redis-lock

Release 4.0.0

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Overview

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Lock context manager implemented via redis SETNX/BLPOP.

- Free software: BSD 2-Clause License

Interface targeted to be exactly like threading.Lock.

1.1 Usage

Because we don't want to require users to share the lock instance across processes you will have to give them names.

```
from redis import Redis
conn = Redis()

import redis_lock
lock = redis_lock.Lock(conn, "name-of-the-lock")
if lock.acquire(blocking=False):
    print("Got the lock.")
    lock.release()
else:
    print("Someone else has the lock.")
```

1.2 Locks as Context Managers

```
conn = StrictRedis()
with redis_lock.Lock(conn, "name-of-the-lock"):
    print("Got the lock. Doing some work ...")
    time.sleep(5)
```

You can also associate an identifier along with the lock so that it can be retrieved later by the same process, or by a different one. This is useful in cases where the application needs to identify the lock owner (find out who currently owns the lock).

```
import socket
host_id = "owned-by-%s" % socket.gethostname()
lock = redis_lock.Lock(conn, "name-of-the-lock", id=host_id)
if lock.acquire(blocking=False):
    assert lock.locked() is True
    print("Got the lock.")
    lock.release()
else:
    if lock.get_owner_id() == host_id:
        print("I already acquired this in another process.")
    else:
        print("The lock is held on another machine.")
```

1.2.1 Avoid dogpile effect in django

The dogpile is also known as the thundering herd effect or cache stampede. Here's a pattern to avoid the problem without serving stale data. The work will be performed a single time and every client will wait for the fresh data.

To use this you will need django-redis, however, `python-redis-lock` provides you a cache backend that has a cache method for your convenience. Just install `python-redis-lock` like this:

```
pip install "python-redis-lock[django]"
```

Now put something like this in your settings:

```
CACHES = {
    'default': {
        'BACKEND': 'redis_lock.django_cache.RedisCache',
        'LOCATION': 'redis://127.0.0.1:6379/1',
        'OPTIONS': {
            'CLIENT_CLASS': 'django_redis.client.DefaultClient'
        }
    }
}
```

Note: If using a *django-redis < 3.8.x*, you'll probably need *redis_cache* which has been deprecated in favor to *django_redis*. The *redis_cache* module is removed in *django-redis* versions > *3.9.x*. See django-redis notes.

This backend just adds a convenient `.lock(name, expire=None)` function to django-redis's cache backend.

You would write your functions like this:

```
from django.core.cache import cache

def function():
    val = cache.get(key)
    if not val:
        with cache.lock(key):
            val = cache.get(key)
            if not val:
                # DO EXPENSIVE WORK
                val = ...
                cache.set(key, value)
    return val
```

1.2.2 Troubleshooting

In some cases, the lock remains in redis forever (like a server blackout / redis or application crash / an unhandled exception). In such cases, the lock is not removed by restarting the application. One solution is to turn on the *auto_renewal* parameter in combination with *expire* to set a time-out on the lock, but let *Lock()* automatically keep resetting the expire time while your application code is executing:

```
# Get a lock with a 60-second lifetime but keep renewing it automatically
# to ensure the lock is held for as long as the Python process is running.
with redis_lock.Lock(conn, name='my-lock', expire=60, auto_renewal=True):
    # Do work....
```

Another solution is to use the `reset_all()` function when the application starts:

```
# On application start/restart
import redis_lock
redis_lock.reset_all()
```

Alternatively, you can reset individual locks via the `reset` method.

Use these carefully, if you understand what you do.

1.3 Features

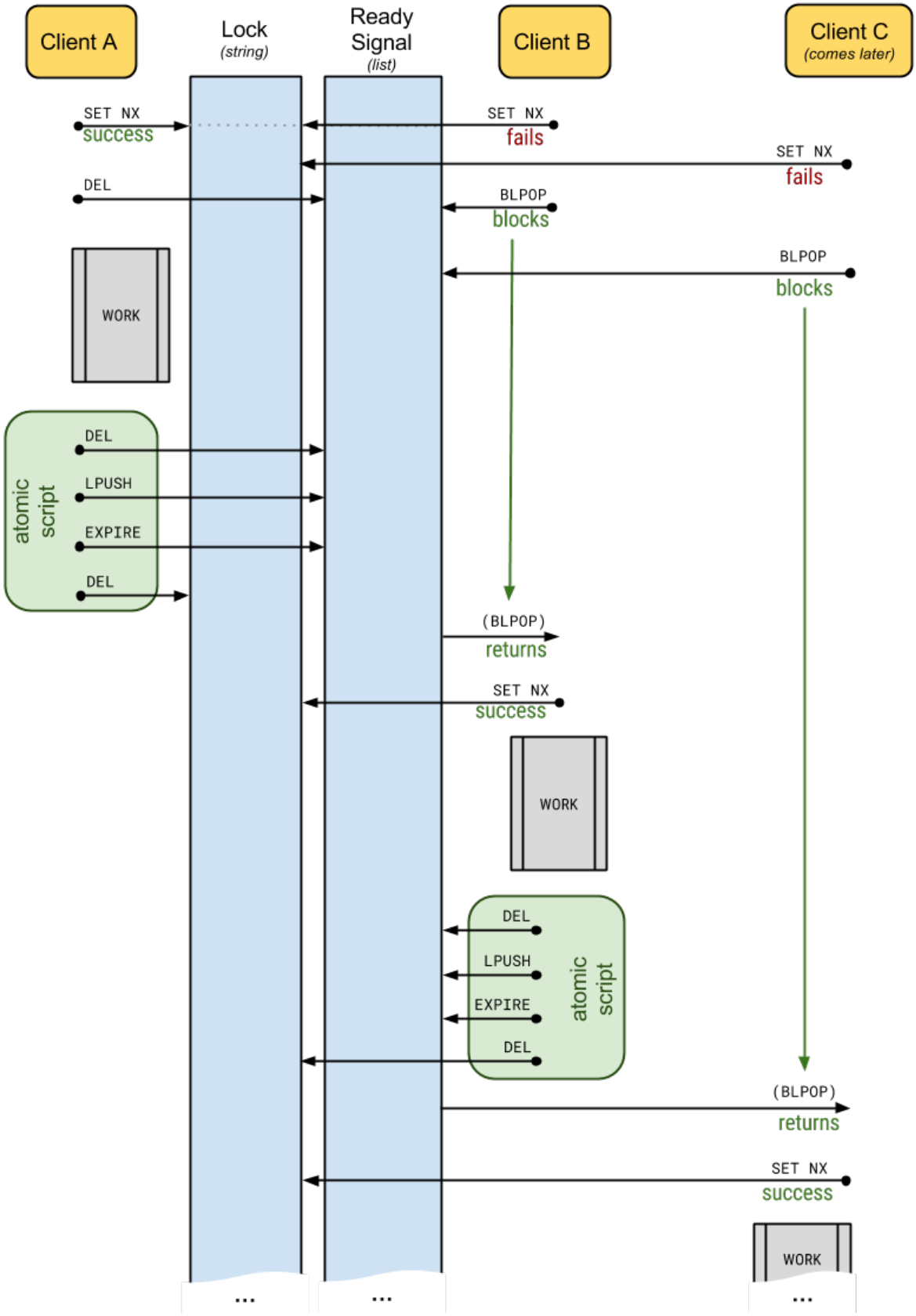
- based on the standard SETNX recipe
- optional expiry
- optional timeout
- optional lock renewal (use a low expire but keep the lock active)
- no spinloops at acquire

1.4 Implementation

`redis_lock` will use 2 keys for each lock named `<name>`:

- `lock:<name>` - a string value for the actual lock
- `lock-signal:<name>` - a list value for signaling the waiters when the lock is released

This is how it works:


Client A
Lock
(string)
Ready
Signal
(list)
Client B
Client C
(comes later)
SET NX
success
SET NX
fails
SET NX
fails
DEL
BLPOP
blocks
BLPOP
blocks
WORK
DEL
LPUSH
EXPIRE
DEL
atomic
script
(BLPOP)
returns
SET NX
success
WORK
DEL
LPUSH
EXPIRE
DEL
atomic
script
(BLPOP)
returns
SET NX
success
WORK
...
...
...

1.5 Documentation

https://python-redis-lock.readthedocs.io/en/latest/

1.6 Development

To run the all tests run:

```
tox
```

1.7 Requirements

OS Any

Runtime Python 2.7, 3.3 or later, or PyPy

Services Redis 2.6.12 or later.

1.8 Similar projects

- bbangert/retools - acquire does spinloop
- distributing-locking-python-and-redis - acquire does polling
- cezarsa/redis_lock - acquire does not block
- andymccurdy/redis-py - acquire does spinloop
- mpessas/python-redis-lock - blocks fine but no expiration
- brainix/pottery - acquire does spinloop

CHAPTER 2

Installation

At the command line:

```
pip install python-redis-lock
```

CHAPTER 3

Usage

To use redis-lock in a project:

```
import redis_lock
```

Blocking lock:

```
conn = StrictRedis()
lock = redis_lock.Lock(conn, "name-of-the-lock")
if lock.acquire():
    print("Got the lock. Doing some work ...")
    time.sleep(5)
```

Blocking lock with timeout:

```
conn = StrictRedis()
lock = redis_lock.Lock(conn, "name-of-the-lock")
if lock.acquire(timeout=3):
    print("Got the lock. Doing some work ...")
    time.sleep(5)
else:
    print("Someone else has the lock.")
```

Non-blocking lock:

```
conn = StrictRedis()
lock = redis_lock.Lock(conn, "name-of-the-lock")
if lock.acquire(blocking=False):
    print("Got the lock. Doing some work ...")
    time.sleep(5)
else:
    print("Someone else has the lock.")
```

Releasing previously acquired lock:

```
conn = StrictRedis()
lock = redis_lock.Lock(conn, "name-of-the-lock")
lock.acquire()
print("Got the lock. Doing some work ...")
time.sleep(5)
lock.release()
```

The above example could be rewritten using context manager:

```
conn = StrictRedis()
with redis_lock.Lock(conn, "name-of-the-lock"):
    print("Got the lock. Doing some work ...")
    time.sleep(5)
```

In cases, where lock not necessarily in acquired state, and user need to ensure, that it has a matching `id`, example:

```
lock1 = Lock(conn, "foo")
lock1.acquire()
lock2 = Lock(conn, "foo", id=lock1.id)
lock2.release()
```

To check if lock with same name is already locked (it can be this or another lock with identical names):

```
is_locked = Lock(conn, "lock-name").locked()
```

You can control the log output by modifying various loggers:

```
logging.getLogger("redis_lock.thread").disabled = True
logging.getLogger("redis_lock").disable(logging.DEBUG)
```

CHAPTER 4

Reference

4.1 redis_lock

exception redis_lock.**AlreadyAcquired**

exception redis_lock.**AlreadyStarted**

exception redis_lock.**InvalidTimeout**

class redis_lock.**Lock**(*redis_client*, *name*, *expire=None*, *id=None*, *auto_renewal=False*, *strict=True*, *signal_expire=1000*)

A Lock context manager implemented via redis SETNX/BLPOP.

acquire(*blocking=True*, *timeout=None*)

Parameters

- **blocking** – Boolean value specifying whether lock should be blocking or not.
- **timeout** – An integer value specifying the maximum number of seconds to block.

extend(*expire=None*)

Extends expiration time of the lock.

Parameters **expire** – New expiration time. If `None` - *expire* provided during lock initialization will be taken.

locked()

Return true if the lock is acquired.

Checks that lock with same name already exists. This method returns true, even if lock have another id.

release()

Releases the lock, that was acquired with the same object.

Note: If you want to release a lock that you acquired in a different place you have two choices:

- Use `Lock("name", id=id_from_other_place).release()`

- Use `Lock("name").reset()`

reset()
Forcibly deletes the lock. Use this with care.

exception redis_lock.**NotAcquired**

exception redis_lock.**NotExpirable**

exception redis_lock.**TimeoutNotUsable**

exception redis_lock.**TimeoutTooLarge**

redis_lock.**reset_all**(*redis_client*)
Forcibly deletes all locks if its remains (like a crash reason). Use this with care.

Parameters **redis_client** – An instance of `StrictRedis`.

CHAPTER 5

Contributing

Contributions are welcome, and they are greatly appreciated! Every little bit helps, and credit will always be given.

5.1 Bug reports

When 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.

5.2 Documentation improvements

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

5.3 Feature requests and feedback

The best way to send feedback is to file an issue at https://github.com/ionelmc/python-redis-lock/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 code contributions are welcome :)

5.4 Development

To set up *python-redis-lock* for local development:

1. Fork python-redis-lock (look for the "Fork" button).
2. Clone your fork locally:

```
git clone git@github.com:YOURGITHUBNAME/python-redis-lock.git
```

3. Create a branch for local development:

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

   Now you can make your changes locally.

4. When you're done making changes run all the checks and docs builder with tox one command:

```
tox
```

5. 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
```

6. Submit a pull request through the GitHub website.

5.4.1 Pull Request Guidelines

If you need some code review or feedback while you're developing the code just make the pull request.

For merging, you should:

1. Include passing tests (run `tox`).
2. Update documentation when there's new API, functionality etc.
3. Add a note to `CHANGELOG.rst` about the changes.
4. Add yourself to `AUTHORS.rst`.

5.4.2 Tips

To run a subset of tests:

```
tox -e envname -- pytest -k test_myfeature
```

To run all the test environments in *parallel*:

```
tox -p auto
```

CHAPTER 6

Authors

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CHAPTER 7

Changelog

7.1 4.0.0 (2022-10-17)

- Dropped support for Python 2.7 and 3.6.
- Switched from Travis to GitHub Actions.
- Made logging messages more consistent.
- Replaced the `redis_lock.refresh.thread.*` loggers with a single `redis_lock.refresh.thread` logger.
- Various testing cleanup (mainly removal of hardcoded tmp paths).

7.2 3.7.0 (2020-11-20)

- Made logger names more specific. Now can have granular filtering on these new logger names:
  - `redis_lock.acquire` (emits *DEBUG* messages)
  - `redis_lock.acquire` (emits *WARN* messages)
  - `redis_lock.acquire` (emits *INFO* messages)
  - `redis_lock.refresh.thread.start` (emits *DEBUG* messages)
  - `redis_lock.refresh.thread.exit` (emits *DEBUG* messages)
  - `redis_lock.refresh.start` (emits *DEBUG* messages)
  - `redis_lock.refresh.shutdown` (emits *DEBUG* messages)
  - `redis_lock.refresh.exit` (emits *DEBUG* messages)
  - `redis_lock.release` (emits *DEBUG* messages)

  Contributed by Salomon Smeke Cohen in PR #80.

- Fixed few CI issues regarding doc checks. Contributed by Salomon Smeke Cohen in PR #81.

7.3 3.6.0 (2020-07-23)

- Improved `timeout`/`expire` validation so that:
  - `timeout` and `expire are converted to ``None` if they are falsy. Previously only `None` disabled these options, other falsy values created buggy situations.
  - Using `timeout` greater than `expire` is now allowed, if `auto_renewal` is set to `True`. Previously a `TimeoutTooLarge` error was raised. See #74.
  - Negative `timeout` or `expire` are disallowed. Previously such values were allowed, and created buggy situations. See #73.
- Updated benchmark and examples.
- Removed the custom script caching code. Now the `register_script` method from the redis client is used. This will fix possible issue with redis clusters in theory, as the redis client has some specific handling for that.

7.4 3.5.0 (2020-01-13)

- Added a `locked` method. Contributed by Artem Slobodkin in PR #72.

7.5 3.4.0 (2019-12-06)

- Fixed regression that can cause deadlocks or slowdowns in certain configurations. See: #71.

7.6 3.3.1 (2019-01-19)

- Fixed failures when running python-redis-lock 3.3 alongside 3.2. See: #64.

7.7 3.3.0 (2019-01-17)

- Fixed deprecated use of `warnings` API. Contributed by Julie MacDonell in PR #54.
- Added `auto_renewal` option in `RedisCache.lock` (the Django cache backend wrapper). Contributed by c in PR #55.
- Changed log level for "%(script)s not cached" from WARNING to INFO.
- Added support for using `decode_responses=True`. Lock keys are pure ascii now.

7.8 3.2.0 (2016-10-29)

- Changed the signal key cleanup operation do be done without any expires. This prevents lingering keys around for some time. Contributed by Andrew Pashkin in PR #38.

- Allow locks with given *id* to acquire. Previously it assumed that if you specify the *id* then the lock was already acquired. See #44 and #39.
- Allow using other redis clients with a `strict=False`. Normally you're expected to pass in an instance of `redis.StrictRedis`.
- Added convenience method *locked_get_or_set* to Django cache backend.

7.9 3.1.0 (2016-04-16)

- Changed the auto renewal to automatically stop the renewal thread if lock gets garbage collected. Contributed by Andrew Pashkin in PR #33.

7.10 3.0.0 (2016-01-16)

- Changed `release` so that it expires signal-keys immediately. Contributed by Andrew Pashkin in PR #28.
- Resetting locks (`reset` or `reset_all`) will release the lock. If there's someone waiting on the reset lock now it will acquire it. Contributed by Andrew Pashkin in PR #29.
- Added the `extend` method on `Lock` objects. Contributed by Andrew Pashkin in PR #24.
- Documentation improvements on `release` method. Contributed by Andrew Pashkin in PR #22.
- Fixed `acquire(block=True)` handling when `expire` option was used (it wasn't blocking indefinitely). Contributed by Tero Vuotila in PR #35.
- Changed `release` to check if lock was acquired with he same id. If not, `NotAcquired` will be raised. Previously there was just a check if it was acquired with the same instance (self._held). **BACKWARDS INCOMPATIBLE**
- Removed the `force` option from `release` - it wasn't really necessary and it only encourages sloppy programming. See #25. **BACKWARDS INCOMPATIBLE**
- Dropped tests for Python 2.6. It may work but it is unsupported.

7.11 2.3.0 (2015-09-27)

- Added the `timeout` option. Contributed by Victor Torres in PR #20.

7.12 2.2.0 (2015-08-19)

- Added the `auto_renewal` option. Contributed by Nick Groenen in PR #18.

7.13 2.1.0 (2015-03-12)

- New specific exception classes: `AlreadyAcquired` and `NotAcquired`.
- Slightly improved efficiency when non-waiting acquires are used.

7.14 2.0.0 (2014-12-29)

- Rename `Lock.token` to `Lock.id`. Now only allowed to be set via constructor. Contributed by Jardel Weyrich in PR #11.

7.15 1.0.0 (2014-12-23)

- Fix Django integration. (reported by Jardel Weyrich)
- Reorganize tests to use py.test.
- Add test for Django integration.
- Add `reset_all` functionality. Contributed by Yokotoka in PR #7.
- Add `Lock.reset` functionality.
- Expose the `Lock.token` attribute.

7.16 0.1.2 (2013-11-05)

- *?*

7.17 0.1.1 (2013-10-26)

- *?*

7.18 0.1.0 (2013-10-26)

- *?*

7.19 0.0.1 (2013-10-25)

- First release on PyPI.

CHAPTER 8

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