aiocache Documentation

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Contents

CHAPTER 1

Installing

```
pip install aiocache
```

If you don't need redis or memcached support, you can install as follows:

```
AIOCACHE_REDIS=no pip install aiocache       # Don't install redis client (aioredis)
AIOCACHE_MEMCACHED=no pip install aiocache   # Don't install memcached client
↪(aiomcache)
```

CHAPTER 2

Usage

Using a cache is as simple as

```
>>> import asyncio
>>> loop = asyncio.get_event_loop()
>>> from aiocache import SimpleMemoryCache
>>> cache = SimpleMemoryCache()
>>> loop.run_until_complete(cache.set('key', 'value'))
True
>>> loop.run_until_complete(cache.get('key'))
'value'
```

Here we are using the *SimpleMemoryCache* but you can use any other listed in *Caches*. All caches contain the same minimum interface which consists on the following functions:

- `add`: Only adds key/value if key does not exist. Otherwise raises ValueError.
- `get`: Retrieve value identified by key.
- `set`: Sets key/value.
- `multi_get`: Retrieves multiple key/values.
- `multi_set`: Sets multiple key/values.
- `exists`: Returns True if key exists False otherwise.
- `increment`: Increment the value stored in the given key.
- `delete`: Deletes key and returns number of deleted items.
- `clear`: Clears the items stored.
- `raw`: Executes the specified command using the underlying client.

You can also setup cache aliases like in Django settings:

```
import asyncio

```

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```
from aiocache import caches, SimpleMemoryCache, RedisCache
from aiocache.serializers import StringSerializer, PickleSerializer

caches.set_config({
    'default': {
        'cache': "aiocache.SimpleMemoryCache",
        'serializer': {
            'class': "aiocache.serializers.StringSerializer"
        }
    },
    'redis_alt': {
        'cache': "aiocache.RedisCache",
        'endpoint': "127.0.0.1",
        'port': 6379,
        'timeout': 1,
        'serializer': {
            'class': "aiocache.serializers.PickleSerializer"
        },
        'plugins': [
            {'class': "aiocache.plugins.HitMissRatioPlugin"},
            {'class': "aiocache.plugins.TimingPlugin"}
        ]
    }
})


async def default_cache():
    cache = caches.get('default')   # This always returns the same instance
    await cache.set("key", "value")

    assert await cache.get("key") == "value"
    assert isinstance(cache, SimpleMemoryCache)
    assert isinstance(cache.serializer, StringSerializer)


async def alt_cache():
    # This generates a new instance every time! You can also use `caches.create('alt
↪')`
    # or even `caches.create('alt', namespace="test", etc...)` to override extra args
    cache = caches.create(**caches.get_alias_config('redis_alt'))
    await cache.set("key", "value")

    assert await cache.get("key") == "value"
    assert isinstance(cache, RedisCache)
    assert isinstance(cache.serializer, PickleSerializer)
    assert len(cache.plugins) == 2
    assert cache.endpoint == "127.0.0.1"
    assert cache.timeout == 1
    assert cache.port == 6379
    await cache.close()


def test_alias():
    loop = asyncio.get_event_loop()
    loop.run_until_complete(default_cache())
    loop.run_until_complete(alt_cache())

```

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```
    cache = RedisCache()
    loop.run_until_complete(cache.delete("key"))
    loop.run_until_complete(cache.close())

    loop.run_until_complete(caches.get('default').close())


if __name__ == "__main__":
    test_alias()
```

In examples folder you can check different use cases:

- Sanic, Aiohttp and Tornado
- Python object in Redis
- Custom serializer for compressing data
- TimingPlugin and HitMissRatioPlugin demos
- Using marshmallow as a serializer
- Using cached decorator.
- Using multi_cached decorator.

CHAPTER 3

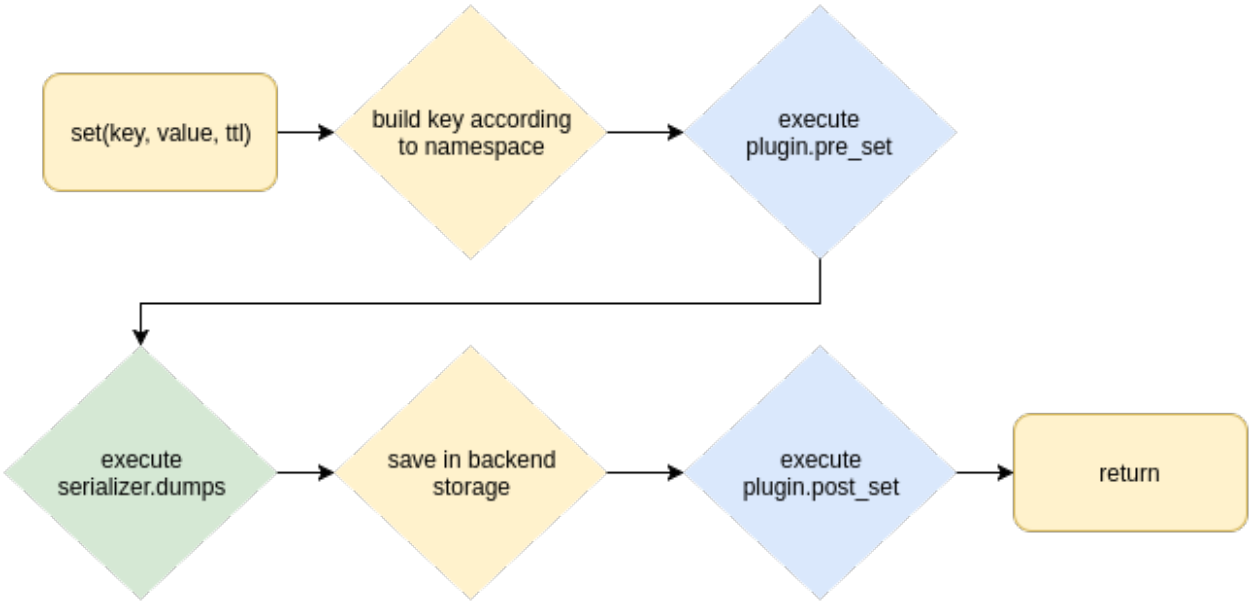
Contents

3.1 Caches

You can use different caches according to your needs. All the caches implement the same interface.

Caches are always working together with a serializer which transforms data when storing and retrieving from the backend. It may also contain plugins that are able to enrich the behavior of your cache (like adding metrics, logs, etc).

This is the flow of the `set` command:



Let's go with a more specific case. Let's pick Redis as the cache with namespace "test" and PickleSerializer as the serializer:

1. We receive `set("key", "value")`.

2. Hook `pre_set` of all attached plugins (none by default) is called.
3. "key" will become "test:key" when calling `build_key`.
4. "value" will become an array of bytes when calling `serializer.dumps` because of `PickleSerializer`.
5. the byte array is stored together with the key using `set` cmd in Redis.
6. Hook `post_set` of all attached plugins is called.

By default, all commands are covered by a timeout that will trigger an `asyncio.TimeoutError` in case of timeout. Timeout can be set at instance level or when calling the command.

The supported commands are:

- add
- get
- set
- multi_get
- multi_set
- delete
- exists
- increment
- expire
- clear
- raw

If you feel a command is missing here do not hesitate to open an issue

3.1.1 BaseCache

class aiocache.base.**BaseCache**(*serializer=None*, *plugins=None*, *namespace=None*, *timeout=5*)

Base class that agregates the common logic for the different caches that may exist. Cache related available options are:

Parameters

- **serializer** – obj derived from *aiocache.serializers.StringSerializer*. Default is *aiocache.serializers.StringSerializer*.
- **plugins** – list of *aiocache.plugins.BasePlugin* derived classes. Default is empty list.
- **namespace** – string to use as default prefix for the key used in all operations of the backend. Default is None
- **timeout** – int or float in seconds specifying maximum timeout for the operations to last. By default its 5. Use 0 or None if you want to disable it.

add(*key*, *value*, *ttl=None*, *dumps_fn=None*, *namespace=None*, *_conn=None*)

Stores the value in the given key with ttl if specified. Raises an error if the key already exists.

Parameters

- **key** – str
- **value** – obj

- **ttl** – int the expiration time in seconds. Due to memcached restrictions if you want compatibility use int. In case you need miliseconds, redis and memory support float ttls
- **dumps_fn** – callable alternative to use as dumps function
- **namespace** – str alternative namespace to use
- **timeout** – int or float in seconds specifying maximum timeout for the operations to last

Returns True if key is inserted

Raises

- ValueError if key already exists
- `asyncio.TimeoutError` if it lasts more than self.timeout

clear(*namespace=None*, *_conn=None*)

Clears the cache in the cache namespace. If an alternative namespace is given, it will clear those ones instead.

Parameters

- **namespace** – str alternative namespace to use
- **timeout** – int or float in seconds specifying maximum timeout for the operations to last

Returns True

Raises `asyncio.TimeoutError` if it lasts more than self.timeout

close(**args*, *_conn=None*, ***kwargs*)

Perform any resource clean up necessary to exit the program safely. After closing, cmd execution is still possible but you will have to close again before exiting.

Raises `asyncio.TimeoutError` if it lasts more than self.timeout

delete(*key*, *namespace=None*, *_conn=None*)

Deletes the given key.

Parameters

- **key** – Key to be deleted
- **namespace** – str alternative namespace to use
- **timeout** – int or float in seconds specifying maximum timeout for the operations to last

Returns int number of deleted keys

Raises `asyncio.TimeoutError` if it lasts more than self.timeout

exists(*key*, *namespace=None*, *_conn=None*)

Check key exists in the cache.

Parameters

- **key** – str key to check
- **namespace** – str alternative namespace to use
- **timeout** – int or float in seconds specifying maximum timeout for the operations to last

Returns True if key exists otherwise False

Raises `asyncio.TimeoutError` if it lasts more than self.timeout

expire(*key*, *ttl*, *namespace=None*, *_conn=None*)

Set the ttl to the given key. By setting it to 0, it will disable it

Parameters

- **key** – str key to expire
- **ttl** – int number of seconds for expiration. If 0, ttl is disabled
- **namespace** – str alternative namespace to use
- **timeout** – int or float in seconds specifying maximum timeout for the operations to last

Returns True if set, False if key is not found

Raises `asyncio.TimeoutError` if it lasts more than self.timeout

get(*key*, *default=None*, *loads_fn=None*, *namespace=None*, *_conn=None*)
Get a value from the cache. Returns default if not found.

Parameters

- **key** – str
- **default** – obj to return when key is not found
- **loads_fn** – callable alternative to use as loads function
- **namespace** – str alternative namespace to use
- **timeout** – int or float in seconds specifying maximum timeout for the operations to last

Returns obj loaded

Raises `asyncio.TimeoutError` if it lasts more than self.timeout

increment(*key*, *delta=1*, *namespace=None*, *_conn=None*)
Increments value stored in key by delta (can be negative). If key doesn't exist, it creates the key with delta as value.

Parameters

- **key** – str key to check
- **delta** – int amount to increment/decrement
- **namespace** – str alternative namespace to use
- **timeout** – int or float in seconds specifying maximum timeout for the operations to last

Returns Value of the key once incremented. -1 if key is not found.

Raises `asyncio.TimeoutError` if it lasts more than self.timeout

Raises `TypeError` if value is not incrementable

multi_get(*keys*, *loads_fn=None*, *namespace=None*, *_conn=None*)
Get multiple values from the cache, values not found are Nones.

Parameters

- **keys** – list of str
- **loads_fn** – callable alternative to use as loads function
- **namespace** – str alternative namespace to use
- **timeout** – int or float in seconds specifying maximum timeout for the operations to last

Returns list of objs

Raises `asyncio.TimeoutError` if it lasts more than self.timeout

multi_set(*pairs*, *ttl=None*, *dumps_fn=None*, *namespace=None*, *_conn=None*)
Stores multiple values in the given keys.

Parameters

- **pairs** – list of two element iterables. First is key and second is value
- **ttl** – int the expiration time in seconds. Due to memcached restrictions if you want compatibility use int. In case you need miliseconds, redis and memory support float ttls
- **dumps_fn** – callable alternative to use as dumps function
- **namespace** – str alternative namespace to use
- **timeout** – int or float in seconds specifying maximum timeout for the operations to last

Returns True

Raises `asyncio.TimeoutError` if it lasts more than self.timeout

raw(*command*, **args*, *_conn=None*, ***kwargs*)
Send the raw command to the underlying client. Note that by using this CMD you will lose compatibility with other backends.

Due to limitations with aiomcache client, args have to be provided as bytes. For rest of backends, str.

Parameters

- **command** – str with the command.
- **timeout** – int or float in seconds specifying maximum timeout for the operations to last

Returns whatever the underlying client returns

Raises `asyncio.TimeoutError` if it lasts more than self.timeout

set(*key*, *value*, *ttl=None*, *dumps_fn=None*, *namespace=None*, *_cas_token=None*, *_conn=None*)
Stores the value in the given key with ttl if specified

Parameters

- **key** – str
- **value** – obj
- **ttl** – int the expiration time in seconds. Due to memcached restrictions if you want compatibility use int. In case you need miliseconds, redis and memory support float ttls
- **dumps_fn** – callable alternative to use as dumps function
- **namespace** – str alternative namespace to use
- **timeout** – int or float in seconds specifying maximum timeout for the operations to last

Returns True if the value was set

Raises `asyncio.TimeoutError` if it lasts more than self.timeout

3.1.2 RedisCache

class aiocache.**RedisCache**(*serializer=None*, ***kwargs*)

Redis cache implementation with the following components as defaults:

- serializer: *aiocache.serializers.JsonSerializer*
- plugins: []

Config options are:

Parameters

- **serializer** – obj derived from *aiocache.serializers.StringSerializer*.
- **plugins** – list of *aiocache.plugins.BasePlugin* derived classes.
- **namespace** – string to use as default prefix for the key used in all operations of the backend. Default is None.
- **timeout** – int or float in seconds specifying maximum timeout for the operations to last. By default its 5.
- **endpoint** – str with the endpoint to connect to. Default is "127.0.0.1".
- **port** – int with the port to connect to. Default is 6379.
- **db** – int indicating database to use. Default is 0.
- **password** – str indicating password to use. Default is None.
- **pool_min_size** – int minimum pool size for the redis connections pool. Default is 1
- **pool_max_size** – int maximum pool size for the redis connections pool. Default is 10

3.1.3 SimpleMemoryCache

class aiocache.**SimpleMemoryCache**(*serializer=None*, ***kwargs*)

Memory cache implementation with the following components as defaults:

- serializer: *aiocache.serializers.JsonSerializer*
- plugins: None

Config options are:

Parameters

- **serializer** – obj derived from *aiocache.serializers.StringSerializer*.
- **plugins** – list of *aiocache.plugins.BasePlugin* derived classes.
- **namespace** – string to use as default prefix for the key used in all operations of the backend. Default is None.
- **timeout** – int or float in seconds specifying maximum timeout for the operations to last. By default its 5.

3.1.4 MemcachedCache

class aiocache.**MemcachedCache**(*serializer=None*, ***kwargs*)

Memcached cache implementation with the following components as defaults:

- serializer: *aiocache.serializers.JsonSerializer*
- plugins: []

Config options are:

Parameters

- **serializer** – obj derived from *aiocache.serializers.StringSerializer*.

- **plugins** – list of *aiocache.plugins.BasePlugin* derived classes.
- **namespace** – string to use as default prefix for the key used in all operations of the backend. Default is None
- **timeout** – int or float in seconds specifying maximum timeout for the operations to last. By default its 5.
- **endpoint** – str with the endpoint to connect to. Default is 127.0.0.1.
- **port** – int with the port to connect to. Default is 11211.
- **pool_size** – int size for memcached connections pool. Default is 2.

3.2 Serializers

Serializers can be attached to backends in order to serialize/deserialize data sent and retrieved from the backend. This allows to apply transformations to data in case you want it to be saved in a specific format in your cache backend. For example, imagine you have your `Model` and want to serialize it to something that Redis can understand (Redis can't store python objects). This is the task of a serializer.

To use a specific serializer:

```
>>> from aiocache import SimpleMemoryCache
>>> from aiocache.serializers import PickleSerializer
cache = SimpleMemoryCache(serializer=PickleSerializer())
```

Currently the following are built in:

3.2.1 NullSerializer

class aiocache.serializers.**NullSerializer**

This serializer does nothing. Its only recommended to be used by *aiocache.SimpleMemoryCache* because for other backends it will produce incompatible data unless you work only with str types.

DISCLAIMER: Be careful with mutable types and memory storage. The following behavior is considered normal (same as `functools.lru_cache`):

```
cache = SimpleMemoryCache()
my_list = [1]
await cache.set("key", my_list)
my_list.append(2)
await cache.get("key")  # Will return [1, 2]
```

classmethod dumps(*value*)

Returns the same value

classmethod loads(*value*)

Returns the same value

3.2.2 StringSerializer

class aiocache.serializers.**StringSerializer**(**args*, ***kwargs*)

Converts all input values to str. All return values are also str. Be careful because this means that if you store an `int(1)`, you will get back '1'.

The transformation is done by just casting to str in the `dumps` method.

If you want to keep python types, use `PickleSerializer`. `JsonSerializer` may also be useful to keep type of symple python types.

classmethod dumps(*value*)
Serialize the received value casting it to str.

Parameters **value** – obj Anything support cast to str

Returns str

classmethod loads(*value*)
Returns value back without transformations

3.2.3 PickleSerializer

class aiocache.serializers.**PickleSerializer**(**args*, ***kwargs*)
Transform data to bytes using pickle.dumps and pickle.loads to retrieve it back.

classmethod dumps(*value*)
Serialize the received value using `pickle.dumps`.

Parameters **value** – obj

Returns bytes

classmethod loads(*value*)
Deserialize value using `pickle.loads`.

Parameters **value** – bytes

Returns obj

3.2.4 JsonSerializer

class aiocache.serializers.**JsonSerializer**(**args*, ***kwargs*)
Transform data to json string with json.dumps and json.loads to retrieve it back. Check https://docs.python.org/3/library/json.html#py-to-json-table for how types are converted.

classmethod dumps(*value*)
Serialize the received value using `json.dumps`.

Parameters **value** – dict

Returns str

classmethod loads(*value*)
Deserialize value using `json.loads`.

Parameters **value** – str

Returns output of `json.loads`.

In case the current serializers are not covering your needs, you can always define your custom serializer as shown in `examples/serializer_class.py`:

```
import sys
import asyncio
import zlib

```

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```
from aiocache import RedisCache
from aiocache.serializers import StringSerializer


class CompressionSerializer(StringSerializer):

    # This is needed because zlib works with bytes.
    # this way the underlying backend knows how to
    # store/retrieve values
    encoding = None

    def dumps(self, value):
        print("I've received:\n{}".format(value))
        compressed = zlib.compress(value.encode())
        print("But I'm storing:\n{}".format(compressed))
        return compressed

    def loads(self, value):
        print("I've retrieved:\n{}".format(value))
        decompressed = zlib.decompress(value).decode()
        print("But I'm returning:\n{}".format(decompressed))
        return decompressed


cache = RedisCache(serializer=CompressionSerializer(), namespace="main")


async def serializer():
    text = (
        "Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod␣
↪tempor incididunt"
        "ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud␣
↪exercitation"
        "ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure␣
↪dolor in"
        "reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur.
↪ Excepteur"
        "sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt␣
↪mollit"
        "anim id est laborum.")
    await cache.set("key", text)
    print("-----------------------------------")
    real_value = await cache.get("key")

    compressed_value = await cache.raw("get", "main:key")
    assert sys.getsizeof(compressed_value) < sys.getsizeof(real_value)


def test_serializer():
    loop = asyncio.get_event_loop()
    loop.run_until_complete(serializer())
    loop.run_until_complete(cache.delete("key"))
    loop.run_until_complete(cache.close())


if __name__ == "__main__":
    test_serializer()
```

You can also use marshmallow as your serializer (`examples/marshmallow_serializer_class.py`):

```
import random
import string
import asyncio

from marshmallow import fields, Schema, post_load

from aiocache import SimpleMemoryCache
from aiocache.serializers import StringSerializer


class RandomModel:
    MY_CONSTANT = "CONSTANT"

    def __init__(self, int_type=None, str_type=None, dict_type=None, list_type=None):
        self.int_type = int_type or random.randint(1, 10)
        self.str_type = str_type or random.choice(string.ascii_lowercase)
        self.dict_type = dict_type or {}
        self.list_type = list_type or []

    def __eq__(self, obj):
        return self.__dict__ == obj.__dict__


class MarshmallowSerializer(Schema, StringSerializer):
    int_type = fields.Integer()
    str_type = fields.String()
    dict_type = fields.Dict()
    list_type = fields.List(fields.Integer())

    def dumps(self, *args, **kwargs):
        # dumps returns (data, errors), we just want to save data
        return super().dumps(*args, **kwargs).data

    def loads(self, *args, **kwargs):
        # dumps returns (data, errors), we just want to return data
        return super().loads(*args, **kwargs).data

    @post_load
    def build_my_type(self, data):
        return RandomModel(**data)

    class Meta:
        strict = True


cache = SimpleMemoryCache(serializer=MarshmallowSerializer(), namespace="main")


async def serializer():
    model = RandomModel()
    await cache.set("key", model)

    result = await cache.get("key")

    assert result.int_type == model.int_type
    assert result.str_type == model.str_type
```

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```
    assert result.dict_type == model.dict_type
    assert result.list_type == model.list_type


def test_serializer():
    loop = asyncio.get_event_loop()
    loop.run_until_complete(serializer())
    loop.run_until_complete(cache.delete("key"))


if __name__ == "__main__":
    test_serializer()
```

By default cache backends assume they are working with `str` types. If your custom implementation transform data to bytes, you will need to set the class attribute `encoding` to `None`.

3.3 Plugins

Plugins can be used to enrich the behavior of the cache. By default all caches are configured without any plugin but can add new ones in the constructor or after initializing the cache class:

```
>>> from aiocache import SimpleMemoryCache
>>> from aiocache.plugins import TimingPlugin
cache = SimpleMemoryCache(plugins=[HitMissRatioPlugin()])
cache.plugins += [TimingPlugin()]
```

You can define your custom plugin by inheriting from *BasePlugin* and overriding the needed methods (the overrides NEED to be async). All commands have `pre_<command_name>` and `post_<command_name>` hooks.

> **Warning:** Both pre and post hooks are executed awaiting the coroutine. If you perform expensive operations with the hooks, you will add more latency to the command being executed and thus, there are more probabilities of raising a timeout error.

A complete example of using plugins:

```
import asyncio
import random
import logging

from aiocache import SimpleMemoryCache
from aiocache.plugins import HitMissRatioPlugin, TimingPlugin, BasePlugin


logger = logging.getLogger(__name__)


class MyCustomPlugin(BasePlugin):

    async def pre_set(self, *args, **kwargs):
        logger.info("I'm the pre_set hook being called with %s %s" % (args, kwargs))

    async def post_set(self, *args, **kwargs):
```

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```
        logger.info("I'm the post_set hook being called with %s %s" % (args, kwargs))


cache = SimpleMemoryCache(
    plugins=[HitMissRatioPlugin(), TimingPlugin(), MyCustomPlugin()],
    namespace="main")


async def run():
    await cache.set("a", "1")
    await cache.set("b", "2")
    await cache.set("c", "3")
    await cache.set("d", "4")

    possible_keys = ["a", "b", "c", "d", "e", "f"]

    for t in range(1000):
        await cache.get(random.choice(possible_keys))

    assert cache.hit_miss_ratio["hit_ratio"] > 0.5
    assert cache.hit_miss_ratio["total"] == 1000

    assert cache.profiling["get_min"] > 0
    assert cache.profiling["set_min"] > 0
    assert cache.profiling["get_max"] > 0
    assert cache.profiling["set_max"] > 0

    print(cache.hit_miss_ratio)
    print(cache.profiling)


def test_run():
    loop = asyncio.get_event_loop()
    loop.run_until_complete(run())
    loop.run_until_complete(cache.delete("a"))
    loop.run_until_complete(cache.delete("b"))
    loop.run_until_complete(cache.delete("c"))
    loop.run_until_complete(cache.delete("d"))


if __name__ == "__main__":
    test_run()
```

3.3.1 BasePlugin

class aiocache.plugins.**BasePlugin**

classmethod add_hook(*func*, *hooks*)

do_nothing(**args*, ***kwargs*)

post_add(**args*, ***kwargs*)

post_clear(**args*, ***kwargs*)

post_delete(**args*, ***kwargs*)

post_exists(**args*, ***kwargs*)

post_expire(**args*, ***kwargs*)

post_get(**args*, ***kwargs*)

post_increment(**args*, ***kwargs*)

post_multi_get(**args*, ***kwargs*)

post_multi_set(**args*, ***kwargs*)

post_raw(**args*, ***kwargs*)

post_set(**args*, ***kwargs*)

pre_add(**args*, ***kwargs*)

pre_clear(**args*, ***kwargs*)

pre_delete(**args*, ***kwargs*)

pre_exists(**args*, ***kwargs*)

pre_expire(**args*, ***kwargs*)

pre_get(**args*, ***kwargs*)

pre_increment(**args*, ***kwargs*)

pre_multi_get(**args*, ***kwargs*)

pre_multi_set(**args*, ***kwargs*)

pre_raw(**args*, ***kwargs*)

pre_set(**args*, ***kwargs*)

3.3.2 TimingPlugin

class aiocache.plugins.**TimingPlugin**

Calculates average, min and max times each command takes. The data is saved in the cache class as a dict attribute called `profiling`. For example, to access the average time of the operation get, you can do `cache.profiling['get_avg']`

post_add(*client*, **args*, *took=0*, ***kwargs*)

post_clear(*client*, **args*, *took=0*, ***kwargs*)

post_delete(*client*, **args*, *took=0*, ***kwargs*)

post_exists(*client*, **args*, *took=0*, ***kwargs*)

post_expire(*client*, **args*, *took=0*, ***kwargs*)

post_get(*client*, **args*, *took=0*, ***kwargs*)

post_increment(*client*, **args*, *took=0*, ***kwargs*)

post_multi_get(*client*, **args*, *took=0*, ***kwargs*)

post_multi_set(*client*, **args*, *took=0*, ***kwargs*)

post_raw(*client*, **args*, *took=0*, ***kwargs*)

post_set(*client*, **args*, *took=0*, ***kwargs*)

classmethod save_time(*method*)

3.3.3 HitMissRatioPlugin

class aiocache.plugins.**HitMissRatioPlugin**

Calculates the ratio of hits the cache has. The data is saved in the cache class as a dict attribute called `hit_miss_ratio`. For example, to access the hit ratio of the cache, you can do `cache.hit_miss_ratio['hit_ratio']`. It also provides the "total" and "hits" keys.

post_get(*client*, *key*, *took=0*, *ret=None*)

post_multi_get(*client*, *keys*, *took=0*, *ret=None*)

3.4 Configuration

3.4.1 Cache aliases

The caches module allows to setup cache configurations and then use them either using an alias or retrieving the config explicitly. To set the config, call `caches.set_config`:

classmethod caches.**set_config**(*config*)

Set (override) the default config for cache aliases from a dict-like structure. The structure is the following:

```
{
    'default': {
        'cache': "aiocache.SimpleMemoryCache",
        'serializer': {
            'class': "aiocache.serializers.StringSerializer"
        }
    },
    'redis_alt': {
        'cache': "aiocache.RedisCache",
        'endpoint': "127.0.0.10",
        'port': 6378,
        'serializer': {
            'class': "aiocache.serializers.PickleSerializer"
        },
        'plugins': [
            {'class': "aiocache.plugins.HitMissRatioPlugin"},
            {'class': "aiocache.plugins.TimingPlugin"}
        ]
    }
}
```

'default' key must always exist when passing a new config. Default configuration is:

```
{
    'default': {
        'cache': "aiocache.SimpleMemoryCache",
        'serializer': {
            'class': "aiocache.serializers.StringSerializer"
        }
    }
}
```

You can set your own classes there. The class params accept both str and class types.

All keys in the config are optional, if they are not passed the defaults for the specified class will be used.

To retrieve a copy of the current config, you can use `caches.get_config` or `caches.get_alias_config` for an alias config.

Next snippet shows an example usage:

```
import asyncio

from aiocache import caches, SimpleMemoryCache, RedisCache
from aiocache.serializers import StringSerializer, PickleSerializer

caches.set_config({
    'default': {
        'cache': "aiocache.SimpleMemoryCache",
        'serializer': {
            'class': "aiocache.serializers.StringSerializer"
        }
    },
    'redis_alt': {
        'cache': "aiocache.RedisCache",
        'endpoint': "127.0.0.1",
        'port': 6379,
        'timeout': 1,
        'serializer': {
            'class': "aiocache.serializers.PickleSerializer"
        },
        'plugins': [
            {'class': "aiocache.plugins.HitMissRatioPlugin"},
            {'class': "aiocache.plugins.TimingPlugin"}
        ]
    }
})


async def default_cache():
    cache = caches.get('default')   # This always returns the same instance
    await cache.set("key", "value")

    assert await cache.get("key") == "value"
    assert isinstance(cache, SimpleMemoryCache)
    assert isinstance(cache.serializer, StringSerializer)


async def alt_cache():
    # This generates a new instance every time! You can also use `caches.create('alt
↪')`
    # or even `caches.create('alt', namespace="test", etc...)` to override extra args
    cache = caches.create(**caches.get_alias_config('redis_alt'))
    await cache.set("key", "value")

    assert await cache.get("key") == "value"
    assert isinstance(cache, RedisCache)
    assert isinstance(cache.serializer, PickleSerializer)
    assert len(cache.plugins) == 2
    assert cache.endpoint == "127.0.0.1"
    assert cache.timeout == 1
    assert cache.port == 6379
    await cache.close()

```

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```
53
54 def test_alias():
55     loop = asyncio.get_event_loop()
56     loop.run_until_complete(default_cache())
57     loop.run_until_complete(alt_cache())
58
59     cache = RedisCache()
60     loop.run_until_complete(cache.delete("key"))
61     loop.run_until_complete(cache.close())
62
63     loop.run_until_complete(caches.get('default').close())
64
65
66 if __name__ == "__main__":
67     test_alias()
```

When you do `caches.get('alias_name')`, the cache instance is built lazily the first time. Next accesses will return the **same** instance. If instead of reusing the same instance, you need a new one every time, use `caches.create('alias_name')`. One of the advantages of `caches.create` is that it accepts extra args that then are passed to the cache constructor. This way you can override args like namespace, endpoint, etc.

3.5 Decorators

aiocache comes with a couple of decorators for caching results from asynchronous functions. Do not use the decorator in synchronous functions, it may lead to unexpected behavior.

3.5.1 cached

class aiocache.**cached**(*ttl=None*, *key=None*, *key_builder=None*, *cache=<class 'aiocache.backends.memory.SimpleMemoryCache'>*, *serializer=None*, *plugins=None*, *alias=None*, *noself=False*, ***kwargs*)

Caches the functions return value into a key generated with module_name, function_name and args.

In some cases you will need to send more args to configure the cache object. An example would be endpoint and port for the RedisCache. You can send those args as kwargs and they will be propagated accordingly.

Only one cache instance is created per decorated call. If you expect high concurrency of calls to the same function, you should adapt the pool size as needed.

Parameters

- **ttl** – int seconds to store the function call. Default is None which means no expiration.
- **key** – str value to set as key for the function return. Takes precedence over key_builder param. If key and key_builder are not passed, it will use module_name + function_name + args + kwargs
- **key_builder** – Callable that allows to build the function dynamically. It receives same args and kwargs as the called function.
- **cache** – cache class to use when calling the `set`/`get` operations. Default is `aiocache.SimpleMemoryCache`.
- **serializer** – serializer instance to use when calling the `dumps`/`loads`. If its None, default one from the cache backend is used.

- **plugins** – list plugins to use when calling the cmd hooks Default is pulled from the cache class being used.
- **alias** – str specifying the alias to load the config from. If alias is passed, other config parameters are ignored. New cache is created every time.
- **noself** – bool if you are decorating a class function, by default self is also used to generate the key. This will result in same function calls done by different class instances to use different cache keys. Use noself=True if you want to ignore it.

```
import asyncio

from collections import namedtuple

from aiocache import cached, RedisCache
from aiocache.serializers import PickleSerializer

Result = namedtuple('Result', "content, status")


@cached(
    ttl=10, cache=RedisCache, key="key", serializer=PickleSerializer(), port=6379,␣
↪namespace="main")
async def cached_call():
    return Result("content", 200)


def test_cached():
    cache = RedisCache(endpoint="127.0.0.1", port=6379, namespace="main")
    loop = asyncio.get_event_loop()
    loop.run_until_complete(cached_call())
    assert loop.run_until_complete(cache.exists("key")) is True
    loop.run_until_complete(cache.delete("key"))
    loop.run_until_complete(cache.close())


if __name__ == "__main__":
    test_cached()
```

3.5.2 multi_cached

class aiocache.**multi_cached**(*keys_from_attr*, *key_builder=None*, *ttl=0*, *cache=<class 'aiocache.backends.memory.SimpleMemoryCache'>*, *serializer=None*, *plugins=None*, *alias=None*, ***kwargs*)

Only supports functions that return dict-like structures. This decorator caches each key/value of the dict-like object returned by the function.

If key_builder is passed, before storing the key, it will be transformed according to the output of the function.

If the attribute specified to be the key is an empty list, the cache will be ignored and the function will be called as expected.

Only one cache instance is created per decorated function. If you expect high concurrency of calls to the same function, you should adapt the pool size as needed.

Parameters

- **keys_from_attr** – arg or kwarg name from the function containing an iterable to use as keys to index in the cache.

- **key_builder** – Callable that allows to change the format of the keys before storing. Receives the key and same args and kwargs as the called function.
- **ttl** – int seconds to store the keys. Default is 0 which means no expiration.
- **cache** – cache class to use when calling the `multi_set`/`multi_get` operations. Default is `aiocache.SimpleMemoryCache`.
- **serializer** – serializer instance to use when calling the `dumps`/`loads`. If its None, default one from the cache backend is used.
- **plugins** – plugins to use when calling the cmd hooks Default is pulled from the cache class being used.
- **alias** – str specifying the alias to load the config from. If alias is passed, other config parameters are ignored. New cache is created every time.

```
import asyncio

from aiocache import multi_cached, RedisCache

DICT = {
    'a': "Z",
    'b': "Y",
    'c': "X",
    'd': "W"
}


@multi_cached("ids", cache=RedisCache, namespace="main")
async def multi_cached_ids(ids=None):
    return {id_: DICT[id_] for id_ in ids}


@multi_cached("keys", cache=RedisCache, namespace="main")
async def multi_cached_keys(keys=None):
    return {id_: DICT[id_] for id_ in keys}


cache = RedisCache(endpoint="127.0.0.1", port=6379, namespace="main")


def test_multi_cached():
    loop = asyncio.get_event_loop()
    loop.run_until_complete(multi_cached_ids(ids=['a', 'b']))
    loop.run_until_complete(multi_cached_ids(ids=['a', 'c']))
    loop.run_until_complete(multi_cached_keys(keys=['d']))

    assert loop.run_until_complete(cache.exists('a'))
    assert loop.run_until_complete(cache.exists('b'))
    assert loop.run_until_complete(cache.exists('c'))
    assert loop.run_until_complete(cache.exists('d'))

    loop.run_until_complete(cache.delete("a"))
    loop.run_until_complete(cache.delete("b"))
    loop.run_until_complete(cache.delete("c"))
    loop.run_until_complete(cache.delete("d"))
    loop.run_until_complete(cache.close())

```

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```
43
44 if __name__ == "__main__":
45     test_multi_cached()
```

Warning: This was added in version 0.6.2 and the API is new. This means its open to breaking changes in future versions until the API is considered stable.

3.6 Locking

Warning: The implementations provided are **NOT** intented for consistency/synchronization purposes. If you need a locking mechanism focused on consistency, consider implementing your mechanism based on more serious tools like https://zookeeper.apache.org/.

There are a couple of locking implementations than can help you to protect against different scenarios:

3.6.1 RedLock

class aiocache.lock.**RedLock**(*client: Type[aiocache.base.BaseCache], key: str, lease: Union[int, float]*)

Implementation of Redlock with a single instance because aiocache is focused on single instance cache.

This locking has some limitations and shouldn't be used in situations where consistency is critical. Those locks are aimed for performance reasons where failing on locking from time to time is acceptable. TLDR: do NOT use this if you need real resource exclusion.

Couple of considerations with the implementation:

- If the lease expires and there are calls waiting, all of them will pass (blocking just happens for the first time).
- When a new call arrives, it will wait always at most lease time. This means that the call could end up blocked longer than needed in case the lease from the blocker expires.

Backend specific implementation:

- Redis implements correctly the redlock algorithm. It sets the key if it doesn't exist. To release, it checks the value is the same as the instance trying to release and if it is, it removes the lock. If not it will do nothing
- Memcached follows the same approach with a difference. Due to memcached lacking a way to execute the operation get and delete commands atomically, any client is able to release the lock. This is a limitation that can't be fixed without introducing race conditions.
- Memory implementation is not distributed, it will only apply to the process running. Say you have 4 processes running APIs with aiocache, the locking will apply only per process (still useful to reduce load per process).

Example usage:

```
from aiocache import RedisCache
from aiocache.lock import RedLock

cache = RedisCache()
async with RedLock(cache, 'key', lease=1):  # Calls will wait here
    result = await cache.get('key')
    if result is not None:
        return result
    result = await super_expensive_function()
    await cache.set('key', result)
```

In the example, first call will start computing the `super_expensive_function` while consecutive calls will block at most 1 second. If the blocking lasts for more than 1 second, the calls will proceed to also calculate the result of `super_expensive_function`.

3.6.2 OptimisticLock

class aiocache.lock.**OptimisticLock**(*client: Type[aiocache.base.BaseCache], key: str*)

Implementation of optimistic lock

Optimistic locking assumes multiple transactions can happen at the same time and they will only fail if before finish, conflicting modifications with other transactions are found, producing a roll back.

Finding a conflict will end up raising an *aiocache.lock.OptimisticLockError* exception. A conflict happens when the value at the storage is different from the one we retrieved when the lock started.

Example usage:

```
cache = RedisCache()

# The value stored in 'key' will be checked here
async with OptimisticLock(cache, 'key') as lock:
    result = await super_expensive_call()
    await lock.cas(result)
```

If any other call sets the value of `key` before the `lock.cas` is called, an `aiocache.lock.OptimisticLockError` will be raised. A way to make the same call crash would be to change the value inside the lock like:

```
cache = RedisCache()

# The value stored in 'key' will be checked here
async with OptimisticLock(cache, 'key') as lock:
    result = await super_expensive_call()
    await cache.set('random_value')  # This will make the `lock.cas` call fail
    await lock.cas(result)
```

If the lock is created with an unexisting key, there will never be conflicts.

cas(*value: Any*, ***kwargs*) → True

Checks and sets the specified value for the locked key. If the value has changed since the lock was created, it will raise an `aiocache.lock.OptimisticLockError` exception.

Raises `aiocache.lock.OptimisticLockError`

3.7 Testing

It's really easy to cut the dependency with aiocache functionality:

```
import asyncio

from asynctest import MagicMock

from aiocache.base import BaseCache


async def async_main():
    mocked_cache = MagicMock(spec=BaseCache)
    mocked_cache.get.return_value = "world"
    print(await mocked_cache.get("hello"))


if __name__ == "__main__":
    loop = asyncio.get_event_loop()
    loop.run_until_complete(async_main())
```

Note that we are passing the *BaseCache* as the spec for the Mock (you need to install `asynctest`).

Also, for debuging purposes you can use *AIOCACHE_DISABLE = 1 python myscript.py* to disable caching.

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