass of *Computer*.

Executable	datastore	Computation
Loader	*SubDataStore*	*data source*
Plotter	*SubDataStore*	*data sink*
Computer	*DirectoryDataStore*	*app*
Memoizer	*HashDataStore*	*app*

CHAPTER 5

Quick reference

5.1 Core

compapp.core	
Parametric(*args, **kwds)	The basic parametrized class.
Parametric.params([nested, type])	Get parameters as a `dict`.
Parametric.paramnames([type])	List names of parameter for this class.
Parametric.defaultparams([nested, type])	Get default parameters as a `dict`.

5.2 Executables

Executable(*args, **kwds)	The base class supporting execution and plugin mechanism.
Executable.prepare()	*[to be extended]* Prepare for `run`/`load`; e.g., execute upstreams.
Executable.run(*args)	*[to be extended]* Do the actual simulation/analysis.
Executable.save()	*[to be extended]* Save the result manually.
Executable.load()	*[to be extended]* Load saved result manually.
Executable.finish()	*[to be extended]* Do anything to be done before exit.
Executable.execute(*args)	Execute this instance.

executables.Loader(*args, **kwds)	*Data source* loaded from disk.
executables.Plotter(*args, **kwds)	An *Assembler* subclass specialized for plotting.
apps	Application base classes.
apps.Computer(*args, **kwds)	Application base class.
apps.Computer.cli([args])	Run Command Line Interface of this class.
apps.Memoizer(*args, **kwds)	`Computer` with *HashDataStore*.

5.3 Plugins

Plugin(*args, **kwds)	Plugin base class.
Plugin.prepare()	*[to be extended]* For a task immediately *after* *Executable.prepare*.
Plugin.pre_run()	*[to be extended]* For a task immediately before *Executable.run*.
Plugin.post_run()	*[to be extended]* For a task immediately after *Executable.run*.
Plugin.save()	*[to be extended]* For a task immediately *after* *Executable.save*.
Plugin.load()	*[to be extended]* For a task immediately *before* *Executable.load*.
Plugin.finish()	*[to be extended]* For a task immediately *before* *Executable.finish*.

5.3.1 compapp.plugins

DirectoryDataStore(*args, **kwds)	Data-store using a directory.
SubDataStore(*args, **kwds)	Data-store using sub-paths of parent data-store.
HashDataStore(*args, **kwds)	Automatically allocated data-store based on hash of parameter.
MetaStore(*args, **kwds)	
Logger(*args, **kwds)	Interface to pre-configured `logging.Logger`.
Debug(*args, **kwds)	Debug helper plugin.
Figure(*args, **kwds)	A wrapper around `matplotlib.pyplot.figure`.
AutoUpstreams(*args, **kwds)	Automatically execute upstreams.
DumpResults(*args, **kwds)	Automatically save owner's results.
DumpParameters(*args, **kwds)	Dump parameters used for its owner.
RecordVCS(*args, **kwds)	Record VCS revision automatically.
RecordTiming(*args, **kwds)	Record timing information.
RecordProgramInfo(*args, **kwds)	
RecordSysInfo(*args, **kwds)	

5.4 Descriptors

OfType(*classes, **kwds)	Attribute accepting only certain type(s) of value.
Required([desc])	Attributes required to be set before *Executable.run*.
List([trait, type, cast])	Attribute accepting only list with certain traits.
Dict([key, value, type, cast])	Attribute accepting only dict with certain traits.
Optional(*classes, **kwds)	Optional parameter.
Choice(default, *choices, **kwds)	Attribute accepting only one of the specified value.
Or(*traits, **kwds)	Use one of the specified traits.
Link(path[, adapter])	"Link" parameter.
Root(**kwds)	An alias of `Link('')`.
Delegate(**kwds)	Delegate parameter to its owner.
MyName([default, isparam])	

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Table 6 – continued from previous page

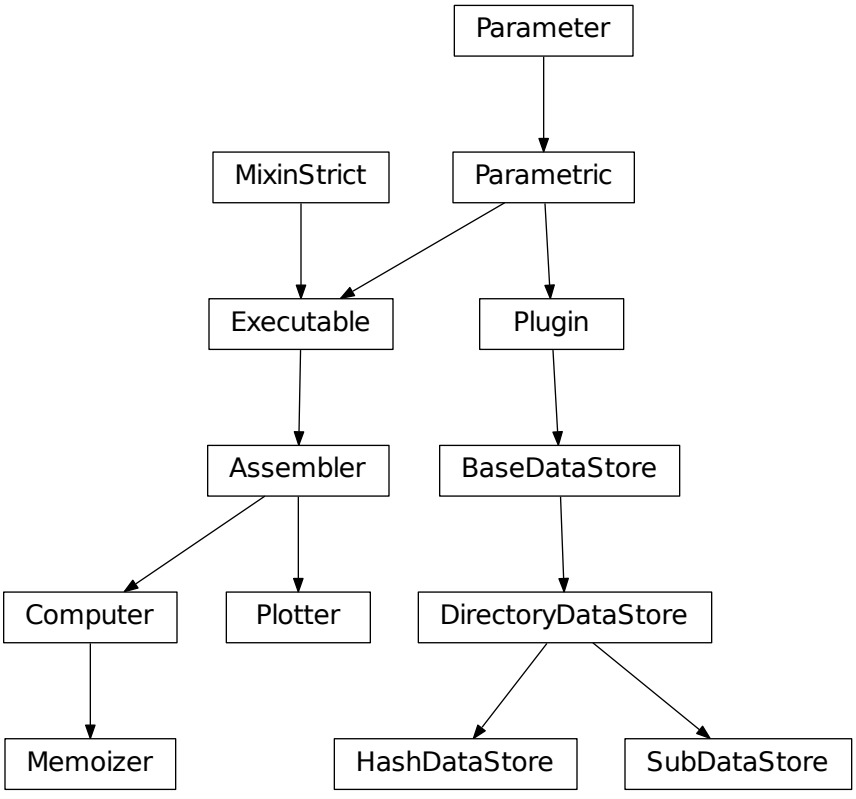
OwnerName([default, isparam])	
Constant(value)	Convenient descriptor for declaring non-parametric property.
dynamic_class(path[, prefix])	Dynamic class loading helper.
ClassPath(default[, prefix])	Class path descriptor that imports specified class on change.
ClassPlaceholder(cpath, **kwds)	Placeholder for an instance of the class specified by *ClassPath*.

5.5 Utilities

setup_interactive()	Configure compapp for REPL (e.g., IPython).

CHAPTER 6

Inheritance diagram



CHAPTER 7

Glossaries

datastore Datastore is the directory to put your simulation and analysis results. compapp may support more advanced data storage (e.g., data bases) in the future. See also `datastore` property.

nested class

owner class

owner app

owner Schematically,:

```
class SubSimulator:
    pass

class MySimulator:          # owns SubSimulator
    sub = SubSimulator      # nests in SubSimulator

class MyApp:                # owns MySimulator
    sim = MySimulator       # nests in MyApp
```

In the above example:

- `MyApp` is the owner class of `MySimulator`.
- `MySimulator` is the owner class of `SubSimulator`.

In turn:

- `SubSimulator` is a nested class of `MySimulator`.
- `MySimulator` is a nested class of `MyApp`.

An owner class happened to be a subclass of *`Computer`* is called an *owner app*. An instance of a owner class is simply called an *owner*.

(Side note: the term *owner* is from the interface of Python descriptor; the `object.__get__` method receives the owner class as its last argument.)

TBE

to be extended Methods and properties marked as *to be extended* or *TBE* may be overridden (extended) by user-defined subclasses to implement certain functionalities. Note that the override is completely optional as oppose to abstract methods and properties which are required to be overridden by subclasses. In Python code, docstrings for such methods and properties are prefixed with `|TO BE EXTENDED|`.

composition over inheritance See: Composition over inheritance - Wikipedia

CHAPTER 8

compapp package

8.1 Subpackages

8.1.1 compapp.descriptors package

Subpackages

compapp.descriptors.tests package

Submodules

compapp.descriptors.tests.test_complex module

class compapp.descriptors.tests.test_complex.**Pluggy**(**args*, ***kwds*)

Bases: *compapp.core.Parametric*

fallback

Use one of the specified traits.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     attr = Or(Choice(*'abc'), OfType(int))
...
>>> mp = MyParametric()
>>> mp.attr = 'a'
>>> mp.attr = 1
>>> mp.attr = 1.0
Traceback (most recent call last):
```

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```
  ...
ValueError: None of the traits are matched to: 1.0
```

`Or` can be combined with *`Link`*-like descriptors:

```
>>> from compapp.descriptors import Delegate
>>> class MyRoot(Parametric):
...     attr = Choice(*'abc', nodefault=True)
...
...     class nested(Parametric):
...         attr = Or(OfType(int), Delegate())
...
>>> par = MyRoot()
>>> par.nested.attr
Traceback (most recent call last):
  ...
AttributeError: 'nested' object has no attribute 'attr'
```

If `par.nested.attr` is not specified (i.e., `OfType(int)` is not in action), accessing to `par.nested.attr` invokes *`Delegate`* which tries to access `par.attr`. In the above example, `par.attr` was not set so the `AttributeError` was raised. Setting `par.attr` makes `par.nested.attr` accessible:

```
>>> par.attr = 'b'
>>> par.nested.attr
'b'
```

Specifying `par.nested.attr` directly invokes *`OfType`*:

```
>>> par.nested.attr = 'c'
Traceback (most recent call last):
  ...
ValueError: None of the traits are matched to: 'c'
>>> par.nested.attr = 496
>>> par.nested.attr
496
```

`__module__ = 'compapp.descriptors.tests.test_complex'`

class compapp.descriptors.tests.test_complex.**Nestable**(**args*, ***kwds*)

Bases: *compapp.core.Parametric*

pluggy

alias of *Pluggy*

`__module__ = 'compapp.descriptors.tests.test_complex'`

class compapp.descriptors.tests.test_complex.**Root**(**args*, ***kwds*)

Bases: *compapp.descriptors.tests.test_complex.Nestable*

class sub(**args*, ***kwds*)

Bases: *compapp.descriptors.tests.test_complex.Nestable*

class sub(**args*, ***kwds*)

Bases: *compapp.descriptors.tests.test_complex.Nestable*

class sub(**args*, ***kwds*)

Bases: *compapp.descriptors.tests.test_complex.Nestable*

class sub(**args*, ***kwds*)
Bases: *compapp.descriptors.tests.test_complex.Nestable*

__module__ = 'compapp.descriptors.tests.test_complex'

__module__ = 'compapp.descriptors.tests.test_complex'

__module__ = 'compapp.descriptors.tests.test_complex'

__module__ = 'compapp.descriptors.tests.test_complex'

__module__ = 'compapp.descriptors.tests.test_complex'

compapp.descriptors.tests.test_complex.**assert_fallbacks_are**(*app*, *what*)

compapp.descriptors.tests.test_complex.**dassert_fallbacks_are**(*obj*, *what*)

compapp.descriptors.tests.test_complex.**test_propagation**()

compapp.descriptors.tests.test_dynamic_class module

compapp.descriptors.tests.test_or module

class compapp.descriptors.tests.test_or.**ParOrDelegate**(**args*, ***kwds*)
Bases: *compapp.core.Parametric*

attr = 1

class nested(**args*, ***kwds*)
Bases: *compapp.core.Parametric*

attr
Use one of the specified traits.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     attr = Or(Choice(*'abc'), OfType(int))
...
>>> mp = MyParametric()
>>> mp.attr = 'a'
>>> mp.attr = 1
>>> mp.attr = 1.0
Traceback (most recent call last):
  ...
ValueError: None of the traits are matched to: 1.0
```

`Or` can be combined with *Link*-like descriptors:

```
>>> from compapp.descriptors import Delegate
>>> class MyRoot(Parametric):
...     attr = Choice(*'abc', nodefault=True)
...
...     class nested(Parametric):
...         attr = Or(OfType(int), Delegate())
...
>>> par = MyRoot()
```

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```
>>> par.nested.attr
Traceback (most recent call last):
  ...
AttributeError: 'nested' object has no attribute 'attr'
```

If `par.nested.attr` is not specified (i.e., `OfType(int)` is not in action), accessing to `par.nested.attr` invokes *`Delegate`* which tries to access `par.attr`. In the above example, `par.attr` was not set so the `AttributeError` was raised. Setting `par.attr` makes `par.nested.attr` accessible:

```
>>> par.attr = 'b'
>>> par.nested.attr
'b'
```

Specifying `par.nested.attr` directly invokes *`OfType`*:

```
>>> par.nested.attr = 'c'
Traceback (most recent call last):
  ...
ValueError: None of the traits are matched to: 'c'
>>> par.nested.attr = 496
>>> par.nested.attr
496
```

`__module__ = 'compapp.descriptors.tests.test_or'`

`__module__ = 'compapp.descriptors.tests.test_or'`

compapp.descriptors.tests.test_or.**test_key_propagation**()

compapp.descriptors.tests.test_or.**test_myname_propagation**()

compapp.descriptors.tests.test_or.**test_propagated_myname**()

compapp.descriptors.tests.test_or.**test_function**()

compapp.descriptors.tests.test_params module

compapp.descriptors.tests.test_params.**test_dict_wo_default**()

compapp.descriptors.tests.test_params.**test_list_wo_default**()

class compapp.descriptors.tests.test_params.**TestDictWithDefault**

Bases: `object`

class MyApp(**args*, ***kwds*)

Bases: *`compapp.core.Parametric`*

x

Attribute accepting only dict with certain traits.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     anydict = Dict()
```

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```
...     strint = Dict(str, int)
...
>>> mp = MyParametric()
>>> mp.anydict = {'a': 1}
>>> mp.strint = {'a': 1}
>>> mp.strint = {1: 1}
Traceback (most recent call last):
  ...
ValueError: MyParametric.strint[...] only accepts type of str: got 1
of type int
>>> mp.strint = {'a': 'b'}
Traceback (most recent call last):
  ...
ValueError: MyParametric.strint['a'] only accepts type of int: got 'b'
of type str
```

__module__ = 'compapp.descriptors.tests.test_params'

test()

__dict__ = dict_proxy({'__module__': 'compapp.descriptors.tests.test_params', '__dict

__module__ = 'compapp.descriptors.tests.test_params'

__weakref__
list of weak references to the object (if defined)

class compapp.descriptors.tests.test_params.**TestOrDefault**
Bases: *compapp.descriptors.tests.test_params.TestDictWithDefault*

class MyApp(**args*, ***kwds*)
Bases: *compapp.core.Parametric*

x
Use one of the specified traits.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     attr = Or(Choice(*'abc'), OfType(int))
...
>>> mp = MyParametric()
>>> mp.attr = 'a'
>>> mp.attr = 1
>>> mp.attr = 1.0
Traceback (most recent call last):
  ...
ValueError: None of the traits are matched to: 1.0
```

`Or` can be combined with *`Link`*-like descriptors:

```
>>> from compapp.descriptors import Delegate
>>> class MyRoot(Parametric):
...     attr = Choice(*'abc', nodefault=True)
...
...     class nested(Parametric):
```

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```
...         attr = Or(OfType(int), Delegate())
...
>>> par = MyRoot()
>>> par.nested.attr
Traceback (most recent call last):
  ...
AttributeError: 'nested' object has no attribute 'attr'
```

If `par.nested.attr` is not specified (i.e., `OfType(int)` is not in action), accessing to `par.nested.attr` invokes *Delegate* which tries to access `par.attr`. In the above example, `par.attr` was not set so the `AttributeError` was raised. Setting `par.attr` makes `par.nested.attr` accessible:

```
>>> par.attr = 'b'
>>> par.nested.attr
'b'
```

Specifying `par.nested.attr` directly invokes *OfType*:

```
>>> par.nested.attr = 'c'
Traceback (most recent call last):
  ...
ValueError: None of the traits are matched to: 'c'
>>> par.nested.attr = 496
>>> par.nested.attr
496
```

__module__ = 'compapp.descriptors.tests.test_params'

__module__ = 'compapp.descriptors.tests.test_params'

compapp.descriptors.tests.test_params.**test_link_default**()

Module contents

Submodules

compapp.descriptors.dynamic_class module

Descriptors for dynamic class loading

Implementation details

dynamic_class works by defining a pair of descriptors for holding "class path" (*ClassPath*) and the instance of the class (*ClassPlaceholder*). Those descriptors make sure that they are consistent; changing *ClassPath* "sets" the class of the objects at *ClassPlaceholder* and setting the instance directly at *ClassPlaceholder* changes *ClassPath*. Accessing the value at *ClassPlaceholder* when it is inconsistent with *ClassPath* raises a `ValueError`.

class compapp.descriptors.dynamic_class.**ClassPath**(*default*, *prefix=None*)

Bases: *compapp.core.DataDescriptor*

Class path descriptor that imports specified class on change.

__init__(*default*, *prefix=None*)
x.__init__(...) initializes x; see help(type(x)) for signature

verify(*obj*, *value*, *myname=None*)

getclass(*obj*)

__module__ = 'compapp.descriptors.dynamic_class'

class compapp.descriptors.dynamic_class.**ClassPlaceholder**(*cpath*, ***kwds*)
Bases: *compapp.core.DataDescriptor*

Placeholder for an instance of the class specified by *ClassPath*.

The actual instantiation process is delayed until it is accessed (i.e., __get__ method is called).

__init__(*cpath*, ***kwds*)
x.__init__(...) initializes x; see help(type(x)) for signature

get(*obj*)

__set__(*obj*, *value*)

__module__ = 'compapp.descriptors.dynamic_class'

compapp.descriptors.dynamic_class.**dynamic_class**(*path*, *prefix=None*, ***kwds*)
Dynamic class loading helper.

Parameters

- **path** (str or type) – The path to default class. The actual class can also be passed.
- **prefix** (str or NoneType) – The module path at which the relative path is resolved.
- **default** (dict) – The default parameter that is passed to the __init__ method of the class at path.
- **isparam** (*bool*) – If False, do not include the class in parameter.

Examples

```
>>> from compapp import Parametric, dynamic_class
>>> class MyApp(Parametric):
...     obj, path = dynamic_class('.ClassA', prefix=__name__, default={})
...
>>> class ClassA(object):
...     def __init__(self, params):
...         self.params = params
...
>>> class ClassB(ClassA):
...     pass
...
```

An instance of a class is automatically loaded at app.obj:

```
>>> app = MyApp()
>>> app.obj
<{module name}.ClassA object at 0x...>
>>> app.obj.params
{}
```

The class to be loaded can be changed dynamically by specifying the `path` attribute/parameter. The path can be full or relative, if the `prefix` argument is specified.

```
>>> app2 = MyApp(obj={'a': 1}, path='.ClassB')
>>> app2.obj
<{module name}.ClassB object at 0x...>
>>> app2.obj.params
{'a': 1}
```

The object can also be set manually. In that case, the corresponding path would be set to the full dotted path.

```
>>> app3 = MyApp()
>>> app3.obj = ClassB({})
>>> app3.path
'{module name}.ClassB'
```

compapp.descriptors.links module

compapp.descriptors.links.**countprefix**(*string*, *prefix*)

class compapp.descriptors.links.**Link**(*path*, *adapter=None*, ***kwds*)

Bases: *compapp.core.Descriptor*

"Link" parameter.

It's like symbolic-link in the file system.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     x = 1
...     broken = Link('..')
...
...     class nest(Parametric):
...         x = 2
...         l0 = Link('')
...         l1 = Link('x')
...         l2 = Link('..x')
...         l3 = Link('.nest.x')
...         broken = Link('..broken')
...
...         class nest(Parametric):
...             x = 3
...             l0 = Link('')
...             l1 = Link('x')
...             l2 = Link('..x')
...             l3 = Link('.nest.x')
...             broken = Link('..broken')
...
>>> par = MyParametric()
>>> par is par.nest.l0 is par.nest.nest.l0
True
>>> par.nest.l1
1
```

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```
>>> par.nest.l2
1
>>> par.nest.l3
3
>>> par.nest.nest.l1
1
>>> par.nest.nest.l2
2
>>> par.nest.nest.l3
Traceback (most recent call last):
  ...
AttributeError: 'nest' object has no attribute 'l3'
>>> hasattr(par, 'broken')
False
>>> hasattr(par.nest, 'broken')
False
>>> hasattr(par.nest.nest, 'broken')
False
```

Todo: Should `path` use more explicit notation as in the JSON pointer? That is to say, use `'#'` instead of `''` (an empty string) to indicate the root. Then, for example, `'x'` would be written as `'#.x'`.

__init__(*path*, *adapter=None*, ***kwds*)
x.__init__(...) initializes x; see help(type(x)) for signature

get(*obj*)

__module__ = 'compapp.descriptors.links'

class compapp.descriptors.links.**Root**(***kwds*)
Bases: *compapp.descriptors.links.Link*

An alias of `Link('')`.

__init__(***kwds*)
x.__init__(...) initializes x; see help(type(x)) for signature

__module__ = 'compapp.descriptors.links'

class compapp.descriptors.links.**Delegate**(***kwds*)
Bases: *compapp.descriptors.links.Link*

Delegate parameter to its owner.

`x = Delegate()` is equivalent to `x = Link('..x')`.

Examples

```
>>> from compapp.core import Parametric
>>> class Parent(Parametric):
...
...     class nest1(Parametric):
...         sampling_period = Delegate()
...
...     class nest2(Parametric):
...         sampling_period = Delegate()
```

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```
...
...     sampling_period = 10.0
...
>>> par = Parent()
>>> par.sampling_period
10.0
>>> par.nest1.sampling_period
10.0
>>> par.nest2.sampling_period
10.0
>>> par.sampling_period = 20.0
>>> par.nest1.sampling_period
20.0
```

__init__(***kwds*)
x.__init__(...) initializes x; see help(type(x)) for signature

get(*obj*)

__module__ = 'compapp.descriptors.links'

class compapp.descriptors.links.**MyName**(*default=Unspecified*, *isparam=Unspecified*)
Bases: *compapp.core.Descriptor*

get(*obj*)

__module__ = 'compapp.descriptors.links'

class compapp.descriptors.links.**OwnerName**(*default=Unspecified*, *isparam=Unspecified*)
Bases: *compapp.core.Descriptor*

get(*obj*)

__module__ = 'compapp.descriptors.links'

compapp.descriptors.misc module

class compapp.descriptors.misc.**Constant**(*value*)
Bases: *compapp.core.Descriptor*

Convenient descriptor for declaring non-parametric property.

```
>>> from compapp import Parametric, Constant
>>> class MyApp(Parametric):
...     c = Constant(1)
>>> app = MyApp()
>>> app.c
1
>>> app.c = 2
Traceback (most recent call last):
  ...
TypeError: can't set attributes <....MyApp ...>.c
>>> app.c
1
```

__init__(*value*)
x.__init__(...) initializes x; see help(type(x)) for signature

get(*_*)

__set__(*obj*, *value*)

__module__ = 'compapp.descriptors.misc'

compapp.descriptors.traits module

compapp.descriptors.traits.**tupleoftypes**(*t*)

compapp.descriptors.traits.**skip_non_str**(*func*)

class compapp.descriptors.traits.**OfType**(**classes*, ***kwds*)

Bases: *compapp.core.DataDescriptor*

Attribute accepting only certain type(s) of value.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     i = OfType(int)
...
>>> MyParametric(i='a')
Traceback (most recent call last):
  ...
ValueError: MyParametric.i only accepts type of int: got 'a' of type str
```

OfType can take multiple classes:

```
>>> class MyParametric(Parametric):
...     i = OfType(int, float, str)
...
>>> mp = MyParametric()
>>> mp.i = 'a'
>>> mp.i = 1j
Traceback (most recent call last):
  ...
ValueError: MyParametric.i only accepts type of int, float or str: got 1j
of type complex
```

It is an error to access unset an *OfType* attribute:

```
>>> mp = MyParametric()
>>> mp.i
Traceback (most recent call last):
  ...
AttributeError: 'MyParametric' object has no attribute 'i'
```

OfType can take *default* argument:

```
>>> class MyParametric(Parametric):
...     i = OfType(int, default=0)
...
>>> mp = MyParametric()
>>> mp.i
0
```

Castable values are cast automatically:

```
>>> class MyParametric(Parametric):
...     x = OfType(float)
...
>>> mp = MyParametric()
>>> mp.x = 1                            # assigning an int...
>>> assert isinstance(mp.x, float)      # ... cast to a float
>>> import numpy
>>> mp.x = numpy.float16(2.0)           # assigning a numpy float...
>>> assert isinstance(mp.x, float)      # ... cast to a float
```

__init__(**classes*, ***kwds*)
x.__init__(...) initializes x; see help(type(x)) for signature

allowed

verify(*obj*, *value*, *myname=None*)

get(*obj*)

parse(*value*)

__module__ = 'compapp.descriptors.traits'

class compapp.descriptors.traits.**Required**(*desc=None*)
Bases: *compapp.core.DataDescriptor*

Attributes required to be set before *Executable.run*.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     i = Required()
...
>>> mp = MyParametric()
>>> has_required_attributes(mp)
False
>>> mp.i = 1
>>> has_required_attributes(mp)
True
```

```
>>> class MyParametric(Parametric):
...     i = Required(OfType(int))
...
>>> mp = MyParametric()
>>> has_required_attributes(mp)
False
>>> mp.i = '1'
Traceback (most recent call last):
  ...
ValueError: MyParametric.i only accepts type of int: got '1' of type str
>>> mp.i = 1
>>> has_required_attributes(mp)
True
```

__init__(*desc=None*)
x.__init__(...) initializes x; see help(type(x)) for signature

__module__ = 'compapp.descriptors.traits'

compapp.descriptors.traits.**has_required_attributes**(*obj*)

compapp.descriptors.traits.**asdesc**(*trait*)

class compapp.descriptors.traits.**List**(*trait=None*, *type=<type 'list'>*, *cast=None*, ***kwds*)

Bases: *compapp.descriptors.traits.OfType*

Attribute accepting only list with certain traits.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     anylist = List()
...     intlist = List(int)
...     castlist = List(int, cast=tuple)
...
>>> mp = MyParametric()
>>> mp.anylist = [1]
>>> mp.anylist = ['a']
>>> mp.intlist = [1]
>>> mp.intlist = [0, 1, '2']
Traceback (most recent call last):
  ...
ValueError: MyParametric.intlist[2] only accepts type of int: got '2'
of type str
```

```
>>> mp.intlist = (1,)
Traceback (most recent call last):
  ...
ValueError: MyParametric.intlist only accepts type of list: got (1,)
of type tuple
>>> mp.castlist = (1,)
>>> mp.castlist
[1]
```

__init__(*trait=None*, *type=<type 'list'>*, *cast=None*, ***kwds*)

x.__init__(...) initializes x; see help(type(x)) for signature

verify(*obj*, *value*, *myname=None*)

__module__ = 'compapp.descriptors.traits'

class compapp.descriptors.traits.**Dict**(*key=None*, *value=None*, *type=<type 'dict'>*, *cast=None*, ***kwds*)

Bases: *compapp.descriptors.traits.OfType*

Attribute accepting only dict with certain traits.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     anydict = Dict()
...     strint = Dict(str, int)
```

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```
...
>>> mp = MyParametric()
>>> mp.anydict = {'a': 1}
>>> mp.strint = {'a': 1}
>>> mp.strint = {1: 1}
Traceback (most recent call last):
  ...
ValueError: MyParametric.strint[...] only accepts type of str: got 1
of type int
>>> mp.strint = {'a': 'b'}
Traceback (most recent call last):
  ...
ValueError: MyParametric.strint['a'] only accepts type of int: got 'b'
of type str
```

__init__(*key=None*, *value=None*, *type=<type 'dict'>*, *cast=None*, ***kwds*)
x.__init__(...) initializes x; see help(type(x)) for signature

verify(*obj*, *value*, *myname=None*)

__module__ = 'compapp.descriptors.traits'

class compapp.descriptors.traits.**Optional**(**classes*, ***kwds*)
Bases: *compapp.descriptors.traits.OfType*

Optional parameter.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     i = Optional(int)
...     j = Optional(int)
>>> sorted(MyParametric.paramnames())
['i', 'j']
>>> MyParametric().params()
{}
>>> MyParametric(i=1).params()
{'i': 1}
>>> MyParametric(j=2).params()
{'j': 2}
>>> assert MyParametric(i=1, j=2).params() == {'i': 1, 'j': 2}
>>> MyParametric(i='alpha')
Traceback (most recent call last):
  ...
ValueError: MyParametric.i only accepts type of int: got 'alpha'
of type str
```

This is useful when writing `Parametric` interface to external library because you would like to avoid writing all default parameters in this case. A simple interface to `matplotlib.pyplot.hist` can be written as:

```
>>> class Hist(Parametric):
...
...     bins = Optional(int)
...     normed = Optional(bool)
...
```

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```
...     def plot(self, ax, x):
...         ax.hist(x, **self.params())
...
>>> from matplotlib import pyplot
>>> fig, ax = pyplot.subplots()
>>> Hist(bins=100, normed=True).plot(ax, range(100))
>>> pyplot.close(fig)
```

verify(*obj*, *value*, *myname=None*)

__module__ = 'compapp.descriptors.traits'

class compapp.descriptors.traits.**Choice**(*default*, **choices*, ***kwds*)

Bases: *compapp.core.DataDescriptor*

Attribute accepting only one of the specified value.

Parameters

- **default** – Default value (see *nodefault*).
- ***choices** – Alternative values.
- **nodefault** (*bool*) – Treat *default* is just an alternative; i.e., do not "initialize" the attribute.
- ****kwds** – See: *DataDescriptor*.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     choice = Choice(1, 2, 'a')
...
>>> mp = MyParametric()
>>> mp.choice
1
>>> mp.choice = 2
>>> mp.choice = 'a'
>>> mp.choice = 'unknown'
Traceback (most recent call last):
  ...
ValueError: MyParametric.choice only accepts one of (1, 2, 'a'):
got 'unknown'
```

__init__(*default*, **choices*, ***kwds*)

x.__init__(...) initializes x; see help(type(x)) for signature

verify(*obj*, *value*, *myname=None*)

parse(*value*)

__module__ = 'compapp.descriptors.traits'

class compapp.descriptors.traits.**Or**(**traits*, ***kwds*)

Bases: *compapp.core.DataDescriptor*

Use one of the specified traits.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     attr = Or(Choice(*'abc'), OfType(int))
...
>>> mp = MyParametric()
>>> mp.attr = 'a'
>>> mp.attr = 1
>>> mp.attr = 1.0
Traceback (most recent call last):
  ...
ValueError: None of the traits are matched to: 1.0
```

Or can be combined with *Link*-like descriptors:

```
>>> from compapp.descriptors import Delegate
>>> class MyRoot(Parametric):
...     attr = Choice(*'abc', nodefault=True)
...
...     class nested(Parametric):
...         attr = Or(OfType(int), Delegate())
...
>>> par = MyRoot()
>>> par.nested.attr
Traceback (most recent call last):
  ...
AttributeError: 'nested' object has no attribute 'attr'
```

If `par.nested.attr` is not specified (i.e., `OfType(int)` is not in action), accessing to `par.nested.attr` invokes *Delegate* which tries to access `par.attr`. In the above example, `par.attr` was not set so the `AttributeError` was raised. Setting `par.attr` makes `par.nested.attr` accessible:

```
>>> par.attr = 'b'
>>> par.nested.attr
'b'
```

Specifying `par.nested.attr` directly invokes *OfType*:

```
>>> par.nested.attr = 'c'
Traceback (most recent call last):
  ...
ValueError: None of the traits are matched to: 'c'
>>> par.nested.attr = 496
>>> par.nested.attr
496
```

__init__ (**traits*, ***kwds*)
x.__init__(...) initializes x; see help(type(x)) for signature

key

__module__ = 'compapp.descriptors.traits'

myname

verify (*obj*, *value*, *myname=None*)

get (*obj*)

parse(*value*)

default

Module contents

8.1.2 compapp.plugins package

Subpackages

compapp.plugins.tests package

Submodules

compapp.plugins.tests.test_autoupstreams module

class compapp.plugins.tests.test_autoupstreams.**AlwaysReady**(**args*, ***kwds*)

Bases: *compapp.executables.Assembler*

run()

[to be extended] Do the actual simulation/analysis.

__module__ = 'compapp.plugins.tests.test_autoupstreams'

class compapp.plugins.tests.test_autoupstreams.**DependsOnAlwaysReady**(**args*, ***kwds*)

Bases: *compapp.plugins.tests.test_autoupstreams.AlwaysReady*

alwaysready_done

"Link" parameter.

It's like symbolic-link in the file system.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     x = 1
...     broken = Link('..')
...
...     class nest(Parametric):
...         x = 2
...         l0 = Link('')
...         l1 = Link('x')
...         l2 = Link('..x')
...         l3 = Link('.nest.x')
...         broken = Link('..broken')
...
...         class nest(Parametric):
...             x = 3
...             l0 = Link('')
...             l1 = Link('x')
...             l2 = Link('..x')
...             l3 = Link('.nest.x')
...             broken = Link('..broken')
```

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```
...
>>> par = MyParametric()
>>> par is par.nest.l0 is par.nest.nest.l0
True
>>> par.nest.l1
1
>>> par.nest.l2
1
>>> par.nest.l3
3
>>> par.nest.nest.l1
1
>>> par.nest.nest.l2
2
>>> par.nest.nest.l3
Traceback (most recent call last):
  ...
AttributeError: 'nest' object has no attribute 'l3'
>>> hasattr(par, 'broken')
False
>>> hasattr(par.nest, 'broken')
False
>>> hasattr(par.nest.nest, 'broken')
False
```

Todo: Should `path` use more explicit notation as in the JSON pointer? That is to say, use `'#'` instead of `''` (an empty string) to indicate the root. Then, for example, `'x'` would be written as `'#.x'`.

__module__ = 'compapp.plugins.tests.test_autoupstreams'

class compapp.plugins.tests.test_autoupstreams.**DependsOnDepAR**(**args*, ***kwds*)

Bases: *compapp.plugins.tests.test_autoupstreams.AlwaysReady*

depar_done

"Link" parameter.

It's like symbolic-link in the file system.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     x = 1
...     broken = Link('..')
...
...     class nest(Parametric):
...         x = 2
...         l0 = Link('')
...         l1 = Link('x')
...         l2 = Link('..x')
...         l3 = Link('.nest.x')
...         broken = Link('..broken')
...
...         class nest(Parametric):
```

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```
...             x = 3
...             l0 = Link('')
...             l1 = Link('x')
...             l2 = Link('..x')
...             l3 = Link('.nest.x')
...             broken = Link('..broken')
...
>>> par = MyParametric()
>>> par is par.nest.l0 is par.nest.nest.l0
True
>>> par.nest.l1
1
>>> par.nest.l2
1
>>> par.nest.l3
3
>>> par.nest.nest.l1
1
>>> par.nest.nest.l2
2
>>> par.nest.nest.l3
Traceback (most recent call last):
  ...
AttributeError: 'nest' object has no attribute 'l3'
>>> hasattr(par, 'broken')
False
>>> hasattr(par.nest, 'broken')
False
>>> hasattr(par.nest.nest, 'broken')
False
```

Todo: Should `path` use more explicit notation as in the JSON pointer? That is to say, use `'#'` instead of `''` (an empty string) to indicate the root. Then, for example, `'x'` would be written as `'#.x'`.

__module__ = 'compapp.plugins.tests.test_autoupstreams'

class compapp.plugins.tests.test_autoupstreams.**DependsOnTwo**(**args*, ***kwds*)

Bases: *compapp.plugins.tests.test_autoupstreams.DependsOnDepAR*

depdepar_done

"Link" parameter.

It's like symbolic-link in the file system.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     x = 1
...     broken = Link('..')
...
...     class nest(Parametric):
...         x = 2
...         l0 = Link('')
```

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```
...         l1 = Link('x')
...         l2 = Link('..x')
...         l3 = Link('.nest.x')
...         broken = Link('..broken')
...
...         class nest(Parametric):
...             x = 3
...             l0 = Link('')
...             l1 = Link('x')
...             l2 = Link('..x')
...             l3 = Link('.nest.x')
...             broken = Link('..broken')
...
>>> par = MyParametric()
>>> par is par.nest.l0 is par.nest.nest.l0
True
>>> par.nest.l1
1
>>> par.nest.l2
1
>>> par.nest.l3
3
>>> par.nest.nest.l1
1
>>> par.nest.nest.l2
2
>>> par.nest.nest.l3
Traceback (most recent call last):
  ...
AttributeError: 'nest' object has no attribute 'l3'
>>> hasattr(par, 'broken')
False
>>> hasattr(par.nest, 'broken')
False
>>> hasattr(par.nest.nest, 'broken')
False
```

Todo: Should `path` use more explicit notation as in the JSON pointer? That is to say, use `'#'` instead of `''` (an empty string) to indicate the root. Then, for example, `'x'` would be written as `'#.x'`.

__module__ = 'compapp.plugins.tests.test_autoupstreams'

class compapp.plugins.tests.test_autoupstreams.**RootApp**(**args*, ***kwds*)

Bases: *compapp.executables.Assembler*

autoupstreams

alias of *compapp.plugins.misc.AutoUpstreams*

alwaysready

alias of *AlwaysReady*

depar

alias of *DependsOnAlwaysReady*

depdepar

alias of *DependsOnDepAR*

deptwo
alias of *DependsOnTwo*

__module__ = 'compapp.plugins.tests.test_autoupstreams'

compapp.plugins.tests.test_autoupstreams.**test_execute**()

compapp.plugins.tests.test_autoupstreams.**test_is_runnable_simple**()

compapp.plugins.tests.test_datastores module

class compapp.plugins.tests.test_datastores.**WithStore**(**args*, ***kwds*)
Bases: *compapp.interface.Executable*

datastore
alias of *compapp.plugins.datastores.DirectoryDataStore*

exists = None

run()
[to be extended] Do the actual simulation/analysis.

__module__ = 'compapp.plugins.tests.test_datastores'

class compapp.plugins.tests.test_datastores.**CheckDir**(**args*, ***kwds*)
Bases: *compapp.plugins.tests.test_datastores.WithStore*

class sub(**args*, ***kwds*)
Bases: *compapp.plugins.tests.test_datastores.WithStore*

class sub(**args*, ***kwds*)
Bases: *compapp.plugins.tests.test_datastores.WithStore*

class sub(**args*, ***kwds*)
Bases: *compapp.plugins.tests.test_datastores.WithStore*

__module__ = 'compapp.plugins.tests.test_datastores'

__module__ = 'compapp.plugins.tests.test_datastores'

__module__ = 'compapp.plugins.tests.test_datastores'

run()
[to be extended] Do the actual simulation/analysis.

__module__ = 'compapp.plugins.tests.test_datastores'

compapp.plugins.tests.test_datastores.**test_nodir**()

compapp.plugins.tests.test_datastores.**test_root_exists**(*tmpdir*)

compapp.plugins.tests.test_datastores.**test_sub_exists**(*tmpdir*)

compapp.plugins.tests.test_dumpresults module

compapp.plugins.tests.test_logger module

compapp.plugins.tests.test_logger.**test_handlers_are_copied**()

compapp.plugins.tests.test_logger.**test_formatters_are_copied**()

class compapp.plugins.tests.test_logger.**Greeter**(**args*, ***kwds*)
Bases: *compapp.apps.Computer*

message = 'hello'

run()
[to be extended] Do the actual simulation/analysis.

__module__ = 'compapp.plugins.tests.test_logger'

class compapp.plugins.tests.test_logger.**MyApp**(**args*, ***kwds*)
Bases: *compapp.plugins.tests.test_logger.Greeter*

class sub(**args*, ***kwds*)
Bases: *compapp.plugins.tests.test_logger.Greeter*

class sub(**args*, ***kwds*)
Bases: *compapp.plugins.tests.test_logger.Greeter*

__module__ = 'compapp.plugins.tests.test_logger'

__module__ = 'compapp.plugins.tests.test_logger'

__module__ = 'compapp.plugins.tests.test_logger'

compapp.plugins.tests.test_logger.**assert_levels**(*output*, *lvl*)

compapp.plugins.tests.test_logger.**test_nested_simple_run**(*capsys*)

compapp.plugins.tests.test_logger.**test_nested_root_config**(*capsys*)

compapp.plugins.tests.test_logger.**test_nested_specific_handler**(*capsys*)

compapp.plugins.tests.test_logger.**test_datastore_log**(*tmpdir*)

Module contents

Submodules

compapp.plugins.datastores module

class compapp.plugins.datastores.**BaseDataStore**(**args*, ***kwds*)
Bases: *compapp.interface.Plugin*

__module__ = 'compapp.plugins.datastores'

compapp.plugins.datastores.**iswritable**(*directory*)
Check if `directory` is writable.

Examples

```
>>> iswritable('.')
True
```

```
>>> os.path.exists('spam')
False
>>> iswritable('spam/egg')
True
```

```
>>> os.access('/', os.W_OK | os.X_OK)
False
>>> os.path.exists('/spam')
False
>>> iswritable('/spam/egg')
False
```

class compapp.plugins.datastores.**DirectoryDataStore**(**args*, ***kwds*)

Bases: *compapp.plugins.datastores.BaseDataStore*

Data-store using a directory.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     datastore = DirectoryDataStore
...
>>> mp = MyParametric()
>>> mp.datastore.dir = 'out'
>>> mp.datastore.path('file')
'out/file'
```

path creates intermediate directories if required:

```
>>> os.listdir('.')
['out']
```

If a *nested class* uses *DirectoryDataStore*, the path is automatically allocated under the *dir* of the *owner class*.

```
>>> class MyParametric(Parametric):
...     datastore = DirectoryDataStore
...
...     class nested(Parametric):
...         datastore = DirectoryDataStore
...
>>> mp = MyParametric()
>>> mp.datastore.dir = 'out'
>>> mp.nested.datastore.path()
'out/nested'
>>> mp.nested.datastore.path('file')
'out/nested/file'
>>> mp.nested.datastore.path('dir', 'file')
'out/nested/dir/file'
```

```
>>> mp.nested.datastore.dir = 'another'
>>> mp.nested.datastore.path('file')
'another/file'
```

overwrite = True

clear_before_run = True

on = True

dir
Path to datastore directory (optional).

is_writable()
Return true if *dir* is writable and the owner is in the "run" mode.

It is checked whether the *owner* is in the "run" mode or in the "load" mode here, so that other plugins can avoid overwriting the datastore in the "load" mode.

is_loadable
True if *dir* exists and meta information is stored in there.

prepare()
[to be extended] For a task immediately *after* `Executable.prepare`.

path(**args*, ***kwds*)
Path relative to the base directory *dir*.

Parameters **args** (*str*) – Path relative to *dir*. It will be joined by `os.path.join`.

Keyword Arguments **mkdir** (*bool*) – If `True` (default), make the parent directory of returned *path* (i.e., `os.path.dirname(path)`, not the *path* itself).

Returns **path** – `os.path.join(self.dir, *args)`

Return type str

exists(**path*)

globitems(*pattern*)

__module__ = 'compapp.plugins.datastores'

class compapp.plugins.datastores.**SubDataStore**(**args*, ***kwds*)
Bases: *compapp.plugins.datastores.DirectoryDataStore*

Data-store using sub-paths of parent data-store.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     datastore = DirectoryDataStore
...
...     class nested(Parametric):
...         datastore = SubDataStore
...
>>> mp = MyParametric()
>>> mp.datastore.dir = 'out'
>>> mp.nested.datastore.path()
'out/nested'
>>> mp.nested.datastore.path('file')
'out/nested-file'
>>> mp.nested.datastore.path('dir', 'file')
'out/nested-dir/file'
>>> mp.nested.datastore.path('a', 'b', 'c')
'out/nested-a/b/c'
>>> mp.nested.datastore.sep = '.'
>>> mp.nested.datastore.path('file')
'out/nested.file'
```

Since *DirectoryDataStore* already can be used for datastore using sub-directories, this class is specialized for the case using files under the directory of parent datastore. If the *owner class* of this datastore uses only a few files, it makes sense to not allocate a directory and to use this type of datastore.

dir

"Link" parameter.

It's like symbolic-link in the file system.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     x = 1
...     broken = Link('..')
...
...     class nest(Parametric):
...         x = 2
...         l0 = Link('')
...         l1 = Link('x')
...         l2 = Link('..x')
...         l3 = Link('.nest.x')
...         broken = Link('..broken')
...
...         class nest(Parametric):
...             x = 3
...             l0 = Link('')
...             l1 = Link('x')
...             l2 = Link('..x')
...             l3 = Link('.nest.x')
...             broken = Link('..broken')
...
>>> par = MyParametric()
>>> par is par.nest.l0 is par.nest.nest.l0
True
>>> par.nest.l1
1
>>> par.nest.l2
1
>>> par.nest.l3
3
>>> par.nest.nest.l1
1
>>> par.nest.nest.l2
2
>>> par.nest.nest.l3
Traceback (most recent call last):
  ...
AttributeError: 'nest' object has no attribute 'l3'
>>> hasattr(par, 'broken')
False
>>> hasattr(par.nest, 'broken')
False
>>> hasattr(par.nest.nest, 'broken')
False
```

Todo: Should *path* use more explicit notation as in the JSON pointer? That is to say, use `'#'` instead of `''` (an empty string) to indicate the root. Then, for example, `'x'` would be written as `'#.x'`.

sep = '-'

path(**args*, ***kwds*)
Path relative to the base directory *dir*.

Parameters **args** (*str*) – Path relative to *dir*. It will be joined by `os.path.join`.

Keyword Arguments **mkdir** (*bool*) – If `True` (default), make the parent directory of returned *path* (i.e., `os.path.dirname(path)`, not the *path* itself).

Returns **path** – `os.path.join(self.dir, *args)`

Return type str

globitems(*pattern*)

__module__ = 'compapp.plugins.datastores'

compapp.plugins.datastores.**hexdigest**(*jsonable*)
Calculate hex digest of a `jsonable` object.

```
>>> hexdigest({'a': 1, 'b': 2, 'c': 3})
'e20096b15530bd66a35a7332619f6666e2322070'
```

class compapp.plugins.datastores.**HashDataStore**(**args*, ***kwds*)
Bases: *compapp.plugins.datastores.DirectoryDataStore*

Automatically allocated data-store based on hash of parameter.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     datastore = HashDataStore
...     a = 1
...
>>> mp = MyParametric()
>>> mp.datastore.prepare()
>>> mp.datastore.dir
'Data/memo/be/a393597a3c5518cad18a4c96c08d038de3f00a'
>>> mp.a = 2
>>> mp.datastore.prepare()
>>> mp.datastore.dir
'Data/memo/a2/722afcdc53688843b61b8d71329fabab16b6ae'
>>> mp.datastore.basedir = '.'
>>> mp.datastore.prepare()
>>> mp.datastore.dir
'./a2/722afcdc53688843b61b8d71329fabab16b6ae'
```

basedir = 'Data/memo'

__module__ = 'compapp.plugins.datastores'

ownerhash()

prepare()
[to be extended] For a task immediately *after* `Executable.prepare`.

compapp.plugins.metastore module

class compapp.plugins.metastore.**MetaStore**(**args*, ***kwds*)
Bases: *compapp.interface.Plugin*

metafile = 'meta.json'

datastore
Delegate parameter to its owner.

`x = Delegate()` is equivalent to `x = Link('..x')`.

Examples

```
>>> from compapp.core import Parametric
>>> class Parent(Parametric):
...
...     class nest1(Parametric):
...         sampling_period = Delegate()
...
...     class nest2(Parametric):
...         sampling_period = Delegate()
...
...     sampling_period = 10.0
...
>>> par = Parent()
>>> par.sampling_period
10.0
>>> par.nest1.sampling_period
10.0
>>> par.nest2.sampling_period
10.0
>>> par.sampling_period = 20.0
>>> par.nest1.sampling_period
20.0
```

log
Delegate parameter to its owner.

`x = Delegate()` is equivalent to `x = Link('..x')`.

Examples

```
>>> from compapp.core import Parametric
>>> class Parent(Parametric):
...
...     class nest1(Parametric):
...         sampling_period = Delegate()
...
...     class nest2(Parametric):
...         sampling_period = Delegate()
```

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```
...
...     sampling_period = 10.0
...
>>> par = Parent()
>>> par.sampling_period
10.0
>>> par.nest1.sampling_period
10.0
>>> par.nest2.sampling_period
10.0
>>> par.sampling_period = 20.0
>>> par.nest1.sampling_period
20.0
```

metafilepath

prepare()
[to be extended] For a task immediately *after* `Executable.prepare`.

record(*name*, *data*)

load()
[to be extended] For a task immediately *before* `Executable.load`.

__module__ = 'compapp.plugins.metastore'

compapp.plugins.misc module

class compapp.plugins.misc.**Logger**(**args*, ***kwds*)
Bases: *compapp.interface.Plugin*

Interface to pre-configured `logging.Logger`.

It does the following automatically:

- make a logger with an appropriate dotted name
- set up handler

```
>>> from compapp import Computer
>>> class MyAppForLoggerDemo(Computer):
...     def run(self):
...         self.log.error('error message')
...         self.log.info('info message')
>>> app = MyAppForLoggerDemo()
>>> app.log.formatters['default']['format'] = \
...     '%(levelname)s %(name)s | %(message)s'
>>> app.log.handlers['console']['stream'] = 'ext://sys.stdout'
>>> app.execute()
ERROR compapp.plugins.misc.MyAppForLoggerDemo.0 | error message
```

log
An instance of `logging.Logger`. This is accessible in and after *Executable.run* or *Executable.load* hooks.

Todo: Make it accessible all the time.

---

critical
error
warn
info
debug
Shortcut for *log.debug* etc.

configurator
Use one of the specified traits.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     attr = Or(Choice(*'abc'), OfType(int))
...
>>> mp = MyParametric()
>>> mp.attr = 'a'
>>> mp.attr = 1
>>> mp.attr = 1.0
Traceback (most recent call last):
  ...
ValueError: None of the traits are matched to: 1.0
```

`Or` can be combined with *Link*-like descriptors:

```
>>> from compapp.descriptors import Delegate
>>> class MyRoot(Parametric):
...     attr = Choice(*'abc', nodefault=True)
...
...     class nested(Parametric):
...         attr = Or(OfType(int), Delegate())
...
>>> par = MyRoot()
>>> par.nested.attr
Traceback (most recent call last):
  ...
AttributeError: 'nested' object has no attribute 'attr'
```

If `par.nested.attr` is not specified (i.e., `OfType(int)` is not in action), accessing to `par.nested.attr` invokes *Delegate* which tries to access `par.attr`. In the above example, `par.attr` was not set so the `AttributeError` was raised. Setting `par.attr` makes `par.nested.attr` accessible:

```
>>> par.attr = 'b'
>>> par.nested.attr
'b'
```

Specifying `par.nested.attr` directly invokes *OfType*:

```
>>> par.nested.attr = 'c'
Traceback (most recent call last):
  ...
ValueError: None of the traits are matched to: 'c'
>>> par.nested.attr = 496
```

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```
>>> par.nested.attr
496
```

handlers
The dictionary *handlers* of the logging configuration dictionary. Each handler may contain a special configuration `'datastore': True` indicating that this handler is configured only if datastore is accessible. For nested classes, this attribute is ignored if *ownconfig* is not `True` (default is `'auto'`).

formatters
The dictionary *formatters* of the logging configuration dictionary. See also *handlers*.

ownconfig
If `'auto'` (default), configure handlers if the owner is the root app and reuse the handlers of owner's logger otherwise. The value `True` forces this logger plugin to make own handlers. The value `False` forces the reuse (which is an error if the owner is the root app).

level
Logger level. Default is `'ERROR'`.

critical
"Link" parameter.

It's like symbolic-link in the file system.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     x = 1
...     broken = Link('..')
...
...     class nest(Parametric):
...         x = 2
...         l0 = Link('')
...         l1 = Link('x')
...         l2 = Link('..x')
...         l3 = Link('.nest.x')
...         broken = Link('..broken')
...
...         class nest(Parametric):
...             x = 3
...             l0 = Link('')
...             l1 = Link('x')
...             l2 = Link('..x')
...             l3 = Link('.nest.x')
...             broken = Link('..broken')
...
>>> par = MyParametric()
>>> par is par.nest.l0 is par.nest.nest.l0
True
>>> par.nest.l1
1
>>> par.nest.l2
1
>>> par.nest.l3
3
```

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```
>>> par.nest.nest.l1
1
>>> par.nest.nest.l2
2
>>> par.nest.nest.l3
Traceback (most recent call last):
  ...
AttributeError: 'nest' object has no attribute 'l3'
>>> hasattr(par, 'broken')
False
>>> hasattr(par.nest, 'broken')
False
>>> hasattr(par.nest.nest, 'broken')
False
```

Todo: Should `path` use more explicit notation as in the JSON pointer? That is to say, use `'#'` instead of `''` (an empty string) to indicate the root. Then, for example, `'x'` would be written as `'#.x'`.

error

"Link" parameter.

It's like symbolic-link in the file system.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     x = 1
...     broken = Link('..')
...
...     class nest(Parametric):
...         x = 2
...         l0 = Link('')
...         l1 = Link('x')
...         l2 = Link('..x')
...         l3 = Link('.nest.x')
...         broken = Link('..broken')
...
...         class nest(Parametric):
...             x = 3
...             l0 = Link('')
...             l1 = Link('x')
...             l2 = Link('..x')
...             l3 = Link('.nest.x')
...             broken = Link('..broken')
...
>>> par = MyParametric()
>>> par is par.nest.l0 is par.nest.nest.l0
True
>>> par.nest.l1
1
>>> par.nest.l2
1
```

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```
>>> par.nest.l3
3
>>> par.nest.nest.l1
1
>>> par.nest.nest.l2
2
>>> par.nest.nest.l3
Traceback (most recent call last):
  ...
AttributeError: 'nest' object has no attribute 'l3'
>>> hasattr(par, 'broken')
False
>>> hasattr(par.nest, 'broken')
False
>>> hasattr(par.nest.nest, 'broken')
False
```

Todo: Should `path` use more explicit notation as in the JSON pointer? That is to say, use `'#'` instead of `''` (an empty string) to indicate the root. Then, for example, `'x'` would be written as `'#.x'`.

warn

"Link" parameter.

It's like symbolic-link in the file system.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     x = 1
...     broken = Link('..')
...
...     class nest(Parametric):
...         x = 2
...         l0 = Link('')
...         l1 = Link('x')
...         l2 = Link('..x')
...         l3 = Link('.nest.x')
...         broken = Link('..broken')
...
...         class nest(Parametric):
...             x = 3
...             l0 = Link('')
...             l1 = Link('x')
...             l2 = Link('..x')
...             l3 = Link('.nest.x')
...             broken = Link('..broken')
...
>>> par = MyParametric()
>>> par is par.nest.l0 is par.nest.nest.l0
True
>>> par.nest.l1
1
```

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```
>>> par.nest.l2
1
>>> par.nest.l3
3
>>> par.nest.nest.l1
1
>>> par.nest.nest.l2
2
>>> par.nest.nest.l3
Traceback (most recent call last):
  ...
AttributeError: 'nest' object has no attribute 'l3'
>>> hasattr(par, 'broken')
False
>>> hasattr(par.nest, 'broken')
False
>>> hasattr(par.nest.nest, 'broken')
False
```

Todo: Should `path` use more explicit notation as in the JSON pointer? That is to say, use `'#'` instead of `''` (an empty string) to indicate the root. Then, for example, `'x'` would be written as `'#.x'`.

info

"Link" parameter.

It's like symbolic-link in the file system.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     x = 1
...     broken = Link('..')
...
...     class nest(Parametric):
...         x = 2
...         l0 = Link('')
...         l1 = Link('x')
...         l2 = Link('..x')
...         l3 = Link('.nest.x')
...         broken = Link('..broken')
...
...         class nest(Parametric):
...             x = 3
...             l0 = Link('')
...             l1 = Link('x')
...             l2 = Link('..x')
...             l3 = Link('.nest.x')
...             broken = Link('..broken')
...
>>> par = MyParametric()
>>> par is par.nest.l0 is par.nest.nest.l0
True
```

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```
>>> par.nest.l1
1
>>> par.nest.l2
1
>>> par.nest.l3
3
>>> par.nest.nest.l1
1
>>> par.nest.nest.l2
2
>>> par.nest.nest.l3
Traceback (most recent call last):
  ...
AttributeError: 'nest' object has no attribute 'l3'
>>> hasattr(par, 'broken')
False
>>> hasattr(par.nest, 'broken')
False
>>> hasattr(par.nest.nest, 'broken')
False
```

Todo: Should `path` use more explicit notation as in the JSON pointer? That is to say, use `'#'` instead of `''` (an empty string) to indicate the root. Then, for example, `'x'` would be written as `'#.x'`.

debug

"Link" parameter.

It's like symbolic-link in the file system.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     x = 1
...     broken = Link('..')
...
...     class nest(Parametric):
...         x = 2
...         l0 = Link('')
...         l1 = Link('x')
...         l2 = Link('..x')
...         l3 = Link('.nest.x')
...         broken = Link('..broken')
...
...         class nest(Parametric):
...             x = 3
...             l0 = Link('')
...             l1 = Link('x')
...             l2 = Link('..x')
...             l3 = Link('.nest.x')
...             broken = Link('..broken')
...
>>> par = MyParametric()
```

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```
>>> par is par.nest.l0 is par.nest.nest.l0
True
>>> par.nest.l1
1
>>> par.nest.l2
1
>>> par.nest.l3
3
>>> par.nest.nest.l1
1
>>> par.nest.nest.l2
2
>>> par.nest.nest.l3
Traceback (most recent call last):
  ...
AttributeError: 'nest' object has no attribute 'l3'
>>> hasattr(par, 'broken')
False
>>> hasattr(par.nest, 'broken')
False
>>> hasattr(par.nest.nest, 'broken')
False
```

Todo: Should `path` use more explicit notation as in the JSON pointer? That is to say, use `'#'` instead of `''` (an empty string) to indicate the root. Then, for example, `'x'` would be written as `'#.x'`.

datastore

Delegate parameter to its owner.

`x = Delegate()` is equivalent to `x = Link('..x')`.

Examples

```
>>> from compapp.core import Parametric
>>> class Parent(Parametric):
...
...     class nest1(Parametric):
...         sampling_period = Delegate()
...
...     class nest2(Parametric):
...         sampling_period = Delegate()
...
...     sampling_period = 10.0
...
>>> par = Parent()
>>> par.sampling_period
10.0
>>> par.nest1.sampling_period
10.0
>>> par.nest2.sampling_period
10.0
>>> par.sampling_period = 20.0
>>> par.nest1.sampling_period
20.0
```

nametemplate = '{self.__class__.__module__}.{self.__class__.__name__}.{id}'

prepare()
[to be extended] For a task immediately *after* `Executable.prepare`.

configure()

should_configure()

__module__ = 'compapp.plugins.misc'

class compapp.plugins.misc.**DebugNS**(*debug*)
Bases: object

__init__(*debug*)
x.__init__(...) initializes x; see help(type(x)) for signature

__setattr__(*name*, *value*)
x.__setattr__('name', value) <==> x.name = value

__dict__ = dict_proxy({'__module__': 'compapp.plugins.misc', '__setattr__': <functio

__module__ = 'compapp.plugins.misc'

__weakref__
list of weak references to the object (if defined)

class compapp.plugins.misc.**Debug**(**args*, ***kwds*)
Bases: *compapp.interface.Plugin*

Debug helper plugin.

Since *Computer* does not allow random attributes to be set, it's hard to debug or interactively investigate simulation and analysis by storing temporary variable to the *Computer* instance. *Debug* provides the place for that.

- If `store` flag is *not* set, it does not store anything; assignment would be just no-op. This is useful for debugging memory-consuming object.
- If `logger` is defined, and its level is DEBUG, assignment to *Debug* object writes out debug message.

Example

```
>>> from compapp import Computer
>>> class MySimulator(Computer):
...
...     def run(self):
...         tmp = list(range(3))
...         self.dbg.tmp = tmp
...         self.results.div = [x / len(tmp) for x in tmp]
...
>>> app = MySimulator()
>>> app.log.level = 'DEBUG'
```

Before `app.execute()`, let's tweak logger output so that output is concise:

```
>>> app.log.formatters['default']['format'] = \
...     '%(levelname)s %(name)s | %(message)s'
>>> app.log.handlers['console']['stream'] = 'ext://sys.stdout'
```

Finally...:

```
>>> app.execute()
DEBUG compapp.plugins.misc.MySimulator.0 | ...
DEBUG compapp.plugins.misc.MySimulator.0 | tmp = [0, 1, 2]
DEBUG compapp.plugins.misc.MySimulator.0 | ...
```

```
>>> app.dbg.tmp
[0, 1, 2]
```

Note that executing the same app without `.log.level = 'DEBUG'` suppress the logging and storing the temporary variable. The Debug plugin also can be disabled independent of the log level by setting its *enable* to `False`.

```
>>> app = MySimulator()
>>> app.execute()
>>> app.dbg.tmp
Traceback (most recent call last):
  ...
AttributeError: 'DebugNS' object has no attribute 'tmp'
```

log

"Link" parameter.

It's like symbolic-link in the file system.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     x = 1
...     broken = Link('..')
...
...     class nest(Parametric):
...         x = 2
...         l0 = Link('')
...         l1 = Link('x')
...         l2 = Link('..x')
...         l3 = Link('.nest.x')
...         broken = Link('..broken')
...
...         class nest(Parametric):
...             x = 3
...             l0 = Link('')
...             l1 = Link('x')
...             l2 = Link('..x')
...             l3 = Link('.nest.x')
...             broken = Link('..broken')
...
>>> par = MyParametric()
>>> par is par.nest.l0 is par.nest.nest.l0
True
>>> par.nest.l1
1
>>> par.nest.l2
1
>>> par.nest.l3
```

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```
3
>>> par.nest.nest.l1
1
>>> par.nest.nest.l2
2
>>> par.nest.nest.l3
Traceback (most recent call last):
  ...
AttributeError: 'nest' object has no attribute 'l3'
>>> hasattr(par, 'broken')
False
>>> hasattr(par.nest, 'broken')
False
>>> hasattr(par.nest.nest, 'broken')
False
```

Todo: Should `path` use more explicit notation as in the JSON pointer? That is to say, use `'#'` instead of `''` (an empty string) to indicate the root. Then, for example, `'x'` would be written as `'#.x'`.

enable
If `'auto'` (default), enable this plugin if the log level of *Logger* plugin is `'DEBUG'` or lower. `True` (`False`) enables (disables) this plugin independent of the log level.

__init__(**args*, ***kwds*)
x.__init__(...) initializes x; see help(type(x)) for signature

is_logging_debug()

is_enabled()

__module__ = 'compapp.plugins.misc'

class compapp.plugins.misc.**Figure**(**args*, ***kwds*)
Bases: *compapp.interface.Plugin*

A wrapper around `matplotlib.pyplot.figure`.

Automatically save and (optionally) show the figure at the end of execution.

Examples

Normally, *Figure* is prepared by an *Executable* subclass such as *Computer*. To manually play with *Figure*, it is equivalent to do:

```
>>> figure = Figure()
>>> figure.prepare()
```

Calling a *Figure* instance gives you a matplotlib figure.

```
>>> figure()
<Figure size ... with 0 Axes>
```

It also has *subplots* which is just a thin wrapper around `matplotlib.pyplot.subplots`:

```
>>> fig, (ax1, ax2) = figure.subplots(2)
```

Suppose you have a nested *Computer*s:

```
>>> from compapp.apps import Computer
>>> class MyApp(Computer):
...     class sub(Computer):
...         class sub(Computer):
...             pass
```

Global *Figure* plugin configuration The attribute *autoclose* is *Link*ed to the plugin of the owner `Computer`. It makes possible to configure *Figure* plugins "globally":

```
>>> app = MyApp()
>>> app.sub.figure.autoclose  # default value
True
>>> app.figure.autoclose = False
>>> app.sub.figure.autoclose
False
>>> app.sub.sub.figure.autoclose
False
```

A "sub-tree" of the *Computer*s can be configured separately:

```
>>> app.sub.figure.autoclose = True
>>> app.sub.sub.figure.autoclose
True
>>> app.figure.autoclose
False
```

Similar global/sub-tree configuration mechanism works for the *show* attribute:

```
>>> app.figure.show  # default value
False
>>> app.figure.show = True
>>> app.sub.figure.show
True
>>> app.sub.sub.figure.show
True
```

```
>>> import os
>>> from compapp import Computer
>>> class MyApp(Computer):
...     def run(self):
...         self.figure()
...         self.figure(name='alpha')
...         self.figure(name='beta')
...
>>> app = MyApp()
>>> app.datastore.dir = 'out'
>>> app.execute()
>>> sorted(f for f in os.listdir('out') if f.startswith('figure-'))
['figure-0.png', 'figure-alpha.png', 'figure-beta.png']
```

See also:

Example: compapp.samples.simple_plots, *Example: compapp.samples.named_figure*

ext = 'png'

datastore
*Delegate*ed attribute accessing to a *BaseDataStore*.

show
Automatically call `matplotlib.pyplot.show` if `True`. The default is `False`, if not specified by the *owner class*. See: *Global Figure plugin configuration*.

autoclose
Automatically close matplotlib figures if `True` which is the default, if not specified by the *owner class*. See: *Global Figure plugin configuration*.

prepare()
[to be extended] For a task immediately *after* `Executable.prepare`.

register(*fig*, *name=None*)
Register `fig` so that it is automatically saved, showed and closed.

__call__(**args*, ***kwds*)
Make a new matplotlib figure.

All the positional and keyword arguments are passed to `matplotlib.pyplot.figure` except one keyword argument *name*.

Parameters **name** (*str, int, or None*) – Unique name of the figure. It is an error to call this method with the same *name* twice.

Returns fig

Return type matplotlib.figure.Figure

__getitem__(*name*)
Make a new matplotlib figure or get the new one.

Examples

The usual preparation (see: *Figure*):

```
>>> figure = Figure()
>>> figure.prepare()
```

If figure is created with a name, it can be accessed by the dict-like interface:

```
>>> fig_a = figure(name='a')
>>> assert fig_a is figure['a']  # access an existing figure
>>> fig_b = figure['b']  # create a new figure
>>> assert fig_b is figure['b']
```

Note that a new figure is created always when *name* is `None`:

```
>>> assert figure[None] is not figure[None]
```

Parameters **name** (*str, int, or None*) – Unique name of the figure.

Returns fig

Return type matplotlib.figure.Figure

save()
[to be extended] For a task immediately *after* `Executable.save`.

finish()
[to be extended] For a task immediately *before* `Executable.finish`.

subplots(**args*, ***kwds*)
Wrapper around `matplotlib.pyplot.subplot`.

All the positional and keyword arguments are passed to `matplotlib.pyplot.subplot` except one keyword argument *name*.

Parameters **name** (*str, int, or None*) – Unique name of the figure. It is an error to call this method with the same *name* twice.

Returns

- **fig** (`matplotlib.figure.Figure`)
- **ax** (`matplotlib.axes.Axes` or `tuple`)

__module__ = 'compapp.plugins.misc'

compapp.plugins.misc.**is_runnable**(*excbl*)

class compapp.plugins.misc.**AutoUpstreams**(**args*, ***kwds*)
Bases: *compapp.interface.Plugin*

Automatically execute upstreams.

__module__ = 'compapp.plugins.misc'

static is_runnable(*excbl*)

prepare()
[to be extended] For a task immediately *after* `Executable.prepare`.

class compapp.plugins.misc.**PluginWrapper**(**args*, ***kwds*)
Bases: *compapp.interface.Plugin*

Combine multiple plugins into one plugin.

Some plugin such as `AutoDump` has no "interface" and just works behind-the-scene. In this case, having `MyApp.autodump = AutoDump` is just wasting user's name-space. This class avoid this by moving all those behind-the-scene plugins into one name. See `Computer.plugin` for its use-case.

__module__ = 'compapp.plugins.misc'

finish()

load()

post_run()

pre_run()

prepare()

save()

__getattr__(*name*)

compapp.plugins.misc.**makemethod**(*method*)

compapp.plugins.misc.**real_owner**(*self*)

compapp.plugins.programinfo module

class compapp.plugins.programinfo.**RecordProgramInfo**(**args*, ***kwds*)

Bases: *compapp.interface.Plugin*

meta

"Link" parameter.

It's like symbolic-link in the file system.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     x = 1
...     broken = Link('..')
...
...     class nest(Parametric):
...         x = 2
...         l0 = Link('')
...         l1 = Link('x')
...         l2 = Link('..x')
...         l3 = Link('.nest.x')
...         broken = Link('..broken')
...
...         class nest(Parametric):
...             x = 3
...             l0 = Link('')
...             l1 = Link('x')
...             l2 = Link('..x')
...             l3 = Link('.nest.x')
...             broken = Link('..broken')
...
>>> par = MyParametric()
>>> par is par.nest.l0 is par.nest.nest.l0
True
>>> par.nest.l1
1
>>> par.nest.l2
1
>>> par.nest.l3
3
>>> par.nest.nest.l1
1
>>> par.nest.nest.l2
2
>>> par.nest.nest.l3
Traceback (most recent call last):
  ...
AttributeError: 'nest' object has no attribute 'l3'
>>> hasattr(par, 'broken')
False
>>> hasattr(par.nest, 'broken')
False
>>> hasattr(par.nest.nest, 'broken')
False
```

Todo: Should `path` use more explicit notation as in the JSON pointer? That is to say, use `'#'` instead of `''` (an empty string) to indicate the root. Then, for example, `'x'` would be written as `'#.x'`.

pre_run()
[to be extended] For a task immediately before `Executable.run`.

__module__ = 'compapp.plugins.programinfo'

compapp.plugins.recorders module

class compapp.plugins.recorders.**DumpResults**(**args*, ***kwds*)
Bases: *compapp.interface.Plugin*

Automatically save owner's results.

Supported back-ends:

- `json` for `dict`, `list` or `tuple`
- `numpy.savez` for `numpy.ndarray`
- pandas.HDFStore for pandas object

Example

```
>>> import numpy
>>> import pandas
>>> from compapp.apps import Computer
```

Examples below use an app class derived from *Computer* since it is bundled with the *DumpResults* plugin:

```
>>> Computer.magics.dumpresults
<class 'compapp.plugins.recorders.DumpResults'>
```

```
>>> class MyApp(Computer):
...
...     def run(self):
...         self.results.int = 0
...         self.results.float = 1.0
...         self.results.list = [2, 3, 4]
...         self.results.tuple = (5, 6, 7)
...         self.results.array = numpy.arange(8)
...         self.results.df = pandas.DataFrame({'col': [9, 10, 11]})
...         self.isrun = True
...     isrun = False
...
>>> app = MyApp()
>>> app.datastore.dir = 'out'
>>> os.path.exists(app.datastore.dir)
False
>>> app.execute()
>>> app.isrun
True
>>> os.path.exists(app.datastore.dir)
True
```

The results of the above "simulation" is saved in `results.*` under `app.datastore.dir`:

```
>>> from glob import glob
>>> sorted(glob(app.datastore.path('results.*')))
['out/results.hdf5', 'out/results.json', 'out/results.npz']
```

Now let's load these results.

```
>>> app2 = MyApp()
>>> app2.mode = 'load'
>>> app2.datastore.dir = 'out'
>>> app2.execute()
>>> app2.isrun
False
>>> sorted(app2.results)
['array', 'df', 'float', 'int', 'list', 'tuple']
>>> app2.results.list
[2, 3, 4]
>>> app2.results.array
array([0, 1, 2, 3, 4, 5, 6, 7])
>>> app2.results.df
   col
0    9
1   10
2   11
```

Note that simple Python types are saved as JSON. Thus, some type information is stripped off after reloading:

```
>>> app2.results.tuple
[5, 6, 7]
```

result_names = ('results',)
These attributes of the owner class are dumped.

pre_run()
[to be extended] For a task immediately before `Executable.run`.

save()
[to be extended] For a task immediately *after* `Executable.save`.

save_now()
Save results to disk immediately.

classmethod save_results(*owner*, *name*)

static save_results_json(*data*, *path*)

static save_results_npz(*data*, *path*)

static save_results_hdf5(*data*, *path*)
Save pandas objects in `data` to a HDFStore at `path`.

Implementation notes

It is important to note that repeatedly overwrite the same HDF file is a bad practice, since deleting objects in HDF does **not** free the space:

> Can you delete objects in an HDF5 file ? If yes, how ?
>
> Yes, you can use the H5Ldelete function to delete objects in an HDF5 file (for HDF5 1.6, use H5Gunlink). Currently, however, **the space where the object was located in the file does not**

> **get re-used**. Therefore the size of the file will remain the same. You can get rid of this unused space in a file by writing the contents of the HDF5 file to a new file.
>
> —http://ns1.hdfgroup.org/hdf5-quest.html#del
>
> found via HDFStore file size mysteriously increases - Issue #2132 - pandas-dev/pandas

That's why this function first creates a new HDF file at `path + '.new'` and then move it to `path`.

load()
[to be extended] For a task immediately *before* `Executable.load`.

static load_results_json(*path*)

static load_results_npz(*path*)

static load_results_hdf5(*path*)

save_maybe()
Save results in a background thread, if the thread is not busy.

__module__ = 'compapp.plugins.recorders'

class compapp.plugins.recorders.**DumpParameters**(**args*, ***kwds*)
Bases: *compapp.interface.Plugin*

Dump parameters used for its owner.

Example

```
>>> from compapp.core import Parametric
>>> from compapp.apps import Computer
```

Examples below use an app class derived from *Computer* since it is bundled with the *DumpResults* plugin:

```
>>> Computer.magics.dumpparameters
<class 'compapp.plugins.recorders.DumpParameters'>
```

```
>>> class MyApp(Computer):
...     i = 0
...     x = 1.0
...     class nested(Parametric):
...         i = 10
...         x = 11.0
...
>>> app = MyApp()
>>> app.datastore.dir = 'out'
>>> app.i = -1
>>> app.execute()
```

The parameters are dumped automatically to `out/params.json`:

```
>>> app.datastore.path('params.json')
'out/params.json'
>>> os.path.exists('out/params.json')
True
```

Running the app using `mode='load'` automatically loads the parameters:

```
>>> app2 = MyApp()
>>> app2.mode = 'load'
>>> app2.datastore.dir = 'out'
>>> app2.execute()
>>> app2.i
-1
```

pre_run()
[to be extended] For a task immediately before `Executable.run`.

__module__ = 'compapp.plugins.recorders'

load()
[to be extended] For a task immediately *before* `Executable.load`.

compapp.plugins.sysinfo module

class compapp.plugins.sysinfo.**RecordSysInfo**(**args*, ***kwds*)
Bases: *compapp.interface.Plugin*

meta
"Link" parameter.

It's like symbolic-link in the file system.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     x = 1
...     broken = Link('..')
...
...     class nest(Parametric):
...         x = 2
...         l0 = Link('')
...         l1 = Link('x')
...         l2 = Link('..x')
...         l3 = Link('.nest.x')
...         broken = Link('..broken')
...
...         class nest(Parametric):
...             x = 3
...             l0 = Link('')
...             l1 = Link('x')
...             l2 = Link('..x')
...             l3 = Link('.nest.x')
...             broken = Link('..broken')
...
>>> par = MyParametric()
>>> par is par.nest.l0 is par.nest.nest.l0
True
>>> par.nest.l1
1
>>> par.nest.l2
1
```

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```
>>> par.nest.l3
3
>>> par.nest.nest.l1
1
>>> par.nest.nest.l2
2
>>> par.nest.nest.l3
Traceback (most recent call last):
  ...
AttributeError: 'nest' object has no attribute 'l3'
>>> hasattr(par, 'broken')
False
>>> hasattr(par.nest, 'broken')
False
>>> hasattr(par.nest.nest, 'broken')
False
```

Todo: Should `path` use more explicit notation as in the JSON pointer? That is to say, use `'#'` instead of `''` (an empty string) to indicate the root. Then, for example, `'x'` would be written as `'#.x'`.

root
An alias of `Link('')`.

pre_run()
[to be extended] For a task immediately before `Executable.run`.

__module__ = 'compapp.plugins.sysinfo'

compapp.plugins.timing module

compapp.plugins.timing.**getrusage_self**()
See: getrusage(2)

compapp.plugins.timing.**gettimings**()

class compapp.plugins.timing.**RecordTiming**(**args*, ***kwds*)
Bases: *compapp.interface.Plugin*

Record timing information.

```
>>> import time
>>> from compapp.apps import Computer
>>> class MyApp(Computer):
...     def run(self):
...         time.sleep(0.5)
>>> app = MyApp()
>>> app.execute()
```

```
>>> timing = app.magics.meta.data['timing']
>>> (timing['post']['rusage']['ru_utime']
... + timing['post']['rusage']['ru_stime']
... - timing['pre']['rusage']['ru_utime']
... - timing['pre']['rusage']['ru_stime']) < 1.5
True
```

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```
>>> 0.5 < timing['post']['time'] - timing['pre']['time'] < 1.5
True
```

meta

"Link" parameter.

It's like symbolic-link in the file system.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     x = 1
...     broken = Link('..')
...
...     class nest(Parametric):
...         x = 2
...         l0 = Link('')
...         l1 = Link('x')
...         l2 = Link('..x')
...         l3 = Link('.nest.x')
...         broken = Link('..broken')
...
...         class nest(Parametric):
...             x = 3
...             l0 = Link('')
...             l1 = Link('x')
...             l2 = Link('..x')
...             l3 = Link('.nest.x')
...             broken = Link('..broken')
...
>>> par = MyParametric()
>>> par is par.nest.l0 is par.nest.nest.l0
True
>>> par.nest.l1
1
>>> par.nest.l2
1
>>> par.nest.l3
3
>>> par.nest.nest.l1
1
>>> par.nest.nest.l2
2
>>> par.nest.nest.l3
Traceback (most recent call last):
  ...
AttributeError: 'nest' object has no attribute 'l3'
>>> hasattr(par, 'broken')
False
>>> hasattr(par.nest, 'broken')
False
>>> hasattr(par.nest.nest, 'broken')
False
```

Todo: Should `path` use more explicit notation as in the JSON pointer? That is to say, use `'#'` instead of `''` (an empty string) to indicate the root. Then, for example, `'x'` would be written as `'#.x'`.

pre_run()
[to be extended] For a task immediately before `Executable.run`.

__module__ = 'compapp.plugins.timing'

post_run()
[to be extended] For a task immediately after `Executable.run`.

compapp.plugins.vcs module

class compapp.plugins.vcs.**Git**(*filepath*)
Bases: object

vcstype = 'git'

git_cmd = ('git',)

__init__(*filepath*)
x.__init__(...) initializes x; see help(type(x)) for signature

git(**cmd*)

revision()

isclean()

vcsinfo()

__dict__ = dict_proxy({'__module__': 'compapp.plugins.vcs', 'git': <function git>, '

__module__ = 'compapp.plugins.vcs'

__weakref__
list of weak references to the object (if defined)

compapp.plugins.vcs.**getvcs**(*filepath*)

class compapp.plugins.vcs.**RecordVCS**(**args*, ***kwds*)
Bases: *compapp.interface.Plugin*

Record VCS revision automatically.

Example

```
>>> from compapp.apps import Computer
>>> app = Computer()
>>> app.datastore.dir = 'out'
>>> app.execute()
>>> vcsinfo = app.magics.meta.data['vcs']
>>> sorted(vcsinfo)
['filepath', 'isclean', 'revision', 'root', 'vcs']
>>> from compapp import apps
>>> apps.__file__ == vcsinfo['filepath']
True
```

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```
>>> vcsinfo['vcs']
'git'
```

VCS information is loaded when the app is executed in load mode:

```
>>> app2 = Computer()
>>> app2.mode = 'load'
>>> app2.datastore.dir = 'out'
>>> app2.execute()
>>> app2.magics.meta.data['vcs'] == vcsinfo
True
```

meta

"Link" parameter.

It's like symbolic-link in the file system.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     x = 1
...     broken = Link('..')
...
...     class nest(Parametric):
...         x = 2
...         l0 = Link('')
...         l1 = Link('x')
...         l2 = Link('..x')
...         l3 = Link('.nest.x')
...         broken = Link('..broken')
...
...         class nest(Parametric):
...             x = 3
...             l0 = Link('')
...             l1 = Link('x')
...             l2 = Link('..x')
...             l3 = Link('.nest.x')
...             broken = Link('..broken')
...
>>> par = MyParametric()
>>> par is par.nest.l0 is par.nest.nest.l0
True
>>> par.nest.l1
1
>>> par.nest.l2
1
>>> par.nest.l3
3
>>> par.nest.nest.l1
1
>>> par.nest.nest.l2
2
>>> par.nest.nest.l3
Traceback (most recent call last):
```

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```
  ...
AttributeError: 'nest' object has no attribute 'l3'
>>> hasattr(par, 'broken')
False
>>> hasattr(par.nest, 'broken')
False
>>> hasattr(par.nest.nest, 'broken')
False
```

Todo: Should `path` use more explicit notation as in the JSON pointer? That is to say, use `'#'` instead of `''` (an empty string) to indicate the root. Then, for example, `'x'` would be written as `'#.x'`.

pre_run()
[to be extended] For a task immediately before `Executable.run`.

__module__ = 'compapp.plugins.vcs'

Module contents

8.1.3 compapp.samples package

Submodules

compapp.samples.named_figure module

class compapp.samples.named_figure.**MyApp**(**args*, ***kwds*)
Bases: *compapp.apps.Computer*

run()
[to be extended] Do the actual simulation/analysis.

__module__ = 'compapp.samples.named_figure'

compapp.samples.pluggable_plotter_exec module

class compapp.samples.pluggable_plotter_exec.**HistPlotter**(**args*, ***kwds*)
Bases: *compapp.executables.Plotter*

bins = 100

run(*x*)
[to be extended] Do the actual simulation/analysis.

__module__ = 'compapp.samples.pluggable_plotter_exec'

class compapp.samples.pluggable_plotter_exec.**CumHistPlotter**(**args*, ***kwds*)
Bases: *compapp.samples.pluggable_plotter_exec.HistPlotter*

cumulative = True

__module__ = 'compapp.samples.pluggable_plotter_exec'

class compapp.samples.pluggable_plotter_exec.**MySimulator**(**args*, ***kwds*)
Bases: *compapp.apps.Computer*

samples = 1000

run()
[to be extended] Do the actual simulation/analysis.

__module__ = 'compapp.samples.pluggable_plotter_exec'

class compapp.samples.pluggable_plotter_exec.**MyApp**(**args*, ***kwds*)
Bases: *compapp.apps.Computer*

sim
alias of *MySimulator*

density
alias of *HistPlotter*

cumdist
alias of *CumHistPlotter*

run()
[to be extended] Do the actual simulation/analysis.

__module__ = 'compapp.samples.pluggable_plotter_exec'

compapp.samples.pluggable_plotter_link module

class compapp.samples.pluggable_plotter_link.**HistPlotter**(**args*, ***kwds*)
Bases: *compapp.executables.Plotter*

bins = 100

data
"Link" parameter.

It's like symbolic-link in the file system.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     x = 1
...     broken = Link('..')
...
...     class nest(Parametric):
...         x = 2
...         l0 = Link('')
...         l1 = Link('x')
...         l2 = Link('..x')
...         l3 = Link('.nest.x')
...         broken = Link('..broken')
...
...         class nest(Parametric):
...             x = 3
...             l0 = Link('')
...             l1 = Link('x')
...             l2 = Link('..x')
...             l3 = Link('.nest.x')
...             broken = Link('..broken')
```

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```
...
>>> par = MyParametric()
>>> par is par.nest.l0 is par.nest.nest.l0
True
>>> par.nest.l1
1
>>> par.nest.l2
1
>>> par.nest.l3
3
>>> par.nest.nest.l1
1
>>> par.nest.nest.l2
2
>>> par.nest.nest.l3
Traceback (most recent call last):
  ...
AttributeError: 'nest' object has no attribute 'l3'
>>> hasattr(par, 'broken')
False
>>> hasattr(par.nest, 'broken')
False
>>> hasattr(par.nest.nest, 'broken')
False
```

Todo: Should `path` use more explicit notation as in the JSON pointer? That is to say, use `'#'` instead of `''` (an empty string) to indicate the root. Then, for example, `'x'` would be written as `'#.x'`.

run()
[to be extended] Do the actual simulation/analysis.

__module__ = 'compapp.samples.pluggable_plotter_link'

class compapp.samples.pluggable_plotter_link.**CumHistPlotter**(**args*, ***kwds*)
Bases: *compapp.samples.pluggable_plotter_link.HistPlotter*

cumulative = True

__module__ = 'compapp.samples.pluggable_plotter_link'

class compapp.samples.pluggable_plotter_link.**MySimulator**(**args*, ***kwds*)
Bases: *compapp.apps.Computer*

samples = 1000

run()
[to be extended] Do the actual simulation/analysis.

__module__ = 'compapp.samples.pluggable_plotter_link'

class compapp.samples.pluggable_plotter_link.**MyApp**(**args*, ***kwds*)
Bases: *compapp.apps.Computer*

autoupstreams
alias of *compapp.plugins.misc.AutoUpstreams*

sim
alias of *MySimulator*

density
alias of *HistPlotter*

cumdist
alias of *CumHistPlotter*

__module__ = 'compapp.samples.pluggable_plotter_link'

compapp.samples.simple_plots module

class compapp.samples.simple_plots.**MyApp**(**args*, ***kwds*)
Bases: *compapp.apps.Computer*

run()
[to be extended] Do the actual simulation/analysis.

__module__ = 'compapp.samples.simple_plots'

Module contents

8.1.4 compapp.tests package

Submodules

compapp.tests.test_apps module

compapp.tests.test_base module

compapp.tests.test_base.**test_unspecified_pickleable**()

compapp.tests.test_base.**test_unspecified_repr**()

compapp.tests.test_base.**test_unspecified_bool**()

compapp.tests.test_core module

class compapp.tests.test_core.**ParWithMissingLink**(**args*, ***kwds*)
Bases: *compapp.core.Parametric*

sub
alias of *compapp.core.Parametric*

link
"Link" parameter.

It's like symbolic-link in the file system.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     x = 1
...     broken = Link('..')
```

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```
...
...     class nest(Parametric):
...         x = 2
...         l0 = Link('')
...         l1 = Link('x')
...         l2 = Link('..x')
...         l3 = Link('.nest.x')
...         broken = Link('..broken')
...
...         class nest(Parametric):
...             x = 3
...             l0 = Link('')
...             l1 = Link('x')
...             l2 = Link('..x')
...             l3 = Link('.nest.x')
...             broken = Link('..broken')
...
>>> par = MyParametric()
>>> par is par.nest.l0 is par.nest.nest.l0
True
>>> par.nest.l1
1
>>> par.nest.l2
1
>>> par.nest.l3
3
>>> par.nest.nest.l1
1
>>> par.nest.nest.l2
2
>>> par.nest.nest.l3
Traceback (most recent call last):
  ...
AttributeError: 'nest' object has no attribute 'l3'
>>> hasattr(par, 'broken')
False
>>> hasattr(par.nest, 'broken')
False
>>> hasattr(par.nest.nest, 'broken')
False
```

Todo: Should `path` use more explicit notation as in the JSON pointer? That is to say, use `'#'` instead of `''` (an empty string) to indicate the root. Then, for example, `'x'` would be written as `'#.x'`.

__module__ = 'compapp.tests.test_core'

compapp.tests.test_core.**test_missing_link**()

compapp.tests.test_executable module

compapp.tests.test_interface module

compapp.tests.test_loader module

compapp.tests.test_loader.**test_load_dynamic_class**(*tmpdir*)

compapp.tests.test_parametric module

class compapp.tests.test_parametric.**MyParametric**(**args*, ***kwds*)
Bases: *compapp.core.Parametric*

i = 1

x = 2.0

class nested(**args*, ***kwds*)
Bases: *compapp.core.Parametric*

a = 100

b = 200

__module__ = 'compapp.tests.test_parametric'

__module__ = 'compapp.tests.test_parametric'

class compapp.tests.test_parametric.**TestMixObject**(*methodName='runTest'*)
Bases: unittest.case.TestCase

class AutoMixed(**args*, ***kwds*)
Bases: *compapp.tests.test_parametric.MyParametric*

class nested
Bases: object

a = -1

__dict__ = dict_proxy({'a': -1, '__dict__': <attribute '__dict__' of 'nested'

__module__ = 'compapp.tests.test_parametric'

__weakref__
list of weak references to the object (if defined)

__module__ = 'compapp.tests.test_parametric'

test_default_value()

test_custom_value()

__module__ = 'compapp.tests.test_parametric'

class compapp.tests.test_parametric.**TestMixClassObj**(*methodName='runTest'*)
Bases: *compapp.tests.test_parametric.TestMixObject*

class AutoMixed(**args*, ***kwds*)
Bases: *compapp.tests.test_parametric.MyParametric*

class nested

```
            a = -1
            __module__ = 'compapp.tests.test_parametric'
        __module__ = 'compapp.tests.test_parametric'
    __module__ = 'compapp.tests.test_parametric'
```

compapp.tests.test_parametric.**test_assembler_init**()

compapp.tests.test_parser module

compapp.tests.test_samples module

compapp.tests.test_setters module

class compapp.tests.test_setters.**MyApp**(**args*, ***kwds*)
Bases: *compapp.apps.Computer*

dynamic
Placeholder for an instance of the class specified by *ClassPath*.

The actual instantiation process is delayed until it is accessed (i.e., __get__ method is called).

classpath
Class path descriptor that imports specified class on change.

__module__ = 'compapp.tests.test_setters'

class compapp.tests.test_setters.**ClassA**(**args*, ***kwds*)
Bases: *compapp.apps.Computer*

x = 0

__module__ = 'compapp.tests.test_setters'

class compapp.tests.test_setters.**ClassB**(**args*, ***kwds*)
Bases: *compapp.tests.test_setters.ClassA*

x = 2

__module__ = 'compapp.tests.test_setters'

compapp.tests.test_setters.**test_subs_dynamic_class**()

compapp.tests.test_strict module

compapp.tests.test_variator module

Module contents

8.1.5 compapp.utils package

Submodules

compapp.utils.files module

compapp.utils.files.**safewrite**(**args*, ***kwds*)

Open a temporary file and replace it with `path` upon close.

Examples

```
>>> with open('data.txt', 'w') as f:
...     _ = f.write('original content')
>>> with safewrite('data.txt') as f:
...     _ = f.write(str(1 / 0))
Traceback (most recent call last):
  ...
ZeroDivisionError: ...
>>> with open('data.txt') as f:
...     print(f.read())
original content
```

If it were a normal `open`, then the original content would be wiped out.

```
>>> with open('data.txt', 'w') as f:
...     _ = f.write(str(1 / 0))
Traceback (most recent call last):
  ...
ZeroDivisionError: ...
>>> with open('data.txt') as f:
...     print(f.read())
```

compapp.utils.importer module

compapp.utils.importer.**import_object**(*name*, *current_module=None*)

Import an object at "dotted path".

```
>>> from importlib import import_module
>>> import_object('importlib.import_module') is import_module
True
```

Any object such as package, module, sub-module, function and class can be imported:

```
>>> import_object('json')
<module 'json' from '...'>
```

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```
>>> import_object('json.load')
<function load at ...>
>>> import_object('os.path')
<module ...>
>>> import_object('os.path.join')
<function ...join at ...>
```

To support relative import, `current_module` has to be provided. Typically, it's `__name__`.:

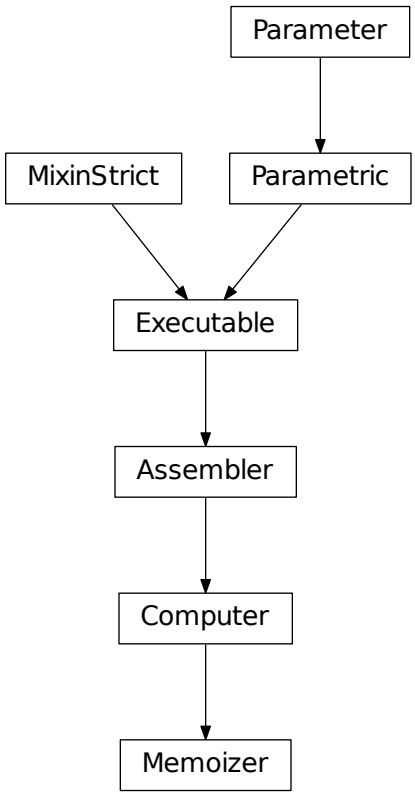
```
import_object('spam.egg', __name__)
```

Module contents

8.2 Submodules

8.2.1 compapp.apps module

Application base classes.



compapp.apps.**print_full_help**(*app*)

class compapp.apps.**Computer**(**args*, ***kwds*)
Bases: *compapp.executables.Assembler*

Application base class.

Everything needed for save/load functions are implemented by plugins (see: *magics*). Only the method `run()` is needed to be implemented most of the cases.

cli(*args=None*)
Run Command Line Interface of this class.

Examples

```
myapp.py --datastore.dir OUT
myapp.py --sub.floats[0] 10
myapp.py --sub.plotters[0].bin 100
myapp.py --params parameters.yaml
```

If multiple parameter files are given, they will be mixed together before given to the class:

```
myapp.py --params base.yaml extension.yaml
```

Data file for nested classes (`:file=` modifier):

```
myapp.py --simulator:file=param.yaml --plotter:file=plotter.json
```

Literal eval (`:leval=` modifier):

```
myapp.py --alpha:leval='2**3'
```

Regular help:

```
myapp.py -h
myapp.py --help
```

Full Help (include full list of parameters):

```
myapp.py -H
myapp.py --help-all
```

classmethod get_parser()

classmethod from_param(*param*, *require_all=False*, *filter_param=False*)
Create an instance based on `param` and `execute` it.

Parameters

- **param** (*dict*) –
- **require_all** (*bool*) – If true, a `ValueError` is raised if `param` does not have all parameters for this and nested `Parametric` classes.
- **filter_param** (*bool*) – If true, keys and sub-keys in `param` which is not valid to this class are removed.

Returns self

Return type *Computer*

__module__ = 'compapp.apps'

class compapp.apps.**Memoizer**(**args*, ***kwds*)

Bases: *compapp.apps.Computer*

Computer with *HashDataStore*.

Examples

```
>>> class UpStream1(Memoizer):
...
...     parameter = 1
...     isrun = None
...
...     def run(self):
...         self.results.data = 'result of intense computation'
...         self.results.name = type(self).__name__
...         self.isrun = True
...
...     def load(self):
...         self.isrun = False
...
>>> class UpStream2(UpStream1):
...     pass
...
>>> class DownStream(UpStream1):
...     up1 = UpStream1
...     up2 = UpStream2
...
...     def run(self):
...         self.up1.execute()
...         self.up2.execute()
...         super(DownStream, self).run()
...         self.results.sum = (self.up1.results.data +
...                             self.up2.results.data)
...
>>> up1 = UpStream1()
>>> up1.execute()
>>> assert up1.isrun
>>> up1 = UpStream1()
>>> up1.execute()
>>> assert not up1.isrun
>>> down = DownStream()
>>> down.execute()
>>> assert not down.up1.isrun
>>> assert down.up2.isrun
>>> assert down.isrun
>>> down.up1.results.data == 'result of intense computation'
True
```

mode

Attribute accepting only one of the specified value.

Parameters

- **default** – Default value (see *nodefault*).
- ***choices** – Alternative values.
- **nodefault** (*bool*) – Treat *default* is just an alternative; i.e., do not "initialize" the attribute.

- ****kwds** – See: *DataDescriptor*.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     choice = Choice(1, 2, 'a')
...
>>> mp = MyParametric()
>>> mp.choice
1
>>> mp.choice = 2
>>> mp.choice = 'a'
>>> mp.choice = 'unknown'
Traceback (most recent call last):
  ...
ValueError: MyParametric.choice only accepts one of (1, 2, 'a'):
got 'unknown'
```

__module__ = 'compapp.apps'

datastore
alias of *compapp.plugins.datastores.HashDataStore*

8.2.2 compapp.base module

compapp.base.**constant**(*cls*)
Pickleable singleton generator.

Usage:

```
>>> @constant
... class MyConstant(object):
...     pass
...
>>> MyConstant
MyConstant
```

exception compapp.base.**MultiException**(*message='Multiple exceptions are raised:'*, *errors=None*)
Bases: exceptions.Exception

__init__(*message='Multiple exceptions are raised:'*, *errors=None*)
x.__init__(...) initializes x; see help(type(x)) for signature

__str__() <==> *str(x)*

record(***kwds*)

classmethod recorder(***kwds*)
Context manager to raise error (if any) at the end of execution.

```
>>> with MultiException.recorder() as mexc:
...     with mexc.record():
...         raise ValueError(1)
...     with mexc.record():
...         raise RuntimeError(2)
```

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```
Traceback (most recent call last):
  ...
MultiException: Multiple exceptions are raised:
* ValueError: 1
* RuntimeError: 2
```

classmethod run(*callbacks*)

Run all `callbacks` ignoring exceptions and raise at the end (if any).

```
>>> def raiser(e):
...     raise e
>>> MultiException.run([
...     # takes tuple (func, arg1, arg2, ...):
...     (raiser, ValueError(1)),
...     # or a function without any argument:
...     lambda: raiser(RuntimeError(2)),
... ])
Traceback (most recent call last):
  ...
MultiException: Multiple exceptions are raised:
* ValueError: 1
* RuntimeError: 2
```

__module__ = 'compapp.base'

__weakref__

list of weak references to the object (if defined)

class compapp.base.**DictObject**(**args*, ***kwds*)

Bases: `object`

Dict-Object Hybrid

Example

```
>>> obj = DictObject()
>>> obj['mykey'] = 'myval'
>>> obj.mykey
'myval'
>>> obj()
{'mykey': 'myval'}
>>> obj
DictObject({'mykey': 'myval'})
>>> 'mykey' in obj
True
>>> '__init__' in obj
False
>>> list(obj)
['mykey']
>>> len(obj)
1
>>> del obj['mykey']
>>> len(obj)
0
>>> obj.mykey = 'anotherval'
>>> obj['mykey']
```

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```
'anotherval'
>>> del obj.mykey
>>> len(obj)
0
>>> obj = DictObject()
>>> obj
DictObject({})
```

__init__(**args*, ***kwds*)
x.__init__(...) initializes x; see help(type(x)) for signature

__getitem__(*name*)

__setitem__(*name*, *value*)

__call__(*...*) <==> *x(...)*

__iter__()

__delitem__(*x*)

__contains__(*x*)

__len__()

__repr__() <==> *repr(x)*

__eq__(*other*)
x.__eq__(y) <==> x==y

__dict__ = dict_proxy({'__delitem__': <function __delitem__>, '__module__': 'compapp

__module__ = 'compapp.base'

__weakref__
list of weak references to the object (if defined)

compapp.base.**dotted_to_nested**(*ddict*)
Convert dotted dictionary to nested dictionary.

```
>>> assert dotted_to_nested({
...     'a.b.c': 1,
...     'a.d': 2,
... }) == dict(
...     a=dict(b=dict(c=1),
...            d=2),
... )
```

compapp.base.**deepmixdicts**(**dicts*)
Deeply mix dictionaries.

```
>>> deepmixdicts(
...     {'a': 1, 'b': 2, 'sub': {'x': 1, 'y': 2, 'sub': {'v': 1}}},
...     {'a': 2, 'c': 3, 'sub': {'x': 2, 'z': 3, 'sub': {'v': 2}}},
... ) == {
...     'a': 2, 'b': 2, 'c': 3,
...     'sub': {
...         'x': 2, 'y': 2, 'z': 3,
...         'sub': {'v': 2},
...     },
```

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```
... }
True
```

compapp.base.**itervars**(*obj*)

compapp.base.**props_of**(*obj*, *_type*)
Yield attributes of type _type which already exist at the "class-level".

compapp.base.**mixdicts**(*dicts*)

8.2.3 compapp.cli module

compapp.cli.**import_appclass**(*path*, *supcls=<class 'compapp.apps.Computer'>*)

compapp.cli.**cli_run**(*path*, *args*)
Run application class at path with args.

Examples

```
run compapp.samples.pluggable_plotter_exec.MyApp
```

When there is only one compapp.Computer subclass in a module, class name can be omitted. Thus, these are equivalent:

```
run compapp.samples.simple_plots.MyApp
run compapp.samples.simple_plots
```

If there are multiple classes, a "main" class for a module can be declared simply by setting it to a variable called main, i.e., by main = MyApp.

When A/B/C/D.py is passed as path and A/B/ (say) is a project root, i.e., there is a A/B/setup.py file, then it is equivalent to passing the module path C.D. Thus, the following is equivalent to above two:

```
run compapp/samples/simple_plots.py
```

compapp.cli.**cli_mrun**(*path*, *args*)
Run any class at path with different parameters.

See help of run command for how path is interpreted. Note that path can point to any class (not just Computer subclass).

compapp.cli.**make_parser**(*doc=None*)

compapp.cli.**main**(*args=None*)

8.2.4 compapp.conftest module

8.2.5 compapp.core module

compapp.core.**basic_types = (<type 'complex'>, <type 'float'>, <type 'int'>, <type 'str'>, <**
Basic Python types.

compapp.core.**simple_type_check**(*default*, *actual*, *errfmt*, ***fmtkwds*)

compapp.core.**automixin**(*owner*, *key*, *params*)

class compapp.core.**WeakRefProperty**(*name*)
Bases: object

__init__(*name*)
x.__init__(...) initializes x; see help(type(x)) for signature

__get__(*obj*, *cls*)

__set__(*obj*, *value*)

__dict__ = dict_proxy({'__module__': 'compapp.core', '__set__': <function __set__>,

__module__ = 'compapp.core'

__weakref__
list of weak references to the object (if defined)

class compapp.core.**Private**
Bases: object

owner

__init__()
x.__init__(...) initializes x; see help(type(x)) for signature

set_context(*owner*, *myname*)

getroot()

__dict__ = dict_proxy({'__module__': 'compapp.core', 'getroot': <function getroot>,

__module__ = 'compapp.core'

__weakref__
list of weak references to the object (if defined)

class compapp.core.**Parameter**
Bases: object

__dict__ = dict_proxy({'__dict__': <attribute '__dict__' of 'Parameter' objects>, '__

__module__ = 'compapp.core'

__weakref__
list of weak references to the object (if defined)

compapp.core.**private**(*par*)
Access the private data storage for compapp internals.

Parameters **par** (*Parameter*) –

Returns **prv** – The *Private* instance attached to the object `par` of any subclass of *Parameter* is returned.

Return type *Private*

class compapp.core.**Descriptor**(*default=Unspecified*, *isparam=Unspecified*)
Bases: object

__init__(*default=Unspecified*, *isparam=Unspecified*)
x.__init__(...) initializes x; see help(type(x)) for signature

isparam = False

myname(*obj*, *error=False*)

__get__(*obj*, *cls*)

__dict__ = dict_proxy({'__module__': 'compapp.core', 'myname': <function myname>, 'i

__module__ = 'compapp.core'

__weakref__
list of weak references to the object (if defined)

class compapp.core.**DataDescriptor**(***kwds*)
Bases: *compapp.core.Descriptor*

isparam = True

__init__(***kwds*)
x.__init__(...) initializes x; see help(type(x)) for signature

get(*obj*)

verify(*obj*, *value*, *myname=None*)

__set__(*obj*, *value*)

__module__ = 'compapp.core'

class compapp.core.**Parametric**(**args*, ***kwds*)
Bases: *compapp.core.Parameter*

The basic parametrized class.

Any properties which are a subclass of *Parameter* or whose type are one of *basic_types* are considered as "parameter" to the class.

Note that *Parametric* class itself is a subclass of *Parameter*. Thus, it allows "nested parameter", i.e., *Parametric* class having *Parametric* property.

Example

```
>>> class MyParametric(Parametric):
...     i = 1
...     x = 2.0
...
...     class param(Parametric):
...         a = 100
...         b = 200
...
>>> mp = MyParametric({'i': 30, 'param': {'a': 0}})
>>> mp.x
2.0
>>> mp.i
30
>>> mp.param.a
0
>>> mp.param.b
200
```

Automatic parameter mix-in. If it is just for resetting parameter, you don't need to inherit nested *Parametric* classes; it happens automatically.

```
>>> class Base(Parametric):
...     class x(Parametric):
...         i = 0
```

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```
...         j = 1
...
>>> class Another(Base):
...     class x:  # do not need to inherit Base.x
...         i = -1
...
>>> par = Another()
>>> par.x.i
-1
>>> par.x.j
1
```

Automatic type-checking and casting.

```
>>> MyParametric(i='a')
Traceback (most recent call last):
  ...
ValueError: Value 'a' (type: str) cannot be assigned to the
variable MyParametric.i (default: 1) ...
>>> mp = MyParametric()
>>> mp.x = 1j
Traceback (most recent call last):
  ...
ValueError: Value 1j (type: complex) cannot be assigned to the
variable MyParametric.x (default: 2.0) ...
>>> MyParametric(x=10).x
10.0
```

__init__(**args*, ***kwds*)
x.__init__(...) initializes x; see help(type(x)) for signature

__setattr__(*name*, *value*)
x.__setattr__('name', value) <==> x.name = value

params(*nested=False*, *type=None*)
Get parameters as a `dict`.

Parameters

- **nested** (*bool*) – if true, return a nested `dict` for *Parametric* properties.
- **type** – type of parameters to be returned

Returns **params**

Return type dict

Example

```
>>> class MyParametric(Parametric):
...     x = 1.0
...     i = 1
...     s = 'A'
...
...     class ps(Parametric):
...         y = 2.0
...         j = 2
```

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```
...
>>> mp = MyParametric()
>>> mp.params() == {'x': 1.0, 'i': 1, 's': 'A'}
True
>>> mp.params(nested=True) == dict(mp.params(), ps=dict(y=2.0, j=2))
True
>>> mp.params(nested=True, type=int) == {'i': 1, 'ps': {'j': 2}}
True
```

classmethod paramnames(*type=None*)

List names of parameter for this class.

User sub-class can modify own behavior by overriding this method.

Example

```
>>> class MyParametric(Parametric):
...     x = 1.0
...     i = 1
...     s = 'string'
...
...     class ps(Parametric):
...         pass
...
>>> sorted(MyParametric.paramnames())
['i', 'ps', 's', 'x']
>>> MyParametric.paramnames(type=float)
['x']
```

classmethod defaultparams(*nested=False*, *type=None*)

Get default parameters as a `dict`.

Example

```
>>> class MyParametric(Parametric):
...     x = 1.0
...     i = 1
...     s = 'string'
...
...     class ps(Parametric):
...         y = 2.0
...         j = 2
...
>>> shallow = {
...     'x': 1.0, 'i': 1, 's': 'string'
... }
>>> MyParametric.defaultparams() == shallow
True
>>> MyParametric.defaultparams(nested=True) \
...     == dict(shallow, ps={'y': 2.0, 'j': 2})
True
>>> MyParametric.defaultparams(nested=True, type=int) \
...     == {'i': 1, 'ps': {'j': 2}}
True
```

__module__ = 'compapp.core'

class compapp.core.**Defer**

Bases: object

Callback registry.

Example

```
>>> defer = Defer()
>>> @defer(1, y=2)
... def _(x, y):
...     print('x:', x, ' ', 'y:', y)
...
>>> defer.call()
x: 1   y: 2
```

Once the callbacks are called, they are cleared from the registry.

```
>>> defer.call()
```

Of course, decorator syntax is not mandatory:

```
>>> defer('x:', 1)(print)
<function ...>
>>> defer.call()
x: 1
```

The callback registry can be categorized with keys:

```
>>> for i in range(3):
...     for v in 'xy':
...         _ = defer.keyed(('cat', i), v, '=', i)(print)
...
```

One category can be run by specifying `key` argument of *`call`*.

```
>>> defer.call(('cat', 1))
y = 1
x = 1
```

Calling without `key` argument means "call everything". Note that the category 1 callbacks are not called below, since they were already called.

```
>>> defer.call()
y = 2
x = 2
y = 0
x = 0
```

__init__()

x.__init__(...) initializes x; see help(type(x)) for signature

__dict__ = dict_proxy({'__dict__': <attribute '__dict__' of 'Defer' objects>, '__modu

__module__ = 'compapp.core'

__weakref__
list of weak references to the object (if defined)

keyed(*key*, **args*, ***kwds*)
Register a callback with `key`.

__call__(**args*, ***kwds*)
Register a callback; equivalent to `.keyed(Unspecified, ...)`

call(*key=None*)
Call deferred callbacks and un-register them.

8.2.6 compapp.executables module

Executable subclasses.

class compapp.executables.**MagicPlugins**(**args*, ***kwds*)
Bases: *compapp.plugins.misc.PluginWrapper*

__module__ = 'compapp.executables'

autoupstreams
alias of *compapp.plugins.misc.AutoUpstreams*

dumpparameters
alias of *compapp.plugins.recorders.DumpParameters*

dumpresults
alias of *compapp.plugins.recorders.DumpResults*

meta
alias of *compapp.plugins.metastore.MetaStore*

programinfo
alias of *compapp.plugins.programinfo.RecordProgramInfo*

recordtiming
alias of *compapp.plugins.timing.RecordTiming*

recordvcs
alias of *compapp.plugins.vcs.RecordVCS*

sysinfo
alias of *compapp.plugins.sysinfo.RecordSysInfo*

class compapp.executables.**Assembler**(**args*, ***kwds*)
Bases: *compapp.interface.Executable*

Executable bundled with useful plugins.

mode
Execution mode. The mode `'run'` and `'load'` means to call *run* and *load*, respectively. When `'auto'` is specified, call *run* if *is_loadable* returns `True` otherwise call *load*.

results
Attributes set to this property are saved to *datastore* by *DumpResults* plugin. Downstream classes must rely *only* on the data under this property. For debugging purpose, use *dbg* to store intermediate variables.

magics
Plugins that work behind the scene.

alias of *MagicPlugins*

dbg

"Link" parameter.

It's like symbolic-link in the file system.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     x = 1
...     broken = Link('..')
...
...     class nest(Parametric):
...         x = 2
...         l0 = Link('')
...         l1 = Link('x')
...         l2 = Link('..x')
...         l3 = Link('.nest.x')
...         broken = Link('..broken')
...
...         class nest(Parametric):
...             x = 3
...             l0 = Link('')
...             l1 = Link('x')
...             l2 = Link('..x')
...             l3 = Link('.nest.x')
...             broken = Link('..broken')
...
>>> par = MyParametric()
>>> par is par.nest.l0 is par.nest.nest.l0
True
>>> par.nest.l1
1
>>> par.nest.l2
1
>>> par.nest.l3
3
>>> par.nest.nest.l1
1
>>> par.nest.nest.l2
2
>>> par.nest.nest.l3
Traceback (most recent call last):
  ...
AttributeError: 'nest' object has no attribute 'l3'
>>> hasattr(par, 'broken')
False
>>> hasattr(par.nest, 'broken')
False
>>> hasattr(par.nest.nest, 'broken')
False
```

Todo: Should `path` use more explicit notation as in the JSON pointer? That is to say, use `'#'` instead of `''` (an empty string) to indicate the root. Then, for example, `'x'` would be written as `'#.x'`.

class figure(**args*, ***kwds*)
Bases: *compapp.plugins.misc.Figure*

Figure with *SubDataStore*.

datastore
alias of *compapp.plugins.datastores.SubDataStore*

__module__ = 'compapp.executables'

datastore
alias of *compapp.plugins.datastores.DirectoryDataStore*

should_load()
Return `True` if *load* should be run.

Default is to return `False` always. See also *Assembler.is_loadable*.

is_loadable()
[to be extended] Return `True` if `self` is loadable.

Default implementation returns the value of *.datastore.is_loadable* which reflects whether or not params.json exists in the *.datastore.dir*.

argrange
Number of arguments that the *run* method accepts.

```
>>> class MyComp00(Assembler):
...     def run(self):
...         pass
...
>>> MyComp00().argrange
(0, 0)
```

```
>>> class MyComp12(Assembler):
...     def run(self, x, y=1):
...         pass
...
>>> MyComp12().argrange
(1, 2)
```

```
>>> class MyComp2i(Assembler):
...     def run(self, x, y, *args):
...         pass
...
>>> MyComp2i().argrange
(2, None)
```

__module__ = 'compapp.executables'

debug
alias of *compapp.plugins.misc.Debug*

log
alias of *compapp.plugins.misc.Logger*

class compapp.executables.**Loader**(**args*, ***kwds*)
Bases: *compapp.executables.Assembler*

Data source loaded from disk.

class magics(**args*, ***kwds*)
Bases: *compapp.executables.MagicPlugins*

dumpresults = None

__module__ = 'compapp.executables'

__module__ = 'compapp.executables'

datastore
alias of *compapp.plugins.datastores.SubDataStore*

class compapp.executables.**Plotter**(**args*, ***kwds*)
Bases: *compapp.executables.Assembler*

An *Assembler* subclass specialized for plotting.

Example

```
class DensityPlotter(Plotter):
    pass

class CumulativeDistributionPlotter(Plotter):
    pass

class MyApp(Computer):
    density = DensityPlotter
    dist = CumulativeDistributionPlotter

    def run(self):
        self.simulator.execute()
        self.density.execute(self.simulator)
        self.dist.execute(self.simulator)
```

Then `myapp.py --datastore.dir out/` saves density plot in `out/density-0.png` and cumulative distribution in `out/dist-0.png`.

__module__ = 'compapp.executables'

figure
alias of *compapp.plugins.misc.Figure*

datastore
alias of *compapp.plugins.datastores.SubDataStore*

8.2.7 compapp.interactive module

compapp.interactive.**setup_interactive**()
Configure compapp for REPL (e.g., IPython).

This function modify the default for compapp classes (only *Figure*, at the moment) to behave nicely in REPLs.

8.2.8 compapp.interface module

class compapp.interface.**Executable**(**args*, ***kwds*)
Bases: *compapp.strict.MixinStrict*, *compapp.core.Parametric*

The base class supporting execution and plugin mechanism.

Example

```
>>> class MyPlugin(Plugin):
...     def pre_run(self):
...         print('Pre-run:', self.__class__.__name__)
...
>>> class MyExec(Executable):
...     myplugin = MyPlugin
...
...     def run(self):
...         print('Run:', self.__class__.__name__)
...
>>> excbl = MyExec()
>>> excbl.execute()
Pre-run: MyPlugin
Run: MyExec
```

__init__ (**args*, ***kwds*)
x.__init__(...) initializes x; see help(type(x)) for signature

defer
Attribute accepting only certain type(s) of value.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     i = OfType(int)
...
>>> MyParametric(i='a')
Traceback (most recent call last):
  ...
ValueError: MyParametric.i only accepts type of int: got 'a' of type str
```

`OfType` can take multiple classes:

```
>>> class MyParametric(Parametric):
...     i = OfType(int, float, str)
...
>>> mp = MyParametric()
>>> mp.i = 'a'
>>> mp.i = 1j
Traceback (most recent call last):
  ...
ValueError: MyParametric.i only accepts type of int, float or str: got 1j
of type complex
```

It is an error to access unset an `OfType` attribute:

```
>>> mp = MyParametric()
>>> mp.i
Traceback (most recent call last):
  ...
AttributeError: 'MyParametric' object has no attribute 'i'
```

`OfType` can take *default* argument:

```
>>> class MyParametric(Parametric):
...     i = OfType(int, default=0)
...
>>> mp = MyParametric()
>>> mp.i
0
```

Castable values are cast automatically:

```
>>> class MyParametric(Parametric):
...     x = OfType(float)
...
>>> mp = MyParametric()
>>> mp.x = 1                          # assigning an int...
>>> assert isinstance(mp.x, float)    # ... cast to a float
>>> import numpy
>>> mp.x = numpy.float16(2.0)         # assigning a numpy float...
>>> assert isinstance(mp.x, float)    # ... cast to a float
```

execute(**args*)

Execute this instance.

Basically, this function does this:

```
prepare()
Plugin.prepare()
if should_load():
    load()
    Plugin.load()
else:
    Plugin.pre_run()
    run()
    Plugin.post_run()
    save()
    Plugin.save()
Plugin.finish()
finish()
```

Note that `Plugin.<method>()` are run for all plugins.

should_load()

Return `True` if *load* should be run.

Default is to return `False` always. See also *Assembler.is_loadable*.

prepare()

[to be extended] Prepare for *run*/*load*; e.g., execute upstreams.

run(**args*)

[to be extended] Do the actual simulation/analysis.

save()

[to be extended] Save the result manually.

load()

[to be extended] Load saved result manually.

finish()

[to be extended] Do anything to be done before exit.

__module__ = 'compapp.interface'

compapp.interface.**call_plugins**(*self*, *method*)

class compapp.interface.**Plugin**(**args*, ***kwds*)
Bases: *compapp.core.Parametric*

Plugin base class.

__init__(**args*, ***kwds*)
x.__init__(...) initializes x; see help(type(x)) for signature

prepare()
[to be extended] For a task immediately *after* *Executable.prepare*.

pre_run()
[to be extended] For a task immediately before *Executable.run*.

post_run()
[to be extended] For a task immediately after *Executable.run*.

save()
[to be extended] For a task immediately *after* *Executable.save*.

load()
[to be extended] For a task immediately *before* *Executable.load*.

__module__ = 'compapp.interface'

finish()
[to be extended] For a task immediately *before* *Executable.finish*.

8.2.9 compapp.loader module

compapp.loader.**load**(*path*)
Load result saved at path.

path can be a path to a datastore directory, a path to a params.json file, or a path to a meta.json file.

Examples

```
>>> from compapp import Computer, load
>>> class MyApp(Computer):
...     x = 1
...     def run(self):
...         self.results.y = self.x ** 2
```

```
>>> app = MyApp()
>>> app.datastore.dir = 'out'
>>> app.execute()
>>> assert load('out').results == app.results
>>> assert load('out/meta.json').results == app.results
>>> assert load('out/params.json').results == app.results
```

8.2.10 compapp.parser module

class compapp.parser.**Option**(*lhs*, *rhs*, *modifier*)
Bases: tuple

__dict__ = dict_proxy({'__module__': 'compapp.parser', '__getstate__': <function __g

__getnewargs__()
Return self as a plain tuple. Used by copy and pickle.

__getstate__()
Exclude the OrderedDict from pickling

__module__ = 'compapp.parser'

static __new__(*_cls*, *lhs*, *rhs*, *modifier*)
Create new instance of Option(lhs, rhs, modifier)

__repr__()
Return a nicely formatted representation string

__slots__ = ()

lhs
Alias for field number 0

modifier
Alias for field number 2

rhs
Alias for field number 1

compapp.parser.**parse_key**(*key*)

compapp.parser.**parse_assignment_options**(*arguments*)
Parse assignment options (e.g., –dict['key']).

compapp.parser.**parse_bool**(*value*)

compapp.parser.**parse_value**(*holder*, *name*, *value*)

compapp.parser.**assign_option**(*obj*, *lhs*, *rhs*)

compapp.parser.**load_any**(*path*)
Load any data file from given path.

compapp.parser.**process_modifier**(*lhs*, *rhs*, *modifier*)

compapp.parser.**process_assignment_options**(*obj*, *options*)

compapp.parser.**make_parser**(*doc=None*)

compapp.parser.**parseargs**(*parser*, *args=None*)

8.2.11 compapp.setters module

compapp.setters.**rec_setattr**(*obj*, *name*, *value*)
Recursive version of `setattr`.

If `value` is a `dict` *and* the attribute `name` of `obj` is some non-simple object, set attributes of it by the values of the dictionary `value`. Otherwise fallbacks to `setattr`.

compapp.setters.**rec_setattrs**(*obj*, *dct*)
Set values of nested dictionary `dct` to attributes of `obj`.

```
>>> class A(object):
...     b = c = d = e = f = None
>>> a = A()
```

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```
>>> a.b = A()
>>> a.b.c = A()
>>> rec_setattrs(a, dict(b=dict(c=dict(d=1), e=2), f=3))
>>> a.b.c.d
1
>>> a.b.e
2
>>> a.f
3
```

8.2.12 compapp.strict module

class compapp.strict.**MixinStrict**

Bases: object

__setattr__(*name*, *value*)

x.__setattr__('name', value) <==> x.name = value

__dict__ = dict_proxy({'__module__': 'compapp.strict', '__setattr__': <function __se

__module__ = 'compapp.strict'

__weakref__

list of weak references to the object (if defined)

8.2.13 compapp.testing module

8.2.14 compapp.variator module

class compapp.variator.**ParamBuilder**(**args*, ***kwds*)

Bases: *compapp.core.Parametric*

choices

Attribute accepting only dict with certain traits.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     anydict = Dict()
...     strint = Dict(str, int)
...
>>> mp = MyParametric()
>>> mp.anydict = {'a': 1}
>>> mp.strint = {'a': 1}
>>> mp.strint = {1: 1}
Traceback (most recent call last):
  ...
ValueError: MyParametric.strint[...] only accepts type of str: got 1
of type int
>>> mp.strint = {'a': 'b'}
Traceback (most recent call last):
  ...
```

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```
ValueError: MyParametric.strint['a'] only accepts type of int: got 'b'
of type str
```

ranges
Attribute accepting only dict with certain traits.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     anydict = Dict()
...     strint = Dict(str, int)
...
>>> mp = MyParametric()
>>> mp.anydict = {'a': 1}
>>> mp.strint = {'a': 1}
>>> mp.strint = {1: 1}
Traceback (most recent call last):
  ...
ValueError: MyParametric.strint[...] only accepts type of str: got 1
of type int
>>> mp.strint = {'a': 'b'}
Traceback (most recent call last):
  ...
ValueError: MyParametric.strint['a'] only accepts type of int: got 'b'
of type str
```

linspaces
Attribute accepting only dict with certain traits.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     anydict = Dict()
...     strint = Dict(str, int)
...
>>> mp = MyParametric()
>>> mp.anydict = {'a': 1}
>>> mp.strint = {'a': 1}
>>> mp.strint = {1: 1}
Traceback (most recent call last):
  ...
ValueError: MyParametric.strint[...] only accepts type of str: got 1
of type int
>>> mp.strint = {'a': 'b'}
Traceback (most recent call last):
  ...
ValueError: MyParametric.strint['a'] only accepts type of int: got 'b'
of type str
```

logspaces
Attribute accepting only dict with certain traits.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     anydict = Dict()
...     strint = Dict(str, int)
...
>>> mp = MyParametric()
>>> mp.anydict = {'a': 1}
>>> mp.strint = {'a': 1}
>>> mp.strint = {1: 1}
Traceback (most recent call last):
  ...
ValueError: MyParametric.strint[...] only accepts type of str: got 1
of type int
>>> mp.strint = {'a': 'b'}
Traceback (most recent call last):
  ...
ValueError: MyParametric.strint['a'] only accepts type of int: got 'b'
of type str
```

build_params()

keys()

__module__ = 'compapp.variator'

compapp.variator.**execute**(*arg*)

class compapp.variator.**Variator**(**args*, ***kwds*)

Bases: *compapp.apps.Computer*

base

Placeholder for an instance of the class specified by *ClassPath*.

The actual instantiation process is delayed until it is accessed (i.e., __get__ method is called).

classpath

Class path descriptor that imports specified class on change.

builder

alias of *ParamBuilder*

processes = -1

executor

Attribute accepting only one of the specified value.

Parameters

- **default** – Default value (see *nodefault*).
- ***choices** – Alternative values.
- **nodefault** (*bool*) – Treat *default* is just an alternative; i.e., do not "initialize" the attribute.
- ****kwds** – See: *DataDescriptor*.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     choice = Choice(1, 2, 'a')
...
>>> mp = MyParametric()
>>> mp.choice
1
>>> mp.choice = 2
>>> mp.choice = 'a'
>>> mp.choice = 'unknown'
Traceback (most recent call last):
  ...
ValueError: MyParametric.choice only accepts one of (1, 2, 'a'):
got 'unknown'
```

datastore_format = '{}'

variants

Attribute accepting only certain type(s) of value.

Examples

```
>>> from compapp.core import Parametric
>>> class MyParametric(Parametric):
...     i = OfType(int)
...
>>> MyParametric(i='a')
Traceback (most recent call last):
  ...
ValueError: MyParametric.i only accepts type of int: got 'a' of type str
```

`OfType` can take multiple classes:

```
>>> class MyParametric(Parametric):
...     i = OfType(int, float, str)
...
>>> mp = MyParametric()
>>> mp.i = 'a'
>>> mp.i = 1j
Traceback (most recent call last):
  ...
ValueError: MyParametric.i only accepts type of int, float or str: got 1j
of type complex
```

It is an error to access unset an `OfType` attribute:

```
>>> mp = MyParametric()
>>> mp.i
Traceback (most recent call last):
  ...
AttributeError: 'MyParametric' object has no attribute 'i'
```

`OfType` can take *default* argument:

```
>>> class MyParametric(Parametric):
...     i = OfType(int, default=0)
...
>>> mp = MyParametric()
>>> mp.i
0
```

Castable values are cast automatically:

```
>>> class MyParametric(Parametric):
...     x = OfType(float)
...
>>> mp = MyParametric()
>>> mp.x = 1                          # assigning an int...
>>> assert isinstance(mp.x, float)    # ... cast to a float
>>> import numpy
>>> mp.x = numpy.float16(2.0)         # assigning a numpy float...
>>> assert isinstance(mp.x, float)    # ... cast to a float
```

run()

[to be extended] Do the actual simulation/analysis.

__module__ = 'compapp.variator'

8.3 Module contents

8.3.1 Bases classes for simulation/analysis “apps”

CHAPTER 9

compapp

CHAPTER 10

Indices and tables

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