Discover asyncio event loop

Pycon 2014, Lyon

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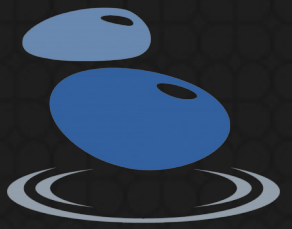

- Python core developer since 2010
- `github.com/haypo/`
- `bitbucket.org/haypo/`
- Working for eNovance

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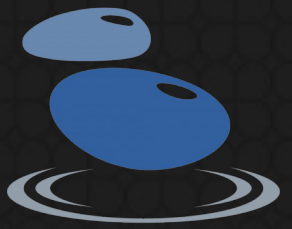
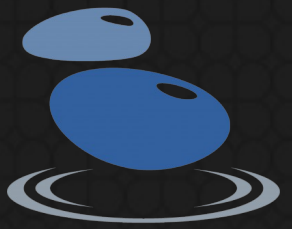
Disclamer



- How asyncio is implemented
- Simplified code snippets close to asyncio, but different
- No error handling nor optimization
- (asyncio handles errors and is optimized)

Agenda



1. Callbacks
2. Timers
3. Selectors
4. Generator and yield from
5. Coroutine
6. Task

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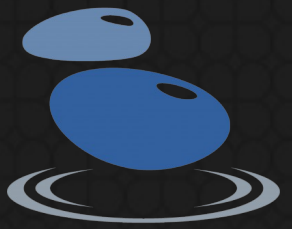
Callbacks



```
class CallbackEventLoop:
    def __init__(self):
        self.callbacks = []

    def call_soon(self, func):
        self.callbacks.append(func)

    def execute_callbacks(self):
        callbacks = self.callbacks
        self.callbacks = []
        for cb in callbacks:
            cb()
```

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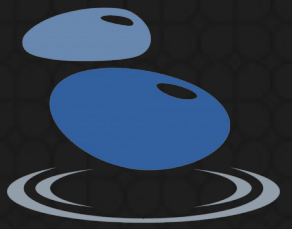
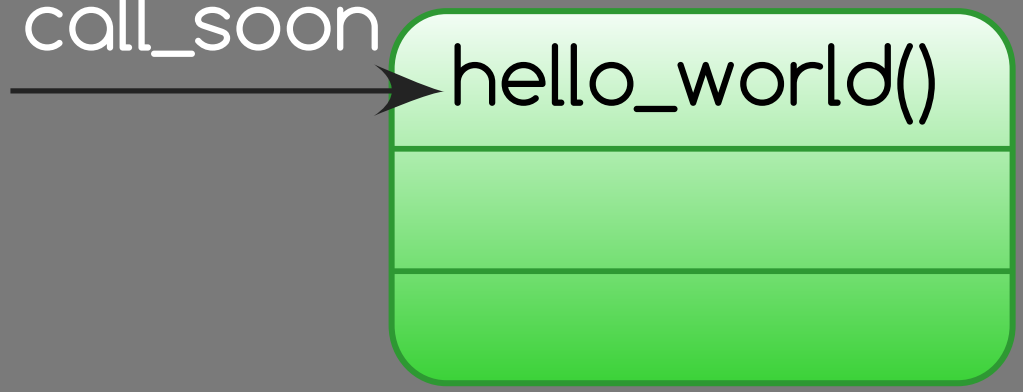
Callbacks



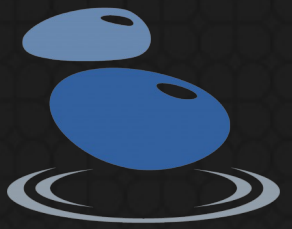
Code

```
.call_soon(hello_world)
```



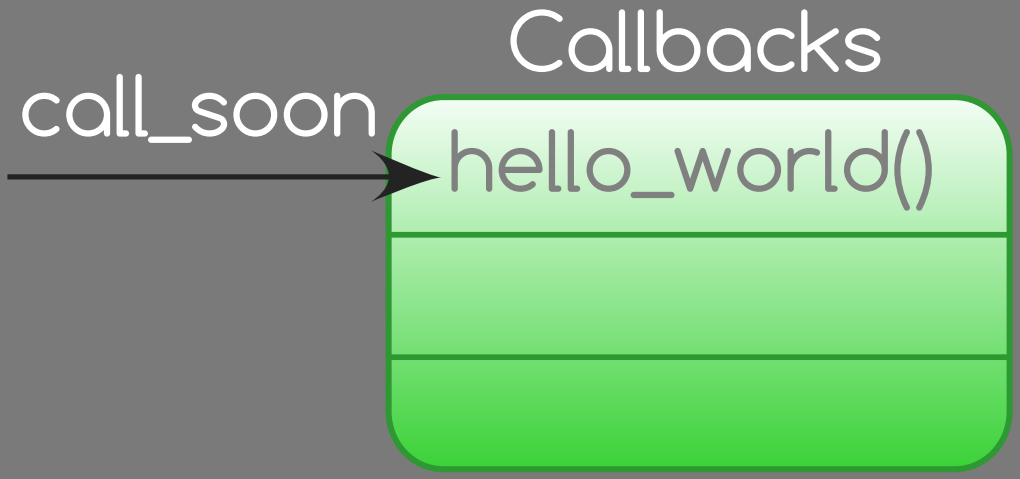
Output

Callbacks



Code

```
.call_soon(hello_world)
.execute_callbacks()
```



Output

```
Hello World!
```

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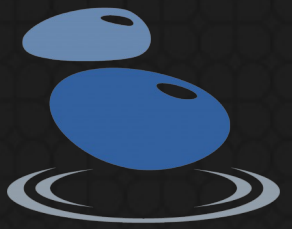
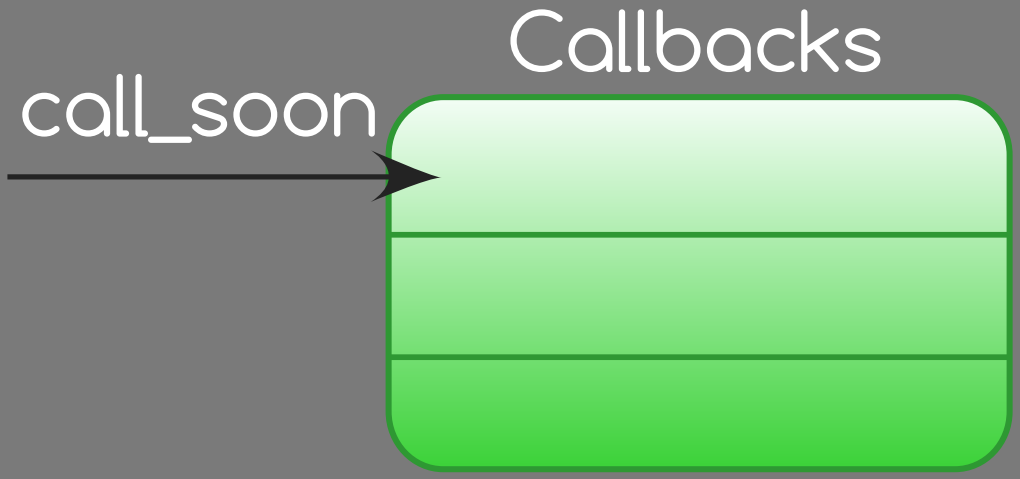
Callbacks



Code

```
.call_soon(hello_world)
.execute_callbacks()
```



Output

```
Hello World!
```

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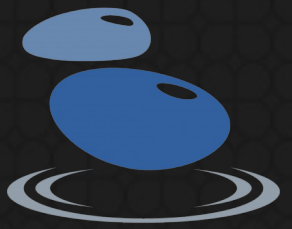
Timers



```
class TimerEventLoop(CallbackEventLoop):

    def __init__(self):
        super().__init__()
        self.timers = []

    def call_at(self, when, func):
        timer = (when, func)
        self.timers.append(timer)

    ...
```

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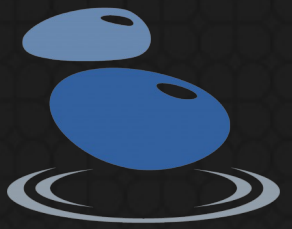
Timers



```
class TimerEventLoop(CallbackEventLoop):
    ...
    def execute_timers(self):
        now = time.time()
        new_timers = []
        for when, func in self.timers:
            if when <= now:
                self.call_soon(func)
            else:
                new_timers.append((when, func))
        self.timers = new_timers

        self.execute_callback()
```

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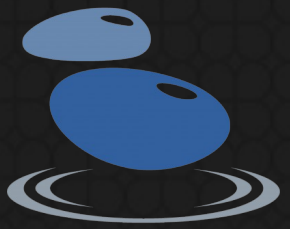
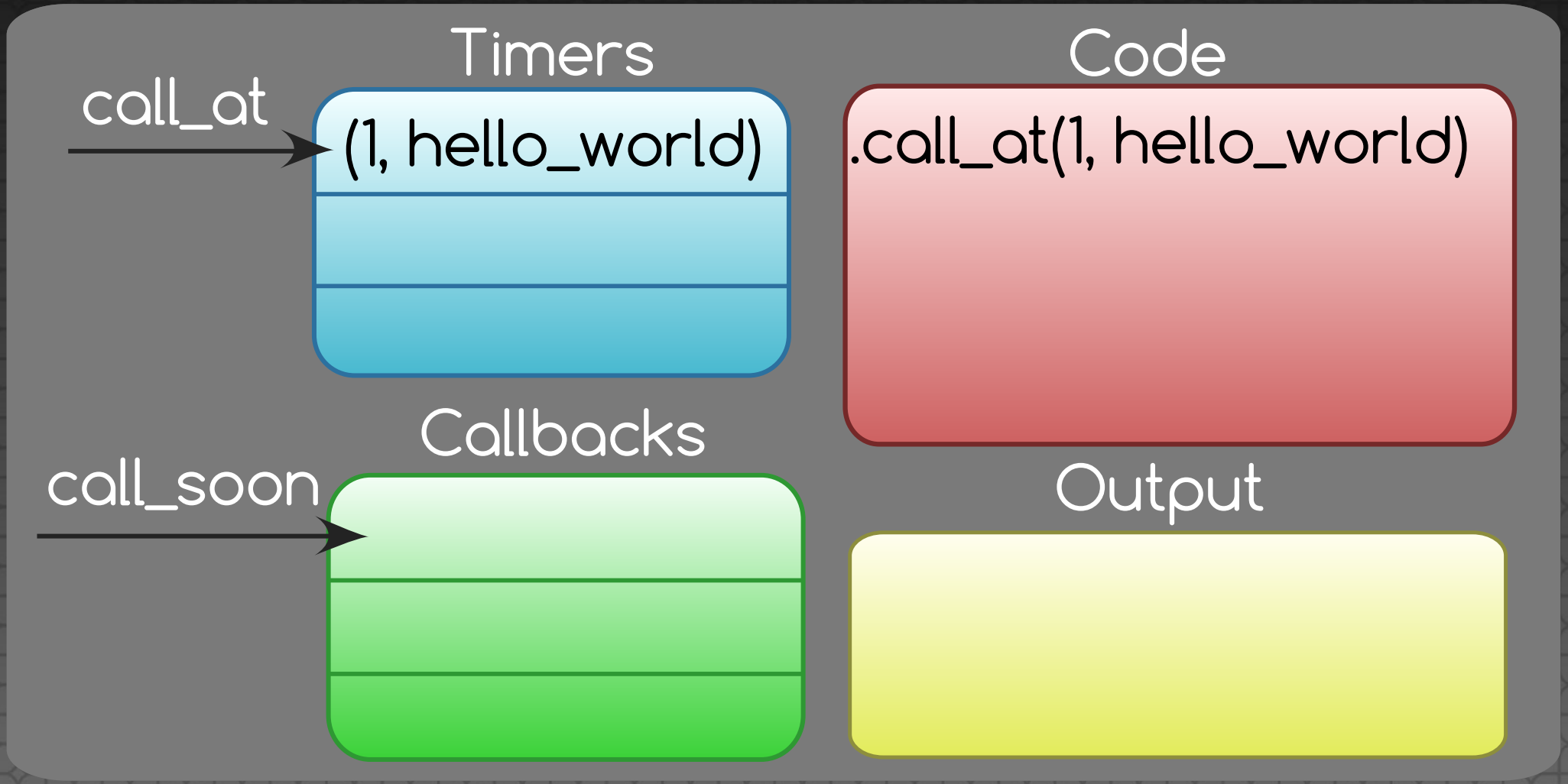
Timers





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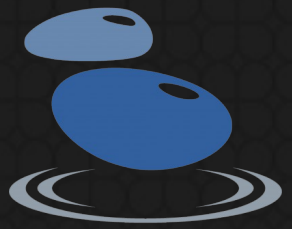
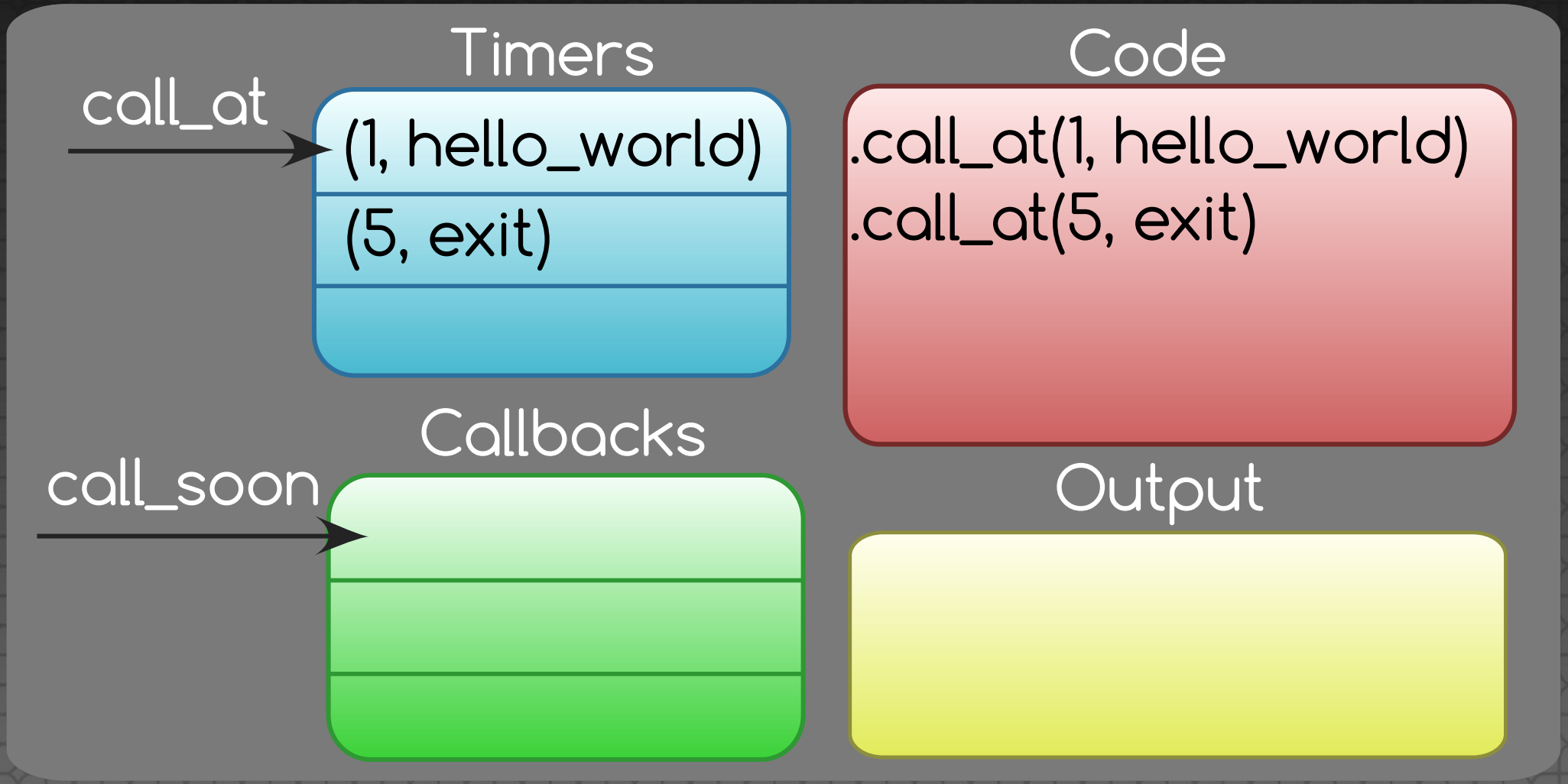
Timers





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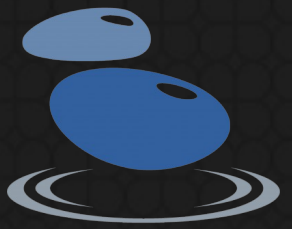
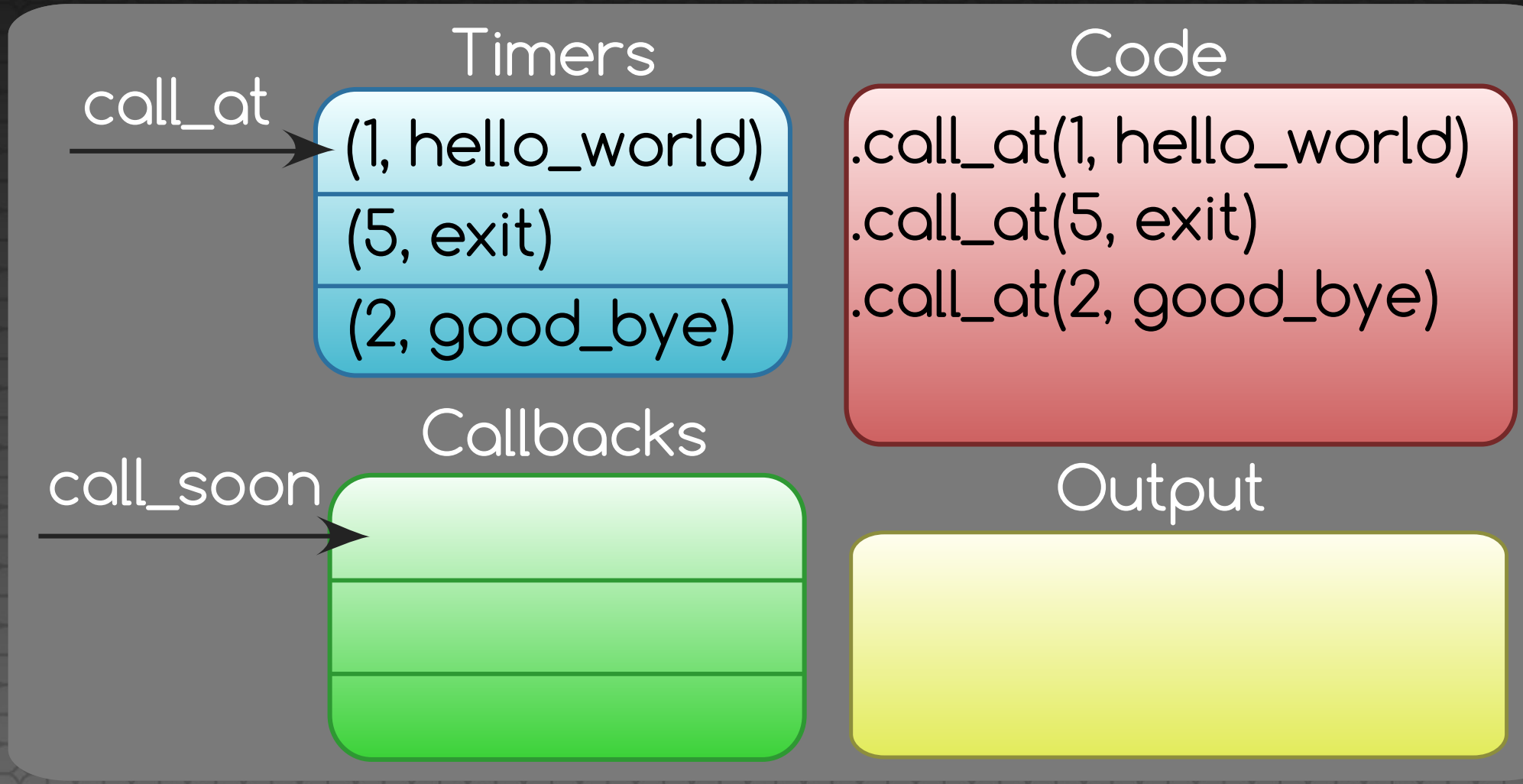
Timers





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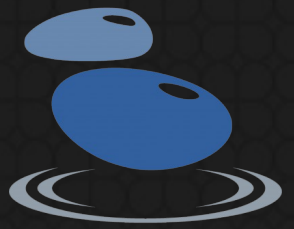
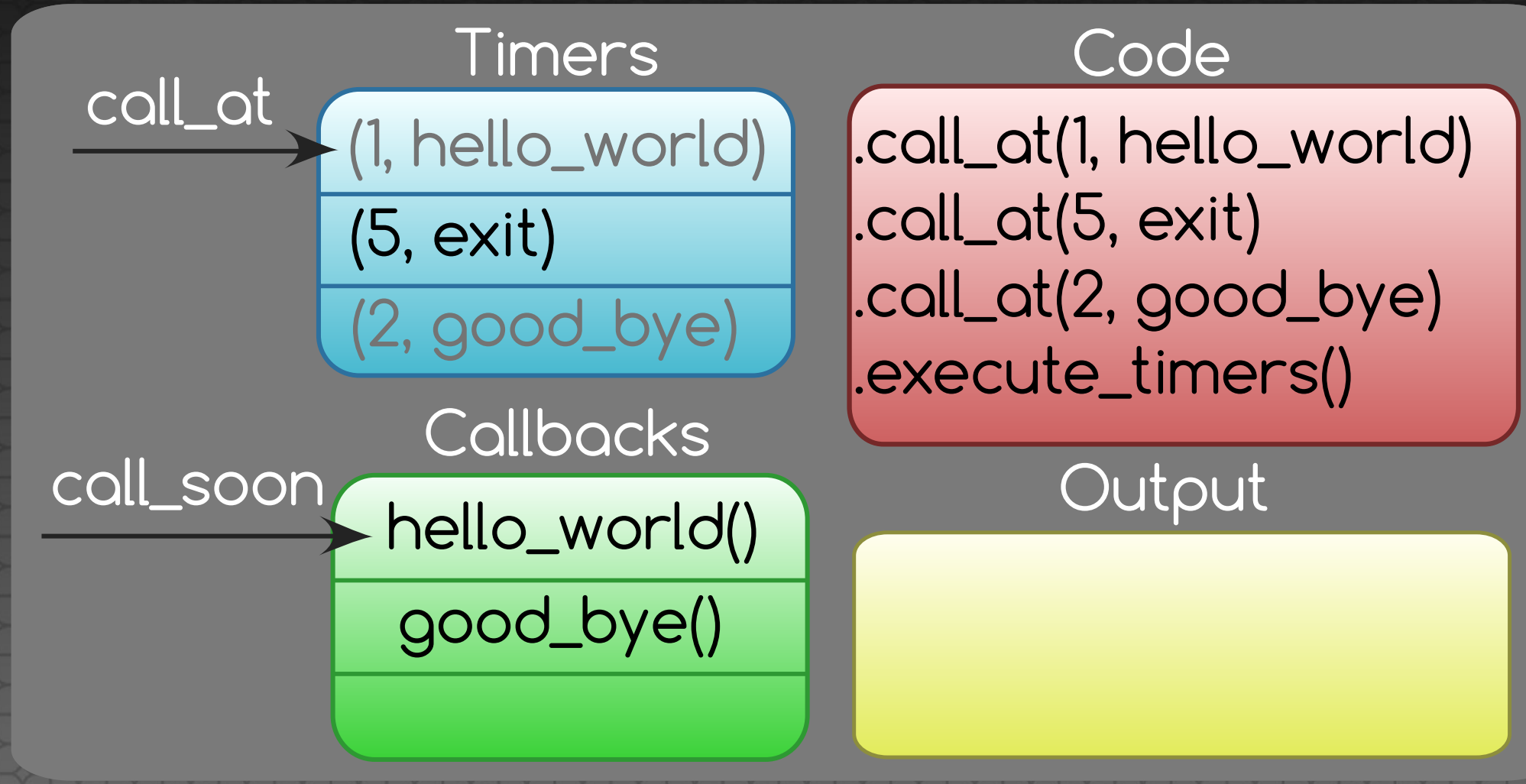
Timers





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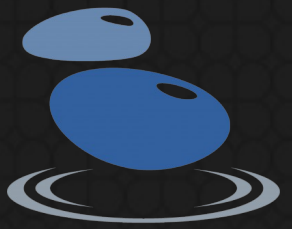
Timers



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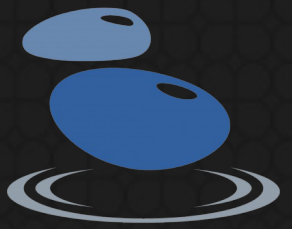
Timers



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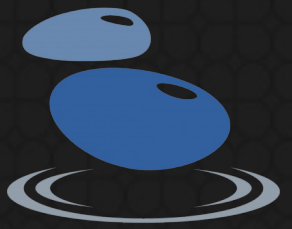
Selector



```
class SelectorEventLoop(TimerEventLoop):

    def __init__(self):
        super().__init__()
        self.selector = selectors.Selector()

    def add_reader(self, sock, func):
        self.selector.register(sock,
                               selectors.EVENT_READ, func)

    ...
```

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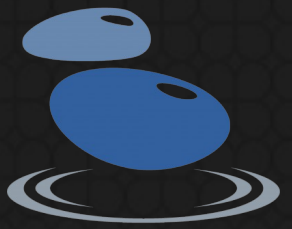
Selector



```
class SelectorEventLoop(TimerEventLoop):
    ...
    def select(self):
        timeout = self.compute_timeout()

        events = self.selector.select(timeout)
        for key, mask in events:
            func = key.data
            self.call_soon(func, key.fileobj)

        self.execute_timers()
```

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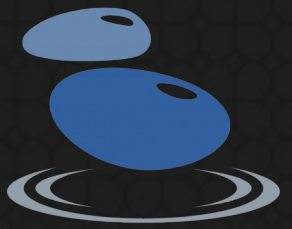
Selector



```
class SelectorEventLoop(TimerEventLoop):
    ...
    def compute_timeout(self):
        if self.callbacks:
            # already something to do
            return 0
        elif self.timers:
            next_timer = min(self.timers)[0]
            timeout = next_timer - time.time()
            return max(timeout, 0.0)
        else:
            # blocking call
            return None
```

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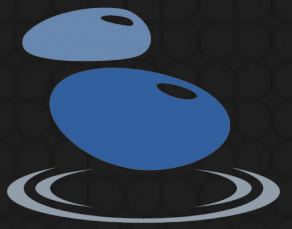
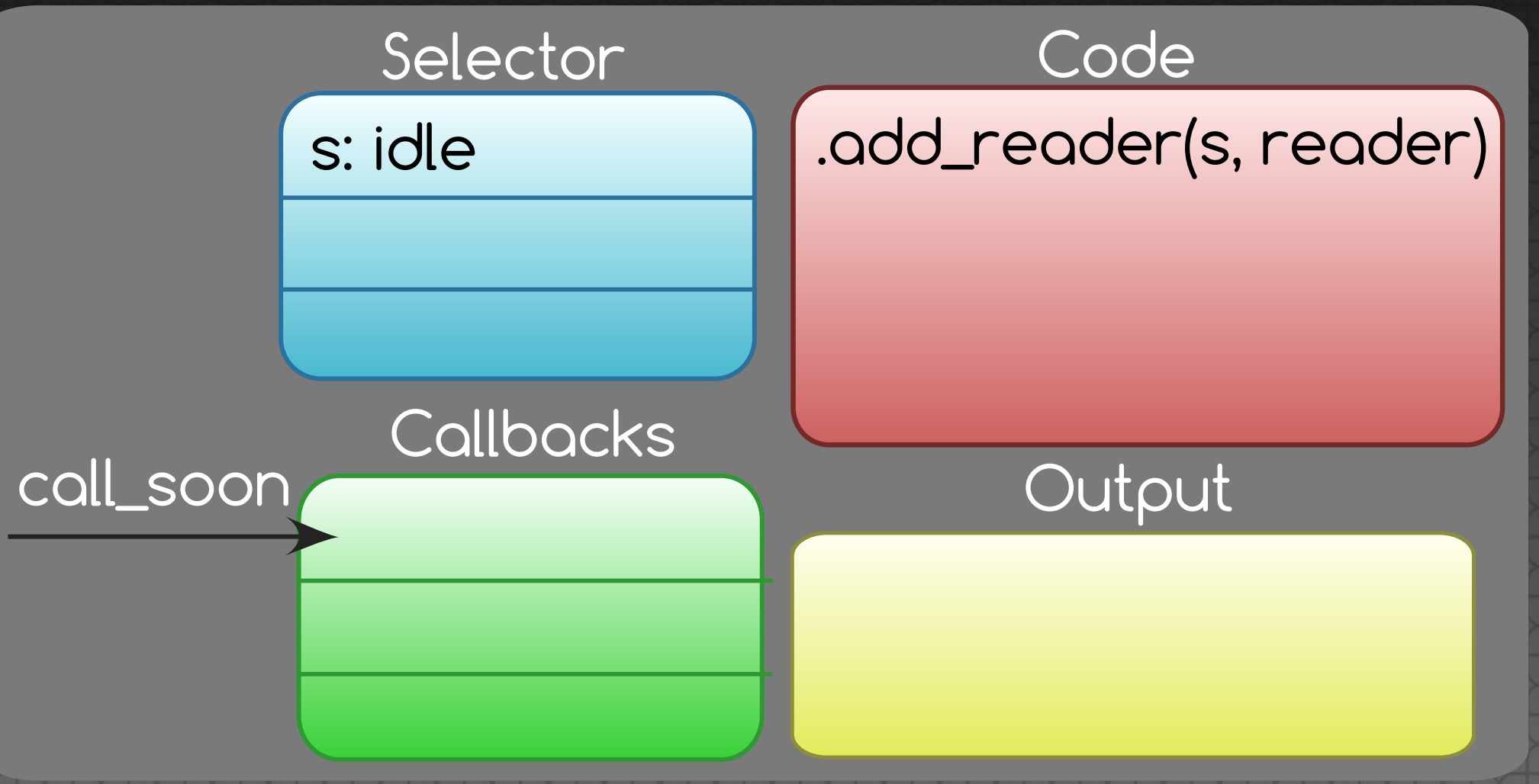
Selector





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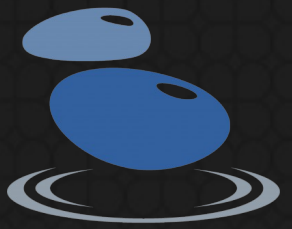
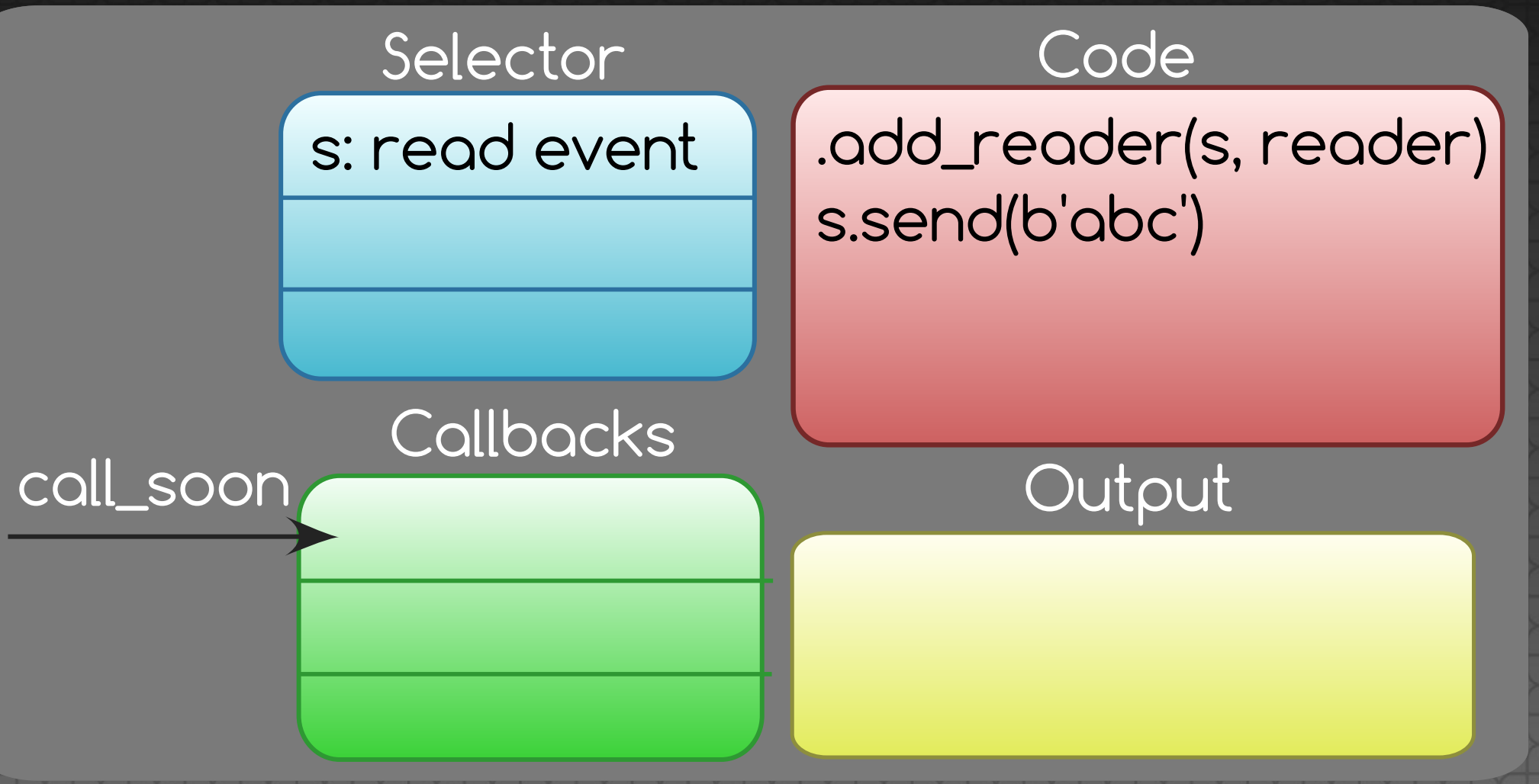
Selector





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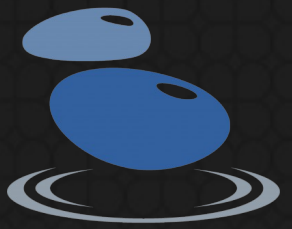
Selector



Selector

s: read event

Code

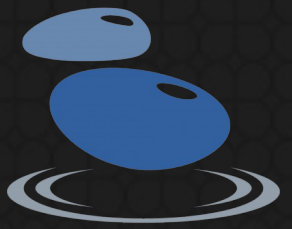
```
.add_reader(s, reader)
s.send(b'abc')
.select()
```

Callbacks

call_soon → reader()

Output

Selector



Selector

s: idle

Code

```
.add_reader(s, reader)
s.send(b'abc')
.select()
```

Callbacks

call_soon → reader()

Output

Received: b'abc'

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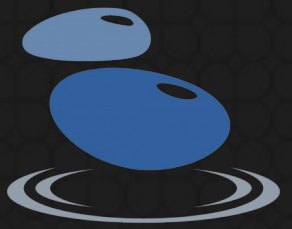
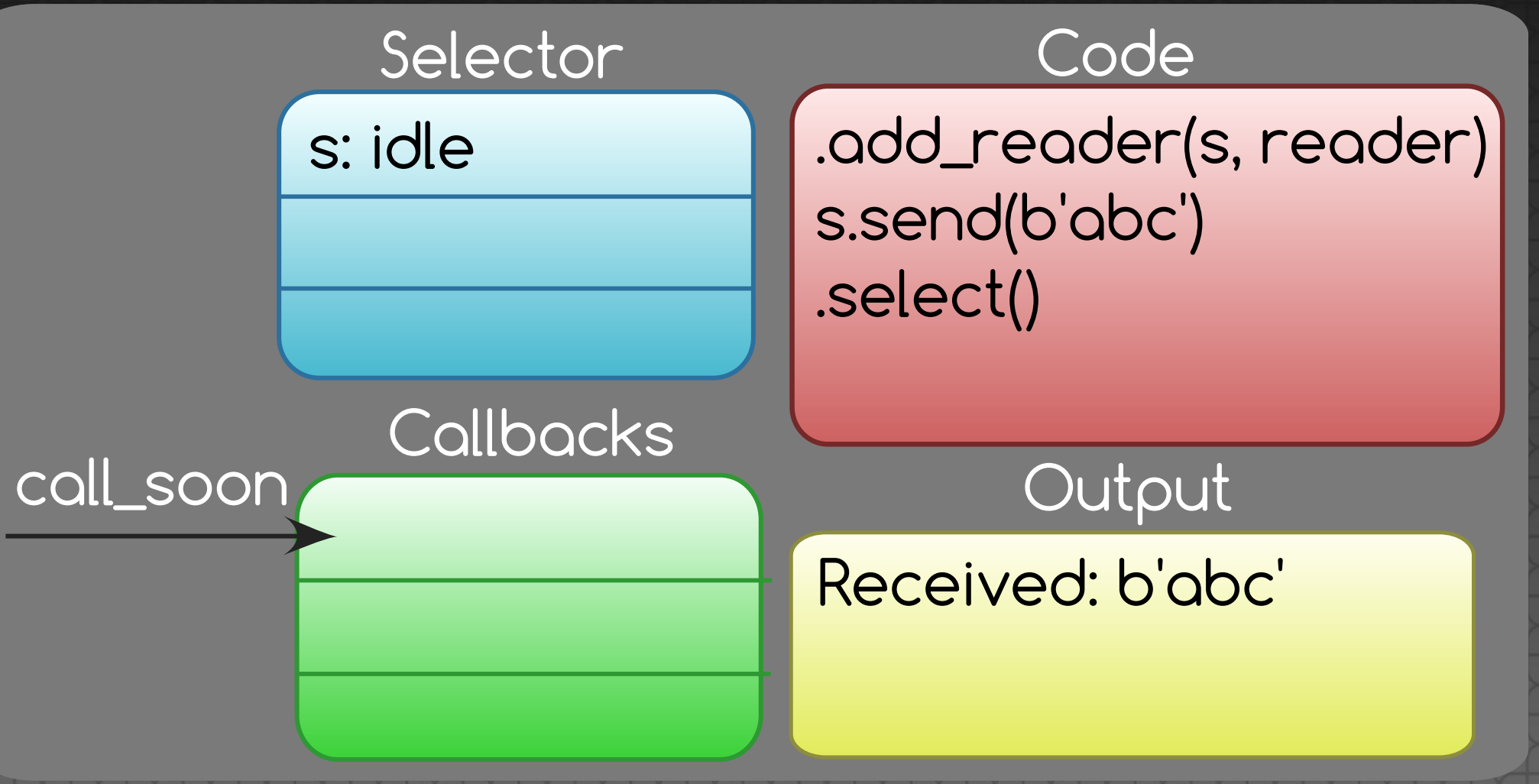
Selector





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Thanks David Malcom for the LibreOffice model

http://dmalcolm.livejournal.com/