darc

Release 1.0.0

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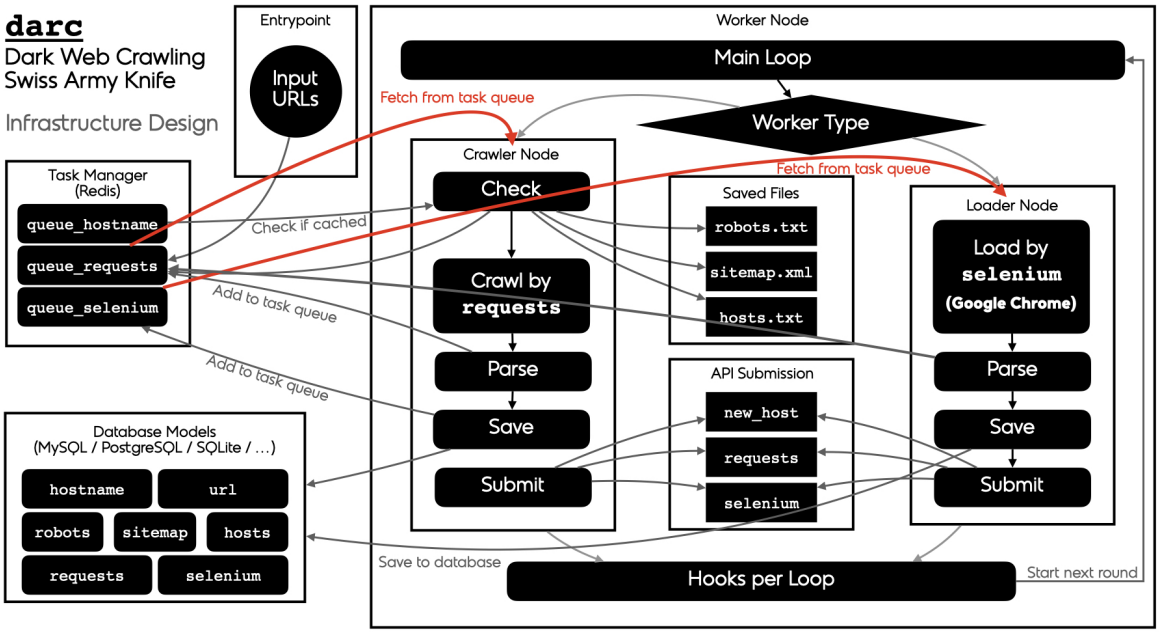
CONTENTS

Important: Starting from version `1.0.0`, new features of the project will not be developed into this public repository. Only bugfix and security patches will be applied to the update and new releases.

darc is designed as a swiss army knife for darkweb crawling. It integrates `requests` to collect HTTP request and response information, such as cookies, header fields, etc. It also bundles `selenium` to provide a fully rendered web page and screenshot of such view.



CHAPTER

ONE

HOW TO ...

This is the knowledge base for *darc* project. Should you request for more articles, please create an issue at the GitHub repository.

1.1 How to gracefully deploy `darc`?

Important: It is **NOT** necessary to work at the `darc` repository folder directly. You can just use `darc` with your customised code somewhere as you wish.

However, for simplicity, all relative paths referred in this article is relative to the project root of the `darc` repository.

To deploy `darc`, there would generally be three basic steps:

1. deploy the `darc` Docker image;
2. setup the `healthcheck` watchdog service;
3. install the `upload` cron job (optional)

1.1.1 To Start With

Per best practice, the system must have as least **2 GB RAM** and **2 CPU cores** to handle the `loader` worker properly. And the capacity of the RAM will heavily impact the performance of the `selenium` integration as Google Chrome is the renowned memory monster.

Note: Imma assume that you're using *NIX systems, as I don't believe a Windows user is gonna see this ;)

Firstly, you will need to clone the repository to your system:

```
git clone https://github.com/JarryShaw/darc.git
# change your working directory
cd darc
```

then set up the folders you need for the log files:

```
mkdir -p logs
mkdir -p logs/cron
```

And now, you will need to decide where you would like to store the data (documents crawled and saved by `darc`); let's assume that you have a `/data` disk mounted on the system – since that's what I have on mine xD – which would be big enough to use as a safe seperated storage place from the system so that `darc` will not crash your system by exhausting the storage,

```
mkdir /data/darc
# and make a shortcut
ln -s /data/darc data
```

therefore, you're gonna save your data in `/data/darc` folder.

1.1.2 Software Dependency

After setting local systems, there're some software dependencies you shall install:

1. Docker

`darc` is exclusively deployed through Docker environment, even though it can also be deployed directly on a host machine, either Linux or macOS, and perhaps Windows but I had never tested.

2. Database

`darc` needs database backend for the task queue management and other stuffs. It is highly recommended to deploy `darc` with Redis; but if you insist, you may use relationship database (e.g. MySQL, SQLite, PostgreSQL, etc.) instead.

Important: In this article, I will not discuss about the usage of relationship database as they're just too miserable for `darc` in terms of availability anyway.

As per best practice, *4 GB RAM* would be minimal requirement for the Redis database. It would be suggested to use directly a cloud provider hosted Redis database instead of running it on the same server as `darc`.

1.1.3 Deploy `darc` Docker Image

As discussed in *Docker Integration*, `darc` is exclusively integrated with Docker workflow. So basically, just pull the image from Docker Hub or GitHub Container Registry:

```
# Docker Hub
docker pull jsnbzh/darc:latest
# GitHub Container Registry
docker pull ghcr.io/jarryshaw/darc:latest
```

In cases where you would like to use a *debug* image, which changes the `apt` sources to China hosted and IPython and other auxiliaries installed, you call also pull such image instead:

```
# Docker Hub
docker pull jsnbzh/darc:debug
# GitHub Container Registry
docker pull ghcr.io/jarryshaw/darc-debug:latest
```

Then you will need to customise the `docker-compose.yml` based on your needs. Default values and descriptive help messages can be found in the file.

The rest of it is easy as just calling `docker-compose` command to manage the deployed containers, thus I shall not discuss further.

Deploy with Customisations

Important: I've made a sample customisation at `demo/deploy/` folder, which can be used directly as a new repository to start with your customisation, please check it out before moving forwards.

As in the sample customisation, you can simply use the `Dockerfile` there as your Docker environment declration. And the entrypoint file `market/run.py` has the sites customisations registered and the CLI bundled.

1.1.4 Setup `healthcheck` Daemon Service

Since `darc` can be quite a burden to its host system, I introduced this healthcheck service as discussed in *Auxiliary Scripts*.

For a normal **System V** based service system, you can simply install the `darc-healthcheck` service to `/etc/systemd/system/`:

```
ln -s extra/healthcheck.service /etc/systemd/system/darc-healthcheck.service
```

then enable it to run at startup:

```
sudo systemctl enable darc-healthcheck.service
```

And from now on, you can simply manage the `darc-healthcheck` service through `systemctl` or `service` command as you prefer.

1.1.5 Install `upload` Cron Job

In certain cases, you might wish to upload the API submission JSON files to your FTP server which has much more space than the deploy server, then you can utilise the `upload` cron job as mentioned in *Auxiliary Scripts*.

Simply type the following command:

```
crontab -e
```

and add the cron job into the file opened:

```
10 0 * * * ( cd /path/to/darc/ && /path/to/python3 /path/to/darc/extra/upload.py --host␣
↪ftp://hostname --user username:password ) >> /path/to/darc/logs/cron/darc-upload.log 2>
↪&1
```

just remember to change the paths, hostname and credential respectively; and at last, to activate the new cron job:

```
sudo systemctl restart cron.service
```

Now, `darc` API submission JSON files will be uploaded to the target FTP server everyday at *0:10 am*.

1.1.6 Bonus Tip

There is a `Makefile` at the project root. You can play and try to exploit it. A very useful command is that

```
make reload
```

when you wish to pull the remote repository and restart `darc` gracefully.

1.2 How to implement a sites customisation?

As had been discussed already in the documentation, the implementation of a sites customisation is dead simple: just inherits the *darc.sites.BaseSite* class and overwrites the corresponding *crawler()* and *loader()* *abstract* **static methods**.

See below an example from the documentation.

```
from darc.sites import BaseSite, register
```

As the class below suggests, you may implement and register your sites customisation for *mysite.com* and *www.mysite.com* using the `MySite` class, where *hostname* attribute contains the list of hostnames to which the class should be associated with.

NB: Implementation details of the `crawler` and `loader` methods will be discussed in following sections.

```
class MySite(BaseSite):
    """This is a site customisation class for demonstration purpose.
    You may implement a module as well should you prefer."""

    #: List[str]: Hostnames the sites customisation is designed for.
    hostname = ['mysite.com', 'www.mysite.com']

    @staticmethod
    def crawler(timestamp, session, link): ...

    @staticmethod
    def loader(timestamp, driver, link): ...
```

Should your sites customisation be associated with multiple sites, you can just add them all to the `hostname` attribute; when you call *darc.sites.register()* to register your sites customisation, the function will automatically handle the registry association information.

```
# register sites implicitly
register(MySite)
```

Nonetheless, in case where you would rather specify the hostnames at runtime (instead of adding them to the `hostname` attribute), you may just leave out the `hostname` attribute as `None` and specify your list of hostnames at *darc.sites.register()* function call.

```
# register sites explicitly
register(MySite, 'mysite.com', 'www.mysite.com')
```

1.2.1 Crawler Hook

The `crawler` method is based on `requests.Session` objects and returns a `requests.Response` instance representing the *crawled* web page.

Type annotations of the method can be described as

```
@staticmethod
def crawler(session: requests.Session, link: darc.link.Link) -> requests.Response: ...
```

where `session` is the `requests.Session` instance with **proxy** presets and `link` is the target link (parsed by *darc.link.parse_link()* to provide more information than mere string).

For example, let's say you would like to inject a cookie named `SessionID` and an `Authentication` header with some fake identity, then you may write the `crawler` method as below.

```
@staticmethod
def crawler(timestamp, session, link):
    """Crawler hook for my site.

    Args:
        timestamp (datetime.datetime): Timestamp of the worker node reference.
        session (requests.Session): Session object with proxy settings.
        link (darc.link.Link): Link object to be crawled.

    Returns:
        requests.Response: The final response object with crawled data.

    """
    # inject cookies
    session.cookies.set('SessionID', 'fake-session-id-value')

    # insert headers
    session.headers['Authentication'] = 'Basic fake-identity-credential'

    response = session.get(link.url, allow_redirects=True)
    return response
```

In this case when *darc* crawling the link, the HTTP(S) request will be provided with a session cookie and HTTP header, so that it may bypass potential authorisation checks and land on the target page.

1.2.2 Loader Hook

The `loader` method is based on `selenium.webdriver.Chrome` objects and returns a the original web driver instance containing the *loaded* web page.

Type annotations of the method can be described as

```
@staticmethod
def loader(driver: selenium.webdriver.Chrome, link: darc.link.Link) -> selenium.
↪webdriver.Chrome: ...
```

where `driver` is the `selenium.webdriver.Chrome` instance with **proxy** presets and `link` is the target link (parsed by *darc.link.parse_link()* to provide more information than mere string).

For example, let's say you would like to animate user login and go to the target page after successful attempt, then you may write the `loader` method as below.

```
@staticmethod
def loader(timestamp, driver, link):
    """Loader hook for my site.

    Args:
        timestamp: Timestamp of the worker node reference.
        driver (selenium.webdriver.Chrome): Web driver object with proxy settings.
        link (darc.link.Link): Link object to be loaded.

    Returns:
        selenium.webdriver.Chrome: The web driver object with loaded data.

    """
    # land on login page
    driver.get('https://%s/login' % link.host)

    # animate login attempt
    form = driver.find_element_by_id('login-form')
    form.find_element_by_id('username').send_keys('admin')
    form.find_element_by_id('password').send_keys('p@ssd')
    form.click()

    # check if the attempt succeeded
    if driver.title == 'Please login!':
        raise ValueError('failed to login %s' % link.host)

    # go to the target page
    driver.get(link.url)

    # wait for page to finish loading
    from darc.const import SE_WAIT  # should've been put with the top-level import␣
↪statements
    if SE_WAIT is not None:
        time.sleep(SE_WAIT)

    return driver
```

In this case when *darc* loading the link, the web driver will first perform user login, so that it may bypass potential authorisation checks and land on the target page.

1.2.3 In case to drop the link from task queue...

In some scenarios, you may want to remove the target link from the task queue, then there're basically two ways:

1. do like a wildling, remove it directly from the database

As there're three task queues used in *darc*, each represents task queues for the *crawler* (`requests` database) and *loader* (`selenium` database) worker nodes and a track record for known hostnames (hostname database), you will need to call corresponding functions to remove the target link from the database desired.

Possible functions are as below:

- *darc.db.drop_hostname()*
- *darc.db.drop_requests()*
- *darc.db.drop_selenium()*

all take one positional argument `link`, i.e. the *darc.link.Link* object to be removed.

Say you would like to remove `https://www.mysite.com` from the `requests` database, then you may just run

```
from darc.db import drop_requests
from darc.link import parse_link

link = parse_link('https://www.mysite.com')
drop_requests(link)
```

2. or make it in an elegant way

When implementing the sites customisation, you may wish to drop certain links at runtime, then you may simply raise *darc.error.LinkNoReturn* in the corresponding `crawler` and/or `loader` methods.

For instance, you would like to proceed with `mysite.com` but **NOT** `www.mysite.com` in the sites customisation, then you may implement your class as

```
from darc.error import LinkNoReturn

class MySite(BaseSite):

    ...

    @staticmethod
    def crawler(timestamp, session, link):
        if link.host == 'www.mysite.com':
            raise LinkNoReturn(link)

        ...

    @staticmethod
    def loader(timestamp, driver, link):
        if link.host == 'www.mysite.com':
            raise LinkNoReturn(link)

        ...
```

1.2.4 Then what should I do to include my sites customisation?

Simple as well!

Just *install* your codes to where you're running *darc*, e.g. the Docker container, remote server, etc.; then change the startup by injecting your codes before the entrypoint.

Say the structure of the working directory is as below:

```
.
|-- .venv/
|   |-- lib/python3.8/site-packages
```

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```
|   |   |-- darc/
|   |   |   |-- ...
|   |   |-- ...
|   |-- ...
|-- mysite.py
|-- ...
```

where `.venv` is the folder of virtual environment with *darc* installed and `mysite.py` is the file with your sites customisation.

Then you just need to change your `mysite.py` with some additional lines as below:

```
# mysite.py

import sys

from darc.__main__ import main
from darc.sites import BaseSite, register


class MySite(BaseSite):

    ...


# register sites
register(MySite)

if __name__ == '__main__':
    sys.exit(main())
```

And now, you can start *darc* through `python mysite.py [...]` instead of `python -m darc [...]` with your sites customisation registered to the system.

See also:

`mysite.py`

1.3 How to implement a custom proxy middleware?

As had been discussed already in the documentation, the implementation of a custom proxy is merely two *factory* functions: one yields a `requests.Session` and/or `requests_futures.sessions.FuturesSession` instance, one yields a `selenium.webdriver.Chrome` instance; both with proxy presets.

See below an example from the documentation.

```
from darc.proxy import register
```

1.3.1 Session Factory

The session factory returns a `requests.Session` and/or `requests_futures.sessions.FuturesSession` instance with presets, e.g. proxies, user agent, etc.

Type annocation of the function can be described as

```
def get_session(futures=False) -> requests.Session: ...

@typing.overload
def get_session(futures=True) -> requests_futures.sessions.FuturesSession: ...
```

For example, let's say you're implementing a Socks5 proxy for *localhost:9293*, with other presets same as the default factory function, c.f. *darc.requests.null_session()*.

```
import requests
import requests_futures.sessions

from darc.const import DARC_CPU
from darc.requests import default_user_agent


def socks5_session(futures=False):
    """Socks5 proxy session.

    Args:
        futures: If returns a :class:`requests_futures.FuturesSession`.

    Returns:
        Union[requests.Session, requests_futures.FuturesSession]:
        The session object with Socks5 proxy settings.

    """
    if futures:
        session = requests_futures.sessions.FuturesSession(max_workers=DARC_CPU)
    else:
        session = requests.Session()

    session.headers['User-Agent'] = default_user_agent(proxy='Socks5')
    session.proxies.update({
        'http': 'socks5h://localhost:9293',
        'https': 'socks5h://localhost:9293',
    })
    return session
```

In this case when *darc* needs to use a Socks5 session for its *crawler* worker nodes, it will call the `socks5_session` function to obtain a preset session instance.

1.3.2 Driver Factory

The driver factory returns a `selenium.webdriver.Chrome` instance with presets, e.g. proxies, options/switches, etc.

Type annocation of the function can be described as

```
def get_driver() -> selenium.webdriver.Chrome: ...
```

For example, let's say you're implementing a Socks5 proxy for *localhost:9293*, with other presets same as the default factory function, c.f. *darc.selenium.null_driver()*.

```
import selenium.webdriver
import selenium.webdriver.common.proxy

from darc.selenium import BINARY_LOCATION


def socks5_driver():
    """Socks5 proxy driver.

    Returns:
        selenium.webdriver.Chrome: The web driver object with Socks5 proxy settings.

    """
    options = selenium.webdriver.ChromeOptions()
    options.binary_location = BINARY_LOCATION
    options.add_argument('--proxy-server=socks5://localhost:9293')
    options.add_argument('--host-resolver-rules="MAP * ~NOTFOUND , EXCLUDE localhost"')

    proxy = selenium.webdriver.Proxy()
    proxy.proxyType = selenium.webdriver.common.proxy.ProxyType.MANUAL
    proxy.http_proxy = 'socks5://localhost:9293'
    proxy.ssl_proxy = 'socks5://localhost:9293'

    capabilities = selenium.webdriver.DesiredCapabilities.CHROME.copy()
    proxy.add_to_capabilities(capabilities)

    driver = selenium.webdriver.Chrome(options=options,
                                       desired_capabilities=capabilities)
    return driver
```

In this case when *darc* needs to use a Socks5 driver for its *loader* worker nodes, it will call the `socks5_driver` function to obtain a preset driver instance.

1.3.3 What should I do to register the proxy?

All proxies are managed in the *darc.proxy* module and you can register your own proxy through `darc.proxy.register()`:

```
# register proxy
register('socks5', socks5_session, socks5_driver)
```

As the codes above suggest, the `darc.proxy.register()` takes three positional arguments: proxy type, session and driver factory functions.

See also:

`socks5.py`

CHAPTER

TWO

TECHNICAL DOCUMENTATION

darc is designed as a swiss army knife for darkweb crawling. It integrates `requests` to collect HTTP request and response information, such as cookies, header fields, etc. It also bundles `selenium` to provide a fully rendered web page and screenshot of such view.

2.1 Main Processing

The *darc.process* module contains the main processing logic of the *darc* module.

darc.process.**_process**(*worker*)

Wrapper function to start the worker process.

Return type
None

Parameters
worker (*process_crawler | process_loader*) –

darc.process.**process**(*worker*)

Main process.

The function will register `_signal_handler()` for `SIGTERM`, and start the main process of the *darc* darkweb crawlers.

Parameters
worker (`Literal['crawler', 'loader']`) – Worker process type.

Raises
ValueError – If `worker` is not a valid value.

Return type
None

Before starting the workers, the function will start proxies through

- `darc.proxy.tor.tor_proxy()`
- `darc.proxy.i2p.i2p_proxy()`
- `darc.proxy.zeronet.zeronet_proxy()`
- `darc.proxy.freenet.freenet_proxy()`

The general process can be described as following for *workers* of `crawler` type:

1. *process_crawler()*: obtain URLs from the `requests` link database (c.f. *load_requests()*), and feed such URLs to *crawler()*.

   Note: If *FLAG_MP* is `True`, the function will be called with *multiprocessing* support; if *FLAG_TH* if `True`, the function will be called with *multithreading* support; if none, the function will be called in single-threading.

2. *crawler()*: parse the URL using *parse_link()*, and check if need to crawl the URL (c.f. *PROXY_WHITE_LIST*, *PROXY_BLACK_LIST* , *LINK_WHITE_LIST* and *LINK_BLACK_LIST*); if true, then crawl the URL with `requests`.

   If the URL is from a brand new host, *darc* will first try to fetch and save `robots.txt` and sitemaps of the host (c.f. *save_robots()* and *save_sitemap()*), and extract then save the links from sitemaps (c.f. *read_sitemap()*) into link database for future crawling (c.f. *save_requests()*). Also, if the submission API is provided, *submit_new_host()* will be called and submit the documents just fetched.

   If `robots.txt` presented, and *FORCE* is `False`, *darc* will check if allowed to crawl the URL.

   Note: The root path (e.g. `/` in https://www.example.com/) will always be crawled ignoring `robots.txt`.

   At this point, *darc* will call the customised hook function from *darc.sites* to crawl and get the final response object. *darc* will save the session cookies and header information, using *save_headers()*.

   Note: If `requests.exceptions.InvalidSchema` is raised, the link will be saved by *save_invalid()*. Further processing is dropped.

   If the content type of response document is not ignored (c.f. *MIME_WHITE_LIST* and *MIME_BLACK_LIST*), *submit_requests()* will be called and submit the document just fetched.

   If the response document is HTML (`text/html` and `application/xhtml+xml`), *extract_links()* will be called then to extract all possible links from the HTML document and save such links into the database (c.f. *save_requests()*).

   And if the response status code is between `400` and `600`, the URL will be saved back to the link database (c.f. *save_requests()*). If **NOT**, the URL will be saved into `selenium` link database to proceed next steps (c.f. *save_selenium()*).

The general process can be described as following for *workers* of `loader` type:

1. *process_loader()*: in the meanwhile, *darc* will obtain URLs from the `selenium` link database (c.f. *load_selenium()*), and feed such URLs to *loader()*.

   Note: If *FLAG_MP* is `True`, the function will be called with *multiprocessing* support; if *FLAG_TH* if `True`, the function will be called with *multithreading* support; if none, the function will be called in single-threading.

2. *loader()*: parse the URL using *parse_link()* and start loading the URL using `selenium` with Google Chrome.

   At this point, *darc* will call the customised hook function from *darc.sites* to load and return the original `Chrome` object.

   If successful, the rendered source HTML document will be saved, and a full-page screenshot will be taken and saved.

If the submission API is provided, *submit_selenium()* will be called and submit the document just loaded.

Later, *extract_links()* will be called then to extract all possible links from the HTML document and save such links into the `requests` database (c.f. *save_requests()*).

After each *round*, *darc* will call registered hook functions in sequential order, with the type of worker (`'crawler'` or `'loader'`) and the current link pool as its parameters, see *register()* for more information.

If in reboot mode, i.e. *REBOOT* is `True`, the function will exit after first round. If not, it will renew the Tor connections (if bootstrapped), c.f. *renew_tor_session()*, and start another round.

darc.process.**process_crawler**()

A worker to run the *crawler()* process.

Warns
HookExecutionFailed – When hook function raises an error.

Return type
`None`

darc.process.**process_loader**()

A worker to run the *loader()* process.

Warns
HookExecutionFailed – When hook function raises an error.

Return type
`None`

darc.process.**register**(*hook*, *, *_index=None*)

Register hook function.

Parameters

- **hook** (`Callable[[Literal['crawler', 'loader'], List[Link]], None]`) – Hook function to be registered.
- **_index** (*int | None*) –

Keyword Arguments
_index – Position index for the hook function.

Return type
`None`

The hook function takes two parameters:

1. a `str` object indicating the type of worker, i.e. `'crawler'` or `'loader'`;
2. a `list` object containing *Link* objects, as the current processed link pool.

The hook function may raises *WorkerBreak* so that the worker shall break from its indefinite loop upon finishing of current *round*. Any value returned from the hook function will be ignored by the workers.

See also:

The hook functions will be saved into *_HOOK_REGISTRY*.

darc.process.**_HOOK_REGISTRY: List[Callable[[Literal['crawler', 'loader'], List[Link]], None]] = []**

List of hook functions to be called between each *round*.

Type
List[Callable[[Literal['crawler', 'loader'], List[Link]]]

darc.process._WORKER_POOL: List[Process | Thread] = []

List of active child processes and/or threads.

Type
List[Union[Process, Thread]]

2.2 Web Crawlers

The *darc.crawl* module provides two types of crawlers.

- *crawler()* – crawler powered by requests
- *loader()* – crawler powered by selenium

darc.crawl.**crawler**(*link*)

Single requests crawler for an entry link.

Parameters
link (*Link*) – URL to be crawled by requests.

Return type
None

The function will first parse the URL using *parse_link()*, and check if need to crawl the URL (c.f. *PROXY_WHITE_LIST*, *PROXY_BLACK_LIST*, *LINK_WHITE_LIST* and *LINK_BLACK_LIST*); if true, then crawl the URL with requests.

If the URL is from a brand new host, *darc* will first try to fetch and save robots.txt and sitemaps of the host (c.f. *save_robots()* and *save_sitemap()*), and extract then save the links from sitemaps (c.f. *read_sitemap()*) into link database for future crawling (c.f. *save_requests()*).

Note: A host is new if *have_hostname()* returns True.

If *darc.proxy.null.fetch_sitemap()* and/or *darc.proxy.i2p.fetch_hosts()* failed when fetching such documents, the host will be removed from the hostname database through *drop_hostname()*, and considered as new when next encounter.

Also, if the submission API is provided, *submit_new_host()* will be called and submit the documents just fetched.

If robots.txt presented, and *FORCE* is False, *darc* will check if allowed to crawl the URL.

Note: The root path (e.g. / in https://www.example.com/) will always be crawled ignoring robots.txt.

At this point, *darc* will call the customised hook function from *darc.sites* to crawl and get the final response object. *darc* will save the session cookies and header information, using *save_headers()*.

Note: If requests.exceptions.InvalidSchema is raised, the link will be saved by *save_invalid()*. Further processing is dropped, and the link will be removed from the requests database through *drop_requests()*.

If *LinkNoReturn* is raised, the link will be removed from the `requests` database through *drop_requests()*.

If the content type of response document is not ignored (c.f. *MIME_WHITE_LIST* and *MIME_BLACK_LIST*), *submit_requests()* will be called and submit the document just fetched.

If the response document is HTML (`text/html` and `application/xhtml+xml`), *extract_links()* will be called then to extract all possible links from the HTML document and save such links into the database (c.f. *save_requests()*).

And if the response status code is between `400` and `600`, the URL will be saved back to the link database (c.f. *save_requests()*). If **NOT**, the URL will be saved into `selenium` link database to proceed next steps (c.f. *save_selenium()*).

`darc.crawl.loader`(*link*)

Single `selenium` loader for an entry link.

Parameters

- **link** – URL to be crawled by `selenium`.
- **link** (Link) –

Return type
None

The function will first parse the URL using *parse_link()* and start loading the URL using `selenium` with Google Chrome.

At this point, *darc* will call the customised hook function from *darc.sites* to load and return the original `selenium.webdriver.chrome.webdriver.WebDriver` object.

Note: If *LinkNoReturn* is raised, the link will be removed from the `selenium` database through *drop_selenium()*.

If successful, the rendered source HTML document will be saved, and a full-page screenshot will be taken and saved.

Note: When taking full-page screenshot, *loader()* will use `document.body.scrollHeight` to get the total height of web page. If the page height is *less than* **1,000 pixels**, then *darc* will by default set the height as **1,000 pixels**.

Later *darc* will tell `selenium` to resize the window (in *headless* mode) to **1,024 pixels** in width and **110%** of the page height in height, and take a *PNG* screenshot.

If the submission API is provided, *submit_selenium()* will be called and submit the document just loaded.

Later, *extract_links()* will be called then to extract all possible links from the HTML document and save such links into the `requests` database (c.f. *save_requests()*).

See also:

- *darc.const.SE_EMPTY*
- *darc.const.SE_WAIT*

2.3 URL Utilities

The *Link* class is the key data structure of the *darc* project, it contains all information required to identify a URL's proxy type, hostname, path prefix when saving, etc.

The *link* module also provides several wrapper function to the urllib.parse module.

class darc.link.**Link**(*url*, *proxy*, *host*, *base*, *name*, *url_parse*, *url_backref=None*)

Bases: object

Parsed link.

Parameters

- **url** (str) – original link
- **proxy** (str) – proxy type
- **host** (Optional[str]) – URL's hostname
- **base** (str) – base folder for saving files
- **name** (str) – hashed link for saving files
- **url_parse** (ParseResult) – parsed URL from urllib.parse.urlparse()
- **url_backref** (Optional[*Link*]) – optional *Link* instance from which current link was extracted

Returns
Parsed link object.

Return type
Link

Note: *Link* is a dataclass object. It is safely *hashable*, through hash(url).

__hash__()

Provide hash support to the *Link* object.

Return type
int

asdict()

Convert to a dict instance.

Return type
Dict[str, Any]

base: str

base folder for saving files

host: Optional[str]

URL's hostname

name: str

hashed link for saving files

proxy: str

proxy type

url: *str*

original link

url_backref: *Optional[Link] = None*

optional *Link* instance from which current link was extracted

url_parse: *ParseResult*

parsed URL from `urllib.parse.urlparse()`

darc.link.**parse_link**(*link*, *host=None*, ***, *backref=None*)

Parse link.

Parameters

- **link** (*str*) – link to be parsed
- **host** (*Optional[str]*) – hostname of the link
- **backref** (*Link | None*) –

Keyword Arguments

backref – optional *Link* instance from which current link was extracted

Return type

Link

Returns

The parsed link object.

Note: If `host` is provided, it will override the hostname of the original `link`.

The parsing process of proxy type is as follows:

0. If `host` is `None` and the parse result from `urllib.parse.urlparse()` has no `netloc` (or hostname) specified, then set `hostname` as `(null)`; else set it as is.
1. If the scheme is `data`, then the `link` is a data URI, set `hostname` as `data` and `proxy` as `data`.
2. If the scheme is `javascript`, then the link is some JavaScript codes, set `proxy` as `script`.
3. If the scheme is `bitcoin`, then the link is a Bitcoin address, set `proxy` as `bitcoin`.
4. If the scheme is `ethereum`, then the link is an Ethereum address, set `proxy` as `ethereum`.
5. If the scheme is `ed2k`, then the link is an ED2K magnet link, set `proxy` as `ed2k`.
6. If the scheme is `magnet`, then the link is a magnet link, set `proxy` as `magnet`.
7. If the scheme is `mailto`, then the link is an email address, set `proxy` as `mail`.
8. If the scheme is `irc`, then the link is an IRC link, set `proxy` as `irc`.
9. If the scheme is **NOT** any of `http` or `https`, then set `proxy` to the scheme.
10. If the host is `None`, set `hostname` to `(null)`, set `proxy` to `null`.
11. If the host is an onion (`.onion`) address, set `proxy` to `tor`.
12. If the host is an I2P (`.i2p`) address, or any of `localhost:7657` and `localhost:7658`, set `proxy` to `i2p`.
13. If the host is *localhost* on `ZERONET_PORT`, and the path is not `/`, i.e. **NOT** root path, set `proxy` to `zeronet`; and set the first part of its path as `hostname`.

    Example:

For a ZeroNet address, e.g., `http://127.0.0.1:43110/1HeLLo4uzjaLetFx6NH3PMwFP3qbRbTf3D`, *parse_link()* will parse the `hostname` as `1HeLLo4uzjaLetFx6NH3PMwFP3qbRbTf3D`.

14. If the host is *localhost* on `FREENET_PORT`, and the path is not `/`, i.e. **NOT** root path, set `proxy` to `freenet`; and set the first part of its path as `hostname`.

    Example:

    For a Freenet address, e.g., `http://127.0.0.1:8888/USK@nwa8lHa271k2QvJ8aa0Ov7IHAV-DFOCFgmDt3X6BpCI,DuQSUZiI~agF8c-6tjsFFGuZ8eICrzWCILB60nT8KKo,AQACAAE/sone/77/`, *parse_link()* will parse the `hostname` as `USK@nwa8lHa271k2QvJ8aa0Ov7IHAV-DFOCFgmDt3X6BpCI,DuQSUZiI~agF8c-6tjsFFGuZ8eICrzWCILB60nT8KKo,AQACAAE`.

15. If the host is a proxied onion (`.onion.sh`) address, set `proxy` to `tor2web`.

16. If none of the cases above satisfied, the `proxy` will be set as `null`, marking it a plain normal link.

The `base` for parsed link *Link* object is defined as

```
<root>/<proxy>/<scheme>/<hostname>/
```

where `root` is *PATH_DB*.

The `name` for parsed link *Link* object is the sha256 hash (c.f. `hashlib.sha256()`) of the original `link`.

darc.link.**quote**(*string*, *safe='/'*, *encoding=None*, *errors=None*)

Wrapper function for `urllib.parse.quote()`.

Parameters

- **string** (`str`) – string to be quoted
- **safe** (`Union`[`bytes`, `str`]) – charaters not to escape
- **encoding** (`Optional`[`str`]) – string encoding
- **errors** (`Optional`[`str`]) – encoding error handler

Return type
`str`

Returns
The quoted string.

Note: The function suppressed possible errors when calling `urllib.parse.quote()`. If any, it will return the original string.

---

darc.link.**unquote**(*string*, *encoding='utf-8'*, *errors='replace'*)

Wrapper function for `urllib.parse.unquote()`.

Parameters

- **string** (`str`) – string to be unquoted
- **encoding** (`str`) – string encoding
- **errors** (`str`) – encoding error handler

Return type
`str`

Returns
The quoted string.

Note: The function suppressed possible errors when calling `urllib.parse.unquote()`. If any, it will return the original string.

`darc.link.`**`urljoin`**(*base*, *url*, *allow_fragments=True*)

Wrapper function for `urllib.parse.urljoin()`.

Parameters

- **base** (`AnyStr`) – base URL
- **url** (`AnyStr`) – URL to be joined
- **allow_fragments** (`bool`) – if allow fragments

Return type
`AnyStr`

Returns
The joined URL.

Note: The function suppressed possible errors when calling `urllib.parse.urljoin()`. If any, it will return `base/url` directly.

`darc.link.`**`urlparse`**(*url*, *scheme=''*, *allow_fragments=True*)

Wrapper function for `urllib.parse.urlparse()`.

Parameters

- **url** (`str`) – URL to be parsed
- **scheme** (`str`) – URL scheme
- **allow_fragments** (`bool`) – if allow fragments

Return type
`ParseResult`

Returns
The parse result.

Note: The function suppressed possible errors when calling `urllib.parse.urlparse()`. If any, it will return `urllib.parse.ParseResult(scheme=scheme, netloc='', path=url, params='', query='', fragment='')` directly.

`darc.link.`**`urlsplit`**(*url*, *scheme=''*, *allow_fragments=True*)

Wrapper function for `urllib.parse.urlsplit()`.

Parameters

- **url** (`str`) – URL to be split
- **scheme** (`str`) – URL scheme
- **allow_fragments** (`bool`) – if allow fragments

Return type
SplitResult

Returns
The split result.

Note: The function suppressed possible errors when calling `urllib.parse.urlsplit()`. If any, it will return `urllib.parse.SplitResult(scheme=scheme, netloc='', path=url, params='', query='', fragment='')` directly.

2.4 Source Parsing

The *darc.parse* module provides auxiliary functions to read `robots.txt`, sitemaps and HTML documents. It also contains utility functions to check if the proxy type, hostname and content type if in any of the black and white lists.

`darc.parse._check`(*temp_list*)

Check hostname and proxy type of links.

Parameters
temp_list (List[*Link*]) – List of links to be checked.

Return type
List[*Link*]

Returns
List of links matches the requirements.

Note: If *CHECK_NG* is `True`, the function will directly call *_check_ng()* instead.

See also:

- *darc.parse.match_host()*
- *darc.parse.match_proxy()*

`darc.parse._check_ng`(*temp_list*)

Check content type of links through `HEAD` requests.

Parameters
temp_list (List[*Link*]) – List of links to be checked.

Return type
List[*Link*]

Returns
List of links matches the requirements.

See also:

- *darc.parse.match_host()*
- *darc.parse.match_proxy()*
- *darc.parse.match_mime()*

darc.parse.**check_robots**(*link*)

Check if `link` is allowed in `robots.txt`.

Parameters
link (*Link*) – The link object to be checked.

Return type
bool

Returns
If `link` is allowed in `robots.txt`.

Note: The root path of a URL will always return `True`.

---

darc.parse.**extract_links**(*link*, *html*, *check=False*)

Extract links from HTML document.

Parameters

- **link** (*Link*) – Original link of the HTML document.
- **html** (Union[str, bytes]) – Content of the HTML document.
- **check** (bool) – If perform checks on extracted links, default to *CHECK*.

Return type
List[*Link*]

Returns
List of extracted links.

See also:

- *darc.parse._check()*
- *darc.parse._check_ng()*

darc.parse.**extract_links_from_text**(*link*, *text*)

Extract links from raw text source.

Parameters

- **link** (*Link*) – Original link of the source document.
- **text** (str) – Content of source text document.

Return type
List[*Link*]

Returns
List of extracted links.

Important: The extraction is **NOT** as reliable since we did not perform TLD checks on the extracted links and we cannot guarantee all links to be extracted.

The URL patterns used to extract links are defined by *darc.parse.URL_PAT* and you may register your own expressions by *DARC_URL_PAT*.

---

darc.parse.**get_content_type**(*response*)

Get content type from `response`.

Parameters
response (requests.Response) – Response object.

Return type
str

Returns
The content type from `response`.

Note: If the `Content-Type` header is not defined in `response`, the function will utilise `magic` to detect its content type.

---

darc.parse.**match_host**(*host*)

Check if hostname in black list.

Parameters
host (Optional[str]) – Hostname to be checked.

Return type
bool

Returns
If `host` in black list.

Note: If `host` is `None`, then it will always return `True`.

See also:

- *darc.const.LINK_WHITE_LIST*
- *darc.const.LINK_BLACK_LIST*
- *darc.const.LINK_FALLBACK*

darc.parse.**match_mime**(*mime*)

Check if content type in black list.

Parameters
mime (str) – Content type to be checked.

Return type
bool

Returns
If `mime` in black list.

See also:

- *darc.const.MIME_WHITE_LIST*
- *darc.const.MIME_BLACK_LIST*
- *darc.const.MIME_FALLBACK*

darc.parse.**match_proxy**(*proxy*)

Check if proxy type in black list.

Parameters
proxy (str) – Proxy type to be checked.

Return type
bool

Returns
If proxy in black list.

Note: If proxy is script, then it will always return True.

See also:

- *darc.const.PROXY_WHITE_LIST*
- *darc.const.PROXY_BLACK_LIST*
- *darc.const.PROXY_FALLBACK*

darc.parse.**URL_PAT: List[re.Pattern]**

Regular expression patterns to match all reasonable URLs.

Currently, we have two builtin patterns:

1. HTTP(S) and other *regular* URLs, e.g. WebSocket, IRC, etc.

```
re.compile(r'(?P<url>((https?|wss?|irc):)?(//)?\w+(\.\w+)+/?\S*)', re.UNICODE),
```

2. Bitcoin accounts, data URIs, (ED2K) magnet links, email addresses, telephone numbers, JavaScript functions, etc.

```
re.compile(r'(?P<url>(bitcoin|data|ed2k|magnet|mailto|script|tel):\w+)', re.ASCII)
```

Environ
DARC_URL_PAT

See also:

The patterns are used in *darc.parse.extract_links_from_text()*.

2.5 Source Saving

The *darc.save* module contains the core utilities for managing fetched files and documents.

The data storage under the root path (*PATH_DB*) is typically as following:

```
data
├── api
|   └── <date>
|       └── <proxy>
|           └── <scheme>
|
```

(continues on next page)

(continued from previous page)

```
│               └── <hostname>
│                   ├── new_host
│                   │   └── <hash>_<timestamp>.json
│                   ├── requests
│                   │   └── <hash>_<timestamp>.json
│                   └── selenium
│                       └── <hash>_<timestamp>.json
├── link.csv
├── misc
│   ├── bitcoin.txt
│   ├── data
│   │   └── <hash>_<timestamp>.<ext>
│   ├── ed2k.txt
│   ├── invalid.txt
│   ├── irc.txt
│   ├── magnet.txt
│   └── mail.txt
└── <proxy>
    └── <scheme>
        └── <hostname>
            ├── <hash>_<timestamp>.json
            ├── robots.txt
            └── sitemap_<hash>.xml
```

darc.save.**sanitise**(*link*, *time=None*, *raw=False*, *data=False*, *headers=False*, *screenshot=False*)

Sanitise link to path.

Parameters

- **link** (*Link*) – Link object to sanitise the path
- **time** (*datetime*) – Timestamp for the path.
- **raw** (bool) – If this is a raw HTML document from requests.
- **data** (bool) – If this is a generic content type document.
- **headers** (bool) – If this is response headers from requests.
- **screenshot** (bool) – If this is the screenshot from selenium.

Return type

str

Returns

- If raw is True, <root>/<proxy>/<scheme>/<hostname>/<hash>_<timestamp>_raw.html.
- If data is True, <root>/<proxy>/<scheme>/<hostname>/<hash>_<timestamp>.dat.
- If headers is True, <root>/<proxy>/<scheme>/<hostname>/<hash>_<timestamp>.json.
- If screenshot is True, <root>/<proxy>/<scheme>/<hostname>/<hash>_<timestamp>.png.
- If none above, <root>/<proxy>/<scheme>/<hostname>/<hash>_<timestamp>.html.

See also:

- *darc.crawl.crawler()*
- *darc.crawl.loader()*

darc.save.**save_headers**(*time*, *link*, *response*, *session*)

Save HTTP response headers.

Parameters

- **time** (*datetime*) – Timestamp of response.
- **link** (*Link*) – Link object of response.
- **response** (requests.Response) – Response object to be saved.
- **session** (requests.Session) – Session object of response.

Return type

str

Returns

Saved path to response headers, i.e. <root>/<proxy>/<scheme>/<hostname>/<hash>_<timestamp>.json.

The JSON data saved is as following:

```
{
    "[metadata]": {
        "url": "...",
        "proxy": "...",
        "host": "...",
        "base": "...",
        "name": "..."
    },
    "Timestamp": "...",
    "URL": "...",
    "Method": "GET",
    "Status-Code": "...",
    "Reason": "...",
    "Cookies": {
        "...": "..."
    },
    "Session": {
        "...": "..."
    },
    "Request": {
        "...": "..."
    },
    "Response": {
        "...": "..."
    },
    "History": [
        {"...": "..."}
    ]
}
```

See also:

- *darc.save.sanitise()*
- *darc.crawl.crawler()*

darc.save.**save_link**(*link*)

Save link hash database `link.csv`.

The CSV file has following fields:

- proxy type: *link.proxy*
- URL scheme: *link.url_parse.scheme*
- hostname: *link.base*
- link hash: *link.name*
- original URL: *link.url*

Parameters
link (*Link*) – Link object to be saved.

Return type
None

See also:

- *darc.const.PATH_LN*
- *darc.save._SAVE_LOCK*

darc.save.**_SAVE_LOCK: multiprocessing.Lock | threading.Lock | contextlib.nullcontext**

I/O lock for saving link hash database `link.csv`.

See also:

- *darc.save.save_link()*
- *darc.const.get_lock()*

2.6 Link Database

The *darc* project utilises Redis based database to provide tele-process communication.

Note: In its first implementation, the *darc* project used `Queue` to support such communication. However, as noticed when runtime, the `Queue` object will be much affected by the lack of memory.

There will be three databases, all following the save naming convension with `queue_` prefix:

- the hostname database – `queue_hostname` (*HostnameQueueModel*)
- the `requests` database – `queue_requests` (*RequestsQueueModel*)
- the `selenium` database – `queue_selenium` (*SeleniumQueueModel*)

For `queue_hostname`, `queue_requests` and `queue_selenium`, they are all Redis **sorted set** data type.

If *FLAG_DB* is `True`, then the module uses the RDS storage described by the `peewee` models as backend.

`darc.db._db_operation`(*operation*, **args*, ***kwargs*)

Retry operation on database.

Parameters

- **operation** (`Callable`[`...`, `TypeVar`(`_T`)]) – Callable / method to perform.
- ***args** (`Any`) – Arbitrary positional arguments.
- **kwargs** (*Any*) –

Keyword Arguments

****kwargs** – Arbitrary keyword arguments.

Return type

`TypeVar`(`_T`)

Returns

Any return value from a successful `operation` call.

`darc.db._drop_hostname_db`(*link*)

Remove link from the hostname database.

The function updates the `HostnameQueueModel` table.

Parameters

link (*Link*) – Link to be removed.

Return type

`None`

`darc.db._drop_hostname_redis`(*link*)

Remove link from the hostname database.

The function updates the `queue_hostname` database.

Parameters

link (*Link*) – Link to be removed.

Return type

`None`

`darc.db._drop_requests_db`(*link*)

Remove link from the `requests` database.

The function updates the *RequestsQueueModel* table.

Parameters

link (*Link*) – Link to be removed.

Return type

`None`

`darc.db._drop_requests_redis`(*link*)

Remove link from the `requests` database.

The function updates the `queue_requests` database.

Parameters

link (*Link*) – Link to be removed.

Return type
None

darc.db._drop_selenium_db(*link*)

Remove link from the selenium database.

The function updates the *SeleniumQueueModel* table.

Parameters
link (*Link*) – Link to be removed.

Return type
None

darc.db._drop_selenium_redis(*link*)

Remove link from the selenium database.

The function updates the queue_selenium database.

Parameters
link (*Link*) – Link to be removed.

Return type
None

darc.db._gen_arg_msg(**args*, ***kwargs*)

Sanitise arguments representation string.

Parameters

- ***args** (Any) – Arbitrary arguments.
- **kwargs** (*Any*) –

Keyword Arguments
****kwargs** – Arbitrary keyword arguments.

Return type
str

Returns
Sanitised arguments representation string.

darc.db._have_hostname_db(*link*)

Check if current link is a new host.

The function checks the HostnameQueueModel table.

Parameters
link (*Link*) – Link to check against.

Return type
Tuple[bool, bool]

Returns
A tuple of two bool values representing if such link is a known host and needs force refetch respectively.

darc.db._have_hostname_redis(*link*)

Check if current link is a new host.

The function checks the queue_hostname database.

Parameters
link (*Link*) – Link to check against.

Return type
Tuple[bool, bool]

Returns
A tuple of two bool values representing if such link is a known host and needs force refetch respectively.

darc.db.**_load_requests_db**()

Load link from the requests database.

The function reads the *RequestsQueueModel* table.

Return type
List[*Link*]

Returns
List of loaded links from the requests database.

Note: At runtime, the function will load links with maximum number at *MAX_POOL* to limit the memory usage.

darc.db.**_load_requests_redis**()

Load link from the requests database.

The function reads the queue_requests database.

Return type
List[*Link*]

Returns
List of loaded links from the requests database.

Note: At runtime, the function will load links with maximum number at *MAX_POOL* to limit the memory usage.

darc.db.**_load_selenium_db**()

Load link from the selenium database.

The function reads the *SeleniumQueueModel* table.

Return type
List[*Link*]

Returns
List of loaded links from the selenium database.

Note: At runtime, the function will load links with maximum number at *MAX_POOL* to limit the memory usage.

darc.db.**_load_selenium_redis**()

Load link from the selenium database.

The function reads the queue_selenium database.

Parameters
check – If perform checks on loaded links, default to *CHECK*.

Return type
List[*Link*]

Returns
List of loaded links from the `selenium` database.

Note: At runtime, the function will load links with maximum number at *MAX_POOL* to limit the memory usage.

---

darc.db.**_redis_command**(*command*, **args*, ***kwargs*)

Wrapper function for Redis command.

Parameters

- **command** (str) – Command name.
- ***args** (Any) – Arbitrary arguments for the Redis command.
- **kwargs** (*Any*) –

Keyword Arguments
****kwargs** – Arbitrary keyword arguments for the Redis command.

Return type
Any

Returns
Values returned from the Redis command.

Warns
RedisCommandFailed – Warns at each round when the command failed.

See also:

Between each retry, the function sleeps for *RETRY_INTERVAL* second(s) if such value is **NOT** None.

darc.db.**_redis_get_lock**(*key*)

Get a lock for Redis operations.

Parameters
key (Literal['queue_hostname', 'queue_requests', 'queue_selenium']) – Lock target key.

Return type
Union[Redlock, AbstractContextManager[TypeVar(T_co, covariant=True)]]

Returns
Return a new `pottery.redlock.Redlock` object using key `key` that mimics the behavior of `threading.Lock`.

Seel Also:
If *REDIS_LOCK* is False, returns a `contextlib.nullcontext` instead.

darc.db.**_save_requests_db**(*entries*, *single=False*, *score=None*, *nx=False*, *xx=False*)

Save link to the `requests` database.

The function updates the *RequestsQueueModel* table.

Parameters

- **entries** (Union[*Link*, List[*Link*]]) – Links to be added to the `requests` database. It can be either a `list` of links, or a single link string (if `single` set as True).

- **single** (bool) – Indicate if entries is a list of links or a single link string.
- **score** (Optional[float]) – Score to for the Redis sorted set.
- **nx** (bool) – Only create new elements and not to update scores for elements that already exist.
- **xx** (bool) – Only update scores of elements that already exist. New elements will not be added.

Return type
None

darc.db._save_requests_redis(*entries*, *single=False*, *score=None*, *nx=False*, *xx=False*)

Save link to the requests database.

The function updates the queue_requests database.

Parameters

- **entries** (Union[*Link*, List[*Link*]]) – Links to be added to the requests database. It can be either a list of links, or a single link string (if single set as True).
- **single** (bool) – Indicate if entries is a list of links or a single link string.
- **score** (Optional[float]) – Score to for the Redis sorted set.
- **nx** (bool) – Forces ZADD to only create new elements and not to update scores for elements that already exist.
- **xx** (bool) – Forces ZADD to only update scores of elements that already exist. New elements will not be added.

Return type
None

darc.db._save_selenium_db(*entries*, *single=False*, *score=None*, *nx=False*, *xx=False*)

Save link to the selenium database.

The function updates the *SeleniumQueueModel* table.

Parameters

- **entries** (Union[*Link*, List[*Link*]]) – Links to be added to the selenium database. It can be either a list of links, or a single link string (if single set as True).
- **single** (bool) – Indicate if entries is a list of links or a single link string.
- **score** (Optional[float]) – Score to for the Redis sorted set.
- **nx** (bool) – Only create new elements and not to update scores for elements that already exist.
- **xx** (bool) – Only update scores of elements that already exist. New elements will not be added.

Return type
None

darc.db._save_selenium_redis(*entries*, *single=False*, *score=None*, *nx=False*, *xx=False*)

Save link to the selenium database.

The function updates the queue_selenium database.

Parameters

- **entries** (Union[*Link*, List[*Link*]]) – Links to be added to the `selenium` database. It can be either an *iterable* of links, or a single link string (if `single` set as `True`).
- **single** (bool) – Indicate if `entries` is an *iterable* of links or a single link string.
- **score** (Optional[float]) – Score to for the Redis sorted set.
- **nx** (bool) – Forces `ZADD` to only create new elements and not to update scores for elements that already exist.
- **xx** (bool) – Forces `ZADD` to only update scores of elements that already exist. New elements will not be added.

Return type
None

When `entries` is a list of *Link* instances, we tries to perform *bulk* update to easy the memory consumption. The *bulk* size is defined by *BULK_SIZE*.

Notes

The `entries` will be dumped through `pickle` so that *darc* do not need to parse them again.

---

darc.db.**drop_hostname**(*link*)

Remove link from the hostname database.

Parameters
link (*Link*) – Link to be removed.

Return type
None

See also:

- *darc.db._drop_hostname_db()*
- *darc.db._drop_hostname_redis()*

darc.db.**drop_requests**(*link*)

Remove link from the `requests` database.

Parameters
link (*Link*) – Link to be removed.

Return type
None

See also:

- *darc.db._drop_requests_db()*
- *darc.db._drop_requests_redis()*

darc.db.**drop_selenium**(*link*)

Remove link from the `selenium` database.

Parameters
link (*Link*) – Link to be removed.

Return type
None

See also:

- *darc.db._drop_selenium_db()*
- *darc.db._drop_selenium_redis()*

darc.db.**have_hostname**(*link*)

Check if current link is a new host.

Parameters
link (*Link*) – Link to check against.

Return type
Tuple[bool, bool]

Returns
A tuple of two bool values representing if such link is a known host and needs force refetch respectively.

See also:

- *darc.db._have_hostname_db()*
- *darc.db._have_hostname_redis()*

darc.db.**load_requests**(*check=False*)

Load link from the requests database.

Parameters
check (bool) – If perform checks on loaded links, default to *CHECK*.

Return type
List[*Link*]

Returns
List of loaded links from the requests database.

Note: At runtime, the function will load links with maximum number at *MAX_POOL* to limit the memory usage.

See also:

- *darc.db._load_requests_db()*
- *darc.db._load_requests_redis()*

darc.db.**load_selenium**(*check=False*)

Load link from the selenium database.

Parameters
check (bool) – If perform checks on loaded links, default to *CHECK*.

Return type
List[*Link*]

Returns
List of loaded links from the selenium database.

Note: At runtime, the function will load links with maximum number at *MAX_POOL* to limit the memory usage.

See also:

- *darc.db._load_selenium_db()*
- *darc.db._load_selenium_redis()*

darc.db.**save_requests**(*entries*, *single=False*, *score=None*, *nx=False*, *xx=False*)

Save link to the `requests` database.

The function updates the `queue_requests` database.

Parameters

- **entries** (Union[*Link*, List[*Link*]]) – Links to be added to the `requests` database. It can be either a `list` of links, or a single link string (if `single` set as `True`).
- **single** (bool) – Indicate if `entries` is a `list` of links or a single link string.
- **score** (Optional[float]) – Score to for the Redis sorted set.
- **nx** (bool) – Only create new elements and not to update scores for elements that already exist.
- **xx** (bool) – Only update scores of elements that already exist. New elements will not be added.

Return type
None

Notes

The `entries` will be dumped through `pickle` so that *darc* do not need to parse them again.

When `entries` is a list of *Link* instances, we tries to perform *bulk* update to easy the memory consumption. The *bulk* size is defined by *BULK_SIZE*.

See also:

- *darc.db._save_requests_db()*
- *darc.db._save_requests_redis()*

darc.db.**save_selenium**(*entries*, *single=False*, *score=None*, *nx=False*, *xx=False*)

Save link to the `selenium` database.

Parameters

- **entries** (Union[*Link*, List[*Link*]]) – Links to be added to the `selenium` database. It can be either a `list` of links, or a single link string (if `single` set as `True`).
- **single** (bool) – Indicate if `entries` is a `list` of links or a single link string.
- **score** (Optional[float]) – Score to for the Redis sorted set.
- **nx** (bool) – Only create new elements and not to update scores for elements that already exist.

- **xx** (bool) – Only update scores of elements that already exist. New elements will not be added.

Return type
None

Notes

The `entries` will be dumped through `pickle` so that *darc* do not need to parse them again.

When `entries` is a list of *Link* instances, we tries to perform *bulk* update to easy the memory consumption. The *bulk* size is defined by *BULK_SIZE*.

See also:

- *darc.db._save_selenium_db()*
- *darc.db._save_selenium_redis()*

darc.db.**BULK_SIZE**: int

Default
100

Environ
DARC_BULK_SIZE

Bulk size for updating Redis databases.

See also:

- *darc.db.save_requests()*
- *darc.db.save_selenium()*

darc.db.**LOCK_TIMEOUT**: float | None

Default
10

Environ
DARC_LOCK_TIMEOUT

Lock blocking timeout.

Note: If is an infinit `inf`, no timeout will be applied.

See also:

Get a lock from `darc.db.get_lock()`.

darc.db.**MAX_POOL**: int

Default
1_000

Environ
DARC_MAX_POOL

Maximum number of links loading from the database.

Note: If is an infinit `inf`, no limit will be applied.

darc.db.**REDIS_LOCK**: bool

Default
False

Environ
DARC_REDIS_LOCK

If use Redis (Lua) lock to ensure process/thread-safely operations.

See also:

Toggles the behaviour of `darc.db.get_lock()`.

darc.db.**RETRY_INTERVAL**: int

Default
10

Environ
DARC_RETRY

Retry interval between each Redis command failure.

Note: If is an infinit `inf`, no interval will be applied.

See also:

Toggles the behaviour of `darc.db.redis_command()`.

2.7 Data Submission

The *darc* project integrates the capability of submitting fetched data and information to a web server, to support real-time cross-analysis and status display.

There are three submission events:

1. New Host Submission – *API_NEW_HOST*

   Submitted in *crawler()* function call, when the crawling URL is marked as a new host.

2. Requests Submission – *API_REQUESTS*

   Submitted in *crawler()* function call, after the crawling process of the URL using `requests`.

3. Selenium Submission – *API_SELENIUM*

   Submitted in *loader()* function call, after the loading process of the URL using `selenium`.

See also:

Please refer to *data schema* for more information about the submission data.

darc.submit.**get_hosts**(*link*)

Read `hosts.txt`.

Parameters
link (*Link*) – Link object to read `hosts.txt`.

Return type
Optional[File]

Returns

- If `hosts.txt` exists, return the data from `hosts.txt`.
  - `path` – relative path from `hosts.txt` to root of data storage *PATH_DB*, `<proxy>/<scheme>/<hostname>/hosts.txt`
  - `data` – *base64* encoded content of `hosts.txt`
- If not, return `None`.

See also:

- *darc.crawl.crawler()*
- *darc.proxy.i2p.save_hosts()*

darc.submit.**get_robots**(*link*)

Read `robots.txt`.

Parameters
link (*Link*) – Link object to read `robots.txt`.

Return type
Optional[File]

Returns

- If `robots.txt` exists, return the data from `robots.txt`.
  - `path` – relative path from `robots.txt` to root of data storage *PATH_DB*, `<proxy>/<scheme>/<hostname>/robots.txt`
  - `data` – *base64* encoded content of `robots.txt`
- If not, return `None`.

See also:

- *darc.crawl.crawler()*
- *darc.proxy.null.save_robots()*

darc.submit.**get_sitemaps**(*link*)

Read sitemaps.

Parameters
link (*Link*) – Link object to read sitemaps.

Return type
Optional[List[File]]

Returns

- If sitemaps exist, return list of the data from sitemaps.

- path – relative path from sitemap to root of data storage *PATH_DB*, <proxy>/<scheme>/<hostname>/sitemap_<hash>.xml
- data – *base64* encoded content of sitemap

- If not, return None.

See also:

- *darc.crawl.crawler()*
- *darc.proxy.null.save_sitemap()*

darc.submit.**save_submit**(*domain*, *data*)

Save failed submit data.

Parameters

- **domain** ('new_host', 'requests' or 'selenium') – Domain of the submit data.
- **data** (Dict[str, Any]) – Submit data.

Return type
None

Notes

The saved files will be categorised by the actual runtime day for better maintenance.

See also:

- *darc.submit.PATH_API*
- *darc.submit.submit()*
- *darc.submit.submit_new_host()*
- *darc.submit.submit_requests()*
- *darc.submit.submit_selenium()*

darc.submit.**submit**(*api*, *domain*, *data*)

Submit data.

Parameters

- **api** (str) – API URL.
- **domain** ('new_host', 'requests' or 'selenium') – Domain of the submit data.
- **data** (Dict[str, Any]) – Submit data.

Return type
None

See also:

- *darc.submit.API_RETRY*
- *darc.submit.save_submit()*
- *darc.submit.submit_new_host()*

- *darc.submit.submit_requests()*
- *darc.submit.submit_selenium()*

darc.submit.**submit_new_host**(*time*, *link*, *partial=False*, *force=False*)

Submit new host.

When a new host is discovered, the *darc* crawler will submit the host information. Such includes `robots.txt` (if exists) and `sitemap.xml` (if any).

Parameters

- **time** (*datetime.datetime*) – Timestamp of submission.
- **link** (*Link*) – Link object of submission.
- **partial** (`bool`) – If the data is not complete, i.e. failed when fetching `robots.txt`, `hosts.txt` and/or sitemaps.
- **force** (`bool`) – If the data is force re-fetched, i.e. cache expired when checking with *darc.db.have_hostname()*.

Return type

`None`

If *API_NEW_HOST* is `None`, the data for submission will directly be save through *save_submit()*.

The data submitted should have following format:

```
{
    // partial flag - true / false
    "$PARTIAL$": ...,
    // force flag - true / false
    "$FORCE$": ...,
    // metadata of URL
    "[metadata]": {
        // original URL - <scheme>://<netloc>/<path>;<params>?<query>#<fragment>
        "url": ...,
        // proxy type - null / tor / i2p / zeronet / freenet
        "proxy": ...,
        // hostname / netloc, c.f. ``urllib.parse.urlparse``
        "host": ...,
        // base folder, relative path (to data root path ``PATH_DATA``) in␣
↪containter - <proxy>/<scheme>/<host>
        "base": ...,
        // sha256 of URL as name for saved files (timestamp is in ISO format)
        //   JSON log as this one - <base>/<name>_<timestamp>.json
        //   HTML from requests - <base>/<name>_<timestamp>_raw.html
        //   HTML from selenium - <base>/<name>_<timestamp>.html
        //   generic data files - <base>/<name>_<timestamp>.dat
        "name": ...,
        // originate URL - <scheme>://<netloc>/<path>;<params>?<query>#<fragment>
        "backref": ...
    },
    // requested timestamp in ISO format as in name of saved file
    "Timestamp": ...,
    // original URL
    "URL": ...,
```

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```
    // robots.txt from the host (if not exists, then ``null``)
    "Robots": {
        // path of the file, relative path (to data root path ``PATH_DATA``) in␣
↪container
        //   - <proxy>/<scheme>/<host>/robots.txt
        "path": ...,
        // content of the file (**base64** encoded)
        "data": ...,
    },
    // sitemaps from the host (if none, then ``null``)
    "Sitemaps": [
        {
            // path of the file, relative path (to data root path ``PATH_DATA``) in␣
↪container
            //   - <proxy>/<scheme>/<host>/sitemap_<name>.xml
            "path": ...,
            // content of the file (**base64** encoded)
            "data": ...,
        },
        ...
    ],
    // hosts.txt from the host (if proxy type is ``i2p``; if not exists, then␣
↪``null``)
    "Hosts": {
        // path of the file, relative path (to data root path ``PATH_DATA``) in␣
↪container
        //   - <proxy>/<scheme>/<host>/hosts.txt
        "path": ...,
        // content of the file (**base64** encoded)
        "data": ...,
    }
}
```

See also:

- *darc.submit.API_NEW_HOST*
- *darc.submit.submit()*
- *darc.submit.save_submit()*
- *darc.submit.get_robots()*
- *darc.submit.get_sitemaps()*
- *darc.submit.get_hosts()*

darc.submit.**submit_requests**(*time*, *link*, *response*, *session*, *content*, *mime_type*, *html=True*)

Submit requests data.

When crawling, we'll first fetch the URl using `requests`, to check its availability and to save its HTTP headers information. Such information will be submitted to the web UI.

Parameters

- **time** (*datetime.datetime*) – Timestamp of submission.

- **link** (*Link*) – Link object of submission.
- **response** (*requests.Response*) – Response object of submission.
- **session** (*requests.Session*) – Session object of submission.
- **content** (bytes) – Raw content of from the response.
- **mime_type** (str) – Content type.
- **html** (bool) – If current document is HTML or other files.

Return type
None

If *API_REQUESTS* is None, the data for submission will directly be save through *save_submit()*.

The data submitted should have following format:

```
{
    // metadata of URL
    "[metadata]": {
        // original URL - <scheme>://<netloc>/<path>;<params>?<query>#<fragment>
        "url": ...,
        // proxy type - null / tor / i2p / zeronet / freenet
        "proxy": ...,
        // hostname / netloc, c.f. ``urllib.parse.urlparse``
        "host": ...,
        // base folder, relative path (to data root path ``PATH_DATA``) in␣
↪containter - <proxy>/<scheme>/<host>
        "base": ...,
        // sha256 of URL as name for saved files (timestamp is in ISO format)
        //   JSON log as this one - <base>/<name>_<timestamp>.json
        //   HTML from requests - <base>/<name>_<timestamp>_raw.html
        //   HTML from selenium - <base>/<name>_<timestamp>.html
        //   generic data files - <base>/<name>_<timestamp>.dat
        "name": ...,
        // originate URL - <scheme>://<netloc>/<path>;<params>?<query>#<fragment>
        "backref": ...
    },
    // requested timestamp in ISO format as in name of saved file
    "Timestamp": ...,
    // original URL
    "URL": ...,
    // request method
    "Method": "GET",
    // response status code
    "Status-Code": ...,
    // response reason
    "Reason": ...,
    // response cookies (if any)
    "Cookies": {
        ...
    },
    // session cookies (if any)
    "Session": {
        ...
```

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```
    },
    // request headers (if any)
    "Request": {
        ...
    },
    // response headers (if any)
    "Response": {
        ...
    },
    // content type
    "Content-Type": ...,
    // requested file (if not exists, then ``null``)
    "Document": {
        // path of the file, relative path (to data root path ``PATH_DATA``) in␣
↪container
        //   - <proxy>/<scheme>/<host>/<name>_<timestamp>_raw.html
        // or if the document is of generic content type, i.e. not HTML
        //   - <proxy>/<scheme>/<host>/<name>_<timestamp>.dat
        "path": ...,
        // content of the file (**base64** encoded)
        "data": ...,
    },
    // redirection history (if any)
    "History": [
        // same record data as the original response
        {"...": "..."}
    ]
}
```

See also:

- *darc.submit.API_REQUESTS*
- *darc.submit.submit()*
- *darc.submit.save_submit()*
- darc.submit.get_raw()
- *darc.crawl.crawler()*

darc.submit.**submit_selenium**(*time*, *link*, *html*, *screenshot*)

Submit selenium data.

After crawling with `requests`, we'll then render the URl using `selenium` with Google Chrome and its web driver, to provide a fully rendered web page. Such information will be submitted to the web UI.

Parameters

- **time** (*datetime.datetime*) – Timestamp of submission.
- **link** (*Link*) – Link object of submission.
- **html** (`str`) – HTML source of the web page.
- **screenshot** (`Optional`[`str`]) – *base64* encoded screenshot.

Return type
None

If *API_SELENIUM* is None, the data for submission will directly be save through *save_submit()*.

Note: This information is optional, only provided if the content type from requests is HTML, status code not between 400 and 600, and HTML data not empty.

The data submitted should have following format:

```
{
    // metadata of URL
    "[metadata]": {
        // original URL - <scheme>://<netloc>/<path>;<params>?<query>#<fragment>
        "url": ...,
        // proxy type - null / tor / i2p / zeronet / freenet
        "proxy": ...,
        // hostname / netloc, c.f. ``urllib.parse.urlparse``
        "host": ...,
        // base folder, relative path (to data root path ``PATH_DATA``) in␣
↪containter - <proxy>/<scheme>/<host>
        "base": ...,
        // sha256 of URL as name for saved files (timestamp is in ISO format)
        //   JSON log as this one - <base>/<name>_<timestamp>.json
        //   HTML from requests - <base>/<name>_<timestamp>_raw.html
        //   HTML from selenium - <base>/<name>_<timestamp>.html
        //   generic data files - <base>/<name>_<timestamp>.dat
        "name": ...,
        // originate URL - <scheme>://<netloc>/<path>;<params>?<query>#<fragment>
        "backref": ...
    },
    // requested timestamp in ISO format as in name of saved file
    "Timestamp": ...,
    // original URL
    "URL": ...,
    // rendered HTML document (if not exists, then ``null``)
    "Document": {
        // path of the file, relative path (to data root path ``PATH_DATA``) in␣
↪container
        //   - <proxy>/<scheme>/<host>/<name>_<timestamp>.html
        "path": ...,
        // content of the file (**base64** encoded)
        "data": ...,
    },
    // web page screenshot (if not exists, then ``null``)
    "Screenshot": {
        // path of the file, relative path (to data root path ``PATH_DATA``) in␣
↪container
        //   - <proxy>/<scheme>/<host>/<name>_<timestamp>.png
        "path": ...,
        // content of the file (**base64** encoded)
        "data": ...,
    }
```

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```
}
```

See also:

- *darc.submit.API_SELENIUM*
- *darc.submit.submit()*
- *darc.submit.save_submit()*
- darc.submit.get_html()
- darc.submit.get_screenshot()
- *darc.crawl.loader()*

darc.submit.**PATH_API = '{PATH_DB}/api/'**

Path to the API submittsion records, i.e. `api` folder under the root of data storage.

See also:

- *darc.const.PATH_DB*

darc.submit.**SAVE_DB: bool**

Save submitted data to database.

Default
True

Environ
SAVE_DB

darc.submit.**API_RETRY: int**

Retry times for API submission when failure.

Default
3

Environ
API_RETRY

darc.submit.**API_NEW_HOST: str**

API URL for *submit_new_host()*.

Default
None

Environ
API_NEW_HOST

darc.submit.**API_REQUESTS: str**

API URL for *submit_requests()*.

Default
None

Environ
API_REQUESTS

darc.submit.**API_SELENIUM: str**

API URL for *submit_selenium()*.

Default
None

Environ
API_SELENIUM

Note: If *API_NEW_HOST*, *API_REQUESTS* and *API_SELENIUM* is None, the corresponding submit function will save the JSON data in the path specified by *PATH_API*.

See also:

The *darc* provides a demo on how to implement a *darc*-compliant web backend for the data submission module. See the *demo* page for more information.

2.8 Requests Wrapper

The *darc.requests* module wraps around the requests module, and provides some simple interface for the *darc* project.

darc.requests.**default_user_agent**(*name='python-darc'*, *proxy=None*)

Generates the default user agent.

Parameters

- **name** (str) – Base name.
- **proxy** (Optional[str]) – Proxy type.

Return type
str

Returns
User agent in format of `{name}/{darc.__version__} ({proxy} Proxy)`.

darc.requests.**i2p_session**(*futures=False*)

I2P (.i2p) session.

Parameters
futures (bool) – If returns a `requests_futures.FuturesSession`.

Returns
The session object with I2P proxy settings.

Return type
Union[requests.Session, requests_futures.FuturesSession]

See also:

- `darc.proxy.i2p.I2P_REQUESTS_PROXY`

darc.requests.**null_session**(*futures=False*)

No proxy session.

Parameters
futures (bool) – If returns a `requests_futures.FuturesSession`.

Returns
The session object with no proxy settings.

Return type
Union[requests.Session, requests_futures.FuturesSession]

darc.requests.**request_session**(*link*, *futures=False*)

Get requests session.

Parameters

- **link** (*Link*) – Link requesting for requests.Session.
- **futures** (bool) – If returns a `requests_futures.FuturesSession`.

Returns
The session object with corresponding proxy settings.

Return type
Union[requests.Session, requests_futures.FuturesSession]

Raises
UnsupportedLink – If the proxy type of `link` if not specified in the `LINK_MAP`.

See also:

- `darc.proxy.LINK_MAP`

darc.requests.**tor_session**(*futures=False*)

Tor (.onion) session.

Parameters
futures (bool) – If returns a `requests_futures.FuturesSession`.

Returns
The session object with Tor proxy settings.

Return type
Union[requests.Session, requests_futures.FuturesSession]

See also:

- `darc.proxy.tor.TOR_REQUESTS_PROXY`

2.9 Selenium Wrapper

The *darc.selenium* module wraps around the `selenium` module, and provides some simple interface for the *darc* project.

darc.selenium.**get_capabilities**(*type='null'*)

Generate desied capabilities.

Parameters
type (str) – Proxy type for capabilities.

Return type
Dict[str, str]

Returns
The desied capabilities for the web driver `WebDriver`.

Raises
UnsupportedProxy – If the proxy type is **NOT** `null`, `tor` or `i2p`.

See also:

- `darc.proxy.tor.TOR_SELENIUM_PROXY`
- `darc.proxy.i2p.I2P_SELENIUM_PROXY`

`darc.selenium.`**`get_options`**(*type='null'*)

Generate options.

Parameters
type (`str`) – Proxy type for options.

Returns

The options for the web driver
`WebDriver`.

Return type
selenium.webdriver.chrome.options.Options

Raises

- *UnsupportedPlatform* – If the operation system is **NOT** macOS or Linux and *CHROME_BINARY_LOCATION* is **NOT** set.
- *UnsupportedProxy* – If the proxy type is **NOT** `null`, `tor` or `i2p`.

Important: The function raises `UnsupportedPlatform` in cases where *BINARY_LOCATION* is `None`.

Please provide *CHROME_BINARY_LOCATION* when running *darc* in `loader` mode on non *macOS* and/or *Linux* systems.

See also:

- `darc.proxy.tor.TOR_PORT`
- `darc.proxy.i2p.I2P_PORT`

References

- Google Chrome command line switches
- Disable sandbox (`--no-sandbox`) when running as `root` user
  - https://crbug.com/638180
  - https://stackoverflow.com/a/50642913/7218152
- Disable usage of `/dev/shm`
  - http://crbug.com/715363
- Using Socks proxy

---

darc.selenium.**i2p_driver**()

I2P (.i2p) driver.

Returns
The web driver object with I2P proxy settings.

Return type
selenium.webdriver.chrome.webdriver.WebDriver

See also:

- *darc.selenium.get_options()*
- *darc.selenium.get_capabilities()*

darc.selenium.**null_driver**()

No proxy driver.

Returns
The web driver object with no proxy settings.

Return type
selenium.webdriver.chrome.webdriver.WebDriver

See also:

- *darc.selenium.get_options()*
- *darc.selenium.get_capabilities()*

darc.selenium.**request_driver**(*link*)

Get selenium driver.

Parameters
link (*Link*) – Link requesting for WebDriver.

Returns
The web driver object with corresponding proxy settings.

Return type
selenium.webdriver.chrome.webdriver.WebDriver

Raises
UnsupportedLink – If the proxy type of link if not specified in the LINK_MAP.

See also:

- darc.proxy.LINK_MAP

darc.selenium.**tor_driver**()

Tor (.onion) driver.

Returns
The web driver object with Tor proxy settings.

Return type
selenium.webdriver.chrome.webdriver.WebDriver

See also:

- *darc.selenium.get_options()*

- *darc.selenium.get_capabilities()*

darc.selenium.**BINARY_LOCATION**: str | None

Path to Google Chrome binary location.

Default
google-chrome

Environ
CHROME_BINARY_LOCATION

2.10 Proxy Utilities

The *darc.proxy* module provides various proxy support to the *darc* project.

2.10.1 Bitcoin Addresses

The *darc.proxy.bitcoin* module contains the auxiliary functions around managing and processing the bitcoin addresses.

Currently, the *darc* project directly save the bitcoin addresses extracted to the data storage file *PATH* without further processing.

darc.proxy.bitcoin.**save_bitcoin**(*link*)

Save bitcoin address.

The function will save bitcoin address to the file as defined in *PATH*.

Parameters
link (*Link*) – Link object representing the bitcoin address.

Return type
None

darc.proxy.bitcoin.**PATH = '{PATH_MISC}/bitcoin.txt'**

Path to the data storage of bitcoin addresses.

See also:

- *darc.const.PATH_MISC*

darc.proxy.bitcoin.**LOCK**: multiprocessing.Lock | threading.Lock | contextlib.nullcontext

I/O lock for saving bitcoin addresses *PATH*.

See also:

- *darc.const.get_lock()*

2.10.2 Data URI Schemes

The *darc.proxy.data* module contains the auxiliary functions around managing and processing the data URI schemes.

Currently, the *darc* project directly save the data URI schemes extracted to the data storage path *PATH* without further processing.

darc.proxy.data.**save_data**(*link*)

Save data URI.

The function will save data URIs to the data storage as defined in *PATH*.

Parameters
link (*Link*) – Link object representing the data URI.

Return type
None

darc.proxy.data.**PATH = '{PATH_MISC}/data/'**

Path to the data storage of data URI schemes.

See also:

- *darc.const.PATH_MISC*

2.10.3 ED2K Magnet Links

The *darc.proxy.ed2k* module contains the auxiliary functions around managing and processing the ED2K magnet links.

Currently, the *darc* project directly save the ED2K magnet links extracted to the data storage file *PATH* without further processing.

darc.proxy.ed2k.**save_ed2k**(*link*)

Save ed2k magnet link.

The function will save ED2K magnet link to the file as defined in *PATH*.

Parameters
link (*Link*) – Link object representing the ED2K magnet links.

Return type
None

darc.proxy.ed2k.**PATH = '{PATH_MISC}/ed2k.txt'**

Path to the data storage of bED2K magnet links.

See also:

- *darc.const.PATH_MISC*

darc.proxy.ed2k.**LOCK: multiprocessing.Lock | threading.Lock | contextlib.nullcontext**

I/O lock for saving ED2K magnet links *PATH*.

See also:

- *darc.const.get_lock()*

2.10.4 Ethereum Addresses

The *darc.proxy.ethereum* module contains the auxiliary functions around managing and processing the ethereum addresses.

Currently, the *darc* project directly save the ethereum addresses extracted to the data storage file *PATH* without further processing.

darc.proxy.ethereum.**save_ethereum**(*link*)

Save ethereum address.

The function will save ethereum address to the file as defined in *PATH*.

Parameters
link (*Link*) – Link object representing the ethereum address.

Return type
None

darc.proxy.ethereum.**PATH = '{PATH_MISC}/ethereum.txt'**

Path to the data storage of ethereum addresses.

See also:

- *darc.const.PATH_MISC*

darc.proxy.ethereum.**LOCK: multiprocessing.Lock | threading.Lock | contextlib.nullcontext**

I/O lock for saving ethereum addresses *PATH*.

See also:

- *darc.const.get_lock()*

2.10.5 Freenet Proxy

The *darc.proxy.freenet* module contains the auxiliary functions around managing and processing the Freenet proxy.

darc.proxy.freenet.**_freenet_bootstrap**()

Freenet bootstrap.

The bootstrap arguments are defined as *_FREENET_ARGS*.

Raises
subprocess.CalledProcessError – If the return code of *_FREENET_PROC* is non-zero.

Return type
None

See also:

- *darc.proxy.freenet.freenet_bootstrap()*
- *darc.proxy.freenet.launch_freenet()*
- *darc.proxy.freenet.BS_WAIT*
- *darc.proxy.freenet._FREENET_BS_FLAG*
- *darc.proxy.freenet._FREENET_PROC*

darc.proxy.freenet.**freenet_bootstrap**()

Bootstrap wrapper for Freenet.

The function will bootstrap the Freenet proxy. It will retry for *FREENET_RETRY* times in case of failure.

Also, it will **NOT** re-bootstrap the proxy as is guaranteed by *_FREENET_BS_FLAG*.

Warns
FreenetBootstrapFailed – If failed to bootstrap Freenet proxy.

Raises
UnsupportedPlatform – If the system is not supported, i.e. not macOS or Linux.

Return type
None

See also:

- *darc.proxy.freenet._freenet_bootstrap()*
- *darc.proxy.freenet.FREENET_RETRY*
- *darc.proxy.freenet._FREENET_BS_FLAG*

darc.proxy.freenet.**launch_freenet**()

Launch Freenet process. :rtype: Popen[bytes]

See also:

This function mocks the behaviour of stem.process.launch_tor().

Return type
Popen[bytes]

The following constants are configuration through environment variables:

darc.proxy.freenet.**FREENET_PORT: int**

Port for Freenet proxy connection.

Default
8888

Environ
FREENET_PORT

darc.proxy.freenet.**FREENET_RETRY: int**

Retry times for Freenet bootstrap when failure.

Default
3

Environ
FREENET_RETRY

darc.proxy.freenet.**BS_WAIT: float**

Time after which the attempt to start Freenet is aborted.

Default
90

Environ
FREENET_WAIT

Note: If not provided, there will be **NO** timeouts.

darc.proxy.freenet.**FREENET_PATH**: str

Path to the Freenet project.

Default
`/usr/local/src/freenet`

Environ
FREENET_PATH

darc.proxy.freenet.**FREENET_ARGS**: List[str]

Freenet bootstrap arguments for `run.sh start`.

If provided, it should be parsed as command line arguments (c.f. `shlex.split()`).

Default
`''`

Environ
FREENET_ARGS

Note: The command will be run as *DARC_USER*, if current user (c.f. `getpass.getuser()`) is *root*.

The following constants are defined for internal usage:

darc.proxy.freenet.**_MNG_FREENET**: bool

If manage Freenet proxy through *darc*.

Default
`True`

Environ
DARC_FREENET

darc.proxy.freenet.**_FREENET_BS_FLAG**: bool

If the Freenet proxy is bootstrapped.

darc.proxy.freenet.**_FREENET_PROC**: subprocess.Popen

Freenet proxy process running in the background.

darc.proxy.freenet.**_FREENET_ARGS**: List[str]

Freenet proxy bootstrap arguments.

2.10.6 I2P Proxy

The *darc.proxy.i2p* module contains the auxiliary functions around managing and processing the I2P proxy.

darc.proxy.i2p.**_i2p_bootstrap**()

I2P bootstrap.

The bootstrap arguments are defined as *_I2P_ARGS*.

Raises
subprocess.CalledProcessError – If the return code of *_I2P_PROC* is non-zero.

Return type
None

See also:

- *darc.proxy.i2p.i2p_bootstrap()*
- *darc.proxy.i2p.launch_i2p()*
- *darc.proxy.i2p.BS_WAIT*
- *darc.proxy.i2p._I2P_BS_FLAG*
- *darc.proxy.i2p._I2P_PROC*

darc.proxy.i2p.**fetch_hosts**(*link*, *force=False*)

Fetch `hosts.txt`.

Parameters

- **link** (*darc_link.Link*) – Link object to fetch for its `hosts.txt`.
- **force** (bool) – Force refetch `hosts.txt`.

Return type
None

Returns
Content of the `hosts.txt` file.

darc.proxy.i2p.**get_hosts**(*link*)

Read `hosts.txt`.

Parameters
link (*darc_link.Link*) – Link object to read `hosts.txt`.

Return type
Optional[File]

Returns

- If `hosts.txt` exists, return the data from `hosts.txt`.
  - `path` – relative path from `hosts.txt` to root of data storage *PATH_DB*, `<proxy>/<scheme>/<hostname>/hosts.txt`
  - `data` – *base64* encoded content of `hosts.txt`
- If not, return None.

See also:

- *darc.submit.submit_new_host()*
- *darc.proxy.i2p.save_hosts()*

darc.proxy.i2p.**have_hosts**(*link*)

Check if `hosts.txt` already exists.

Parameters
link (*darc_link.Link*) – Link object to check if `hosts.txt` already exists.

Return type
Optional[str]

Returns

- If `hosts.txt` exists, return the path to `hosts.txt`, i.e. `<root>/<proxy>/<scheme>/<hostname>/hosts.txt`.
- If not, return `None`.

`darc.proxy.i2p.`**`i2p_bootstrap`**`()`

Bootstrap wrapper for I2P.

The function will bootstrap the I2P proxy. It will retry for *I2P_RETRY* times in case of failure.

Also, it will **NOT** re-bootstrap the proxy as is guaranteed by *_I2P_BS_FLAG*.

Warns
I2PBootstrapFailed – If failed to bootstrap I2P proxy.

Raises
UnsupportedPlatform – If the system is not supported, i.e. not macOS or Linux.

Return type
`None`

See also:

- *darc.proxy.i2p._i2p_bootstrap()*
- *darc.proxy.i2p.I2P_RETRY*
- *darc.proxy.i2p._I2P_BS_FLAG*

`darc.proxy.i2p.`**`launch_i2p`**`()`

Launch I2P process. :rtype: Popen[bytes]

See also:

This function mocks the behaviour of `stem.process.launch_tor()`.

Return type
Popen[bytes]

`darc.proxy.i2p.`**`read_hosts`**`(`*`link`*`, `*`text`*`, `*`check=False`*`)`

Read `hosts.txt`.

Parameters

- **link** (*darc_link.Link*) – Link object to fetch for its `hosts.txt`.
- **text** (`str`) – Content of `hosts.txt`.
- **check** (`bool`) – If perform checks on extracted links, default to *CHECK*.

Return type
List[darc_link.Link]

Returns
List of links extracted.

`darc.proxy.i2p.`**`save_hosts`**`(`*`link`*`, `*`text`*`)`

Save `hosts.txt`.

Parameters

- **link** (*darc_link.Link*) – Link object of `hosts.txt`.

- **text** (str) – Content of hosts.txt.

Return type
str

Returns
Saved path to hosts.txt, i.e. <root>/<proxy>/<scheme>/<hostname>/hosts.txt.

See also:

- *darc.save.sanitise()*

darc.proxy.i2p.**I2P_REQUESTS_PROXY: Dict[str, Any]**

Proxy for I2P sessions.

See also:

- *darc.requests.i2p_session()*

darc.proxy.i2p.**I2P_SELENIUM_PROXY: selenium.webdriver.common.proxy.Proxy**

Proxy for I2P web drivers.

See also:

- *darc.selenium.i2p_driver()*

The following constants are configuration through environment variables:

darc.proxy.i2p.**I2P_PORT: int**

Port for I2P proxy connection.

Default
4444

Environ
I2P_PORT

darc.proxy.i2p.**I2P_RETRY: int**

Retry times for I2P bootstrap when failure.

Default
3

Environ
I2P_RETRY

darc.proxy.i2p.**BS_WAIT: float**

Time after which the attempt to start I2P is aborted.

Default
90

Environ
I2P_WAIT

Note: If not provided, there will be **NO** timeouts.

darc.proxy.i2p.**I2P_ARGS: List[str]**

I2P bootstrap arguments for `i2prouter start`.

If provided, it should be parsed as command line arguments (c.f. `shlex.split()`).

Default
`''`

Environ
I2P_ARGS

Note: The command will be run as *DARC_USER*, if current user (c.f. `getpass.getuser()`) is *root*.

The following constants are defined for internal usage:

darc.proxy.i2p.**_MNG_I2P: bool**

If manage I2P proxy through *darc*.

Default
`True`

Environ
DARC_I2P

darc.proxy.i2p.**_I2P_BS_FLAG: bool**

If the I2P proxy is bootstrapped.

darc.proxy.i2p.**_I2P_PROC: subprocess.Popen**

I2P proxy process running in the background.

darc.proxy.i2p.**_I2P_ARGS: List[str]**

I2P proxy bootstrap arguments.

2.10.7 IRC Addresses

The *darc.proxy.irc* module contains the auxiliary functions around managing and processing the IRC addresses.

Currently, the *darc* project directly save the IRC addresses extracted to the data storage file *PATH* without further processing.

darc.proxy.irc.**save_irc**(*link*)

Save IRC address.

The function will save IRC address to the file as defined in *PATH*.

Parameters
link (*Link*) – Link object representing the IRC address.

Return type
`None`

darc.proxy.irc.**PATH = '{PATH_MISC}/irc.txt'**

Path to the data storage of IRC addresses.

See also:

- *darc.const.PATH_MISC*

darc.proxy.irc.**LOCK**: multiprocessing.Lock | threading.Lock | contextlib.nullcontext

I/O lock for saving IRC addresses *PATH*.

See also:

- *darc.const.get_lock()*

2.10.8 Magnet Links

The *darc.proxy.magnet* module contains the auxiliary functions around managing and processing the magnet links.

Currently, the *darc* project directly save the magnet links extracted to the data storage file *PATH* without further processing.

darc.proxy.magnet.**save_magnet**(*link*)

Save magnet link.

The function will save magnet link to the file as defined in *PATH*.

Parameters
link (*Link*) – Link object representing the magnet link

Return type
None

darc.proxy.magnet.**PATH = '{PATH_MISC}/magnet.txt'**

Path to the data storage of magnet links.

See also:

- *darc.const.PATH_MISC*

darc.proxy.magnet.**LOCK**: multiprocessing.Lock | threading.Lock | contextlib.nullcontext

I/O lock for saving magnet links *PATH*.

See also:

- *darc.const.get_lock()*

2.10.9 Email Addresses

The *darc.proxy.mail* module contains the auxiliary functions around managing and processing the email addresses.

Currently, the *darc* project directly save the email addresses extracted to the data storage file *PATH* without further processing.

darc.proxy.mail.**save_mail**(*link*)

Save email address.

The function will save email address to the file as defined in *PATH*.

Parameters
link (*Link*) – Link object representing the email address.

Return type
None

darc.proxy.mail.**PATH = '{PATH_MISC}/mail.txt'**

Path to the data storage of email addresses.

See also:

- *darc.const.PATH_MISC*

darc.proxy.mail.**LOCK: multiprocessing.Lock | threading.Lock | contextlib.nullcontext**

I/O lock for saving email addresses *PATH*.

See also:

- *darc.const.get_lock()*

2.10.10 No Proxy

The *darc.proxy.null* module contains the auxiliary functions around managing and processing normal websites with no proxy.

darc.proxy.null.**fetch_sitemap**(*link*, *force=False*)

Fetch sitemap.

The function will first fetch the `robots.txt`, then fetch the sitemaps accordingly.

Parameters

- **link** (*Link*) – Link object to fetch for its sitemaps.
- **force** (`bool`) – Force refetch its sitemaps.

Return type
`None`

Returns
Contents of `robots.txt` and sitemaps.

See also:

- *darc.proxy.null.read_robots()*
- *darc.proxy.null.read_sitemap()*
- `darc.parse.get_sitemap()`

darc.proxy.null.**get_sitemap**(*link*, *text*, *host=None*)

Fetch link to other sitemaps from a sitemap.

Parameters

- **link** (*Link*) – Original link to the sitemap.
- **text** (`str`) – Content of the sitemap.
- **host** (`Optional[str]`) – Hostname of the URL to the sitemap, the value may not be same as in `link`.

Return type
`List[Link]`

Returns
List of link to sitemaps.

Note: As specified in the sitemap protocol, it may contain links to other sitemaps.*[0]

darc.proxy.null.**have_robots**(*link*)

Check if `robots.txt` already exists.

Parameters
link (*Link*) – Link object to check if `robots.txt` already exists.

Return type
Optional[str]

Returns

- If `robots.txt` exists, return the path to `robots.txt`, i.e. `<root>/<proxy>/<scheme>/<hostname>/robots.txt`.
- If not, return None.

darc.proxy.null.**have_sitemap**(*link*)

Check if sitemap already exists.

Parameters
link (*Link*) – Link object to check if sitemap already exists.

Return type
Optional[str]

Returns

- If sitemap exists, return the path to the sitemap, i.e. `<root>/<proxy>/<scheme>/<hostname>/sitemap_<hash>.xml`.
- If not, return None.

darc.proxy.null.**read_robots**(*link*, *text*, *host=None*)

Read `robots.txt` to fetch link to sitemaps.

Parameters

- **link** (*Link*) – Original link to `robots.txt`.
- **text** (str) – Content of `robots.txt`.
- **host** (Optional[str]) – Hostname of the URL to `robots.txt`, the value may not be same as in `link`.

Return type
List[*Link*]

Returns
List of link to sitemaps.

Note: If the link to sitemap is not specified in `robots.txt`†[0], the fallback link `/sitemap.xml` will be used.

darc.proxy.null.**read_sitemap**(*link*, *text*, *check=False*)

Read sitemap.

Parameters

[0] https://www.sitemaps.org/protocol.html#index
[0] https://www.sitemaps.org/protocol.html#submit_robots

- **link** (*Link*) – Original link to the sitemap.
- **text** (str) – Content of the sitemap.
- **check** (bool) – If perform checks on extracted links, default to *CHECK*.

Return type
List[*Link*]

Returns
List of links extracted.

See also:

- *darc.parse._check()*
- *darc.parse._check_ng()*

darc.proxy.null.**save_invalid**(*link*)

Save link with invalid scheme.

The function will save link with invalid scheme to the file as defined in *PATH*.

Parameters
link (*Link*) – Link object representing the link with invalid scheme.

Return type
None

darc.proxy.null.**save_robots**(*link*, *text*)

Save `robots.txt`.

Parameters

- **link** (*Link*) – Link object of `robots.txt`.
- **text** (str) – Content of `robots.txt`.

Return type
str

Returns
Saved path to `robots.txt`, i.e. `<root>/<proxy>/<scheme>/<hostname>/robots.txt`.

See also:

- *darc.save.sanitise()*

darc.proxy.null.**save_sitemap**(*link*, *text*)

Save sitemap.

Parameters

- **link** (*Link*) – Link object of sitemap.
- **text** (str) – Content of sitemap.

Return type
str

Returns
Saved path to sitemap, i.e. `<root>/<proxy>/<scheme>/<hostname>/sitemap_<hash>.xml`.

See also:

- *darc.save.sanitise()*

darc.proxy.null.**PATH = '{PATH_MISC}/invalid.txt'**

Path to the data storage of links with invalid scheme.

See also:

- *darc.const.PATH_MISC*

darc.proxy.null.**LOCK: multiprocessing.Lock | threading.Lock | contextlib.nullcontext**

I/O lock for saving links with invalid scheme *PATH*.

See also:

- *darc.const.get_lock()*

2.10.11 JavaScript Links

The *darc.proxy.script* module contains the auxiliary functions around managing and processing the JavaScript links.

Currently, the *darc* project directly save the JavaScript links extracted to the data storage path *PATH* without further processing.

darc.proxy.script.**save_script**(*link*)

Save JavaScript link.

The function will save JavaScript link to the file as defined in *PATH*.

Parameters
link (*Link*) – Link object representing the JavaScript link.

Return type
None

darc.proxy.script.**PATH = '{PATH_MISC}/script.txt'**

Path to the data storage of bitcoin addresses.

See also:

- *darc.const.PATH_MISC*

darc.proxy.script.**LOCK: multiprocessing.Lock | threading.Lock | contextlib.nullcontext**

I/O lock for saving JavaScript links *PATH*.

See also:

- *darc.const.get_lock()*

2.10.12 Telephone Numbers

The *darc.proxy.tel* module contains the auxiliary functions around managing and processing the telephone numbers.

Currently, the *darc* project directly save the telephone numbers extracted to the data storage file *PATH* without further processing.

darc.proxy.tel.**save_tel**(*link*)

Save telephone number.

The function will save telephone number to the file as defined in *PATH*.

Parameters
link (*Link*) – Link object representing the telephone number.

Return type
None

darc.proxy.tel.**PATH = '{PATH_MISC}/tel.txt'**

Path to the data storage of bitcoin addresses.

See also:

- *darc.const.PATH_MISC*

darc.proxy.tel.**LOCK: multiprocessing.Lock | threading.Lock | contextlib.nullcontext**

I/O lock for saving telephone numbers *PATH*.

See also:

- *darc.const.get_lock()*

2.10.13 Tor Proxy

The *darc.proxy.tor* module contains the auxiliary functions around managing and processing the Tor proxy.

darc.proxy.tor.**_tor_bootstrap**()

Tor bootstrap.

The bootstrap configuration is defined as *_TOR_CONFIG*.

If *TOR_PASS* not provided, the function will request for it. :rtype: None

See also:

- *darc.proxy.tor.tor_bootstrap()*
- *darc.proxy.tor.BS_WAIT*
- *darc.proxy.tor.TOR_PASS*
- *darc.proxy.tor._TOR_BS_FLAG*
- *darc.proxy.tor._TOR_PROC*
- *darc.proxy.tor._TOR_CTRL*

Return type
None

darc.proxy.tor.**print_bootstrap_lines**(*line*)

Print Tor bootstrap lines.

Parameters
line (str) – Tor bootstrap line.

Return type
None

darc.proxy.tor.**renew_tor_session**()

Renew Tor session.

Return type
None

darc.proxy.tor.**tor_bootstrap**()

Bootstrap wrapper for Tor.

The function will bootstrap the Tor proxy. It will retry for *TOR_RETRY* times in case of failure.

Also, it will **NOT** re-bootstrap the proxy as is guaranteed by *_TOR_BS_FLAG*.

Warns
TorBootstrapFailed – If failed to bootstrap Tor proxy.

Return type
None

See also:

- *darc.proxy.tor._tor_bootstrap()*
- *darc.proxy.tor.TOR_RETRY*
- *darc.proxy.tor._TOR_BS_FLAG*

darc.proxy.tor.**TOR_REQUESTS_PROXY: Dict[str, Any]**

Proxy for Tor sessions.

See also:

- *darc.requests.tor_session()*

darc.proxy.tor.**TOR_SELENIUM_PROXY: selenium.webdriver.common.proxy.Proxy**

Proxy for Tor web drivers.

See also:

- *darc.selenium.tor_driver()*

The following constants are configuration through environment variables:

darc.proxy.tor.**TOR_PORT: int**

Port for Tor proxy connection.

Default
9050

Environ
TOR_PORT

darc.proxy.tor.**TOR_CTRL: int**

Port for Tor controller connection.

Default
9051

Environ
TOR_CTRL

darc.proxy.tor.**TOR_PASS: str**

Tor controller authentication token.

Default
None

Environ
TOR_PASS

Note: If not provided, it will be requested at runtime.

darc.proxy.tor.**TOR_RETRY: int**

Retry times for Tor bootstrap when failure.

Default
3

Environ
TOR_RETRY

darc.proxy.tor.**BS_WAIT: float**

Time after which the attempt to start Tor is aborted.

Default
90

Environ
TOR_WAIT

Note: If not provided, there will be **NO** timeouts.

darc.proxy.tor.**TOR_CFG: Dict[str, Any]**

Tor bootstrap configuration for `stem.process.launch_tor_with_config()`.

Default
{}

Environ
TOR_CFG

Note: If provided, it will be parsed from a JSON encoded string.

The following constants are defined for internal usage:

darc.proxy.tor.**_MNG_TOR: bool**

If manage Tor proxy through *darc*.

Default
True

Environ
DARC_TOR

darc.proxy.tor._TOR_BS_FLAG: bool

If the Tor proxy is bootstrapped.

darc.proxy.tor._TOR_PROC: subprocess.Popen

Tor proxy process running in the background.

darc.proxy.tor._TOR_CTRL: stem.control.Controller

Tor controller process (`stem.control.Controller`) running in the background.

darc.proxy.tor._TOR_CONFIG: List[str]

Tor bootstrap configuration for `stem.process.launch_tor_with_config()`.

2.10.14 ZeroNet Proxy

The *darc.proxy.zeronet* module contains the auxiliary functions around managing and processing the ZeroNet proxy.

darc.proxy.zeronet._zeronet_bootstrap()

ZeroNet bootstrap.

The bootstrap arguments are defined as *_ZERONET_ARGS*.

Raises
subprocess.CalledProcessError – If the return code of *_ZERONET_PROC* is non-zero.

Return type
None

See also:

- *darc.proxy.zeronet.zeronet_bootstrap()*
- *darc.proxy.zeronet.launch_zeronet()*
- *darc.proxy.zeronet.BS_WAIT*
- *darc.proxy.zeronet._ZERONET_BS_FLAG*
- *darc.proxy.zeronet._ZERONET_PROC*

darc.proxy.zeronet.launch_zeronet()

Launch ZeroNet process. :rtype: Popen[bytes]

See also:

This function mocks the behaviour of `stem.process.launch_tor()`.

Return type
Popen[bytes]

darc.proxy.zeronet.**zeronet_bootstrap**()

Bootstrap wrapper for ZeroNet.

The function will bootstrap the ZeroNet proxy. It will retry for *ZERONET_RETRY* times in case of failure.

Also, it will **NOT** re-bootstrap the proxy as is guaranteed by *_ZERONET_BS_FLAG*.

Warns
ZeroNetBootstrapFailed – If failed to bootstrap ZeroNet proxy.

Raises
UnsupportedPlatform – If the system is not supported, i.e. not macOS or Linux.

Return type
None

See also:

- *darc.proxy.zeronet._zeronet_bootstrap()*
- *darc.proxy.zeronet.ZERONET_RETRY*
- *darc.proxy.zeronet._ZERONET_BS_FLAG*

The following constants are configuration through environment variables:

darc.proxy.zeronet.**ZERONET_PORT**: int

Port for ZeroNet proxy connection.

Default
43110

Environ
ZERONET_PORT

darc.proxy.zeronet.**ZERONET_RETRY**: int

Retry times for ZeroNet bootstrap when failure.

Default
3

Environ
ZERONET_RETRY

darc.proxy.zeronet.**BS_WAIT**: float

Time after which the attempt to start ZeroNet is aborted.

Default
90

Environ
ZERONET_WAIT

Note: If not provided, there will be **NO** timeouts.

darc.proxy.zeronet.**ZERONET_PATH**: str

Path to the ZeroNet project.

Default
/usr/local/src/zeronet

Environ
ZERONET_PATH

darc.proxy.zeronet.**ZERONET_ARGS: List[str]**
ZeroNet bootstrap arguments for `run.sh start`.

If provided, it should be parsed as command line arguments (c.f. `shlex.split()`).

Default
`''`

Environ
ZERONET_ARGS

Note: The command will be run as *DARC_USER*, if current user (c.f. `getpass.getuser()`) is *root*.

The following constants are defined for internal usage:

darc.proxy.zeronet.**_MNG_ZERONET: bool**
If manage ZeroNet proxy through *darc*.

Default
`True`

Environ
DARC_ZERONET

darc.proxy.zeronet.**_ZERONET_BS_FLAG: bool**
If the ZeroNet proxy is bootstrapped.

darc.proxy.zeronet.**_ZERONET_PROC: subprocess.Popen**
ZeroNet proxy process running in the background.

darc.proxy.zeronet.**_ZERONET_ARGS: List[str]**
ZeroNet proxy bootstrap arguments.

To tell the *darc* project which proxy settings to be used for the `requests.Session` objects and `WebDriver` objects, you can specify such information in the *darc.proxy.LINK_MAP* mapping dictionarty.

darc.proxy.**LINK_MAP: DefaultDict[str, Tuple[types.FunctionType, types.FunctionType]]**

```
LINK_MAP = collections.defaultdict(
    lambda: (darc.requests.null_session, darc.selenium.null_driver),
    {
        'tor': (darc.requests.tor_session, darc.selenium.tor_driver),
        'i2p': (darc.requests.i2p_session, darc.selenium.i2p_driver),
    }
)
```

The mapping dictionary for proxy type to its corresponding `requests.Session` factory function and `WebDriver` factory function.

The fallback value is the no proxy `requests.Session` object (*null_session()*) and `WebDriver` object (*null_driver()*).

See also:

- *darc.requests* – `requests.Session` factory functions
- *darc.selenium* – `WebDriver` factory functions

2.11 Sites Customisation

As websites may have authentication requirements, etc., over its content, the *darc.sites* module provides sites customisation hooks to both `requests` and `selenium` crawling processes.

Important: To create a sites customisation, define your class by inheriting `darc.sites.BaseSite` and register it to the *darc* module through *darc.sites.register()*.

2.11.1 Base Sites Customisation

The *darc.sites._abc* module provides the *abstract base class* for sites customisation implementation. All sites customisation **must** inherit from the *BaseSite* exclusively.

Important: The *BaseSite* class is **NOT** intended to be used directly from the *darc.sites._abc* module. Instead, you are recommended to import it from *darc.sites* respectively.

class darc.sites._abc.**BaseSite**

Bases: `object`

Abstract base class for sites customisation.

static crawler(*timestamp*, *session*, *link*)

Crawler hook for my site.

Parameters

- **timestamp** (`datetime`) – Timestamp of the worker node reference.
- **session** (`Session`) – Session object with proxy settings.
- **link** (*Link*) – Link object to be crawled.

Raises

LinkNoReturn – This link has no return response.

Return type

`Union`[`NoReturn`, `Response`]

static loader(*timestamp*, *driver*, *link*)

Loader hook for my site.

Parameters

- **timestamp** (`datetime`) – Timestamp of the worker node reference.
- **driver** (*selenium.webdriver.Chrome*) – Web driver object with proxy settings.
- **link** (*Link*) – Link object to be loaded.

Raises

LinkNoReturn – This link has no return response.

Return type

`Union`[`NoReturn`, `WebDriver`]

hostname: `Optional[List[str]] = None`

Hostnames (**case insensitive**) the sites customisation is designed for.

2.11.2 Default Hooks

The *darc.sites.default* module is the fallback for sites customisation.

class darc.sites.default.**DefaultSite**

Bases: *BaseSite*

Default hooks.

static crawler(*timestamp*, *session*, *link*)

Default crawler hook.

Parameters

- **timestamp** (datetime) – Timestamp of the worker node reference.
- **session** (*requests.Session*) – Session object with proxy settings.
- **link** (*Link*) – Link object to be crawled.

Returns
The final response object with crawled data.

Return type
requests.Response

See also:

- *darc.crawl.crawler()*

static loader(*timestamp*, *driver*, *link*)

Default loader hook.

When loading, if *SE_WAIT* is a valid time lapse, the function will sleep for such time to wait for the page to finish loading contents.

Parameters

- **timestamp** (datetime) – Timestamp of the worker node reference.
- **driver** (*selenium.webdriver.Chrome*) – Web driver object with proxy settings.
- **link** (*Link*) – Link object to be loaded.

Returns
The web driver object with loaded data.

Return type
selenium.webdriver.Chrome

Note: Internally, `selenium` will wait for the browser to finish loading the pages before return (i.e. the web API event `DOMContentLoaded`). However, some extra scripts may take more time running after the event.

See also:

- *darc.crawl.loader()*
- *darc.const.SE_WAIT*

2.11.3 Bitcoin Addresses

The *darc.sites.bitcoin* module is customised to handle bitcoin addresses.

class darc.sites.bitcoin.**Bitcoin**

Bases: *BaseSite*

Bitcoin addresses.

static crawler(*timestamp*, *session*, *link*)

Crawler hook for bitcoin addresses.

Parameters

- **timestamp** (datetime) – Timestamp of the worker node reference.
- **session** (requests.Session) – Session object with proxy settings.
- **link** (*Link*) – Link object to be crawled.

Raises

LinkNoReturn – This link has no return response.

Return type

NoReturn

static loader(*timestamp*, *driver*, *link*)

Not implemented.

Raises

LinkNoReturn – This hook is not implemented.

Return type

NoReturn

Parameters

- **timestamp** (*datetime*) –
- **driver** (*WebDriver*) –
- **link** (Link) –

2.11.4 Data URI Schemes

The *darc.sites.data* module is customised to handle data URI schemes.

class darc.sites.data.**DataURI**

Bases: *BaseSite*

Data URI schemes.

static crawler(*timestamp*, *session*, *link*)

Crawler hook for data URIs.

Parameters

- **timestamp** (datetime) – Timestamp of the worker node reference.
- **session** (requests.Session) – Session object with proxy settings.
- **link** (*Link*) – Link object to be crawled.

Raises
LinkNoReturn – This link has no return response.

Return type
NoReturn

static loader(*timestamp*, *driver*, *link*)

Not implemented.

Raises
LinkNoReturn – This hook is not implemented.

Return type
NoReturn

Parameters

- **timestamp** (*datetime*) –
- **driver** (*WebDriver*) –
- **link** (Link) –

2.11.5 ED2K Magnet Links

The *darc.sites.ed2k* module is customised to handle ED2K magnet links.

class darc.sites.ed2k.**ED2K**

Bases: *BaseSite*

ED2K magnet links.

static crawler(*timestamp*, *session*, *link*)

Crawler hook for ED2K magnet links.

Parameters

- **timestamp** (datetime) – Timestamp of the worker node reference.
- **session** (requests.Session) – Session object with proxy settings.
- **link** (*Link*) – Link object to be crawled.

Raises
LinkNoReturn – This link has no return response.

Return type
NoReturn

static loader(*timestamp*, *driver*, *link*)

Not implemented.

Raises
LinkNoReturn – This hook is not implemented.

Return type
NoReturn

Parameters

- **timestamp** (*datetime*) –
- **driver** (*WebDriver*) –

- **link** (Link) –

2.11.6 Ethereum Addresses

The *darc.sites.ethereum* module is customised to handle ethereum addresses.

class darc.sites.ethereum.**Ethereum**

Bases: *BaseSite*

Ethereum addresses.

static crawler(*timestamp*, *session*, *link*)

Crawler hook for ethereum addresses.

Parameters

- **timestamp** (datetime) – Timestamp of the worker node reference.
- **session** (requests.Session) – Session object with proxy settings.
- **link** (*Link*) – Link object to be crawled.

Raises

LinkNoReturn – This link has no return response.

Return type

NoReturn

static loader(*timestamp*, *driver*, *link*)

Not implemented.

Raises

LinkNoReturn – This hook is not implemented.

Return type

NoReturn

Parameters

- **timestamp** (*datetime*) –
- **driver** (*WebDriver*) –
- **link** (Link) –

2.11.7 IRC Addresses

The *darc.sites.irc* module is customised to handle IRC addresses.

class darc.sites.irc.**IRC**

Bases: *BaseSite*

IRC addresses.

static crawler(*timestamp*, *session*, *link*)

Crawler hook for IRC addresses.

Parameters

- **timestamp** (datetime) – Timestamp of the worker node reference.
- **session** (requests.Session) – Session object with proxy settings.

- **link** (*Link*) – Link object to be crawled.

Raises
LinkNoReturn – This link has no return response.

Return type
NoReturn

static loader(*timestamp*, *driver*, *link*)

Not implemented.

Raises
LinkNoReturn – This hook is not implemented.

Return type
NoReturn

Parameters

- **timestamp** (*datetime*) –
- **driver** (*WebDriver*) –
- **link** (Link) –

2.11.8 Magnet Links

The *darc.sites.magnet* module is customised to handle magnet links.

class darc.sites.magnet.**Magnet**

Bases: *BaseSite*

Magnet links.

static crawler(*timestamp*, *session*, *link*)

Crawler hook for magnet links.

Parameters

- **timestamp** (datetime) – Timestamp of the worker node reference.
- **session** (requests.Session) – Session object with proxy settings.
- **link** (*Link*) – Link object to be crawled.

Raises
LinkNoReturn – This link has no return response.

Return type
NoReturn

static loader(*timestamp*, *driver*, *link*)

Not implemented.

Raises
LinkNoReturn – This hook is not implemented.

Return type
NoReturn

Parameters

- **timestamp** (*datetime*) –

- **driver** (*WebDriver*) –
- **link** (Link) –

2.11.9 Email Addresses

The *darc.sites.mail* module is customised to handle email addresses.

class darc.sites.mail.**Email**

Bases: *BaseSite*

Email addresses.

static crawler(*timestamp*, *session*, *link*)

Crawler hook for email addresses.

Parameters

- **timestamp** (datetime) – Timestamp of the worker node reference.
- **session** (requests.Session) – Session object with proxy settings.
- **link** (*Link*) – Link object to be crawled.

Raises

LinkNoReturn – This link has no return response.

Return type

NoReturn

static loader(*timestamp*, *driver*, *link*)

Not implemented.

Raises

LinkNoReturn – This hook is not implemented.

Return type

NoReturn

Parameters

- **timestamp** (*datetime*) –
- **driver** (*WebDriver*) –
- **link** (Link) –

2.11.10 JavaScript Links

The *darc.sites.script* module is customised to handle JavaScript links.

class darc.sites.script.**Script**

Bases: *BaseSite*

JavaScript links.

static crawler(*timestamp*, *session*, *link*)

Crawler hook for JavaScript links.

Parameters

- **timestamp** (datetime) – Timestamp of the worker node reference.

- **session** (requests.Session) – Session object with proxy settings.
- **link** (*Link*) – Link object to be crawled.

Raises
LinkNoReturn – This link has no return response.

Return type
NoReturn

static loader(*timestamp*, *driver*, *link*)

Not implemented.

Raises
LinkNoReturn – This hook is not implemented.

Return type
NoReturn

Parameters

- **timestamp** (*datetime*) –
- **driver** (*WebDriver*) –
- **link** (Link) –

2.11.11 Telephone Numbers

The *darc.sites.tel* module is customised to handle telephone numbers.

class darc.sites.tel.**Tel**

Bases: *BaseSite*

Telephone numbers.

static crawler(*timestamp*, *session*, *link*)

Crawler hook for telephone numbers.

Parameters

- **timestamp** (datetime) – Timestamp of the worker node reference.
- **session** (requests.Session) – Session object with proxy settings.
- **link** (*Link*) – Link object to be crawled.

Raises
LinkNoReturn – This link has no return response.

Return type
NoReturn

static loader(*timestamp*, *driver*, *link*)

Not implemented.

Raises
LinkNoReturn – This hook is not implemented.

Return type
NoReturn

Parameters

- **timestamp** (*datetime*) –
- **driver** (*WebDriver*) –
- **link** (Link) –

To start with, you just need to define your sites customisation by inheriting *BaseSite* and overload corresponding *crawler()* and/or *loader()* methods.

To customise behaviours over requests, you sites customisation class should have a crawler() method, e.g. *DefaultSite.crawler*.

The function takes the requests.Session object with proxy settings and a *Link* object representing the link to be crawled, then returns a requests.Response object containing the final data of the crawling process.

darc.sites.**crawler_hook**(*timestamp*, *session*, *link*)

Customisation as to requests sessions.

Parameters

- **timestamp** (datetime) – Timestamp of the worker node reference.
- **session** (*requests.Session*) – Session object with proxy settings.
- **link** (*Link*) – Link object to be crawled.

Returns

The final response object with crawled data.

Return type

requests.Response

See also:

- darc.sites.SITE_MAP
- *darc.sites._get_site()*
- *darc.crawl.crawler()*

To customise behaviours over selenium, you sites customisation class should have a loader() method, e.g. *DefaultSite.loader*.

The function takes the WebDriver object with proxy settings and a *Link* object representing the link to be loaded, then returns the WebDriver object containing the final data of the loading process.

darc.sites.**loader_hook**(*timestamp*, *driver*, *link*)

Customisation as to selenium drivers.

Parameters

- **timestamp** (datetime) – Timestamp of the worker node reference.
- **driver** (*selenium.webdriver.Chrome*) – Web driver object with proxy settings.
- **link** (*Link*) – Link object to be loaded.

Returns

The web driver object with loaded data.

Return type

selenium.webdriver.Chrome

See also:

- darc.sites.SITE_MAP
- *darc.sites._get_site()*
- *darc.crawl.loader()*

To tell the *darc* project which sites customisation module it should use for a certain hostname, you can register such module to the *SITEMAP* mapping dictionary through *register()*:

darc.sites.**register**(*site*, **hostname*)

Register new site map.

Parameters

- **site** (Type[*BaseSite*]) – Sites customisation class inherited from *BaseSite*.
- ***hostname** (*Tuple[str]*) – Optional list of hostnames the sites customisation should be registered with. By default, we use site.hostname.

Return type
None

darc.sites.**SITEMAP: DefaultDict[str, Type[*darc.sites._abc.BaseSite*]]**

```
from darc.sites.default import DefaultSite

SITEMAP = collections.defaultdict(lambda: DefaultSite, {
    # 'www.sample.com': SampleSite,  # local customised class
})
```

The mapping dictionary for hostname to sites customisation classes.

The fallback value is *darc.sites.default.DefaultSite*.

darc.sites.**_get_site**(*link*)

Load sites customisation if any.

If the sites customisation does not exist, it will fallback to the default hooks, *DefaultSite*.

Parameters
link (*Link*) – Link object to fetch sites customisation class.

Return type
Type[*BaseSite*]

Returns
The sites customisation class.

See also:

- *darc.sites.SITEMAP*

See also:

Please refer to *Customisations* for more examples and explanations.

2.12 Module Constants

2.12.1 Auxiliary Function

darc.const.**getpid**(*path='/home/docs/checkouts/readthedocs.org/user_builds/darc/checkouts/latest/docs/source/data/darc.pid'*)

Get process ID.

The process ID will be saved under the *PATH_DB* folder, in a file named `darc.pid`. If no such file exists, `-1` will be returned.

Parameters
path (str) – Path to the process ID file.

Return type
int

Returns
The process ID.

See also:

- *darc.const.PATH_ID*

darc.const.**get_lock**()

Get a lock.

Return type
Union[Lock, allocate_lock, nullcontext]

Returns
Lock context based on *FLAG_MP* and *FLAG_TH*.

2.12.2 General Configurations

darc.const.**REBOOT: bool**

If exit the program after first round, i.e. crawled all links from the `requests` link database and loaded all links from the `selenium` link database.

This can be useful especially when the capacity is limited and you wish to save some space before continuing next round. See *Docker integration* for more information.

Default
False

Environ
DARC_REBOOT

darc.const.**DEBUG: bool**

If run the program in debugging mode.

Default
False

Environ
DARC_DEBUG

darc.const.**VERBOSE: bool**

If run the program in verbose mode. If *DEBUG* is `True`, then the verbose mode will be always enabled.

Default
`False`

Environ
DARC_VERBOSE

darc.const.**FORCE: bool**

If ignore `robots.txt` rules when crawling (c.f. *crawler()*).

Default
`False`

Environ
DARC_FORCE

darc.const.**CHECK: bool**

If check proxy and hostname before crawling (when calling *extract_links()*, *read_sitemap()* and *read_hosts()*).

If *CHECK_NG* is `True`, then this environment variable will be always set as `True`.

Default
`False`

Environ
DARC_CHECK

darc.const.**CHECK_NG: bool**

If check content type through `HEAD` requests before crawling (when calling *extract_links()*, *read_sitemap()* and *read_hosts()*).

Default
`False`

Environ
DARC_CHECK_CONTENT_TYPE

darc.const.**ROOT: str**

The root folder of the project.

darc.const.**CWD = '.'**

The current working direcory.

darc.const.**DARC_CPU: int**

Number of concurrent processes. If not provided, then the number of system CPUs will be used.

Default
`None`

Environ
DARC_CPU

darc.const.**FLAG_MP: bool**

If enable *multiprocessing* support.

Default
`True`

Environ
DARC_MULTIPROCESSING

darc.const.**FLAG_TH: bool**

If enable *multithreading* support.

Default
False

Environ
DARC_MULTITHREADING

Note: *FLAG_MP* and *FLAG_TH* can **NOT** be toggled at the same time.

---

darc.const.**DARC_USER: str**

Non-root user for proxies.

Default
current login user (c.f. `getpass.getuser()`)

Environ
DARC_USER

2.12.3 Data Storage

See also:

See *darc.db* for more information about database integration.

darc.const.**REDIS: redis.Redis**

URL to the Redis database.

Default
`redis://127.0.0.1`

Environ
REDIS_URL

darc.const.**DB: peewee.Database**

URL to the RDS storage.

Default
`sqlite://{PATH_DB}/darc.db`

Environ
:envvar`DB_URL`

darc.const.**DB_WEB: peewee.Database**

URL to the data submission storage.

Default
`sqlite://{PATH_DB}/darcweb.db`

Environ
:envvar`DB_URL`

darc.const.**FLAG_DB: bool**

Flag if uses RDS as the task queue backend. If *REDIS_URL* is provided, then `False`; else, `True`.

darc.const.**PATH_DB: str**

Path to data storage.

Default
`data`

Environ
PATH_DATA

See also:

See *darc.save* for more information about source saving.

darc.const.**PATH_MISC = '{PATH_DB}/misc/'**

Path to miscellaneous data storage, i.e. `misc` folder under the root of data storage.

See also:

- *darc.const.PATH_DB*

darc.const.**PATH_LN = '{PATH_DB}/link.csv'**

Path to the link CSV file, `link.csv`.

See also:

- *darc.const.PATH_DB*
- *darc.save.save_link*

darc.const.**PATH_ID = '{PATH_DB}/darc.pid'**

Path to the process ID file, `darc.pid`.

See also:

- *darc.const.PATH_DB*
- *darc.const.getpid()*

2.12.4 Web Crawlers

darc.const.**DARC_WAIT: float | None**

Time interval between each round when the `requests` and/or `selenium` database are empty.

Default
`60`

Environ
DARC_WAIT

darc.const.**TIME_CACHE: float**

Time delta for caches in seconds.

The *darc* project supports *caching* for fetched files. *TIME_CACHE* will specify for how log the fetched files will be cached and **NOT** fetched again.

Note: If *TIME_CACHE* is `None` then caching will be marked as *forever*.

Default
60

Environ
TIME_CACHE

darc.const.**SE_WAIT: float**

Time to wait for `selenium` to finish loading pages.

Note: Internally, `selenium` will wait for the browser to finish loading the pages before return (i.e. the web API event `DOMContentLoaded`). However, some extra scripts may take more time running after the event.

Default
60

Environ
SE_WAIT

darc.const.**SE_EMPTY = '<html><head></head><body></body></html>'**

The empty page from `selenium`.

See also:

- *darc.crawl.loader()*

2.12.5 White / Black Lists

darc.const.**LINK_WHITE_LIST: List[re.Pattern]**

White list of hostnames should be crawled.

Default
[]

Environ
LINK_WHITE_LIST

Note: Regular expressions are supported.

darc.const.**LINK_BLACK_LIST: List[re.Pattern]**

Black list of hostnames should be crawled.

Default
[]

Environ
LINK_BLACK_LIST

Note: Regular expressions are supported.

darc.const.**LINK_FALLBACK: bool**

Fallback value for *match_host()*.

Default
`False`

Environ
LINK_FALLBACK

darc.const.**MIME_WHITE_LIST: List[re.Pattern]**

White list of content types should be crawled.

Default
`[]`

Environ
MIME_WHITE_LIST

Note: Regular expressions are supported.

darc.const.**MIME_BLACK_LIST: List[re.Pattern]**

Black list of content types should be crawled.

Default
`[]`

Environ
MIME_BLACK_LIST

Note: Regular expressions are supported.

darc.const.**MIME_FALLBACK: bool**

Fallback value for *match_mime()*.

Default
`False`

Environ
MIME_FALLBACK

darc.const.**PROXY_WHITE_LIST: List[str]**

White list of proxy types should be crawled.

Default
`[]`

Environ
PROXY_WHITE_LIST

Note: The proxy types are **case insensitive**.

darc.const.**PROXY_BLACK_LIST: List[str]**

Black list of proxy types should be crawled.

Default
`[]`

Environ
PROXY_BLACK_LIST

Note: The proxy types are **case insensitive**.

darc.const.**PROXY_FALLBACK: bool**

Fallback value for *match_proxy()*.

Default
`False`

Environ
PROXY_FALLBACK

2.13 Custom Exceptions

The *darc* project provides following custom exceptions:

- *LinkNoReturn*
- *UnsupportedLink*
- *UnsupportedPlatform*
- *UnsupportedProxy*
- *WorkerBreak*

Note: All exceptions are inherited from *_BaseException*.

The *darc* project provides following custom warnings:

- *TorBootstrapFailed*
- *I2PBootstrapFailed*
- *ZeroNetBootstrapFailed*
- *FreenetBootstrapFailed*
- *APIRequestFailed*
- *SiteNotFoundWarning*
- *LockWarning*
- *TorRenewFailed*
- *RedisCommandFailed*
- *HookExecutionFailed*

Note: All warnings are inherited from *_BaseWarning*.

exception darc.error.**APIRequestFailed**

Bases: *_BaseWarning*

API submit failed.

exception darc.error.DatabaseOperaionFailed

Bases: *_BaseWarning*

Database operation execution failed.

exception darc.error.FreenetBootstrapFailed

Bases: *_BaseWarning*

Freenet bootstrap process failed.

exception darc.error.HookExecutionFailed

Bases: *_BaseWarning*

Failed to execute hook function.

exception darc.error.I2PBootstrapFailed

Bases: *_BaseWarning*

I2P bootstrap process failed.

exception darc.error.LinkNoReturn(*link=None*, *, *drop=True*)

Bases: *_BaseException*

The link has no return value from the hooks.

Parameters

- **link** (darc.link.Link) – Original link object.
- **drop** (*bool*) –

Keyword Arguments

drop – If drops the `link` from task queues.

Return type

None

__init__(*link=None*, *, *drop=True*)

Parameters

drop (*bool*) –

Return type

None

exception darc.error.LockWarning

Bases: *_BaseWarning*

Failed to acquire Redis lock.

exception darc.error.RedisCommandFailed

Bases: *_BaseWarning*

Redis command execution failed.

exception darc.error.SiteNotFoundWarning

Bases: *_BaseWarning*, ImportWarning

Site customisation not found.

exception darc.error.TorBootstrapFailed

Bases: *_BaseWarning*

Tor bootstrap process failed.

exception darc.error.**TorRenewFailed**

Bases: *_BaseWarning*

Tor renew request failed.

exception darc.error.**UnsupportedLink**

Bases: *_BaseException*

The link is not supported.

exception darc.error.**UnsupportedPlatform**

Bases: *_BaseException*

The platform is not supported.

exception darc.error.**UnsupportedProxy**

Bases: *_BaseException*

The proxy is not supported.

exception darc.error.**WorkerBreak**

Bases: *_BaseException*

Break from the worker loop.

exception darc.error.**ZeroNetBootstrapFailed**

Bases: *_BaseWarning*

ZeroNet bootstrap process failed.

exception darc.error.**_BaseException**

Bases: Exception

Base exception class for *darc* module.

exception darc.error.**_BaseWarning**

Bases: Warning

Base warning for *darc* module.

2.14 Data Models

The *darc.model* module contains all data models defined for the *darc* project, including RDS-based task queue and data submission.

2.14.1 Task Queues

The *darc.model.tasks* module defines the data models required for the task queue of *darc*.

See also:

Please refer to *darc.db* module for more information about the task queues.

Hostname Queue

Important: The hostname queue is a **set** named `queue_hostname` in a Redis based task queue.

The *darc.model.tasks.hostname* model contains the data model defined for the hostname queue.

class darc.model.tasks.hostname.**HostnameQueueModel**(**args*, ***kwargs*)

Bases: *BaseModel*

Hostname task queue.

DoesNotExist

alias of `HostnameQueueModelDoesNotExist`

hostname: str = <CharField: HostnameQueueModel.hostname>

Hostname (c.f. *link.host*).

id = <AutoField: HostnameQueueModel.id>

timestamp: datetime = <DateTimeField: HostnameQueueModel.timestamp>

Timestamp of last update.

Crawler Queue

Important: The *crawler* queue is a **sorted set** named `queue_requests` in a Redis based task queue.

The *darc.model.tasks.requests* model contains the data model defined for the *crawler* queue.

class darc.model.tasks.requests.**RequestsQueueModel**(**args*, ***kwargs*)

Bases: *BaseModel*

Task queue for *crawler()*.

DoesNotExist

alias of `RequestsQueueModelDoesNotExist`

hash: str = <CharField: RequestsQueueModel.hash>

Sha256 hash value (c.f. *Link.name*).

id = <AutoField: RequestsQueueModel.id>

link: darc_link.Link = <PickleField: RequestsQueueModel.link>

Pickled target *Link* instance.

text: str = <TextField: RequestsQueueModel.text>

URL as raw text (c.f. *Link.url*).

timestamp: datetime = <DateTimeField: RequestsQueueModel.timestamp>

Timestamp of last update.

Loader Queue

Important: The *loader* queue is a **sorted set** named `queue_selenium` in a Redis based task queue.

The *darc.model.tasks.selenium* model contains the data model defined for the *loader* queue.

class darc.model.tasks.selenium.**SeleniumQueueModel**(**args*, ***kwargs*)

Bases: *BaseModel*

Task queue for *loader()*.

DoesNotExist

alias of `SeleniumQueueModelDoesNotExist`

hash: str = <CharField: SeleniumQueueModel.hash>

Sha256 hash value (c.f. *Link.name*).

id = <AutoField: SeleniumQueueModel.id>

link: darc_link.Link = <PickleField: SeleniumQueueModel.link>

Pickled target *Link* instance.

text: str = <TextField: SeleniumQueueModel.text>

URL as raw text (c.f. *Link.url*).

timestamp: datetime = <DateTimeField: SeleniumQueueModel.timestamp>

Timestamp of last update.

2.14.2 Submission Data Models

The *darc.model.web* module defines the data models to store the data crawled from the *darc* project.

See also:

Please refer to *darc.submit* module for more information about data submission.

Hostname Records

The *darc.model.web.hostname* module defines the data model representing hostnames, specifically from `new_host` submission.

See also:

Please refer to *darc.submit.submit_new_host()* for more information.

class darc.model.web.hostname.**HostnameModel**(**args*, ***kwargs*)

Bases: *BaseModelWeb*

Data model for a hostname record.

Important: The *alive* of a hostname is toggled if *crawler()* successfully requested a URL with such hostname.

DoesNotExist

alias of `HostnameModelDoesNotExist`

property alive: bool

If the hostname is still active.

We consider the hostname as *inactive*, only if all subsidiary URLs are *inactive*.

discovery: datetime = <DateTimeField: HostnameModel.discovery>

Timestamp of first `new_host` submission.

hostname: str = <CharField: HostnameModel.hostname>

Hostname (c.f. *link.host*). The maximum length of the host name and of the fully qualified domain name (FQDN) is 63 bytes per label and 255 characters per FQDN.

hosts: List[HostsModel]

`hosts.txt` for the hostname, back reference from *HostsModel.host*.

id = <AutoField: HostnameModel.id>

last_seen: datetime = <DateTimeField: HostnameModel.last_seen>

Timestamp of last related submission.

proxy: *Proxy* = <IntEnumField: HostnameModel.proxy>

Proxy type (c.f. *link.proxy*).

robots: List[RobotsModel]

`robots.txt` for the hostname, back reference from *RobotsModel.host*.

property since: datetime

The hostname is active/inactive since such timestamp.

We confider the timestamp by the earlies timestamp of related subsidiary *active/inactive* URLs.

sitemaps: List[SitemapModel]

`sitemap.xml` for the hostname, back reference from `SitemapModel.sitemaps`.

urls: List[URLModel]

URLs with the same hostname, back reference from *URLModel.hostname*.

URL Records

The *darc.model.web.url* module defines the data model representing URLs, specifically from `requests` and `selenium` submission.

See also:

Please refer to *darc.submit.submit_requests()* and *darc.submit.submit_selenium()* for more information.

class darc.model.web.url.**URLModel**(**args*, ***kwargs*)

Bases: *BaseModelWeb*

Data model for a requested URL.

Important: The *alive* of a URL is toggled if *crawler()* successfully requested such URL and the status code is ok.

DoesNotExist

alias of `URLModelDoesNotExist`

classmethod get_by_url(*url*)

Select by URL.

Parameters
url (str) – URL to select.

Return type
URLModel

Returns
Selected URL model.

alive: bool = <BooleanField: URLModel.alive>

If the hostname is still active.

children

property childrent: List[*URLModel*]

Back reference to which URLs were identified from the URL.

discovery: datetime = <DateTimeField: URLModel.discovery>

Timestamp of first submission.

hash: str = <CharField: URLModel.hash>

Sha256 hash value (c.f. *Link.name*).

hostname: *HostnameModel* = <ForeignKeyField: URLModel.hostname>

Hostname (c.f. *link.host*).

hostname_id = <ForeignKeyField: URLModel.hostname>

id = <AutoField: URLModel.id>

last_seen: datetime = <DateTimeField: URLModel.last_seen>

Timestamp of last submission.

parents

proxy: *Proxy* = <IntEnumField: URLModel.proxy>

Proxy type (c.f. *link.proxy*).

requests: List[*RequestsModel*]

`requests` submission record, back reference from `RequestsModel.url`.

selenium: List[*SeleniumModel*]

`selenium` submission record, back reference from `SeleniumModel.url`.

since: datetime = <DateTimeField: URLModel.since>

The hostname is active/inactive since this timestamp.

url: str = <TextField: URLModel.url>

Original URL (c.f. *link.url*).

class darc.model.web.url.**URLThroughModel**(**args*, ***kwargs*)

Bases: *BaseModelWeb*

Data model for the map of URL extration chain.

DoesNotExist

alias of `URLThroughModelDoesNotExist`

child: List[*URLModel*] = <ForeignKeyField: URLThroughModel.child>

Back reference to which URLs were identified from the URL.

child_id = <ForeignKeyField: URLThroughModel.child>

id = <AutoField: URLThroughModel.id>

parent: List[*URLModel*] = <ForeignKeyField: URLThroughModel.parent>

Back reference to where the URL was identified.

parent_id = <ForeignKeyField: URLThroughModel.parent>

`robots.txt` Records

The *darc.model.web.robots* module defines the data model representing `robots.txt` data, specifically from `new_host` submission.

See also:

Please refer to *darc.submit.submit_new_host()* for more information.

class darc.model.web.robots.**RobotsModel**(**args*, ***kwargs*)

Bases: *BaseModelWeb*

Data model for `robots.txt` data.

DoesNotExist

alias of `RobotsModelDoesNotExist`

document: str = <TextField: RobotsModel.document>

Document data as `str`.

host: HostnameModel = <ForeignKeyField: RobotsModel.host>

Hostname (c.f. *link.host*).

host_id = <ForeignKeyField: RobotsModel.host>

id = <AutoField: RobotsModel.id>

timestamp: datetime = <DateTimeField: RobotsModel.timestamp>

Timestamp of the submission.

`sitemap.xml` Records

The *darc.model.web.sitemap* module defines the data model representing `sitemap.xml` data, specifically from `new_host` submission.

See also:

Please refer to *darc.submit.submit_new_host()* for more information.

class darc.model.web.sitemap.**SitemapModel**(**args*, ***kwargs*)

Bases: *BaseModelWeb*

Data model for `sitemap.xml` data.

DoesNotExist

alias of `SitemapModelDoesNotExist`

document: str = <TextField: SitemapModel.document>

Document data as str.

host: HostnameModel = <ForeignKeyField: SitemapModel.host>

Hostname (c.f. *link.host*).

host_id = <ForeignKeyField: SitemapModel.host>

id = <AutoField: SitemapModel.id>

timestamp: datetime = <DateTimeField: SitemapModel.timestamp>

Timestamp of the submission.

hosts.txt Records

The *darc.model.web.hosts* module defines the data model representing hosts.txt data, specifically from new_host submission.

See also:

Please refer to *darc.submit.submit_new_host()* for more information.

class darc.model.web.hosts.**HostsModel**(**args*, ***kwargs*)

Bases: *BaseModelWeb*

Data model for hosts.txt data.

DoesNotExist

alias of HostsModelDoesNotExist

document: str = <TextField: HostsModel.document>

Document data as str.

host: HostnameModel = <ForeignKeyField: HostsModel.host>

Hostname (c.f. *link.host*).

host_id = <ForeignKeyField: HostsModel.host>

id = <AutoField: HostsModel.id>

timestamp: datetime = <DateTimeField: HostsModel.timestamp>

Timestamp of the submission.

Crawler Records

The *darc.model.web.requests* module defines the data model representing *crawler*, specifically from requests submission.

See also:

Please refer to *darc.submit.submit_requests()* for more information.

class darc.model.web.requests.**RequestsHistoryModel**(**args*, ***kwargs*)

Bases: *BaseModelWeb*

Data model for history records from requests submission.

DoesNotExist

alias of RequestsHistoryModelDoesNotExist

cookies: Cookies = <JSONField: RequestsHistoryModel.cookies>

Response cookies.

document: bytes = <BlobField: RequestsHistoryModel.document>

Document data as bytes.

id = <AutoField: RequestsHistoryModel.id>

index: int = <IntegerField: RequestsHistoryModel.index>

History index number.

method: str = <CharField: RequestsHistoryModel.method>

Request method (normally GET).

model: *RequestsModel* = <ForeignKeyField: RequestsHistoryModel.model>

Original record.

model_id = <ForeignKeyField: RequestsHistoryModel.model>

reason: str = <TextField: RequestsHistoryModel.reason>

Response reason string.

request: Headers = <JSONField: RequestsHistoryModel.request>

Request headers.

response: Headers = <JSONField: RequestsHistoryModel.response>

Response headers.

status_code: int = <IntegerField: RequestsHistoryModel.status_code>

Status code.

timestamp: datetime = <DateTimeField: RequestsHistoryModel.timestamp>

Timestamp of the submission.

url: str = <TextField: RequestsHistoryModel.url>

Request URL.

class darc.model.web.requests.**RequestsModel**(**args*, ***kwargs*)

Bases: *BaseModelWeb*

Data model for documents from requests submission.

DoesNotExist

alias of RequestsModelDoesNotExist

cookies: Cookies = <JSONField: RequestsModel.cookies>

Response cookies.

document: bytes = <BlobField: RequestsModel.document>

Document data as bytes.

history: List[RequestsHistoryModel]

List of redirect history, back reference from *RequestsHistoryModel.model*.

id = <AutoField: RequestsModel.id>

is_html: bool = <BooleanField: RequestsModel.is_html>

If document is HTML or miscellaneous data.

method: str = <CharField: RequestsModel.method>

Request method (normally `GET`).

mime_type: str = <CharField: RequestsModel.mime_type>

Conetent type.

reason: str = <TextField: RequestsModel.reason>

Response reason string.

request: Headers = <JSONField: RequestsModel.request>

Request headers.

response: Headers = <JSONField: RequestsModel.response>

Response headers.

session: Cookies = <JSONField: RequestsModel.session>

Session cookies.

status_code: int = <IntegerField: RequestsModel.status_code>

Status code.

timestamp: datetime = <DateTimeField: RequestsModel.timestamp>

Timestamp of the submission.

url: URLModel = <ForeignKeyField: RequestsModel.url>

Original URL (c.f. *link.url*).

url_id = <ForeignKeyField: RequestsModel.url>

Loader Records

The *darc.model.web.selenium* module defines the data model representing *loader*, specifically from `selenium` submission.

See also:

Please refer to *darc.submit.submit_selenium()* for more information.

class darc.model.web.selenium.**SeleniumModel**(**args*, ***kwargs*)

Bases: *BaseModelWeb*

Data model for documents from `selenium` submission.

DoesNotExist

alias of `SeleniumModelDoesNotExist`

document: str = <TextField: SeleniumModel.document>

Document data as `str`.

id = <AutoField: SeleniumModel.id>

screenshot: Optional[bytes] = <BlobField: SeleniumModel.screenshot>

Screenshot in PNG format as `bytes`.

timestamp: datetime = <DateTimeField: SeleniumModel.timestamp>

Timestamp of the submission.

url: URLModel = <ForeignKeyField: SeleniumModel.url>

Original URL (c.f. *link.url*).

url_id = <ForeignKeyField: SeleniumModel.url>

2.14.3 Base Model

The *darc.model.abc* module contains abstract base class of all data models for the *darc* project.

class darc.model.abc.**BaseMeta**

Bases: object

Basic metadata for data models.

table_function()

Generate table name dynamically (c.f. table_function()).

Return type
str

Parameters
model_class (*Model*) –

database = <peewee.SqliteDatabase object>

Reference database storage (c.f. *DB*).

class darc.model.abc.**BaseMetaWeb**

Bases: *BaseMeta*

Basic metadata for data models of data submission.

table_function()

Generate table name dynamically (c.f. table_function()).

Return type
str

Parameters
model_class (*Model*) –

database = <peewee.SqliteDatabase object>

Reference database storage (c.f. *DB*).

class darc.model.abc.**BaseModel**(**args*, ***kwargs*)

Bases: Model

Base model with standard patterns.

Notes

The model will implicitly have a AutoField attribute named as *id*.

DoesNotExist

alias of BaseModelDoesNotExist

to_dict(*keep_id=False*)

Convert record to `dict`.

Parameters
keep_id (`bool`) – If keep the ID auto field.

Return type
`None`

Returns
The data converted through `playhouse.shortcuts.model_to_dict()`.

Meta

Basic metadata for data models.

id = <AutoField: BaseModel.id>

class darc.model.abc.**BaseModelWeb**(**args*, ***kwargs*)

Bases: *BaseModel*

Base model with standard patterns for data submission.

Notes

The model will implicitly have a `AutoField` attribute named as *id*.

DoesNotExist

alias of `BaseModelWebDoesNotExist`

Meta

Basic metadata for data models.

id = <AutoField: BaseModelWeb.id>

2.14.4 Miscellaneous Utilities

The *darc.model.utils* module contains several miscellaneous utility functions and data fields.

class darc.model.utils.**IPField**(*null=False*, *index=False*, *unique=False*, *column_name=None*, *default=None*, *primary_key=False*, *constraints=None*, *sequence=None*, *collation=None*, *unindexed=False*, *choices=None*, *help_text=None*, *verbose_name=None*, *index_type=None*, *db_column=None*, *_hidden=False*)

Bases: `IPField`

IP data field.

db_value(*val*)

Dump the value for database storage.

Parameters

- **value** – Source IP address instance.
- **val** (*str | IPv4Address | IPv6Address | None*) –

Return type
`Optional`[`int`]

Returns
Integral representation of the IP address.

python_value(*val*)

Load the value from database storage.

Parameters

- **value** – Integral representation of the IP address.
- **val** (*int | None*) –

Return type
Union[IPv4Address, IPv6Address, None]

Returns
Original IP address instance.

class darc.model.utils.**IntEnumField**(*null=False*, *index=False*, *unique=False*, *column_name=None*, *default=None*, *primary_key=False*, *constraints=None*, *sequence=None*, *collation=None*, *unindexed=False*, *choices=None*, *help_text=None*, *verbose_name=None*, *index_type=None*, *db_column=None*, *_hidden=False*)

Bases: IntegerField

enum.IntEnum data field.

Parameters
choices (*IntEnum*) –

python_value(*value*)

Load the value from database storage.

Parameters
value (Optional[int]) – Integral representation of the enumeration.

Return type
Optional[IntEnum]

Returns
Original enumeration object.

choices: IntEnum

The original enum.IntEnum class.

class darc.model.utils.**JSONField**(*json_dumps=None*, *json_loads=None*, ***kwargs*)

Bases: JSONField

JSON data field.

db_value(*value*)

Dump the value for database storage.

Parameters
value (Any) – Source JSON value.

Return type
Optional[str]

Returns
JSON serialised string data.

python_value(*value*)

Load the value from database storage.

Parameters
value (Optional[str]) – Serialised JSON string.

Return type
Any

Returns
Original JSON data.

class darc.model.utils.**PickleField**(*null=False*, *index=False*, *unique=False*, *column_name=None*, *default=None*, *primary_key=False*, *constraints=None*, *sequence=None*, *collation=None*, *unindexed=False*, *choices=None*, *help_text=None*, *verbose_name=None*, *index_type=None*, *db_column=None*, *_hidden=False*)

Bases: BlobField

Pickled data field.

db_value(*value*)

Dump the value for database storage.

Parameters
value (Any) – Source value.

Return type
Optional[bytes]

Returns
Picked bytestring data.

python_value(*value*)

Load the value from database storage.

Parameters
value (Optional[bytes]) – SPicked bytestring data.

Return type
Any

Returns
Original data.

class darc.model.utils.**Proxy**(*value*)

Bases: IntEnum

Proxy types supported by *darc*.

FREENET = 5

Freenet proxy.

I2P = 3

I2P proxy.

NULL = 1

No proxy.

TOR = 2

Tor proxy.

TOR2WEB = 6

Proxied Tor (tor2web, no proxy).

ZERONET = 4

ZeroNet proxy.

darc.model.utils.**table_function**(*model_class*)

Generate table name dynamically.

The function strips `Model` from the class name and calls `peewee.make_snake_case()` to generate a proper table name.

Parameters
model_class (`Model`) – Data model class.

Return type
`str`

Returns
Generated table name.

As the websites can be sometimes irritating for their anti-robots verification, login requirements, etc., the *darc* project also privides hooks to customise crawling behaviours around both `requests` and `selenium`.

See also:

Such customisation, as called in the *darc* project, site hooks, is site specific, user can set up your own hooks unto a certain site, c.f. *darc.sites* for more information.

Still, since the network is a world full of mysteries and miracles, the speed of crawling will much depend on the response speed of the target website. To boost up, as well as meet the system capacity, the *darc* project introduced multiprocessing, multithreading and the fallback slowest single-threaded solutions when crawling.

Note: When rendering the target website using `selenium` powered by the renown Google Chrome, it will require much memory to run. Thus, the three solutions mentioned above would only toggle the behaviour around the use of `selenium`.

To keep the *darc* project as it is a swiss army knife, only the main entrypoint function *darc.process.process()* is exported in global namespace (and renamed to *darc.darc()*), see below:

darc.**darc**(*worker*)

Main process.

The function will register `_signal_handler()` for `SIGTERM`, and start the main process of the *darc* darkweb crawlers.

Parameters
worker (`Literal['crawler', 'loader']`) – Worker process type.

Raises
ValueError – If `worker` is not a valid value.

Return type
`None`

Before starting the workers, the function will start proxies through

- `darc.proxy.tor.tor_proxy()`
- `darc.proxy.i2p.i2p_proxy()`

- darc.proxy.zeronet.zeronet_proxy()
- darc.proxy.freenet.freenet_proxy()

The general process can be described as following for *workers* of `crawler` type:

1. *process_crawler()*: obtain URLs from the `requests` link database (c.f. *load_requests()*), and feed such URLs to *crawler()*.

   Note: If *FLAG_MP* is `True`, the function will be called with *multiprocessing* support; if *FLAG_TH* if `True`, the function will be called with *multithreading* support; if none, the function will be called in single-threading.

2. *crawler()*: parse the URL using *parse_link()*, and check if need to crawl the URL (c.f. *PROXY_WHITE_LIST*, *PROXY_BLACK_LIST* , *LINK_WHITE_LIST* and *LINK_BLACK_LIST*); if true, then crawl the URL with `requests`.

   If the URL is from a brand new host, *darc* will first try to fetch and save `robots.txt` and sitemaps of the host (c.f. *save_robots()* and *save_sitemap()*), and extract then save the links from sitemaps (c.f. *read_sitemap()*) into link database for future crawling (c.f. *save_requests()*). Also, if the submission API is provided, *submit_new_host()* will be called and submit the documents just fetched.

   If `robots.txt` presented, and *FORCE* is `False`, *darc* will check if allowed to crawl the URL.

   Note: The root path (e.g. `/` in https://www.example.com/) will always be crawled ignoring `robots.txt`.

   At this point, *darc* will call the customised hook function from *darc.sites* to crawl and get the final response object. *darc* will save the session cookies and header information, using *save_headers()*.

   Note: If `requests.exceptions.InvalidSchema` is raised, the link will be saved by *save_invalid()*. Further processing is dropped.

   If the content type of response document is not ignored (c.f. *MIME_WHITE_LIST* and *MIME_BLACK_LIST*), *submit_requests()* will be called and submit the document just fetched.

   If the response document is HTML (`text/html` and `application/xhtml+xml`), *extract_links()* will be called then to extract all possible links from the HTML document and save such links into the database (c.f. *save_requests()*).

   And if the response status code is between `400` and `600`, the URL will be saved back to the link database (c.f. *save_requests()*). If **NOT**, the URL will be saved into `selenium` link database to proceed next steps (c.f. *save_selenium()*).

The general process can be described as following for *workers* of `loader` type:

1. *process_loader()*: in the meanwhile, *darc* will obtain URLs from the `selenium` link database (c.f. *load_selenium()*), and feed such URLs to *loader()*.

   Note: If *FLAG_MP* is `True`, the function will be called with *multiprocessing* support; if *FLAG_TH* if `True`, the function will be called with *multithreading* support; if none, the function will be called in single-threading.

2. *loader()*: parse the URL using *parse_link()* and start loading the URL using `selenium` with Google Chrome.

At this point, *darc* will call the customised hook function from *darc.sites* to load and return the original `Chrome` object.

If successful, the rendered source HTML document will be saved, and a full-page screenshot will be taken and saved.

If the submission API is provided, *submit_selenium()* will be called and submit the document just loaded.

Later, *extract_links()* will be called then to extract all possible links from the HTML document and save such links into the `requests` database (c.f. *save_requests()*).

After each *round*, *darc* will call registered hook functions in sequential order, with the type of worker (`'crawler'` or `'loader'`) and the current link pool as its parameters, see *register()* for more information.

If in reboot mode, i.e. *REBOOT* is `True`, the function will exit after first round. If not, it will renew the Tor connections (if bootstrapped), c.f. *renew_tor_session()*, and start another round.

See also:

The function is renamed from *darc.process.process()*.

And we also exported the necessary hook registration functions to the global namespace, see below:

darc.**register_hooks**(*hook*, *, *_index=None*)

Register hook function.

Parameters

- **hook** (`Callable[[Literal['crawler', 'loader'], List[Link]], None]`) – Hook function to be registered.
- **_index** (*int | None*) –

Keyword Arguments

_index – Position index for the hook function.

Return type

`None`

The hook function takes two parameters:

1. a `str` object indicating the type of worker, i.e. `'crawler'` or `'loader'`;
2. a `list` object containing *Link* objects, as the current processed link pool.

The hook function may raises *WorkerBreak* so that the worker shall break from its indefinite loop upon finishing of current *round*. Any value returned from the hook function will be ignored by the workers.

See also:

The hook functions will be saved into *_HOOK_REGISTRY*.

See also:

The function is renamed from *darc.process.register()*.

darc.**register_proxy**(*proxy*, *session=<function null_session>*, *driver=<function null_driver>*)

Register new proxy type.

Parameters

- **proxy** (`str`) – Proxy type.
- **session** (`Callable[[bool], Union[Session, FuturesSession]]`) – Session factory function, c.f. *darc.requests.null_session()*.

- **driver** (Callable[[], WebDriver]) – Driver factory function, c.f. *darc.selenium.null_driver()*.

Return type
None

See also:

The function is renamed from `darc.proxy.register()`.

darc.**register_sites**(*site*, **hostname*)

Register new site map.

Parameters

- **site** (Type[*BaseSite*]) – Sites customisation class inherited from *BaseSite*.
- ***hostname** (*Tuple[str]*) – Optional list of hostnames the sites customisation should be registered with. By default, we use `site.hostname`.

Return type
None

See also:

The function is renamed from *darc.sites.register()*.

For more information on the hooks, please refer to the *customisation* documentations.

CHAPTER

THREE

CONFIGURATION

The *darc* project is generally configurable through numerous environment variables. Below is the full list of supported environment variables you may use to configure the behaviour of *darc*.

3.1 General Configurations

DARC_REBOOT

Type
bool (int)

Default
0

If exit the program after first round, i.e. crawled all links from the `requests` link database and loaded all links from the `selenium` link database.

This can be useful especially when the capacity is limited and you wish to save some space before continuing next round. See *Docker integration* for more information.

DARC_DEBUG

Type
bool (int)

Default
0

If run the program in debugging mode.

DARC_VERBOSE

Type
bool (int)

Default
0

If run the program in verbose mode. If `DARC_DEBUG` is `True`, then the verbose mode will be always enabled.

DARC_FORCE

Type
bool (int)

Default
0

If ignore `robots.txt` rules when crawling (c.f. *crawler()*).

DARC_CHECK

Type
bool (int)

Default
0

If check proxy and hostname before crawling (when calling *extract_links()*, *read_sitemap()* and *read_hosts()*).

If `DARC_CHECK_CONTENT_TYPE` is `True`, then this environment variable will be always set as `True`.

DARC_CHECK_CONTENT_TYPE

Type
bool (int)

Default
0

If check content type through `HEAD` requests before crawling (when calling *extract_links()*, *read_sitemap()* and *read_hosts()*).

DARC_URL_PAT

Type
List[Tuple[str, str, int]] (JSON)

Default
[]

Regular expression patterns to match all reasonable URLs.

The environment variable should be **JSON** encoded, as an *array* of *three-element pairs*. In each pair, it contains one scheme (`str`) as the fallback default scheme for matched URL, one Python regular expression string (`str`) as described in the builtin `re` module and one numeric value (`int`) representing the flags as defined in the builtin `re` module as well.

Important: The patterns **must** have a named match group `url`, e.g. `(?P<url>bitcoin:\w+)` so that the function can extract matched URLs from the given pattern.

And the regular expression will always be used in **ASCII** mode, i.e., with `re.ASCII` flag to compile.

DARC_CPU

Type
int

Default
None

Number of concurrent processes. If not provided, then the number of system CPUs will be used.

DARC_MULTIPROCESSING

Type
bool (int)

Default
1

If enable *multiprocessing* support.

DARC_MULTITHREADING

Type
bool (int)

Default
0

If enable *multithreading* support.

Note: DARC_MULTIPROCESSING and DARC_MULTITHREADING can **NOT** be toggled at the same time.

DARC_USER

Type
str

Default
current login user (c.f. getpass.getuser())

Non-root user for proxies.

3.2 Data Storage

See also:

See *darc.save* for more information about source saving.

See *darc.db* for more information about database integration.

PATH_DATA

Type
str (path)

Default
data

Path to data storage.

REDIS_URL

Type
str (url)

Default
redis://127.0.0.1

URL to the Redis database.

DB_URL

Type
str (url)

URL to the RDS storage.

Important: The task queues will be saved to `darc` database; the data submittsion will be saved to `darcweb` database.

Thus, when providing this environment variable, please do **NOT** specify the database name.

`DARC_BULK_SIZE`

Type
`int`

Default
`100`

Bulk size for updating databases.

See also:

- *darc.db.save_requests()*
- *darc.db.save_selenium()*

`LOCK_TIMEOUT`

Type
`float`

Default
`10`

Lock blocking timeout.

Note: If is an infinit `inf`, no timeout will be applied.

See also:

Get a lock from `darc.db.get_lock()`.

`DARC_MAX_POOL`

Type
`int`

Default
`1_000`

Maximum number of links loaded from the database.

Note: If is an infinit `inf`, no limit will be applied.

See also:

- *darc.db.load_requests()*
- *darc.db.load_selenium()*

REDIS_LOCK

Type
bool (int)

Default
0

If use Redis (Lua) lock to ensure process/thread-safely operations.

See also:

Toggles the behaviour of `darc.db.get_lock()`.

RETRY_INTERVAL

Type
int

Default
10

Retry interval between each Redis command failure.

Note: If is an infinit `inf`, no interval will be applied.

See also:

Toggles the behaviour of `darc.db.redis_command()`.

3.3 Web Crawlers

DARC_WAIT

Type
float

Default
60

Time interval between each round when the `requests` and/or `selenium` database are empty.

DARC_SAVE

Type
bool (int)

Default
0

If save processed link back to database.

Note: If *DARC_SAVE* is `True`, then *DARC_SAVE_REQUESTS* and *DARC_SAVE_SELENIUM* will be forced to be `True`.

See also:

See *darc.db* for more information about link database.

DARC_SAVE_REQUESTS

Type
bool (int)

Default
0

If save *crawler()* crawled link back to requests database.

See also:

See *darc.db* for more information about link database.

DARC_SAVE_SELENIUM

Type
bool (int)

Default
0

If save *loader()* crawled link back to selenium database.

See also:

See *darc.db* for more information about link database.

TIME_CACHE

Type
float

Default
60

Time delta for caches in seconds.

The *darc* project supports *caching* for fetched files. TIME_CACHE will specify for how log the fetched files will be cached and **NOT** fetched again.

Note: If TIME_CACHE is None then caching will be marked as *forever*.

SE_WAIT

Type
float

Default
60

Time to wait for selenium to finish loading pages.

Note: Internally, selenium will wait for the browser to finish loading the pages before return (i.e. the web API event DOMContentLoaded). However, some extra scripts may take more time running after the event.

CHROME_BINARY_LOCATION

Type
str

Default
`google-chrome`

Path to the Google Chrome binary location.

Note: This environment variable is mandatory for non *macOS* and/or *Linux* systems.

See also:

See *darc.selenium* for more information.

3.4 White / Black Lists

LINK_WHITE_LIST

Type
`List[str]` (JSON)

Default
`[]`

White list of hostnames should be crawled.

Note: Regular expressions are supported.

LINK_BLACK_LIST

Type
`List[str]` (JSON)

Default
`[]`

Black list of hostnames should be crawled.

Note: Regular expressions are supported.

LINK_FALLBACK

Type
`bool` (`int`)

Default
`0`

Fallback value for *match_host()*.

MIME_WHITE_LIST

Type
`List[str]` (JSON)

Default
`[]`

White list of content types should be crawled.

Note: Regular expressions are supported.

MIME_BLACK_LIST

Type
List[str] (JSON)

Default
[]

Black list of content types should be crawled.

Note: Regular expressions are supported.

MIME_FALLBACK

Type
bool (int)

Default
0

Fallback value for *match_mime()*.

PROXY_WHITE_LIST

Type
List[str] (JSON)

Default
[]

White list of proxy types should be crawled.

Note: The proxy types are **case insensitive**.

PROXY_BLACK_LIST

Type
List[str] (JSON)

Default
[]

Black list of proxy types should be crawled.

Note: The proxy types are **case insensitive**.

PROXY_FALLBACK

Type
bool (int)

Default
0

Fallback value for *match_proxy()*.

Note: If provided, LINK_WHITE_LIST, LINK_BLACK_LIST, MIME_WHITE_LIST, MIME_BLACK_LIST, PROXY_WHITE_LIST and PROXY_BLACK_LIST should all be JSON encoded strings.

3.5 Data Submission

SAVE_DB

Type
bool

Default
True

Save submitted data to database.

API_RETRY

Type
int

Default
3

Retry times for API submission when failure.

API_NEW_HOST

Type
str

Default
None

API URL for *submit_new_host()*.

API_REQUESTS

Type
str

Default
None

API URL for *submit_requests()*.

API_SELENIUM

Type
str

Default
None

API URL for *submit_selenium()*.

Note: If `API_NEW_HOST`, `API_REQUESTS` and `API_SELENIUM` is `None`, the corresponding submit function will save the JSON data in the path specified by `PATH_DATA`.

3.6 Tor Proxy Configuration

DARC_TOR

Type
`bool` (`int`)

Default
`1`

If manage the Tor proxy through *darc*.

TOR_PORT

Type
`int`

Default
`9050`

Port for Tor proxy connection.

TOR_CTRL

Type
`int`

Default
`9051`

Port for Tor controller connection.

TOR_PASS

Type
`str`

Default
`None`

Tor controller authentication token.

Note: If not provided, it will be requested at runtime.

TOR_RETRY

Type
`int`

Default
`3`

Retry times for Tor bootstrap when failure.

TOR_WAIT

Type
float

Default
90

Time after which the attempt to start Tor is aborted.

Note: If not provided, there will be **NO** timeouts.

TOR_CFG

Type
Dict[str, Any] (JSON)

Default
{}

Tor bootstrap configuration for stem.process.launch_tor_with_config().

Note: If provided, it should be a JSON encoded string.

3.7 I2P Proxy Configuration

DARC_I2P

Type
bool (int)

Default
1

If manage the I2P proxy through *darc*.

I2P_PORT

Type
int

Default
4444

Port for I2P proxy connection.

I2P_RETRY

Type
int

Default
3

Retry times for I2P bootstrap when failure.

I2P_WAIT

Type
float

Default
90

Time after which the attempt to start I2P is aborted.

Note: If not provided, there will be **NO** timeouts.

I2P_ARGS

Type
str (Shell)

Default
''

I2P bootstrap arguments for `i2prouter start`.

If provided, it should be parsed as command line arguments (c.f. `shlex.split()`).

Note: The command will be run as DARC_USER, if current user (c.f. `getpass.getuser()`) is *root*.

3.8 ZeroNet Proxy Configuration

DARC_ZERONET

Type
bool (int)

Default
1

If manage the ZeroNet proxy through *darc*.

ZERONET_PORT

Type
int

Default
4444

Port for ZeroNet proxy connection.

ZERONET_RETRY

Type
int

Default
3

Retry times for ZeroNet bootstrap when failure.

ZERONET_WAIT

Type
float

Default
90

Time after which the attempt to start ZeroNet is aborted.

Note: If not provided, there will be **NO** timeouts.

ZERONET_PATH

Type
str (path)

Default
/usr/local/src/zeronet

Path to the ZeroNet project.

ZERONET_ARGS

Type
str (Shell)

Default
''

ZeroNet bootstrap arguments for `ZeroNet.sh main`.

Note: If provided, it should be parsed as command line arguments (c.f. `shlex.split()`).

3.9 Freenet Proxy Configuration

DARC_FREENET

Type
bool (int)

Default
1

If manage the Freenet proxy through *darc*.

FREENET_PORT

Type
int

Default
8888

Port for Freenet proxy connection.

FREENET_RETRY

Type
int

Default
3

Retry times for Freenet bootstrap when failure.

FREENET_WAIT

Type
float

Default
90

Time after which the attempt to start Freenet is aborted.

Note: If not provided, there will be **NO** timeouts.

FREENET_PATH

Type
str (path)

Default
/usr/local/src/freenet

Path to the Freenet project.

FREENET_ARGS

Type
str (Shell)

Default
''

Freenet bootstrap arguments for `run.sh start`.

If provided, it should be parsed as command line arguments (c.f. `shlex.split()`).

Note: The command will be run as `DARC_USER`, if current user (c.f. `getpass.getuser()`) is *root*.

CHAPTER

FOUR

CUSTOMISATIONS

Currently, *darc* provides three major customisation points, besides the various *environment variables*.

4.1 Hooks between Rounds

See also:

See *darc.process.register()* for technical information.

As the workers are defined as indefinite loops, we introduced the *hooks between rounds* to be called at end of each loop. Such hook functions can process all links that had been crawled and/or loaded in the past round, or to indicate the end of the indefinite loop, so that we can stop the workers in an elegant way.

A typical hook function can be defined as following:

```
from darc.error import WorkerBreak
from darc.process import register


def dummy_hook(node_type, link_pool):
    """A sample hook function that prints the processed links
    in the past round and informs the work to quit.

    Args:
        node_type (Literal['crawler', 'loader']): Type of worker node.
        link_pool (List[darc.link.Link]): List of processed links.

    Returns:
        NoReturn: The hook function will never return, though return
            values will be ignored anyway.

    Raises:
        darc.error.WorkerBreak: Inform the work to quit after this round.

    """
    if node_type == 'crawler':
        verb = 'crawled'
    elif node_type == 'loader':
        verb = 'loaded'
    else:
        raise ValueError('unknown type of worker node: %s' % node_type)
```

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```
    for link in link_pool:
        print('We just %s the link: %s' % (verb, link.url))
    raise WorkerBreak


# register the hook function
register(dummy_hook)
```

4.2 Custom Proxy

See also:

- *How to implement a custom proxy middleware?*
- See `darc.proxy.register()` for technical information.

Sometimes, we need proxies to connect to certain targers, such as the Tor network and I2P proxy. *darc* decides if it need to use a proxy for connection based on the *proxy* value of the target link.

By default, *darc* uses *no proxy* for `requests` sessions and `selenium` drivers. However, you may use your own proxies by registering and/or customising the corresponding factory functions.

A typical factory function pair (e.g., for Socks5 proxy) can be defined as following:

```
import requests
import requests_futures.sessions
import selenium.webdriver
import selenium.webdriver.common.proxy
from darc.const import DARC_CPU
from darc.proxy import register
from darc.requests import default_user_agent
from darc.selenium import BINARY_LOCATION


def socks5_session(futures=False):
    """Socks5 proxy session.

    Args:
        futures: If returns a :class:`requests_futures.FuturesSession`.

    Returns:
        Union[requests.Session, requests_futures.FuturesSession]:
        The session object with Socks5 proxy settings.

    """
    if futures:
        session = requests_futures.sessions.FuturesSession(max_workers=DARC_CPU)
    else:
        session = requests.Session()

    session.headers['User-Agent'] = default_user_agent(proxy='Socks5')
```

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```
    session.proxies.update({
        'http': 'socks5h://localhost:9293',
        'https': 'socks5h://localhost:9293',
    })
    return session


def socks5_driver():
    """Socks5 proxy driver.

    Returns:
        selenium.webdriver.Chrome: The web driver object with Socks5 proxy settings.

    """
    options = selenium.webdriver.ChromeOptions()
    options.binary_location = BINARY_LOCATION
    options.add_argument('--proxy-server=socks5://localhost:9293')
    options.add_argument('--host-resolver-rules="MAP * ~NOTFOUND , EXCLUDE localhost"')

    proxy = selenium.webdriver.Proxy()
    proxy.proxyType = selenium.webdriver.common.proxy.ProxyType.MANUAL
    proxy.http_proxy = 'socks5://localhost:9293'
    proxy.ssl_proxy = 'socks5://localhost:9293'

    capabilities = selenium.webdriver.DesiredCapabilities.CHROME.copy()
    proxy.add_to_capabilities(capabilities)

    driver = selenium.webdriver.Chrome(options=options,
                                       desired_capabilities=capabilities)
    return driver


# register proxy
register('socks5', socks5_session, socks5_driver)
```

4.3 Sites Customisation

See also:

- *How to implement a sites customisation?*
- See *darc.sites.register()* for technical information.

Since websites may require authentication and/or anti-robot checks, we need to insert certain cookies, animate some user interactions to bypass such requirements. *darc* decides which customisation to use based on the hostname, i.e. *host* value of the target link.

By default, *darc* uses *darc.sites.default* as the *no op* for both `requests` sessions and `selenium` drivers. However, you may use your own sites customisation by registering and/or customising the corresponding classes, which inherited from *BaseSite*.

A typical sites customisation class (for better demonstration) can be defined as following:

```python
import time

from darc.const import SE_WAIT
from darc.sites import BaseSite, register


class MySite(BaseSite):
    """This is a site customisation class for demonstration purpose.
    You may implement a module as well should you prefer."""

    #: List[str]: Hostnames the sites customisation is designed for.
    hostname = ['mysite.com', 'www.mysite.com']

    @staticmethod
    def crawler(session, link):
        """Crawler hook for my site.

        Args:
            session (requests.Session): Session object with proxy settings.
            link (darc.link.Link): Link object to be crawled.

        Returns:
            requests.Response: The final response object with crawled data.

        """
        # inject cookies
        session.cookies.set('SessionID', 'fake-session-id-value')

        response = session.get(link.url, allow_redirects=True)
        return response

    @staticmethod
    def loader(driver, link):
        """Loader hook for my site.

        Args:
            driver (selenium.webdriver.Chrome): Web driver object with proxy settings.
            link (darc.link.Link): Link object to be loaded.

        Returns:
            selenium.webdriver.Chrome: The web driver object with loaded data.

        """
        # land on login page
        driver.get('https://%s/login' % link.host)

        # animate login attempt
        form = driver.find_element_by_id('login-form')
        form.find_element_by_id('username').send_keys('admin')
        form.find_element_by_id('password').send_keys('p@ssd')
        form.click()

        driver.get(link.url)
```

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```
        # wait for page to finish loading
        if SE_WAIT is not None:
            time.sleep(SE_WAIT)

        return driver


# register sites
register(MySite)
```

Important: Please note that you may raise *darc.error.LinkNoReturn* in the `crawler` and/or `loader` methods to indicate that such link should be ignored and removed from the task queues, e.g. *darc.sites.data*.

CHAPTER

FIVE

DOCKER INTEGRATION

The *darc* project is integrated with Docker and Compose. Though published to Docker Hub, you can still build by yourself.

Important: The `debug` image contains miscellaneous documents, i.e. whole repository in it; and pre-installed some useful tools for debugging, such as IPython, etc.

The Docker image is based on Ubuntu Bionic (18.04 LTS), setting up all Python dependencies for the *darc* project, installing Google Chrome (version 79.0.3945.36) and corresponding ChromeDriver, as well as installing and configuring Tor, I2P, ZeroNet, FreeNet, NoIP proxies.

Note: NoIP is currently not fully integrated in the *darc* due to misunderstanding in the configuration process. Contributions are welcome.

When building the image, there is an *optional* argument for setting up a *non-root* user, c.f. environment variable `DARC_USER` and module constant *DARC_USER*. By default, the username is `darc`.

```
FROM ubuntu:focal

LABEL org.opencontainers.image.title="darc" \
      org.opencontainers.image.description="Darkweb Crawler Project" \
      org.opencontainers.image.url="https://darc.jarryshaw.me/" \
      org.opencontainers.image.source="https://github.com/JarryShaw/darc" \
      org.opencontainers.image.version="1.0.0" \
      org.opencontainers.image.licenses='BSD 3-Clause "New" or "Revised" License'

STOPSIGNAL SIGINT
HEALTHCHECK --interval=1h --timeout=1m \
    CMD wget https://httpbin.org/get -O /dev/null || exit 1

ARG DARC_USER="darc"
ENV LANG="C.UTF-8" \
    LC_ALL="C.UTF-8" \
    PYTHONIOENCODING="UTF-8" \
    DEBIAN_FRONTEND="teletype" \
    DARC_USER="${DARC_USER}"
    # DEBIAN_FRONTEND="noninteractive"

COPY extra/retry.sh /usr/local/bin/retry
```

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```
COPY extra/install.py /usr/local/bin/pty-install
#COPY extra/rename-jdk.sh /usr/local/bin/rename-jdk
COPY vendor/jdk-11.0.18_linux-x64_bin.tar.gz /var/cache/oracle-jdk11-installer-local/

RUN set -x \
 && retry apt-get update \
 && retry apt-get install --yes --no-install-recommends \
        apt-utils \
 && retry apt-get install --yes --no-install-recommends \
        gcc \
        g++ \
        libmagic1 \
        make \
        software-properties-common \
        tar \
        unzip \
        zlib1g-dev \
 && retry add-apt-repository ppa:deadsnakes/ppa --yes \
 && retry add-apt-repository ppa:linuxuprising/java --yes \
 && retry add-apt-repository ppa:i2p-maintainers/i2p --yes
RUN retry apt-get update \
 && retry apt-get install --yes --no-install-recommends \
        python3.9-dev \
        python3-pip \
        python3-setuptools \
        python3-wheel \
 && ln -sf /usr/bin/python3.9 /usr/local/bin/python3
RUN retry pty-install --stdin '6\n70' apt-get install --yes --no-install-recommends \
        tzdata \
 #&& retry rename-jdk \
 && retry pty-install --stdin 'yes' apt-get install --yes \
        oracle-java11-installer-local
RUN retry apt-get install --yes --no-install-recommends \
        sudo \
 && adduser --disabled-password --gecos '' ${DARC_USER} \
 && adduser ${DARC_USER} sudo \
 && echo '%sudo ALL=(ALL) NOPASSWD:ALL' >> /etc/sudoers

## Tor
RUN retry apt-get install --yes --no-install-recommends tor
COPY extra/torrc.focal /etc/tor/torrc

## I2P
RUN retry apt-get install --yes --no-install-recommends i2p
COPY extra/i2p.focal /etc/defaults/i2p

## ZeroNet
COPY vendor/ZeroNet-linux-dist-linux64.tar.gz /tmp
RUN set -x \
 && cd /tmp \
 && tar xvpfz ZeroNet-linux-dist-linux64.tar.gz \
 && mv ZeroNet-linux-dist-linux64 /usr/local/src/zeronet
```

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```
COPY extra/zeronet.focal.conf /usr/local/src/zeronet/zeronet.conf

## FreeNet
USER darc
COPY vendor/new_installer_offline.jar /tmp
RUN set -x \
 && cd /tmp \
 && ( pty-install --stdin '/home/darc/freenet\n1' java -jar new_installer_offline.jar ||␣
↪true ) \
 && sudo mv /home/darc/freenet /usr/local/src/freenet
USER root

## NoIP
COPY vendor/noip-duc-linux.tar.gz /tmp
RUN set -x \
 && cd /tmp \
 && tar xvpfz noip-duc-linux.tar.gz \
 && mv noip-2.1.9-1 /usr/local/src/noip \
 && cd /usr/local/src/noip \
 && make
 # && make install

# # set up timezone
# RUN echo 'Asia/Shanghai' > /etc/timezone \
#  && rm -f /etc/localtime \
#  && ln -snf /usr/share/zoneinfo/Asia/Shanghai /etc/localtime \
#  && dpkg-reconfigure -f noninteractive tzdata

COPY vendor/chromedriver_linux64.zip \
     vendor/google-chrome-stable_current_amd64.deb /tmp/
RUN set -x \
 ## ChromeDriver
 && unzip -d /usr/bin /tmp/chromedriver_linux64.zip \
 && which chromedriver \
 ## Google Chrome
 && ( dpkg --install /tmp/google-chrome-stable_current_amd64.deb || true ) \
 && retry apt-get install --fix-broken --yes --no-install-recommends \
 && dpkg --install /tmp/google-chrome-stable_current_amd64.deb \
 && which google-chrome

# Using pip:
COPY requirements.txt /tmp
RUN python3 -m pip install -r /tmp/requirements.txt --no-cache-dir

RUN set -x \
 && rm -rf \
        ## APT repository lists
        /var/lib/apt/lists/* \
        ## Python dependencies
        /tmp/requirements.txt \
        /tmp/pip \
        ## ChromeDriver
```

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```
        /tmp/chromedriver_linux64.zip \
        ## Google Chrome
        /tmp/google-chrome-stable_current_amd64.deb \
        ## Vendors
        /tmp/new_installer_offline.jar \
        /tmp/noip-duc-linux.tar.gz \
        /tmp/ZeroNet-linux-dist-linux64.tar.gz \
 #&& apt-get remove --auto-remove --yes \
 #       software-properties-common \
 #       unzip \
 && apt-get autoremove -y \
 && apt-get autoclean \
 && apt-get clean

ENTRYPOINT [ "python3", "-m", "darc" ]
#ENTRYPOINT [ "bash", "/app/run.sh" ]
CMD [ "--help" ]

WORKDIR /app
COPY darc/ /app/darc/
COPY LICENSE \
     MANIFEST.in \
     README.rst \
     extra/run.sh \
     setup.cfg \
     setup.py \
     test_darc.py /app/
RUN python3 -m pip install -e .
```

Note:

- `retry` is a shell script for retrying the commands until success

```
#!/usr/bin/env bash

while true; do
    >&2 echo "+ $@"
    $@ && break
    >&2 echo "exit: $?"
done
>&2 echo "exit: 0"
```

- `pty-install` is a Python script simulating user input for APT package installation with `DEBIAN_FRONTEND` set as `Teletype`.

```
#!/usr/bin/env python3
# -*- coding: utf-8 -*-
"""Install packages requiring interactions."""

import argparse
import os
import subprocess  # nosec: B404
```

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```
import sys
import tempfile
from typing import TYPE_CHECKING

if TYPE_CHECKING:
    from argparse import ArgumentParser


def get_parser() -> 'ArgumentParser':
    """Argument parser."""
    parser = argparse.ArgumentParser('install',
                                     description='pseudo-interactive package installer')

    parser.add_argument('-i', '--stdin', help='content for input')
    parser.add_argument('command', nargs=argparse.REMAINDER, help='command to execute')

    return parser


def main() -> int:
    """Entrypoint."""
    parser = get_parser()
    args = parser.parse_args()
    text = args.stdin.encode().decode('unicode_escape')

    path = tempfile.mktemp(prefix='install-')  # nosec: B306
    with open(path, 'w') as file:
        file.write(text)

    with open(path, 'r') as file:
        proc = subprocess.run(args.command, stdin=file)  # pylint: disable=subprocess-
↪run-check # nosec: B603

    os.remove(path)
    return proc.returncode


if __name__ == "__main__":
    sys.exit(main())
```

As always, you can also use Docker Compose to manage the *darc* image. Environment variables can be set as described in the configuration section.

```
version: '3'

services:
  crawler:
    image: jsnbzh/darc:latest
    build: &build
      context: .
      args:
```

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```
      # non-root user
      DARC_USER: "darc"
  container_name: crawler
  #entrypoint: [ "bash", "/app/run.sh" ]
  command: [ "--type", "crawler",
             "--file", "/app/text/tor.txt",
             "--file", "/app/text/tor2web.txt",
             "--file", "/app/text/i2p.txt",
             "--file", "/app/text/zeronet.txt",
             "--file", "/app/text/freenet.txt",
             "--file", "/app/text/clinic.txt" ]
  environment:
    ## [PYTHON] force the stdout and stderr streams to be unbuffered
    PYTHONUNBUFFERED: 1
    # reboot mode
    DARC_REBOOT: 0
    # debug mode
    DARC_DEBUG: 0
    # verbose mode
    DARC_VERBOSE: 1
    # force mode (ignore robots.txt)
    DARC_FORCE: 1
    # check mode (check proxy and hostname before crawling)
    DARC_CHECK: 1
    # check mode (check content type before crawling)
    DARC_CHECK_CONTENT_TYPE: 0
    # save mode
    DARC_SAVE: 0
    # save mode (for requests)
    DAVE_SAVE_REQUESTS: 0
    # save mode (for selenium)
    DAVE_SAVE_SELENIUM: 0
    # processes
    DARC_CPU: 16
    # multiprocessing
    DARC_MULTIPROCESSING: 1
    # multithreading
    DARC_MULTITHREADING: 0
    # time lapse
    DARC_WAIT: 60
    # bulk size
    DARC_BULK_SIZE: 1000
    # data storage
    PATH_DATA: "data"
    # save data submitssion
    SAVE_DB: 0
    # Redis URL
    REDIS_URL: 'redis://
↪:UCf7y123aHgaYeGnvLRasALjFfDVHGCz6KiR5Z0WC0DL4ExvSGw5SkcOxBywc0qtZBHVrSVx2QMGewXNP6qVow@redis
↪'
    # database URL
    #DB_URL: 'mysql://
```

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```
↪root:b8y9dpz3MJSQtwnZIW77ydASBOYfzA7HJfugv77wLrWQzrjCx5m3spoaiqRi4kU52syYy2jxJZR3U2kwPkEVTA@db
↪'
      # max pool
      DARC_MAX_POOL: 10
      # Tor proxy & control port
      TOR_PORT: 9050
      TOR_CTRL: 9051
      # Tor management method
      TOR_STEM: 1
      # Tor authentication
      TOR_PASS: "16:B9D36206B5374B3F609045F9609EE670F17047D88FF713EFB9157EA39F"
      # Tor bootstrap retry
      TOR_RETRY: 10
      # Tor bootstrap wait
      TOR_WAIT: 90
      # Tor bootstrap config
      TOR_CFG: "{}"
      # I2P port
      I2P_PORT: 4444
      # I2P bootstrap retry
      I2P_RETRY: 10
      # I2P bootstrap wait
      I2P_WAIT: 90
      # I2P bootstrap config
      I2P_ARGS: ""
      # ZeroNet port
      ZERONET_PORT: 43110
      # ZeroNet bootstrap retry
      ZERONET_RETRY: 10
      # ZeroNet project path
      ZERONET_PATH: "/usr/local/src/zeronet"
      # ZeroNet bootstrap wait
      ZERONET_WAIT: 90
      # ZeroNet bootstrap config
      ZERONET_ARGS: ""
      # Freenet port
      FREENET_PORT: 8888
      # Freenet bootstrap retry
      FREENET_RETRY: 0
      # Freenet project path
      FREENET_PATH: "/usr/local/src/freenet"
      # Freenet bootstrap wait
      FREENET_WAIT: 90
      # Freenet bootstrap config
      FREENET_ARGS: ""
      # time delta for caches in seconds
      TIME_CACHE: 2_592_000  # 30 days
      # time to wait for selenium
      SE_WAIT: 5
      # extract link pattern
      LINK_WHITE_LIST: '[
        ".*?\\.onion",
```

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```
      ".*?\\.i2p", "127\\.0\\.0\\.1:7657", "localhost:7657", "127\\.0\\.0\\.1:7658",
↪"localhost:7658",
      "127\\.0\\.0\\.1:43110", "localhost:43110",
      "127\\.0\\.0\\.1:8888", "localhost:8888"
    ]'
    # link black list
    LINK_BLACK_LIST: '[ "(.*\\.)?facebookcorewwwi\\.onion", "(.*\\.)?nytimes3xbfgragh\\
↪.onion" ]'
    # link fallback flag
    LINK_FALLBACK: 1
    # content type white list
    MIME_WHITE_LIST: '[ "text/html", "application/xhtml+xml" ]'
    # content type black list
    MIME_BLACK_LIST: '[ "text/css", "application/javascript", "text/json" ]'
    # content type fallback flag
    MIME_FALLBACK: 0
    # proxy type white list
    PROXY_WHITE_LIST: '[ "tor", "i2p", "freenet", "zeronet", "tor2web" ]'
    # proxy type black list
    PROXY_BLACK_LIST: '[ "null", "data" ]'
    # proxy type fallback flag
    PROXY_FALLBACK: 0
    # API retry times
    API_RETRY: 10
    # API URLs
    #API_NEW_HOST: 'https://example.com/api/new_host'
    #API_REQUESTS: 'https://example.com/api/requests'
    #API_SELENIUM: 'https://example.com/api/selenium'
  restart: "always"
  networks: &networks
    - darc
  volumes: &volumes
    - ./text:/app/text
    - ./extra:/app/extra
    - /data/darc:/app/data

loader:
  image: jsnbzh/darc:latest
  build: *build
  container_name: loader
  #entrypoint: [ "bash", "/app/run.sh" ]
  command: [ "--type", "loader" ]
  environment:
    ## [PYTHON] force the stdout and stderr streams to be unbuffered
    PYTHONUNBUFFERED: 1
    # reboot mode
    DARC_REBOOT: 0
    # debug mode
    DARC_DEBUG: 0
    # verbose mode
    DARC_VERBOSE: 1
    # force mode (ignore robots.txt)
```

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```
    DARC_FORCE: 1
    # check mode (check proxy and hostname before crawling)
    DARC_CHECK: 1
    # check mode (check content type before crawling)
    DARC_CHECK_CONTENT_TYPE: 0
    # save mode
    DARC_SAVE: 0
    # save mode (for requests)
    DAVE_SAVE_REQUESTS: 0
    # save mode (for selenium)
    DAVE_SAVE_SELENIUM: 0
    # processes
    DARC_CPU: 1
    # multiprocessing
    DARC_MULTIPROCESSING: 0
    # multithreading
    DARC_MULTITHREADING: 0
    # time lapse
    DARC_WAIT: 60
    # data storage
    PATH_DATA: "data"
    # Redis URL
    REDIS_URL: 'redis://
↪:UCf7y123aHgaYeGnvLRasALjFfDVHGCz6KiR5Z0WC0DL4ExvSGw5SkcOxBywc0qtZBHVrSVx2QMGewXNP6qVow@redis
↪'
    # database URL
    #DB_URL: 'mysql://
↪root:b8y9dpz3MJSQtwnZIW77ydASBOYfzA7HJfugv77wLrWQzrjCx5m3spoaiqRi4kU52syYy2jxJZR3U2kwPkEVTA@db
↪'
    # max pool
    DARC_MAX_POOL: 10
    # save data submitssion
    SAVE_DB: 0
    # Tor proxy & control port
    TOR_PORT: 9050
    TOR_CTRL: 9051
    # Tor management method
    TOR_STEM: 1
    # Tor authentication
    TOR_PASS: "16:B9D36206B5374B3F609045F9609EE670F17047D88FF713EFB9157EA39F"
    # Tor bootstrap retry
    TOR_RETRY: 10
    # Tor bootstrap wait
    TOR_WAIT: 90
    # Tor bootstrap config
    TOR_CFG: "{}"
    # I2P port
    I2P_PORT: 4444
    # I2P bootstrap retry
    I2P_RETRY: 10
    # I2P bootstrap wait
    I2P_WAIT: 90
```

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```
      # I2P bootstrap config
      I2P_ARGS: ""
      # ZeroNet port
      ZERONET_PORT: 43110
      # ZeroNet bootstrap retry
      ZERONET_RETRY: 10
      # ZeroNet project path
      ZERONET_PATH: "/usr/local/src/zeronet"
      # ZeroNet bootstrap wait
      ZERONET_WAIT: 90
      # ZeroNet bootstrap config
      ZERONET_ARGS: ""
      # Freenet port
      FREENET_PORT: 8888
      # Freenet bootstrap retry
      FREENET_RETRY: 0
      # Freenet project path
      FREENET_PATH: "/usr/local/src/freenet"
      # Freenet bootstrap wait
      FREENET_WAIT: 90
      # Freenet bootstrap config
      FREENET_ARGS: ""
      # time delta for caches in seconds
      TIME_CACHE: 2_592_000  # 30 days
      # time to wait for selenium
      SE_WAIT: 5
      # extract link pattern
      LINK_WHITE_LIST: '[
        ".*?\\.onion",
        ".*?\\.i2p", "127\\.0\\.0\\.1:7657", "localhost:7657", "127\\.0\\.0\\.1:7658",
↪"localhost:7658",
        "127\\.0\\.0\\.1:43110", "localhost:43110",
        "127\\.0\\.0\\.1:8888", "localhost:8888"
      ]'
      # link black list
      LINK_BLACK_LIST: '[ "(.*\\.)?facebookcorewwwi\\.onion", "(.*\\.)?nytimes3xbfgragh\\
↪.onion" ]'
      # link fallback flag
      LINK_FALLBACK: 1
      # content type white list
      MIME_WHITE_LIST: '[ "text/html", "application/xhtml+xml" ]'
      # content type black list
      MIME_BLACK_LIST: '[ "text/css", "application/javascript", "text/json" ]'
      # content type fallback flag
      MIME_FALLBACK: 0
      # proxy type white list
      PROXY_WHITE_LIST: '[ "tor", "i2p", "freenet", "zeronet", "tor2web" ]'
      # proxy type black list
      PROXY_BLACK_LIST: '[ "null", "data" ]'
      # proxy type fallback flag
      PROXY_FALLBACK: 0
      # API retry times
```

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```
      API_RETRY: 10
      # API URLs
      #API_NEW_HOST: 'https://example.com/api/new_host'
      #API_REQUESTS: 'https://example.com/api/requests'
      #API_SELENIUM: 'https://example.com/api/selenium'
    restart: "always"
    networks: *networks
    volumes: *volumes

# network settings
networks:
  darc:
    driver: bridge
```

Note: Should you wish to run *darc* in reboot mode, i.e. set *DARC_REBOOT* and/or *REBOOT* as `True`, you may wish to change the entrypoint to

```
bash /app/run.sh
```

where `run.sh` is a shell script wraps around *darc* especially for reboot mode.

```
#!/usr/bin/env bash

set -e

# time lapse
WAIT=${DARC_WAIT=10}

# signal handlers
trap '[ -f ${PATH_DATA}/darc.pid ] && kill -2 $(cat ${PATH_DATA}/darc.pid)' SIGINT␣
↪SIGTERM SIGKILL

# initialise
echo "+ Starting application..."
python3 -m darc $@
sleep ${WAIT}

# mainloop
while true; do
    echo "+ Restarting application..."
    python3 -m darc
    sleep ${WAIT}
done
```

In such scenario, you can customise your `run.sh` to, for instance, archive then upload current data crawled by *darc* to somewhere else and save up some disk space.

CHAPTER

SIX

WEB BACKEND DEMO

This is a demo of API for communication between the *darc* crawlers (*darc.submit*) and web UI.

See also:

Please refer to *data schema* for more information about the submission data.

Assuming the web UI is developed using the `Flask` microframework.

```python
# -*- coding: utf-8 -*-

import sys
from typing import TYPE_CHECKING

import flask

if TYPE_CHECKING:
    from flask import Response

# Flask application
app = flask.Flask(__file__)


@app.route('/api/new_host', methods=['POST'])
def new_host() -> 'Response':
    """When a new host is discovered, the :mod:`darc` crawler will submit the
    host information. Such includes ``robots.txt`` (if exists) and
    ``sitemap.xml`` (if any).

    Data format::

        {
            // partial flag - true / false
            "$PARTIAL$": ...,
            // force flag - true / false
            "$FORCE$": ...,
            // metadata of URL
            "[metadata]": {
                // original URL - <scheme>://<netloc>/<path>;<params>?<query>#<fragment>
                "url": ...,
                // proxy type - null / tor / i2p / zeronet / freenet
                "proxy": ...,
                // hostname / netloc, c.f. ``urllib.parse.urlparse``
```

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```
                "host": ...,
                // base folder, relative path (to data root path ``PATH_DATA``) in␣
↪containter - <proxy>/<scheme>/<host>
                "base": ...,
                // sha256 of URL as name for saved files (timestamp is in ISO format)
                //   JSON log as this one - <base>/<name>_<timestamp>.json
                //   HTML from requests - <base>/<name>_<timestamp>_raw.html
                //   HTML from selenium - <base>/<name>_<timestamp>.html
                //   generic data files - <base>/<name>_<timestamp>.dat
                "name": ...,
                // originate URL - <scheme>://<netloc>/<path>;<params>?<query>#<fragment>
                "backref": ...
            },
            // requested timestamp in ISO format as in name of saved file
            "Timestamp": ...,
            // original URL
            "URL": ...,
            // robots.txt from the host (if not exists, then ``null``)
            "Robots": {
                // path of the file, relative path (to data root path ``PATH_DATA``) in␣
↪container
                //   - <proxy>/<scheme>/<host>/robots.txt
                "path": ...,
                // content of the file (**base64** encoded)
                "data": ...,
            },
            // sitemaps from the host (if none, then ``null``)
            "Sitemaps": [
                {
                    // path of the file, relative path (to data root path ``PATH_DATA``)␣
↪in container
                    //   - <proxy>/<scheme>/<host>/sitemap_<name>.xml
                    "path": ...,
                    // content of the file (**base64** encoded)
                    "data": ...,
                },
                ...
            ],
            // hosts.txt from the host (if proxy type is ``i2p``; if not exists, then␣
↪``null``)
            "Hosts": {
                // path of the file, relative path (to data root path ``PATH_DATA``) in␣
↪container
                //   - <proxy>/<scheme>/<host>/hosts.txt
                "path": ...,
                // content of the file (**base64** encoded)
                "data": ...,
            }
        }

    """
    # JSON data from the request
```

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```
    data = flask.request.json  # pylint: disable=unused-variable

    # do whatever processing needed
    ...

    return flask.make_response()



@app.route('/api/requests', methods=['POST'])
def from_requests() -> 'Response':
    """When crawling, we'll first fetch the URl using ``requests``, to check
    its availability and to save its HTTP headers information. Such information
    will be submitted to the web UI.

    Data format::

        {
            // metadata of URL
            "[metadata]": {
                // original URL - <scheme>://<netloc>/<path>;<params>?<query>#<fragment>
                "url": ...,
                // proxy type - null / tor / i2p / zeronet / freenet
                "proxy": ...,
                // hostname / netloc, c.f. ``urllib.parse.urlparse``
                "host": ...,
                // base folder, relative path (to data root path ``PATH_DATA``) in␣
↪container - <proxy>/<scheme>/<host>
                "base": ...,
                // sha256 of URL as name for saved files (timestamp is in ISO format)
                //   JSON log as this one - <base>/<name>_<timestamp>.json
                //   HTML from requests - <base>/<name>_<timestamp>_raw.html
                //   HTML from selenium - <base>/<name>_<timestamp>.html
                //   generic data files - <base>/<name>_<timestamp>.dat
                "name": ...,
                // originate URL - <scheme>://<netloc>/<path>;<params>?<query>#<fragment>
                "backref": ...
            },
            // requested timestamp in ISO format as in name of saved file
            "Timestamp": ...,
            // original URL
            "URL": ...,
            // request method
            "Method": "GET",
            // response status code
            "Status-Code": ...,
            // response reason
            "Reason": ...,
            // response cookies (if any)
            "Cookies": {
                ...
            },
```

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```
            // session cookies (if any)
            "Session": {
                ...
            },
            // request headers (if any)
            "Request": {
                ...
            },
            // response headers (if any)
            "Response": {
                ...
            },
            // content type
            "Content-Type": ...,
            // requested file (if not exists, then ``null``)
            "Document": {
                // path of the file, relative path (to data root path ``PATH_DATA``) in␣
↪container
                //   - <proxy>/<scheme>/<host>/<name>_<timestamp>_raw.html
                // or if the document is of generic content type, i.e. not HTML
                //   - <proxy>/<scheme>/<host>/<name>_<timestamp>.dat
                "path": ...,
                // content of the file (**base64** encoded)
                "data": ...,
            },
            // redirection history (if any)
            "History": [
                // same records as the original response
                {"...": "..."}
            ]
        }

    """
    # JSON data from the request
    data = flask.request.json  # pylint: disable=unused-variable

    # do whatever processing needed
    ...

    return flask.make_response()


@app.route('/api/selenium', methods=['POST'])
def from_selenium() -> 'Response':
    """After crawling with ``requests``, we'll then render the URl using
    ``selenium`` with Google Chrome and its driver, to provide a fully rendered
    web page. Such information will be submitted to the web UI.

    Note:
        This information is optional, only provided if the content type from
        ``requests`` is HTML, status code < 400, and HTML data not empty.
```

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```
    Data format::

        {
            // metadata of URL
            "[metadata]": {
                // original URL - <scheme>://<netloc>/<path>;<params>?<query>#<fragment>
                "url": ...,
                // proxy type - null / tor / i2p / zeronet / freenet
                "proxy": ...,
                // hostname / netloc, c.f. ``urllib.parse.urlparse``
                "host": ...,
                // base folder, relative path (to data root path ``PATH_DATA``) in␣
↪containter - <proxy>/<scheme>/<host>
                "base": ...,
                // sha256 of URL as name for saved files (timestamp is in ISO format)
                //   JSON log as this one - <base>/<name>_<timestamp>.json
                //   HTML from requests - <base>/<name>_<timestamp>_raw.html
                //   HTML from selenium - <base>/<name>_<timestamp>.html
                //   generic data files - <base>/<name>_<timestamp>.dat
                "name": ...,
                // originate URL - <scheme>://<netloc>/<path>;<params>?<query>#<fragment>
                "backref": ...
            },
            // requested timestamp in ISO format as in name of saved file
            "Timestamp": ...,
            // original URL
            "URL": ...,
            // rendered HTML document (if not exists, then ``null``)
            "Document": {
                // path of the file, relative path (to data root path ``PATH_DATA``) in␣
↪container
                //   - <proxy>/<scheme>/<host>/<name>_<timestamp>.html
                "path": ...,
                // content of the file (**base64** encoded)
                "data": ...,
            },
            // web page screenshot (if not exists, then ``null``)
            "Screenshot": {
                // path of the file, relative path (to data root path ``PATH_DATA``) in␣
↪container
                //   - <proxy>/<scheme>/<host>/<name>_<timestamp>.png
                "path": ...,
                // content of the file (**base64** encoded)
                "data": ...,
            }
        }

    """
    # JSON data from the request
    data = flask.request.json  # pylint: disable=unused-variable

    # do whatever processing needed
```

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```
    ...

    return flask.make_response()


if __name__ == "__main__":
    sys.exit(app.run())  # type: ignore[func-returns-value]
```

CHAPTER

SEVEN

DATA MODELS DEMO

This is a demo of data models for database storage of the submitted data from the *darc* crawlers.

Assuming the database is using `peewee` as ORM and MySQL as backend.

Important: For more updated, battlefield-tested version of the data models, please refer to *darc.model.web*.

```python
# -*- coding: utf-8 -*-
# pylint: disable=ungrouped-imports

import enum
import os
from typing import TYPE_CHECKING

import peewee
import playhouse.mysql_ext
import playhouse.shortcuts

if TYPE_CHECKING:
    from datetime import datetime
    from enum import IntEnum
    from typing import Any, Dict, List, Optional

# database client
DB = playhouse.db_url.connect(os.getenv('DB_URL', 'mysql://127.0.0.1'))


class IntEnumField(peewee.IntegerField):
    """:class:`enum.IntEnum` data field."""

    #: The original :class:`enum.IntEnum` class.
    choices: 'IntEnum'

    # def db_value(self, value: 'Optional[IntEnum]') -> 'Optional[str]':  # pylint:␣
↪disable=inconsistent-return-statements
    #     """Dump the value for database storage.

    #     Args:
    #         val: Original enumeration object.
```

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```
    #     Returns:
    #         Integral representation of the enumeration.

    #     """
    #     if value is not None:
    #         return value

    def python_value(self, value: 'Optional[int]') -> 'Optional[IntEnum]':  # pylint: ␣
↪disable=inconsistent-return-statements
        """Load the value from database storage.

        Args:
            value: Integral representation of the enumeration.

        Returns:
            Original enumeration object.

        """
        if value is not None:
            return self.choices(value)  # type: ignore
        return None


class Proxy(enum.IntEnum):
    """Proxy types supported by :mod:`darc`.

    .. _tor2web: https://onion.sh/
    """

    #: No proxy.
    NULL = enum.auto()
    #: Tor proxy.
    TOR = enum.auto()
    #: I2P proxy.
    I2P = enum.auto()
    #: ZeroNet proxy.
    ZERONET = enum.auto()
    #: Freenet proxy.
    FREENET = enum.auto()
    #: Proxied Tor (`tor2web`_, no proxy).
    TOR2WEB = enum.auto()


def table_function(model_class: peewee.Model) -> str:
    """Generate table name dynamically.

    The function strips ``Model`` from the class name and
    calls :func:`peewee.make_snake_case` to generate a
    proper table name.

    Args:
        model_class: Data model class.
```

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```
    Returns:
        Generated table name.

    """
    name = model_class.__name__  # type: str
    if name.endswith('Model'):
        name = name[:-5]  # strip ``Model`` suffix
    return peewee.make_snake_case(name)


class BaseMeta:
    """Basic metadata for data models."""

    #: Reference database storage (c.f. :class:`~darc.const.DB`).
    database = DB

    #: Generate table name dynamically (c.f. :func:`~darc.model.table_function`).
    table_function = table_function


class BaseModel(peewee.Model):
    """Base model with standard patterns.

    Notes:
        The model will implicitly have a :class:`~peewee.AutoField`
        attribute named as :attr:`id`.

    """

    #: Basic metadata for data models.
    Meta = BaseMeta

    def to_dict(self, keep_id: bool = False) -> 'Dict[str, Any]':
        """Convert record to :obj:`dict`.

        Args:
            keep_id: If keep the ID auto field.

        Returns:
            The data converted through :func:`playhouse.shortcuts.model_to_dict`.

        """
        data = playhouse.shortcuts.model_to_dict(self)
        if keep_id:
            return data

        if 'id' in data:
            del data['id']
        return data
```

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```
class HostnameModel(BaseModel):
    """Data model for a hostname record."""

    #: Hostname (c.f. :attr:`link.host <darc.link.Link.host>`).
    hostname: str = peewee.CharField(max_length=255, unique=True)  # a valid FQDN is at␣
↪most 255 characters
    #: Proxy type (c.f. :attr:`link.proxy <darc.link.Link.proxy>`).
    proxy: 'Proxy' = IntEnumField(choices=Proxy)

    #: Timestamp of first ``new_host`` submission.
    discovery: 'datetime' = peewee.DateTimeField()
    #: Timestamp of last related submission.
    last_seen: 'datetime' = peewee.DateTimeField()


class RobotsModel(BaseModel):
    """Data model for ``robots.txt`` data."""

    #: Hostname (c.f. :attr:`link.host <darc.link.Link.host>`).
    host: 'HostnameModel' = peewee.ForeignKeyField(HostnameModel, backref='robots')
    #: Timestamp of the submission.
    timestamp: 'datetime' = peewee.DateTimeField()

    #: Document data as :obj:`bytes`.
    data: bytes = peewee.BlobField()
    #: Path to the document.
    path: str = peewee.CharField()


class SitemapModel(BaseModel):
    """Data model for ``sitemap.xml`` data."""

    #: Hostname (c.f. :attr:`link.host <darc.link.Link.host>`).
    host: 'HostnameModel' = peewee.ForeignKeyField(HostnameModel, backref='sitemaps')
    #: Timestamp of the submission.
    timestamp: 'datetime' = peewee.DateTimeField()

    #: Document data as :obj:`bytes`.
    data: bytes = peewee.BlobField()
    #: Path to the document.
    path: str = peewee.CharField()


class HostsModel(BaseModel):
    """Data model for ``hosts.txt`` data."""

    #: Hostname (c.f. :attr:`link.host <darc.link.Link.host>`).
    host: 'HostnameModel' = peewee.ForeignKeyField(HostnameModel, backref='hosts')
    #: Timestamp of the submission.
    timestamp: 'datetime' = peewee.DateTimeField()

    #: Document data as :obj:`bytes`.
```

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```
    data: bytes = peewee.BlobField()
    #: Path to the document.
    path: str = peewee.CharField()


class URLModel(BaseModel):
    """Data model for a requested URL."""

    #: Timestamp of last related submission.
    last_seen: 'datetime' = peewee.DateTimeField()
    #: Original URL (c.f. :attr:`link.url <darc.link.Link.url>`).
    url: str = peewee.TextField()

    #: Hostname (c.f. :attr:`link.host <darc.link.Link.host>`).
    host: HostnameModel = peewee.ForeignKeyField(HostnameModel, backref='urls')
    #: Proxy type (c.f. :attr:`link.proxy <darc.link.Link.proxy>`).
    proxy: str = peewee.CharField(max_length=8)

    #: Base path (c.f. :attr:`link.base <darc.link.Link.base>`).
    base: str = peewee.CharField()
    #: Link hash (c.f. :attr:`link.name <darc.link.Link.name>`).
    name: str = peewee.FixedCharField(max_length=64)

    @classmethod
    def get_by_url(cls, url: str) -> 'URLModel':
        """Select by URL.

        Args:
            url: URL to select.

        Returns:
            Selected URL model.

        """
        return cls.get(cls.url == url)

    @property
    def parents(self) -> 'List[URLModel]':
        """Back reference to where the URL was identified."""
        return (URLModel
                .select()
                .join(URLThroughModel, on=URLThroughModel.parent)
                .where(URLThroughModel.child == self)
                .order_by(URLModel.url))

    @property
    def childrent(self) -> 'List[URLModel]':
        """Back reference to which URLs were identified from the URL."""
        return (URLModel
                .select()
                .join(URLThroughModel, on=URLThroughModel.child)
                .where(URLThroughModel.parent == self)
```

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```
                .order_by(URLModel.url))


class URLThroughModel(BaseModel):
    """Data model for the map of URL extration chain."""

    #: Back reference to where the URL was identified.
    parent: 'List[URLModel]' = peewee.ForeignKeyField(URLModel, backref='parents')
    #: Back reference to which URLs were identified from the URL.
    child: 'List[URLModel]' = peewee.ForeignKeyField(URLModel, backref='children')

    class Meta(BaseMeta):
        indexes = (
            # Specify a unique multi-column index on from/to-url.
            (('parent', 'child'), True),
        )


class RequestsDocumentModel(BaseModel):
    """Data model for documents from ``requests`` submission."""

    #: Original URL (c.f. :attr:`link.url <darc.link.Link.url>`).
    url: 'URLModel' = peewee.ForeignKeyField(URLModel, backref='requests')

    #: Document data as :obj:`bytes`.
    data: bytes = peewee.BlobField()
    #: Path to the document.
    path: str = peewee.CharField()


class SeleniumDocumentModel(BaseModel):
    """Data model for documents from ``selenium`` submission."""

    #: Original URL (c.f. :attr:`link.url <darc.link.Link.url>`).
    url: 'URLModel' = peewee.ForeignKeyField(URLModel, backref='selenium')

    #: Document data as :obj:`bytes`.
    data: bytes = peewee.BlobField()
    #: Path to the document.
    path: str = peewee.CharField()
```

CHAPTER

EIGHT

SUBMISSION DATA SCHEMA

To better describe the submitted data, *darc* provides several JSON schema generated from `pydantic` models.

8.1 New Host Submission

The data submission from *darc.submit.submit_new_host()*.

```
{
  "title": "new_host",
  "description": "Data submission from :func:`darc.submit.submit_new_host`.",
  "type": "object",
  "properties": {
    "$PARTIAL$": {
      "title": "$Partial$",
      "description": "partial flag - true / false",
      "type": "boolean"
    },
    "$RELOAD$": {
      "title": "$Reload$",
      "description": "reload flag - true / false",
      "type": "boolean"
    },
    "[metadata]": {
      "title": "[Metadata]",
      "description": "metadata of URL",
      "allOf": [
        {
          "$ref": "#/definitions/Metadata"
        }
      ]
    },
    "Timestamp": {
      "title": "Timestamp",
      "description": "requested timestamp in ISO format as in name of saved file",
      "type": "string",
      "format": "date-time"
    },
    "URL": {
      "title": "Url",
      "description": "original URL",
```

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```
      "minLength": 1,
      "maxLength": 65536,
      "format": "uri",
      "type": "string"
    },
    "Robots": {
      "title": "Robots",
      "description": "robots.txt from the host (if not exists, then ``null``)",
      "allOf": [
        {
          "$ref": "#/definitions/RobotsDocument"
        }
      ]
    },
    "Sitemaps": {
      "title": "Sitemaps",
      "description": "sitemaps from the host (if none, then ``null``)",
      "type": "array",
      "items": {
        "$ref": "#/definitions/SitemapDocument"
      }
    },
    "Hosts": {
      "title": "Hosts",
      "description": "hosts.txt from the host (if proxy type is ``i2p``; if not exists,␣
↪then ``null``)",
      "allOf": [
        {
          "$ref": "#/definitions/HostsDocument"
        }
      ]
    }
  },
  "required": [
    "$PARTIAL$",
    "$RELOAD$",
    "[metadata]",
    "Timestamp",
    "URL"
  ],
  "definitions": {
    "Proxy": {
      "title": "Proxy",
      "description": "Proxy type.",
      "enum": [
        "null",
        "tor",
        "i2p",
        "zeronet",
        "freenet"
      ],
      "type": "string"
```

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```
    },
    "Metadata": {
      "title": "metadata",
      "description": "Metadata of URL.",
      "type": "object",
      "properties": {
        "url": {
          "title": "Url",
          "description": "original URL - <scheme>://<netloc>/<path>;<params>?<query>#
↪<fragment>",
          "minLength": 1,
          "maxLength": 65536,
          "format": "uri",
          "type": "string"
        },
        "proxy": {
          "$ref": "#/definitions/Proxy"
        },
        "host": {
          "title": "Host",
          "description": "hostname / netloc, c.f. ``urllib.parse.urlparse``",
          "type": "string"
        },
        "base": {
          "title": "Base",
          "description": "base folder, relative path (to data root path ``PATH_DATA``)␣
↪in containter - <proxy>/<scheme>/<host>",
          "type": "string"
        },
        "name": {
          "title": "Name",
          "description": "sha256 of URL as name for saved files (timestamp is in ISO␣
↪format) - JSON log as this one: <base>/<name>_<timestamp>.json; - HTML from requests:
↪<base>/<name>_<timestamp>_raw.html; - HTML from selenium: <base>/<name>_<timestamp>.
↪html; - generic data files: <base>/<name>_<timestamp>.dat",
          "type": "string"
        }
      },
      "required": [
        "url",
        "proxy",
        "host",
        "base",
        "name"
      ]
    },
    "RobotsDocument": {
      "title": "RobotsDocument",
      "description": "``robots.txt`` document data.",
      "type": "object",
      "properties": {
        "path": {
```

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```
          "title": "Path",
          "description": "path of the file, relative path (to data root path ``PATH_
↪DATA``) in container - <proxy>/<scheme>/<host>/robots.txt",
          "type": "string"
        },
        "data": {
          "title": "Data",
          "description": "content of the file (**base64** encoded)",
          "type": "string"
        }
      },
      "required": [
        "path",
        "data"
      ]
    },
    "SitemapDocument": {
      "title": "SitemapDocument",
      "description": "Sitemaps document data.",
      "type": "object",
      "properties": {
        "path": {
          "title": "Path",
          "description": "path of the file, relative path (to data root path ``PATH_
↪DATA``) in container - <proxy>/<scheme>/<host>/sitemap_<name>.xml",
          "type": "string"
        },
        "data": {
          "title": "Data",
          "description": "content of the file (**base64** encoded)",
          "type": "string"
        }
      },
      "required": [
        "path",
        "data"
      ]
    },
    "HostsDocument": {
      "title": "HostsDocument",
      "description": "``hosts.txt`` document data.",
      "type": "object",
      "properties": {
        "path": {
          "title": "Path",
          "description": "path of the file, relative path (to data root path ``PATH_
↪DATA``) in container - <proxy>/<scheme>/<host>/hosts.txt",
          "type": "string"
        },
        "data": {
          "title": "Data",
          "description": "content of the file (**base64** encoded)",
```

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```
          "type": "string"
        }
      },
      "required": [
        "path",
        "data"
      ]
    }
  }
}
```

8.2 Requests Submission

The data submission from *darc.submit.submit_requests()*.

```
{
  "title": "requests",
  "description": "Data submission from :func:`darc.submit.submit_requests`.",
  "type": "object",
  "properties": {
    "$PARTIAL$": {
      "title": "$Partial$",
      "description": "partial flag - true / false",
      "type": "boolean"
    },
    "[metadata]": {
      "title": "[Metadata]",
      "description": "metadata of URL",
      "allOf": [
        {
          "$ref": "#/definitions/Metadata"
        }
      ]
    },
    "Timestamp": {
      "title": "Timestamp",
      "description": "requested timestamp in ISO format as in name of saved file",
      "type": "string",
      "format": "date-time"
    },
    "URL": {
      "title": "Url",
      "description": "original URL",
      "minLength": 1,
      "maxLength": 65536,
      "format": "uri",
      "type": "string"
    },
    "Method": {
      "title": "Method",
```

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```
      "description": "request method",
      "type": "string"
    },
    "Status-Code": {
      "title": "Status-Code",
      "description": "response status code",
      "exclusiveMinimum": 0,
      "type": "integer"
    },
    "Reason": {
      "title": "Reason",
      "description": "response reason",
      "type": "string"
    },
    "Cookies": {
      "title": "Cookies",
      "description": "response cookies (if any)",
      "type": "object",
      "additionalProperties": {
        "type": "string"
      }
    },
    "Session": {
      "title": "Session",
      "description": "session cookies (if any)",
      "type": "object",
      "additionalProperties": {
        "type": "string"
      }
    },
    "Request": {
      "title": "Request",
      "description": "request headers (if any)",
      "type": "object",
      "additionalProperties": {
        "type": "string"
      }
    },
    "Response": {
      "title": "Response",
      "description": "response headers (if any)",
      "type": "object",
      "additionalProperties": {
        "type": "string"
      }
    },
    "Content-Type": {
      "title": "Content-Type",
      "description": "content type",
      "pattern": "[a-zA-Z0-9.-]+/[a-zA-Z0-9.-]+",
      "type": "string"
    },
```

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```
    "Document": {
      "title": "Document",
      "description": "requested file (if not exists, then ``null``)",
      "allOf": [
        {
          "$ref": "#/definitions/RequestsDocument"
        }
      ]
    },
    "History": {
      "title": "History",
      "description": "redirection history (if any)",
      "type": "array",
      "items": {
        "$ref": "#/definitions/HistoryModel"
      }
    }
  },
  "required": [
    "$PARTIAL$",
    "[metadata]",
    "Timestamp",
    "URL",
    "Method",
    "Status-Code",
    "Reason",
    "Cookies",
    "Session",
    "Request",
    "Response",
    "Content-Type",
    "History"
  ],
  "definitions": {
    "Proxy": {
      "title": "Proxy",
      "description": "Proxy type.",
      "enum": [
        "null",
        "tor",
        "i2p",
        "zeronet",
        "freenet"
      ],
      "type": "string"
    },
    "Metadata": {
      "title": "metadata",
      "description": "Metadata of URL.",
      "type": "object",
      "properties": {
        "url": {
```

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```
          "title": "Url",
          "description": "original URL - <scheme>://<netloc>/<path>;<params>?<query>#
↪<fragment>",
          "minLength": 1,
          "maxLength": 65536,
          "format": "uri",
          "type": "string"
        },
        "proxy": {
          "$ref": "#/definitions/Proxy"
        },
        "host": {
          "title": "Host",
          "description": "hostname / netloc, c.f. ``urllib.parse.urlparse``",
          "type": "string"
        },
        "base": {
          "title": "Base",
          "description": "base folder, relative path (to data root path ``PATH_DATA``)␣
↪in containter - <proxy>/<scheme>/<host>",
          "type": "string"
        },
        "name": {
          "title": "Name",
          "description": "sha256 of URL as name for saved files (timestamp is in ISO␣
↪format) - JSON log as this one: <base>/<name>_<timestamp>.json; - HTML from requests:
↪<base>/<name>_<timestamp>_raw.html; - HTML from selenium: <base>/<name>_<timestamp>.
↪html; - generic data files: <base>/<name>_<timestamp>.dat",
          "type": "string"
        }
      },
      "required": [
        "url",
        "proxy",
        "host",
        "base",
        "name"
      ]
    },
    "RequestsDocument": {
      "title": "RequestsDocument",
      "description": ":mod:`requests` document data.",
      "type": "object",
      "properties": {
        "path": {
          "title": "Path",
          "description": "path of the file, relative path (to data root path ``PATH_
↪DATA``) in container - <proxy>/<scheme>/<host>/<name>_<timestamp>_raw.html; or if the␣
↪document is of generic content type, i.e. not HTML - <proxy>/<scheme>/<host>/<name>_
↪<timestamp>.dat",
          "type": "string"
        },
```

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```
      "data": {
        "title": "Data",
        "description": "content of the file (**base64** encoded)",
        "type": "string"
      }
    },
    "required": [
      "path",
      "data"
    ]
  },
  "HistoryModel": {
    "title": "HistoryModel",
    "description": ":mod:`requests` history data.",
    "type": "object",
    "properties": {
      "URL": {
        "title": "Url",
        "description": "original URL",
        "minLength": 1,
        "maxLength": 65536,
        "format": "uri",
        "type": "string"
      },
      "Method": {
        "title": "Method",
        "description": "request method",
        "type": "string"
      },
      "Status-Code": {
        "title": "Status-Code",
        "description": "response status code",
        "exclusiveMinimum": 0,
        "type": "integer"
      },
      "Reason": {
        "title": "Reason",
        "description": "response reason",
        "type": "string"
      },
      "Cookies": {
        "title": "Cookies",
        "description": "response cookies (if any)",
        "type": "object",
        "additionalProperties": {
          "type": "string"
        }
      },
      "Session": {
        "title": "Session",
        "description": "session cookies (if any)",
        "type": "object",
```

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```
          "additionalProperties": {
            "type": "string"
          }
        },
        "Request": {
          "title": "Request",
          "description": "request headers (if any)",
          "type": "object",
          "additionalProperties": {
            "type": "string"
          }
        },
        "Response": {
          "title": "Response",
          "description": "response headers (if any)",
          "type": "object",
          "additionalProperties": {
            "type": "string"
          }
        },
        "Document": {
          "title": "Document",
          "description": "content of the file (**base64** encoded)",
          "type": "string"
        }
      },
      "required": [
        "URL",
        "Method",
        "Status-Code",
        "Reason",
        "Cookies",
        "Session",
        "Request",
        "Response",
        "Document"
      ]
    }
  }
}
```

8.3 Selenium Submission

The data submission from *darc.submit.submit_selenium()*.

```
{
  "title": "selenium",
  "description": "Data submission from :func:`darc.submit.submit_requests`.",
  "type": "object",
  "properties": {
```

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```
    "$PARTIAL$": {
      "title": "$Partial$",
      "description": "partial flag - true / false",
      "type": "boolean"
    },
    "[metadata]": {
      "title": "[Metadata]",
      "description": "metadata of URL",
      "allOf": [
        {
          "$ref": "#/definitions/Metadata"
        }
      ]
    },
    "Timestamp": {
      "title": "Timestamp",
      "description": "requested timestamp in ISO format as in name of saved file",
      "type": "string",
      "format": "date-time"
    },
    "URL": {
      "title": "Url",
      "description": "original URL",
      "minLength": 1,
      "maxLength": 65536,
      "format": "uri",
      "type": "string"
    },
    "Document": {
      "title": "Document",
      "description": "rendered HTML document (if not exists, then ``null``)",
      "allOf": [
        {
          "$ref": "#/definitions/SeleniumDocument"
        }
      ]
    },
    "Screenshot": {
      "title": "Screenshot",
      "description": "web page screenshot (if not exists, then ``null``)",
      "allOf": [
        {
          "$ref": "#/definitions/ScreenshotDocument"
        }
      ]
    }
  },
  "required": [
    "$PARTIAL$",
    "[metadata]",
    "Timestamp",
    "URL"
```

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```
  ],
  "definitions": {
    "Proxy": {
      "title": "Proxy",
      "description": "Proxy type.",
      "enum": [
        "null",
        "tor",
        "i2p",
        "zeronet",
        "freenet"
      ],
      "type": "string"
    },
    "Metadata": {
      "title": "metadata",
      "description": "Metadata of URL.",
      "type": "object",
      "properties": {
        "url": {
          "title": "Url",
          "description": "original URL - <scheme>://<netloc>/<path>;<params>?<query>#
↪<fragment>",
          "minLength": 1,
          "maxLength": 65536,
          "format": "uri",
          "type": "string"
        },
        "proxy": {
          "$ref": "#/definitions/Proxy"
        },
        "host": {
          "title": "Host",
          "description": "hostname / netloc, c.f. ``urllib.parse.urlparse``",
          "type": "string"
        },
        "base": {
          "title": "Base",
          "description": "base folder, relative path (to data root path ``PATH_DATA``)␣
↪in containter - <proxy>/<scheme>/<host>",
          "type": "string"
        },
        "name": {
          "title": "Name",
          "description": "sha256 of URL as name for saved files (timestamp is in ISO␣
↪format) - JSON log as this one: <base>/<name>_<timestamp>.json; - HTML from requests:
↪<base>/<name>_<timestamp>_raw.html; - HTML from selenium: <base>/<name>_<timestamp>.
↪html; - generic data files: <base>/<name>_<timestamp>.dat",
          "type": "string"
        }
      },
      "required": [
```

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```
        "url",
        "proxy",
        "host",
        "base",
        "name"
      ]
    },
    "SeleniumDocument": {
      "title": "SeleniumDocument",
      "description": ":mod:`selenium` document data.",
      "type": "object",
      "properties": {
        "path": {
          "title": "Path",
          "description": "path of the file, relative path (to data root path ``PATH_
↪DATA``) in container - <proxy>/<scheme>/<host>/<name>_<timestamp>.html",
          "type": "string"
        },
        "data": {
          "title": "Data",
          "description": "content of the file (**base64** encoded)",
          "type": "string"
        }
      },
      "required": [
        "path",
        "data"
      ]
    },
    "ScreenshotDocument": {
      "title": "ScreenshotDocument",
      "description": "Screenshot document data.",
      "type": "object",
      "properties": {
        "path": {
          "title": "Path",
          "description": "path of the file, relative path (to data root path ``PATH_
↪DATA``) in container - <proxy>/<scheme>/<host>/<name>_<timestamp>.png",
          "type": "string"
        },
        "data": {
          "title": "Data",
          "description": "content of the file (**base64** encoded)",
          "type": "string"
        }
      },
      "required": [
        "path",
        "data"
      ]
    }
  }
```

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```
}
```

8.4 Model Definitions

```python
# -*- coding: utf-8 -*-
# pylint: disable=ungrouped-imports,no-name-in-module
"""JSON schema generator."""

from typing import TYPE_CHECKING

import pydantic.schema
from pydantic import BaseModel, Field

__all__ = ['NewHostModel', 'RequestsModel', 'SeleniumModel']

if TYPE_CHECKING:
    from datetime import datetime
    from enum import Enum
    from typing import Any, Dict, List, Optional

    from pydantic import AnyUrl, PositiveInt

    CookiesType = List[Dict[str, Any]]
    HeadersType = Dict[str, str]

    class Proxy(str, Enum):
        """Proxy type."""

        null = 'null'
        tor = 'tor'
        i2p = 'i2p'
        zeronet = 'zeronet'
        freenet = 'freenet'

################################################################################
# Miscellaneous auxiliaries
################################################################################


class Metadata(BaseModel):
    """Metadata of URL."""

    url: 'AnyUrl' = Field(
        description='original URL - <scheme>://<netloc>/<path>;<params>?<query>#
↪<fragment>')
    proxy: 'Proxy' = Field(
        description='proxy type - null / tor / i2p / zeronet / freenet')
    host: str = Field(
        description='hostname / netloc, c.f. ``urllib.parse.urlparse``')
    base: str = Field(
```

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```
        description=('base folder, relative path (to data root path ``PATH_DATA``) in␣
↪containter '
                     '- <proxy>/<scheme>/<host>'))
    name: str = Field(
        description=('sha256 of URL as name for saved files (timestamp is in ISO format)
↪'
                     '- JSON log as this one: <base>/<name>_<timestamp>.json; '
                     '- HTML from requests: <base>/<name>_<timestamp>_raw.html; '
                     '- HTML from selenium: <base>/<name>_<timestamp>.html; '
                     '- generic data files: <base>/<name>_<timestamp>.dat'))
    backref: str = Field(
        description='originate URL - <scheme>://<netloc>/<path>;<params>?<query>#
↪<fragment>')

    class Config:
        title = 'metadata'


class RobotsDocument(BaseModel):
    """``robots.txt`` document data."""

    path: str = Field(
        description=('path of the file, relative path (to data root path ``PATH_DATA``)␣
↪in container '
                     '- <proxy>/<scheme>/<host>/robots.txt'))
    data: str = Field(
        description='content of the file (**base64** encoded)')


class SitemapDocument(BaseModel):
    """Sitemaps document data."""

    path: str = Field(
        description=('path of the file, relative path (to data root path ``PATH_DATA``)␣
↪in container '
                     '- <proxy>/<scheme>/<host>/sitemap_<name>.xml'))
    data: str = Field(
        description='content of the file (**base64** encoded)')


class HostsDocument(BaseModel):
    """``hosts.txt`` document data."""

    path: str = Field(
        description=('path of the file, relative path (to data root path ``PATH_DATA``)␣
↪in container '
                     '- <proxy>/<scheme>/<host>/hosts.txt'))
    data: str = Field(
        description='content of the file (**base64** encoded)')


class RequestsDocument(BaseModel):
```

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```
    """:mod:`requests` document data."""

    path: str = Field(
        description=('path of the file, relative path (to data root path ``PATH_DATA``)␣
↪in container '
                     '- <proxy>/<scheme>/<host>/<name>_<timestamp>_raw.html; '
                     'or if the document is of generic content type, i.e. not HTML '
                     '- <proxy>/<scheme>/<host>/<name>_<timestamp>.dat'))
    data: str = Field(
        description='content of the file (**base64** encoded)')


class HistoryModel(BaseModel):
    """:mod:`requests` history data."""

    URL: 'AnyUrl' = Field(
        description='original URL')

    Method: str = Field(
        description='request method')
    status_code: 'PositiveInt' = Field(
        alias='Status-Code',
        description='response status code')
    Reason: str = Field(
        description='response reason')

    Cookies: 'CookiesType' = Field(
        description='response cookies (if any)')
    Session: 'CookiesType' = Field(
        description='session cookies (if any)')

    Request: 'HeadersType' = Field(
        description='request headers (if any)')
    Response: 'HeadersType' = Field(
        description='response headers (if any)')

    Document: str = Field(
        description='content of the file (**base64** encoded)')


class SeleniumDocument(BaseModel):
    """:mod:`selenium` document data."""

    path: str = Field(
        description=('path of the file, relative path (to data root path ``PATH_DATA``)␣
↪in container '
                     '- <proxy>/<scheme>/<host>/<name>_<timestamp>.html'))
    data: str = Field(
        description='content of the file (**base64** encoded)')


class ScreenshotDocument(BaseModel):
```

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```
    """Screenshot document data."""

    path: str = Field(
        description=('path of the file, relative path (to data root path ``PATH_DATA``)␣
↪in container '
                     '- <proxy>/<scheme>/<host>/<name>_<timestamp>.png'))
    data: str = Field(
        description='content of the file (**base64** encoded)')


################################################################################
# JSON schema definitions
################################################################################


class NewHostModel(BaseModel):
    """Data submission from :func:`darc.submit.submit_new_host`."""

    partial: bool = Field(
        alias='$PARTIAL$',
        description='partial flag - true / false')
    reload: bool = Field(
        alias='$RELOAD$',
        description='reload flag - true / false')
    metadata: 'Metadata' = Field(
        alias='[metadata]',
        description='metadata of URL')

    Timestamp: 'datetime' = Field(
        description='requested timestamp in ISO format as in name of saved file')
    URL: 'AnyUrl' = Field(
        description='original URL')

    Robots: 'Optional[RobotsDocument]' = Field(
        description='robots.txt from the host (if not exists, then ``null``)')
    Sitemaps: 'Optional[List[SitemapDocument]]' = Field(
        description='sitemaps from the host (if none, then ``null``)')
    Hosts: 'Optional[HostsDocument]' = Field(
        description='hosts.txt from the host (if proxy type is ``i2p``; if not exists,␣
↪then ``null``)')


    class Config:
        title = 'new_host'


class RequestsModel(BaseModel):
    """Data submission from :func:`darc.submit.submit_requests`."""

    partial: bool = Field(
        alias='$PARTIAL$',
        description='partial flag - true / false')
```

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```
    metadata: 'Metadata' = Field(
        alias='[metadata]',
        description='metadata of URL')

    Timestamp: 'datetime' = Field(
        description='requested timestamp in ISO format as in name of saved file')
    URL: 'AnyUrl' = Field(
        description='original URL')

    Method: str = Field(
        description='request method')
    status_code: 'PositiveInt' = Field(
        alias='Status-Code',
        description='response status code')
    Reason: str = Field(
        description='response reason')

    Cookies: 'CookiesType' = Field(
        description='response cookies (if any)')
    Session: 'CookiesType' = Field(
        description='session cookies (if any)')

    Request: 'HeadersType' = Field(
        description='request headers (if any)')
    Response: 'HeadersType' = Field(
        description='response headers (if any)')
    content_type: str = Field(
        alias='Content-Type',
        regex='[a-zA-Z0-9.-]+/[a-zA-Z0-9.-]+',
        description='content type')

    Document: 'Optional[RequestsDocument]' = Field(
        description='requested file (if not exists, then ``null``)')
    History: 'List[HistoryModel]' = Field(
        description='redirection history (if any)')

    class Config:
        title = 'requests'


class SeleniumModel(BaseModel):
    """Data submission from :func:`darc.submit.submit_requests`."""

    partial: bool = Field(
        alias='$PARTIAL$',
        description='partial flag - true / false')
    metadata: 'Metadata' = Field(
        alias='[metadata]',
        description='metadata of URL')

    Timestamp: 'datetime' = Field(
        description='requested timestamp in ISO format as in name of saved file')
```

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```
    URL: 'AnyUrl' = Field(
        description='original URL')

    Document: 'Optional[SeleniumDocument]' = Field(
        description='rendered HTML document (if not exists, then ``null``)')
    Screenshot: 'Optional[ScreenshotDocument]' = Field(
        description='web page screenshot (if not exists, then ``null``)')

    class Config:
        title = 'selenium'


if __name__ == "__main__":
    import json
    import os

    os.makedirs('schema', exist_ok=True)

    with open('schema/new_host.schema.json', 'w') as file:
        print(NewHostModel.schema_json(indent=2), file=file)
    with open('schema/requests.schema.json', 'w') as file:
        print(RequestsModel.schema_json(indent=2), file=file)
    with open('schema/selenium.schema.json', 'w') as file:
        print(SeleniumModel.schema_json(indent=2), file=file)

    schema = pydantic.schema.schema([NewHostModel, RequestsModel, SeleniumModel],
                                    title='DARC Data Submission JSON Schema')
    with open('schema/darc.schema.json', 'w') as file:
        json.dump(schema, file, indent=2)
```

CHAPTER

NINE

AUXILIARY SCRIPTS

Since the `darc` project can be deployed through *Docker Integration*, we provided some auxiliary scripts to help with the deployment.

9.1 Health Check

File location

- Entry point: `extra/healthcheck.py`
- System V service: `extra/healthcheck.service`

```
usage: healthcheck [-h] [-f FILE] [-i INTERVAL] ...

health check running container

positional arguments:
  services              name of services

optional arguments:
  -h, --help            show this help message and exit
  -f FILE, --file FILE  path to compose file
  -i INTERVAL, --interval INTERVAL
                        interval (in seconds) of health check
```

This script will watch the running status of containers managed by Docker Compose. If the containers are stopped or of *unhealthy* status, it will bring the containers back alive.

Also, as the internal program may halt unexpectedly whilst the container remains *healthy*, the script will watch if the program is still active through its output messages. If inactive, the script will restart the containers.

9.2 Upload API Submission Files

File location

- Entry point: `extra/upload.py`
- Helper script: `extra/upload.sh`
- Cron sample: `extra/upload.cron`

```
usage: upload [-h] [-p PATH] -H HOST [-U USER]

upload API submission files

optional arguments:
  -h, --help            show this help message and exit
  -p PATH, --path PATH  path to data storage
  -H HOST, --host HOST  upstream hostname
  -U USER, --user USER  upstream user credential
```

This script will automatically upload API submission files, c.f. *darc.submit*, using *curl(1)*. The `--user` option is supplied for the same option of *curl(1)*.

Important: As the *darc.submit.save_submit()* is categorising saved API submission files by its actual date, the script is also uploading such files by the saved dates. Therefore, as the *cron(8)* sample suggests, the script should better be run everyday *slightly after* **12:00 AM** (*0:00* in 24-hour format).

9.3 Remove Repeated Lines

File location

`extra/uniq.py`

This script works the same as *uniq(1)*, except it filters one input line at a time without putting pressure onto memory utilisation.

9.4 Redis Clinic

File location

- Entry point: `extra/clinic.py`
- Helper script: `extra/clinic.lua`
- Cron sample: `extra/clinic.cron`

```
usage: clinic [-h] -r REDIS [-f FILE] [-t TIMEOUT] ...

memory clinic for Redis

positional arguments:
  services              name of services

optional arguments:
  -h, --help            show this help message and exit
  -r REDIS, --redis REDIS
                        URI to the Redis server
  -f FILE, --file FILE  path to compose file
  -t TIMEOUT, --timeout TIMEOUT
                        shutdown timeout in seconds
```

Since Redis may take more and more memory as the growth of crawled data and task queues, this script will truncate the Redis task queues (`queue_requests` & `queue_selenium`), as well as the corresponding `pickle` caches of *darc.link.Link*.

Note: We used Lua scrpit to slightly accelerate the whole procedure, as it may bring burden to the host server if running through Redis client.

Warning: Due to restriction on the Alibaba Cloud (Aliyun) customised version of Redis, i.e. AsparaDB for Redis, this Lua script is not allowed be to executed. It is recommended to manually cleanup the database before we find out an alternative solution.

CHAPTER

TEN

RATIONALE

There are two types of *workers*:

- `crawler` – runs the *darc.crawl.crawler()* to provide a fresh view of a link and test its connectability
- `loader` – run the *darc.crawl.loader()* to provide an in-depth view of a link and provide more visual information

The general process can be described as following for *workers* of `crawler` type:

1. *process_crawler()*: obtain URLs from the `requests` link database (c.f. *load_requests()*), and feed such URLs to *crawler()*.

   Note: If *FLAG_MP* is `True`, the function will be called with *multiprocessing* support; if *FLAG_TH* if `True`, the function will be called with *multithreading* support; if none, the function will be called in single-threading.

2. *crawler()*: parse the URL using *parse_link()*, and check if need to crawl the URL (c.f. *PROXY_WHITE_LIST*, *PROXY_BLACK_LIST*, *LINK_WHITE_LIST* and *LINK_BLACK_LIST*); if true, then crawl the URL with `requests`.

   If the URL is from a brand new host, *darc* will first try to fetch and save `robots.txt` and sitemaps of the host (c.f. *save_robots()* and *save_sitemap()*), and extract then save the links from sitemaps (c.f. *read_sitemap()*) into link database for future crawling (c.f. *save_requests()*). Also, if the submission API is provided, *submit_new_host()* will be called and submit the documents just fetched.

   If `robots.txt` presented, and *FORCE* is `False`, *darc* will check if allowed to crawl the URL.

   Note: The root path (e.g. `/` in https://www.example.com/) will always be crawled ignoring `robots.txt`.

   At this point, *darc* will call the customised hook function from *darc.sites* to crawl and get the final response object. *darc* will save the session cookies and header information, using *save_headers()*.

   Note: If `requests.exceptions.InvalidSchema` is raised, the link will be saved by *save_invalid()*. Further processing is dropped.

   If the content type of response document is not ignored (c.f. *MIME_WHITE_LIST* and *MIME_BLACK_LIST*), *submit_requests()* will be called and submit the document just fetched.

   If the response document is HTML (`text/html` and `application/xhtml+xml`), *extract_links()* will be called then to extract all possible links from the HTML document and save such links into the database (c.f. *save_requests()*).

And if the response status code is between `400` and `600`, the URL will be saved back to the link database (c.f. *save_requests()*). If **NOT**, the URL will be saved into `selenium` link database to proceed next steps (c.f. *save_selenium()*).

The general process can be described as following for *workers* of `loader` type:

1. *process_loader()*: in the meanwhile, *darc* will obtain URLs from the `selenium` link database (c.f. *load_selenium()*), and feed such URLs to *loader()*.

   Note: If *FLAG_MP* is `True`, the function will be called with *multiprocessing* support; if *FLAG_TH* if `True`, the function will be called with *multithreading* support; if none, the function will be called in single-threading.

2. *loader()*: parse the URL using *parse_link()* and start loading the URL using `selenium` with Google Chrome.

   At this point, *darc* will call the customised hook function from *darc.sites* to load and return the original `WebDriver` object.

   If successful, the rendered source HTML document will be saved, and a full-page screenshot will be taken and saved.

   If the submission API is provided, *submit_selenium()* will be called and submit the document just loaded.

   Later, *extract_links()* will be called then to extract all possible links from the HTML document and save such links into the `requests` database (c.f. *save_requests()*).

Important: For more information about the hook functions, please refer to the *customisation* documentations.

CHAPTER

ELEVEN

INSTALLATION

Note: *darc* supports Python all versions above and includes **3.6**. Currently, it only supports and is tested on Linux (*Ubuntu 18.04*) and macOS (*Catalina*).

When installing in Python versions below **3.8**, *darc* will use `walrus` to compile itself for backport compatibility.

```
pip install darc
```

Please make sure you have Google Chrome and corresponding version of Chrome Driver installed on your system.

Important: Starting from version **0.3.0**, we introduced Redis for the task queue database backend.

Since version **0.6.0**, we introduced relationship database storage (e.g. MySQL, SQLite, PostgreSQL, etc.) for the task queue database backend, besides the Redis database, since it can be too much memory-costly when the task queue becomes vary large.

Please make sure you have one of the backend database installed, configured, and running when using the *darc* project.

However, the *darc* project is shipped with Docker and Compose support. Please see *Docker Integration* for more information.

Or, you may refer to and/or install from the Docker Hub repository:

```
docker pull jsnbzh/darc[:TAGNAME]
```

or GitHub Container Registry, with more updated and comprehensive images:

```
docker pull ghcr.io/jarryshaw/darc[:TAGNAME]
# or the debug image
docker pull ghcr.io/jarryshaw/darc-debug[:TAGNAME]
```

CHAPTER

TWELVE

USAGE

Important: Though simple CLI, the *darc* project is more configurable by environment variables. For more information, please refer to the *environment variable configuration* documentations.

The *darc* project provides a simple CLI:

```
usage: darc [-h] [-v] -t {crawler,loader} [-f FILE] ...

the darkweb crawling swiss army knife

positional arguments:
  link                  links to craw

optional arguments:
  -h, --help            show this help message and exit
  -v, --version         show program's version number and exit
  -t {crawler,loader}, --type {crawler,loader}
                        type of worker process
  -f FILE, --file FILE  read links from file
```

It can also be called through module entrypoint:

```
python -m python-darc ...
```

Note: The link files can contain **comment** lines, which should start with `#`. Empty lines and comment lines will be ignored when loading.

CHAPTER

THIRTEEN

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PYTHON MODULE INDEX

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