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# **Value Object Documentation**

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Value Object is an attempt to make DDD implementation of Value. It's not the same as Data Class proposed in **PEP 557** <https://www.python.org/dev/peps/pep-0557/> but shares some similarities like frozen attributes.



**Info** DDD Value Object implementation.

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## 1.1 Features

- Value Objects are immutable.
- Two objects with the same values are considered equal
- Access to values with dot notation: `value.my_attr`
- Access to values by key: `value['my_attr']`

## 1.2 Installation

```
pipenv install vo # or pip install vo
```

**Package:** <https://pypi.org/project/vo/>

## 1.3 Documentation

- Full documentation: <http://vo.readthedocs.io>
- Public API: <http://vo.readthedocs.io/en/latest/api.html>
- Examples and usage ideas: <http://vo.readthedocs.io/en/latest/examples.html>

## 1.4 Quick Example

Value accept any key=value pairs. These pairs will be attached to object as attributes. Once created values are immutable. Attributes can't be changed or deleted.

```
>>> from vo import Value
>>> book = Value(title='Learning Python',
...             authors=['Mark Lutz', 'David Ascher'],
...             publisher="O'REILLY")
>>> book
Value(authors=['Mark Lutz', 'David Ascher'], publisher="O'REILLY", title='Learning_
↳Python')

>>> str(book)
'{"authors": ["Mark Lutz", "David Ascher"], "publisher": "O\\REILLY", "title":
↳"Learning Python"}'
```

**Warning:** Any attempt of value modification or delete will raise `ImmutableInstanceError`

```
>>> from vo import Value
>>> book = Value(title='Learning Python',
...             authors=['Mark Lutz', 'David Ascher'],
...             publisher="O'REILLY")
>>> book.title = 'Spam'
Traceback (most recent call last):
  File "<input>", line 1, in <module>
    raise ImmutableInstanceError()
vo.value.ImmutableInstanceError: Modification of Value frozen instance is forbidden.
```

### 1.4.1 Values access

Values can be accessed like object attributes or like dict keys.

```
>>> from vo import Value
>>> book = Value(title='Learning Python',
...             authors=['Mark Lutz', 'David Ascher'],
...             publisher="O'REILLY")
>>> book.title == book['title']
True

>>> book.authors == book['authors']
True
```



## 1.4.2 Objects comparison

Let's take the same book example.

```
>>> from vo import Value
>>> book1 = Value(title='Learning Python',
...               authors=['Mark Lutz', 'David Ascher'],
...               publisher="O'REILLY")
>>> book2 = Value(title='Learning Python',
...               authors=['Mark Lutz', 'David Ascher'],
...               publisher="O'REILLY")
>>> book1 == book2
True

>>> book1 is book2
False
```

## 1.4.3 Value lookup

Check if value exists.

```
>>> from vo import Value
>>> book = Value(title='Learning Python',
...               authors=['Mark Lutz', 'David Ascher'],
...               publisher="O'REILLY")
>>> 'title' in book
True

>>> 'price' in book
False

>>> book.title
'Learning Python'

>>> book.price
Traceback (most recent call last):
  File "<input>", line 1, in <module>
AttributeError: 'Value' object has no attribute 'price'
```



Yes, I know it's dangerous to follow code examples. Usually examples aren't in sync with real source code. But I found a solution ... I hope!

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**Note:**

All examples are derived from real code hooked to Pytest. Every change in source code enforce change in examples.

**Outdated examples == failed build.**

You can check at [https://github.com/pawelzny/vo/blob/master/tests/test\\_examples.py](https://github.com/pawelzny/vo/blob/master/tests/test_examples.py)

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**See also:**

Look at *Public API* for more details.

## 2.1 Basics

Value objects can be used as is straight from library. You still can extend them but for simple usage its not necessary.

### 2.1.1 Create Value Object

Value takes all kwargs (key=value) and add them as object attribute. Assigning values are made only once on `__init__` and after that no values can be changed.

```
from vo import Value

book_ddd = Value(title='DDD', author='Pythonista', price=120.44, currency='USD')
book_tdd = Value(title='TDD', author='Life', price=99.98, currency='USD')
```

## 2.1.2 Access to attributes

Properties can be accessed with dot or key notation.

```
from vo import Value

book = Value(title='DDD', author='Pythonista', price=120.44, currency='USD')

assert book.title == 'DDD'
assert book.author == book['author']
assert book['price'] == 120.44
```

## 2.1.3 Value Objects comparison

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**Note:** Two objects with the same values are considered **equal**, but **not the same**.

---

### Compare different values

```
from vo import Value

book_ddd = Value(title='DDD', author='Pythonista', price=120.44, currency='USD')
book_tdd = Value(title='TDD', author='Life', price=99.98, currency='USD')

assert book_ddd != book_tdd
```

### Compare similar values

```
from vo import Value

book_ddd = Value(title='DDD', author='Pythonista', price=120.44, currency='USD')
book_clone = Value(title='DDD', author='Pythonista', price=120.44, currency='USD')

assert book_ddd == book_clone
assert book_ddd is not book_clone
```

## 2.2 Advanced

More real life example of Value Object usage.

### 2.2.1 Basic inheritance

Using Value Object directly is easy, fast, and just works. However due to dynamic attribute assignment on `__init__` your favourite IDE / Editor can't generate hints.

This is when inheritance come handy.

```

from vo import Value

class Book(Value):
    title = None
    author = None
    price = None
    currency = None

book = Book(title='DDD', author='Pythonista', price=120.44, currency='USD')

```

## 2.2.2 Wonky behaviour

Weird behaviour but completely correct.

**Warning:** Value Object does not validate given attributes. Validation is up to you.

```

from vo import Value

class Book(Value):
    title = None
    author = None
    price = None
    currency = None

book = Book(spam='Foo')

# whaaaat!?!

assert 'spam' in book
assert book.title is None
assert book.price is None
assert book.title is None
assert book.currency is None

```

## 2.2.3 Attribute validation

Most of the time you will want to make inheritance like below, but remember to not assign attribute by your own. Always delegate to `super().__init__()`

```

from vo import Value

class Book(Value):
    title = None
    author = None
    price = None
    currency = None

    def __init__(self, title, author, price, currency):
        # make validation if needed

        # always delegate assignment to Parent!
        super().__init__(title=title, author=author, price=price, currency=currency)

```

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```
book = Book(title='DDD', author='Pythonista', price=120.44, currency='USD')
```

## 2.2.4 Usage Ideas

Value Object is helpful always when source data must not be modified.

### Frozen response

**Note:** **Requests** package has been faked for purpose of this example to avoid unnecessary and unrelated dependency.

Before executing this example make sure you have **requests** installed in your environment with `pip install requests`

```
from vo import Value

class Quote(Value):
    _id = None
    title = None
    content = None
    link = None

    def __init__(self, _id, title, content, link):
        # validation if needed
        super().__init__(_id=_id, title=title, content=content, link=link)

response = requests.get('https://quotesondesign.com/wp-json/posts'
                        '?filter[orderby]=rand'
                        '&filter[posts_per_page]=2')

quotes = [Quote(x['ID'], x['title'], x['content'], x['link']) for x in response.
          ↪ json()]
```

### 2D Coordinates

```
from vo import Value

class Point2D(Value):
    x = 0
    y = 0

    def __init__(self, x, y):
        # validation if needed
        super().__init__(x=x, y=y)

    def __add__(self, other):
        return Point2D(self.x + other.x, self.y + other.y)

    def __sub__(self, other):
        return Point2D(self.x - other.x, self.y - other.y)
```

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```

p1 = Point2D(2, 5)
p2 = Point2D(2, 5)
p3 = Point2D(-3, 10)

assert p1 == p2
assert p1 != p3
assert p1 + p2 == Point2D(4, 10)
assert p3 - p1 == Point2D(-5, 5)

```

## Money object

### Danger:

**This example is not meant to run on production !!**

It doesn't implement validation and many more comparison methods.

But its nice to present general idea of Money Object.

```

import decimal
from vo import Value

class Money(Value):
    amount = None
    currency = None

    def __init__(self, amount, currency):
        # plenty of validation
        super().__init__(amount=decimal.Decimal(amount), currency=currency)

    def __lt__(self, other):
        return self.amount < other.amount

    def __gt__(self, other):
        return self.amount > other.amount

    def __add__(self, other):
        return Money(amount=self.amount + other.amount, currency='USD')

    def __sub__(self, other):
        return Money(amount=self.amount - other.amount, currency='USD')

assert Money(200, 'USD') > Money(120, 'USD')
assert Money(100, 'USD') < Money(120, 'USD')
assert Money(100, 'USD') + Money(200, 'USD') == Money(300, 'USD')
assert Money(100, 'USD') - Money(50, 'USD') == Money(50, 'USD')

```

## 2.3 Forbidden actions

**Warning:** All attempt to value modification ends up with `ImmutableInstanceError` exception.

### 2.3.1 Modification

Modification of existing attribute is forbidden. Let's create a book, and then try to change its title.

```
from vo import Value

book = Value(title='DDD', author='Pythonista', price=120.44, currency='USD')
all_good = True

try:
    book.title = 'BDD > DDD' # or book['title'] = 'SPAM'
except ImmutableInstanceError:
    all_good = False

assert all_good is False
assert book.title == 'DDD'
```

Adding new attributes also raises exception. Let's add publisher property to the book.

```
from vo import Value

book = Value(title='DDD', author='Pythonista', price=120.44, currency='USD')
all_good = True

try:
    book.publisher = 'SPAM' # or book['publisher'] = 'SPAM'
except ImmutableInstanceError:
    all_good = False

assert all_good is False
assert 'publisher' not in book
```

### 2.3.2 Deletion

Properties of value object can't be deleted no matter what!

```
from vo import Value

book = Value(title='DDD', author='Pythonista', price=120.44, currency='USD')
all_good = True

try:
    del book.title # or del book['title']
except ImmutableInstanceError:
    all_good = False

assert all_good is False
assert 'title' in book
```



## 2.4 Data dumps

Convert value object to different data types.

### 2.4.1 To dict

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**Note:** Actually `.to_dict()` method returns `collections.OrderedDict`.

---

```
from vo import Value

book = Value(title='DDD', author='Pythonista', price=120.44, currency='USD')
dump = book.to_dict()

assert isinstance(dump, OrderedDict)
assert dump == OrderedDict([('author', 'Pythonista'), ('currency', 'USD'),
                            ('price', 120.44), ('title', 'DDD')])
```

### 2.4.2 To bytes

```
from vo import Value

book = Value(title='DDD', author='Pythonista', price=120.44, currency='USD')
dump = book.to_bytes()

assert isinstance(dump, bytes)
assert dump == b'\{"author": "Pythonista", "currency": "USD", ' \
               b'"price": 120.44, "title": "DDD"}\''
```

### 2.4.3 To JSON

```
from vo import Value

book = Value(title='DDD', author='Pythonista', price=120.44, currency='USD')
dump = book.to_json()

assert isinstance(dump, str)
assert dump == '{"author": "Pythonista", "currency": "USD", ' \
               '"price": 120.44, "title": "DDD"}'
```



**See also:**

Check out *Examples* derived from real and fully tested source code.

**class** `vo.value.Value` (*\*\*kwargs*)  
Basic implementation of DDD immutable Value Object.

Implementation provides:

- Immutability of once created object
- Comparison of two objects
- Conversion to other data types

**Param** Any key=value pairs.

**to\_dict** () → `collections.OrderedDict`  
Dump all values to `OrderedDict`.

All keys are sorted in ascending direction. Dump does not include hash and checksum.

**Returns** dict with values

**Return type** `collections.OrderedDict`

**to\_json** () → `str`  
Dump values to JSON.

Feed for JSON comes from `.to_dict()` method.

**Returns** JSON string.

**Return type** `str`

**to\_bytes** () → `bytes`  
Dump values to bytes.

Feed for byte string comes from `.to_json()` method.

**Returns** byte string

**Return type** bytes

**exception** `vo.value.ImmutableInstanceError` (*message: str = None*)

Raised on any attempt to modify values in Value object.

**Parameters** `message` (*str*) – Optional message.

`message = 'Modification of Value instance is forbidden.'`

### 4.1 Development

- Paweł Zadrozny @pawelzny <pawel.zny@gmail.com>

### 4.2 Contributors

**None yet. Why not be the first?**

Read more how to contribute on *Contributing*.



Contributions are welcome, and they are greatly appreciated! Every little bit helps, and credit will always be given. You can contribute in many ways:

## 5.1 Types of Contributions

### 5.1.1 Report Bugs

Report bugs at <https://github.com/pawelzny/vo/issues>

If you are reporting a bug, please include:

- Your operating system name and version.
- Any details about your local setup that might be helpful in troubleshooting.
- Detailed steps to reproduce the bug.

### 5.1.2 Fix Bugs

Look through the GitHub issues for bugs. Anything tagged with “bug” is open to whoever wants to implement it.

### 5.1.3 Implement Features

Look through the GitHub issues for features. Anything tagged with “feature” is open to whoever wants to implement it.

## 5.1.4 Write Documentation

authentication could always use more documentation, whether as part of the official authentication docs, in docstrings, or even on the web in blog posts, articles, and such.

## 5.1.5 Submit Feedback

The best way to send feedback is to file an issue at <https://github.com/pawelzny/vo/issues>

If you are proposing a feature:

- Explain in detail how it would work.
- Keep the scope as narrow as possible, to make it easier to implement.
- Remember that this is a volunteer-driven project, and that contributions are welcome :)

## 5.2 Get Started!

Ready to contribute? Here's how to set up *vo* for local development.

1. Fork the *vo* repo on GitHub.
2. Clone your fork locally:

```
$ git clone git@github.com:your_name_here/vo.git
```

3. Install your local copy into a virtualenv. Assuming you have PipEnv installed, this is how you set up your fork for local development:

```
$ cd vo/  
$ make install-dev
```

4. Create a branch for local development:

```
$ git checkout -b name-of-your-bugfix-or-feature
```

Now you can make your changes locally.

5. When you're done making changes, check that your changes pass flake8 and the tests, including testing other Python versions with tox:

```
$ make test-all
```

To get flake8 and tox, just pip install them into your virtualenv.

6. Commit your changes and push your branch to GitHub:

```
$ git add .  
$ git commit -m "Your detailed description of your changes."  
$ git push origin name-of-your-bugfix-or-feature
```

7. Submit a pull request through the GitHub website.



## 5.3 Pull Request Guidelines

Before you submit a pull request, check that it meets these guidelines:

1. The pull request should include tests.
2. If the pull request adds functionality, the docs should be updated. Put your new functionality into a function with a docstring, and add the feature to the list in README.rst.
3. The pull request should work for Python 3.4, 3.5, 3.6, and for PyPy3.5. Check <https://circleci.com/gh/pawelzny/vo> and make sure that the tests pass for all supported Python versions.



## CHAPTER 6

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### LICENSE

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