61A Lecture 12

Monday, September 26

Implementing Dice

http://www.math.utah.edu/~pa/Random/Random.html

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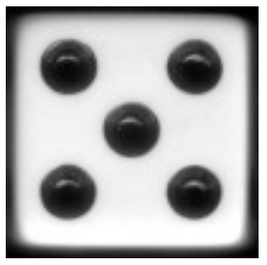

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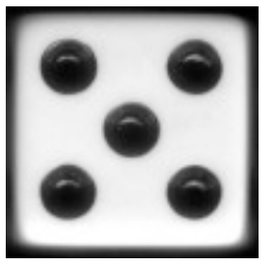

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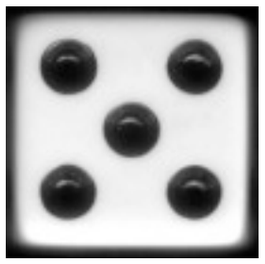

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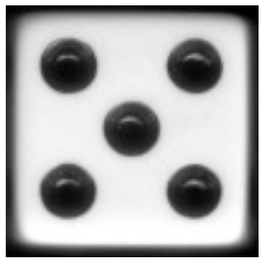

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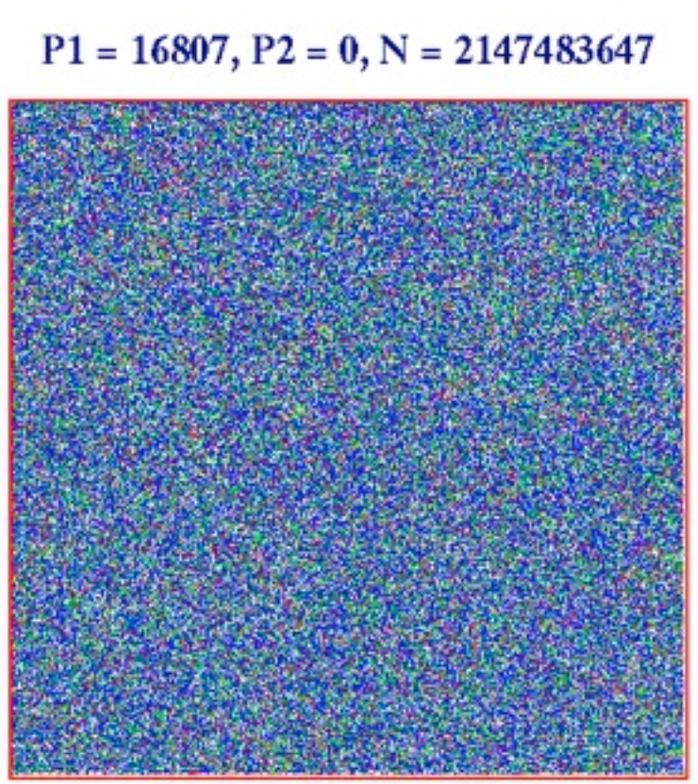

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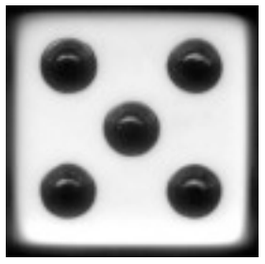

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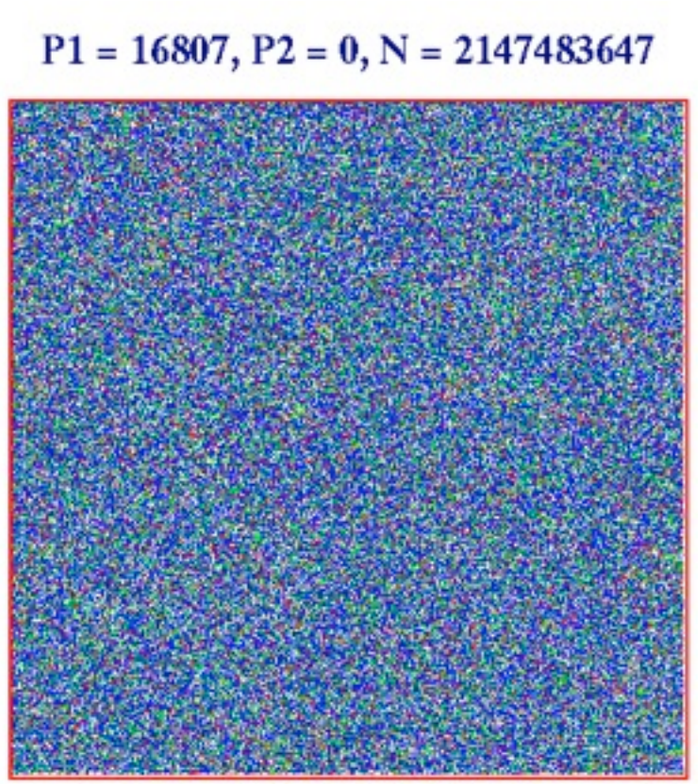

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S.K. Park and K.W. Miller, " Random Number Generators: Good Ones Are Hard To Find", Communications of the ACM, October 1988, pp. 1192-1201.

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Demo

Implementing a Mutable Container Object

```
def make_container(contents):
    def get():
        return contents
    def put(value):
        nonlocal contents
        contents = value
    return get, put
get, put = make_container('Hi')
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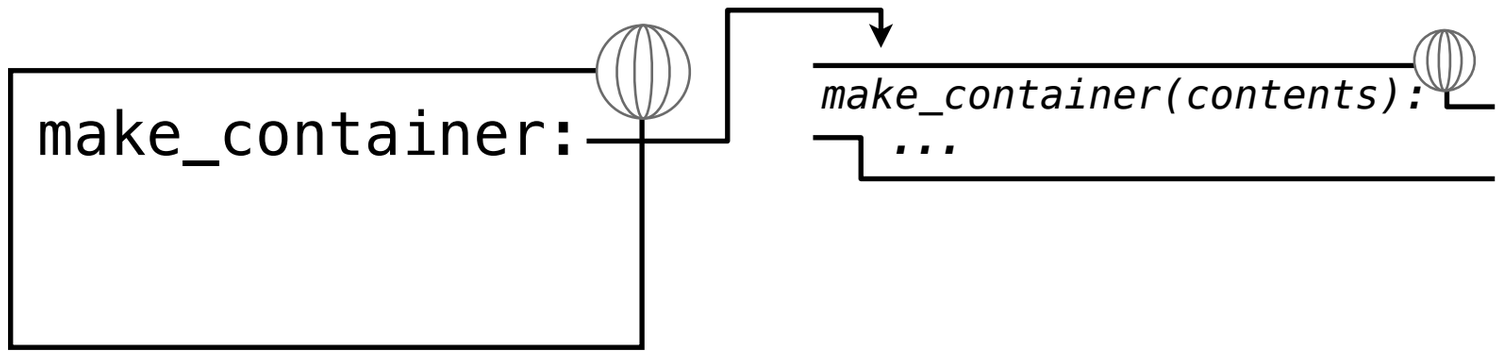


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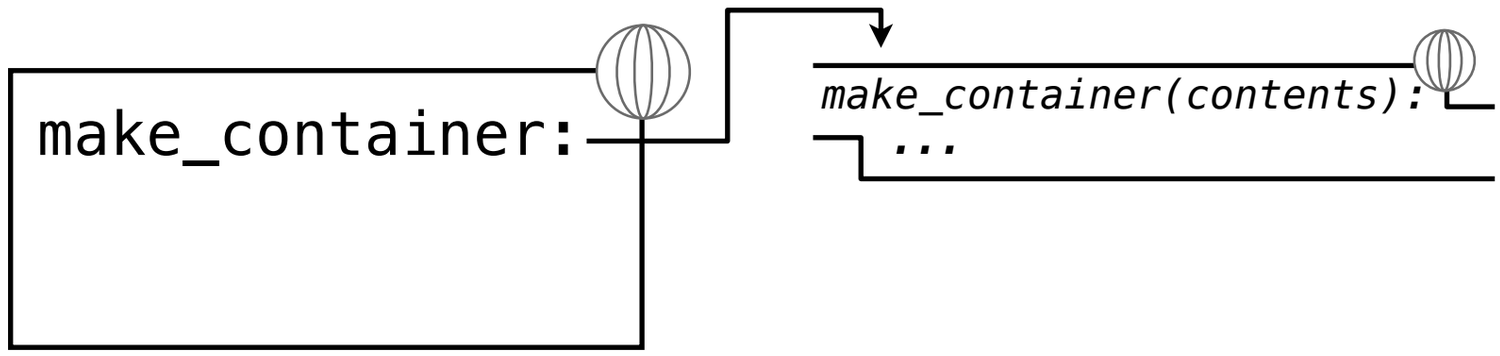

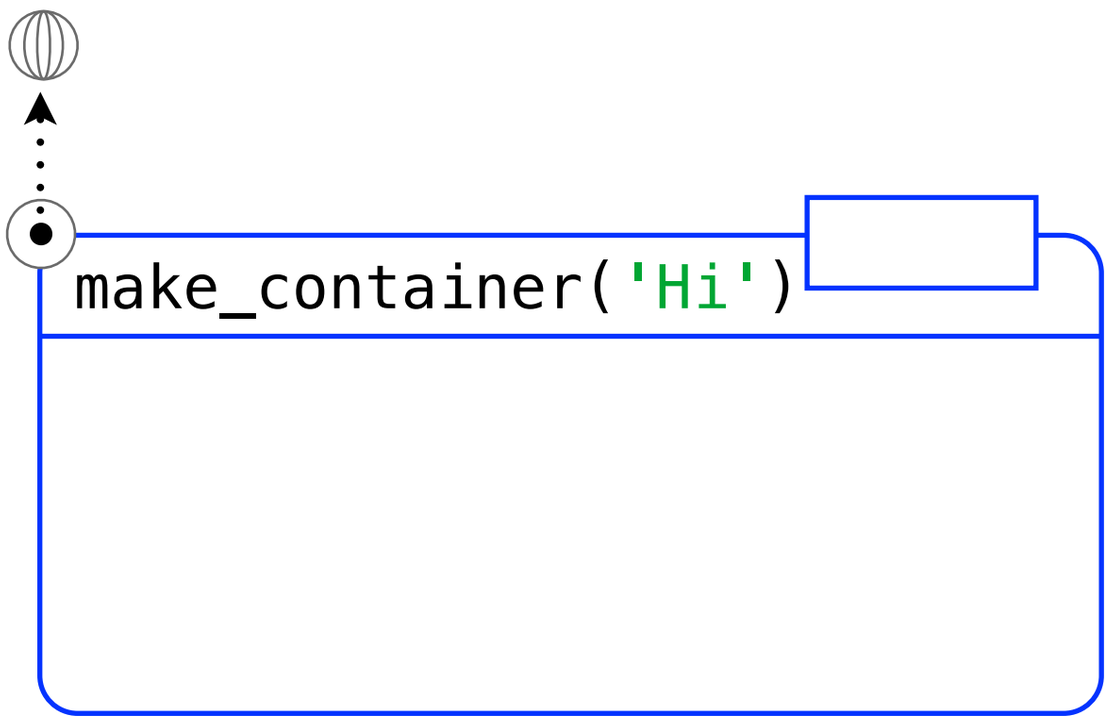


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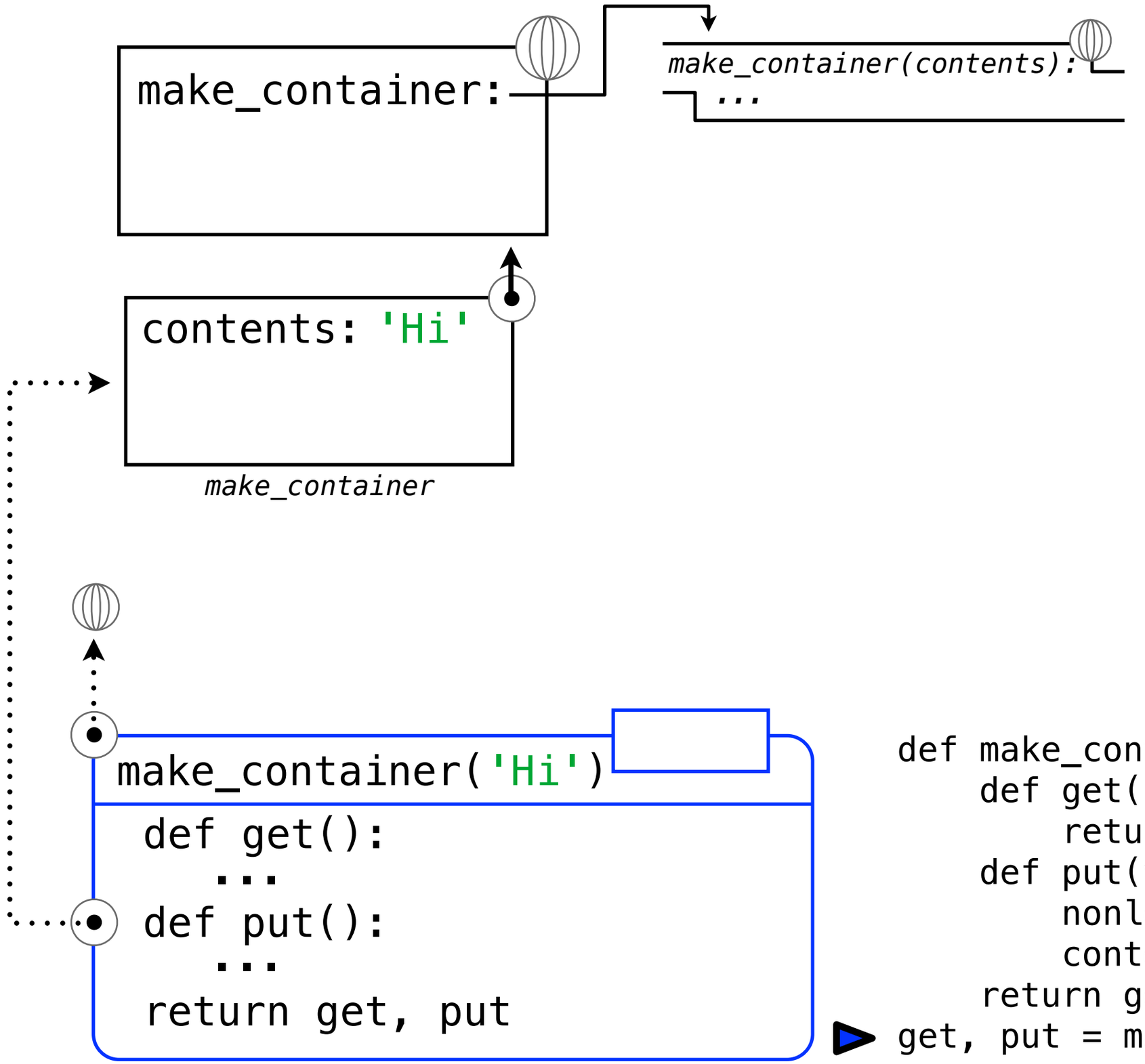


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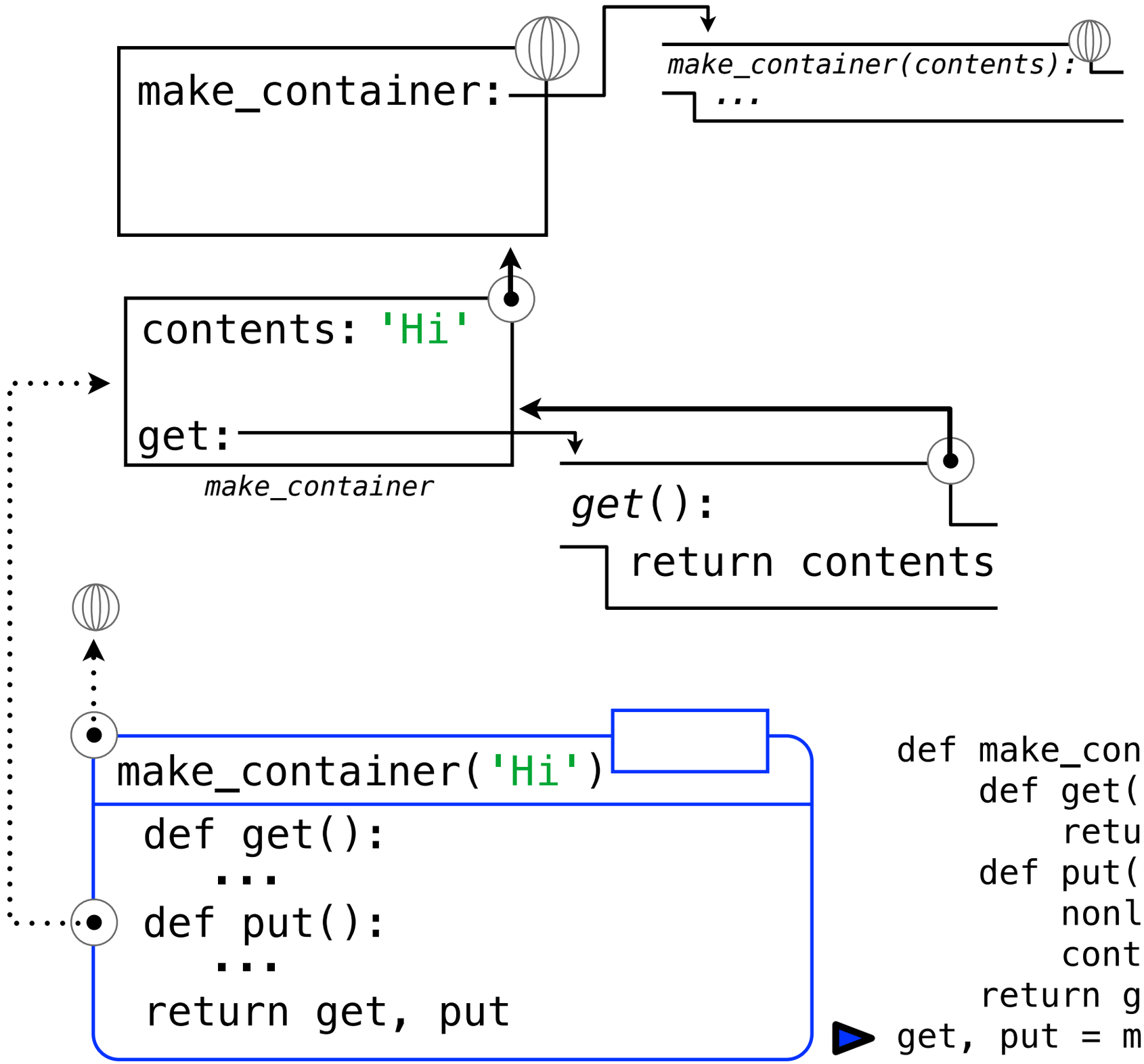


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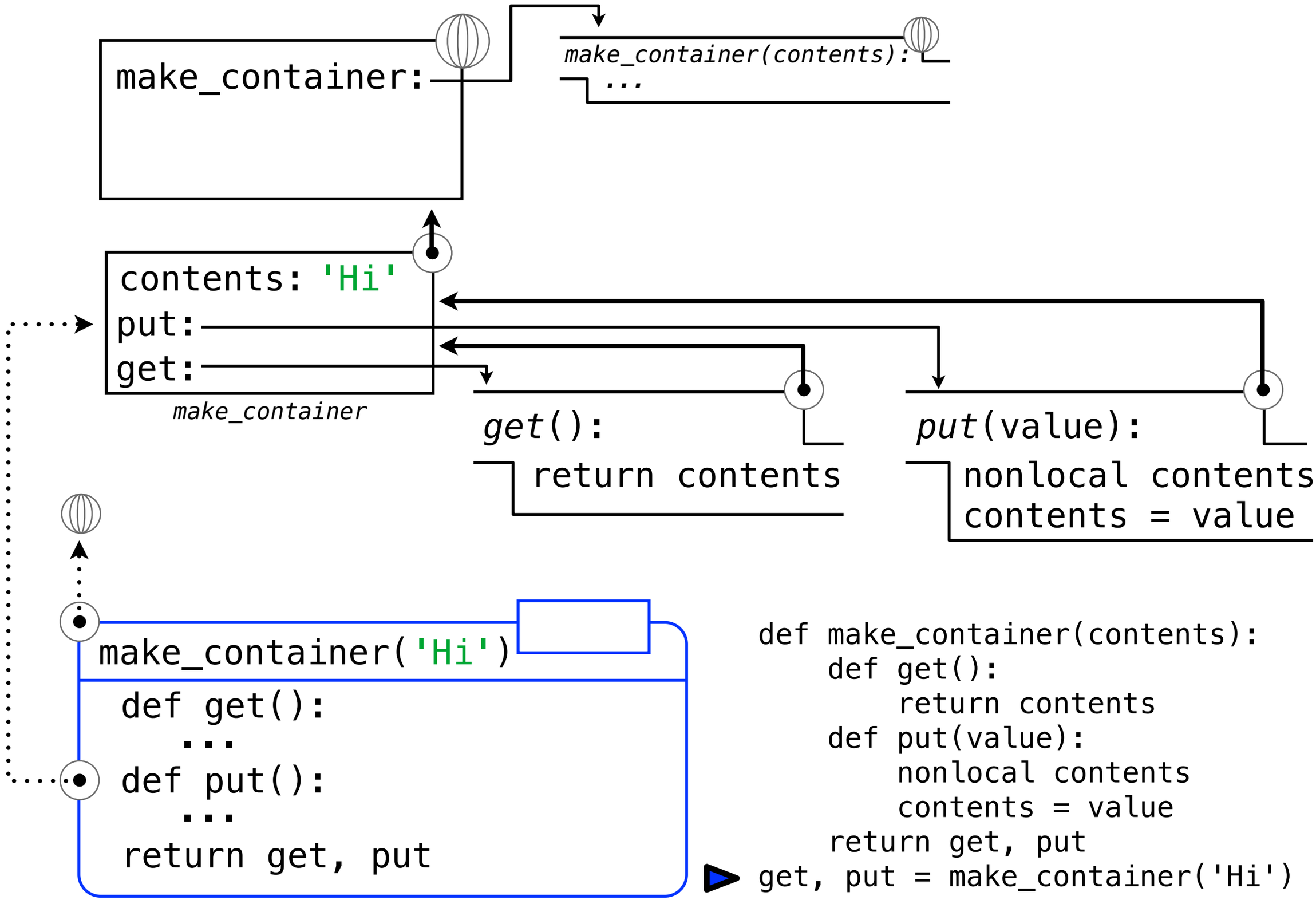


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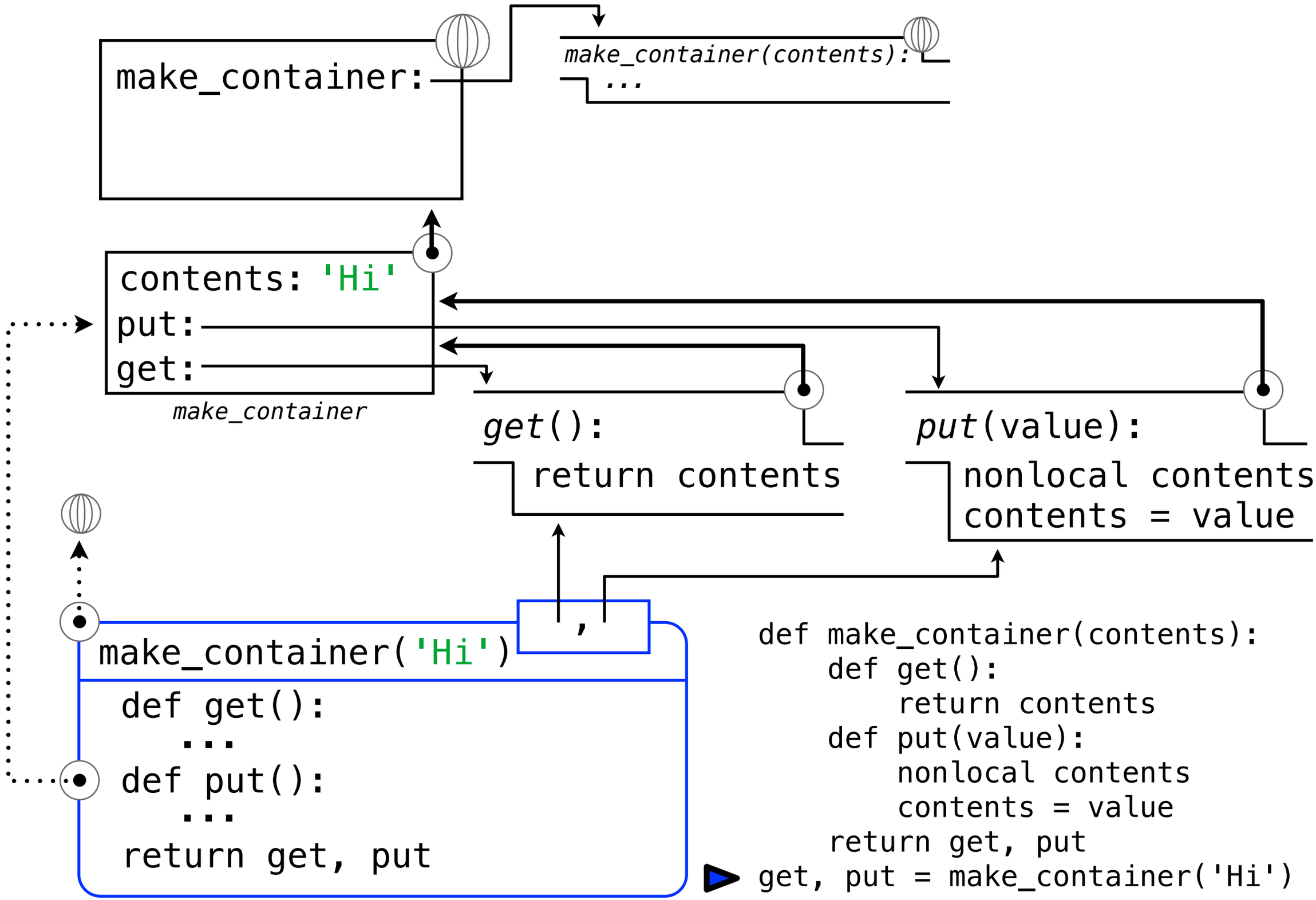

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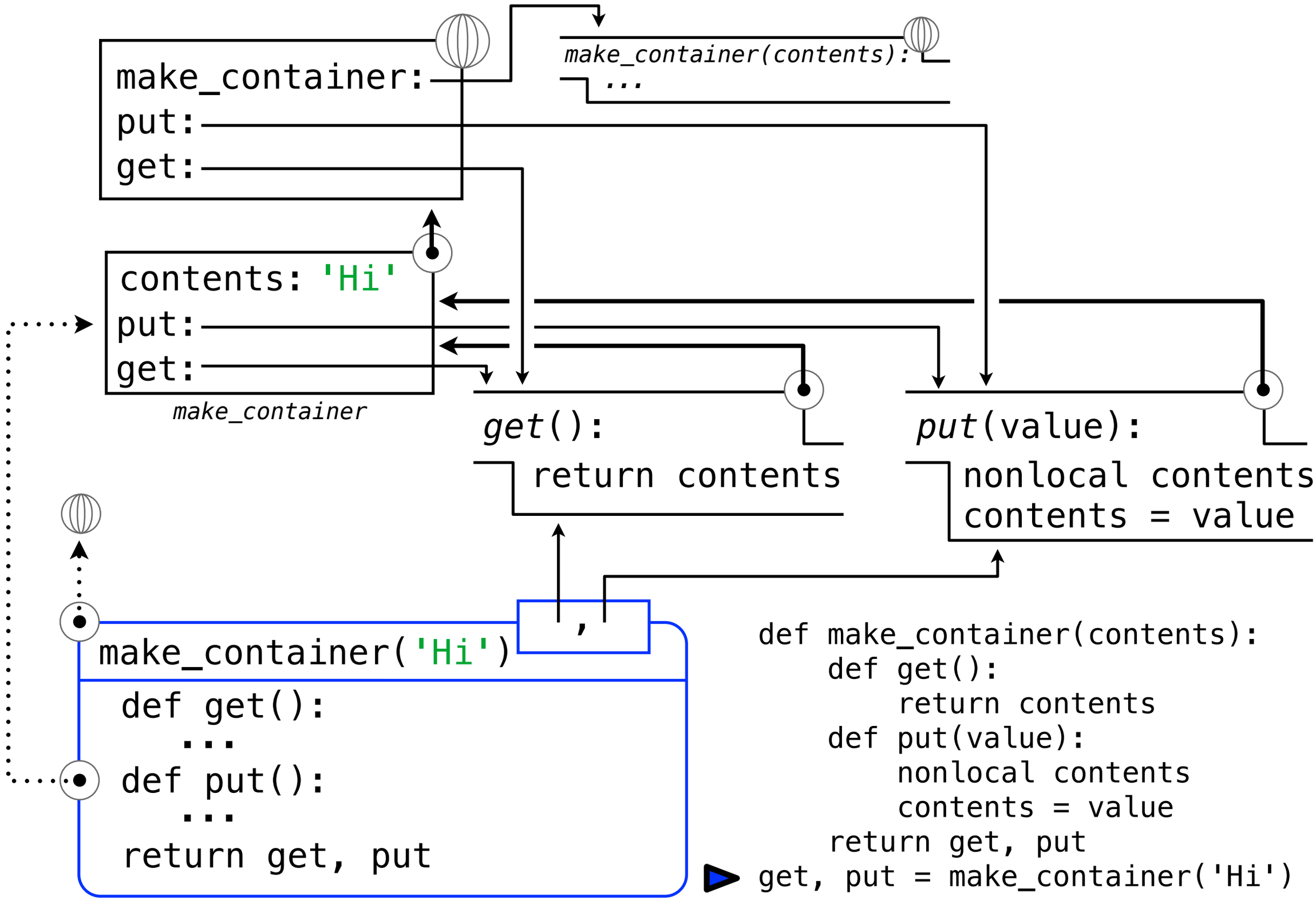

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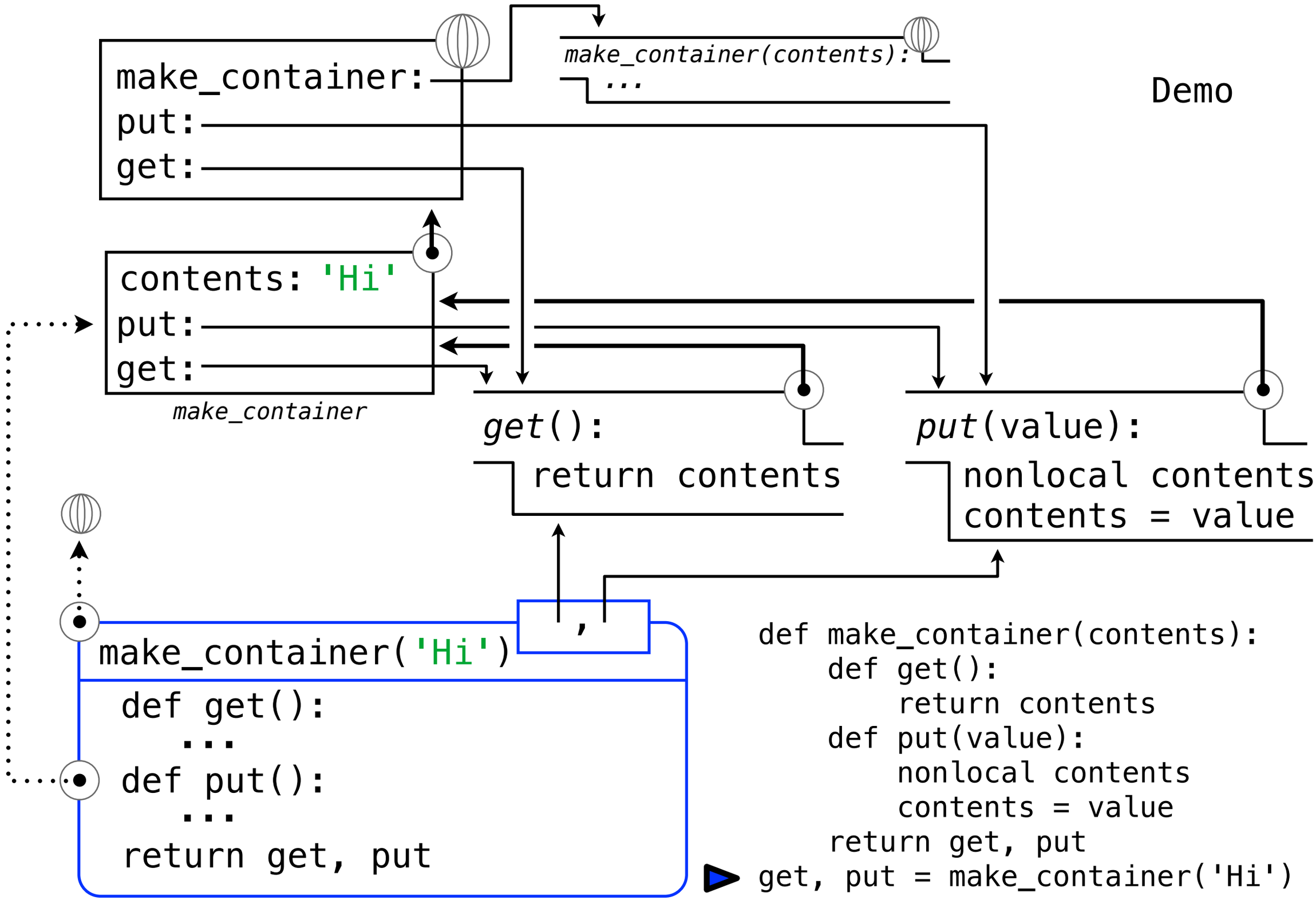
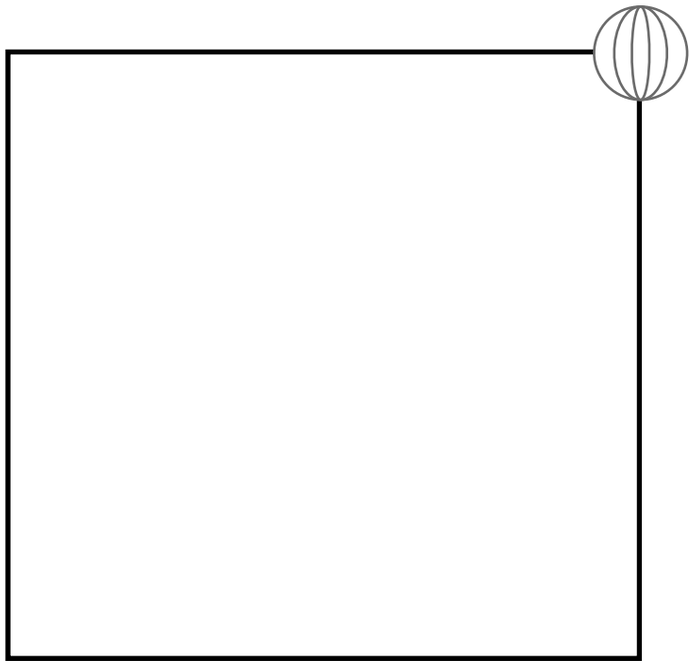


Python Lists

```
['Demo']
```

http://docs.python.org/py3k/library/stdtypes.html#mutable-sequence-types

Sharing and Identity with Lists



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nest = list(suits)

nest[0] = suits

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suits.append('Joker')

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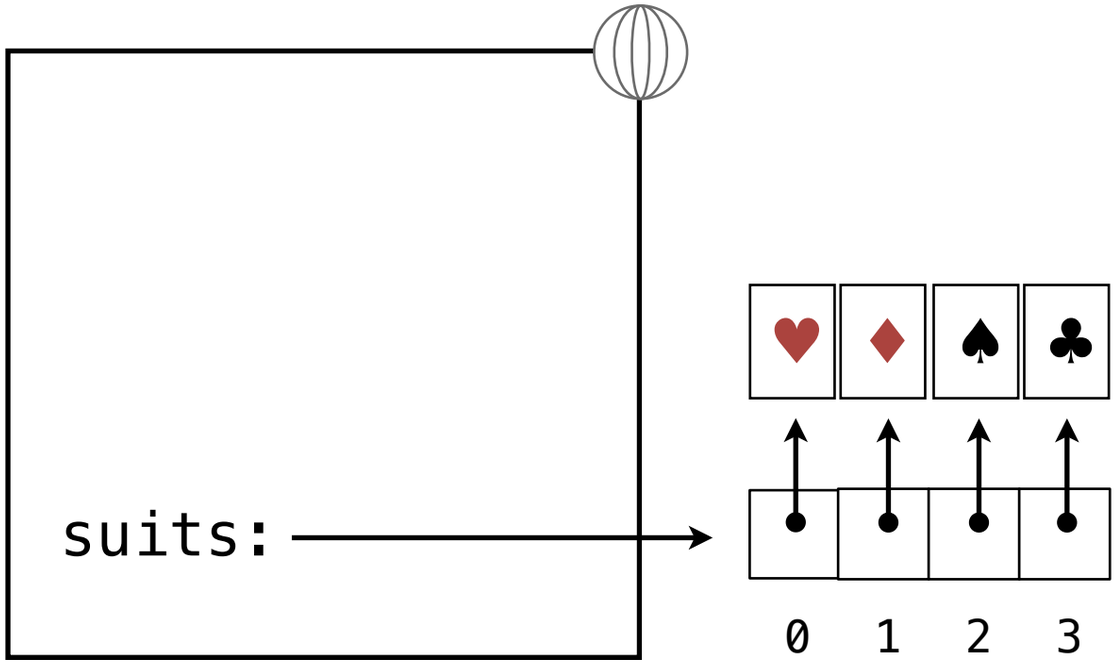


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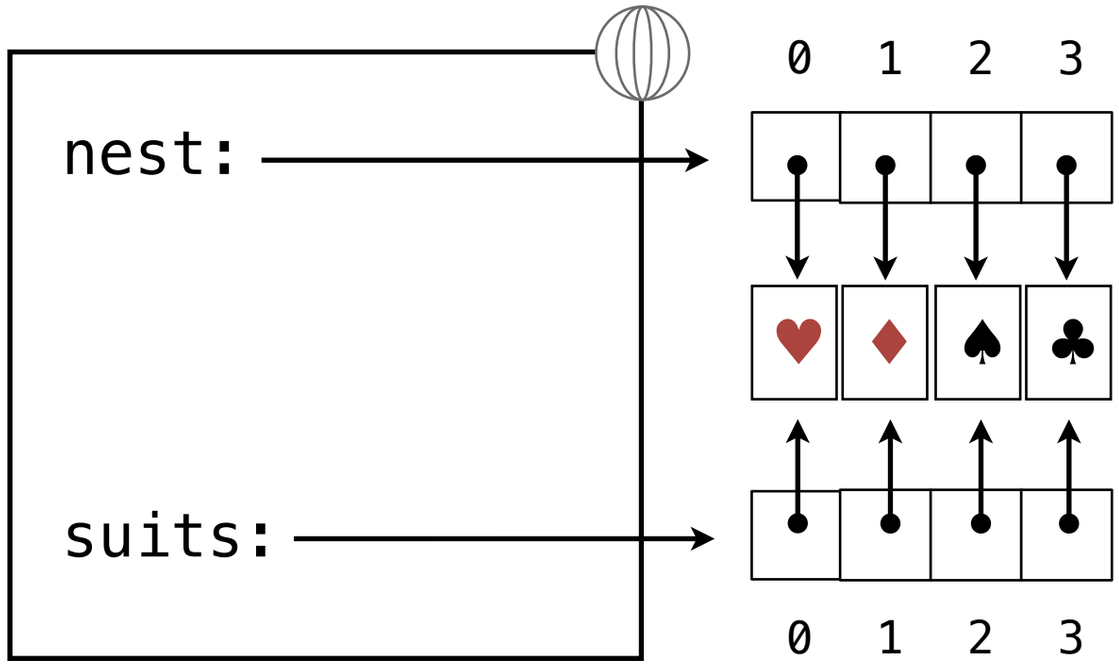


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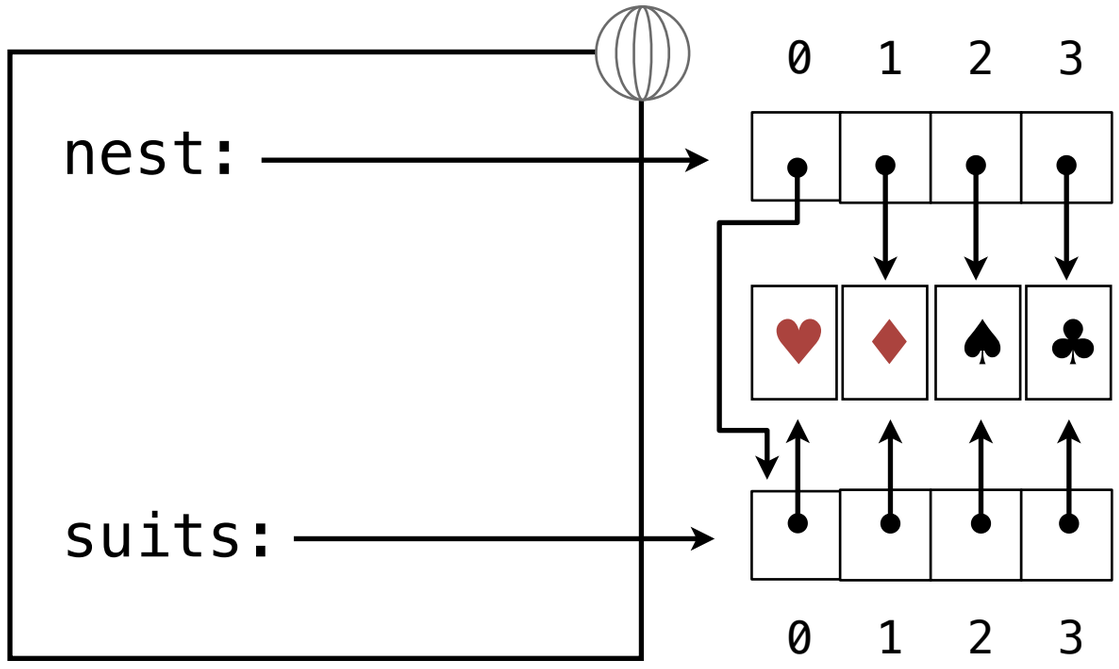


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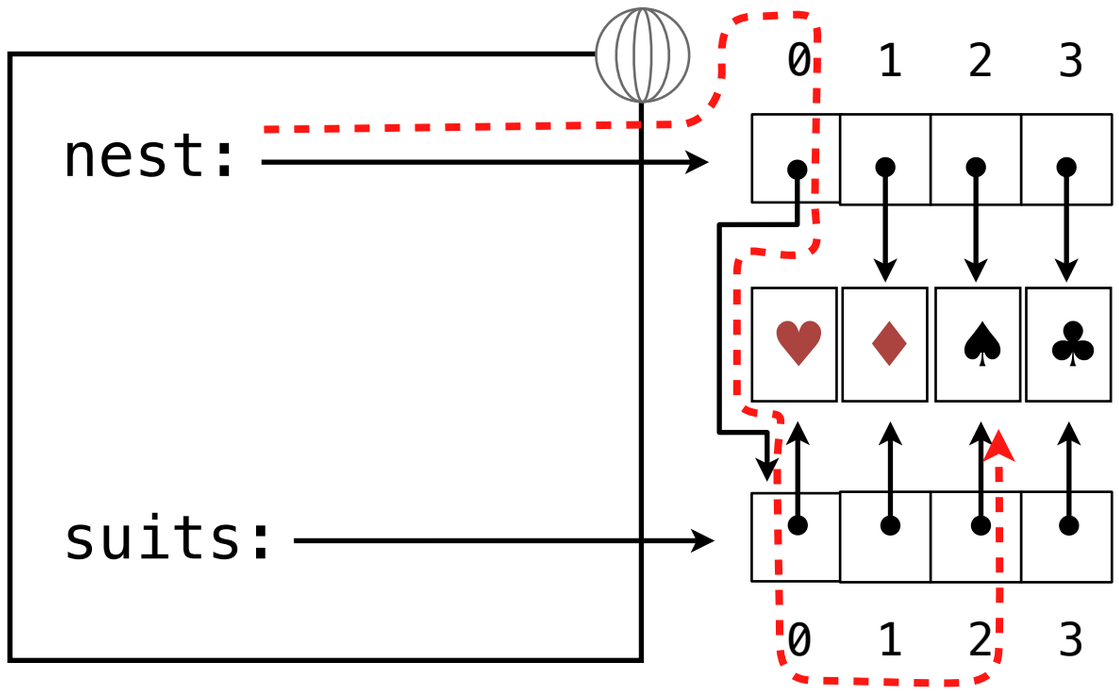


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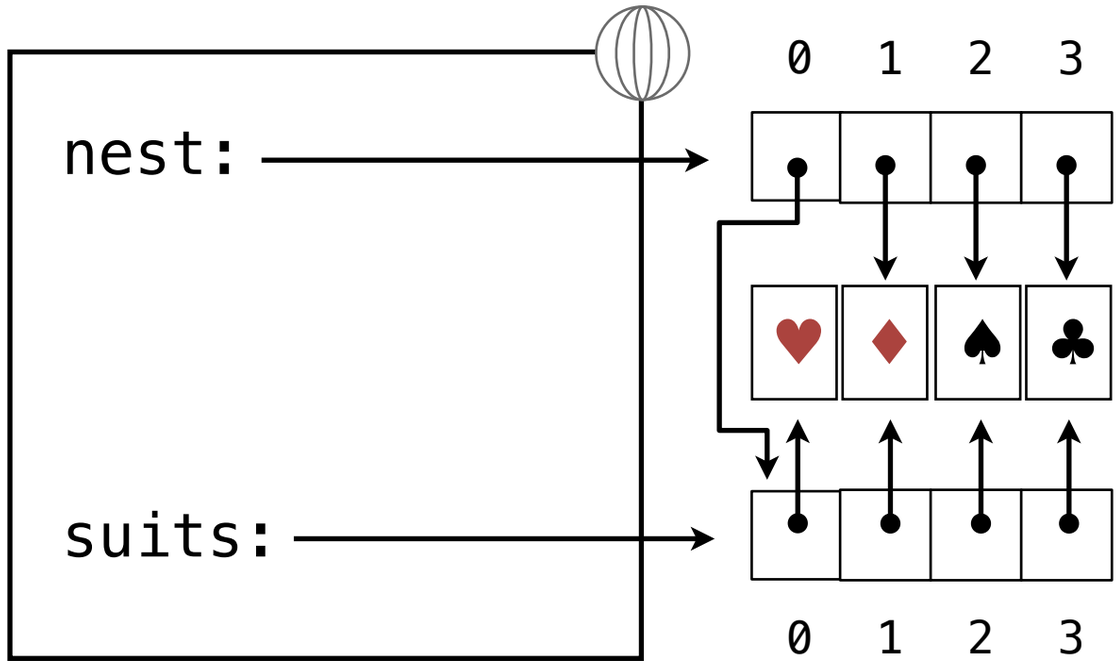


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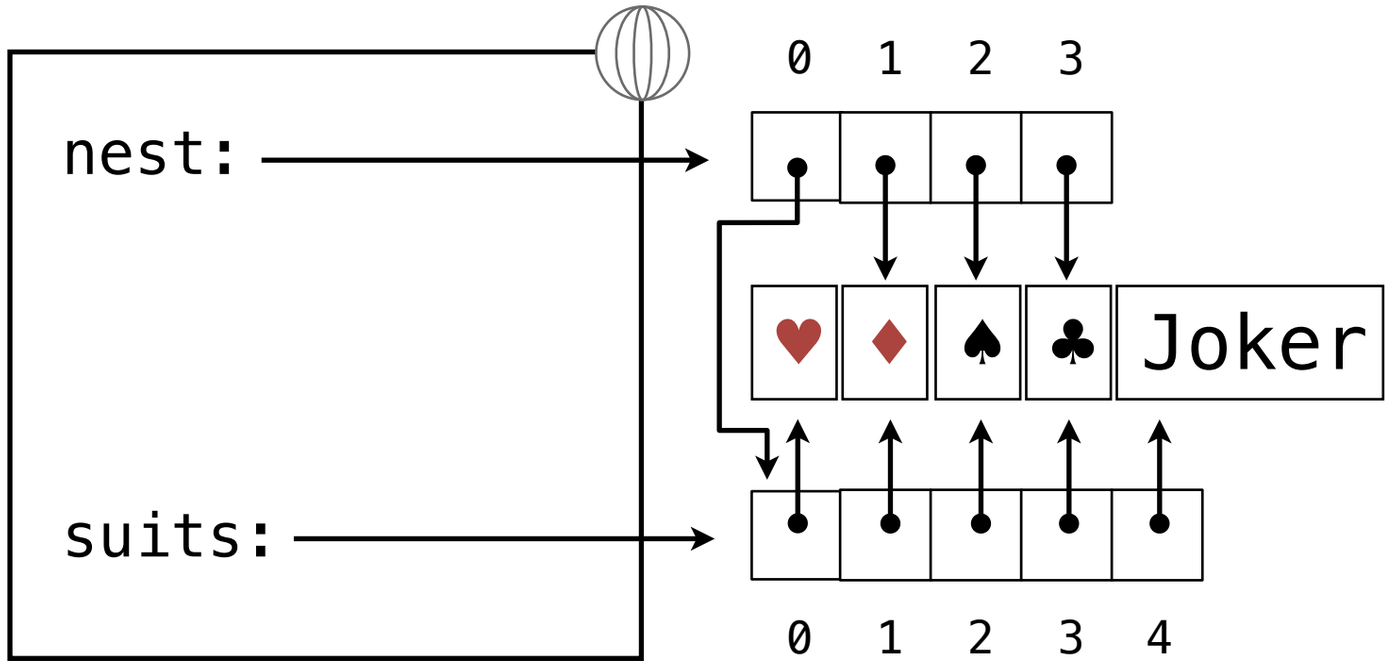


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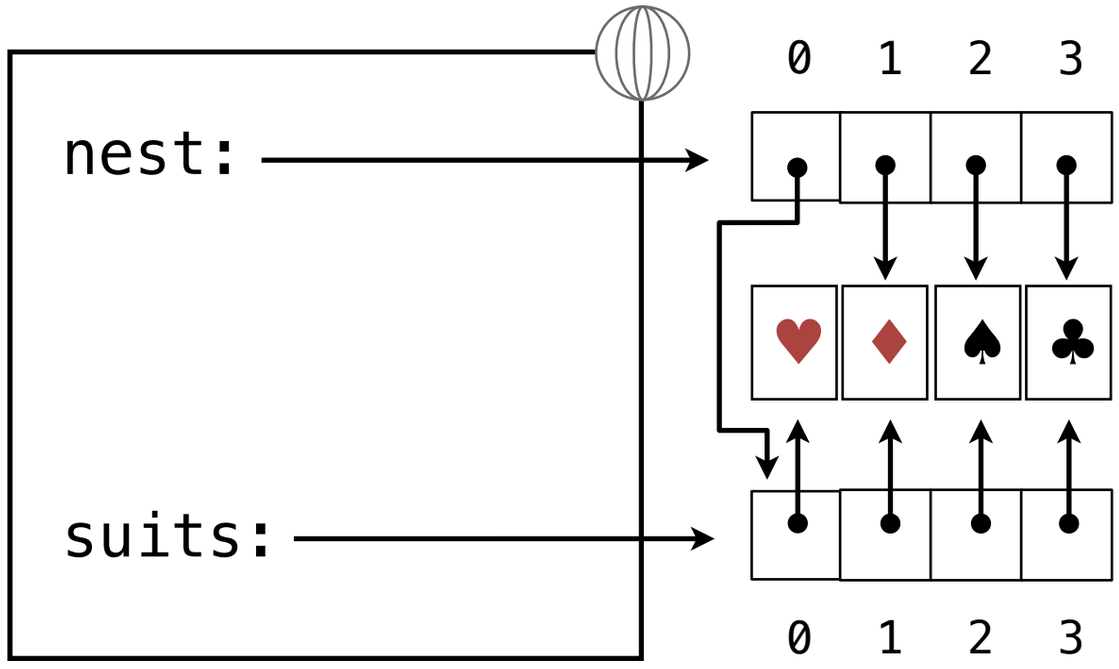


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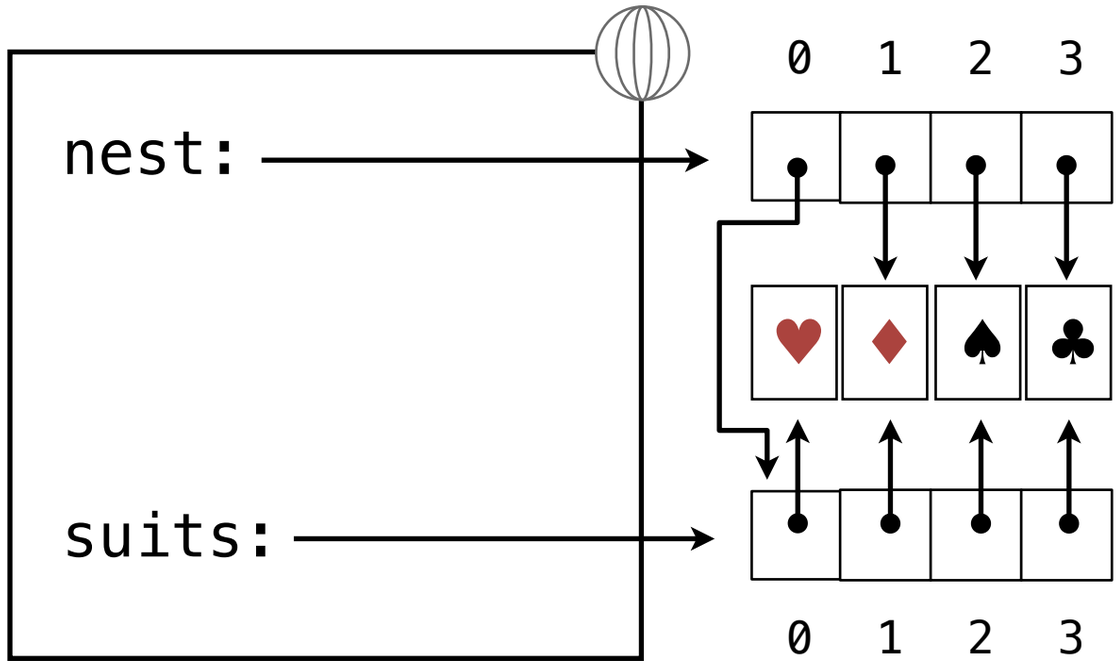
Testing for Identity




```
>>> suits is nest[0]
True
>>> suits is ['♥', '♦', '♠', '♣']
False
>>> suits == ['♥', '♦', '♠', '♣']
True
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- Headers perform equality tests on the message

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    def dispatch(message, value=None):
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        if message == 'get':
            return contents
        if message == 'put':
            contents = value

    return dispatch
```

```
def make_container(contents):

    def get():
        return contents

    def put(value):
        nonlocal contents
        contents = value

    return get, put
```

A Mutable Container That Uses Message Passing

```
def make_container_dispatch(contents):
    def dispatch(message, value=None):
        nonlocal contents
        if message == 'get':
            return contents
        if message == 'put':
            contents = value

    return dispatch
```

```
def make_container(contents):

    def get():
        return contents

    def put(value):
        nonlocal contents
        contents = value

    return get, put
```

Demo

Implementing Mutable Recursive Lists

Implementing Mutable Recursive Lists

Recursive List
Refresher Demo

Implementing Mutable Recursive Lists

```
def make_mutable_rlist():
```

Recursive List Refresher Demo

Implementing Mutable Recursive Lists

```
def make_mutable_rlist():
    contents = empty_rlist
```

Recursive List Refresher Demo

Implementing Mutable Recursive Lists

```
def make_mutable_rlist():
    contents = empty_rlist
    def dispatch(message, value=None):
```

Recursive List Refresher Demo

Implementing Mutable Recursive Lists

```
def make_mutable_rlist():
    contents = empty_rlist
    def dispatch(message, value=None):
        nonlocal contents
```

Recursive List Refresher Demo

Implementing Mutable Recursive Lists

```
def make_mutable_rlist():
    contents = empty_rlist
    def dispatch(message, value=None):
        nonlocal contents
        if message == 'len':
```

Recursive List Refresher Demo

Implementing Mutable Recursive Lists

```
def make_mutable_rlist():
    contents = empty_rlist
    def dispatch(message, value=None):
        nonlocal contents
        if message == 'len':
            return len_rlist(contents)
```

Recursive List Refresher Demo

Implementing Mutable Recursive Lists

```
def make_mutable_rlist():
    contents = empty_rlist
    def dispatch(message, value=None):
        nonlocal contents
        if message == 'len':
            return len_rlist(contents)
        elif message == 'getitem':
```

Recursive List Refresher Demo

Implementing Mutable Recursive Lists

```
def make_mutable_rlist():
    contents = empty_rlist
    def dispatch(message, value=None):
        nonlocal contents
        if message == 'len':
            return len_rlist(contents)
        elif message == 'getitem':
            return getitem_rlist(contents, value)
```

Recursive List Refresher Demo

Implementing Mutable Recursive Lists

```
def make_mutable_rlist():
    contents = empty_rlist
    def dispatch(message, value=None):
        nonlocal contents
        if message == 'len':
            return len_rlist(contents)
        elif message == 'getitem':
            return getitem_rlist(contents, value)
        elif message == 'push_first':
```

Recursive List Refresher Demo

Implementing Mutable Recursive Lists

```
def make_mutable_rlist():
    contents = empty_rlist
    def dispatch(message, value=None):
        nonlocal contents
        if message == 'len':
            return len_rlist(contents)
        elif message == 'getitem':
            return getitem_rlist(contents, value)
        elif message == 'push_first':
            contents = make_rlist(value, contents)
```

Recursive List Refresher Demo

Implementing Mutable Recursive Lists

```
def make_mutable_rlist():
    contents = empty_rlist
    def dispatch(message, value=None):
        nonlocal contents
        if message == 'len':
            return len_rlist(contents)
        elif message == 'getitem':
            return getitem_rlist(contents, value)
        elif message == 'push_first':
            contents = make_rlist(value, contents)
        elif message == 'pop_first':
```

Recursive List Refresher Demo

Implementing Mutable Recursive Lists

```
def make_mutable_rlist():
    contents = empty_rlist
    def dispatch(message, value=None):
        nonlocal contents
        if message == 'len':
            return len_rlist(contents)
        elif message == 'getitem':
            return getitem_rlist(contents, value)
        elif message == 'push_first':
            contents = make_rlist(value, contents)
        elif message == 'pop_first':
            f = first(contents)
```

Recursive List Refresher Demo

Implementing Mutable Recursive Lists

```
def make_mutable_rlist():
    contents = empty_rlist
    def dispatch(message, value=None):
        nonlocal contents
        if message == 'len':
            return len_rlist(contents)
        elif message == 'getitem':
            return getitem_rlist(contents, value)
        elif message == 'push_first':
            contents = make_rlist(value, contents)
        elif message == 'pop_first':
            f = first(contents)
            contents = rest(contents)
```

Recursive List Refresher Demo

Implementing Mutable Recursive Lists

```
def make_mutable_rlist():
    contents = empty_rlist
    def dispatch(message, value=None):
        nonlocal contents
        if message == 'len':
            return len_rlist(contents)
        elif message == 'getitem':
            return getitem_rlist(contents, value)
        elif message == 'push_first':
            contents = make_rlist(value, contents)
        elif message == 'pop_first':
            f = first(contents)
            contents = rest(contents)
            return f
```

Recursive List Refresher Demo

Implementing Mutable Recursive Lists

```
def make_mutable_rlist():
    contents = empty_rlist
    def dispatch(message, value=None):
        nonlocal contents
        if message == 'len':
            return len_rlist(contents)
        elif message == 'getitem':
            return getitem_rlist(contents, value)
        elif message == 'push_first':
            contents = make_rlist(value, contents)
        elif message == 'pop_first':
            f = first(contents)
            contents = rest(contents)
            return f
        elif message == 'str':
```

Recursive List Refresher Demo

Implementing Mutable Recursive Lists

```
def make_mutable_rlist():
    contents = empty_rlist
    def dispatch(message, value=None):
        nonlocal contents
        if message == 'len':
            return len_rlist(contents)
        elif message == 'getitem':
            return getitem_rlist(contents, value)
        elif message == 'push_first':
            contents = make_rlist(value, contents)
        elif message == 'pop_first':
            f = first(contents)
            contents = rest(contents)
            return f
        elif message == 'str':
            return str(contents)
```

Recursive List Refresher Demo

Implementing Mutable Recursive Lists

```
def make_mutable_rlist():
    contents = empty_rlist
    def dispatch(message, value=None):
        nonlocal contents
        if message == 'len':
            return len_rlist(contents)
        elif message == 'getitem':
            return getitem_rlist(contents, value)
        elif message == 'push_first':
            contents = make_rlist(value, contents)
        elif message == 'pop_first':
            f = first(contents)
            contents = rest(contents)
            return f
        elif message == 'str':
            return str(contents)
    return dispatch
```

Recursive List Refresher Demo

Implementing Mutable Recursive Lists

```
def make_mutable_rlist():
    contents = empty_rlist
    def dispatch(message, value=None):
        nonlocal contents
        if message == 'len':
            return len_rlist(contents)
        elif message == 'getitem':
            return getitem_rlist(contents, value)
        elif message == 'push_first':
            contents = make_rlist(value, contents)
        elif message == 'pop_first':
            f = first(contents)
            contents = rest(contents)
            return f
        elif message == 'str':
            return str(contents)
    return dispatch
```

Recursive List Refresher Demo

Demo